City Growth, Cost of Living, and Human Capital

William Yu
Economist, UCLA Anderson Forecast
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Ten years ago, the U.S. economy hit its business cycle peak and then slumped to troughs of the financial crisis and the Great Recession. Ever since, the economy has been slowly recovering at a 2% rate. Have our major cities and metros been growing at a similar pace? The answer is no. In fact, we will show that the economy is growing unequally across the nation.

A prosperous city is naturally related to higher earnings and higher cost of living for residents. So the question is: are residents better off living in a thriving city in terms of their real purchasing power? To answer this question, we present a City Cost of Living Index by measuring the differential of cost of living across metros focused on their rental price differential. In 2012, we launched the City Human Capital Index, which measures the average educational attainment for adult residents. We emphasize that the key to long-term prosperity for a city in the 21st century is based on its human capital.[1] This report will show the updated data of human capital across the country. The relationship between human capital and real earnings across the nation will be presented.

Uneven Employment Growth Across the Country

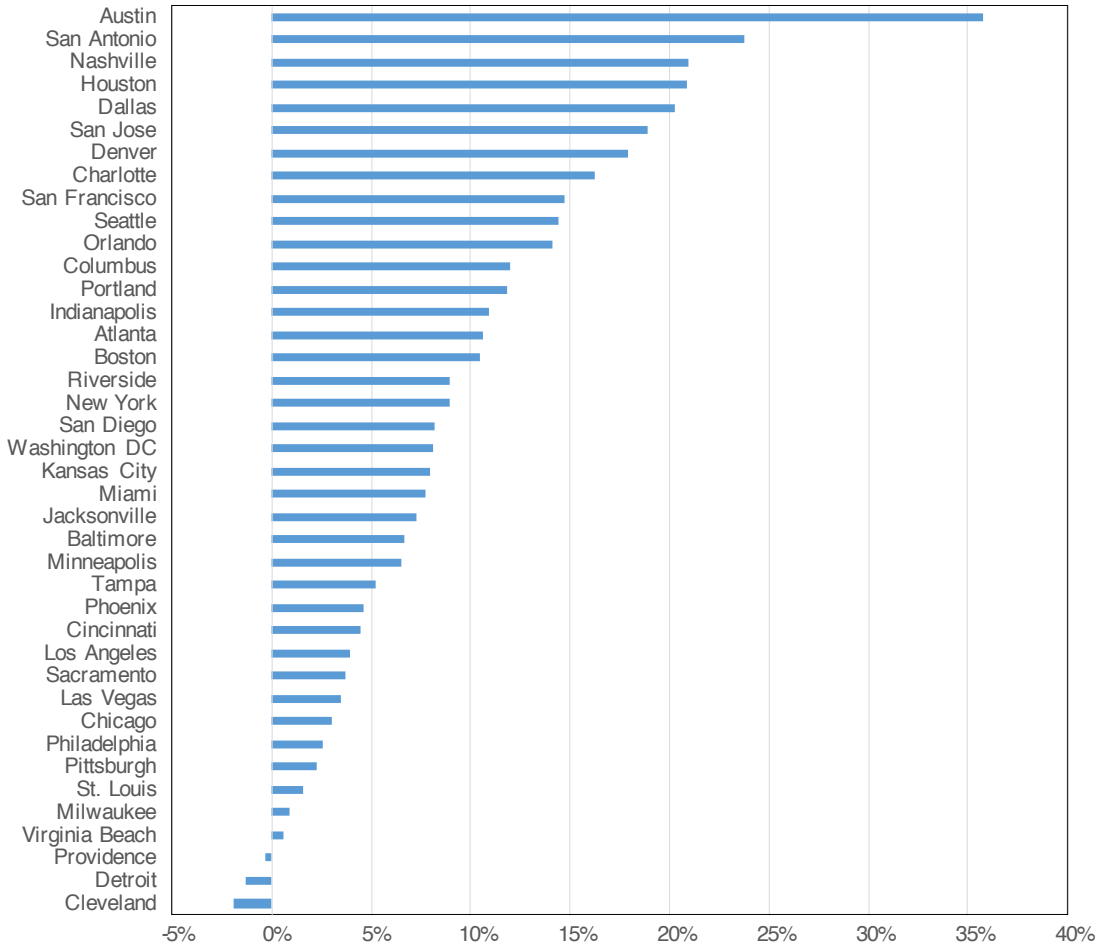
The total U.S. payroll growth is 5.7% from 2006 to 2016. But if we look at the employment growth for the 40 major metros, we find that job growth among these 40 metros are very uneven. Figure 1 displays the nonfarm payroll growth from 2006 to 2016 for the 40 largest metros. Austin is number one with a stunning 36% payroll growth in the past decade, (3.1% growth a year), followed by San Antonio's 24%, Nashville's 21%, Houston's 21%, Dallas's 20%, San Jose's 19%, Denver's 18%, Charlotte's 16%, San Francisco's 15%, and Seattle's 14%. New York's 9% is in the middle as is Washington DC's 8%. Los Angeles's 4% and Chicago's 3% are on the slower-growing end among these 40 metros. Three metros have negative job growth in the period: Providence, Detroit, and Cleveland.

Now let's compare the job growth between these 40 metros and the rest of the country (smaller metros, towns, and rural area). We find another uneven pace of growth. These 40 metros account for 57% of total payroll jobs in the U.S. in 2016. The total job growth for these 40 metros is 9.2% from 2006 to 2016. In contrast, the total job growth for the rest of the country is only 1.5% at the same period.

There are two possible reasons for this growth dichotomy between the major metros and the rest. First, the conglomerate of large metros could increase productivity, innovation, and quality of life as suggested by prominent urban economist – Edward Glaeser in his book: Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier (2012). Second, many manufacturers which used to be the economic center in small towns had left the country in the globalized economy. Many manufacturing jobs were also lost to automation. Brick and mortar retailers have also left small cities as a result of competition from e-commercers. It is worth more discussion on whether this dichotomy is good for the U.S.

1. *For example, see William Yu's "Human Capital: The Key to Los Angeles' Long-Term Prosperity," UCLA Anderson Forecast Report March 2013; "Growing Apart in Los Angeles," UCLA Anderson Forecast Report December 2013; "Problems and Solutions for Los Angeles' Economy: Human Capital, Public Education and Migration," UCLA Anderson Forecast Report March 2014.*

Figure 1 Payroll Employment Growth, 40 Major Metros in the U.S., 2006-1016



Source: Bureau of Labor Statistics

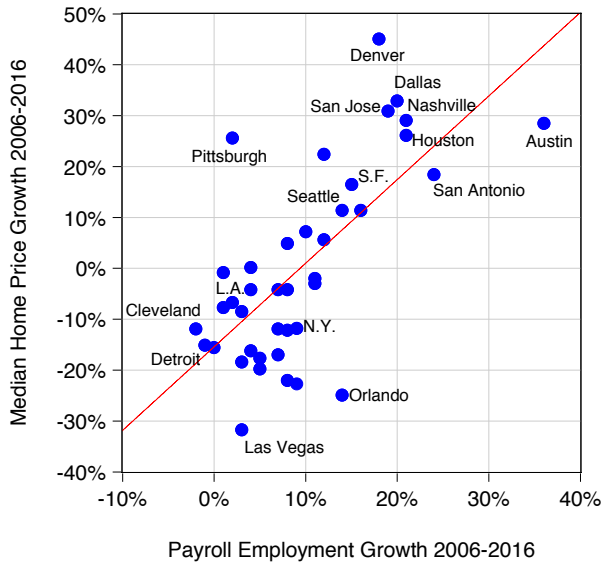
Demand, Supply and Home Prices

As shown in Figure 1, we have seen a disparity of job growth across the country's 40 largest metros. How does the job growth differential explain the home price growth in the past decade? The answer is job growth can explain a lot for the difference in home price growth among these 40 metros from 2006 to 2016, the period of housing price bust and recovery. Figure 2 illuminates this common-sense relationship. As a metro creates more jobs and attracts more people, the population and household formation rise and therefore, demand for housing increases. For better or for worse, home prices rise accordingly.

Metros like Denver, Dallas, Nashville, Austin, Houston and San Antonio have high home price growth while metros like Las Vegas, Cleveland, and Detroit still have negative home price growth during this period.

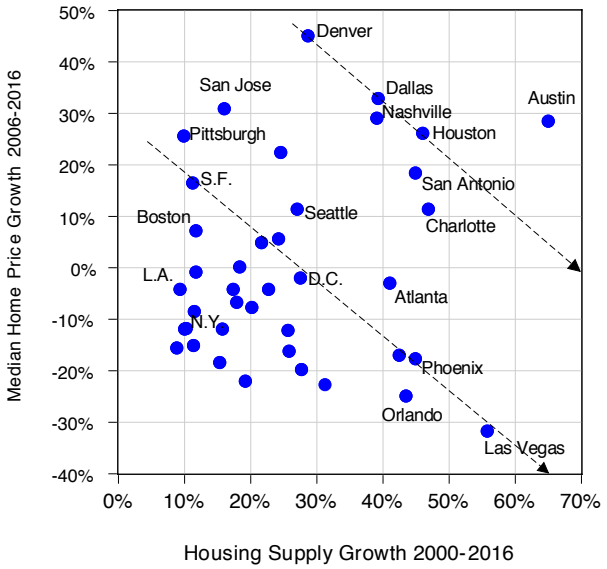
In addition to the demand side, housing supply could also contribute to the differential of home price appreciations among metros. Figure 3 shows the correlation between housing unit supply growth from 2000 to 2016 and home price growth 2006 to 2016. The chart doesn't show a clear correlation. But if we treat Austin, Dallas, Nashville, Houston, Denver, San Antonio as a group for high job growth and the rest of the metros as a group for medium or low job

Figure 2 Correlation Between Payroll Employment Growth and Home Price Growth, 2006-2016



Sources: Bureau of Labor Statistics and Zillow

Figure 3 Correlation Between Housing Supply Growth, 2000-2016 and Home Price Growth, 2006-2016



Sources: American Community Survey and Zillow

growth, we can get two negative correlations. That means high housing supply is related to low home price growth.

By putting these two variables together, the following simple regression demonstrate how both job growth (2006 to 2016) and housing units supply growth (2000 to 2016)[2] could predict home price growth from 2006 to 2016. Both coefficients of job growth and housing supply growth are statistically significant. High job growth leads to high home price growth while high housing supply growth leads to low home price growth. This is a confirmation of basic economics 101. It is worth noting that our simple regression could only demonstrate correlation not causality. The relationship could go from home price growth to job growth and housing supply growth as well. So we should take these coefficients with a grain of salt.

Nevertheless, our result is consistent with the main literature which has documented plenty of evidence that housing supply impacts home prices. For instance, Glaeser, Gyourko, and Saiz (2008)[3] suggested that places with more elastic housing supply have smaller price increases following a fundamental increase in housing demand. Grimes and Aitken (2010)[4] suggested that higher housing supply elasticities help contain price spikes following demand shocks. Glaeser and Ward (2009)[5] argued that U.S. cities have seen increases

$$\text{Home price growth 06-16} = -0.06 + 2.34 \times \text{Job growth 06-16} - 0.61 \times \text{House unit growth 00-16}$$

(t-stat) (-1.5) (7.4) (-3.5)

Adj. R squared = 0.58 Observations = 40

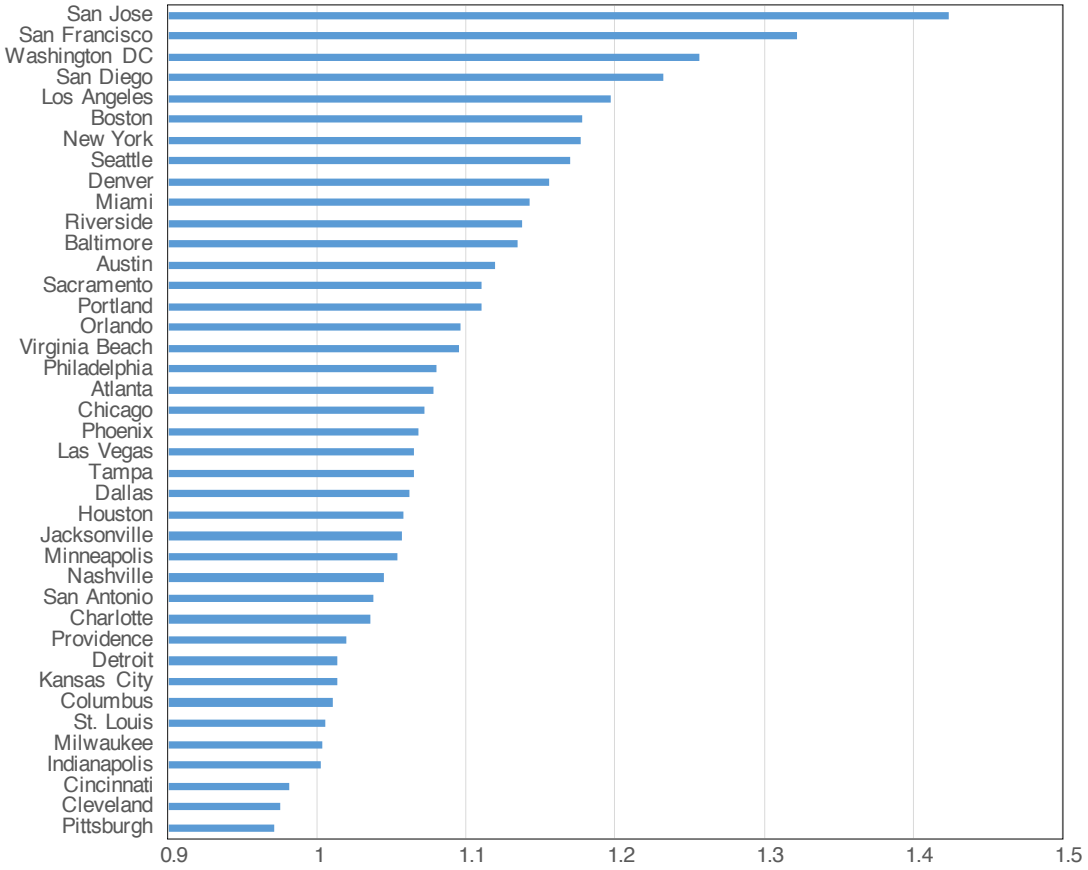
2. *Data is from American Community Survey where they only show the housing units built between 2000-2009, 2010-2013, and 2013 to 2016. We cannot break it down to 2006 to 2016.*
3. *Edward Glaeser, Joseph Gyourko, Saiz (2008), "Housing Supply and Housing Bubbles," Journal of Urban Economics, 64:2, 198-217.*
4. *Arther Grimes and Andrew Aitken (2010), "Housing Supply, Land Costs and Price Adjustment," Real Estate Economics, 38:2, 325-353.*
5. *Ed Glaeser, Bryce Ward (2008), "The Causes and Consequences of Land Use Regulation: Evidence from Greater Boston," Journal of Urban Economics, 65, 265-278.*

in housing prices and decreases in new construction. And land use regulations are associated with reduction in the housing supply. Caldera and Johansson (2013)[6] suggested that in the long run, a more flexible supply of housing is desirable as it allows a better match of housing construction to changes in housing demand. Hsieh and Moretti (2017)[7] pointed out that high productivity cities in the U.S. have adopted stringent restrictions to new housing supply. As a result, misallocation arises because these high productive cities limits the entrance of workers with high productivity from other part of the country.

City Cost of Living Index (CCLI) and Real Earnings

In the previous section, we discussed that demand and supply factors of the housing markets will drive differentials of home price growth across metros. It will eventually cause wide differences in home price, rents, and cost of living across metros. Given the availability of transportation, e-commerce, and mobility in the country, we believe there is little difference in costs for most tradable goods and services across metros. We suspect that a major cause of cost of living differences among metros is the rental price/home

Figure 4 City Cost of Living Index (Based on Rents), 2016



Source: American Community Survey and author's calculation

6. *Aida Caldera and Asa Johansson (2013), "The Price Responsiveness of Housing Supply in OECD Countries," Journal of Housing Economics, 22:3, 231-249.*
7. *Chang-Tai Hsieh and Enrico Moretti (2017), "Housing Constraints and Spatial Misallocation," Working paper.*

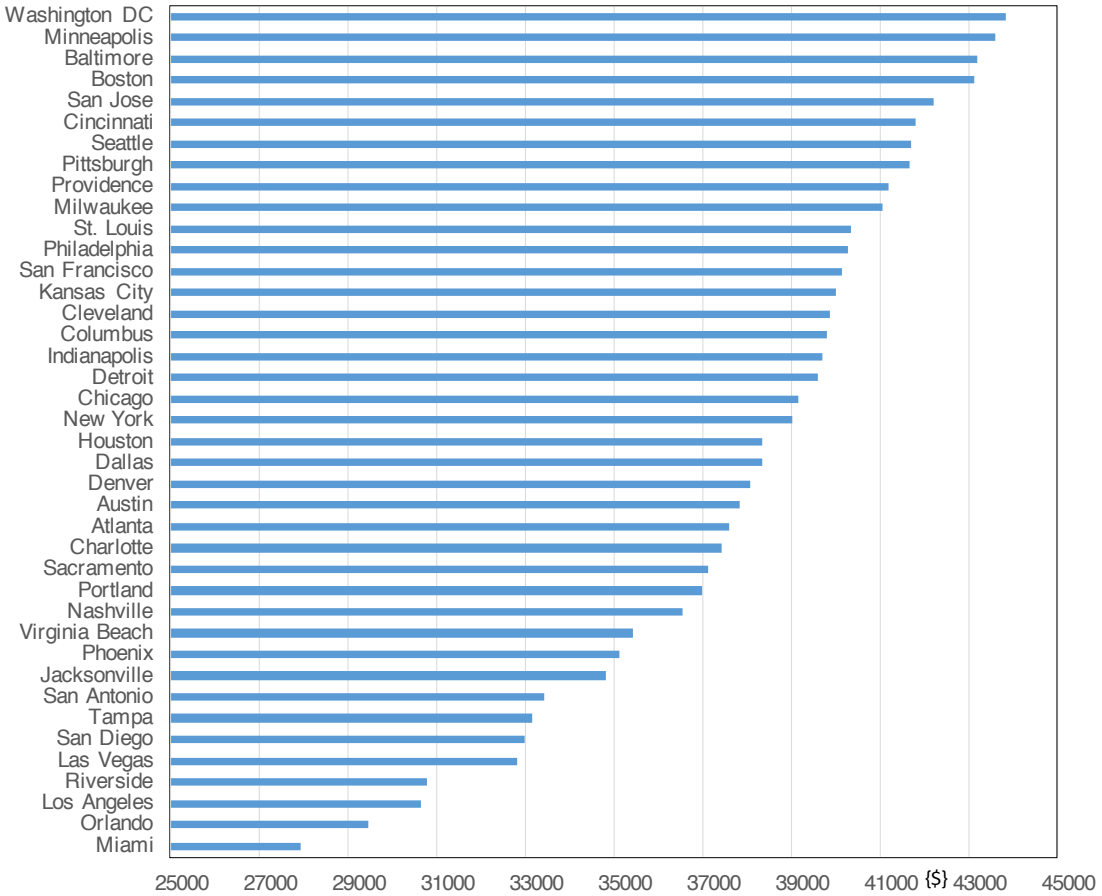
price (mortgage payment). In the future, we will develop a more complete index to incorporate more components in addition to rents.

We assume that rental prices and home prices (mortgage payments) are highly correlated, thus we only use rental prices for a metro to calculate its City Cost of Living Index (CCLI). We use the data of median rents for 511 metros from the American Community Survey in which the average of these 511 median rents ($847) is the base index of 1. We adopt the same weight (30%) of rents calculated in Consumer Price Index by Bureau of Labor Statistics.

Let's use Los Angeles as an example. Los Angeles' median rent is $1,403 in 2016. So we compute the CCLI for L.A. by 0.3*(1,403-847)/847+1 = 1.2. The number means that cost of living in Los Angeles is 20% higher than the national metro average because of its high rent. Figure 4 lists the CCLI in 2016 for 40 major metros. San Jose is the most expensive metro with CCLI of 1.42, followed by San Francisco's 1.32, Washington DC's 1.26, San Diego's 1.23, and Los Angeles's 1.20.

The CCLI is similar to the regional price parity developed by Bureau of Economic Analysis[8] and State Cost of Living Index developed by Missouri Economic Research and Information Center.[9] With CCLI at hand, we can now answer the question: Are residents, in general, better off living in a thriving city with soaring housing cost in terms of their real purchasing power? We calculate the real earn-

Figure 5 Real Earnings Adjusted for City Cost of Living Index, 2016



Source: American Community Survey and author's calculation

8. *https://www.bea.gov/newsreleases/regional/rpp/rpp_newsrelease.htm*
9. *https://www.missourieconomy.org/indicators/cost_of_living/*

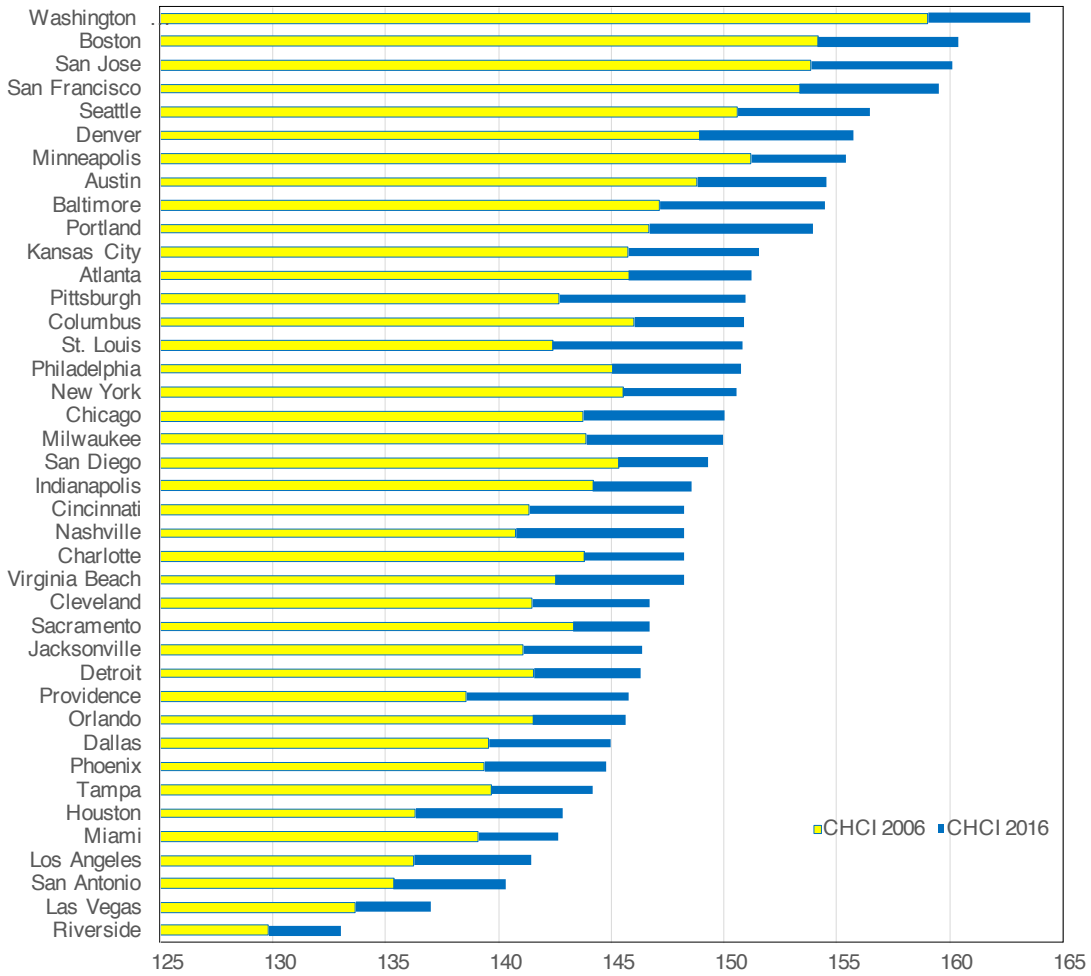
ings across metros by adjusting the nominal earnings with CCLI. For instance, Los Angeles' nominal earning in 2016 is $36,696. After adjusting, the real earning becomes $30,659 (36,696/1.2). Figure 5 presents the real earnings (CCLI adjusted) for 40 major metros. The richest metro in terms of purchasing power is Washington DC ($43,846), followed by Minneapolis' $43,597, Baltimore's $43,199, and Boston's $43,127. Los Angeles is ranked at the bottom number 3 with a real earning of $30,700 for a median earner, followed by Orlando's $29,500 and Miami's $28,000.

City Human Capital Index (CHCI)

How can we explain the dispersion of real earnings (adjusted for CCLI) across these 40 metros? One simple explanation is human capital. In our previous reports, we have documented the methodology of calculating the City Human Capital Index (CHCI). In general, we calculate the average schooling years of local adult residents and use it as a proxy for human capital. For instance, a resident without a high school degree is counted as having 5 schooling years, a resident with a high school degree is counted with 12 years, an Associate's degree is 14 years, a Bachelor's degree is 16 years, and a Master's degree or higher is 19 years. The index is then multiplied by 10 for a simple reading. That said, we can interpret that one-tenth of CHCI is about the average schooling year of local residents.

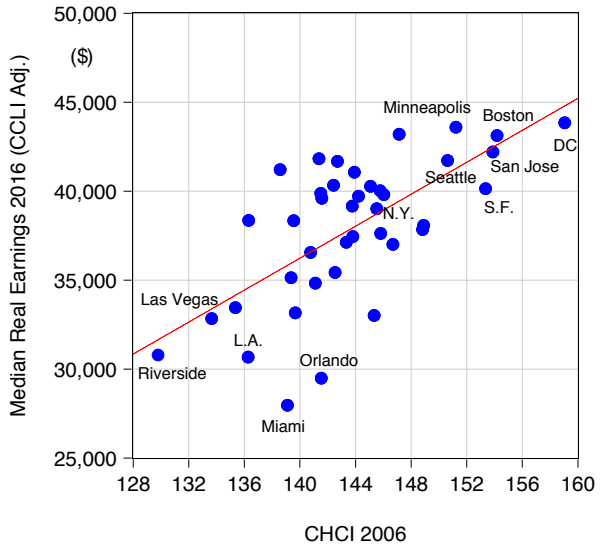
Figure 6 presents the CHCI in 2006 (yellow bar) and in 2016 (blue bar) for the 40 largest metros. By and large, we can see across-the-board enhancement of CHCI. This could be due to migration, and more investment and better out-

Figure 6 City Human Capital Index, 40 Largest Metros, 2006 and 2016



Source: American Community Survey

Figure 7 Correlation Between CHCI and Median Real Earning (CCLI adjusted), 40 Largest Metros, 2016



Source: American Community Survey and author's calculation

comes in education. The four most educated metros in 2006 are still in the same leading position in 2016: Washington DC is first, at 164 (16.4 schooling years), followed by Boston's 160, San Jose's 160, and San Francisco's 160. On the other hand, the four least educated metros in 2006 are still in the same order in 2016. Riverside (Inland Empire) is at 133, Las Vegas at 137, San Antonio at 140 and Los Angeles at 142.

Figures 7 shows the correlation between human capital (CHCI) and real earnings for 40 major metros. We can see a clear correlation between human capital and real median earning of a metro. Note that we use the CHCI in 2006 at the horizontal axis to illuminate that the likely relationship is from human capital to productivity/real earnings, not the other way around.

Our simple regression result tells us that one more schooling year is associated with $4,500 more earnings in these 40 metros. That is equivalent to 12% over the average real earnings in these 40 metros. The estimate is similar to the literature evidence. For instance, a seminal paper, "Estimates of the Economic Return to Schooling from a New Sample of Twins"[10] by Ashenfelter and Krueger (1994) indicated that an additional year of schooling increases wages by 12 to 16 %. Despite the non-linear returns of education, a private return to a schooling year was estimated ranging from 7% to 13% after controlling all other possible factors in the literature.[11]

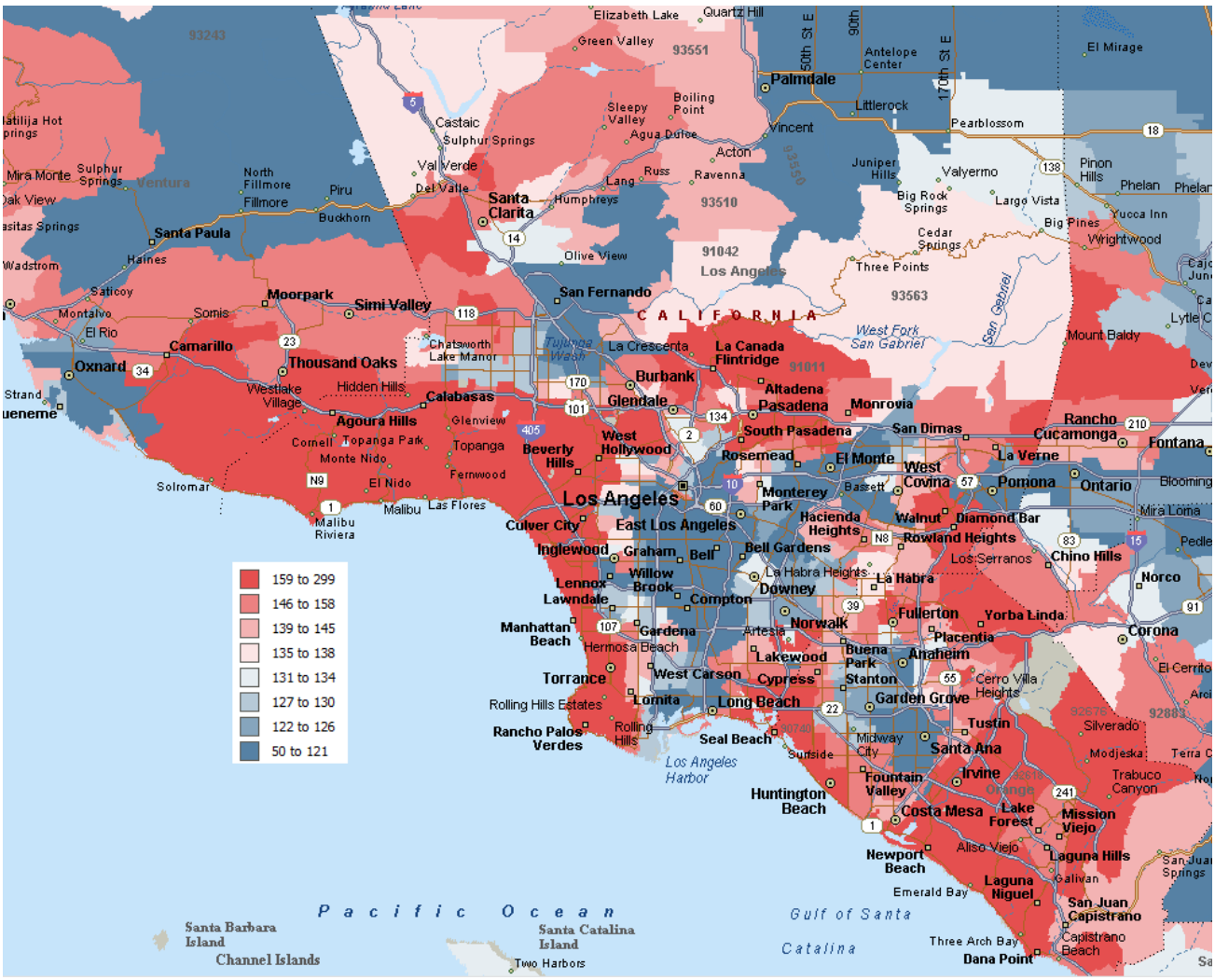
Inequality Within Los Angeles

Figure 8 shows the unequal human capital and real earnings across the major metros. We find that the inequality also exists within a metro. Figure 8 depicts the CHCI by zip code in the Los Angeles metro, in which red represents zip codes with high human capital while blue represents areas with low human capital. The darker the red, the higher the human capital for the region. The darker the blue, the lower the human capital. Figure 8 demonstrates the inequality of human capital in the L.A. It shows a distinct contrast, for example, between West L.A. and South L.A. The average CHCI in West L.A. is above 160 (16 schooling years; beyond bachelor's degree) while the average CHCI in South L.A. is below 100 (below high school diploma).

It is not surprising to find that there is a strong correlation between CHCI and earning by zip code within a metro as we have seen in Figure 7. That said, to have a shared prosperity for a city, it is imperative to focus on investment in education and enhancing human capital for all the children in our city, especially for those disadvantaged children in South L.A.

10. Orley Ashenfelter and Alan Krueger, American Economic Review, 84:5, 1157-1173.
11. George Psacharopoulos & Harry Patrinos, "Returns to investment in education: a further update," Education Economics, (2004), 12:2, 111-134.

Figure 8 City Human Capital Index by Zip Code in L.A. Metro, 2013


159 to 299
146 to 158
139 to 145
135 to 138
131 to 134
127 to 130
122 to 126
50 to 121
Los Angeles
Pacific Ocean
Santa Barbara Island
Channel Islands
Santa Catalina Island
Two Harbors
Gulf of Santa Catalina
Los Angeles Harbor
CALIFORNIA
Palmdale
Santa Clarita
Santa Paula
Ventura
Oxnard
Camarillo
Thousand Oaks
Moorpark
Simi Valley
San Fernando
Burbank
Glendale
Pasadena
Monrovia
Rancho Cucamonga
Fontana
Ontario
Pomona
Chino Hills
Norco
Corona
Anaheim
Fullerton
Placentia
Yorba Linda
Long Beach
Torrance
Huntington Beach
Newport Beach
Irvine
Santa Ana
Tustin
Mission Viejo
Laguna Hills
Laguna Niguel
San Juan Capistrano
Dana Point
Malibu
Beverly Hills
West Hollywood
Culver City
Inglewood
Compton
Downey
Norwalk
Lakewood
Cerritos
Rowland Heights
Hacienda Heights
Walnut
Diamond Bar
Mira Loma
Pedley
Silverado
Modjeska
Trabuco Canyon
Lake Forest
Aliso Viejo
Emerald Bay
Three Arch Bay
Capistrano Beach
Seal Beach
Huntington Beach
Rancho Palos Verdes
Rolling Hills Estates
Manhattan Beach
Hermosa Beach
Lomita
Lawndale
Lennox
Willow Brook
Bell
Bell Gardens
Graham
East Los Angeles
Rosemead
El Monte
West Covina
South Pasadena
San Dimas
La Verne
Altadena
La Canada Flintridge
La Crescenta
Chatsworth
Lake Manor
Calabasas
Agoura Hills
Westlake Village
Hidden Hills
Topanga
Pacoima
Sylmar
Saticoy
Somis
Moorpark
Simi Valley
Santa Clarita
Palmdale
Lancaster
Acton
Vincent
Littlerock
Pearblossom
Juniper Hills
Valyermo
Big Rock Springs
Largo Vista
Big Pines
Wrightwood
Cedar Springs
Three Points
Pinon Hills
Phelan
Yucca Inn
Mount Baldy
Lytle Creek
Antelope Center
El Mirage
Elizabeth Lake
Quartz Hill
Green Valley
Sleepy Valley
Boiling Point
Agua Dulce
Castaic
Sulphur Springs
Val Verde
Del Valle
Piru
Fillmore
North Fillmore
Buckhorn
Haines
Wadsworth
Montalvo
El Rio
Strand
Solromar
Malibu Riviera
Las Flores
Topanga Park
Monte Nido
El Nido
Cornell
Fernwood
Glenview
Olive View
Humphreys
Lang
Russ
Ravenna
Mira Monte
Oak View
Santa Barbara
Tujunga Wash
West Fork San Gabriel
San Gabriel
Cajon Junction
Rancho Palos Verdes
Rolling Hills
Rolling Hills Estates
Hawthorne
Gardena
Torrance
Lomita
Long Beach
Seal Beach
Los Angeles Harbor
Huntington Beach
Fountain Valley
Costa Mesa
Newport Beach
Aliso Viejo
Laguna Hills
Laguna Niguel
San Juan Capistrano
Dana Point
Three Arch Bay
Emerald Bay
Silverado
Modjeska
Trabuco Canyon
Lake Forest
Mission Viejo
Irvine
Santa Ana
Tustin
Garden Grove
Stanton
Buena Park
Anaheim
Placentia
Fullerton
Yorba Linda
Corona
Norco
Chino Hills
Ontario
Pomona
Walnut
Diamond Bar
Rowland Heights
Hacienda Heights
Los Serranos
La Habra
La Habra Heights
Downey
Norwalk
Artesia
Lakewood
Cerritos
Cerro Villa Heights
Midway City
Sunset Beach
Surfside
Huntington Beach
Fountain Valley
Costa Mesa
Newport Beach
Aliso Viejo
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Pedley
Chino Hills
Ontario
Pomona
Rancho Cucamonga
Fontana
Bloomington
Rialto
Colton
Grand Terrace
Loma Linda
Redlands
Yucaipa
Calimesa
Beaumont
Cherry Valley
Banning
Cabazon
Desert Hot Springs
Palm Springs
Cathedral City
Rancho Mirage
Palm Desert
Indio
Coachella
Thermal
Mecca
Oasis
Thermal
Indio
Coachella