

Metropolitan Futures Initiative (MFI) Quarterly Report:

Jobs-Housing Balance in Egohoods in Southern California



Presented by the Metropolitan Futures Initiative (MFI)

School of Social Ecology

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Jobs-Housing Balance in Egooods in Southern California

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January 1, 2017

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About the Metropolitan Futures Initiative (MFI)



The Metropolitan Futures Initiative (MFI) in the School of Social Ecology at the University of California, Irvine aims to develop an improved understanding of communities and their potential for integrative and collaborative planning and action to ensure a bright future for the region. It approaches these goals by bringing together an interdisciplinary research team along with the insights and techniques of “big data” research.

By combining various large longitudinal and spatial data sources, and then employing cutting edge

statistical analyses, the goal is to come to a better understanding of how the various dimensions of the social ecology of a region move together to produce the outcomes observed within our neighborhoods.

With initial focus on Orange County and its location within the larger Southern California area, The Metropolitan Futures Initiative is a commitment to build communities that are economically vibrant, environmentally sustainable, and socially just by partnering the School of Social Ecology’s world class, boundary-crossing scholarship with expertise throughout Southern California.

The *MFI Quarterly Report* series presents cutting edge research focusing on different dimensions of the Southern California region, and the consequences for neighborhoods in the region. Reports released each quarter focus on issues of interest to the public as well as policymakers in the region. In addition, the MFI webpage (mfi.soceco.uci.edu) provides interactive mapping applications that allow policymakers and the public to explore more deeply the data from each Quarterly Report.

The MFI gratefully acknowledges the Heritage Fields El Toro, LLC for their funding support.

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The MFI Research Team:



John R. Hipp is the Director of the Metropolitan Futures Initiative (MFI). He is a professor in the Department of Criminology, Law and Society, the Department of Policy, Planning, and Design, and the Department of Sociology, at the University of California, Irvine. He is also co-director of the Irvine Lab for the Study of Space and Crime (ILSSC). His research interests focus on how neighborhoods change over time, how that change both affects and is affected by neighborhood crime, and the role networks and institutions play in that change. He approaches these questions using quantitative methods as well as social network analysis.



Jae Hong Kim is a member of the MFI Executive Committee and a faculty member in the Department of Planning, Policy, and Design at the University of California, Irvine. His research focuses on urban economic development, land use change, and the nexus between these two critical processes. His academic interests also lie in institutional environments — how institutional environments shape urban development processes — and urban system modeling. His scholarship attempts to advance our knowledge about the complex mechanisms of contemporary urban development and to develop innovative urban planning strategies/tools for both academics and practitioners.



Kevin Kane is a postdoctoral research fellow in the Department of Planning, Policy and Design at the University of California, Irvine. He is an economic geographer interested in the quantitative spatial analysis of urban land-use change and urban development patterns, municipal governance, institutions, and economic development. His research uses land change as an outcome measure – in the form of changes to the built environment, shifting patterns of employment, or the socioeconomic composition of places – and links these to drivers of change including policy, structural economic shifts, or preferences for how we use and travel across urban space.



Young-An Kim is a Ph.D. student in the department of Criminology, Law and Society, at the University of California, Irvine. His research interests focus on crime patterns at micro places, effects of structural characteristics of street segments on crime, and immigration and crime. Besides criminology, he is interested in sociology of health, urban sociology, and quantitative research methods.

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Results in Brief

- Total jobs-housing ratios are adept at distinguishing between areas of high employment concentration and bedroom communities. High values indicate more nearby employment opportunities for local residents:
 - » Downtown and West L.A., Burbank, and Irvine have amongst the highest ratios
 - » Malibu, the Palos Verdes Peninsula, and Chino Hills have amongst the lowest ratios
 - » Certain areas in the Inland Empire have witnessed the highest increases in jobs-housing ratios since 2002
- Low-income jobs-housing ratios help to understand whether local employment opportunities sufficiently exist in close proximity to lower-earning residents.
 - » Santa Monica in particular has a low concentration of lower-end employment relative to lower-income population
 - » Coastal Orange County has a surplus of low-end employment relative to lower-earning population
- Neighborhoods heavier in Asian or Latino population tend to have higher jobs-housing ratios
- Neighborhoods with more immigrants have far poorer local access to jobs – particularly high-paying jobs
- Areas with more single-family housing and a higher percentage of children tend to have lower jobs-housing ratios
- In addition to jobs-housing ratios, a measure of jobs-housing imbalance can help identify the extent to which jobs and housing exist unevenly in places across the region, which can contribute to increased transportation need:
 - » Region-wide, jobs-housing imbalance increased modestly from 2002-2010, suggesting increased separation between jobs and housing
 - » However, this imbalance was only seen at middle- and high-income levels; imbalance remained unchanged at low-income levels



An Introduction to Jobs-Housing Balance in Southern California

A challenge for any region is matching the location of where residents live and where jobs are located. On the one hand, residents oftentimes prefer not to be too close to industrial or commercial sites having certain types of jobs. On the other hand, residents typically do not want to be too far from jobs, as this implies longer commute times and/or limited access to services. And to the extent that many people in the region have longer commutes, this can lead to an overtaxing of the transportation system, which will exacerbate the commute (or other) travel times. Thus, the “balance” between the location of jobs and housing is of considerable interest to policy makers and scholars.

In this Report we study the relationship between the location of jobs and the residential location of potential workers. Jobs-housing balance is a concept commonly-used by urban planners to assess the composition of a neighborhood, and to gauge the level to which an area is “imbalanced” and inherently promoting long travels². Measures of jobs-housing balance have been broadened to include potential job matches by income or skill level. The concept of imbalance can also be related to the so-called Spatial Mismatch Hypothesis³, wherein the mid-century suburbanization of manufacturing jobs was thought to create accessibility problems for lower-income, inner city residents who generally filled those jobs.

Jobs-housing balance has long been of interest to planners in Southern California. A study done in 1993 postulated that, if we were to optimally reallocate all the jobs and housing in Southern California to minimize distance between home and work, we could achieve an average commute time of 8.42 minutes⁴. The Southern California Association of Governments (SCAG) regional plan for 2040 notes that jobs-housing balance is an important part of reducing vehicle miles traveled (VMT) and transportation-related pollution and suggests that transit-oriented development (TOD) may be a remedy. Their report using 2012 data finds that higher wage workers tend to commute longer distances than their lower wage counterparts, while inland counties have lower jobs-housing ratios than coastal counties.⁵

In addition, the California Governor’s Office of Planning and Research periodically surveys cities to gauge the extent to which jobs-housing balance varies statewide. In the most recent survey (2005), 54 out of 132 surveyed jurisdictions had an aspect of jobs-housing balance in their general plans, mostly in the form of housing policies. The city of Irvine, in particular, frequently touts its high level of jobs-housing balance – 2.48, in a recent report – as an indicator of job richness⁶. However, measuring jobs housing balance is highly dependent on the spatial unit analyzed – county, city, census tract, or other level.

This Report's Contributions

This report highlights trends in jobs-housing balance in Southern California since 2002 and offers some methodological improvements in analyzing this indicator of urban sustainability.

First, we distinguish between two related, but different concepts: *jobs-housing ratios* and *jobs-housing imbalance*. A jobs-housing ratio is simply the number of jobs in an area divided by the count of the workers residing in the area. A value below 1.0 indicates that an area is heavier in population and residents are likely to out-commute. Such a place could be considered a “bedroom community.” A value above 1.0 indicates that an area is heavier in employment and residents are likely to in-commute. Such a place might be considered a “job center” (see the July 2016 MFI report on *Detecting Job Density Over Time*). Thus, a jobs-housing ratio measures the extent to which an area has many jobs relative to its housing. If a city is interested in promoting jobs that are accessible to its residents, a jobs-housing ratio may be a meaningful measure of local employment opportunities.

However, jobs-housing ratios do not indicate whether an area is “balanced” and might be contributing to high levels of cross-commuting. While Irvine’s jobs-housing ratio of 2.48 indicates local jobs are available to its residents, this number also indicates that people are commuting to Irvine from elsewhere. Thus, a true measure of jobs-housing imbalance would reflect how far an area’s jobs housing ratio is from 1.0, i.e. perfectly balanced. This report uses a linear transformation of jobs-housing ratios to generate jobs-housing imbalance, which measures the extent to which an area is balanced or not (see the Technical Appendix for details).

Second, we use what are called “egohoods” to analyze the jobs-housing ratio or jobs-housing imbalance experienced by an individual.¹ Most measures of jobs-housing balance use county boundaries, city boundaries, census tracts, or Traffic Analysis Zones (TAZs). One problem encountered with these measures is that the ratio or balance within them depends on their size: for example, a census tract that contains a large shopping mall is likely to have a high jobs-housing ratio but the city that contains it is likely to have a lower ratio since tracts containing housing are included. Neither measure accurately reflects somebody’s local job opportunities. Another problem is that somebody living near a city boundary may have numerous employment opportunities very close by, but if those jobs happen to lie on the other side of the city limits, they are not reflected in the jobs-housing ratio. For example, while the city of Tustin in Orange County does not have an unusually high density of jobs, many Tustin residents are within close proximity to neighboring Irvine which has a surplus of jobs.

* Note that at places in this report – including the title – we refer to “Jobs-Housing Balance” as a broader concept. However, it often refers to two distinctly different measurements: *jobs-housing ratios* and *jobs-housing imbalance*.

1. For a more complete discussion of egohoods, see Hipp, John R. and Adam Boessen. 2013. “Egohoods as waves washing across the city: A new measure of “neighborhoods.”” *Criminology* 51:287-327.

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A more realistic way to compare the relationship between jobs and housing would be to start with an individual and measure the jobs and the housing within a certain distance of him or her. Rather than individuals, we use census blocks, which are roughly comparable to city blocks and typically contain a few hundred people. We then draw a buffer of a certain distance around each block and tally the jobs and population within that distance threshold. We call this an “egohood” and primarily rely on a distance of 2.5 miles, though we also use a 5-mile egohood to check for robustness of our results. Thus, the jobs and housing existing within “a few miles”



of each person are used to gauge local job opportunity. We use data from the US Census Longitudinal Employer-Household Dynamics survey (LEHD). We used data from two time points: 2002 and 2010, allowing for an analysis of how these patterns have changed over the decade.

Third, we analyze the relationship between jobs and housing by income levels of households and at levels of earning at the place of work. A consistent problem in measuring jobs-housing balance is that it doesn’t actually indicate whether a local resident works nearby – it just indicates if there are jobs nearby. Some studies have looked at occupation codes to match residents’ likely occupations with nearby jobs. Instead, this Report uses income and compares balance between (1) high-income jobs and high earning residents, (2) middle income jobs and middle earning residents, and (3) lower income jobs and lower earning residents across Southern California. The purpose of making a distinction based on income/earnings stems from concepts in urban geography. For low-earners, local job opportunities could be more important if transportation is costly – in particular if a car is not available in transit-strapped Southern California. While high-paying jobs are more likely to be in concentrated employment centers, high-earners may be willing to pay more for transportation in order to enjoy more amenities where they live (however, this may not be the case if transportation cost is measured in commute time, which could explain an influx of high earners living near downtowns). The distinction also enables us to reflect the fact that not everyone is qualified for all job positions.

This report proceeds by analyzing the spatial patterns of jobs-housing ratios in 2002 and 2010 overall and by income level. A statistical model is used to explain how present-day jobs-housing balance is related to various socioeconomic characteristics in neighborhoods. Changes in jobs-housing imbalance are then analyzed with maps and a statistical model. Finally, we briefly discuss the relationship between jobs and housing at a city, rather than at an egohood or “individual” level.

Mapping Jobs-Housing Ratio in Southern California

In the first part of this report, we look at jobs-housing ratios. Table 1 shows a “snapshot” of these – first overall, and then based on income level – using our egohood aggregation:

Table 1: Jobs-Housing Ratios in Block Egohoods

	ALL JOBS		LOW-INCOME		MID-INCOME		HIGH-INCOME	
	AVG.	MAX*	AVG.	MAX*	AVG.	MAX*	AVG.	MAX*
2002	1.135	4.952	0.993	4.192	1.048	5.625	1.012	6.996
2010	1.066	5.212	1.003	3.687	1.076	5.253	1.111	8.000

*99th percentile used as max value

Total Jobs and Housing

These maps indicate the ratio of total jobs to total housing.

Egohoods consist of blocks within 2.5 miles. In 2002, we notice several red “hot spots” on the map that represent locations in which there is a very high ratio of jobs to workers. These are job-rich locations, and include West Los Angeles, Downtown Los Angeles, Torrance-Carson, LAX Airport, and Burbank. In Orange County, there are hot spots near East Anaheim-Orange, Costa Mesa, Irvine and Lake Forest. In contrast, areas of dark blue have a relatively low ratio of jobs to workers. These are often in more remote, high-income areas such as Palos Verdes, Malibu, Chino Hills, and Huntington Beach. However, these job-poor areas can also be seen in more central locations such as Florence-Graham/South Gate, Whittier, and Garden Grove. It is notable that the Inland Empire area is relatively job-poor, including Rancho Cucamonga, Rialto, and Moreno Valley; however a few key centers appear near Ontario, Riverside, and Redlands.



Turning to the change from 2002 to 2010 in the location of job hot spots, we see that the cluster around Downtown Los Angeles has expanded and connected into East Los Angeles. Pasadena has emerged as a jobs/worker hot spot by 2010. The area south of LAX has grown as a hot spot, whereas the Torrance/Carson hot spot has shrunk a bit. In the Inland Empire, the Ontario hot spot has expanded somewhat into Rancho Cucamonga, which exhibits a pronounced increase in jobs-housing ratio, and the hot spot near Redlands has grown considerably. There is evidence of a couple of jobs hot spots emerging in 2010 near Victorville, further north in LA County. In Orange County we see that several of the various hot spots from 2002 along the 55 Freeway have coalesced into a single large hot spot in 2010 covering East Anaheim, Orange, East Santa Ana, Tustin, West Irvine, Costa Mesa, and Newport Beach. Eastern Irvine remains a pronounced hot spot for jobs/workers. There is also the emergence of jobs hot spots in south Orange County.

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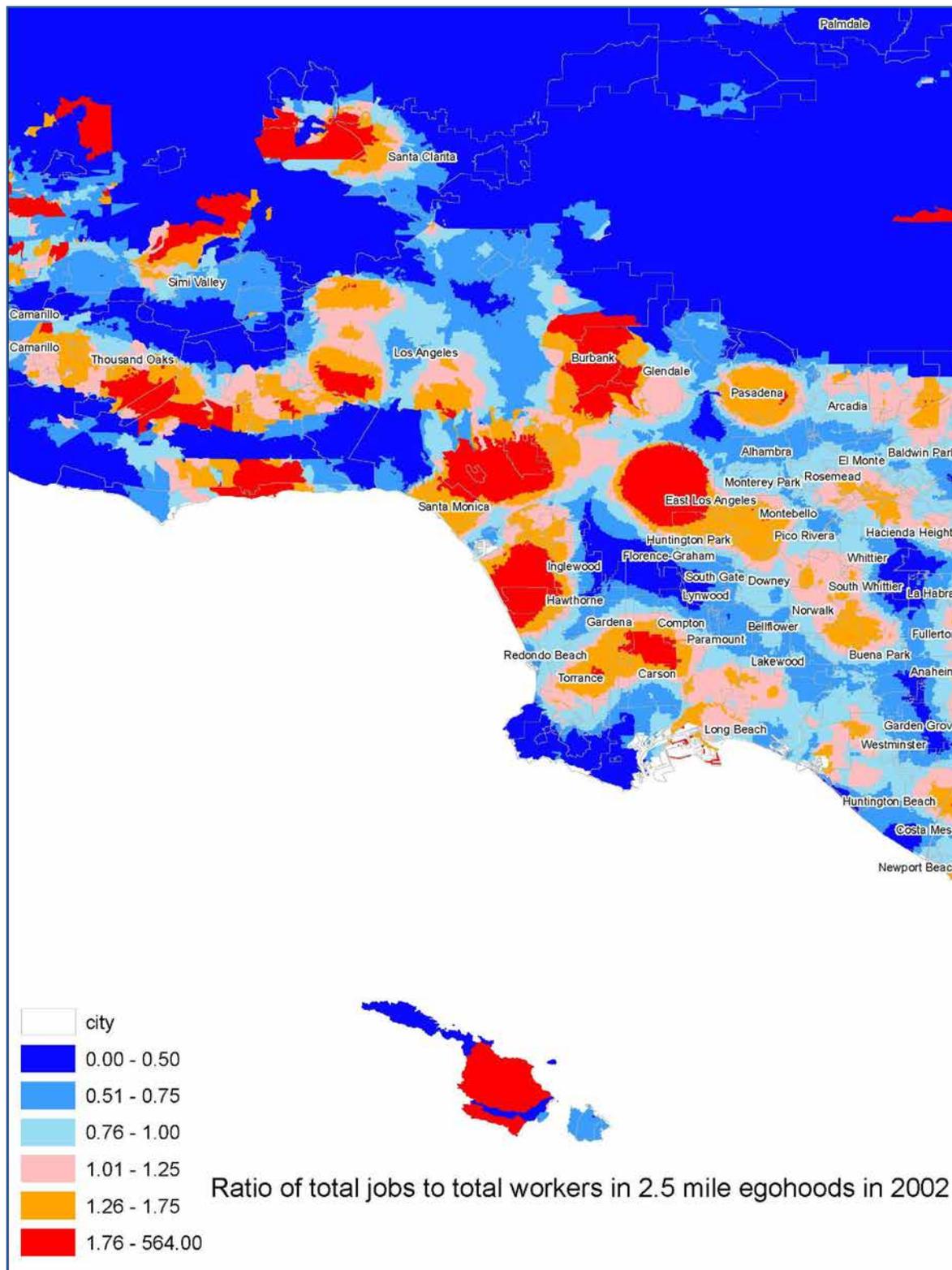


Figure 1: Jobs-housing ratios for all jobs/workers in 2002

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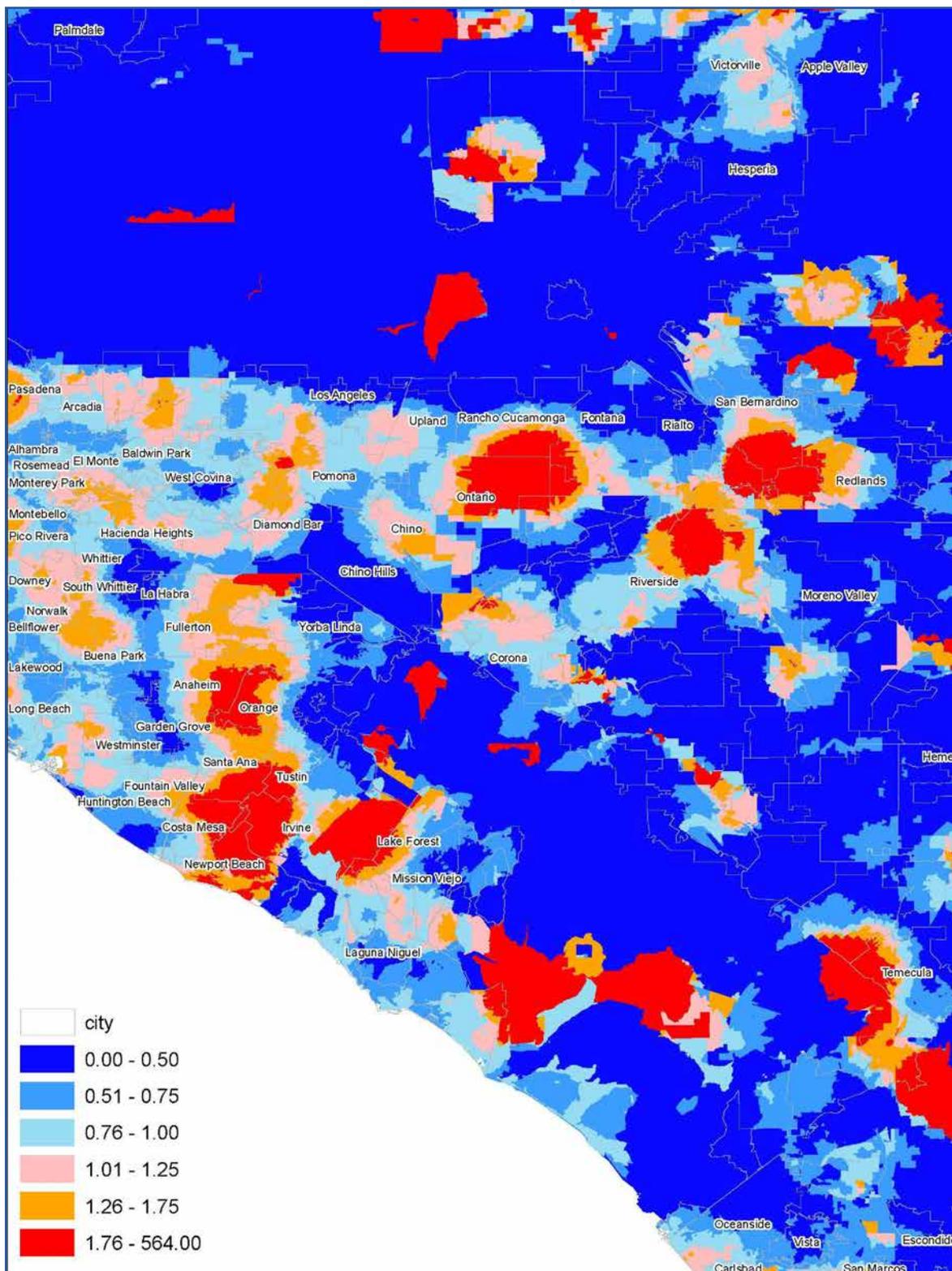


Figure 1a: Jobs-housing ratios for all jobs/workers in 2002

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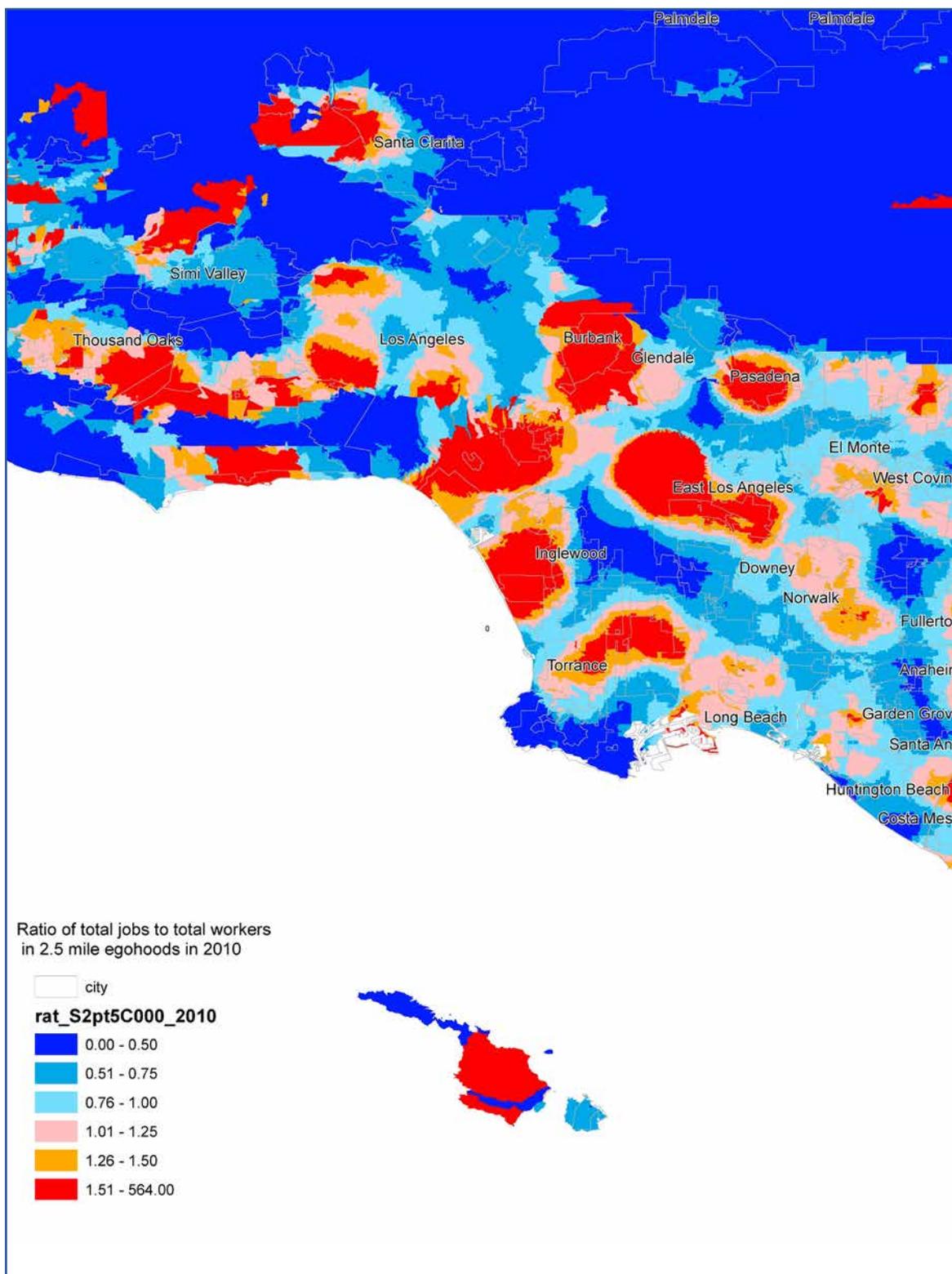


Figure 2: Jobs-housing ratios for all jobs/workers in 2010

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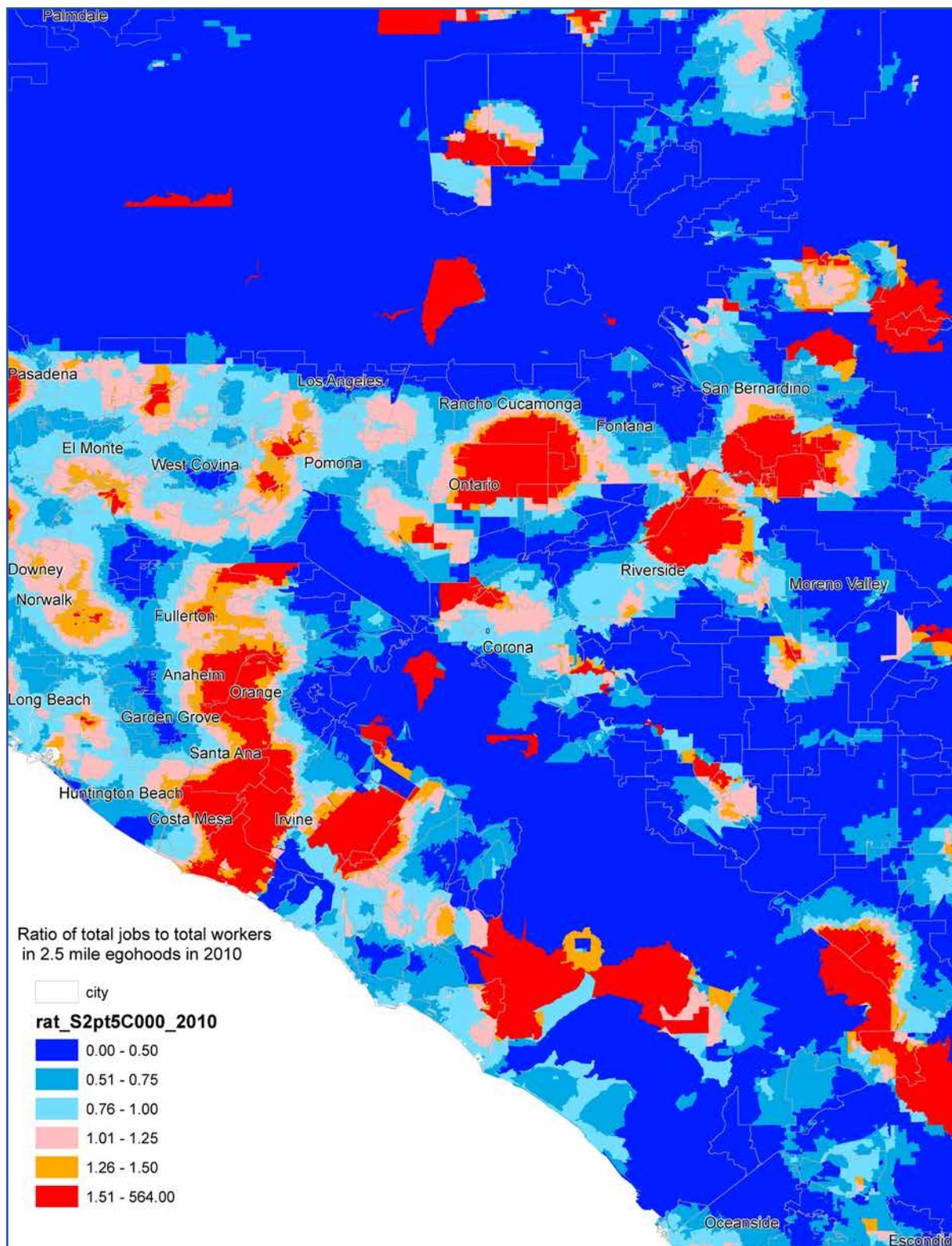
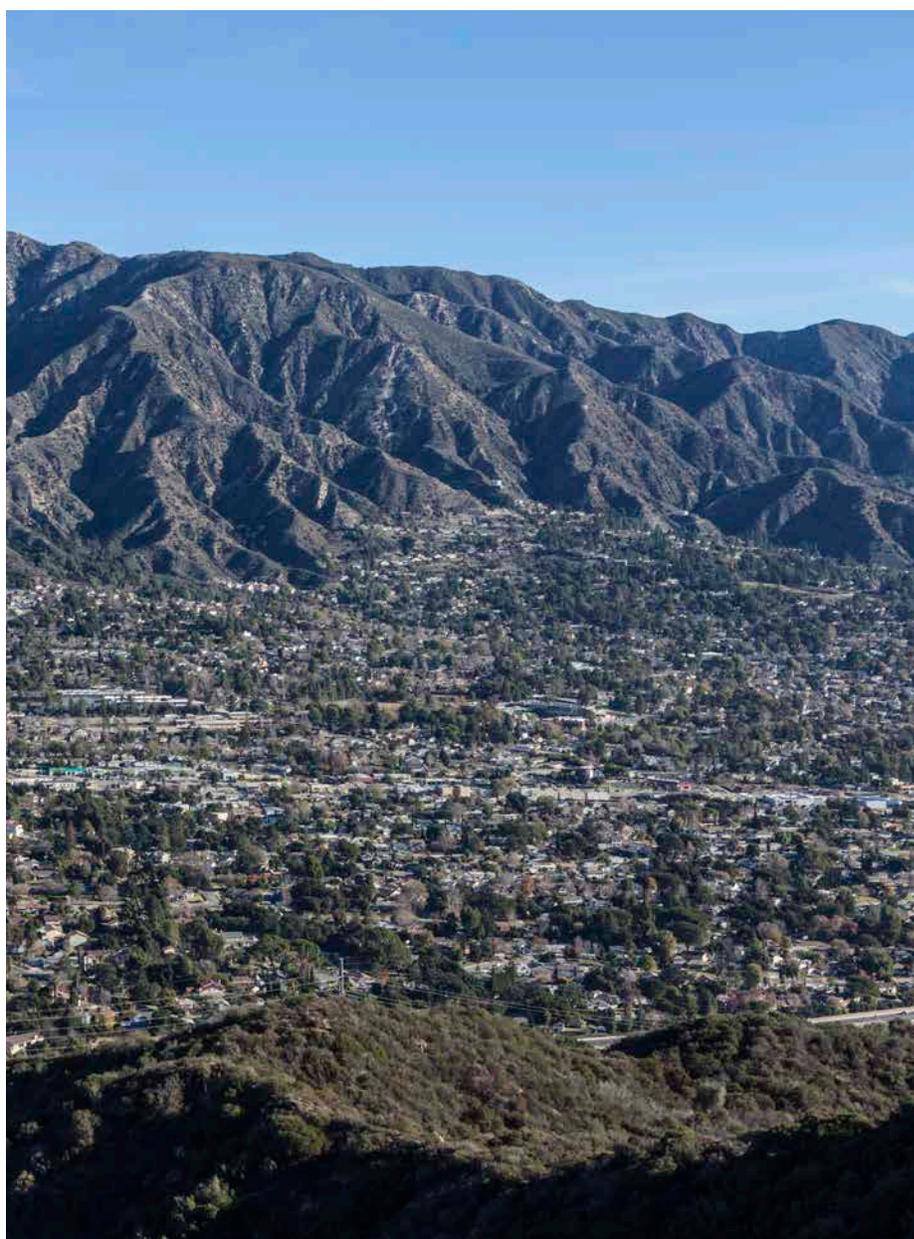


Figure 2a: Jobs-housing ratios for all jobs/workers in 2010

Checking for Robustness: Five-Mile Egohoods

In the next figure, we analyze jobs-housing ratios based on 5-mile egohoods rather than 2.5-mile egohoods. These capture the jobs-housing-ratio over a larger extent. In 2002, it is clear that the 5-mile egohoods yield fewer, but larger, hot spots of high jobs-housing ratios. While the West LA hotspot is larger at this scale, the downtown Los Angeles hot spot no longer appears, reflecting that its high concentration of jobs dissipates when moving further out from the downtown core. Elsewhere, the hotspots in Torrance-Carson, Irvine, Ontario, and Riverside continue to appear but are less extreme in value when measured with 5-mile egohoods.

Turning to the change from 2002 to 2010 in the location of job hot spots for the 5 mile egohoods, we see that whereas the Burbank hot spot has shrunk, the cluster around Downtown Los Angeles has emerged as a very large hot spot by 2010. The Torrance/Carson hot spot has evaporated, as has the one near East Los Angeles and the one near Hacienda Heights. The Ontario hot spot has expanded considerably into Rancho Cucamonga, and the hot spot near Redlands has also grown considerably. There is evidence of jobs hot spots emerging in 2010 out in the Victorville area. In Orange County we see that several of the various hot spots from 2002 have coalesced into a single large hot spot in 2010 covering Costa Mesa, Santa Ana, Tustin, Irvine, and Newport Beach.



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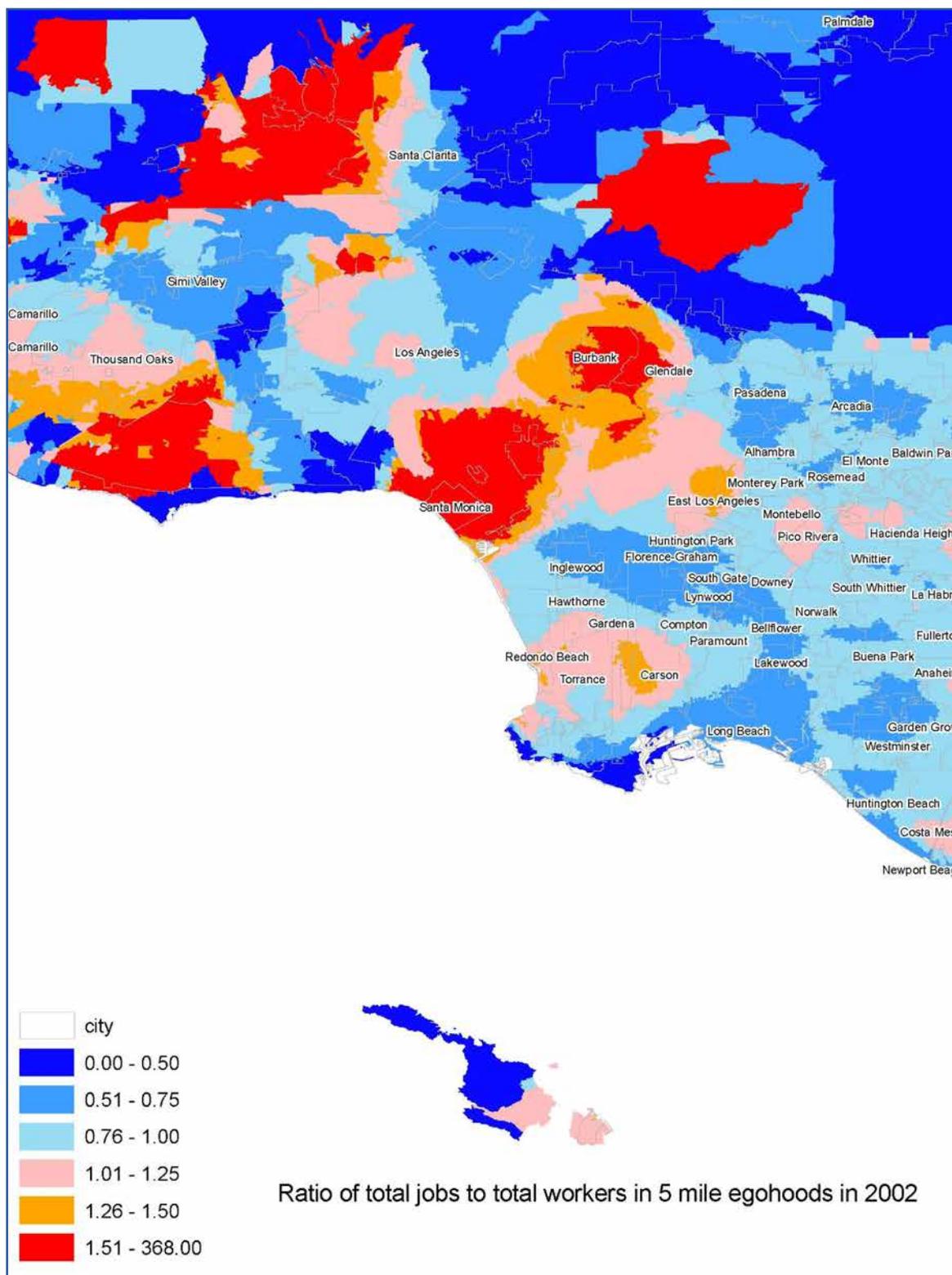


Figure 3: Ratios based on larger (5-mile) egohoods for all jobs/workers in 2002

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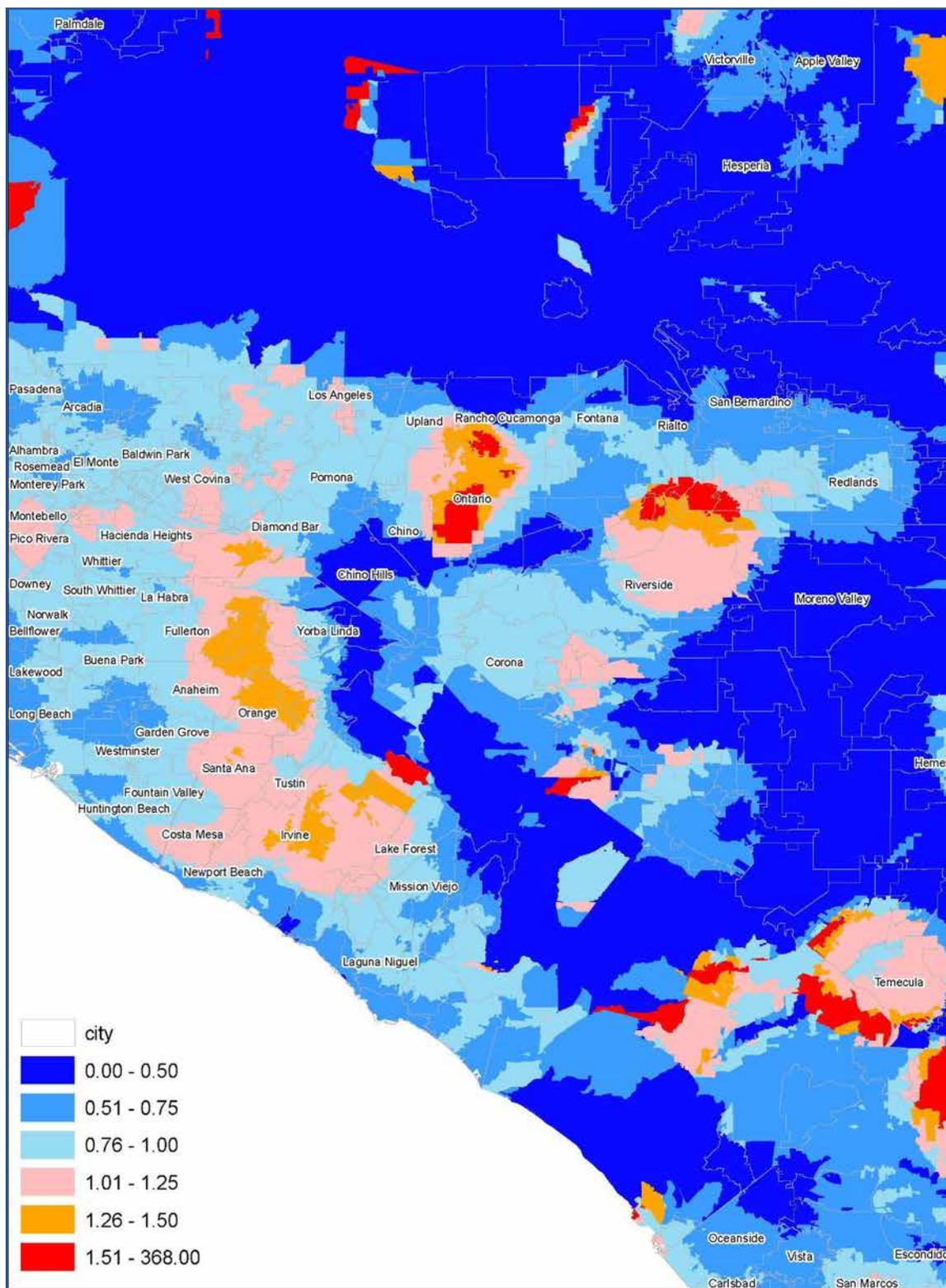


Figure 3a: Ratios based on larger (5-mile) egohoods for all jobs/workers in 2002

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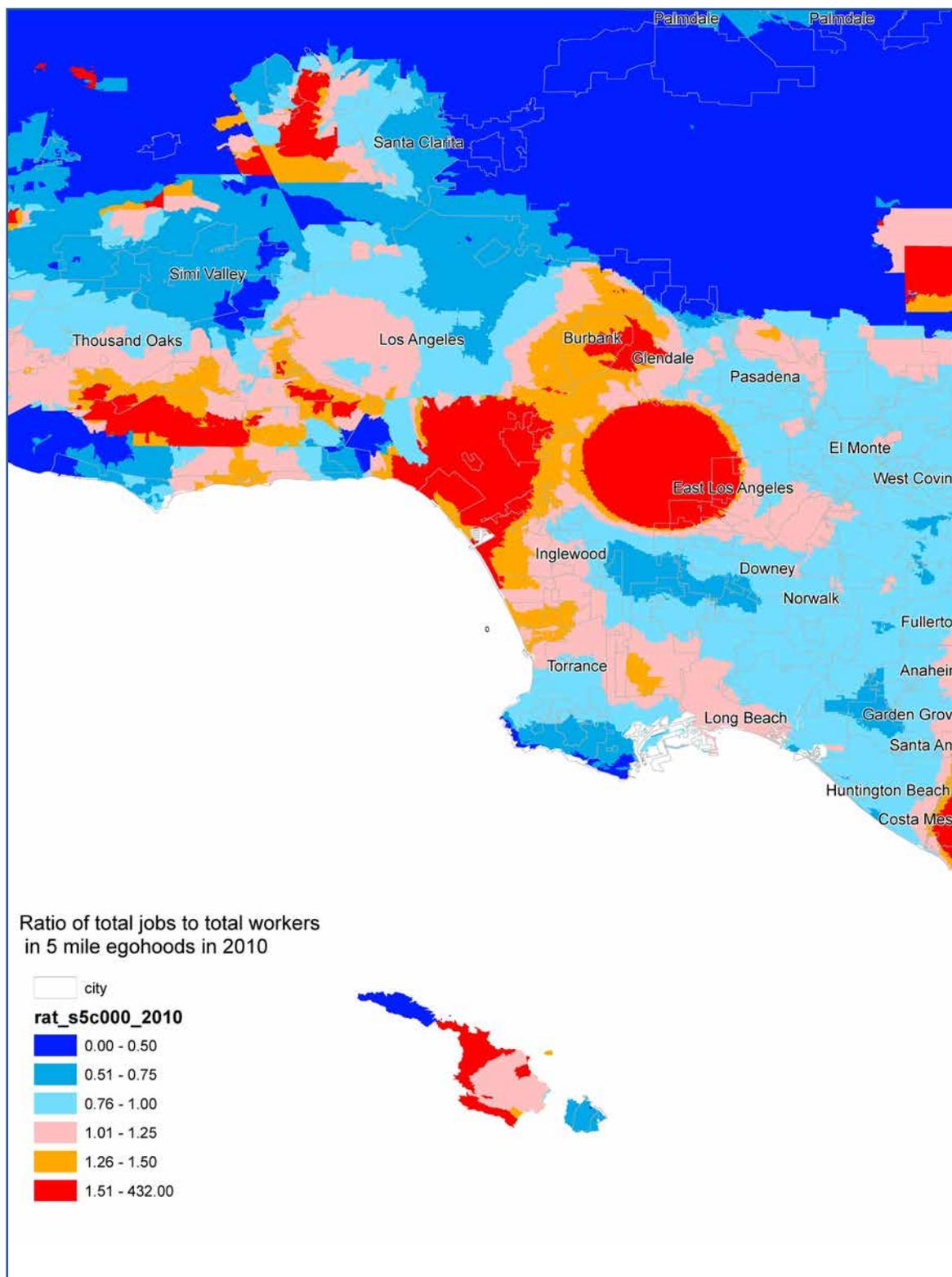


Figure 4: Ratios based on larger (5-mile) egohoods for all jobs/workers in 2010.

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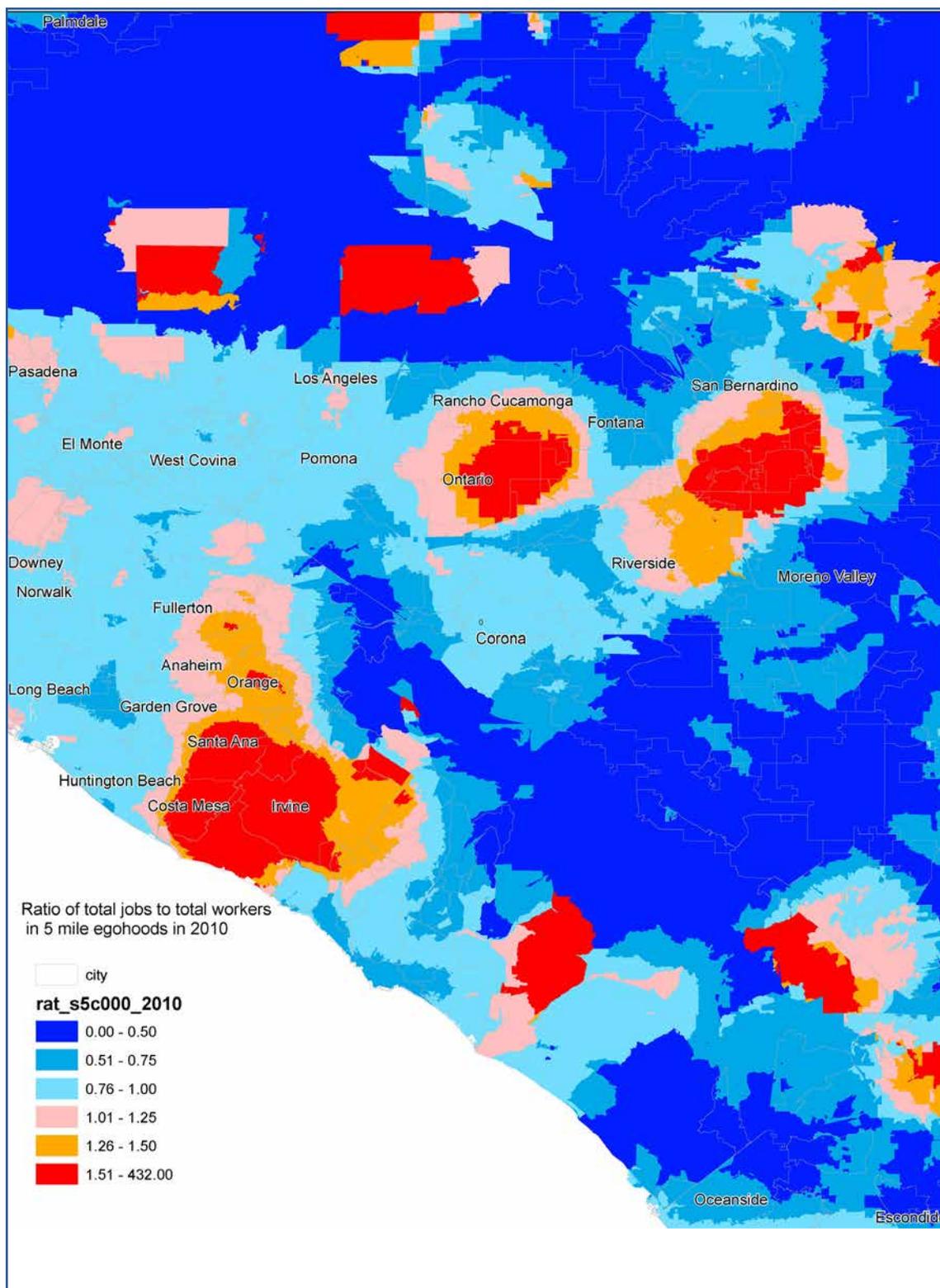


Figure 4a: Ratios based on larger (5-mile) egohoods for all jobs/workers in 2010

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Jobs-Housing Ratios by Income Level

High-income jobs and high-earning residents

We next distinguished between jobs and workers based on income level. We first look at the relationship between high wage jobs and high-income workers. In 2002, there are pronounced hotspots heavy in high-paying jobs (relative to high-income population) in West Los Angeles, Burbank/Glendale, near Hacienda Heights, and a large hot spot centered on Downtown Los Angeles spreading east into East LA. There is a large hot spot in the South Bay spreading into Compton, and large hot spots in Orange County that follow the 55 Freeway as well as in East Irvine. In the Inland Empire, there are large high-income job hot spots in Ontario, near Fontana, and spreading south into Riverside, and near Redlands.

Looking at the change in high-income job hot spots from 2002 to 2010, we see that the concentration near Santa Clarita has shrunk considerably over this period, the one near Simi Valley has migrated south, whereas one has emerged in Malibu. Although, the Burbank/Glendale hot spot has shrunk a bit, one has emerged in Pasadena. Whereas the high-income job hot spot near Hacienda Heights/El Monte has shrunk over this period, the one near LAX has grown considerably. The hot spots in Orange County remain relatively unchanged. In the Inland Empire, the hot spot in Ontario has expanded into Rancho Cucamonga, the hot spot near Riverside has expanded, and one in Redlands/San Bernardino is new and very pronounced.



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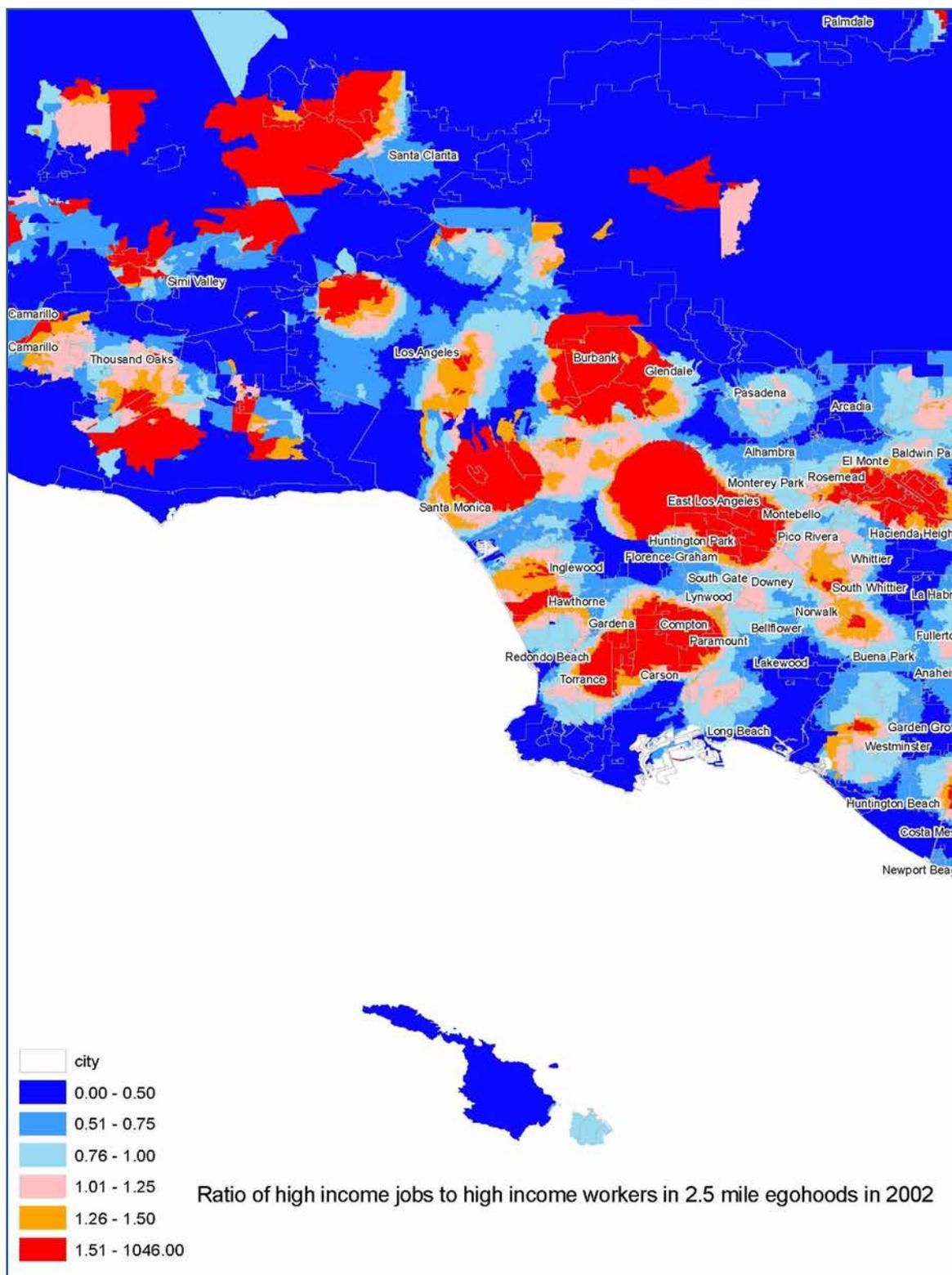


Figure 5: Jobs-housing ratios for high-income jobs and high-earning residents in 2002

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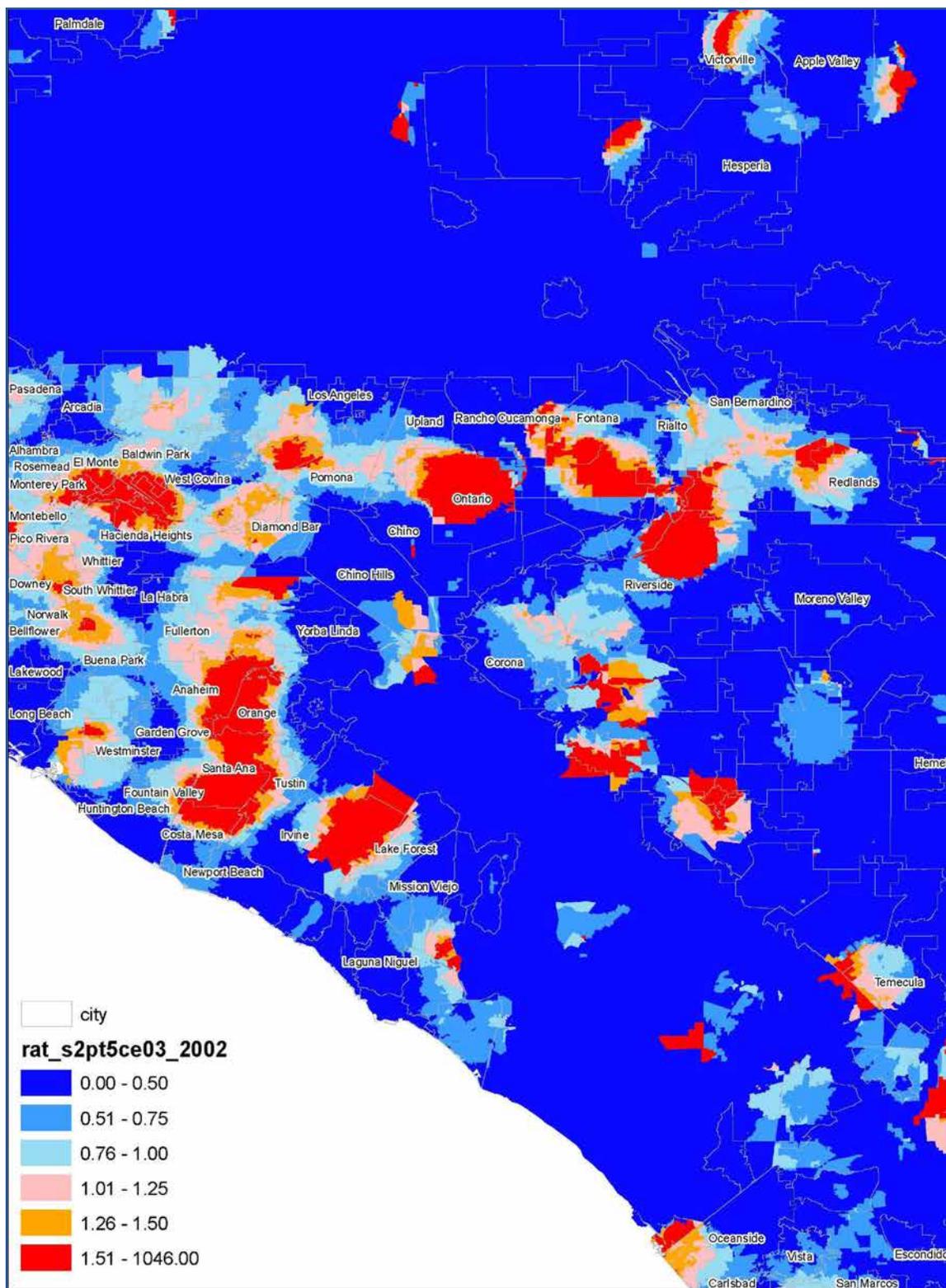


Figure 5a: Jobs-housing ratios for high-income jobs and high-earning residents in 2002

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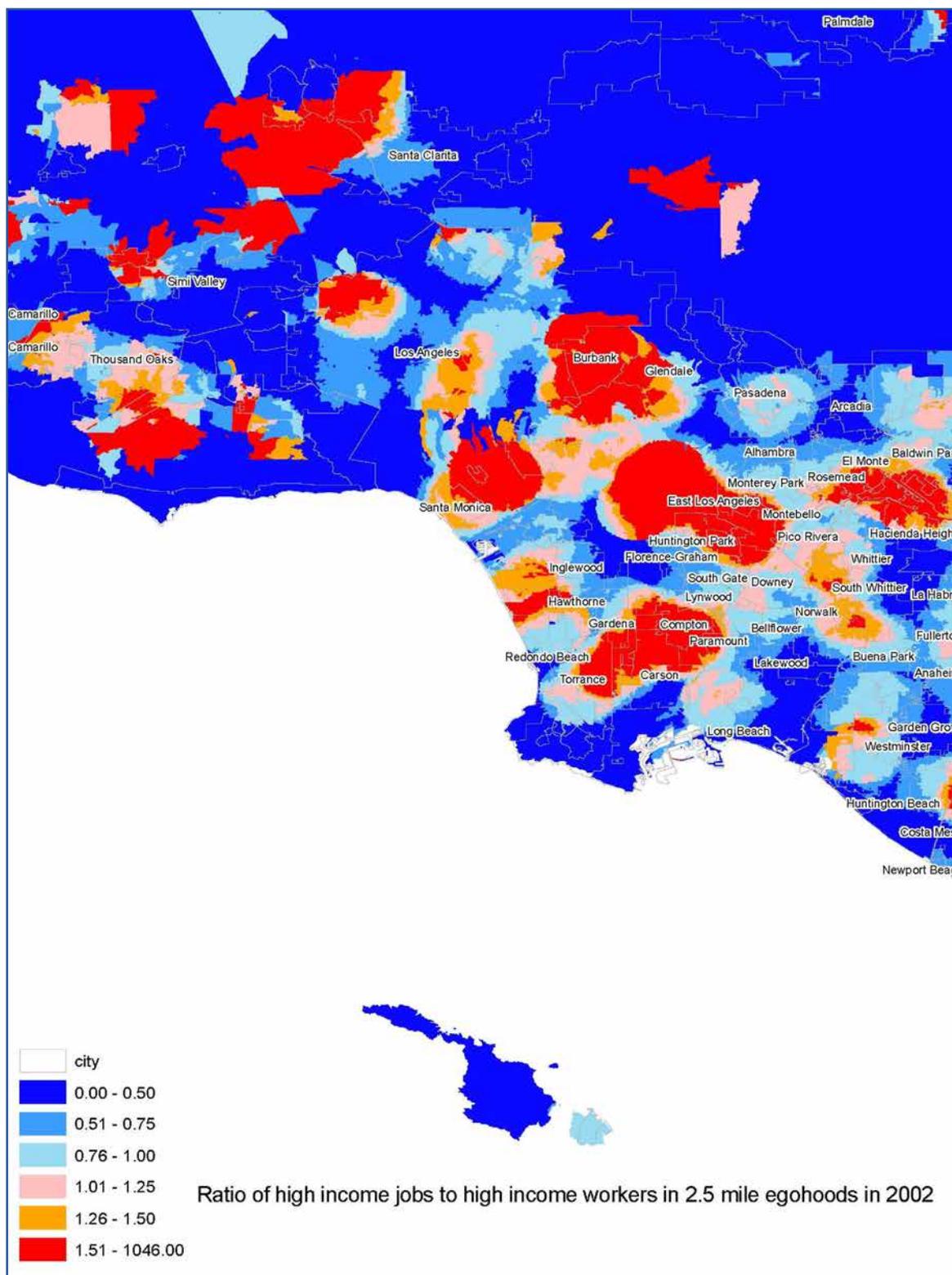


Figure 6: Jobs-housing ratios for high-income jobs and high-earning residents in 2010

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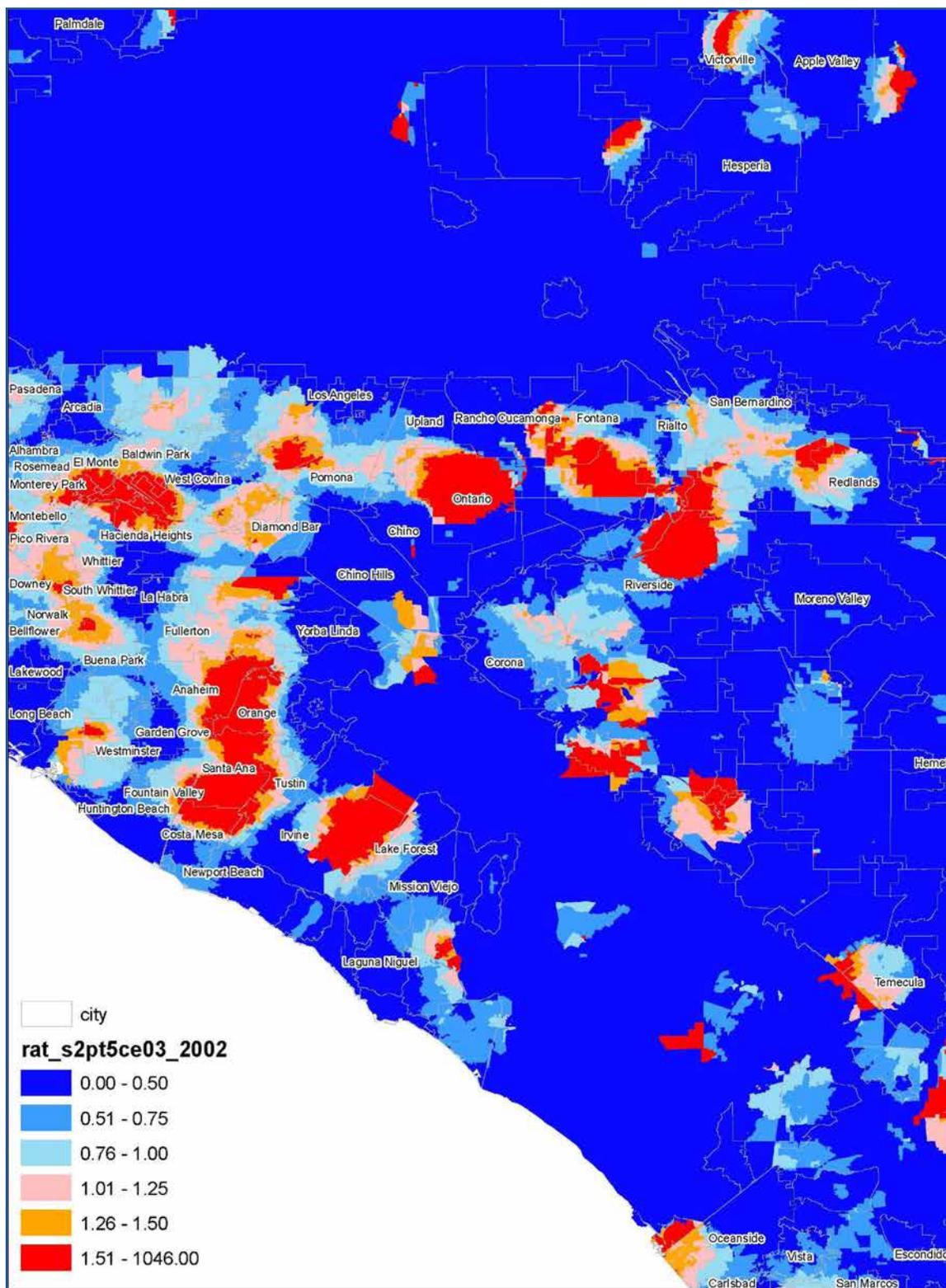


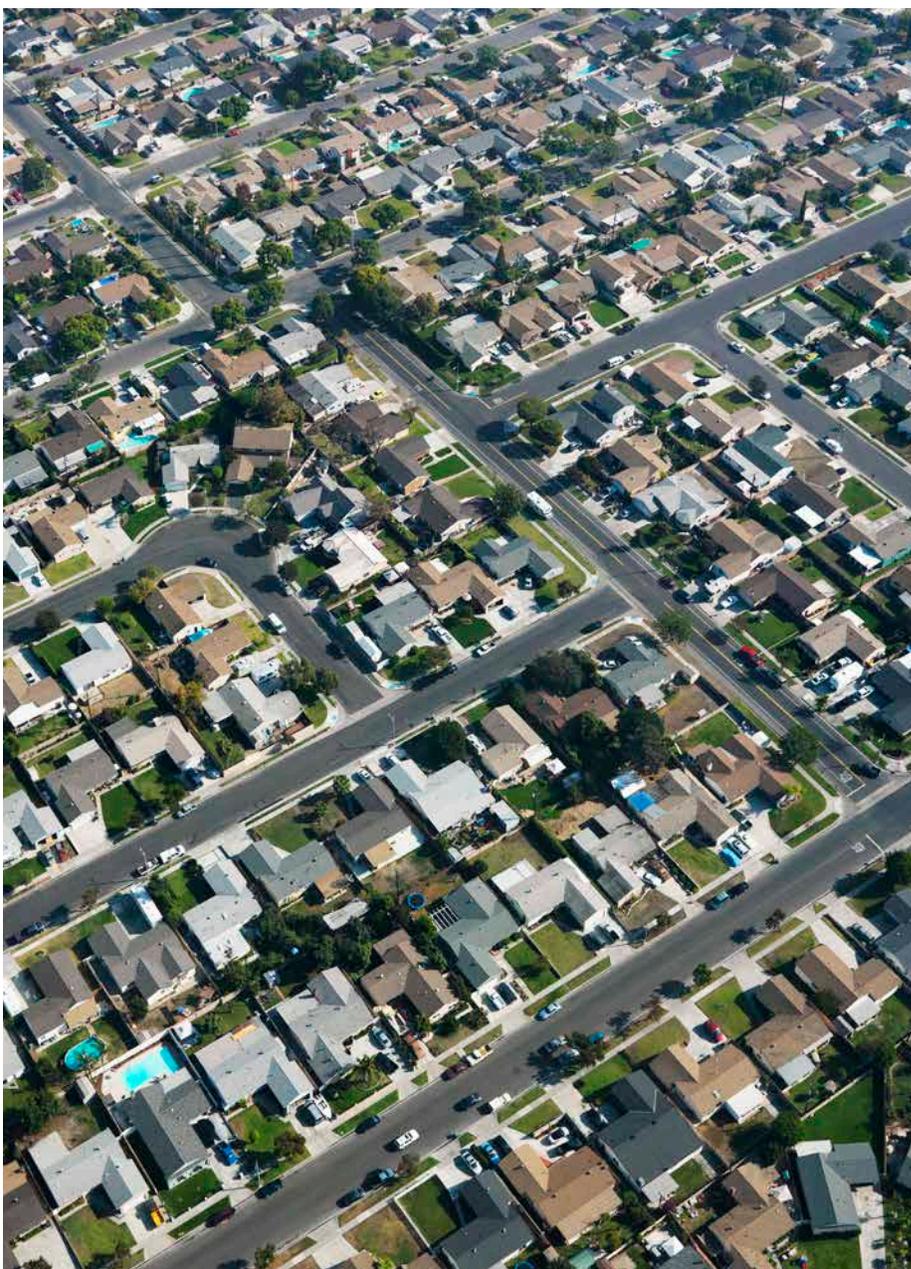
Figure 6a: Jobs-housing ratios for high-income jobs and high-earning residents in 2010

Jobs-Housing Ratios by Income Level

Middle-income jobs and middle-earning residents

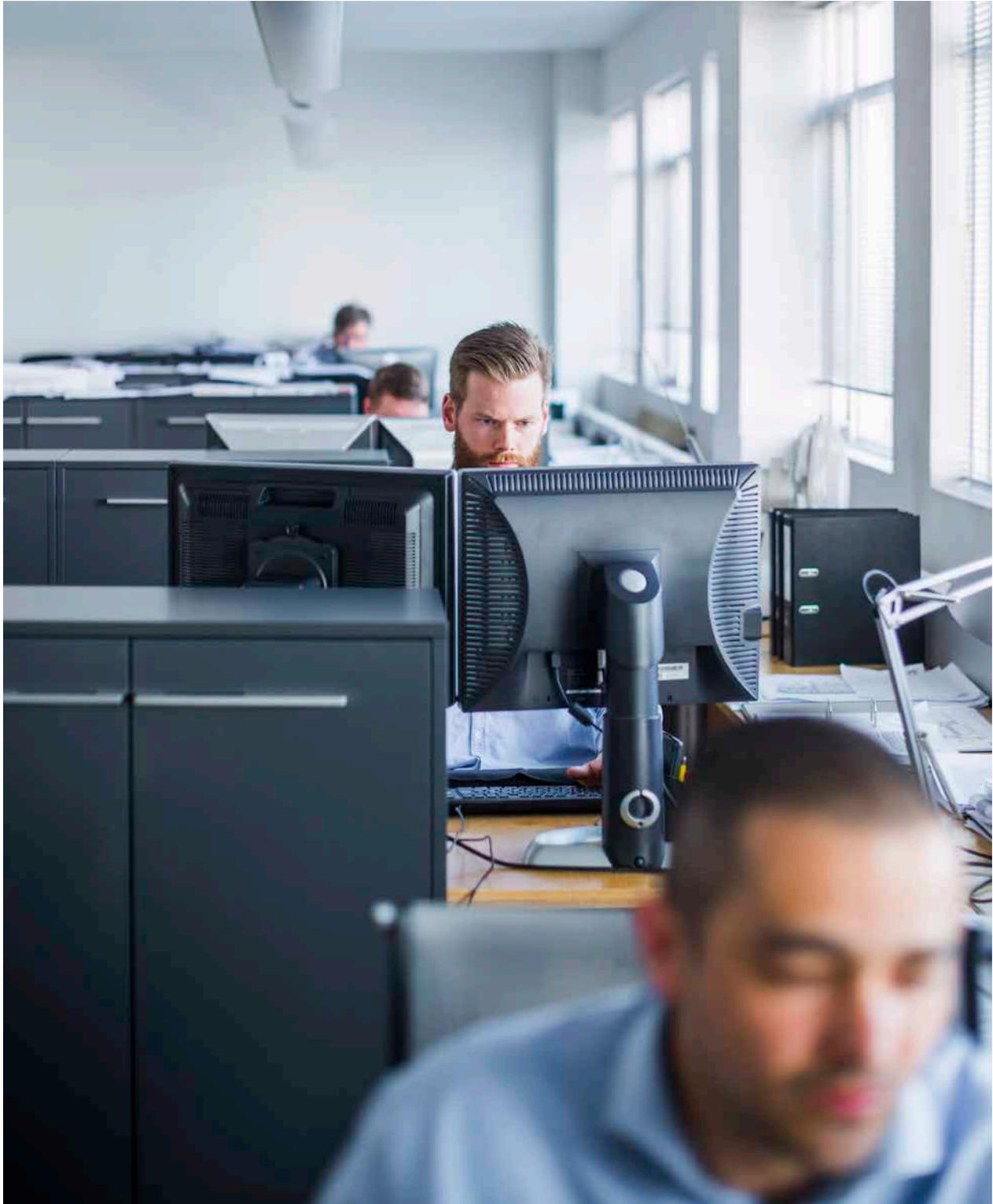
We next compare the spatial distribution of middle income jobs versus resident workers who are in the middle one-third of the income scale. Whereas some of these hot spots are located in the same locations as the high-income hot spots, there are a few differences. For example, in 2002 Lancaster appears as a relatively job-rich location for middle income jobs. There is a large hot spot of middle income job concentration on the West side of Los Angeles, spreading into the Santa Monica mountains and spilling into the San Fernando Valley. In Orange County, there is a very pronounced middle income jobs hot spot in Fullerton and to the north—an area that was not heavy in high-income jobs. There are also middle income hot spots near Laguna Niguel in Orange County, in Corona, and south near the Orange and Riverside County borders.

Looking at the change from 2002 to 2010 in middle income hot spots, there is notable growth in hot spots in Malibu and north in the southern San Fernando Valley. The hot spot near Downtown Los Angeles has grown, as has the one near LAX, and one has emerged in Pasadena. In the Inland Empire, the middle income hot spot in Ontario has spread into Rancho Cucamonga, whereas the one near Redlands has expanded considerably. Several middle income hot spots have emerged in the Victorville area.



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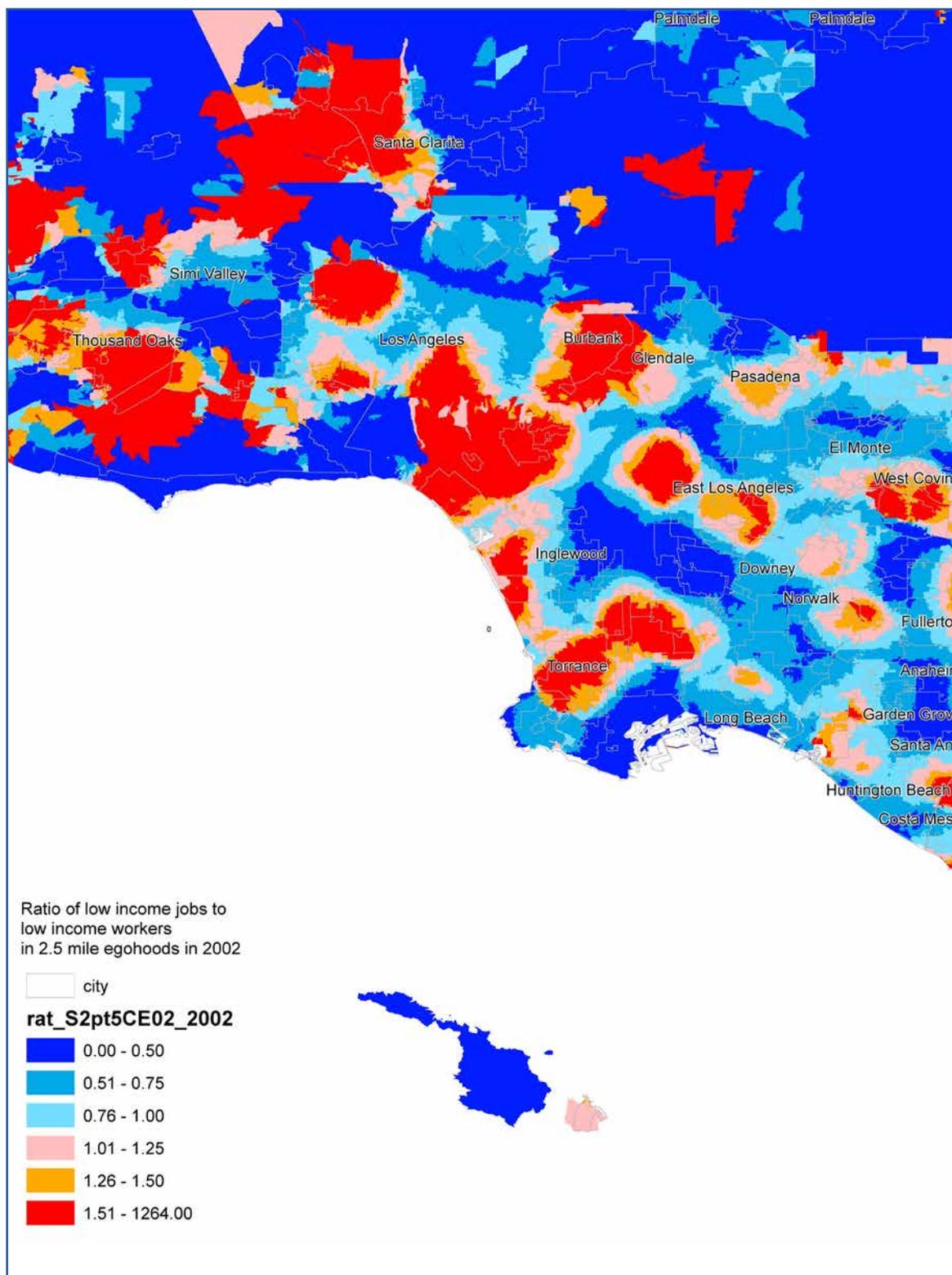


Figure 7: Jobs-housing ratios for middle-income jobs and middle-earning residents in 2002

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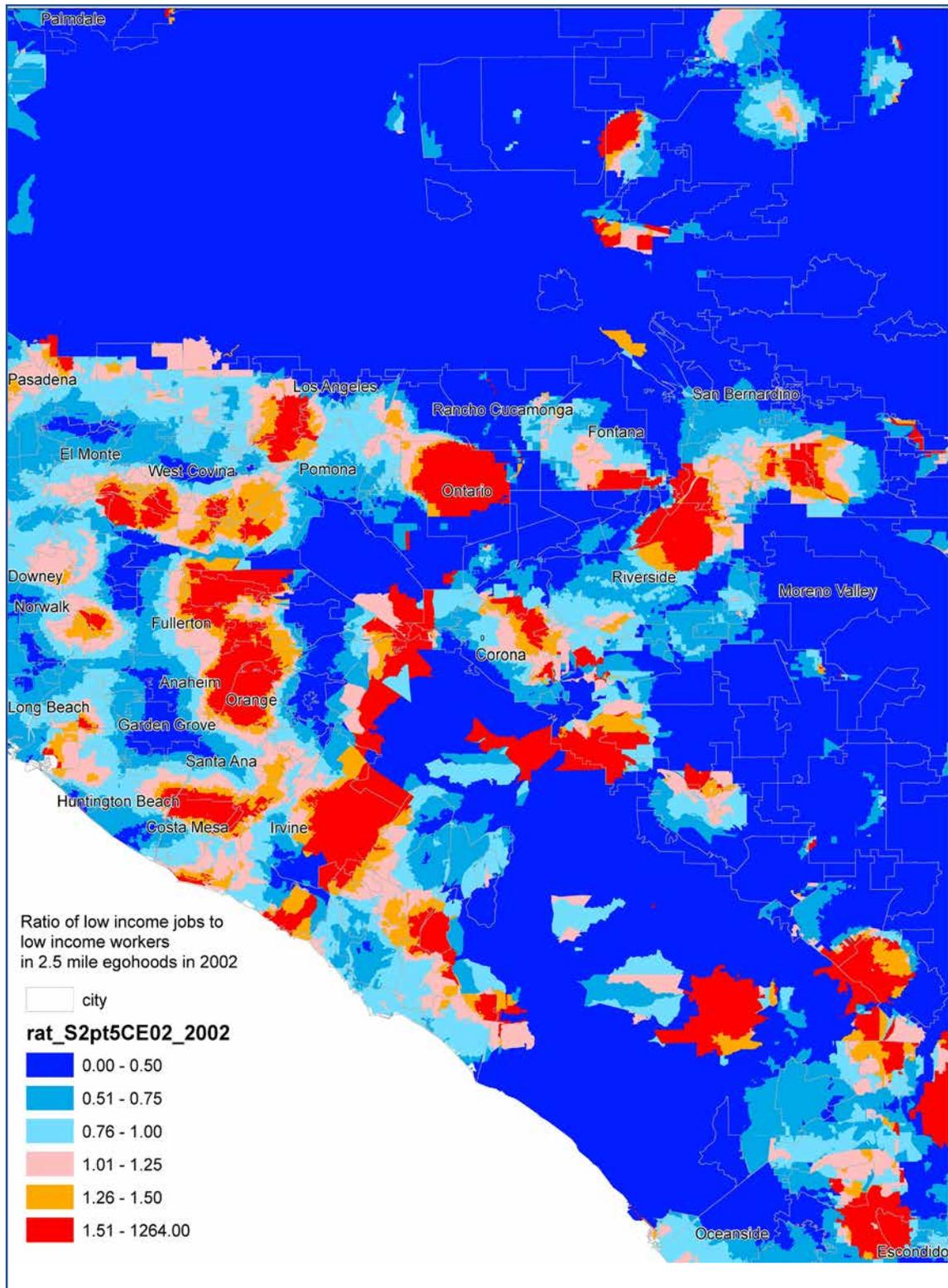


Figure 7a: Jobs-housing ratios for middle-income jobs and middle-earning residents in 2002

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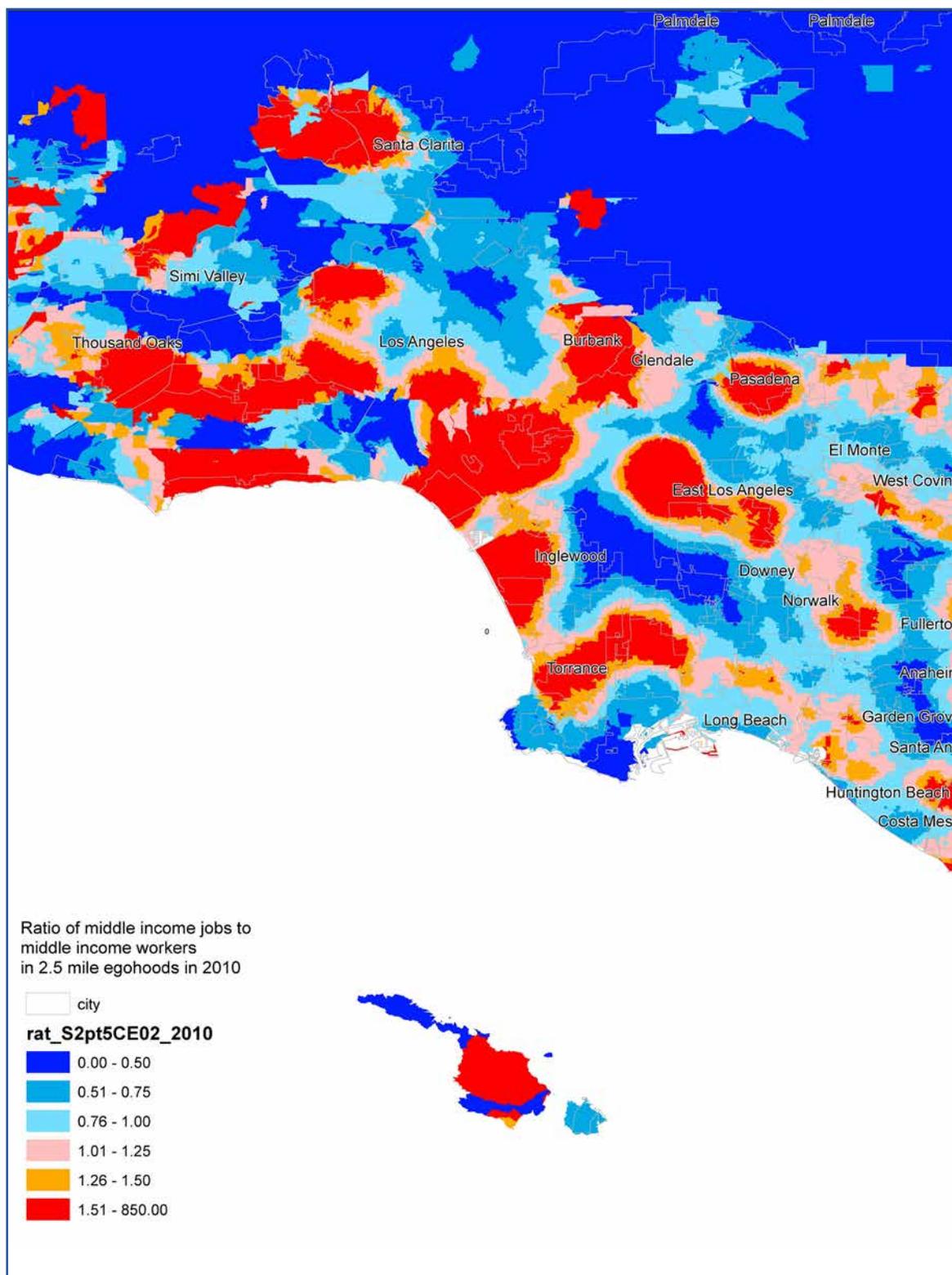


Figure 8: Jobs-housing ratios for middle-income jobs and middle-earning residents in 2010

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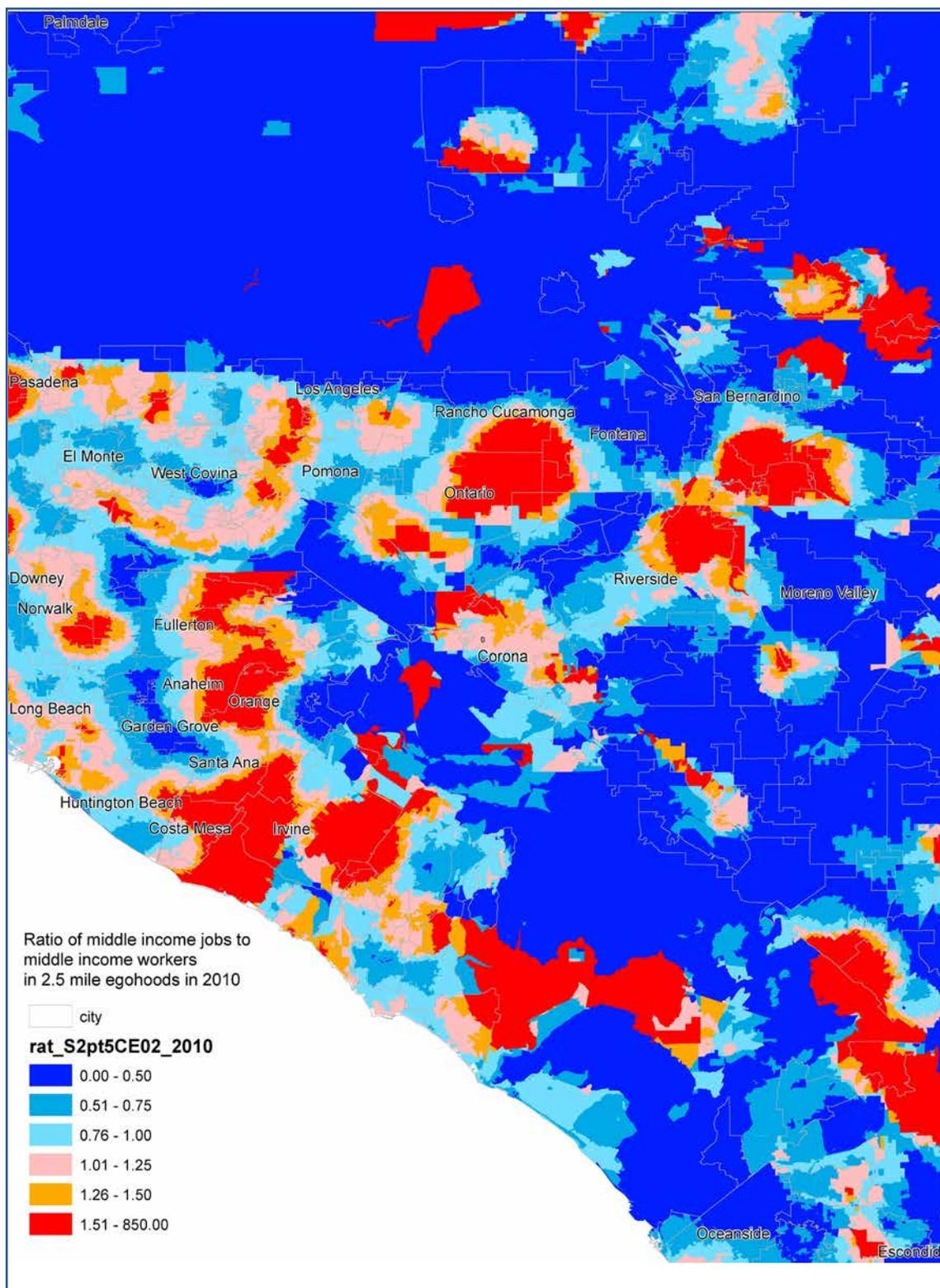
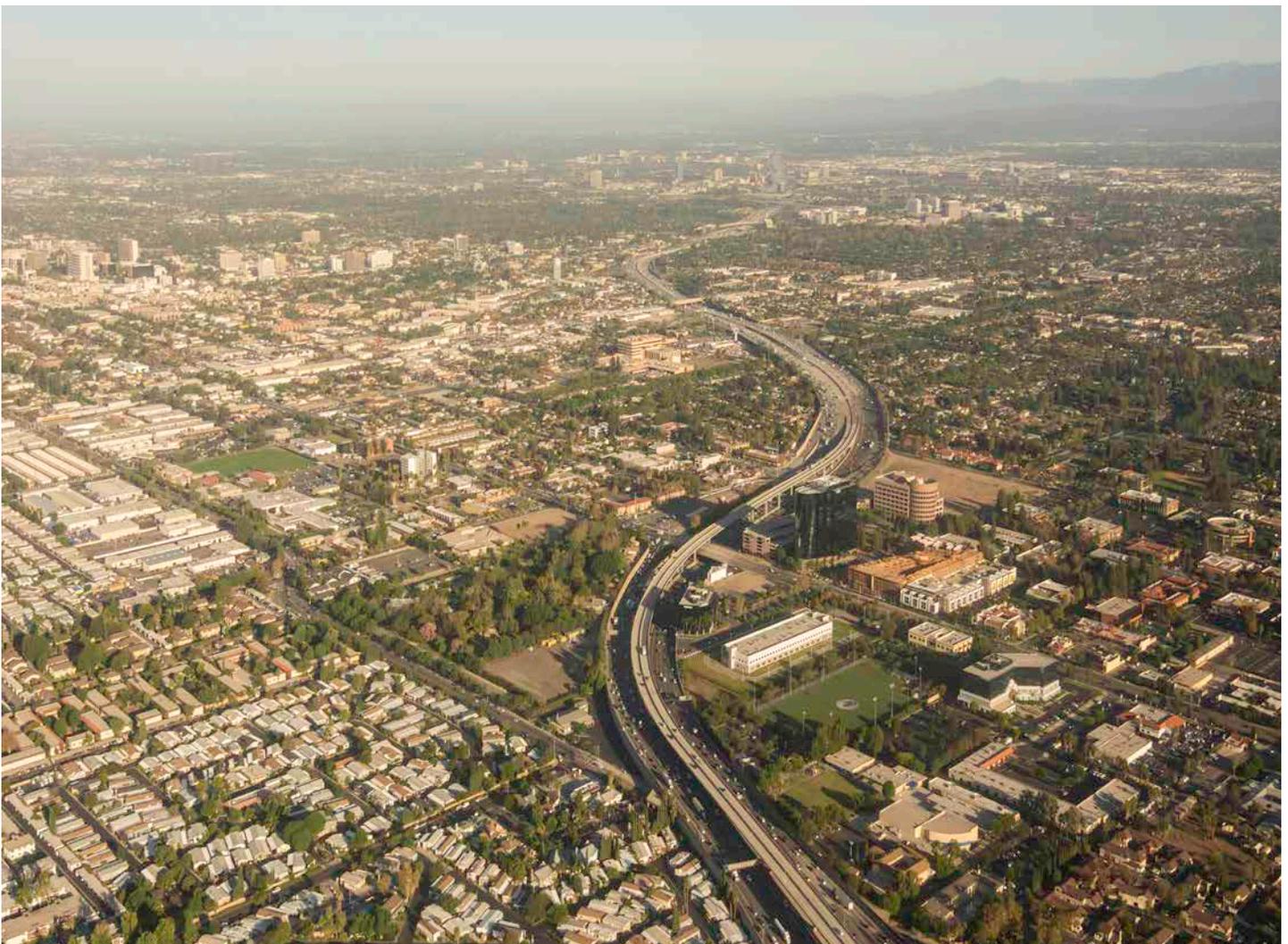


Figure 8a: Jobs-housing ratios for middle-income jobs and middle-earning residents in 2010

Jobs-Housing Ratios by Income Level

Low-income jobs and low-earning residents

Finally, we compare the spatial distribution of low paying jobs versus low earning resident workers. Some contrasts versus the higher income levels stand out in 2002, namely, lower ratios in much of inland Los Angeles County. Downtown Santa Monica, which showed high ratios (i.e. job-heavy) at higher and middle income levels, is notably lower in job-heaviness at lower income levels. The same is true for coastal Orange County, which actually shows a higher ratio between jobs and housing at a lower income level. Whereas there were relatively few high-income jobs (relative to high-income population), this imbalance is not replicated at the lower income stratum. It is likely that some of these areas have few low-paying jobs or residents. Minimal changes are noted between 2002 and 2010 for jobs-housing balance at lower income/wage levels.



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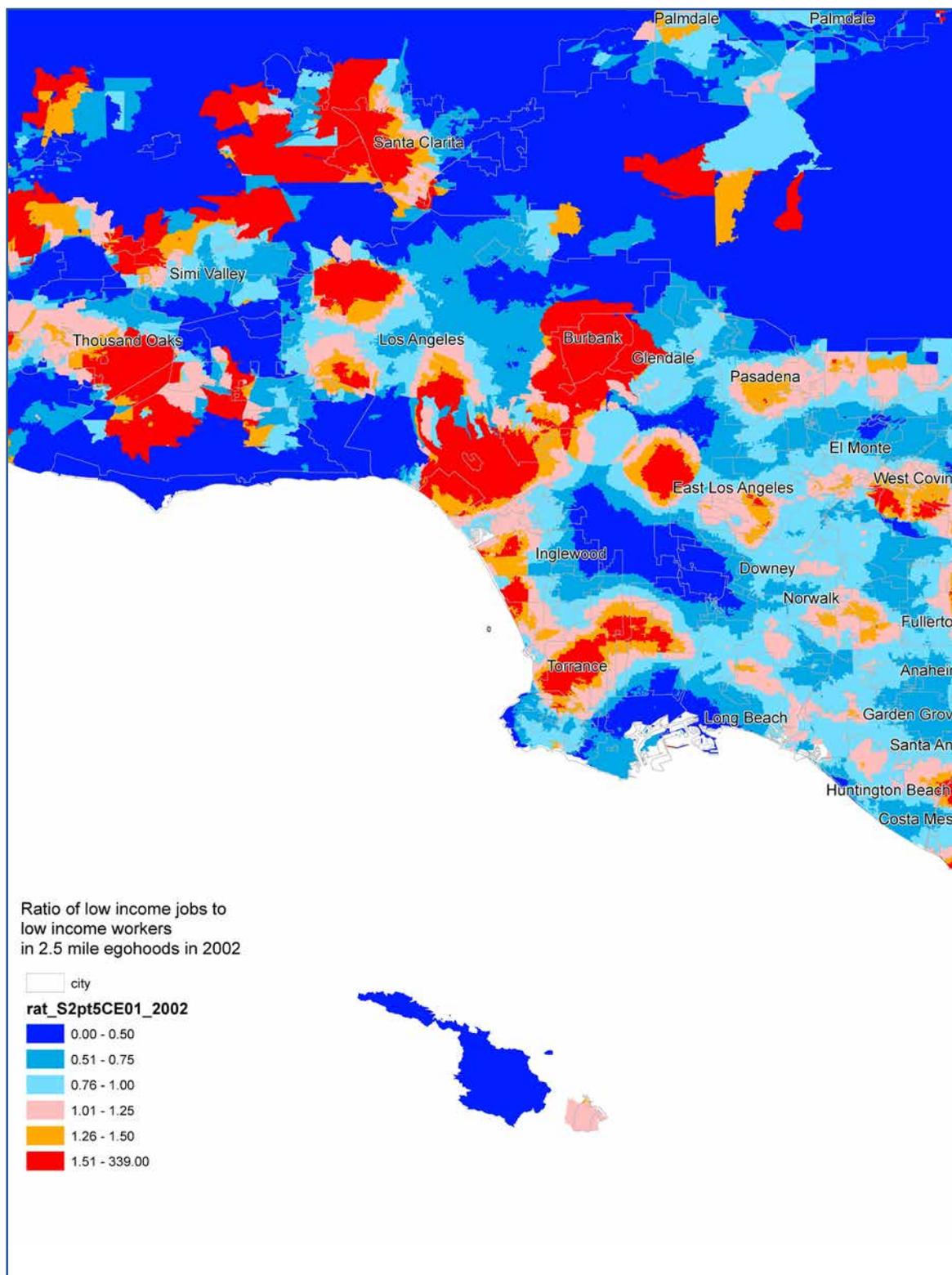


Figure 9: Jobs-housing ratios for low-income jobs and low-earning residents in 2002

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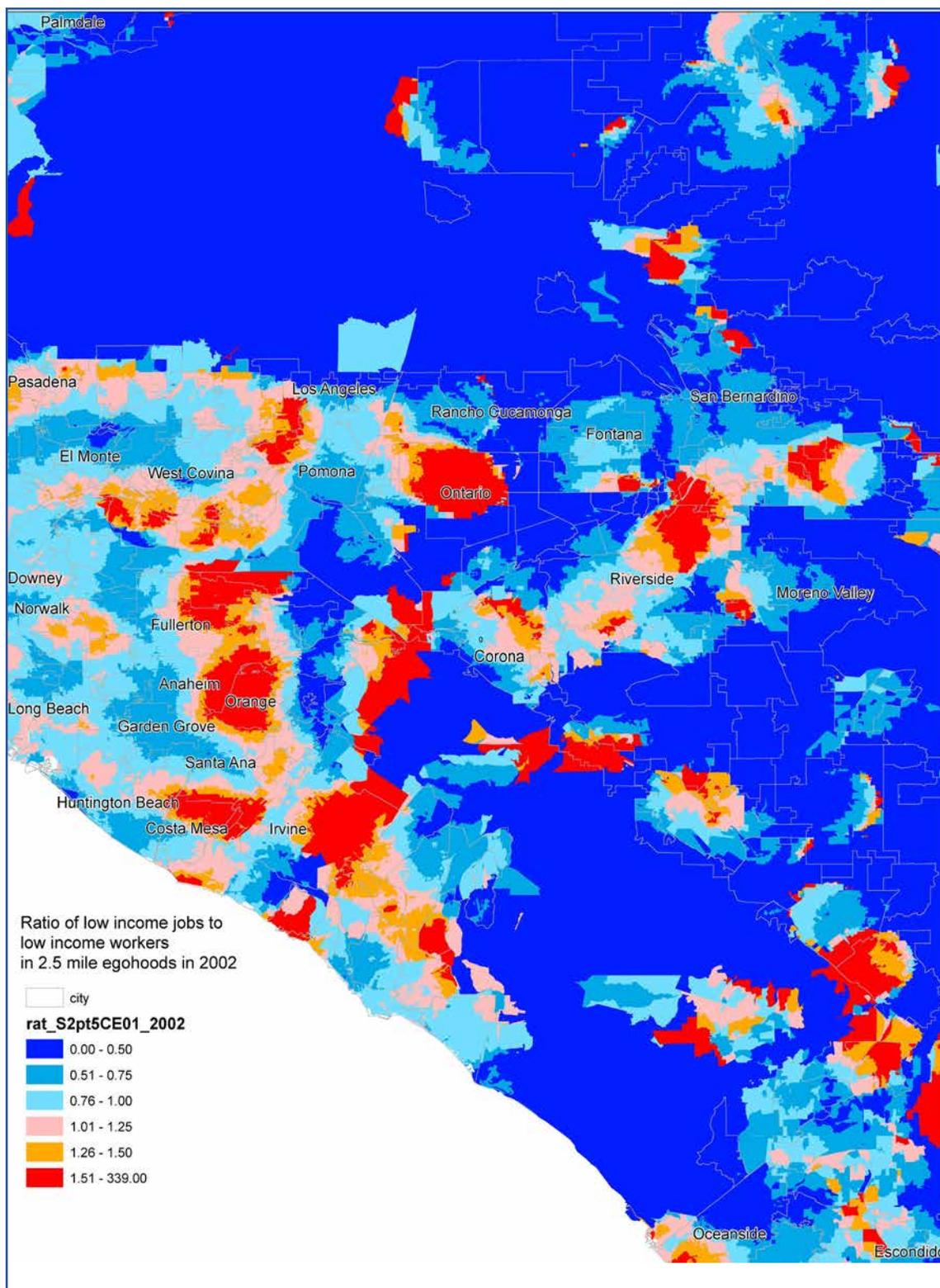


Figure 9a: Jobs-housing ratios for low-income jobs and low-earning residents in 2002

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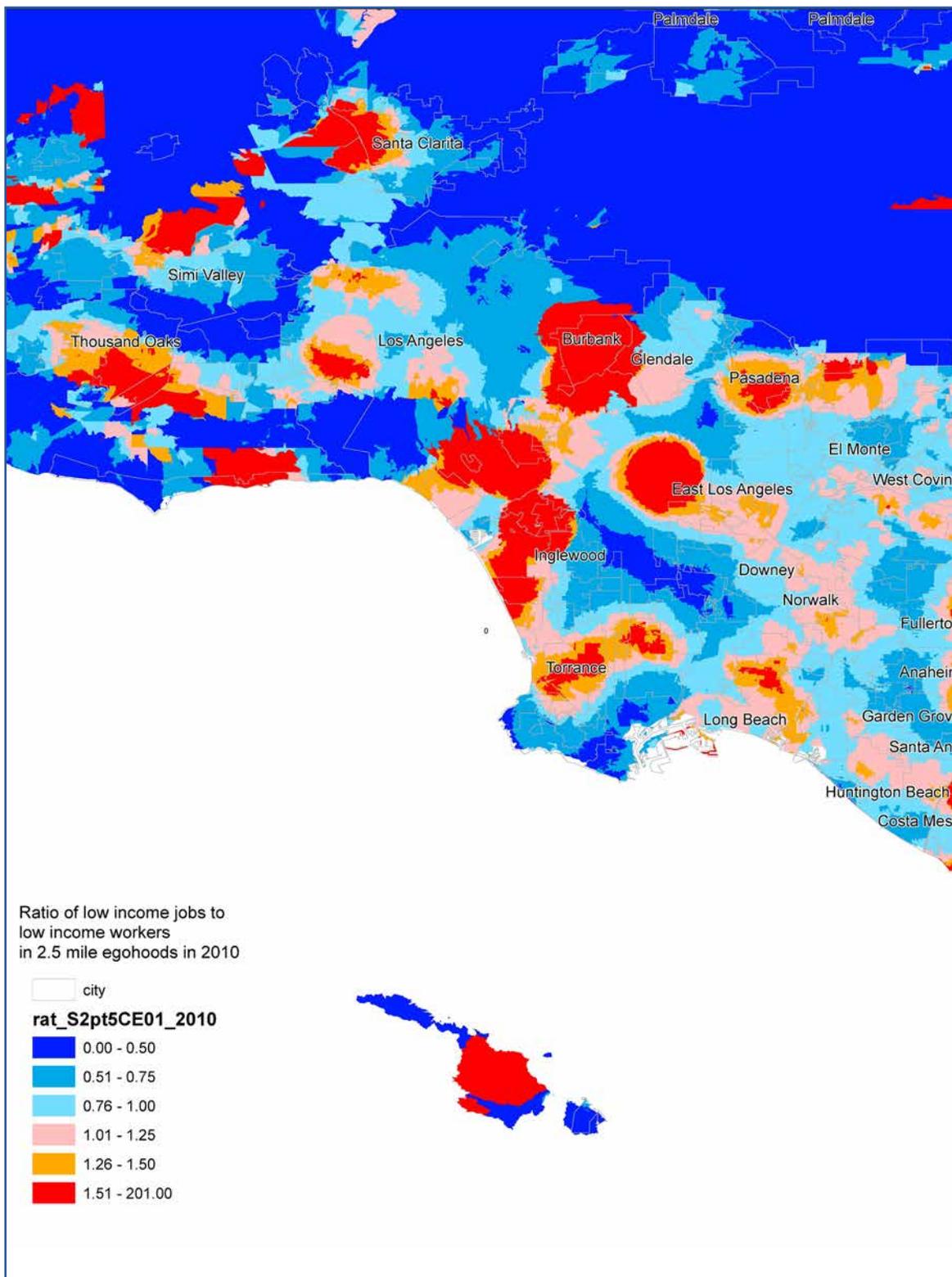


Figure 10: Jobs-housing ratios for low-income jobs and low-earning residents in 2010

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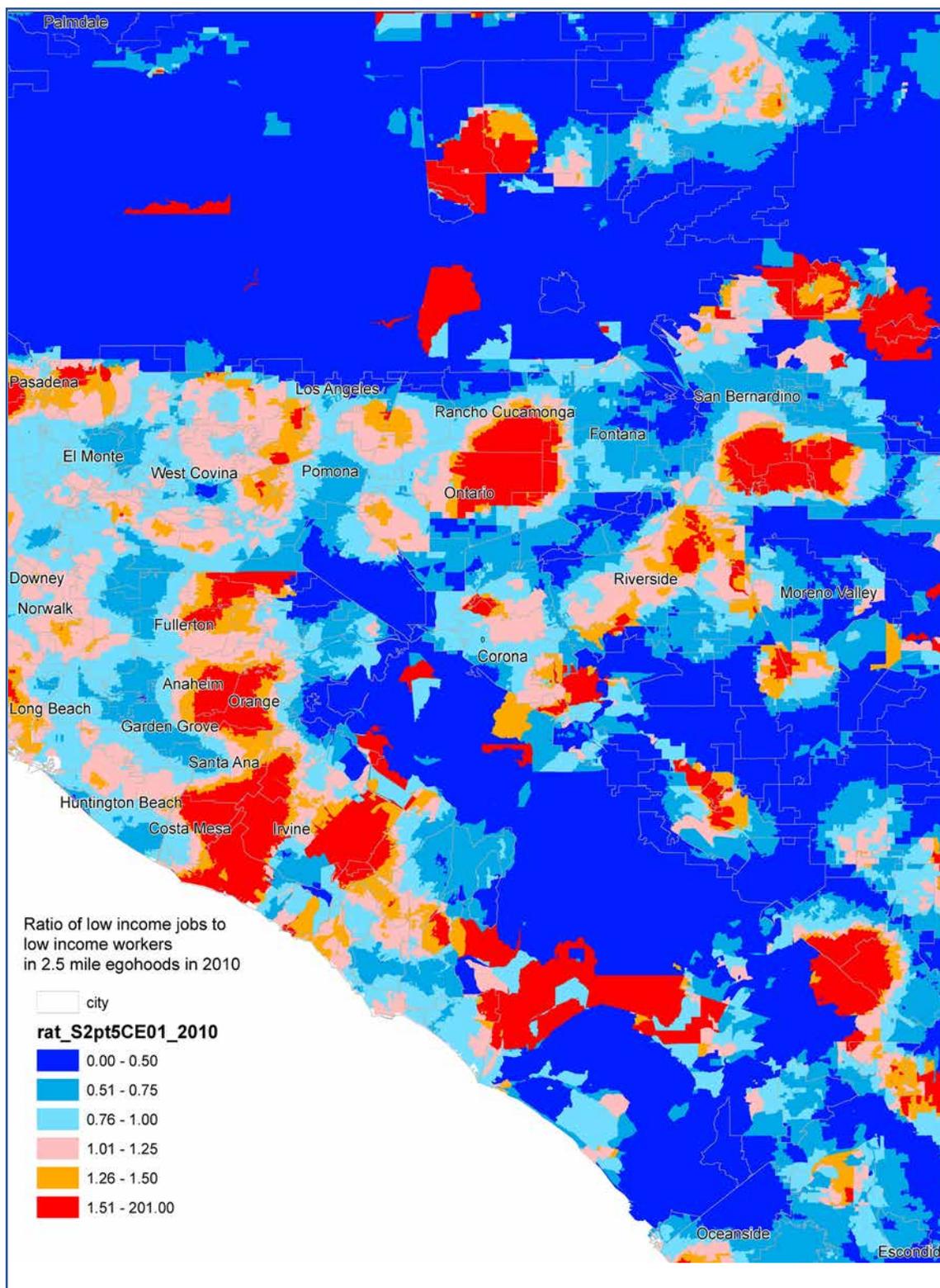


Figure 10a: Jobs-housing ratios for low-income jobs and low-earning residents in 2010

What Explains Jobs-Housing Ratios in Neighborhoods?

In this section, we estimated models that described the characteristics of egooods that have higher jobs-housing ratios. We estimated our egoood models using the same data source, but for 2012.

Explaining Jobs-Housing Ratios in 2012

We find that neighborhoods with higher average income have higher jobs-housing ratios overall, and for jobs in all three income categories. Comparing a neighborhood with high average income to one at the mean² the ratio of jobs to workers is 7.4% higher in the high income neighborhood when viewing all jobs. The ratio is 3.5% higher for low-income jobs, 5% higher for mid-income jobs, and 12.3% higher for high income jobs. So we see that higher income neighborhoods have more jobs nearby, on average.

We also find that neighborhoods with more highly educated residents tend to have more jobs nearby. Compared to a neighborhood with an average percentage of residents with at least a bachelor's degree, a neighborhood with a high percentage of residents with at least a bachelor's degree has a 6.6% higher ratio of total jobs to workers. This neighborhood also has a 6.9% higher jobs to workers ratio for low-income jobs, a 9.5% higher ratio for mid-income jobs, and a 6% higher ratio for high-income jobs.

Turning to the racial/ethnic composition, there is evidence that neighborhoods with more Asian or Latino residents have a higher jobs-housing ratios. Compared to neighborhoods with all white residents, a 10 percentage point increase in Asians results in a 4.6% higher jobs/workers ratio for all jobs, a 2% higher ratio for low-income jobs, a 3.6% higher ratio for mid-income jobs, and a 7.5% higher ratio for high-income jobs. The results are very similar for neighborhoods with more Latinos, as a 10 percentage point increase in Latinos results in a 3.8% higher ratio for all jobs, and 1.5%, 1.6%, and 7.2% higher ratios for low-, mid-, and high-income jobs. On the other hand, neighborhoods with more African Americans have modestly less access to low- and mid-income jobs. Compared to neighborhoods with all white residents, a 10 percentage point increase in African Americans results in a 1.4% lower ratio for low-income jobs, a 1.5% lower ratio for mid-income jobs, but a 2.8% higher ratio for high-income jobs (no difference for total jobs). Neighborhoods with more racial/ethnic mixing (based on the Herfindahl Index) have somewhat fewer jobs nearby: a 1.4% lower ratio for all jobs, a 2.1% lower ratio for mid-income jobs and a 3.3% lower ratio for high-income jobs (but little difference for low-income jobs).

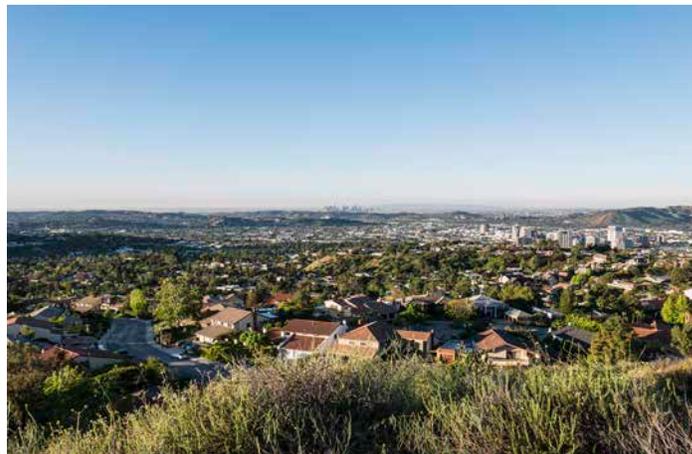
Neighborhoods with more immigrants have very poor access to jobs. A neighborhood with a high composition of immigrants has a 17.2% lower ratio for total jobs, an 11.4% lower ratio for low-income jobs, a 17.9% lower ratio for mid-income jobs, and a 22.8% lower ratio for high-income jobs. This ratio therefore is even worse for the higher income jobs, implying that immigrant neighborhoods tend to have relatively limited access to the highest paying jobs.

2. For all comparisons, "high" refers to a neighborhood with a one standard deviation higher value of the variable of interest.

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Neighborhoods with a high percentage of single family housing tend to have relatively lower access to jobs. A neighborhood with a high percentage of single family housing has an 11.9% lower ratio of total jobs, an 8.1% lower ratio of low-income jobs, a 10.6% lower ratio of mid-income jobs, and a 16.5% lower ratio of high-income jobs. This is not surprising, and illustrates that tracts of single family housing tend to be isolated from job centers. It is worth emphasizing that all of the results we detect in this section are net of the proportion of single family housing: that is, it is not the case that white residents have less access to jobs than Latinos or Asians simply due to the fact that they may be more likely to reside in single family housing tracts. Rather, our results control for these differences, and thus the racial/ethnic differences noted earlier were above and beyond any such housing differences.



We find that neighborhoods with a higher percentage of households with children have less access to jobs. Again, this is not simply due to the fact that such households may be more likely to reside in residential tracts with many single family housing units, as we account for these differences in the models. Thus, a neighborhood with a high percentage of children has a 9.2% lower ratio of total jobs, a 7.5% lower ratio of low-income jobs, a 7.3% lower ratio of mid-income jobs, and a 10.5% lower ratio of high-income jobs.

Finally, we find that neighborhoods with a higher unemployment rate have less access to jobs. This is not necessarily surprising, although it is interesting to note that the relationship for this measure was somewhat weaker than the relationships for some of the other measures already discussed. Thus, a high unemployment neighborhood has a 2.1% lower ratio for total jobs, a 2.3% lower ratio for low-income jobs, a 3.8% lower ratio for mid-income jobs, and a 0.9% lower ratio for high-income jobs.

What Does it Mean to See “Imbalance” between Jobs and Housing?

Thus far we have investigated the simple ratio between jobs and workers (housing). High values represent areas of employment concentration, whereas low values indicate bedroom communities dominated by housing and low in jobs. But we have not yet investigated imbalance itself, i.e., areas that lack an equal representation of jobs and housing. Since promoting balance can be seen as a way to decrease long-distance travel needs – a policy goal for municipalities and the State of California – we now gauge whether areas have become less imbalanced over 2002-2010, rather than just seeing an increase in jobs relative to housing.

Values for our measure of jobs-housing imbalance are shown in Table 2. These values (described in the Technical Appendix) show how far away from balanced an area is. **A value of zero indicates perfect balance.** The median value for jobs-housing imbalance at all income/earning levels increased slightly from 0.444 to 0.471, indicating that the typical person’s 2.5-mile egohood became slightly less balanced between jobs and homes from 2002 to 2010. At low-income levels, the value is unchanged between 2002 and 2010 at 0.376. At middle and high-income levels a modest increase is seen, suggesting that higher-paying jobs became slightly more spatially imbalanced³.

Table 2: Jobs-Housing Imbalance in Block Egohoods

	ALL JOBS		LOW-INCOME		MID-INCOME		HIGH INCOME	
	AVG.	MAX*	AVG.	MAX*	AVG.	MAX*	AVG.	MAX*
2002	0.444	3.320	0.376	3.024	.459	3.044	0.568	3.466
2010	0.471	3.628	0.376	2.871	.475	3.296	0.593	3.785

*99th percentile used as max value

**Scales used is the absolute value of the logarithm of the jobs-housing ratio. See Technical Appendix for detail.

Changes in imbalance can result from numerous processes and are shown in the following map for the period from 2002 to 2010. Job growth that is not accompanied by sufficient nearby housing construction can result in imbalance, which can happen in employment centers. This is likely the case in Irvine, Pasadena, and near LAX airport which witnessed substantial recent job growth and show increases in imbalance. New housing construction that does not involve much employment growth might be seen in rapidly growing suburban areas and can also lead to greater imbalance. This is likely the case in parts of the Inland Empire such as Colton or Banning. However, the Inland Empire is very patchy on this micro-scale measure, with increasingly balanced and decreasingly balanced areas in close proximity. This indicates that commercial and residential development were likely occurring, but in these instances, there was likely some spatial separation between the two.

3. Note that since jobs-housing balance skews to the right (toward high values), the median is a more appropriate representation of the typical person’s experience than the average, which is affected more by these very high values.

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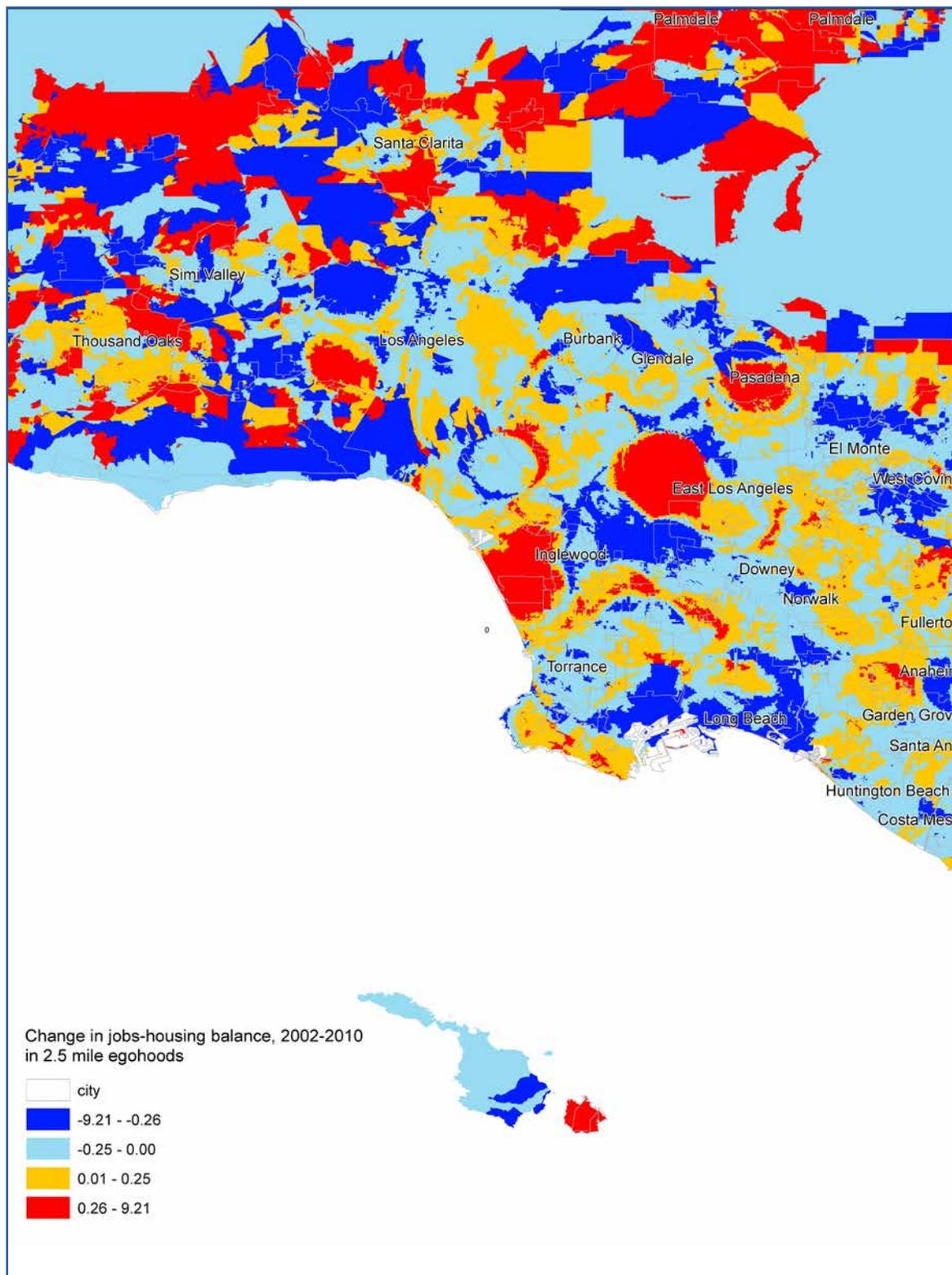


Figure 11: Change in jobs-housing balance, 2002-2010

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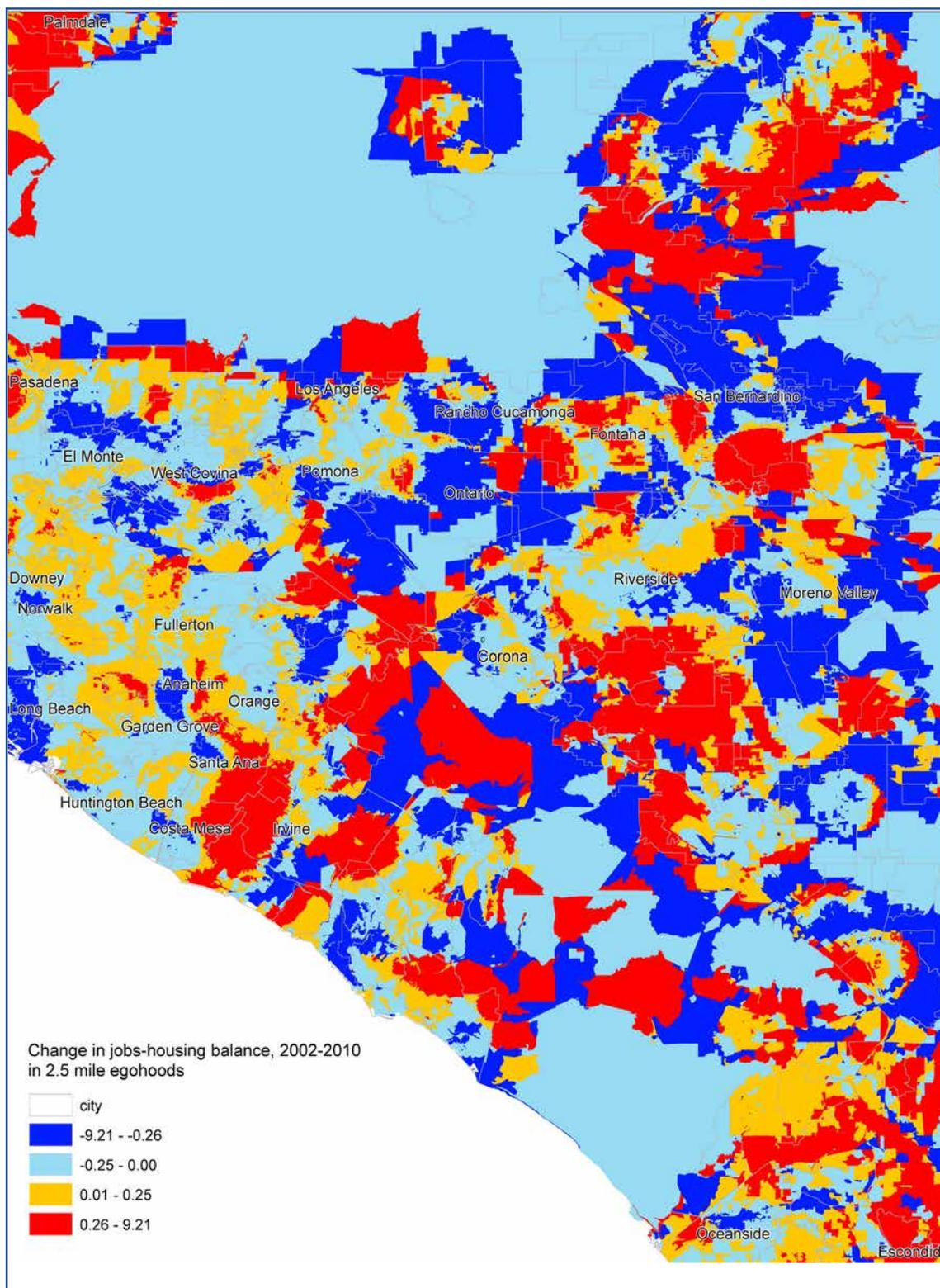


Figure 11a: Change in jobs-housing balance, 2002-2010

Lower imbalance (shown on the map in blue) can be seen as a policy goal in that it can result from the construction of new jobs and new housing together, increased housing near employment centers, or increased commercial infill in residentially-dominated areas. Numerous small examples of this might be found in blue portions of the map. In Long Beach, for example, increased residential construction near the city's historically job-heavy downtown likely resulted in decreased imbalance. However, lower imbalance can also result from the loss of jobs or housing if one of them was overrepresented. For example, El Monte had previously been a center for industrial jobs but saw decreases since the 1990s – this process would have rendered the area less balanced. Our web mapping application (shiny.datascience.uci.edu/uciMetropolitanFutures/jobs_housing_balance) allows for a closer look, especially at small areas which experienced increases or declines.

What Explains Imbalance between Jobs and Housing in Neighborhoods?

For this section, we estimated regression models in which the outcome variable captured how imbalanced the Jobs-Housing measure was for a particular egohood in 2012.

We find that neighborhoods with higher average income are more imbalanced for jobs and housing overall, and for jobs in all three income categories. Comparing a neighborhood with high average income to one at the mean, the imbalance of jobs and workers is 6.6% higher in the high income neighborhood when viewing all jobs. The ratio is 3.2% higher for low-income jobs, 3.1% higher for mid-income jobs, and 9.4% higher for high-income jobs. So we see that higher income neighborhoods tend to be more imbalanced regarding jobs to workers, on average.

We find, however, that neighborhoods with more highly educated residents tend to have relatively balanced jobs to workers. Compared to a neighborhood with an average percentage of residents with at least a bachelor's degree, a neighborhood with a high percentage of residents with at least a bachelor's degree is 19.2% less likely to be imbalanced. This neighborhood is also 15.9% less likely to be imbalanced for low-income jobs, 19.5% less likely to be imbalanced for mid-income jobs, and 16.6% less likely to be imbalanced for high-income jobs.

Regarding racial/ethnic composition, neighborhoods with more African Americans are slightly more imbalanced for low- and mid-income jobs. However, neighborhoods with more Asian or Latino residents (and fewer white residents) are less imbalanced. Compared to neighborhoods with all white residents, an 11 percentage point increase in Asians is about 5-6% less imbalanced. A neighborhood with more Latinos also is less imbalanced for Jobs-Housing. Interestingly, neighborhoods with more racial/ethnic mixing actually are modestly less imbalanced for Jobs-Housing than other neighborhoods (between 1.5% and 5% less imbalanced).

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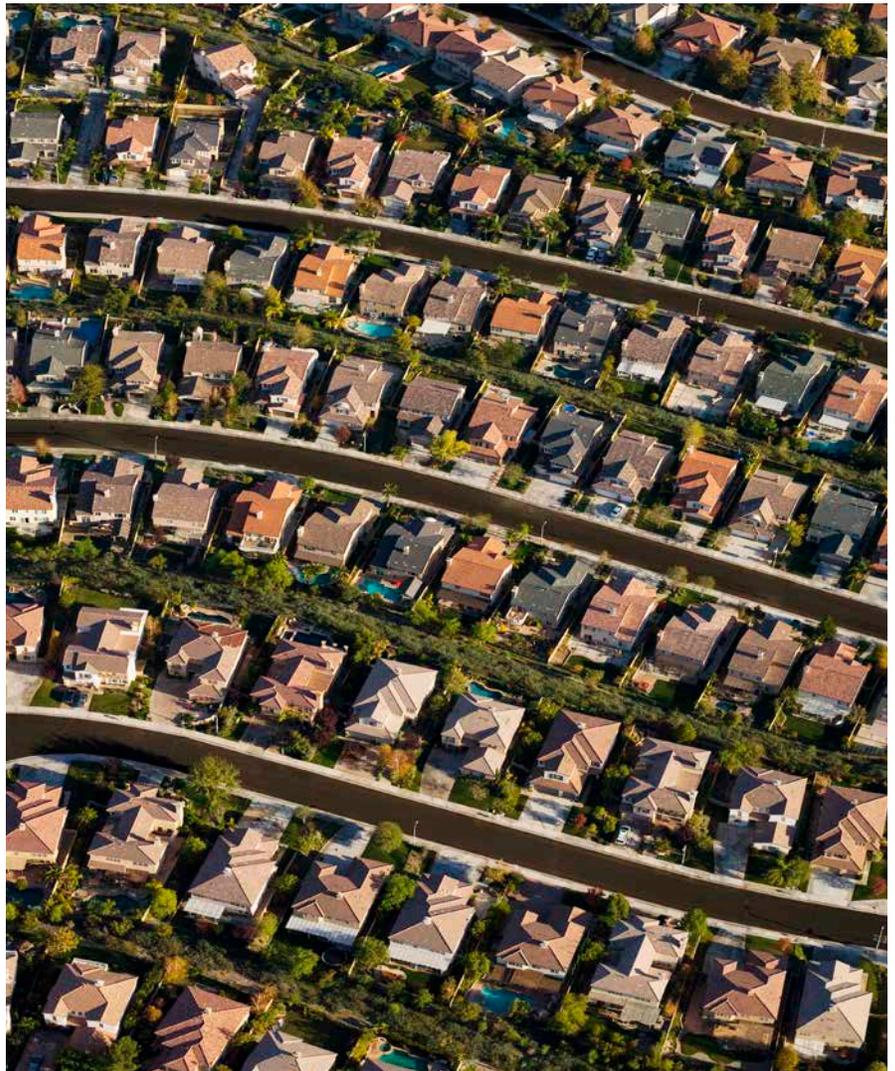
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Neighborhoods with more immigrants are more imbalanced for low- and mid-income jobs. A high immigrant neighborhood is about 10% more imbalanced for low- and mid-income jobs. This ratio therefore is even worse for the higher-income jobs, implying that immigrant neighborhoods tend to have relatively limited access to the highest paying jobs.

Neighborhoods with a high percentage of single family housing have somewhat lower imbalance compared to other neighborhoods. A neighborhood with a high percentage of single family housing is about 4-6% less imbalanced than other neighborhoods.

Neighborhoods with a higher percentage of households with children are more imbalanced. A neighborhood with a high percentage of children is 5.7% more imbalanced for total jobs, 3% more imbalanced for low-income jobs, 4.8% more imbalanced for mid-income jobs, and 8.6% more imbalanced for high-income jobs.

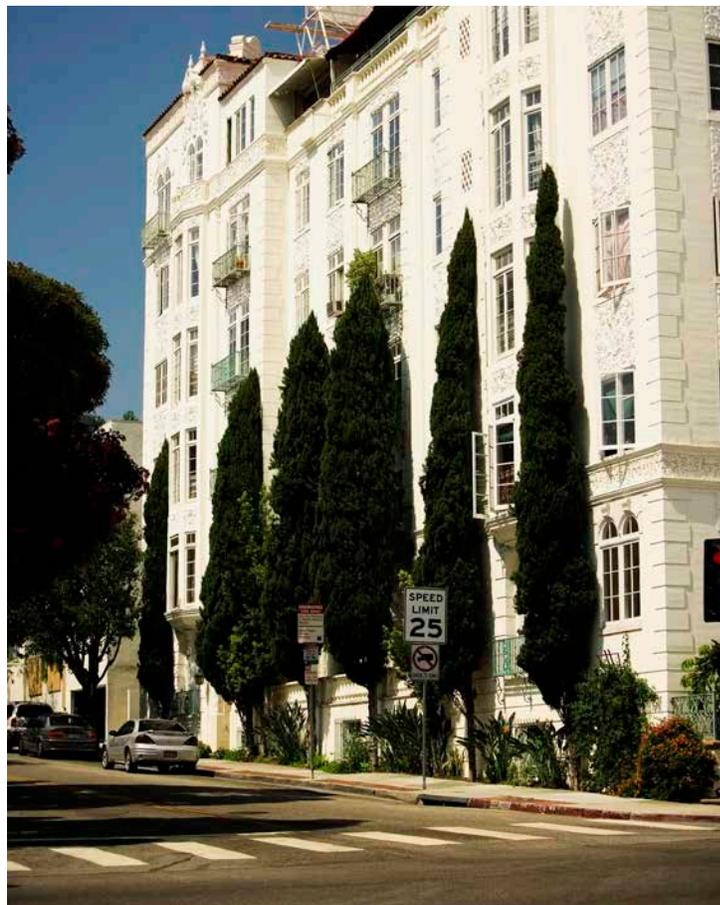
Finally, we find that neighborhoods with a higher unemployment rate also have more job imbalance. A high unemployment neighborhood is 5.8% more imbalanced for total jobs, 2.1% more imbalanced for low-income jobs, 6.3% more imbalanced for mid-income jobs, and 8.8% more imbalanced for high-income jobs.



How Does the Relationship of Jobs to Housing Vary Across Cities?

In the introduction, we discussed the idea that jobs-housing relationships vary based on the spatial scale used. In this section, we aggregated the block-level egohood measures to the city level, in order to gauge whether cities experienced high, low, or changing jobs-housing ratios and levels of imbalance. Rather than simply counting the jobs and housing within the city limits, we take the average value for jobs-housing ratio or imbalance for all block-level egohoods in a city. This more accurately represents the experience of an individual in that city, especially if they live near the city limits.

Maps can be seen in our web mapping application (shiny.datascience.uci.edu/uciMetropolitanFutures/jobs_housing_balance). An interesting contrast is to compare changes in jobs-housing ratios versus changes in jobs-housing imbalance. A city that increases its jobs-housing ratio is one that is becoming more job-heavy, but one that is increasing in jobs-housing balance is moving toward a more equal distribution of jobs and homes. Thus, there are two different ways a city can become more balanced: 1) a city that is jobs rich at one point in time can add housing or lose jobs over time; or 2) a city that is jobs poor at one point in time can add jobs or lose housing over time. In both of these instances, the city will achieve more jobs balance. Likewise, there are two different ways that a city can become more job-imbalanced: 1) a city that is jobs rich at one point in time can add even more jobs or else lose housing over time; or 2) a city that is jobs poor at one point in time can lose even more jobs or gain additional housing over time. In both of these instances, the city will become more imbalanced.



Many cities have opposite values. For example, Temecula, Moreno Valley, and San Bernardino all have high ratios, indicating that they become more employment-focused, i.e. job opportunities for residents increased. These cities also had low values for imbalance, indicating that the changes over 2002-2010 resulted in a more even blend of jobs and workers – a potential way to contribute to decreased commuting. Meanwhile, some cities experienced the opposite: San Juan Capistrano, Banning, and Santa Clarita all saw decreases in job-concentration but increases in imbalance. This would indicate they became more housing dominant, both lowering the ratio and making the city more imbalanced.

Conclusions

While some controversies and difficulties in implementation do exist, jobs-housing balance has been recognized as a way to better manage metropolitan decentralization and address the emerging challenges associated with this decentralization, particularly long-distance travel.⁸ In the broad context of Southern California, this in part means assisting with job growth of the Inland Empire, the origin of the largest mega-commuting flows in the US, or removing barriers to (workforce) housing development in the destination areas.⁹ This broad perspective, however, does not fully disclose the complex spatial layout of land uses and its impacts on regional transportation and local employment opportunity. The scale at which jobs-housing balance is measured, the consideration of a range of incomes, and the simple distinction between “ratios” and “balance” are all critical in obtaining a deeper understanding of the complex pattern.

This Report has explored jobs-housing ratios and imbalance in the Southern California region since 2002 at a more meaningful geographical scale. First, we clearly establish what is meant by jobs-housing ratios and jobs-housing imbalance. Jobs-housing ratios – the more common measure – are useful for measuring job richness relative to worker or housing availability. In contrast, we also utilize a measure of jobs-housing imbalance, which represents whether an area has an even mix and how it might contribute to long, cross-commutes.

This Report makes an additional improvement in measuring jobs and housing by using a novel technique called “egohoods” to analyze the jobs-housing relationship from the perspective of an individual or neighborhood, rather than city-wide. Examining ratios and imbalance at this fine scale can help policy makers target areas for intervention by better identifying micro-level “job deserts” as experienced by individuals, or by identifying areas contributing to high levels of commuting.

Areas with high jobs-housing ratios often surround the region’s employment centers. Some inland areas such as Rancho Cucamonga, Redlands, and Victorville witnessed notable increases in jobs-housing ratios, suggesting that despite the longer commutes typically experienced in the Inland Empire, trends may be changing if job growth outpaces residential growth there – a trend also noted in a recent Southern California Association of Governments report.

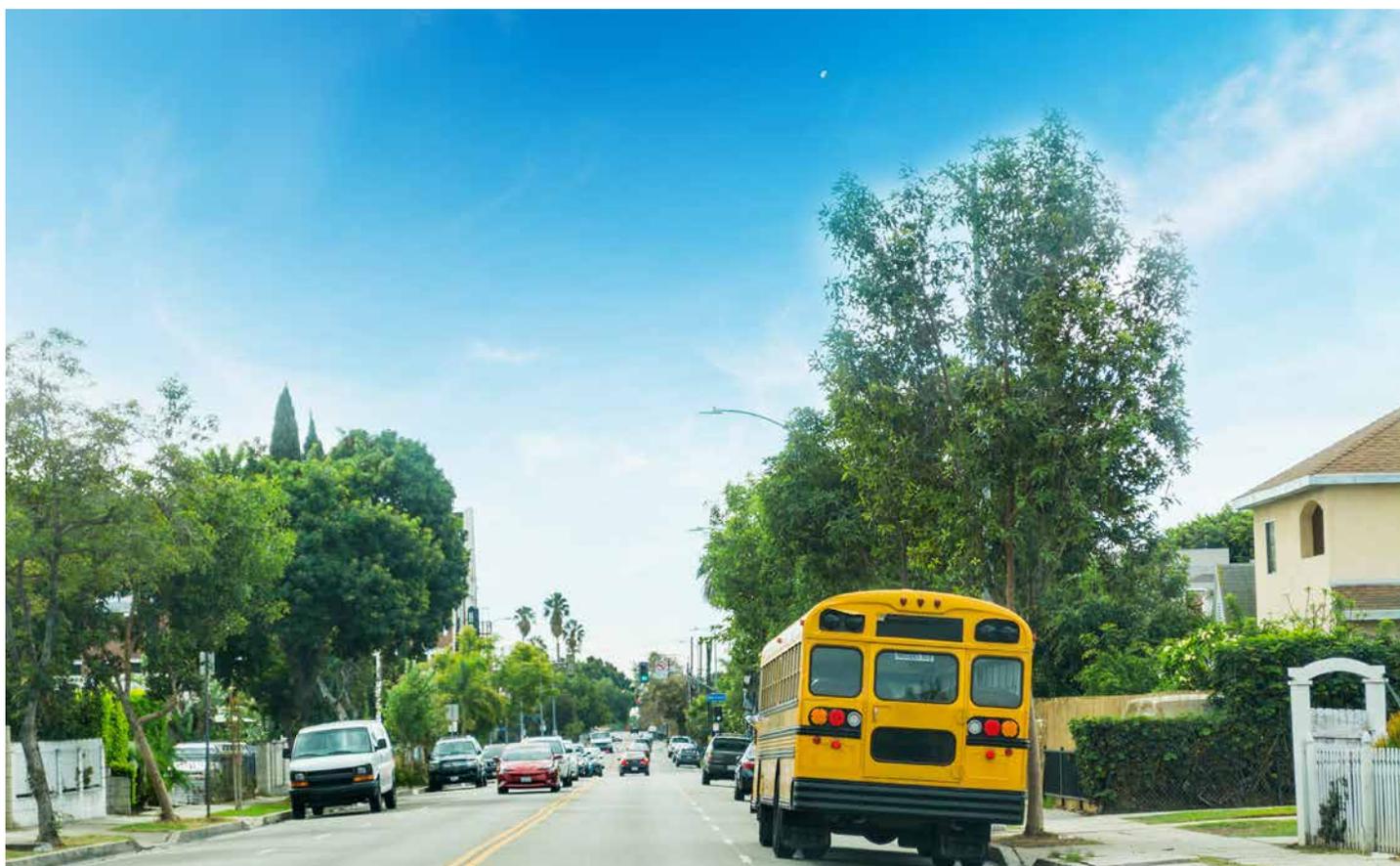
Low-income jobs-housing ratios help understand whether local employment opportunities sufficiently exist in great proximity for lower-earning residents. While spatial patterns are fairly similar to overall ratios, some local differences exist and should be taken into account when analyzing employment opportunity in particular neighborhoods. While higher earners typically prefer spatial separation from their jobs, and high-income jobs are more likely to concentrate in downtowns and job centers, high-income jobs-housing ratios help identify areas where opportunities exist to decrease aggregate commuting by these individuals.

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Neighborhoods heavier in Asian or Latino population tend to have higher jobs-housing ratios; however, neighborhoods with more immigrants have far poorer access to jobs – particularly high-income jobs. Areas with more single-family housing and a higher percentage of children also tend to have lower jobs-housing ratios. The socio-demographics are also associated with temporal changes in jobs-housing imbalance which, overall, increased slightly from 2002-2010 in the region.

Admittedly, imbalance can result from a number of processes – including unavoidable loss of employment – and for a number of reasons – including diverse residents’ preference structures. Furthermore, it is neither possible nor desirable to pursue a perfectly balanced distribution of jobs and housing within a region. It is also important to note that balance does not necessarily lead to a reduction in commuting distance, as business and household location decisions are made not merely to economize the commuting distance but with consideration of numerous other factors. Nevertheless, looking into our metropolitan region through the lens of jobs-housing balance provides key insights.



Technical Appendix

In the main part of the Report, we used the egohood approach to calculating the Jobs-Housing balance. This approach entails: 1) computing the number of workers in each block and the number of jobs in each block (from the LEHD data); 2) for each block in the region, creating a buffer around the block of a particular distance (either 2.5 miles or 5 miles); 3) summing up the number of workers in the blocks within the buffer, and the number of jobs in the blocks within the buffer, and computing this ratio. These values are then shown in the maps.

This report's measure of the change in jobs housing balance from 2002-2010 is as follows:

$$\Delta JHB_{02-10} = \left| \ln \left(\frac{j_{10}}{p_{10}} \right) \right| - \left| \ln \left(\frac{j_{02}}{p_{02}} \right) \right|$$

where j represents jobs and p represents population. A log transformation of the *jobs-housing ratio* ensures that a value of 0.0 represents perfect balance, while its absolute value measures deviation from that balance.

An additional complication comes when estimating the models in the last part of the Report. Whereas the computation of the ratio of jobs to workers in the buffer around an egohood describes the context for a particular block, it does not appropriately account for the competition for these jobs. That is, we can consider that the potential employees of jobs in a block are in fact persons within some buffer of that block; as a consequence, this value shows the amount of competition there is for these jobs. Therefore, we effectively computed egohoods of egohoods in step 2 in the previous paragraph, rather than summing up the jobs and workers in each block, we summed up the jobs and workers in the entire buffer around each block. This computation gives us a more appropriate Jobs-Housing balance context for our models that assess the characteristics of neighborhoods with a better jobs-housing balance. It also implicitly incorporates a spatial decay characteristic into our measure.

The models estimated in this Report were ordinary least squares regression. In each case, the outcome variable was the ratio of jobs to workers in the egohood, log transformed (to account for extreme values).

The covariates in these models were computed for the 1.5 mile egohoods around a block. The variables were constructed using data from the U.S. Census and include: 1) average household income; 2) percent with at least a bachelor's degree; 3) percent Black; 4) percent Asian; 5) percent Latino; 6) racial/ethnic heterogeneity (Herfindahl Index); 7) percent immigrants; 8) percent single family housing units; 9) percent households with children; 10) unemployment rate.

Notes

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2. Calthorpe, Peter. (2011). *Envision Bay Area Scenarios Report*. Mountain View, CA: Calthorpe and Associates.
3. Kain, John F. (1968). Housing segregation, Negro employment, and metropolitan decentralization. *Quarterly Journal of Economics*, 82(2), 175-197. doi: Doi 10.2307/1885893
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5. *Envisioning our Region in 2040*. (2016). Los Angeles: Southern California Association of Governments.
6. 2012. GPA/ZC Draft *Second Supplemental Environmental Impact Review*. Irvine, CA: City of Irvine
7. For a more complete discussion of egohoods, see Hipp, John R. and Adam Boessen. 2013. "Egohoods as waves washing across the city: A new measure of "neighborhoods"." *Criminology* 51:287-327.
8. Levine, J. (1998). Rethinking accessibility and jobs-housing balance. *Journal of the American Planning Association*, 64(2), 133-149.
9. Mega Commuting: Traveling 90 or more minutes and 50 or more miles to work.
10. Source: https://www.census.gov/hhes/commuting/files/2012/Paper-Poster_Megacommuting%20in%20the%20US.pdf



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