Urban Vibrancy and Value Creation

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City level differences in industry-adjusted Tobin's q, an estimate of the value created for shareholders, are large, and have widened sharply over the last twenty years. Proxies for a city's appeal to a "creative class" of workers, such as existing education rates and favorable weather, are strongly associated with Tobin's q, both in levels and changes. These results indicate that shareholders have captured a significant portion of the benefits associated with superior locations. The higher stock prices of firms in these locations appear to be driven by *future* growth opportunities, rather than improvements in *current* operating efficiency.

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1 Introduction

Several decades of recent research in urban economics demonstrate that there exist large and persistent differences not only between urban and rural areas, but also between cities. Dramatic disparities in wages, real estate prices, rents, and various measures of productivity have been documented, and rather than narrowing over time, such cross-city heterogeneity has expanded.[1] Although the specific reasons why some areas prosper so much more than others are debatable – in particular the role played by agglomeration – there is little debate that physical location, now more than ever, is systematically related to a host of outcomes of interest to economists.

This paper, which builds on these insights from the urban economics literature, explores how the location of firms' headquarters affects their abilities to create value for their shareholders. Specifically, using the ratio of a firm's market value to that of its invested capital (Tobin's q) to approximate value creation, we ask whether there are meaningful differences across headquarter cities, after controlling for industry effects. The results indicate that: 1) Industry-adjusted q ratios differ widely across cities, 2) these differences have widened sharply over the last 20 years, and 3) cities associated value creation have distinct characteristics that promote growth opportunities for resident firms.

Given that many measures of output and performance vary geographically, it is fair to first ask what, if anything, we learn that is special by examining geographic patterns in the value created for public shareholders. In our view, there are two main reasons.

The first concerns how the benefits of a superior location are divided between various stakeholders.[2] Most standard models (e.g., Rosen-Roback) assume mobile and perfectly competitive firms that compete away any rents from location-based productivity differences, leaving any surplus (or deficit) to be captured by the less mobile resources – specifically land owners, and if there are migration costs, workers. However, if firms have market power, or if for other reasons capi-

[1] For example, Van Nieuwerburgh and Weill (2010) and Gyourko, Mayer, and Sinai (2013) both document increased dispersion in real estate prices over the last several decades. As for wages, Baum-Snow and Pavan (2012) show that the gap between large and small cities has grown considerably since 1980. With respect to innovation, Sonn and Storper (2008) and Kwon, Lee, Lee, Oh (2017) both show that patent citations are increasingly geographically concentrated, complementing earlier work that documents significant spatial clustering in R&D (Jaffe, Trajtenberg and Henderson (1993), Audretsch and Feldman 1994, Feldman (1994), and Thompson and Fox-Kean (2005)).

[2] Recent examples include Hornbeck and Moretti (2015) and Hseih and Moretti (2017), both of which provide empirical estimates of the extent to which land owners and workers share in the surplus associated with local shocks to total factor productivity.

tal is not perfectly mobile (e.g., there are adjustment costs), some of the surplus will accrue to shareholders. Although casual empiricism suggests that some metro areas seem disproportionately associated with shareholder value creation,[3] the extent to which firm values systematically differ in the cross-section of cities has not been systematically studied in the extant literature.

A second contribution relates to measurement. Before considering how the effects of local productivity differences are divided between the relevant stakeholders, productivity itself must be quantified. As described in Rosenthal and Strange (2004), researchers have taken two broad approaches. The first attempts to estimate productivity functions directly using data on output (e.g., units sold, revenues) and inputs (e.g., amount and/or cost of materials), using either plant-level or accounting data (e.g., Henderson (2003)). The second is indirect, and uses variables presumably related to productivity, such as a city's growth in population and/or new establishments,[4] wages,[5] or rents.[6] [7]

Although such approaches are particularly well suited to measure the productivity of existing plants and factories, their ability to capture value creation linked to future productivity is less obvious. In particular, design, innovation, engineering and similar 'creative' activities are likely to influence a firm's profitability and/or other value-added measure years, or even decades into the future. In such cases, a forward-looking measure of long-run value creation – a natural feature of securities prices – adds a complementary perspective to studies that characterize city-level productivity differences mostly with flow, rather than stock, variables. As we will see, this ends up being an important distinction, not only conceptually, but for identifying which cities constitute superior locations for value creation.

[3]For example, consider that as of year-end 2015, over two thirds of the market capitalization of the 50 largest new firms having gone public since 1980 are headquartered in just two major metropolitan areas: the Bay Area and Seattle. This phenomenon spans various sectors, and features household names such as Apple, Google, Gilead, PayPal, Ross Stores, Amazon, Microsoft, Zillow, Costco, and Starbucks. See Appendix Table A1 for a complete list.

[4]Examples include Henderson, Kuncoro, and Turner (1995) and Glaeser, Kallal, Scheinkman and Shleifer (1992), both of which relate urban agglomeration to city-level employment growth. Likewise, Rosenthal and Strange (2003) explores the link between local productivity shocks and the creation of new establishments.

[5] Studies that use wages to infer differences in regional productivity include Glaeser and Mare (2001), Wheaton and Lewis (2002), Glaeser (2011), Combes, Duranton, and Gobillon (2008, 2012), and de la Roca and Puga (2017).

[6]See, for example, Dekle and Eaton (1999).

[7]Because of the link between wages, rents and preferences for amenities, cross-city changes in these variables capture more than just changes in productivity. Indeed, Gyourko, Mayer, and Sinai (2013) describe a setting where real estate prices in high amenity cities (what they refer superstar cities) respond to macro shifts in the income distribution, rather than local productivity differences. They argue, for example, that the Bay area would have become more expensive relative to other regions, even in the absence of a positive location specific shock, if a macro shock to income increased the demand for Bay Area specific amenities.

We start with a descriptive exercise in Section 3, comparing average Tobin's q between cities, and time-series variation within them. The sample consists of the 38 U.S. cities that contain at least five public firms for every year 1975-2014, and the firms headquartered in them. This results in about 80,000 firm-year observations, which in the average year, collectively account for 90% of the total market capitalization of domestic equities.

In panel regressions of firm-year level q on city fixed effects, year fixed effects, and industry fixed effects, we find that Tobin's q is strongly associated with headquarter location, with the effect growing over time. From 1975-1994, the F-statistic on city fixed effects is 3.7 (incremental R^2 of 2.4%), corresponding to a p-value less than 0.1%. However, in the period after 1995, the F-stat increases sharply to 8.8 (incremental R^2 of 3.3%), which bootstrap analysis indicates is significantly greater than that in the pre-1995 period.[8]

Importantly, the growing importance of headquarter location for value creation represents more than just one or two "superstar" cities. Indeed, firms headquartered in Silicon Valley have experienced some of the sharpest valuation increases over the last twenty years; but other areas with large gains include Boston, Minneapolis, Seattle, and Washington D.C. At the other end, declines in average q are observed in manufacturing centers, such as Cleveland and St. Louis, as well as in energy hubs Oklahoma City and Houston. As above, such comparisons account for differences in industrial composition.

The effects described above are not limited to small firms, whose performance might be directly affected by local economic conditions (e.g., regional retailers, banks, etc). Rather, we find that the significance of city effects does not meaningfully differ between large and small firms, and if anything is more important for the former. Because large companies have less localized operations and customer bases, this suggests that the observed city-specific patterns in value creation are at least partly attributable to *upper management,* who tend to be housed at corporate headquarters.[9] Put differently, even though firms (especially large ones) may have augmented their collective

[8]We select the year 1995 to correspond roughly with the inflection point of the IT wave, with year-over-year growth in websites of over 1000% from 1993 through 1997. Shifting the breakpoint a few years in either direction, or considering the entire decade of the 1990s as a single breakpoint, gives similar results (see Section 3.3). These patterns are robust to alternative definitions of industrial sectors, such as 3-digit SIC, 4-digit SIC, or Fama-French 48. See Table 3.

[9]Bloom, Sadun, and Van Reenen (2012) reach a similar conclusion in an international setting, comparing IT-related productivity in European establishments owned by: 1) US-based multinational corporations, and 2) domestic (European) firms. The authors attribute the higher productivity of the former establishments to superior management practices originating in the US.

geographic footprint – Amazon's search for a "second headquarters" being a recent example – our findings point to a special role for corporate headquarters, where value-generating activities appear to be increasingly concentrated.

Importantly, the growing relevance of headquarter location is not a repackaging of the result that *industrial clusters*, such as energy hub Houston or Silicon Valley for technology, may have become more productive. Although such industrial clustering does appear to create value , our findings point to a more generalized urban agglomeration that spans traditional industrial sectors. For example, when splitting the sample based on a firm's presence in an industrial cluster, we observe little difference in the marginal increase in explanatory power of headquarter cities over time. Likewise, a secondary cross-sectional cut on high- versus low-R&D industries (high-R&D industries tend to geographically cluster more than ones with less R&D) reveals a similar finding, with both types of industries benefiting (or alternatively paying a cost) from being located in a superior (inferior) headquarter location. One factor that *does* appear to matter is firm age, with younger firms – defined as those having been public fewer than 10 years – being apparently more sensitive to urban agglomeration (discussed in more detail below).

The next part of the paper pivots to the cross-section of cities (rather than firms), digging deeper into urban attributes that appear most related to shareholder value creation. While a number of factors likely play a role, we focus our analysis on human capital – specifically, the differential ability of some cities to create or attract a "creative class" of workers (Florida (2002) Moretti (2012)). For this analysis, we link the levels and changes in Tobin's q to higher education rates and good weather, which prior studies indicate are correlated with a city's ability to attract and/or develop human capital. Both have been shown to predict wage and population growth, and serve as our proxies for the immigration and/or development of high value-added workers that may influence firm values.[10] When we relate these to Tobin's q, we are thus testing the joint hypothesis that productivity has grown faster in cities with high stocks of human capital, and that shareholders of public companies share in the resulting surplus.

Confirming prior work, we find that cities with the highest levels of education (measured in

[10]Rauch (1993), Moretti (2004a), and Shapiro (2006) document that controlling for observable worker attributes, wages are higher in more educated cities, suggesting that productivity is also higher. Likewise, city-level consumption amenities have dramatically grown in importance, due in large part to growing incomes (Glaeser, Kolko, and Saiz (2001)). For example, pleasant weather – cooler summers, warmer winters, and less rain – has become strongly related to migration patterns over the last several decades (Rappaport (2007)).

1970, which predates the start of our sample) and most pleasant weather experience sharp spikes in land values and wages. Moreover, we find strong increases in Tobin's q. On an industry-adjusted basis, Tobin's q for the five most educated cities (in 1970) have increased 0.19 more than those for the five least educated cities. A similar comparison, using either maximum July temperature, or an index of pleasant weather that also penalizes cities for cold Januaries and/or precipitation, gives a difference in Tobin's q of 0.31.[11]

A complementary way to characterize the differential creation of shareholder value across headquarter cities is with stock returns.[12] Ranking cities using either college education or weather, we document excess returns mostly in the 1990s, corresponding to the IT revolution. More specifically, differences between high- and low-education cities and/or good- and bad-weather cities are visible around 1993, and continue to widen through the rest of the decade. Interestingly, although the technology sector crashed in early 2000, once we account for industry affiliation, we observe no corresponding "city bust" between, say, San Francisco and Charlotte, suggesting long-lasting differences between cities' abilities to create shareholder value.[13]

As mentioned at the beginning of the introduction, another key benefit of examining capitalized financial variables, such as Tobin's q, is that it captures not only the firm's profitability in the short run, but also profitability expected to manifest over the long run, via growth opportunities. By considering these contributions separately, we thus gain a better sense of the relevant horizon over which city-specific differences in productivity are most influential for stock prices. To explore this distinction, we conduct a similar analysis as with Tobin's q, but on variables intended to primarily measure either a firm's *current operating efficiency*, or the value of its *future growth opportunities*.

As it turns out, our benchmark results regarding Tobin's q appear to be driven almost exclusively

[11] Although the motivation for the human capital proxies come from the literature on urban growth, weather and/or education are important for Tobin's q beyond their effects on population growth. Indeed, while both a city's size and population growth are positively related to industry-adjusted Tobin's q ratios, neither has a meaningful impact on the explanatory power of the education or weather variables.

[12] Although such an approach may somewhat understate city-specific valuation creation because measurement starts only after a firm has gone public (whereas a firm's Tobin's q has the capacity value created prior to its IPO), the fact that stock returns captures unexpected changes allows us to be specific about *when* the market began to recognize disparities in cities' abilities to create shareholder value.

[13] This suggests that differences in city-level average q are difficult to reconcile with differences in expected returns. Eisfeldt and Papanikolaou (2013) documents higher returns among firms with high levels of *organizational capital*, which are productivity enhancements linked to a firm's key employees. In their model, the possibility of losing key employees generates a risk premium. Whereas we do not explore whether such mobility of high-skill workers differs between cities, to the extent that a city's industry-adjusted q captures organizational capital, the results here are consistent with their theoretical predictions, except applied to the cross-section of cities rather than firms.

by differences in expected future growth, rather than the profitability of current assets-in-place. More specifically, cities with the highest values of industry-adjusted Tobin's q also tend to have high capital expenditures and R&D, both of which measure managerial expectations of growth opportunities. On the other hand, not only is operating performance no better in high-q cities, but is uniformly *worse*, both in the cross-section and time-series. As for why this is so, one hypothesis is that high-q cities have lower-than-average profit margins because locally supplied inputs – in particularly land and labor – are most expensive. We verify this empirically: operating profits highest in cities with low wages and cheap real estate (both in levels and changes), precisely the cities where Tobin's q ratios (and changes in these ratios) are lowest.[14]

Combining this set of findings with those above, a coherent story for the entire set of results emerges:

1. The variation in shareholder value creation has become more disperse across headquarter cities, and is not limited to firms in a few industries and/or in industrial clusters;

2. A city's ability to create value appears strongly related to its ability to attract and/or develop human capital, as measured through education rates and weather variables;

3. Firms headquartered in high-q cities tend to invest at very high rates, driving up demand for local workers and space, thus driving up wages and rents;

4. In turn, these higher costs put downward pressure on current corporate profits, such that high-q cities may appear less productive in the short run (i.e., through accounting profits), but not over long horizons (stock prices).

Our first set of findings – increased dispersion in valuation ratios across cities – is, to our knowledge, new to the literature, and contributes to a growing number of studies exploring the link between *where* a firm operates and *how* it performs. Whereas the earliest finance and geography studies approached the issue from the perspective of investors, emphasizing regional differences in information (Coval and Moskowitz (1999, 2001)) or discount rates (Pirinsky and Wang (2006), Hong, Kubik, and Stein (2008)), recent studies attempt to understand how geographic factors

[14]See Moretti (2013) which, in studying the wage gap between college and high school graduates, finds that a substantial portion reflects cost-of-living adjustments, as college graduates are more likely to settle in high-cost cities. See also Eeckhout, Pinheiro, and Schmidheiny (2014).

impact a firm's real business decisions.[15] And, although we focus on the role human capital plays in the regional distribution of growth opportunities, other geographic factors such as a healthy venture capital sector or local tax rates (Moretti and Wilson (forthcoming)) may play complementary roles, and deserve future study.

The results relating a city's education levels and weather to firm values contribute to urban economics studies exploring contemporary determinants of city growth. Importantly however, while the link between city size and productivity is well established, we find that weather and education are related to Tobin's q beyond their effects on population.[16] Thus, a city's ability to create value appears less about adding rank-and-file workers, and more about attracting the "right" people – highly skilled, educated workers in industries where productivity spillovers play a crucial role. In this way, our results directly complement Bacoloda, Blumb, and Strange (2009) and Glaeser and Resseger (2010), both of which document that agglomeration effects are stronger in cities with high concentrations of highly skill workers.

Finally, we regard the apparent disconnect between Tobin's q (a capitalized variable) and operating performance (a flow variable) as a critical distinction, because it underscores the importance of how local productivity is measured. Whereas most value-added measures capture existing productivity,[17] capitalized measures like Tobin's q reflect benefits perhaps into the far distant future. Moreover, beyond the conceptual point, it dramatically changes the set of cities identified as being the most "productive." For example, in 2015, of the top-10 cities ranked in terms of industry-adjusted return on assets, none have significantly positive industry-adjusted Tobin's q, and all but two are negative. In this way, our stock-based findings provide support for city-level measures of productivity that rely on factor prices, with the idea that firms willing to pay higher costs must derive an offsetting benefit.

[15] For example, studies have shown the impact of firm location on public firm investment (Dougal, Parsons, and Titman, 2015); fraud (Parsons, Sulaeman, Titman, 2018a and 2018b); innovation (Matray, 2014); CEO compensation (Francis et al., 2016); payout policy (Becker, Ivkovic, and Weisbenner, 2011; John, Knyazeva, and Knyazeva, 2011); equity issuance (Loughran, 2008); and merger activity (Almazan, De Motta, Titman, and Uysal, 2010).

[16] See, for example, Glaeser and Mare (2001), Glaeser (2011), Combes, Duranton, Gobillon, Puga, and Roux (2012), Behrens, Duranton, and Robert-Nicoud (2014), and de la Roca and Puga (2017).

[17] For an excellent contemporary review on value-added measures and their use in the rent-sharing literature, see Card, Carduso, Heining, and Kline (2016). See also Syverson (2011) for further discussion regarding approaches to measuring productivity differentials.

2 Data

To construct our sample, we start with all public companies in COMPUSTAT traded on the NYSE, NASDAQ, or AMEX over the years 1975 – 2015. We then obtain each firm's historical headquarter location using data from a variety of sources. COMPUSTAT lists the zip code of each firm's *current* city of headquarters, but this will only be valid for the entire sample period for firms having never moved headquarters. Thus, we supplement these data by scraping the header portion from 10-K annual filings for the year 1994-2015, which lists the headquarter city for each year. We obtain supplement data on headquarter location from the Compact Disclosure database (1988-1993), and perform manual searches for many of the remaining firm-years. Given that firms switch headquarters infrequently,[18] we estimate that no more than 0.1% of our firm-year observations have stale headquarters, and that these will be limited to the early part of the sample.

To map zip codes to headquarter city, we aggregate the "Large Central Metro" and "Large Fringe Metro" counties, as designated by the 2006 National Center for Health Statistics (NCHS) Urban Rural Classification Scheme for Counties, in each core-based statistical area (CBSA). We then trim the list of headquarter cities to those which, for every year in the 4-decade sample, had at least five public firms headquartered therein. Our sample consists of all firms headquartered in one of these 32 cities. In the average year, these firms represent about 86% of the total market capitalization of the NYSE/NASDAQ/AMEX universe.

Table 1 summarizes various demographic and firm-level variables for each city. Population, shown in millions in the first column, ranges from 17.7 million (New York City) to slightly under one million (Richmond, VA), with an interquartile range of 2.6 million to 9.2 million. Shown adjacent are average population growth rates. Generally, population growth has flagged in the Northeast, averaging less than 1% for Boston (0.53%), Hartford (0.36%), New York City (0.38%), and Philadelphia (0.37%). Ex-manufacturing hubs in the Midwest have fared even worse, with Pittsburgh (-0.31%), Cleveland (-0.19%), and Detroit (-0.08%) all having suffered population declines. Offsetting these are cities in the Southeast, Sun Belt, and West, with the largest percentage wise gains seen in Phoenix (3.00%), Atlanta (2.52%), and Dallas (2.42%).

The third and fourth columns present, respectively, the average number of publicly traded

[18] We observe 691 headquarter relocations, or about 17 relocations per year.

firms and market capitalization. Unsurprisingly, larger cities are home to more firms, with a cross-city correlation of 85%. Likewise, as with population, column four shows that the total market capitalization of the sample is disproportionately concentrated in a few cities, with New York, Chicago, Dallas, San Francisco, and San Jose contributing as much as all other cities combined.

Table 1 also reports city-level averages for the variables used in our study: Tobin's q, investment rates, research and development, operating income scaled by sales, return on assets, and monthly stock returns. Details regarding variable construction are provided in Appendix Table A2. All firm-level variables are winsorized at the one percent level to minimize the influence of outliers. Population figures are constructed using data from the Bureau of Economic Analysis (BEA) Regional Economic Accounts. Industry classifications are defined as 2-digit Standard Industrial Classification (SIC) code groupings.

3 Geography and Tobin's q

We begin by estimating differences in valuation ratios (Tobin's q) across major U.S. cities, with an eye on how regional heterogeneity may have evolved over time. Section 3.1 starts with univariate differences, followed by Section 3.2, which formalizes these patterns in a regression framework. We then conclude with some robustness and extensions to our main results in section 3.3.

3.1 Univariate comparisons

For each city's 40-year history, Table 1 shows the average of several firm-level variables. Our specific interest is Tobin's q, the average of which clearly differs between cities. On the high end, firms headquartered in the Bay Area tend to have very high valuation ratios – 2.7 on average for both San Francisco and San Jose-based firms – with other West Coast technology hubs Seattle and San Diego not far behind. Relatively high valuations are also observed in Minneapolis, Washington D.C., and Boston, all of which have Tobin's q averages that exceed 2, versus an overall average of 1.8 excluding firms from California.

A large cluster of cities in the middle of the distribution includes large, fairly well-diversified cities such as Altanta (1.9), Chicago (1.8), Dallas (1.7), New York (1.8), and Philadelphia (1.8), and Phoenix (1.8). At the lower end are many former manufacturing hubs, many in the Midwest and

Northeast. The lowest average valuation ratios are observed in Cleveland (1.3), Charlotte (1.4), Richmond (1.4), Hartford (1.5), Milwaukee (1.5), Houston (1.6), and Pittsburgh (1.6). In a unified regression including all firm-year observations (roughly 66,000 observations), the null hypothesis that Tobin's q is the same across cities is strongly rejected ($p < 0.001$).

For our purposes, of greater interest is how this city-level heterogeneity has changed over time, particularly around the IT revolution beginning in the early 1990s. Figure 1 plots the average, value-weighted Tobin's q for each city in two sub-periods: 1975-1994 (left) and 1995-2015 (right). Lines connect a city's average q in the early period to that in the later period. For example, Kansas City had the highest ranked average q in the early period, but slipped to 20^{th} when measured after 1995.

Two things stand out about Figure 1. First, just eyeballing the differences between time periods, it is clear that the average differences between cities has expanded considerably in the latter two decades. The standard deviation in q across cities is 0.35 in the first twenty years, but doubles to 0.69 in the last two decades. Second, although there are dramatic exceptions such as San Francisco (going from 15^{th} to 5^{th}), Portland (25^{th} to 10^{th}), Cleveland (13^{th} to 26^{rd}), and Providence (14^{th} to 28^{rd}), there is considerable persistence in the ordinal rankings. For example, roughly half of the cities change 5 or fewer rank positions. Among the cities ranked in the bottom ten in the first half of the sample, only Portland and San Francisco rank above the median afterward. At the other end, Kansas City (1^{st} to 20^{th}) and Columbus (9^{th} to 17^{th}) are the only ones originally in the top ten to dip below the median.

3.2 Fixed effects regressions

Table 2 formalizes these differences in a regression framework. We estimate regressions of Tobin's q, separately for the twenty year period from 1975-1994, and the following two decades (1995-2014). Of interest are the estimated coefficients on headquarter fixed effects and in particular, whether their significance changes over time.

Benchmark estimates. Columns 1 and 2 show the results when only year and headquarter city fixed effects are included. In the early half of the sample, the F-statistic on the city fixed effects takes a value of 5.31 ($p < 0.01$), indicating significant geographic differences in average valuation ratios. However, headquarter location appears to be much more important in the latter two decades,

as evidenced by an F-statistic of almost 20. After 1995, relative to Chicago (the omitted city), about half the cities have significant point estimates, with seven positive and eight negative.

While the dramatic ascent of the San Francisco Bay Area is clear, the estimated city effects suggest that there is more to the story. Relative to Chicago, firms in Boston, Seattle, and Washington D.C. have experienced gains on par with those observed in Silicon Valley. On the other hand, manufacturing hubs such as Cleveland and St. Louis have fared much poorer, with marginally weaker declines observed in Hartford, Houston, Richmond, and Kansas City.

Controlling for industry. When interpreting these findings, an important observation is that cities differ in terms of industrial composition. Although a number of cities are well diversified across sectors – examples include Chicago, Philadelphia, and New York – many others are relatively concentrated in one or a few sectors. For example, in each of the following cities, at least 30% of resident firms are from the same industrial sector: Detroit (transportation equipment), Houston (oil/gas), Oklahoma City (oil/gas), San Jose (electronic and other electrical equipment and components), and Seattle (business services).

To account for potential heterogeneity in the distribution of sectors across regions, columns 3 and 4 add industry fixed effects constructed using 2-digit SIC codes.[19] As seen, controlling for industry also reduces the significance of the headquarter fixed effects, most so in the latter two decades. Nevertheless, the importance of location remains much more important in the second half of the sample ($F = 11.34$) compared to the first ($F = 4.69$). As before, bootstraps indicate that the difference in estimated city fixed effects pre- and post-1995 is highly significant ($p < 0.01$).

Firm life cycles. Another possible explanation is that average firm age tends to differ between cities. For example, San Francisco has a disproportionate concentration of young companies, many in technology. If initial public offerings tend to cluster disproportionately in some cities rather than others, and if such young firms have high average q (they do), perhaps this explains some of the cross-city variation we observe. To address this possibility, we include in the regression a series of non-parametric dummies for firm age (years being publicly listed): < 5 years, 5-10, 10-15, 15-20, 20-25, and > 25 years. The fraction of firm-years in each bin are, respectively, 27%, 20%, 16%, 11%, 7% and 19%.

[19] To minimize the influence of outliers, industry effects are only estimated for years in which at least five firms sharing the same 2-digit SIC code. Otherwise, firms are re-classified as SIC 2-Digit 99, or "Nonclassifiable Establishments." This procedure yields 27 industries.

As indicated in columns 5 and 6, these controls provide some account for the distribution of value creation across headquarter cities, but the effect is modest. Even with the non-parametric age dummies as controls, but the F-statistic is still over twice as large in the last two decades compared to the first ($F = 3.68$ versus $F = 8.83$), a difference significant at the 1% level.

Discussion. Before proceeding, we note two features of these empirical patterns. First, similar persistence to what we observed in Figure 1 carries through in regressions that control for temporal, industry, and life cycle effects. In column 2 of Table 2 for example (only year fixed effects), of the fifteen cities with estimates significant at the 5% level in the latter half of the sample, all have point estimates of the same sign in the earlier half (column 1) with the exception of Washington D.C.. Or, making the comparison in reverse, every statistically significant city in the first 20 years (column 1) but two remains significant, and with the same sign, in the latter half (column 2). Similar persistence is observed in the adjacent columns which control, respectively, for industry and firm age. These observations, combined with the general strengthening of the city dummies, suggest that the technology revolution that began in the mid-1990s primarily served to reinforce whatever cross-city differences existed beforehand.

Second, the magnitudes reported in Table 2 are substantial. Examining the last two columns of Table 2, the estimates suggest that even after controlling for industry, time, and firm age, average valuations across cities can easily differ by 25% or more. Even ignoring the five lowest and five highest city-level coefficients, the average firm in Minneapolis ($7th$ highest) has a Tobin's q 0.17 higher than those in Chicago, whereas Dallas-headquartered firms ($9th$ lowest) have deficits of almost the same magnitude (-0.14). Using Chicago' post-1995 average q (1.99) as a benchmark, these estimates imply that the average q (net of controls) in Minneapolis is almost 17% higher ($1.99 + 0.17 = 2.16$) compared to Dallas ($1.99 - 0.14 = 1.85$). At the more extreme ends of the distribution, the percentage differences are larger still.

3.3 Robustness and alternative specifications

In addition to year, industry, and firm age controls, we conducted a number of robustness checks and extensions to our benchmark specifications.

Alternative industry controls. Panel A of Table 3 presents our key result when sectors are defined differently. Using three-digit SIC codes (columns 1 and 2) rather than two (Table 2), the

F-statistic on city dummies still increases markedly after 1995 ($F = 7.00$) versus before ($F = 2.94$), a statistically significant difference. Results using a more refined industry definition (4-digit SIC) are shown in columns 3 and 4, giving an even stronger result than our benchmark specification. Finally, the last two columns indicate that city fixed effects are collectively and significantly more important after 1995, when industries are defined using Fama and French's (48) classification. In addition, we have also experimented with dynamic industry controls via *industry* $\times$ *year* fixed effects (not tabulated), which has little effect on the results. Specifically, interacting 2-digit-SIC codes with each year gives an F-statistic on headquarter fixed effects of 4.66 in the first two decades, versus 11.36 in the latter two. This difference is statistically significant at the 1% level.

Alternative metropolitan classifications. In the next panel (B) of Table 3, we vary the region that constitutes a "city." The geographical unit in the first two columns is smaller than in our main specification, including only firms headquartered in the core counties surrounding a CBSA's principle city. Despite decreasing the sample size by about 40% and the number of estimable cities from 38 to 31, the pre- and post-1995 change in city fixed effects is similar, if not slightly stronger, compared to Table 2. When the geographic unit is expanded relative to our benchmark definition (as in columns 3 and 4), resulting in a slightly (4%) larger sample and four additional cities estimated, the results remain quantitatively and qualitatively similar.

Alternative date breakpoints. Table 2 compared the F-statistics for headquarter cities using a single year (1995) as ushering in the information age. In reality, the entire 1990s were characterized by information and technological innovations which, together, contributed to the importance of local spillovers for firm value. When thinking about which alternative dates might make sense, it seems clear that 1990 is too early (the first website wasn't online until a year later)[20] and likewise, that the dot-com bust (2000) is probably too late. We choose 1995 because it coincides with the midpoint of the steepest percentage wise growth in the number of websites, from about 100 in 1993 to over 1,000,000 in 1997.

However, the estimates in the final panel (C) of Table 3 indicates that there is little special about this particular year. If we back up three years to 1992 (columns 1 and 2), or advance three years to 1998 (columns 3 and 4), the change in the F-statistic for city fixed effects is very similar

[20]The first website (http://info.cern.ch/hypertext/WWW/TheProject.html.), created by Tim Berners-Lee, went live on August 6, 1991. Incidentally, the content of the site was dedicated mostly to how to create a website, and explained the use of hypertext.

to our baseline model. In the last pair of columns, we are completely agnostic about the specific transition year, considering the entire 1990s decade as the 'breakpoint.' Here too, the F-statistic for headquarter is over twice as large after 2000 ($F = 6.30$) compared to 1989 and before ($F = 2.81$). In untabulated analysis, treating the entire 1990-2000 decade as a single break point, and testing for differences in the significance of city-level F-statistics in the pre-1990 and post-2000 periods, gives similar results to that reported in the table.

3.4 City-specific value creation in the cross-section of firms

The prior results suggest that headquarter location is increasingly informative about firm values. However, because they only report *average* effects, the findings are not specific about the types of firms that benefit more, or less, from regional factors. This section reports results pertaining to this question. In particular, we look at the extent to which the value of headquarter location depends on the size, 'techiness,' and age of firms.

Firm size. The first question we ask is whether the importance of location is more (or less) pronounced for firms of different sizes, and whether this has changed over time. We are interested in this distinction for several reasons. First, for both large and small firms, headquarters contains a heavy concentration of top managers and employees involved in high creative activities such as strategy, idea generation, and product design. However, because large firms have more geographically disperse customers and manufacturing facilities (often overseas), a cross-sectional size cut provides some information about whether locational attributes are most relevant for a firm's 'creative talent' versus its rank-and-file employees.

The alternative possibility, which a cross-sectional cut on firm size addresses, is that a city's local economic conditions are a prime determinant of a firm's prospects and performance. Such possibilities might include 1) local tax rates;[21] 2) fluctuations in property values (Chaney, Sraer, and Thesmar (2012)); 3) direct exposure to the local economy, as would be the case for regionalized retailers; 4) capital market conditions, via reliance on local banks or undiversified equity investors (e.g., Coval and Moskowitz (1999). While each of these factors have the potential to influence firm values, it seems clear that they should matter more for small firms, which have greater exposure

[21] Moretti and Wilson's recent work on personal tax rates should be interpreted here less as an alternative to human capital flows influencing firm values, and more as a microfoundation for why some cities might be increasingly attractive to high value-added workers

to local financial institutions, equity investors, and customers.

As Panel A of Table 4 indicates, for the early half of the sample, location is nearly identical between large and small firms. However, in the last twenty years, headquarter location has become dramatically more important for large firms, while the significance for small firms remains unchanged. Using the median market capitalization across the sample to define the large-small firm breakpoint, only the half comprised of larger firms shows a significant increase (F=2.85 before 1995, and F=8.27 after 1995). Among firms below the size threshold, although headquarter city fixed effects are significant both before and after 1995, the statistical significance is almost identical (F=2.97 and F=3.17, respectively). From this evidence, we conclude that the importance of local economic conditions is mostly a small-firm phenomenon. Differences in cities' collective appeal to high value-added workers, on the other hand, provides a more satisfactory account of the observed patterns, particularly the increased importance of headquarter location for large firms.

Tech clustering. A second cross-sectional cut explores whether the ascent of areas like the Bay Area and Boston are limited to a few key industries – in particular technology – or whether firms across the industrial spectrum share in the gains. The specific concern is that cities where we have observed the most value creation (e.g., Boston, Seattle) tend to have high concentrations of firms in technology or knowledge-intensive industries. If firms in such tech clusters (such as Silicon Valley's Hewlett-Packard) differ systematically from their more isolated industrial peers (such as IBM, located in rural New York), then the increased significance of city fixed effects may be driven by firm values being increasingly sensitive to the benefits of industrial clustering.[22]

Fortunately, the data allow us to test this possibility directly. For each city-year pairing, we identify an industry cluster as containing 10% or more, measured in terms of market capitalization, of all firms in the 2-digit SIC industrial sector.[23]. Examples of clusters include Houston (energy), Detroit (automobiles), Seattle (software), and the San Francisco Bay Area (software and technology). With this definition, slightly less than 40% of firms are assigned to an industrial cluster. Of interest is whether the increased significance of city fixed effects in the latter two decades (as seen in the full sample) differs between clusters and non-clusters.

Panel B of Table 4 shows the results. Comparing the difference in F-statistics across the two

[22]Statistically, although we have already controlled for industry effects in our analysis, industry and/or industry-year fixed effects may fail to capture important heterogeneity in the types of firms located in certain areas.

[23]Results are similar if we define clusters using the number of firms rather than market capitalization.

groups, we see that while there is a marginal increase among clustered firms (F=2.48 prior to 1995; F=3.59 after 1995), the difference is much more pronounced for firms outside industrial clusters (F=2.78; F=5.27). Our interpretation of this evidence is that although industrial clusters may have also been an important driver of firm value, there appear to be a set of urban attributes that influence firm productivity and prospects across a wide variety of industrial sectors.

Research and development. We next split the sample using the intensity of R&D expenditures at the industry level. Our motivation for examining this variable is that the most innovative sectors depend on knowledge spillovers, which are facilitated by face-to-face contact.[24] Consequently, we hypothesize that firms in industries with high R&D intensity may stand to gain the most from being headquartered in a "vibrant" location.

During each year, and for each 2-digit SIC industry, we sum research and development expenses across all firms, and divide by the sum (across the industry) of lagged assets. We then rank industries by this aggregate measure, and split the sample by below/above median, creating two samples of roughly the same size each year. We then estimate city headquarter fixed effects separately for these two groups, both pre-1995 and post-1995.

Panel C of Table 4 shows the results. Starting with columns 1 and 3, we see that the F-values for headquarter fixed effects are very similar (2.95 versus 2.78) for both high- and low-R&D industries. Likewise, columns 2 and 4 indicate that in each case, headquarter cities have become more informative about Tobin's q, and approximately to the same degree for each group, after the mid 1990s. Thus, as in Panel B, the cross-sectional cuts here suggest that the increased importance of headquarter cities does not seem to differ between high- and low-R&D expenditures at the industry level.

Thus, together with the cross-sectional analysis on industrial clusters (panel B), these findings suggest that the increase in Tobin's q ratios in cities conventionally identified as technology hubs like Seattle, Boston, and the Bay Area were *not* limited to firms in high-tech industries.

New versus old firms. The final panel (D) shows the results sorted by the number of years since a firm's IPO. Here, as above, we are interested in whether the impact of headquarter location varies by position in a firm's life cycle. Here, we hypothesize that young firms are disproportionately trying

[24] As an example, contrast the tight spatial clustering between Apple, Facebook, Google, Cisco, and other technology firms clustering in Silicon Valley, and the relatively disperse distribution in Houston's energy firms Conono-Philips (far west), Apache (Galleria), Halliburton (north central).

to develop growth opportunities, and that some cities are particularly good "nurseries" for ideas (Duranton and Puga (2001)). Note that although this cross-sectional cut is conceptually similar to R&D expenditures, there are two important differences. First, although heavy investments in R&D are probably a reliable indicator of growth opportunities, the converse is less clear. For example, consider financial services, banks, retailers, and energy firms, all of which may experience rapid growth, but without conventional R&D expenses. In these cases, firm age may be a better proxy for growth potential. Second, note that the division in Panel C is at the industry, not firm level.

In Panel D, the leftmost pair of columns consists of firms having been public for ten or fewer years, and in columns 3 and 4, the estimation features all other firm-year observations (i.e., firms having been public for more than 10 years).[25]. Starting with columns 1 and 2, we see that among young firms, the effect of headquarter location is much more significant over the last twenty years ($F = 8.09$), compared to the prior two decades ($F = 4.27$), a significant increase. On the other hand, for firms having been public a decade or more (columns 3 and 4), city fixed effects appear less important, both in a static and dynamic sense. Indeed, in the first twenty years, headquarters are not significant ($F = 1.32$; $p = 0.12$), only becoming so after 1995 ($F = 3.52$; $p < 0.01$).

4 Winning and losing cities

Summarizing the results to this point, headquarter location is increasingly informative about firm values (Section 3), particularly among young firms, for which the development of growth opportunities is likely of particular importance. In this section, we move to the cross-section from the perspective of cities, exploring which cities have experienced the sharpest gains in shareholder wealth. While there are likely to be a number of regional attributes that may influence locally headquartered companies, our analysis here focuses on an area's stock of human capital.

We examine two variables shown to be related to regional productivity and wages in the urban economics literature – *college education* and *good weather* – and use them to explain the regional dispersion in firm valuations. The basic idea is that cities either rich in, or able to attract, skilled workers were a kind of 'dry powder' for the technological revolution in the 1990s, and that the

[25]This ranking is inherently dynamic, implying that some firms will be classified as old firms for our entire sample (e.g., General Electric, Coca-Cola), and others will switch categories ten years after their initial public offering. For example, Cisco went public in February 1990, and accordingly, is classified as young until February 2000, and old afterward.

subsequent gains were ultimately reflected in market values.

4.1 College education

Our first measure of a city's human capital is the percent of its residents with a college degree. Several studies in the urban economics literature rely upon a similar measure of the quality of a city's workforce, including recent work by Moretti (2004a), Glaeser and Berry (2005), and Shapiro (2006). To minimize concerns about reverse causality, we calculate the percentage in 1970, which predates the beginning of our sample by five years.

In the first column of Table 5, we ask whether the percentage of a city's residents with a college degree in 1970 is related to the stock valuations of local firms. Importantly, we include an interaction with the post-1995 dummy variable, which allows the slopes to differ before and after the year 1995. In the first two decades, we estimate a coefficient of 2.42 ($p < 0.01$), indicating that before 1995, more educated cities tended to have higher valuation ratios. This magnitude suggests that a 2% change in college education rates (roughly the interquartile range between cities) is associated with a increase in q of about 0.03. However, as indicated by the interaction term, the spread in q between cities with initially high and low college education rates has dramatically expanded over the last two decades. After 1995, the same 2% would predict an increase in Tobin's q of $(1.37 + 6.12) * .02 = 0.15$, more than doubling the effect prior to 1995.

A complementary way of exploring the relation between education and Tobin's q is to conduct the analysis at the city-level, rather than at the firm-level. Using the estimates in the last two columns of Table 2, we take the difference in each city's industry-adjusted q between the early (pre-1995) and later (post-1995) periods, and plot these differences against education. Figure 2 shows this graphically. To gauge the magnitude of the slope of this line, compare a city with a college education rate of 15% (the average of all cities above the median) to a city with a rate of 10% (the average for all cities below the median). The regression estimate indicates that Tobin's q, on average, would be $4.57 \times (0.15 - 0.10) = 0.23$ units higher in the more educated city. Despite the x variable being a generated regressor, which introduces measurement error that biases the regression slope to zero, the estimated coefficient on college education is significant at the 1% level.

4.2 Good weather

Our second proxy for the strength of an area's human capital relates to weather. As documented by Rappaport (2007), throughout the twentieth century, U.S. residents have consistently moved to areas with good weather, in particular warmer winters and cooler, less humid summers. Rappaport interprets this increased appetite for good weather as resulting from growing incomes, i.e., the value of pleasant weather as a consumption amenity has increased. Regardless of the mechanism, our hypothesis is that cities with good weather are primed not only to experience population growth generally, but because prices in the best weather cities tend to be higher (e.g., San Francisco), these locations may be disproportionately attractive to workers of especially high skill or talent. It is these workers, we hypothesize, that have the largest impact on firm values.

Returning to Table 5, the second column shows the results that explain firm-year variation in Tobin's q using each city's average July temperature. As with college education, we allow for a structural break in the slope around the year 1995. The negative slope in the first two decades suggests that in the 1970s and 1980s, cities with hot summers tend to have lower than average valuation ratios. However, as with education rates, the importance of July temperature is about three times as strong over the last twenty years, as indicated by the significant ($p < 0.01$) interaction term.

To give a sense of the size of these regression estimates, a shift the size of the interquartile range in July temperature (9 degrees) is associated with a change in Tobin's q of $0.03 \times 9 = 0.27$, or about two-thirds of the standard deviation of Tobin's q across cities (0.38). A similar result obtains using each city's average July *heat index*, which takes into account relative humidity in addition to temperature (column 3). Here too, higher values, which indicate hotter and/or muggier weather, are associated with lower Tobin's q, with a more negative slope after 1995.

A perhaps more complete measure of good weather is the average annual number of "pleasant days," which require: 1) a maximum temperature no higher than 85 degrees F, 2) a minimum temperature no lower than 45 degrees F, 3) a mean temperature between 55 and 75 degrees F and 3) no measurable precipitation.[26] Cities on the West Coast rank highly in this dimension, with California cities owning the top four spots, followed by (perhaps more surprisingly) Seattle in fifth

[26] An interactive map with these data for most U.S. cities is available here: http://kellegous.com/j/2014/02/03/pleasant-places/.

place. The other extreme includes cities that regularly dip below 45 degrees F (e.g., Salt Lake City), and those with both hot summer and cold winters, such as St. Louis, Cincinnati, and Louisville.

As with July temperature and heat index, the logarithm of pleasant days is cross-sectionally related to Tobin's q, but much more strongly in recent decades. Prior to 1995, an increase in the percentage of pleasant days of 25%, which spans the interquartile range – Philadelphia is at the 25^{th} percentile (56 days) with Miami one day over the 75^{th} percentile (70 days) – is associated with an approximate increase in Tobin's q of $[log(70) - log(56)] \times 0.11 = 0.03$. However, in the last twenty years, the effect is over three times as large, with the same shift in pleasant weather predicting a change in q of 0.09. Similar to what Figure 2 shows with education, Figure 3 shows that cities with the best weather have experienced the largest *increases* in industry-adjusted Tobin's q. The t-statistic on the best-fit line is 1.95, with a slope of 0.19.

Returning to Table 5, note that in addition to the weather and education variables already discussed, all the estimates feature controls for city size and growth, and allow both sets of estimates to differ between the early and late halves of the sample. By including these controls, we attempt to distinguish between the agglomeration benefits associated with locating in large and/or growing cities, which is the subject of a substantial urban labor literature, versus the benefits of being located in cities with a highly skilled workforce (which may also be large and/or growing).[27]

The coefficients reported in the bottom several rows of Table 5 capture the city-size and growth effects. To measure city size, each year we classify large (small) cities as those in the top (bottom) third in terms of population. Medium-sized cities are in between, and are the omitted category in the regression. In general, city size is not reliably related to Tobin's q, although there is some weak evidence that the smallest cities are associated with a value penalty in the last two decades.

To control for growth, we also include each city's year-over-year change in raw population as an explanatory variable in our Tobin's q regressions. And, as with city size, we interact this with an indicator for the post-1994 period. Across most specifications, Tobin's q tends to be higher in growing cities during the first twenty years of our sample. However, in about half the cases, this effect is wiped out by a negative coefficient in the later period, suggesting that raw population

[27]The *urban wage premium* refers to the finding that urban workers earn about 30-60% more than their more rural counterparts. For example, Glaeser (2011) documents a 30% urban premium within the United States; Combes, Duranton, and Gobillon (2008) find roughly double this magnitude in France; De la Roca and Puga (2015) study wages in Spain, estimating a 55% premium between the largest Spanish cities and rural areas. This evidence indicates that workers tend to be more productive in larger cities.

growth has perhaps become less important for value creation. One illustration of the ambiguous effect of population growth is that only one of the ten fastest growing U.S. cities from 1975-2015 experienced a positive increase in industry-adjusted average q, between the first and second halves of our sample.

We view this set of (mostly non) results as important because as shown in the urban economics literature, pleasant weather and education are strongly related to population growth. That both continue to manifest a strong relation with Tobin's q, despite controlling for city size and growth, suggests the following takeaway: when considering value created for public shareholders, raw population is not what matters, but rather a city's concentration of the "right people." We reiterate that our notion of value creation is that which accrues to shareholders via higher stock prices. Thus, even though workers with high education command higher wages, the present value of their productivity creates an economic rent captured by the firm's owners.

4.3 Stock returns through the 1990s

A complementary estimate of the value created for shareholders is to analyze stock returns, rather than the evolution of average Tobin's q between cities. One advantage is that stock returns – although noisier than Tobin's q – are not influenced by accounting choices (e.g., what part of a firm's R&D is capitalized), [28] recapitalizations, or investment policy, any of which may change the denominator in Tobin's q, and potentially conflate estimates of the wealth created for shareholders.

Another advantage relates to measurement. Because stock returns capture unexpected changes, movements in financial securities provide a precise measure of when the benefits (or costs) related to a particular location became recognized by the market. Indeed, as the patterns below indicate, the rapid divergence between the cities least, and most, associated with value creation occurred during the 1990s, corresponding to the introduction of the internet.

Figure 7 shows how the value of a hypothetical dollar invested in three different portfolios evolved through the 1990s. We first rank all cities in terms of college education rates, and then in terms of pleasant weather, as described above. After summing the ranks, we separate the top five cities, the bottom five cities, and all others. The figure shows how an equally weighted portfolio

[28] See Peters and Taylor (2017) for a more developed discussion of this issue. We have also estimated our results using their modified q, and find similar results.

would have performed from 1990-2000, in each portfolio. Importantly, for this analysis, we restrict the set of firms to those that existed in 1990, i.e., new firms that went public during this decade are not included. The cumulative returns displayed are net of 2-digit SIC industry effects.

As seen, the blue line (representing firms in the top five cities) experienced nearly a doubling of value, even on an industry adjusted basis. Firms outside these five cities underperformed their industry benchmarks, with those in the bottom five cities performing (slightly) worse still. That the patterns here parallel those for Tobin's q suggest that either measure provides a reliable measure of value creation, and is more specific about the exact timing over which these city-specific changes occurred.

5 Margins or growth?

Generally, when a firm's Tobin's q increases, it is either because its existing assets have become more efficient, or because the market expects efficiency improvements to occur in the future. One of the contributions of this paper is to better understand the nature of productivity differences that exist between cities, in particular, whether these manifest over short or long horizons. For example, a number of recent studies point to the importance of management trainings, with benefits on plant-level efficiency that occur relatively quickly.[29] If this is the case, the empirical prediction is straightforward: cities with high Tobin's q should be associated with high operating efficiency, and thus, higher corporate profits.

However, it is also possible that the types of knowledge spillovers most responsible for value creation – and thus for Tobin's q – have little to do with a firm's current performance. Rather, for firms focused on future profits, operating efficiency from existing assets may be a secondary consideration, with the primary goal being investing for the future. In these cases, it is possible for high-q cities to have little association with current profits. Moreover, given that heavy investments in future profitability (e.g., R&D) may drive up the local wages and rents, it is possible for a negative relation between Tobin's q and operating profits to obtain. The tests in this section are intended to make headway on this distinction.

[29] See Syverson (2011), Section 3.1, for an in-depth review of recent studies on managerial quality and plant-level efficiency.

5.1 Profit margins

As mentioned directly above, all else equal, more efficient firms will have higher valuation ratios. Accordingly, we explore whether: 1) In the cross-section, do cities with high average industry-adjusted q have higher industry-adjusted profit margins? 2) In the time-series, do increases (decreases) in city-level average industry-adjusted q pre/post-1995 correlate with similar increases (decreases) in industry-adjusted profits?

For the first question, we regress profitability measured at the firm-year level on city-of-headquarter fixed effects, controlling for industry and year fixed effects (as we did for Tobin's q in Table 2). Although stock prices ultimately reflect capitalized cash flows, one operational complication is that cash flows exhibit substantial year-to-year variation, for example, being influenced by a firm's investment policy.[30] Thus, in hopes of obtaining more stable measures of performance, we measure profitability using return-on-assets (net income divided by the book value of assets), as well as the ratio of operating income to sales ($\frac{OI}{Sales}$). With city-of-headquarter fixed effects for both measures, we ask whether firms in high-q cities tend to also be more profitable.

Panel A of Figure 4 shows the results. The x-axis represents the regression estimate of each city's industry-adjusted fixed effect for each measure of firm profitability. For example, Cleveland's abnormal $\frac{OI}{Sales}$ is 0.11, shown at the bottom right hand portion of the figure with a blue diamond; likewise, Cleveland's estimated fixed effect for ROA (0.14) is depicted with a green triangle. Each of these is mapped to Cleveland's industry-adjusted Tobin's q (-0.37), plotted on the y-axis. The cross-sectional relationships imply a negative relation between a city's industry-adjusted profitability, and its industry-adjusted Tobin's q. Thus, Panel A of Figure 4 provides no support for the hypothesis that regional dispersion in q is driven by current profitability – in fact, the result goes in the unexpected direction.

We also examine whether *changes* in q are positively correlated with changes in firm profitability at the city level. To see if this is the case, we estimate city-of-headquarter fixed effects from 1974-1994, and then again from 1995-2015, for both profitability measures (as we did with Tobin's q in Table 2). For each city, we then plot in Panel B of Figure 4 the difference in the estimated fixed effects for each profitability measure (x-axis), against the difference between a city's industry-

[30] For a discussion of the empirical challenges associated with measuring growth rates in earnings and cash flows, see Chan, Karceski, and Lakonishok (2003).

adjusted Tobin's q in the first and second halves of the sample (y axis).

For both the triangles (ROA) and diamonds ($\frac{OI}{Sales}$), we observe negative cross-sectional relationships, indicating that on average, profit margins and Tobin's q tend to move in opposite directions over time within cities. In both cases, the estimated slopes are significant at conventional levels (see columns 3 and 4 of Appendix Table A3), with the caveat that both x and y variables are estimated, which biases OLS coefficients toward zero. Together, the results here suggest that both in the cross-section, as well as in the time-series, city-level variation is not well accounted for by differences in the profitability of resident firms.

5.2 Growth

Given the (null) results above – i.e., that firms in high-q cities are no more profitable than those in low-q ones – we examine whether prospects over longer horizons paint a different picture. We thus conduct a similar analysis as above, but consider variables intended to capture a firm's growth prospects. Rather than calculate growth rates of either of the profit margins explored above, which are extremely volatile, we rely on proxies that capture *managerial perceptions* of the firm's future opportunities.[31] These are investment expenditures and research and development scaled by lagged assets.[32]

As with the analysis of firm profitability above, Panel A of Figure 5 shows the cross-sectional relation between a city's average industry-adjusted q, and measures of its industry-adjusted growth. In both cases, we observe a strong positive relation. That both proxies behave the same way (i.e., being positively related to city-level q), combined with the results in the preceding section, suggests that regional variation in q reflects, at least partly, differences in expected growth prospects.

However, there are some important caveats to this interpretation, owing to measurement issues related to our proxies for growth. Note that we are taking R&D and investment as indicators for managerial beliefs about growth rates (g) in cash flows. However, because R&D is treated as an

[31] Ideally, we would measure growth rates in earnings or free cash flows, and link city-of-headquarter fixed effects for these measures to the those for Tobin's q. However, because a large percentage of firm-year observations have negative earnings, and thus cannot serve as a benchmark for calculating growth in later years, missing observations result for about one-third of the observations. Further, beyond such cases, earnings are very close to zero for another substantial fraction of companies, leading to highly volatile estimates. See Lakonishok, Shleifer, and Vishny (1994) and Chan, Karceski, and Lakonishok (2003).

[32] Investment is defined as capital expenditures divided by lagged net property, plant, and equipment (CAPX/L.PPENT). For examples of papers that have adopted a similar definition, see Kaplan and Zingales (1997), Bertrand and Schoar (2004), and Chaney, Sraer, and Thesmar (2012).

accounting expense, it lowers book values which, because this is the denominator, will increase Tobin's q. As it turns out, this effect is quantitatively modest. If we capitalize R&D expenditures and depreciate them over time (5 or 10 years), rather than expense them, the relation between industry-adjusted q and industry-adjusted R&D is nearly identical.

Moving to the time series, Panel B of Figure 5 show the results of a similar exercise as described in the preceding section, except the x variables are R&D and investment. In both cases, changes in a city's industry-adjusted q are positively correlated with changes in industry-adjusted measures of growth expectations. (See also Appendix Table A3 for the OLS output for each regression shown in Panel B of the figure.)

The findings in this and the prior section highlight that being headquartered in thriving metro areas such as Seattle, Boston, Silicon Valley, and Washington D.C. is a double edged sword. On the one hand, high q ratios in such cities are sustained by a virtuous cycle of highly skilled workers, and the incentives for local companies to help them develop through training, and thus attracting the next generation of skilled workers. On the other hand, such growth is not free, and may come at the expense of short-run profits. For example, Figure 6 reveals that property prices and wages are higher in cities with high Tobin's q, in part explaining the lower profitability of firms located there. The figure's y-axis shows each city's change in abnormal q (between the first and second 20-year period), and on the x-axis, the log change in housing prices (squares) and average wages (triangles).[33] As seen, rising valuation ratios tend to correspond to increases in both real estate prices and wages. Because all else equal, lower margins should equate to lower stock prices, increases in growth opportunities must be strong enough to overcome the but-for effects of higher costs.

6 Conclusion

The evidence in this paper indicates that a favorable location can be a source of comparative advantage for firms, and the magnitude of the benefits of a favorable location has increased over time. Moreover, human capital seems to be a key driving phenomenon. At the firm level, the

[33]Note that housing prices are measured starting in 1980 (the earliest that reliable housing data are available), whereas wages begin in 1970. To avoid look-ahead bias, changes in a city's Tobin's q are measured starting in 1980 for the comparison with house prices.

types of companies for which headquarter cities seem to matter most are precisely the ones for which human capital is most important, i.e., relatively young firms in technology and related fields. Recall, however, that because our analysis accounts for differences in industry classification (as well as firm age), the above result should be viewed akin to an interaction between industry and location – with technical industries more affected by location – rather than a pure industry (or life cycle) effect that changes over time.

The importance of human capital also emerges in the cross-section of cities, with education rate and/or pleasant weather being strongly related to Tobin's q. Complementing a number of urban economics studies that link these variables to wages and population growth, our findings thus suggest that shareholders share in the productivity gains associated with a superior location. Given that most standard models assume that competition between firms leaves little residual value for their owners, these results suggest that accounting for shareholders' rents may be an important consideration, in addition to those that accrue to workers and land owners.

In some respects, what we do not find is as interesting as what we do find. First, although high-q cities tend to be growing cities, growth per se is not a particularly important determinant of value creation. Thus, although education levels and weather do predict population growth, value creation for public companies seems to be less about adding raw population, and more about attracting the "creative class" that appear to generate economic rents above their high wages, relative to rank-and-file workers.

Our second important 'non-result' is that we do not find evidence that firms in the more favorable locations experience higher profitability. The fact that winning cities are associated with high stock prices, but not with high realized profits, indicates that these favorable locations facilitate the creation of new opportunities, but do not bear fruit immediately. In this way, we view our results as analogous to the observation that younger workers in major cities do not realize higher immediate real compensation, but because they tend to build human capital in more vibrant locations, their long-term compensation is higher.[34]

Finally, note that although new firms do tend to disproportionately choose to locate in high-q cities, the entry of new firms does not appear to entirely compete away the benefits that the

[34]See Glaeser and Mare (2001) and de la Roca and Puga (2015).

incumbent firms experience from a good location.[35] This evidence suggests that understanding the nature of the competitive dynamics between workers and firms in these locations may be key to understanding other aspects of these urban economies. For example, Silicon Valley hosts firms like Facebook, Apple and Google, which benefit from being in a location that allows them to attract and retain the best talent. These firms pay their employees extremely well, but apparently, because of these firms' market power, their shareholders capture some of the benefits of the firms' access to this superior talent. Theoretical models that provide more precise empirical guidance on such dynamics, and subsequent empirical work, are fruitful opportunities for future work.

[35] Recall Appendix Table A1, which shows the heavy concentration of initial public offerings in a small number of cities.

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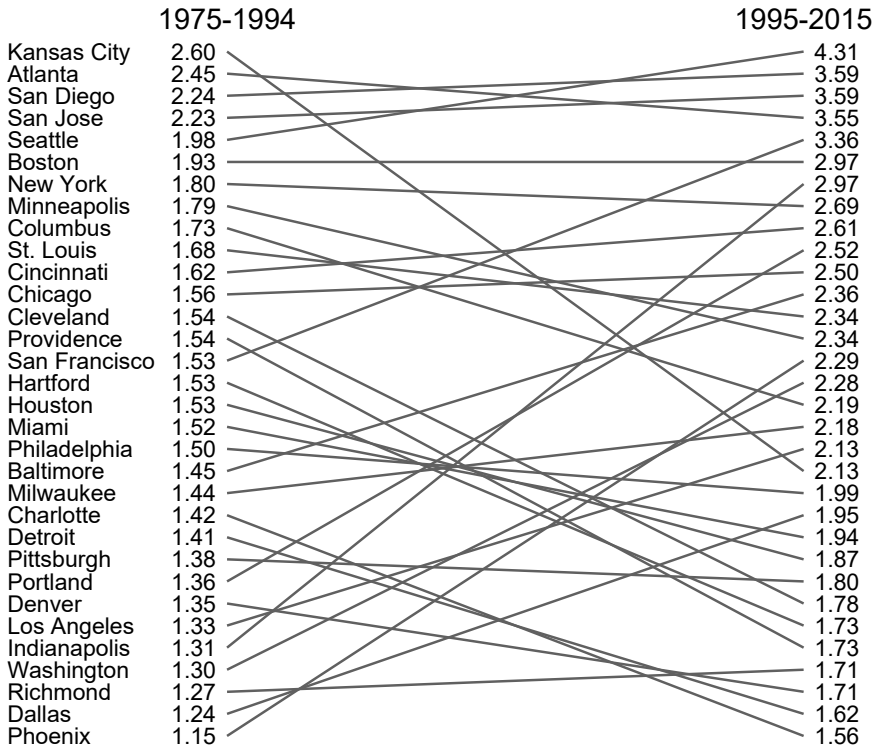


Figure 1: Average Area Q Pre- and Post-1995 This plot lists the value-weighted average Q for firms by area for the years 1975 – 1994 and the years 1995 – 2015.

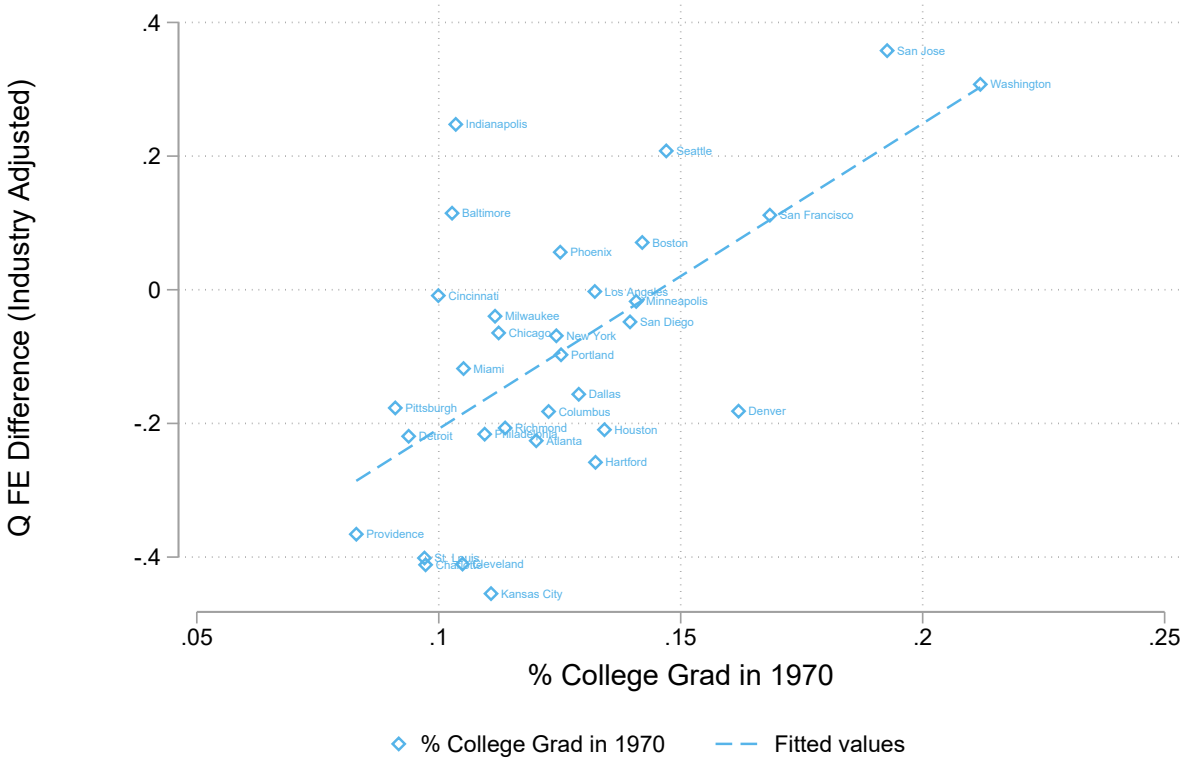


Figure 2: Changes in Area Q Versus Pre-Existing Human Capital Stock This plot shows the change in an area's Q fixed effect estimate as reported columns 5 and 6 of Table 2 versus the area's percentage of college graduates in 1970.

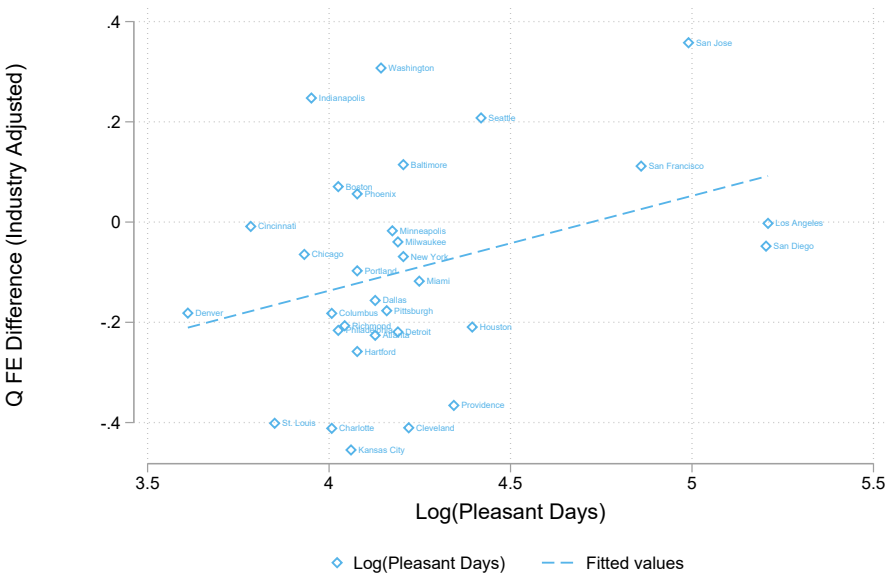
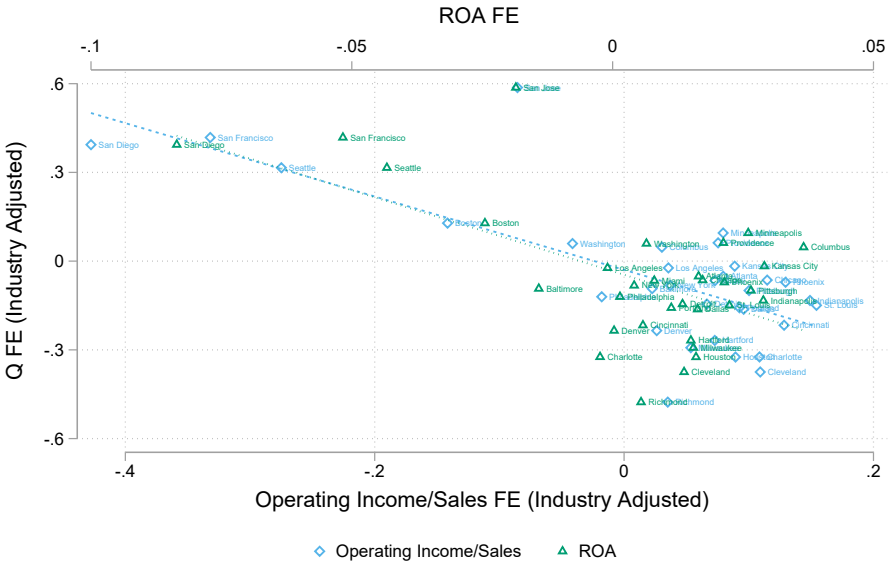


Figure 3: Change in Area Q Versus Log(Pleasant Days) This plot shows the change in an area's Q fixed effect estimate as reported columns 5 and 6 of Table 2 versus the log of an area's number of pleasant days per year, where a pleasant day is defined as a day with the average temperature over 1992 - 2014 between 55 and 75 degrees Fahrenheit, a minimum temperature above 45 degrees Fahrenheit, a maximum temperature below 85 degrees Fahrenheit and no significant precipitation or snow depth.

Panel A: Levels



Panel B: Changes

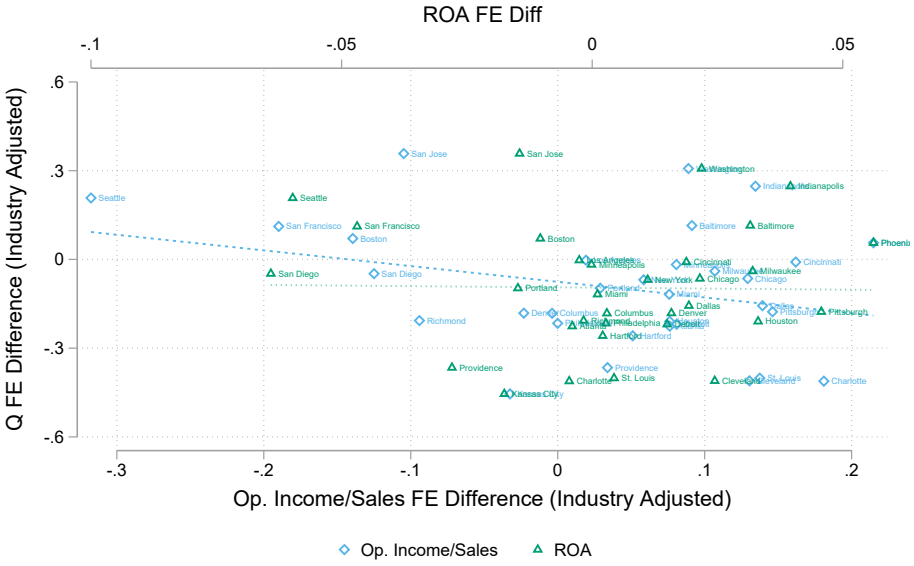
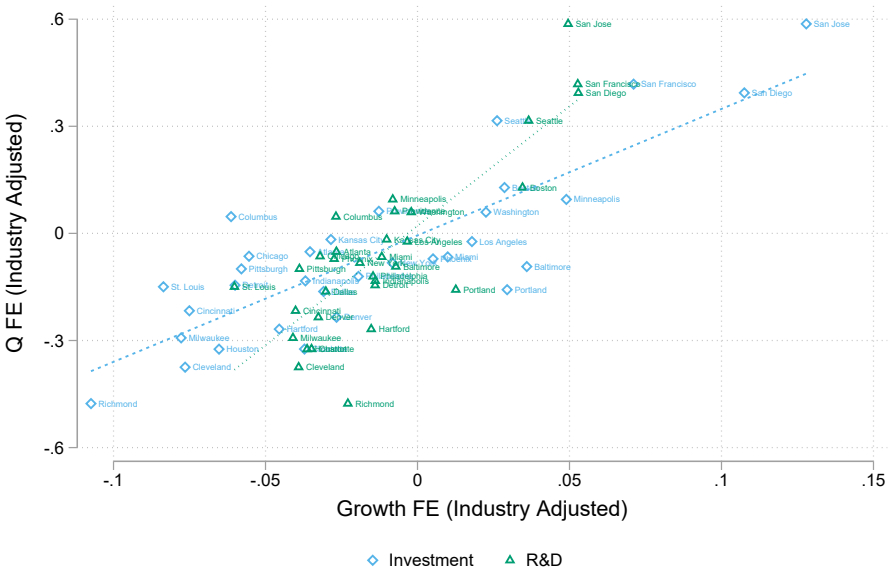


Figure 4: Area Q Versus Area Profit Margins Panel A of this plot shows each city's industry- and year-adjusted Tobin's q versus each city's industry- and year-adjusted operating income-to-sales (blue diamonds) and return on assets (green triangles). Panel B plots each city's change in industry- and year-adjusted Tobin's q (as reported columns 5 and 6 of Table 2) versus each city's change in industry- and year-adjusted operating income-to-sales (blue diamonds) and return on assets (green triangles). In both panels, the top y-axis applies to operating income and the bottom to ROA.

Panel A: Levels



Panel B: Changes

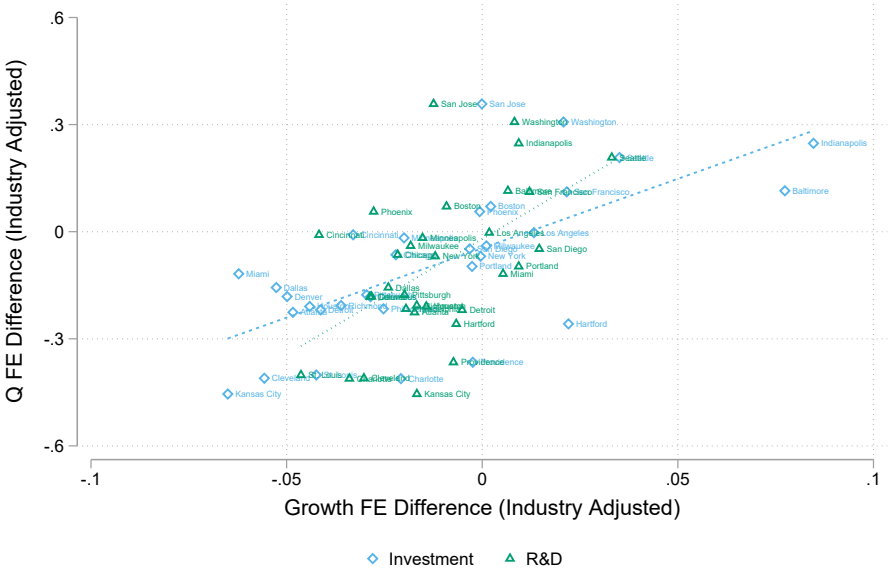


Figure 5: Area Q Versus Area Growth Opportunities Panel A of this plot shows each city's industry- and year-adjusted Tobin's q versus each city's industry and year-adjusted investment rates (blue diamonds) and R&D-to-assets (green triangles). Panel B plots each city's change in industry- and year-adjusted Tobin's q (as reported columns 5 and 6 of Table 2) versus each city's change in industry- and year-adjusted investment rates (blue diamonds) and R&D-to-assets (green triangles). In both panels, the top y-axis applies to operating income and the bottom to ROA.

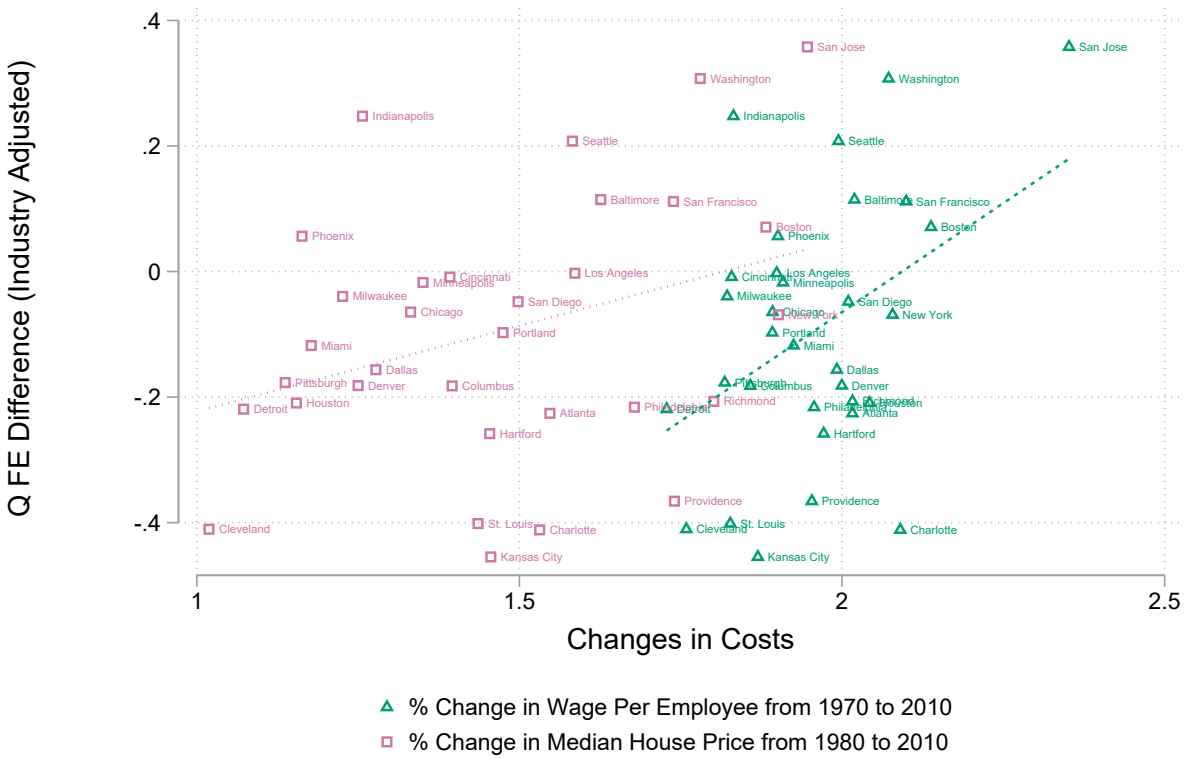


Figure 6: Crowding Out This figure plots each city's change in industry- and year-adjusted Tobin's q (as reported columns 5 and 6 of Table 2) versus the area's log change in the area's average wage per employee 1970, and the area's median house value in 1980.

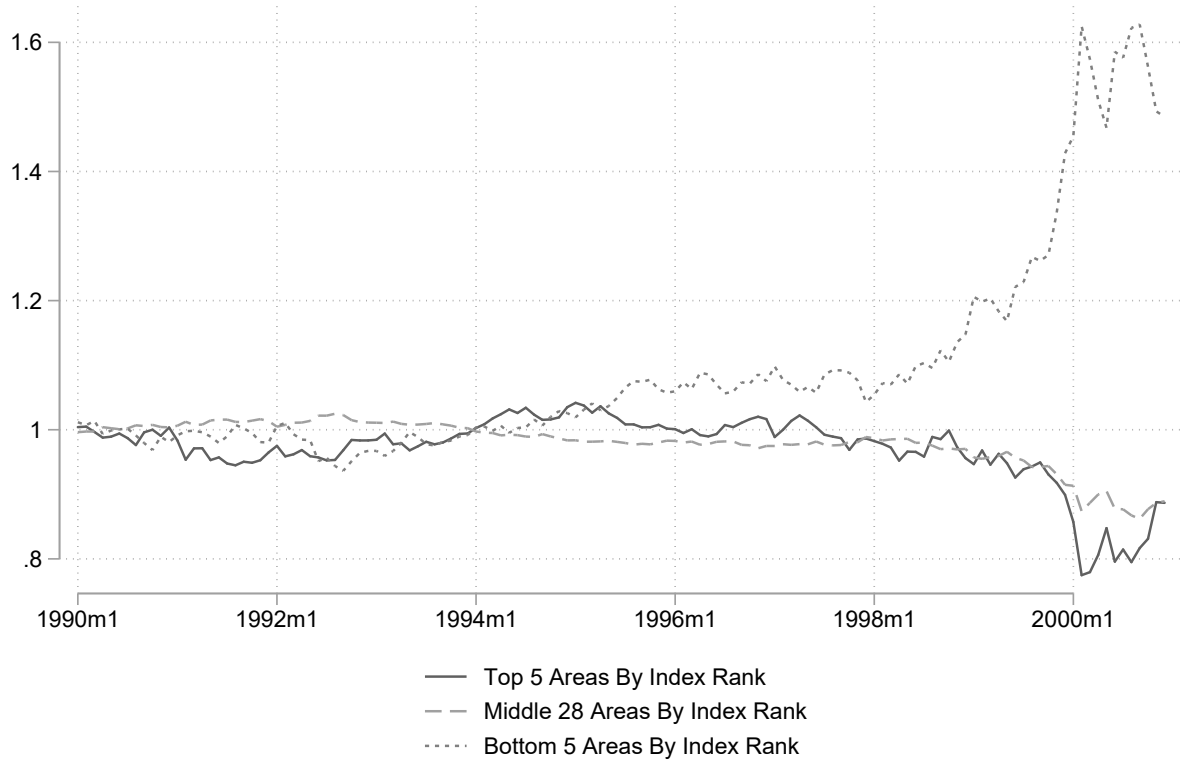


Figure 7: Cumulative Monthly Industry-Adjusted Area Returns This plot shows the cumulative monthly return of industry adjusted value-weighted portfolios formed by an index that sums the ranks of an area's percentage of college graduates in 1970 and average number of pleasant days per year. The top five areas by index rank are San Jose, San Francisco, San Diego, Seattle, and Los Angeles. The bottom five areas are Charlotte, Cincinnati, Chicago, St. Louis, and Indianapolis. The sample begins in January 1990 and ends in December 2000.

Table 1: Summary Statistics

This table reports area-level averages for firms and areas over the years 1975-2015 for the following variables: area population in millions, area population growth rate, area percentage of college graduates in 1970, average area July temperature, average area July Heat Index, average area number of pleasant days per year, number of firms per area, market capitalization of area firms relative to total market capitalization, Tobin's Q, investment-to-lagged net PP&E, R&D-to-lagged assets, operating income-to-sales, ROA, and monthly stock returns (in percentages).

(1) Area	(2) Pop. (M)	(3) Growth	(4) Grads	(5) Temp.	(6) HI	(7) Days	(8) Firms	(9) % MC	(10) Q	(11) Inv.	(12) R&D	(13) OI/Sales	(14) ROA	(15) Ret.
Atlanta	4.11	2.52	0.12	80	100	62	57	4.10	1.91	0.35	0.06	0.08	0.04	1.28
Baltimore	2.50	0.62	0.10	77	92	67	19	0.32	1.88	0.41	0.08	−0.05	0.00	1.45
Boston	4.35	0.53	0.14	74	83	56	124	2.92	2.25	0.43	0.14	−0.23	−0.02	1.39
Charlotte	1.34	2.23	0.10	80	98	55	13	0.27	1.44	0.29	0.04	0.11	0.03	1.11
Chicago	8.74	0.47	0.11	73	88	51	110	6.94	1.75	0.28	0.04	0.11	0.05	1.34
Cincinnati	1.93	0.62	0.10	76	94	44	20	2.08	1.58	0.25	0.04	0.13	0.04	1.40
Cleveland	2.14	−0.19	0.10	72	86	68	32	0.86	1.33	0.23	0.03	0.09	0.05	1.45
Columbus	1.57	1.17	0.12	75	90	55	17	0.43	1.80	0.27	0.04	0.05	0.07	1.42
Dallas	4.91	2.42	0.13	85	109	62	93	6.75	1.68	0.34	0.04	0.13	0.04	1.30
Denver	2.13	1.97	0.16	73	87	37	49	1.65	1.70	0.37	0.04	0.03	0.01	1.25
Detroit	4.34	−0.08	0.09	74	85	66	23	0.85	1.61	0.28	0.05	0.10	0.05	1.30
Hartford	1.12	0.36	0.13	74	88	59	12	0.27	1.46	0.27	0.05	0.11	0.05	1.69
Houston	4.81	2.33	0.13	84	110	81	102	3.64	1.55	0.31	0.04	0.10	0.03	1.19
Indianapolis	1.48	1.24	0.10	75	90	52	12	0.26	1.75	0.35	0.06	0.12	0.05	1.50
Kansas City	1.77	0.94	0.11	79	101	58	15	0.54	1.86	0.33	0.07	0.11	0.06	1.51
Los Angeles	11.64	0.99	0.13	69	90	183	130	3.82	1.83	0.39	0.08	0.03	0.03	1.49
Miami	4.71	1.84	0.11	84	106	70	47	0.99	1.86	0.39	0.06	0.06	0.03	1.73
Milwaukee	1.48	0.31	0.11	72	82	66	21	0.55	1.51	0.27	0.03	0.12	0.05	1.34
Minneapolis	2.85	1.27	0.14	73	85	65	69	1.68	2.03	0.40	0.07	0.06	0.05	1.49
New York	17.71	0.38	0.12	77	87	67	252	26.48	1.78	0.34	0.06	0.02	0.03	1.43
Philadelphia	5.62	0.37	0.11	78	93	56	74	1.80	1.76	0.34	0.07	−0.04	0.03	1.48
Phoenix	3.17	3.00	0.13	93	107	59	27	0.58	1.81	0.38	0.05	0.12	0.04	1.54
Pittsburgh	2.47	−0.31	0.09	73	85	64	26	1.12	1.62	0.26	0.03	0.11	0.06	1.41
Portland	1.87	1.77	0.13	68	80	59	25	0.50	1.74	0.40	0.10	0.10	0.04	1.60
Providence	1.54	0.32	0.08	73	86	77	10	0.47	1.84	0.33	0.05	0.12	0.05	1.39
Richmond	0.94	1.44	0.11	78	100	57	9	0.27	1.35	0.21	0.05	0.01	0.04	1.31
St. Louis	2.69	0.35	0.10	80	98	47	26	1.39	1.75	0.26	0.03	0.13	0.05	1.35
San Diego	2.80	1.37	0.14	71	75	182	52	0.92	2.63	0.51	0.17	−0.64	−0.09	1.24
San Francisco	4.06	0.94	0.17	63	68	129	116	5.27	2.68	0.50	0.17	−0.49	−0.05	1.30
San Jose	1.70	1.04	0.19	70	85	147	134	7.64	2.73	0.57	0.16	−0.11	−0.01	1.54
Seattle	3.01	1.59	0.15	65	75	83	41	3.82	2.47	0.45	0.14	−0.37	−0.04	1.31
Washington	3.44	1.37	0.21	79	95	63	58	1.73	2.18	0.44	0.10	−0.12	0.01	1.40
All Areas	6.60	1.06	0.13	75	90	84	107	6.94	1.94	0.37	0.09	−0.03	0.02	1.40

Table 2: Variation in Area Q Pre- and Post-1995.

This table reports estimates of area fixed-effects from regressions of firm-level Q on 2-digit SIC industry, area, and year fixed effects for the pre-1995 and post-1995 time period. The final two columns add firm age fixed effects which are a set of dummy variables corresponding to five year intervals of Compustat firm age up to age 25. Regression standard errors are robust to heteroscedasticity and clustered by firm. Statistical significance is indicated as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	(1) 75-94 Q	(2) 95-15 Q	(3) 75-94 Q	(4) 95-15 Q	(5) 75-94 Q	(6) 95-15 Q
Atlanta	0.25**	−0.02	0.17	−0.03	0.13	−0.04
Baltimore	−0.07	0.20	−0.08	0.06	−0.13	0.05
Boston	0.21***	0.49***	0.15*	0.27***	0.08	0.22**
Charlotte	−0.14	−0.45***	−0.01	−0.39***	−0.06	−0.41***
Cincinnati	−0.14	−0.16	−0.20**	−0.20	−0.20**	−0.14
Cleveland	−0.20**	−0.55***	−0.18**	−0.58***	−0.15*	−0.50***
Columbus	0.15	−0.09	0.24	0.06	0.19	0.07
Dallas	−0.05	−0.18*	0.01	−0.13	−0.05	−0.14
Denver	−0.05	−0.18*	−0.02	−0.15	−0.10	−0.21**
Detroit	−0.07	−0.18	−0.01	−0.13	0.02	−0.14
Hartford	−0.09	−0.39***	−0.10	−0.38***	−0.10	−0.29**
Houston	−0.16**	−0.34***	−0.11	−0.27***	−0.17**	−0.31***
Indianapolis	−0.19**	0.02	−0.17**	0.08	−0.26***	0.05
Kansas City	0.31	−0.09	0.34*	−0.17	0.28	−0.11
Los Angeles	0.01	0.12	0.03	0.09	−0.00	0.06
Miami	0.12	−0.01	0.07	−0.02	0.03	−0.02
Milwaukee	−0.20**	−0.30**	−0.20**	−0.27*	−0.25***	−0.22
Minneapolis	0.20**	0.22*	0.17*	0.14	0.12	0.17
New York	0.00	0.09	−0.04	−0.03	−0.02	−0.02
Philadelphia	0.03	−0.06	0.03	−0.14	0.02	−0.13
Phoenix	−0.13	0.03	−0.05	0.07	−0.10	0.02
Pittsburgh	−0.07	−0.20	0.03	−0.09	0.02	−0.09
Portland	−0.06	−0.14	0.04	−0.08	−0.06	−0.10
Providence	0.27	−0.09	0.35	−0.04	0.31	0.00
Richmond	−0.22**	−0.56***	−0.30***	−0.47***	−0.28**	−0.42***
St. Louis	0.14	−0.18	0.16	−0.21*	0.14	−0.20
San Diego	0.58**	0.81***	0.54**	0.53***	0.42*	0.43***
San Francisco	0.49***	0.90***	0.43***	0.59***	0.33***	0.50***
San Jose	0.52***	0.94***	0.47***	0.85***	0.33***	0.75***
Seattle	0.27*	0.71***	0.27*	0.51***	0.17	0.44***
Washington	−0.00	0.41***	−0.13	0.28**	−0.16*	0.21
Observations	25031	41422	25031	41422	25031	41422
R^2	0.10	0.09	0.15	0.14	0.18	0.16
City F-Stat	5.31	19.61	4.69	11.34	3.68	8.83
City P-value	0.00	0.00	0.00	0.00	0.00	0.00
Industry F-Stat			13.57	23.98	11.05	20.02
Industry P-value			0.00	0.00	0.00	0.00
Industry FE	No	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Age FE	No	No	No	No	Yes	Yes

Table 3: Robustness and alternative specifications.

This table reports results from the same regression specifications as Table 2 columns 5 and 6 with slight variations in each panel. Panel A varies our industry classification. Columns 1 and 2 classify industries by 3-digit SIC code and columns 3 and 4 by 4-digit SIC code. Panel B varies our area definition. Columns 1 and 2 further restrict our area definition by limiting locations to only the core-counties surrounding a CBSA's principle city. Columns 3 and 4 expand our area definition to include all firms in a CBSA. Panel C varies the timing of our tech boom breakpoint from 1995 to 1992 in columns 1 and 2 and to 1998 in columns 3 and 4. For each regression we report the F-statistic from a test of the joint significance of the city fixed effects (City F-Stat), and the bootstrapped p-value corresponding to the post-1995 minus pre-1995 difference in these variables. Regression standard errors are robust to heteroscedasticity and clustered by firm. Statistical significance is indicated as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Panel A: Varying Industry Definition

	(1) SIC3 75-94 Q	(2) SIC3 95-15 Q	(3) SIC4 75-94 Q	(4) SIC4 95-15 Q
Observations	25031	41422	25031	41422
City F-Stat	2.94	7.00	4.08	11.64
Diff P-value	0.000		0.000	

Panel B: Varying Area Definition

	(1) Core 75-94 Q	(2) Core 95-15 Q	(3) CBSA 75-94 Q	(4) CBSA 95-15 Q
Observations	17943	26870	30074	47438
City F-Stat	3.46	6.71	3.21	6.74
Diff P-value	0.001		0.000	

Panel C: Varying Tech Boom Timing Breakpoint

	(1) 75-91 Q	(2) 92-15 Q	(3) 75-97 Q	(4) 98-15 Q
Observations	19798	46655	31423	35030
City F-Stat	3.00	9.02	4.85	8.10
Diff P-value	0.000		0.000	

Table 4: Cross-sectional results.

This table reports the same regressions as columns 5 and 6 of Table 2 (i.e., regressions of Q on area, industry, age, and year fixed effects) sorting on different crosssectional cuts. Panel A sorts the sample on whether a firm has market capitalization above or below the median sample market capitalization. Panel B sorts firms annually by whether they are located within or without an industry cluster, where an industry cluster is defined as 10% or more of an industry's market cap being located in the same area. All industry cluster definitions require there be at least 10 firms in an industry for a potential cluster to exist. Panel C sorts firms annually by whether they belong to an industry with above or below median industry R&D. Finally, Panel D sorts firms on whether they have been in Compustat for more or less than ten years. Area fixed effects are only estimated for areas which have at least 30 observations in each sort sample. Regression standard errors are robust to heteroscedasticity and clustered by firm. Statistical significance is indicated as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Panel A: Sorting on Annual Sample Median Market Capitalization

	(1) Below 75-94 Q	(2) Below 95-15 Q	(3) Above 75-94 Q	(4) Above 95-15 Q
Observations	12519	20709	12512	20713
City F-Stat	2.97	3.17	2.85	8.27
Diff P-value		0.775		0.000

Panel B: Sorting on Industry Clusters

	(1) Inside 75-94 Q	(2) Inside 95-15 Q	(3) Outside 75-94 Q	(4) Outside 95-15 Q
Observations	8237	12430	16598	28774
City F-Stat	2.48	3.59	2.77	6.44
Diff P-value		0.825		0.000

Panel C: Sorting On Industry Median R&D

	(1) Above 75-94 Q	(2) Above 95-15 Q	(3) Below 75-94 Q	(4) Below 95-15 Q
Observations	10677	21414	14354	20008
City F-Stat	2.95	5.92	2.78	5.27
Diff P-value		0.008		0.004

Panel D: Sorting On Firm Age

	(1) $\leq$ 10 years 75-94 Q	(2) $\leq$ 10 years 95-15 Q	(3) $>$ 10 years 75-94 Q	(4) $>$ 10 years 95-15 Q
Observations	11566	19446	13465	21976
City F-Stat	4.27	8.09	1.32	3.52
Diff P-value		0.002		0.212

Table 5: Determinants of Q Variation.

This table reports similar regressions to those reported in columns 5 and 6 of Table 2 with the exception that area fixed effects have been substituted by area level continuous regressors, and instead of estimating separate regressions for the pre- and post-1995 period a post-1995 interaction term is included as a regressor. Additionally, controls for log city population and log population growth are added to all specifications. Column 1 examines how Q-levels have changed over time as a function of an area's percentage of college graduates in 1970, column 2 as a function of an area's average July temperature, column 3 as a function of average July high temperature heat index, and column 4 as a function of the log of an area's number of pleasant days per year, where a pleasant day is defined as a day with the average temperature over 1992 - 2014 between 55 and 75 degrees Fahrenheit, a minimum temperature above 45 degrees Fahrenheit, a maximum temperature below 85 degrees Fahrenheit and no significant precipitation or snow depth. Regression standard errors are clustered at the firm level and are reported in parentheses. Statistical significance is indicated as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	(1) Q	(2) Q	(3) Q	(4) Q	(5) Q	(6) Q	(7) Q
% College Grad in 1970	1.37**				0.20	−0.29	0.94
	(0.66)				(0.70)	(0.71)	(0.69)
I[year>1994] × % College Grad in 1970	6.12***				4.04***	3.29***	5.20***
	(0.84)				(1.01)	(1.05)	(0.90)
Avg. July Temperature		−0.01***			−0.01***		
		(0.00)			(0.00)		
I[year>1994] × Avg. July Temperature		−0.02***			−0.01***		
		(0.00)			(0.00)		
Avg. July Heat Index			−0.01***			−0.01***	
			(0.00)			(0.00)	
I[year>1994] × Avg. July Heat Index			−0.01***			−0.01***	
			(0.00)			(0.00)	
Log(Pleasant Days)				0.11**			0.10**
				(0.04)			(0.05)
I[year>1994] × Log(Pleasant Days)				0.28***			0.14**
				(0.06)			(0.06)
Small Cities	−0.06	−0.05	−0.04	−0.05	−0.04	−0.05	−0.04
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
I[year>1994] × Small Cities	0.04	−0.14***	−0.17***	−0.05	−0.06	−0.09*	0.03
	(0.06)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
Big Cities	−0.07	−0.08*	−0.06	−0.10**	−0.08*	−0.07	−0.08*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
I[year>1994] × Big Cities	−0.01	−0.05	−0.04	−0.09*	−0.02	−0.01	−0.03
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Population Growth	1.62	3.32***	4.57***	0.97	3.30***	4.93***	0.67
	(1.19)	(1.23)	(1.33)	(1.20)	(1.28)	(1.42)	(1.19)
I[year>1994] × Population Growth	−10.90***	3.37	5.50**	−5.41***	−2.95	0.02	−8.69***
	(1.87)	(2.09)	(2.18)	(1.87)	(2.34)	(2.52)	(1.86)
Constant	1.31***	3.92***	3.54***	0.78***	3.02***	3.04***	0.63***
	(0.09)	(0.18)	(0.14)	(0.17)	(0.27)	(0.23)	(0.17)
Observations	66453	66453	66453	66453	66453	66453	66453
R^2	0.18	0.18	0.19	0.18	0.18	0.19	0.18
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix

Table A1: Ranking of Firms by 2015 Market Capitalization

This table reports the headquarter location (by CBSA principal city name), market capitalization, IPO year, and founding year for the 50 firms with the largest market capitalization (measured as of their 2015 fiscal year-end) which IPO'd after 1980 and were founded after 1975. Firms headquartered in San Jose, San Francisco, or Seattle are highlighted in gray.

Rank	Name	CBSA	Market Cap.	Founding	IPO
1	Apple Inc	San Jose	615336	1977	1980
2	Alphabet Inc	San Jose	534764	1998	2004
3	Microsoft Corp	Seattle	354392	1975	1986
4	Amazon.com Inc	Seattle	318344	1995	1997
5	Facebook Inc	San Francisco	297758	2004	2012
6	Oracle Corp	San Francisco	166066	1977	1986
7	Home Depot Inc. (The)	Atlanta	157452	1978	1981
8	Cisco Systems Inc	San Jose	144516	1984	1990
9	Gilead Sciences Inc	San Francisco	143892	1987	1992
10	Amgen Inc	Oxnard	122397	1980	1983
11	Unitedhealth Group Inc	Minneapolis	112111	1977	1984
12	Celgene Corp	New York	94203	1986	1987
13	Starbucks Corp	Seattle	84413	1985	1992
14	QUALCOMM Inc.	San Diego	81885	1985	1991
15	Biogen Inc	Boston	66968	1985	1991
16	Priceline Group Inc (The)	Bridgeport	63253	1997	1999
17	Costco Wholesale Corp	Seattle	61335	1983	1985
18	Express Scripts Holding Co	St. Louis	59168	1986	1992
19	Regeneron Pharmaceuticals Inc	New York	56811	1988	1991
20	Blackrock Inc	New York	56389	1988	1999
21	Time Warner Inc	New York	51413	1985	1992
22	EMC Corp	Boston	49896	1979	1986
23	Netflix Inc	San Jose	48948	1999	2002
24	NextEra Energy Inc	Miami	47893	1984	2014
25	salesforce.com Inc	San Francisco	45663	1999	2004
26	Adobe Systems Inc	San Jose	45530	1982	1986
27	Alexion Pharmaceuticals Inc	New Haven	43042	1992	1996
28	Cognizant Technology Solutions Corp	New York	36552	1994	1998
29	Las Vegas Sands Corp	Las Vegas	34837	1988	2004
30	Kinder Morgan Inc.	Houston	33260	1997	2011
31	eBay Inc.	San Jose	32536	1995	1998
32	T-Mobile US Inc	Seattle	32015	1994	2007
33	Tesla Inc	San Jose	31543	2003	2010
34	Altaba Inc	New York	31459	1995	1996
35	Vertex Pharmaceuticals Inc	Boston	30993	1989	1991
36	Intercontinental Exchange Inc	Atlanta	30495	1997	2005
37	LinkedIn Corp	San Jose	29722	2002	2011
38	Intuit Inc.	San Jose	29373	1983	1993

39	Crown Castle International Corp	Houston	28855	1994	1998
40	Illumina Inc	San Diego	28136	1998	2000
41	DISH Network Corp	Denver	26542	1993	1995
42	Synchrony Financial	Bridgeport	25357	2003	2014
43	Boston Scientific Corp	Boston	24832	1979	1992
44	VMware Inc	San Jose	23870	1998	2007
45	Waste Management Inc.	Houston	23866	1985	1988
46	Ross Stores Inc	San Francisco	22636	1982	1985
47	AutoZone Inc	Memphis	21952	1979	1991
48	Fiserv Inc.	Milwaukee	20606	1984	1986
49	Cerner Corp	Kansas City	20455	1980	1986
50	Intuitive Surgical Inc	San Jose	20426	1995	2000

Table A2: Variable Definitions.

This table reports variable definitions. Data sources include the 2006 National Center for Health Statistics Urban/Rural Classification (NCHS), the Bureau of Economic Analysis Regional Economic Accounts (BEA), the Decennial Census of Population and Housing by the U.S. Census Bureau (Census), Compustat North America Fundamentals Annual File (Compustat Annual), and the CRSP Monthly Stock File (CRSP Monthly).

Variable	Description	Source
Tobin's Q	Firm-level annual book debt plus market equity all divided by assets. Specifically, $(AT - LT - PreferredStock + TXDITC + CSHO * PRCC_C)/AT$, where Preferred Stock equals PSTKL or PSTKRV if PSTKL is missing, or PSTK if both PSTKL and PSTKRV are missing.	Compustat Annual
Investment	Firm-level annual capital expenditures divided by the previous year's net property, plant and equipment. Specifically, $CAPX/L.PPENT$.	Compustat Annual
R&D	Firm-level annual R&D expense divided by the previous year's assets. Specifically, $XRD/L.AT$.	Compustat Annual
Operating Income/Sales	Operating income before depreciation divided by revenue. Specifically, $OIBDP/SALE$.	Compustat Annual
ROA	Income before extrodinary items divided by lagged assets. Specifically, $IB/L.AT$.	Compustat Annual
Return	Firm-level monthly stock return.	CRSP Monthly
Area	Firms are classified by headquarter location zipcode (Compustat ADDZIP). Zipcodes are then matched to FIPS codes which are then classified by core-based statistical area (CBSA) and by county type. The areas used in this study correspond to the "large central metro" and "large fringe metro" counties (as classified by the 2006 National Center for Health Statistics Classification Scheme) surrounding the principal cities of CBSAs with at least five firm observations per year for each year of the sample. This results in 38 areas/principal cities.	Compustat Annual, NCHS, Census
2-Digit SIC Code	The first two digits of a firms historical Standard Industrial Classification (SIC) code as recorded by CRSP's SICCD. Industries with less than five observations per year across all years are classified as 2-Digit SIC Code 99, or "Nonclassifiable Establishments." This yields 27 industries.	CRSP Monthly
Population	Annual area population	BEA
Population Growth	Year-on-year log difference in area population.	BEA
Wage Per Employee	Annual area wages and salaries divided by annual area total wage and salary employment.	BEA

% of College Graduates	Percentage of population 25 and over with at least 4 years of college.	Census
Median House Value	Median dollar value of owner occupied housing units.	Census
Avg. July Temperature	Average area July temperature over the years 19712000.	NOAA
Avg. July Heat Index	Average area July heat index over the years 19712000. The heat index combines the average July daily high air temperature and relative humidity in an attempt to determine the human-perceived equivalent temperature.	NOAA
Asset Pricing Factors	Fama-French 5 factors (Rm-Rf, SMB, HML, RMW, CMA) and the Carhart momentum factor (MOM).	Ken French's Data Library

Table A3: Fixed Effect Covariation: Growth Variables Versus Assets In Place.
This table reports regressions of the difference in area fixed effects estimates from columns 5 and 6 of Table 2 (Post-1995 minus Pre-1995 estimates) on the difference in area fixed effects from regressions of Investment, R&D, ROA, and operating income to sales, on city, industry, and age fixed effects. These regressions correspond to the lines plotted in Panel B of Figures 4 and 5. Regression standard errors are robust to heteroscedasticity and are reported in parentheses. Standard errors are bootstrapped with 1,000 repetitions to correct for using generated regressors. Statistical significance is indicated as follows: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	(1) Q FE Diff	(2) Q FE Diff	(3) Q FE Diff	(4) Q FE Diff
Investment FE Diff	3.89***			
	(0.73)			
R&D FE Diff		6.48***		
		(1.66)		
ROA FE Diff			−0.14	
			(1.53)	
Op. Income/Sales FE Diff				−0.53*
				(0.32)
Constant	−0.05	−0.02	−0.10**	−0.08**
	(0.03)	(0.04)	(0.04)	(0.04)
Observations	32	32	32	32
R^2	0.46	0.30	0.00	0.09