The Impact of Broadband Access on Louisiana Population Growth*

Gary A. Wagner, Ph.D.

Acadiana Business Economist Endowed Chair
Professor of Economics

March 2020

Submitted to:
Leslie Durham
Governor's Designee to the Delta Regional Authority

*Any views expressed in this brief reflect the opinions of the author and do not necessarily reflect the official position of the University of Louisiana at Lafayette or the University of Louisiana System. The author may be reached by email at gary.wagner@louisiana.edu or by phone at 337-482-5381.

Executive Summary

According to the U.S. Federal Communications Commission, "high-speed Internet access, or broadband, is critical to economic opportunity, job creation, education, and civic engagement." This research brief outlines the methodology used to empirically investigate the relationship between broadband access and population growth in Louisiana. Using a difference-in-differences research design over the period from 2014 to 2018, this brief finds very strong evidence that consumer broadband download speeds are an important causal factor in explaining population changes across the state. Relative to communities where broadband speeds remained largely unchanged between 2014-2018, the change in population over this period was significantly higher for communities that experienced larger changes in broadband speed. For example, the change in population between 2014 and 2018 for a community that experienced a 50mbps change in consumer download speed is estimated to be 196.2 people higher than the change in population for communities where the change in broadband speed was less than 5mbps between 2014 and 2018. Communities that experienced larger than 50mbps changes in consumer download speeds over this period witnessed even larger changes in total population.

1 Research Methodology

Data on broadband speeds are available from the Federal Communications Commission (FCC) at the Census block level. These data include every service provider in the area and the maximum advertised download/upload speeds for both consumers and businesses at the provider level. The data are collected via Form 477 twice per year and were first made available in December 2014. All empirical analysis in this research brief uses the data from December 2014 and December 2018.

The broadband data are extremely granular because there are 204,447 Census blocks in the State of Louisiana. To merge the broadband data with other economic data that might explain population changes around the State, the broadband data were averaged across Census block groups since block groups are the smallest geographic region for which economic data are available. There are 3,471 Census block groups in Louisiana, so each block group consists of an average of 58.9 Census blocks.

To examine a potential casual relationship between broadband access and population, I followed a simple a difference-in-differences research design focusing on the change between December 2014 and December 2018. In general, the two-period difference-in-differences design can be expressed as:

$$p_i = \alpha + \beta Post_i + \gamma Treat_i + \delta(Post * Treat_i) + \lambda X_i + \varepsilon_i, \tag{1}$$

where p_i is the total population in Census block group i, $Post_i$ is an indicator variable that equals 1 if the year equals 2018, $Treat_i$ equals 1 if the Census block group i is assumed to be "treated" by having faster broadband access, and X_i are other economic variables that might explain population growth. Total population for 2014 and 2018 for each Census block group was obtained from the American Community Survey (ACS) 5-year estimates, respectively. In terms of additional variables that may also influence population (X_t), I controlled for the number of housing units, median household income, and the percentage of the population that is black. These variables are also from the 2014 and 2018 5-year ACS estimates.

The coefficient δ is the difference-in-differences estimate. In the simplest scenario without additional variables like median household income, etc., it is simply the difference in (mean) population for the Census block groups that experienced large improvements in broadband access between 2014 and 2018 less the difference in (mean) population for the Census block groups that experienced no

changes in broadband access.

For illustrative purposes, suppose 50 Census block groups in state experienced a change in consumer broadband speeds of 100 or more mbps between 2014 and 2018. This group of areas would be considered the treatment group. Let's say their average broadband speed was 37.5 in 2014 and 150.8 in 2018. The difference for treatment group is therefore 113.3 (= 150.8 - 37.5). Suppose there are 68 other Census block groups in the state that experienced a change in broadband speed of less than 5 mbps between 2014 and 2018. This group is refereed to as the control group. Let's assume their average download speeds were 27.3 in 2014 and 31.5 in 2018, which yields a difference of 4.2 (= 31.6 - 27.3). The difference-in-differences estimate (δ) would be 113.3 - 4.2 = 109.1. This figure tells us that the change in population for the treatment group was 109.1 people higher between 2014 and 2018 than the change in population in the control group. The computation is more complicated when other variables like median household income are taken into consideration, but the same basic principle applies.

To examine the effects of broadband on population, I defined two control groups and three treatment groups. The first control group is Census block groups where the change in consumer maximum advertised download speeds was less than 5 mbps between 2014 and 2018 (55 areas fall into this category). The second, broader control group uses Census block groups where the change in download speeds was less than 15 mpbs (588 areas fall into this category). The three treatment groups include all Census block groups where consumer download speeds increased by at least 50 mbps (1532 areas), 75 mbps (1259 areas), or 100 or more mbps (972 areas). I then estimated six difference-in-differences regressions using each control group and each of the three treatment groups.

Estimates for the 5 mbps control group are presented in Table 1. The results show, quite clearly, that areas with larger changes in broadband between 2014 and 2018 experienced significantly larger changes in population relative to areas where broadband was relatively flat (a change of less than 5 mpbs). At the high end, areas with broadband changes of 100 mbps or more experienced a change in population of 222.3 people above and beyond the change in population of areas with flat broadband speeds. Figure 1 highlights the Census block groups in the state in the treatment and control groups in this scenario. Census block groups shaded in purple are the areas where the change in broadband speed was relatively flat between 2014 and 2018. The areas with increasing

shades of yellow/orange are the areas in the state that have experienced the largest change in broadband speeds over the same period.

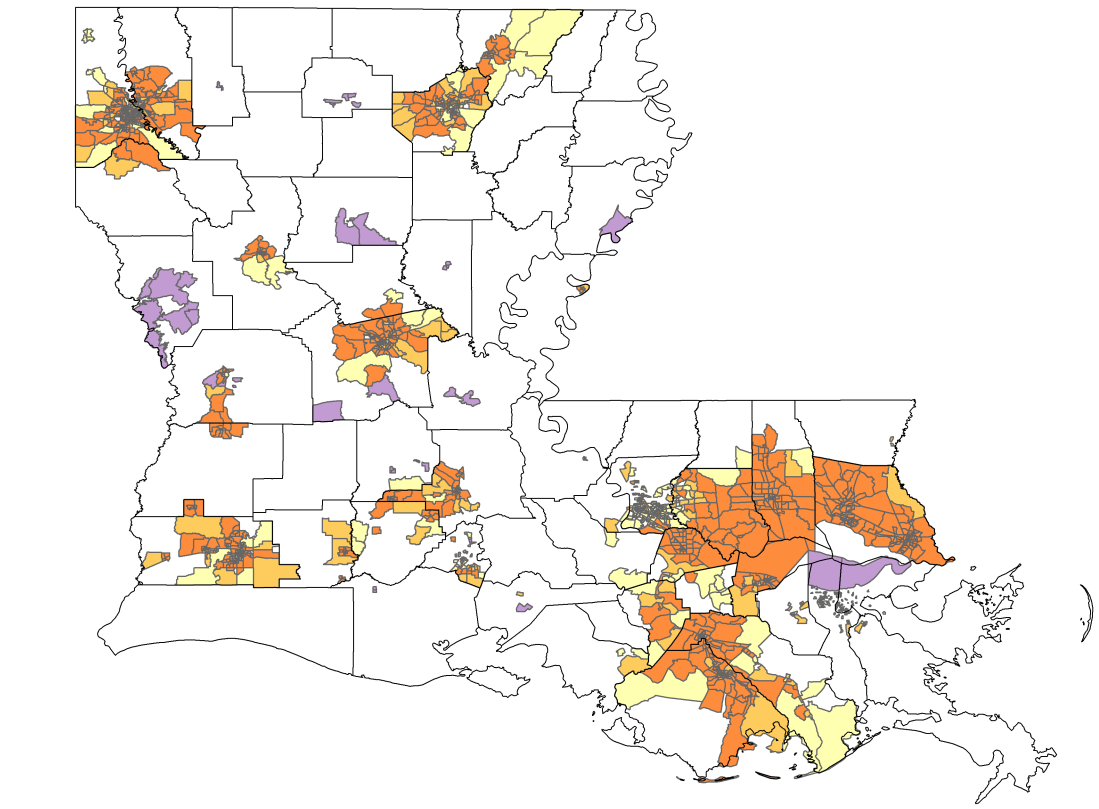
The importance of broadband speeds are still important once the control group is expanded to areas that experienced a change in broadband of less than 15 mbps. These estimates are presented in Table 2 and a map showing the geographic areas falling into each category is presented in Figure 2. I find that changes in broadband speeds of 50, 75, and 100 mbps are responsible for changes in population that are 51.6, 63.1, and 75.8 people higher than in areas where the change in broadband between 2014 and 2018 was more modest (less than 15 mbps).

Table 1: Difference-in-Differences Results: 5 mbps Control Group

	Dependent variable:		
	total population		
	(1) OLS	(2) OLS	(3) OLS
(Intercept)	721.913**	685.893***	768.282***
	(294.016)	(128.407)	(120.717)
median household income	0.006***	0.006***	0.006***
	(0.001)	(0.002)	(0.002)
percent black	5.939***	5.546***	5.930***
	(1.062)	(1.248)	(1.418)
housing units	24.808***	24.542***	24.681***
	(2.250)	(2.489)	(2.726)
post	-140.405	-139.633	-143.371
	(106.410)	(106.126)	(107.352)
treat50	-185.660		
	(157.852)		
post*treat50	196.238*		
	(107.074)		
treat75		-291.490***	
		(106.187)	
post*treat75		200.853*	
		(106.851)	
treat100			-454.078***
			(139.198)
post*treat100			222.348**
			(108.864)
N	3030	2509	1964
Adj. R^2	0.637	0.640	0.644

Terms in parentheses are standard errors clustered by Census tract. All regressions include census tract fixed effects and Parish-specific linear trends. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Figure 1: Areas with Fast and Slow Changes in Broadband Speed: 2014-2018



CHANGE in Advertised Consumer Download Speed: Dec. 2014 to Dec. 2018

Less than 15mbps | 50-75mbps | 75-100mbps | 100 or more mpbs

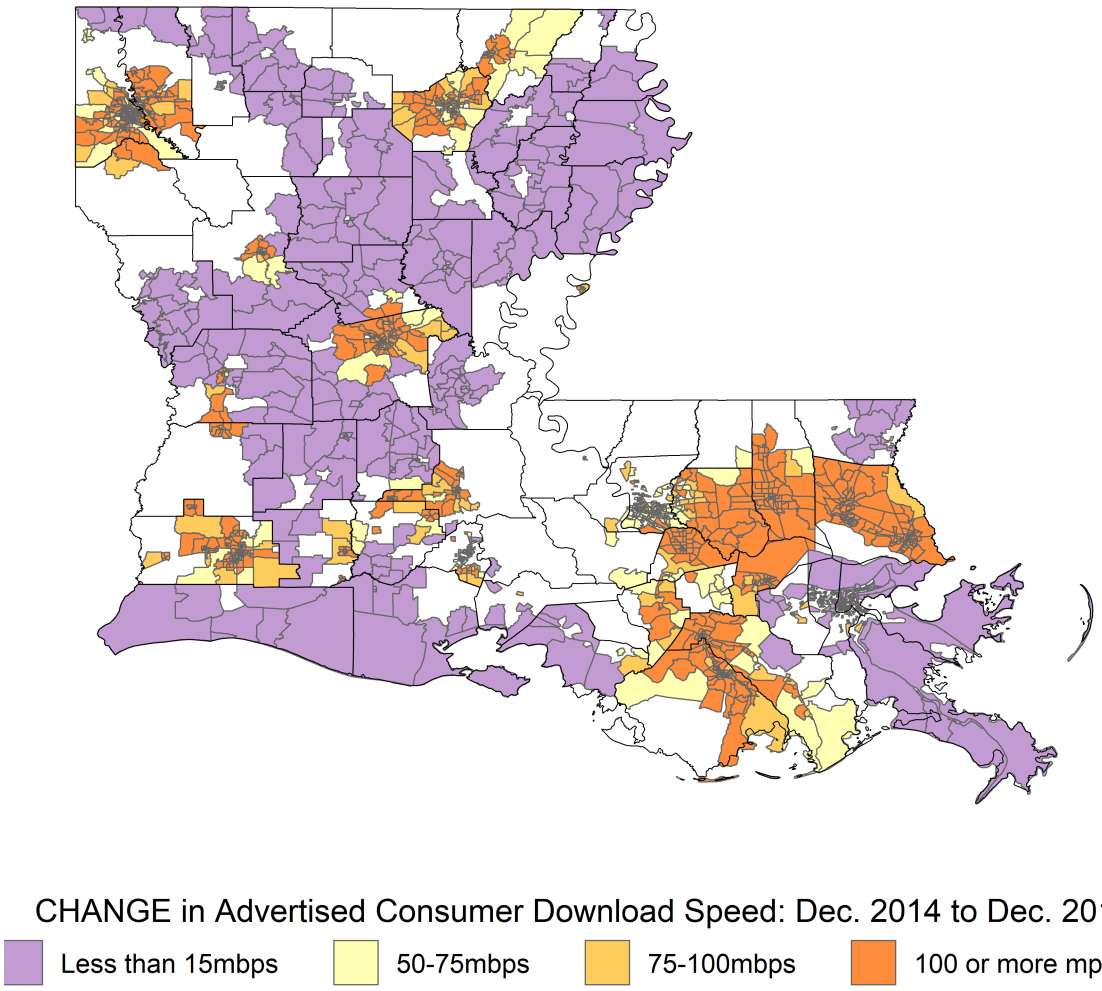
Source: Federal Communications Commission. Calculations by Gary A. Wagner, Ph.D.

Table 2: Difference-in-Differences Results: 15 mbps Control Group

	Dependent variable:		
	total population		
	(1) OLS	(2) OLS	(3) OLS
(Intercept)	433.423***	347.434	769.517**
	(166.691)	(264.913)	(340.574)
median household income	0.005***	0.006***	0.005***
	(0.001)	(0.001)	(0.001)
percent black	4.831***	4.496***	4.771***
	(0.898)	(1.007)	(1.072)
housing units	20.803***	20.209***	19.980***
	(1.687)	(1.740)	(1.847)
post	6.349	2.819	4.188
	(18.164)	(18.614)	(18.707)
treat50	-28.109		
	(127.766)		
post*treat50	51.646**		
	(21.269)		
treat75		-18.436	
		(231.575)	
post*treat75		63.116***	
		(22.499)	
treat100			-328.066
			(327.871)
post*treat100			75.884***
			(24.534)
N	4025	3504	2959
Adj. R^2	0.635	0.640	0.649

Terms in parentheses are standard errors clustered by Census tract. All regressions include census tract fixed effects and Parish-specific linear trends. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Figure 2: Areas with Fast and Slow Changes in Broadband Speed: 2014-2018



Source: Federal Communications Commission. Calculations by Gary A. Wagner, Ph.D.