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Trends in Broadband Competition in Los Angeles County 2015-2016

Lack of competition in the provision of residential broadband services has been a concern for local governments for at least a decade. These concerns relate not only to the detrimental effect of weak competition on infrastructure investments, access prices and service quality. Healthy competition in Internet access services is the best defense against potential abuses by dominant actors that may limit innovation in digital services and infringe on free speech.

This policy brief analyzes trends in residential broadband coverage and competition in LA county. It is based on information about Internet availability and service speeds at the census block level collected by the California Public Utilities Commission (CPUC) for 2015-2016 (the most recent available). This information is combined with data from the American Community Survey (ACS) for the same period to shed light on the relation between broadband investments and community demographics.

The analysis is limited to fixed broadband services (DSL, cable Internet and fiber-based services)[1], and therefore excludes wireless carriers. This is in line with the 2016 FCC Broadband Progress Report, which concluded that fixed and wireless broadband are imperfect substitutes.[2] The analysis focuses on consumer services, while noting that many small businesses subscribe to residential plans. Following the FCC benchmark, broadband is defined as an Internet access service with advertised download speeds of at least 25Mbps and 3Mbps for data upload.[3]

Our findings show that broadband competition remained weak throughout LA County. While the share of residents able to choose between two or more competitors increased in 2016, about half still lacked choice in broadband service. Further, these gains in competition mostly benefited higher-income areas, and largely bypassed Latino residents. Lastly, investments in fiber have stalled, and the availability of next-generation services remained skewed towards wealthier areas.

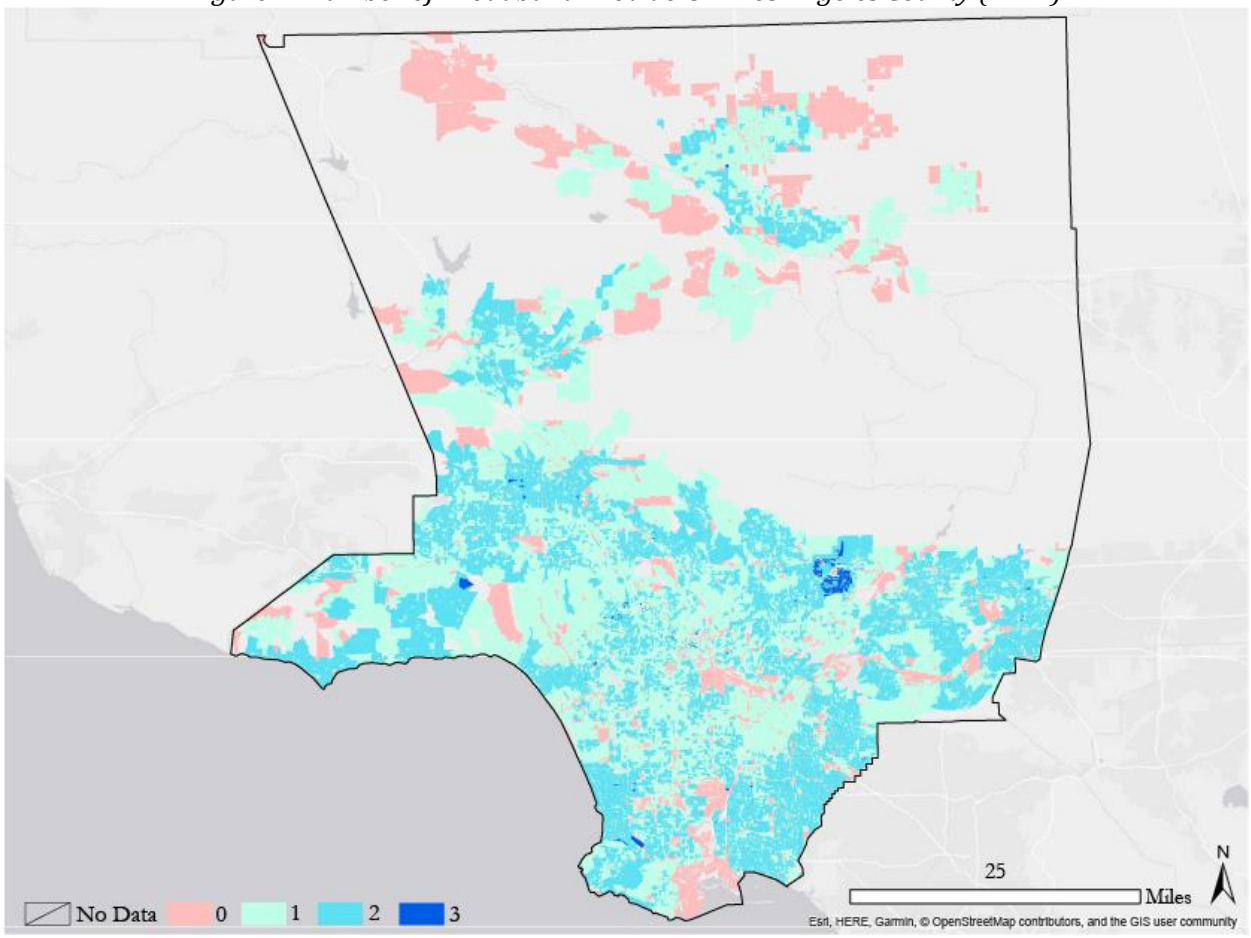
1. Shrinking coverage: Fewer LA residents are served by broadband.

Residential broadband was available to the vast majority of LA County residents in 2016 (Figure 1). However, contrary to expectations the number of unserved residents more than doubled from about 43,000 in 2015 to about 87,000 in 2016. Although this still represents a small minority of less than 1%, the trend raises concern about a deceleration in the expansion of broadband services across LA County.

[1] Digital Subscriber Line (DSL) is a family of technologies to transmit digital data over existing telephone wires. Cable Internet uses existing coaxial cables, while fiber requires new deployment of fiber-optic connections to the home (FTTH) or curb (FTTC).

[2] FCC (2016), *Broadband Progress Report*. GN Docket No. 15-191, pp. 7 (released January 29, 2016).
[3] FCC (2015), *Broadband Progress Report*. GN Docket No. 15-191, pp. 7 (released February 4, 2015).

Figure 1: Number of Broadband Providers in Los Angeles County (2016)

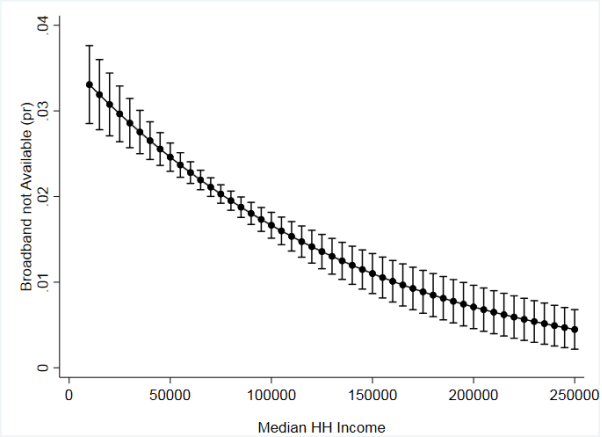


Which areas were not being served by broadband? As shown in Figure 1, these were mostly peri-urban areas with low population density located in the Santa Clarita and Antelope valleys. Nonetheless, there were several broadband deserts within the urban core of LA county, particularly adjacent to industrial clusters in Long Beach, Inglewood and South LA.

To understand the factors that characterize broadband deserts, we estimate a model that predicts the odds that a census block will not be served by broadband based on its demographic characteristics, including population density, median household income, education of the head of household and household racial composition (for details see technical appendix).

Not surprisingly the results corroborate that low population density is the single most important factor predicting lack of broadband in a census block. Yet after controlling for population density and other demographic variables, it remains that low-income areas are far more likely to be unserved. To illustrate this, Figure 2 shows how the probability of a block being unserved declines as median household income increases.

Figure 2: Probability of census block unserved (2016) by median HH income (95% CI)

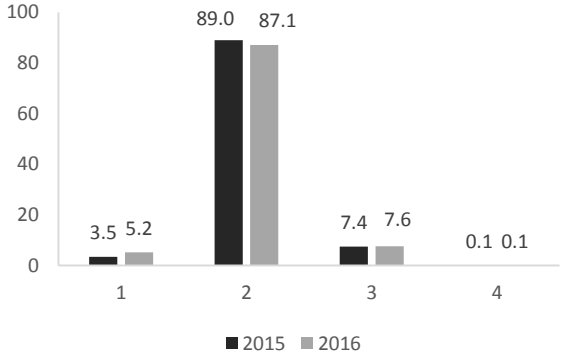


Source: own calculations based on CPUC data.

2. Broadband competition: The number of ISPs remains unchanged but more are offering higher-speed services.

Despite ongoing industry consolidation, there were only small observable changes in the overall number of Internet Service Providers (ISPs) serving LA County during the 2015-2016 period. A duopoly structure remained the norm, as about 87% of Angelenos were able to choose between two ISPs only. In 2016 only a small fraction of residents (7.7%) had a choice between 3 or more competitors, while a similarly small fraction (5.2%) lived in areas served by a single provider (Figure 3).

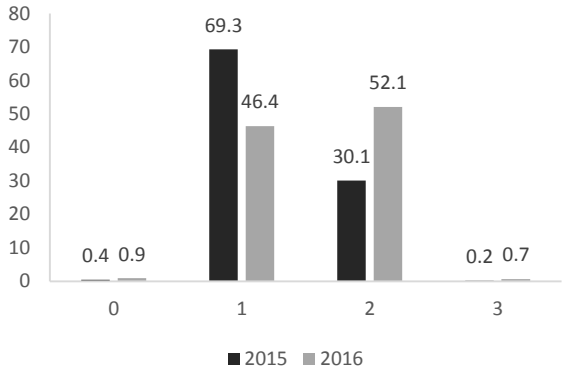
Figure 3: Percentage of residents and number of ISPs (2015-16)



Source: own calculations based on CPUC data.

There was a noticeable improvement however in terms of competition in broadband services (at least 25Mbps/3Mbps). The share of residents serviced by a single broadband provider decreased from 69.3% in 2015 to 46.4% in 2016, while in turn the share of residents with at least two broadband options increased from 30.3% to 52.8% (Figure 4). This trend was mostly driven by speed upgrades by existing DSL providers, rather than deployment of new infrastructure for next-generation services.

Figure 4: Percentage of residents and number of broadband providers (2015-16)

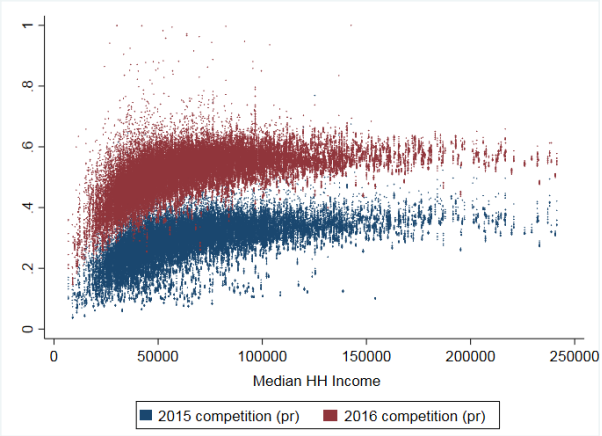


Source: own calculations based on CPUC data.

3. The benefits of competition are bypassing low-income areas and Latino households.

Which areas have benefited the most from increased broadband competition? Figure 5 plots the probability of broadband competition in a census block at different levels of median household income for 2015 and 2016. The figure generally suggests little change in the relation between competition and household income during this period, with gains observed across income levels.

Figure 5: Probability of broadband competition by median HH income (2015-16).



Source: own calculations based on CPUC data.

In order to further explore this question, we divide census blocks into four groups (Table 1). The first group corresponds to blocks with no broadband competition in 2015 that remained unchanged in 2016. The second corresponds to blocks where competition already existed in 2015 and remained unchanged in 2016. These two groups, for which no change is observed during this period, account for about two thirds of census blocks in LA County.

Our primary interest is in the remaining two groups, namely: blocks that lacked competition in 2015 but where two or more broadband providers were observed in 2016, and blocks where competition existed in 2015 but only a single provider remained active in 2016.

Table 1: Percentage of census blocks by competition status in 2015-16

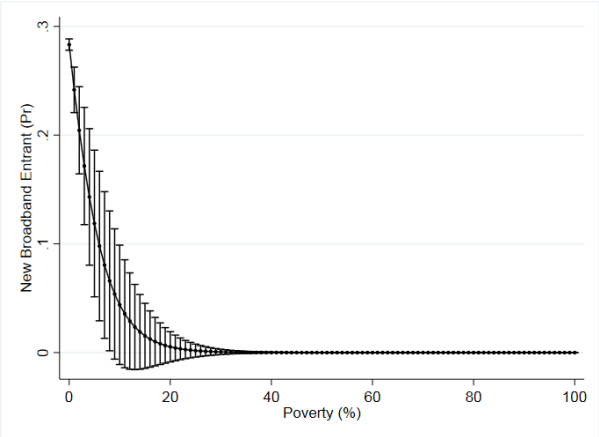
		Competition in 2016		Total
		No	Yes	
Competition in 2015	No	40.8	28.7	69.5
	Yes	6.5	24.0	30.5
Total		47.3	52.7	100.0

Source: own calculations based on CPUC data.

We begin by examining areas with a monopoly provider in 2015 that turned to competition in 2016. These are areas that benefited from new broadband investments (either from existing providers upgrading services from standard to broadband, or from new broadband entrants). They represent about 29% of the LA County population (about 2.8M people). In order to understand the factors driving these improvements in broadband infrastructure, we estimate a model that predicts the odds that a block will be in this group after controlling for population density and other block demographics (see technical annex).

The results show that investments are highly skewed against high-poverty areas and against areas with high share of Latino residents. For example, while the odds of increased broadband competition are about 1 in 3 for blocks with poverty levels below 1%, the odds drop rapidly as poverty levels increase (Figure 6). At household poverty levels of 20% and above, the odds of benefitting from greater broadband competition are essentially zero.

Figure 6: Probability of increased broadband competition (2015-16) by poverty level (95% CI)

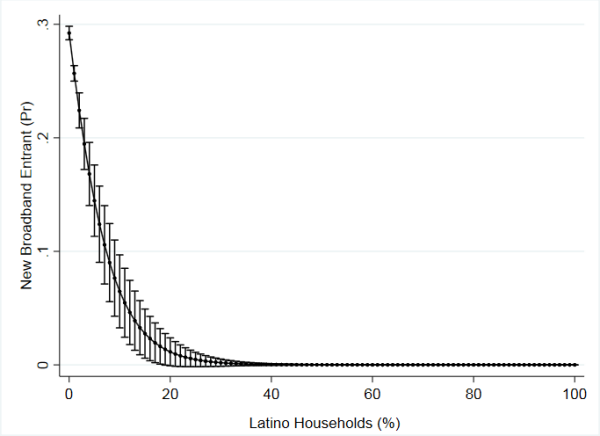


Source: own calculations based on CPUC data.

The case is similar for areas with more Latino residents: controlling for population density, household income and other demographics, the odds of benefiting from new broadband services between 2015 and 2016

decrease as the share of Latino residents increases (Figure 7). An area with few Latino residents had a 30% chance of seeing increased broadband competition in 2016, but as the percentage of Latino households rises above 20%, those odds essentially become null.

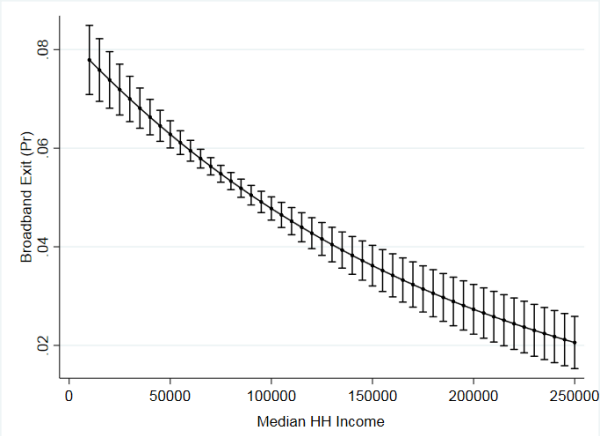
Figure 7: Probability of broadband competition increase (2015-16) by share of Latino HH (95% CI)



Source: own calculations based on CPUC data.

Finally, we examine areas where broadband competition existed in 2015 but is not observed in 2016. In other words these are areas of negative net change in broadband availability. Our findings suggest that, after controlling for population density and other demographics, these areas tend to be low-income, as shown in Figure 8. For example, while the odds of reduced broadband competition are about 7% for areas with median incomes of $20K, they are cut in half for areas with median incomes above $150K.

Figure 8: Probability of broadband competition decrease (2015-16) by HH income (95% CI)



Source: own calculations based on CPUC data.

4. Fiber investments in LA County have stalled

Fiber-based Internet access is widely recognized as the gold standard of the next generation of residential broadband services. In many European countries the coverage of fiber services is well above 60%, while it is almost universal in countries such as South Korea and Japan.[4] In LA County the share of the population served by fiber-based residential Internet remained unchanged between 2015 and 2016 at about 22%. In fact, as shown in Table 2, there was a small net loss of 2.2%, or about 33,000 residents.

Table 2: Percentage of population served by residential fiber services in 2015-16

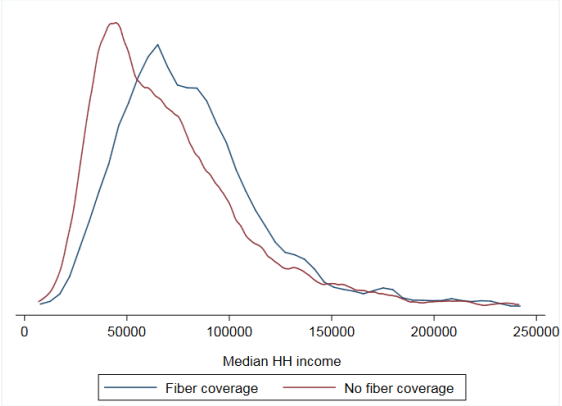
		Fiber in 2016		Total
		No	Yes	
Fiber in 2015	No	75.6	1.9	77.5
	Yes	2.2	20.3	22.5
Total		77.8	22.2	100.0

Source: own calculations based on CPUC data.

[4] See OECD broadband statistics (oecd.org/sti/ict/broadband).

The availability of fiber services remains skewed towards wealthier areas. Figure 9 plots fiber availability by median household incomes at the census block level. The distribution of blocks where fiber is available sits further right, indicating that these areas tend to be wealthier than those where fiber is not available.

Figure 9: Fiber availability by Median HH income (2016)



Source: own calculations based on CPUC data.

Taken together, these trends reflect a significant slowdown in investments in next-generation residential access technologies, which have yet to reach the majority of LA County residents and in particular middle and low-income communities.

5. Conclusions

Unlike investments in other critical local infrastructure such as electricity and roads, broadband investments in LA county (as in most other cities in the US) are driven exclusively by private operators. These operators compete under increasingly lax federal regulations, both in terms of industry organization and competitive behavior.

The findings in this report indicate that competition in broadband services remained weak over the 2015-16 period. Further, while the share of residents that can choose between two residential broadband providers increased significantly (from 30.3% in 2015 to 52.8% in 2016), these gains were mostly concentrated in higher-income areas, and bypassed many Latino residents.

Local efforts to spur investments in next-generation access technologies and promote more equitable Internet access across LA County date back to at least 2014, when the City of Los Angeles launched an ambitious initiative to attract investments in fiber-based services (with speeds of 1Gbps and higher) by existing and new operators. More recently, a coalition of cities in the South Bay (including low-income communities such as Inglewood and Carson, as well as wealthier coastal cities) have partnered in a fiber-optic master plan that could eventually improve the availability of high-speed services to businesses and residents.

Our results suggest that these and other efforts by local governments to promote investments in next-generation broadband and ensure affordable access to all residents on an equitable basis need to renewed. As the digital economy continues to thrive in LA county, the demand for more and better services will only increase. Nevertheless, the evidence indicates that current residential operators are falling short in terms of investments in new technologies, and that new, disruptive market entrants have not materialized.

The evidence also shows that new investments have bypassed many low-income areas, thus exacerbating economic and social inequality in a region that continues to struggle to provide for the less privileged. Correcting market failures in infrastructure investments has always been critical to equitable local development. Our findings indicate that the case of residential broadband is no different.

Technical Appendix

This report uses two data sources. Internet availability and speed data is sourced from the California Public Utilities Commission (CPUC), which annually collects geo-coded information from all ISPs at the census block level. The CPUC collects this data independently of the FCC and uses a number of validation techniques to ensure high data reliability (see www.cpuc.ca.gov).

This information is combined with data from the 2012-2016 American Community Survey (ACS) 5-year estimates which collects demographic information at the census block group level. Since the block group is the smallest geographical unit for which sampling-based demographic data is available, block group data is imputed to all census blocks within a group.

The CPUC dataset contains information for all census blocks in Los Angeles County. However, census blocks without population are excluded from the analysis, leaving a total of about 70,000 census blocks for analysis.

All calculations are based on multivariate logit models that estimate the odds of a binary outcome (such as the odds of a census block not being served by broadband or the odds of a block having two or more broadband providers) controlling for a set number of demographic covariates (see below). Detailed results are available from the authors on request.

Formally, the estimated model is:

$$\Pr(Y_i = 1|X_i) = \frac{exp(\beta X'_i)}{1 + exp(\beta X'_i)}$$

where Y_i is the binary outcome of interest for census block i, X_i is the vector of census block demographics and β is the vector of coefficients that are estimated through maximum likelihood.

The vector of census block demographics X_i includes the following variables from the 2016 ACS 5-year estimates:

- Population density
- Median household income (log)
- Pop. w/bachelor education or higher (%)
- Households below federal poverty line (%)
- African-American head of household (%)
- Latino head of household (%)
- Asian head of household (%)

The map in Figure 1 is taken from an interactive visualization tool that spatially illustrates the data used in this report. The tool was created using the ESRI ArcGIS Online AppBuilder platform, and allows users to explore broadband information in LA County at the census block level for 2015 and 2016. The tool also includes two types of information from the American Community Survey (ACS): demographic information from the ACS 2016 (5-year estimates) and Internet adoption information from the ACS 2016 (1-year estimates). The tool can be found at http://arnicusc.org/research/connected-cities/.

About the project

This document is part of the Connected Cities and Inclusive Growth (CCIG) project, a collaboration between the USC Annenberg Research Network for International Communication (ARNIC) and the USC Price Spatial Analysis Lab (SLAB). More information about the project can be found at arnicusc.org/research/connected-cities.

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About ARNIC

The Annenberg Research Network on International Communication (ARNIC) studies the emergence of new communication infrastructures, examines the attendant transformation of government policies and communication patterns, and analyzes the social and economic consequences. The project is multi-disciplinary – including communication, sociology, economics, and political science approaches – and follows an international comparative perspective spanning North America, Latin America, Asia, Africa, the Middle East, the Pacific, Western and Eastern Europe.

About SLAB

SLAB, the Spatial Analysis Lab at USC Price, aims to advance the visualization of the social sciences for public service through research, public engagement, and teaching. Our research experiments with developing alternative cartographies and exploring their potential roles in society, endeavoring to create knowledge and narratives that support an increasingly inclusive city. Aligned with Price's commitment to social justice and equity, the various activities of SLAB focus on bringing creativity and a humanistic attention to marginalized peoples and places.

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