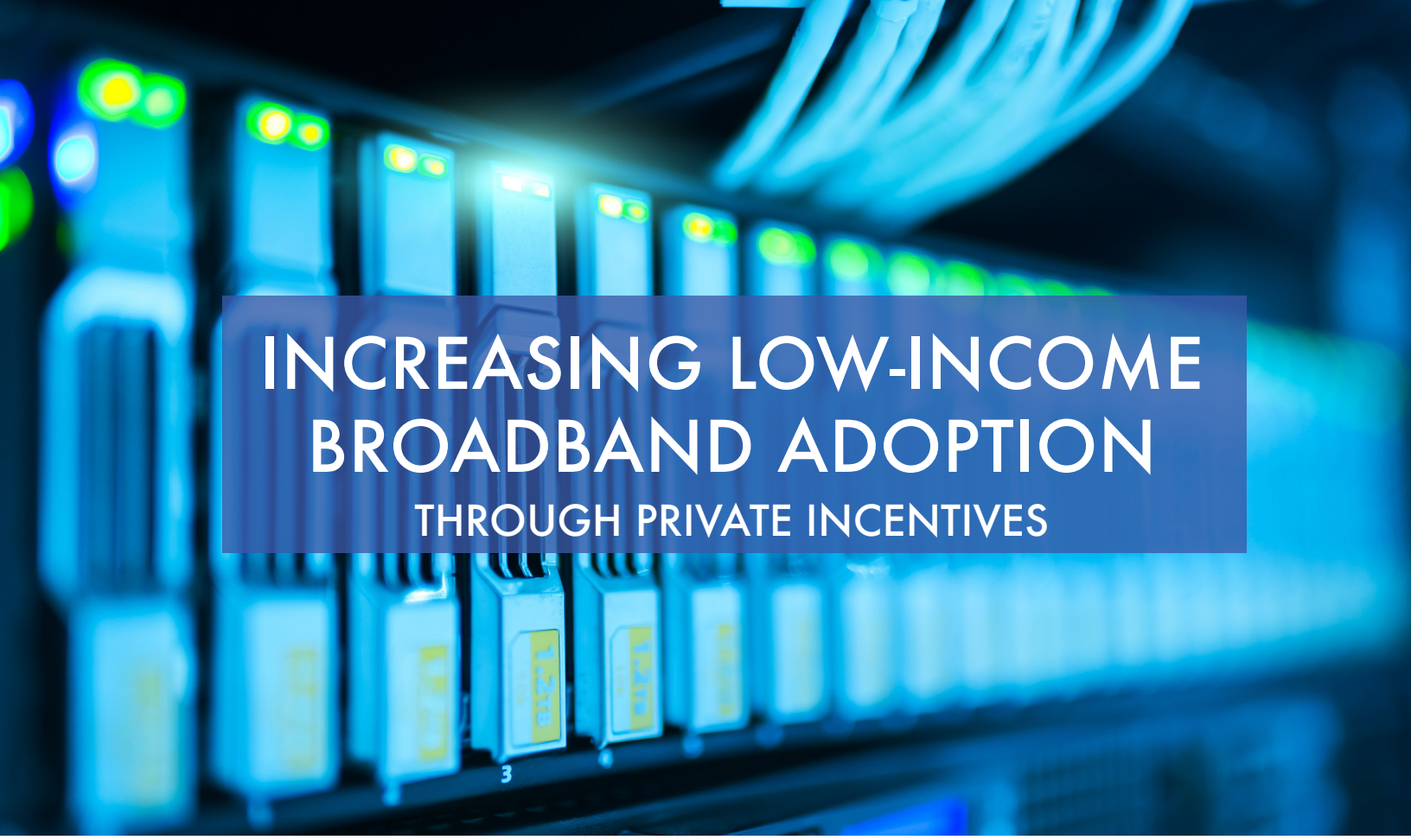

INCREASING LOW-INCOME BROADBAND ADOPTION

THROUGH PRIVATE INCENTIVES

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1. Introduction

A long-standing public policy goal has been ensuring that almost all citizens are connected to some minimum level of communications services. Efforts to achieve this goal typically involve subsidizing investment in rural areas and service for low-income households. Many surveys have asked low-income people why they do not subscribe to broadband, but little evidence exists on how to encourage low-income people to subscribe. Such programs typically involve a tax (implicit or explicit) on one group of users to provide the funding to subsidize another.

This paper evaluates a program by a private Internet Service Provider (ISP) intended to encourage low-income households to subscribe to broadband internet service. As part of its approval of the Comcast-NBCU merger in 2011, the Federal Communications Commission (FCC) mandated a "voluntary commitment" by Comcast to introduce a low-income broadband program that Comcast has branded "Internet Essentials (IE)." We use data from the U.S. Census Current Population Survey (CPS) and the National Broadband Map and a differences-in-differences approach to evaluate the program's effects on subscription rates for eligible households.

We find that between 2011, when the program began, and 2015, broadband adoption by eligible households—those with school-age children who were eligible for free or reduced-price school lunches—had increased by more among households that lived in areas in which Comcast provided broadband internet service than among households that lived in areas served by other cable providers.

Comcast states that it had 500,000 IE cumulative IE connections.[1] Comcast also states that 90 percent of Internet Essentials subscribers did not previously have internet service.[2] Not all of those new adopters can be attributed to IE. Increasing adoption over time means that many of these low-income households would likely have subscribed even without the program. In addition, some low-income households probably switched from another ISP like AT&T to take advantage of IE's lower prices and/or higher quality.

Accounting for those factors in our difference-in-differences approach, we estimate that about 66 percent of IE subscribers represent true increases in low-income adoption as a result of the program, with the remaining subscribers being households that switched from a competitor and households that would have subscribed as part of a general upward trend in adoption.

We find that CPS survey respondents in IE eligible households had small and insignificant increases their likelihood of taking online courses or job training in Comcast territory relative to similar households residing in the territories of other cable providers and they showed no difference in the propensity to apply for jobs online. These results provide no evidence to support internet literacy training.

1 In its 2018 Progress report (available at https://update.comcast.com/wp-content/uploads/sites/33/dlm_uploads/2018/08/Internet-Essentials-2018-Progress-Report.pdf), Comcast reports having connected a total of 1.5 million households since the inception of the program through 2018 (not the number currently connected). Comcast has continued and expanded the program beyond its merger commitment.

2 "Before subscribing to Internet Essentials, 90% of the program's customers did not have a broadband internet subscription at home." https://corporate.comcast.com/values/internet-essentials.

We also did not find robust effects of some of the program's other components. In particular, IE makes computers available for $150, but we found no difference in the change in low-income computer ownership across cable territories. As a result, it would be hard to concluwde that subsidized computers made a difference in broadband subscription despite the visceral appeal of such programs.

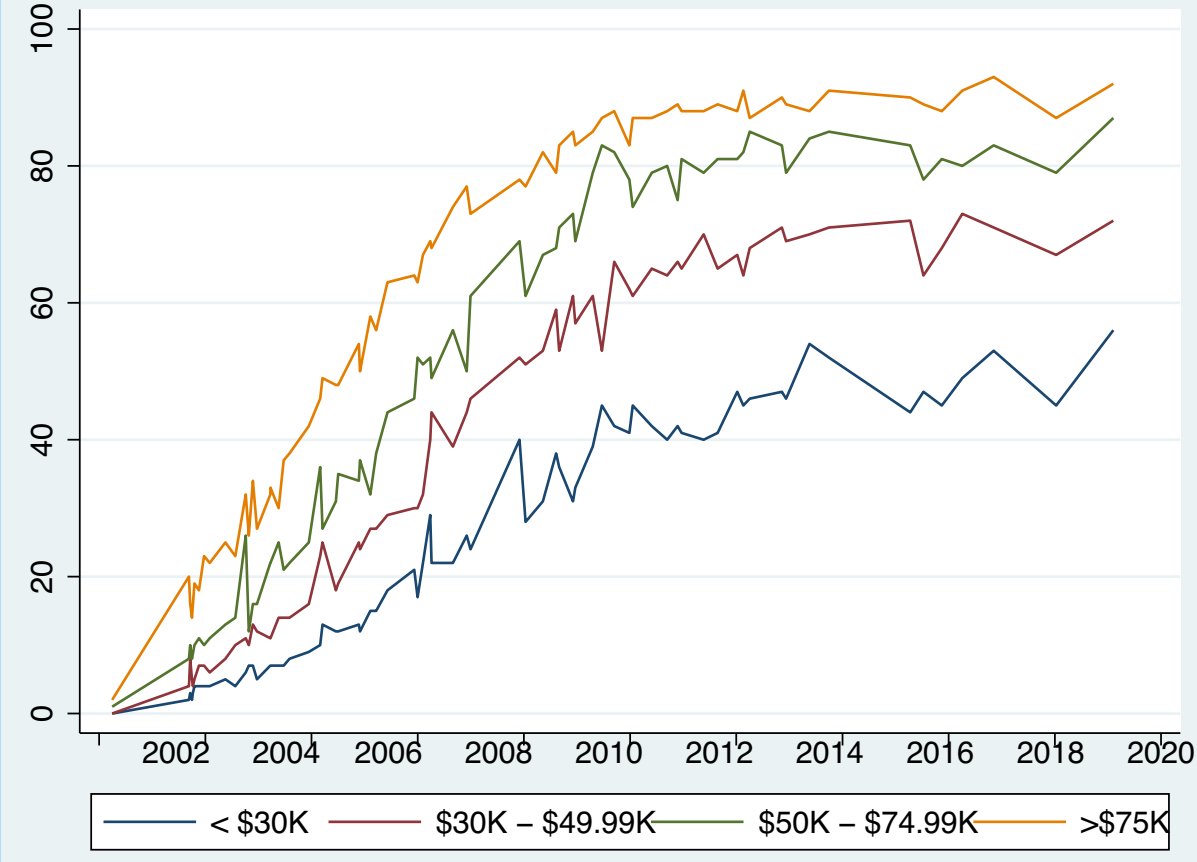
The remainder of the paper proceeds as follows:

Section 2 provides a review of the historical evidence of the impact of subsidy programs. Section 3 describes the private low-income program that is the focus of our analysis. Section 4 sets up our simple model and estimation strategy and describes the data. Section 5 presents and discusses the econometric results and Section 6 provides conclusions.

2. The Income-Based Digital Divide and Government Attempts to Bridge It

As with many new products and services, low-income people have lower rates of broadband adoption than do higher-income people. Figure 1 shows adoption estimates from the Pew Internet and American Life Project, which has tracked broadband adoption since 2001. The figure shows a more or less steady increase in adoption by all income groups over time but with lower-income groups with consistently lower adoption rates.

Figure 1: Broadband Adoption Over Time by Income



Note: Surveys conducted 2000 – 2018. The Center has used several different wordings to identify broadband users in recent year, which may account for some variance in broadband adoption figures between 2015 and 2018. Our survey conducted in July 2015 used a directly comparable question wording to the one conducted in January 2018.
Source: Pew Internet and American Life Project

The U.S. and most countries around the globe have "universal service" programs intended to make some minimum level of certain services, including telecommunications, available to everyone.[3] Mueller (1997) provides a historical account of many of the attempts to increase telephone penetration using subsidies, which have largely taken the form of financial reimbursements to providers. Such subsidies have been both explicit and implicit. For example, Brock (1998) discusses the arcane system of access charges that were implemented to replace the implicit internal subsidies that had been part of the integrated Bell System. These charges led to higher consumer prices for long distance service and lower prices for local service. However, because the elasticity of demand for local service was extremely low, there is no evidence that the cross subsidy increased subscription rates and substantial evidence that it created inefficiency for long distance service.[4]

In addition to general untargeted subsidy programs, such as the myriad rural programs, the FCC has programs designed specifically to target low-income populations. The two main low-income telephone subsidy programs have been Lifeline and Linkup. Lifeline provides discounts on recurring monthly service charges and Linkup reduces the upfront connection charges. Again, the evidence for any substantial effect on subscriptions is weak. Studies by Crandall and Waverman (2000) and Erikson, Kaserman, and Mayo (1998) follow logic similar to Taylor's in citing differences in elasticity for different services. Both note that the tradeoffs of distortions from taxing elastic services to gain minimal subscription gains for inelastic services cause large social losses.

Ackerberg et al. (2014) provide a more granular approach to the effect of Lifeline and Linkup programs. They find that even though elasticity of demand for local service in low-income households is triple the elasticity of the general public, it is still very inelastic. Together, Lifeline and Linkup increased penetration among low-income households by about 6%. However, Linkup, a one-time targeted subsidy to connect households, was more cost effective than a general monthly subsidy, which is the basis of the Lifeline program. Around the same time this research was published, the FCC decided to reduce funding for Linkup.

Research on subsidy programs for rural areas reaches similar conclusions. Boik (2017) concludes that rural broadband subsidy programs would mainly transfer money to those who would subscribe even without the subsidies. Wallsten (2011) finds that much of the money from the FCC's universal service fund goes directly to companies in the form of higher overhead and does not reduce prices or promote investment. Rosston and Wimmer (2000) show that where rural subsidies do provide benefits, most beneficiaries are not low-income households. It follows from all of these studies that the rural universal service funds have not played a large part in increasing subscribership.

Until 2013, all of the evidence on the effectiveness of universal service programs came from ex post evaluation. That year, however, as part of the process to reform the Lifeline program to include broadband, the FCC worked with broadband providers across the country to conduct 14 different experiments to study the effectiveness of different approaches to providing subsidies. The 14 providers tested different mechanisms, specifically bundles of broadband speed, price, and company outreach, and their associations with consumer adoption of broadband. All focused their efforts on participants that had not had broadband in the previous 60 days.

Wallsten (2016) analyzed the results of the 14 experiments. He noted that the main results were unexpected: outside of Puerto Rico, companies were only able to attract

3 For an overview see Wallsten (2009).
4 Taylor, 1990; Brock, 1998

approximately 10 percent as many subscribers as they had expected, and the actual number of participants were very low. Such a low participation rate made it difficult to test some of the questions posed, like the effectiveness of digital literacy training, and highlights the problem catalyzing this research: that we generally do not know how best to entice the remaining broadband non-adopters to connect to broadband.

3. Private Sector Attempts to Bridge the Digital Divide

The private sector also sometimes has its own programs to encourage adoption. This section first discusses the different incentives the private and public sector may face and then provides details about Comcast's IE program.

Public Versus Private Incentives

Government and the private sector share some incentives with respect to increasing broadband adoption. For example, both want to maximize the advertised number of program participants and allow people to think that the number reflects progress closing the digital divide – good publicity is good publicity, after all. But not all private incentives parallel public incentives.

Governments and companies have different incentives when designing and running programs to increase broadband adoption, and these differences could lead to different outcomes. While both entities want to maximize the number of participants for the sake of public relations, politicians may see broadband subsidies as a broader welfare program all low-income people should receive. That is, if they see subsidies as a general welfare program, then they may truly believe the total number of recipients reflects the program's success. While the objective might be noble, it will blunt the program's effectiveness in terms of increasing the number of low-income people online.

A private company's underlying incentives are likely to be different. In particular, their financial incentive is to attract people who do not currently subscribe to their service and are unlikely to subscribe to their existing plans. Moving an existing subscriber from a regular plan to a subsidized plan may be helpful by adding to the total number of participants that can be advertised as evidence of the company's social conscience, but it would represent a revenue loss. Finding people who would only subscribe to a specialized program is, all else equal, worth more to the company. Even in this case, though, the incentive to find households on the margin are somewhat blunted because the company benefits if a household switches from a competing provider even though that does not increase the number of households with broadband service. These incentives, however, are conditional on the company having decided to run such a program. If low-income households are a net cost to serve due to higher customer-service costs or increased likelihood of nonpayment, the company may not have such a program in the first place and may not target households that subscribe to service from a competitor.

Comcast Internet Essentials

On January 20, 2011, the Federal Communications Commission approved the merger of Comcast Corporation with NBCUniversal.[5] While most of the conditions were related to competition policy concerns, one of the many conditions was a requirement to expand broadband adoption.

Section XVI. 2. of the Order discusses a requirement for a new "Comcast Broad band Opportunity Program (CBOP)" and

5 Federal Communications Commission, Memorandum Opinion and Order "In the Matter of Applications of Comcast Corporation, General Electric Company and NBC Universal, Inc. For Consent to Assign Licenses and Transfer Control of Licensees," MB Docket No. 10-56, Rel. Jan 20, 2011.

sets forth a number of specific mandates to fulfill the requirement. The FCC mandated a program to increase broadband adoption among low-income households:

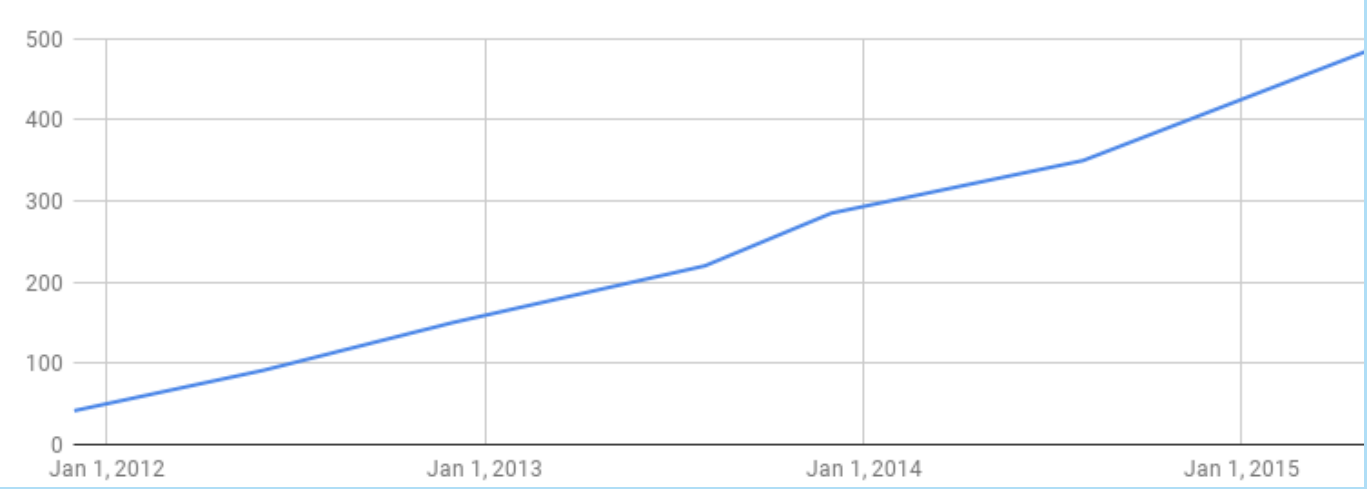
> CBOP shall address the three key barriers to adoption identified in the National Broadband Plan: (i) reducing the cost of broadband access for low income homes; (ii) the lack of a computing device in the home; and (iii) the absence of digital literacy.

The Order then sets forth specific requirements for the program: A $9.95 price per month, no upfront of modem fees, computer equipment for less than $150, and digital literacy training programs. Households would qualify if they had at least one child eligible for free lunch under the National School Lunch Program. The program had to last at least three full school years. Households would not be eligible if they had outstanding debt to Comcast or had subscribed to Comcast broadband within the past 90 days. The first was to reduce the chance of further bad debt and the latter may have been an attempt to promote greater adoption and to reduce the subsidies going to those who would subscribe in the absence of the program (although there may have been ways to minimize the effect of the 90 day requirement by signing up with another provider or sharing with a neighbor for 90 days).

Comcast has continued the program past the FCC required three years and also made more households eligible (for example, including those qualified for reduced price lunch as well as those eligible for free lunch). Additional low-income households (HUD-assisted) even without school age children qualify starting in 2016 and it has made more changes since then, although our study only uses information through 2015.

Comcast does not report the number of current subscribers to IE, instead reporting the number of new connections. If a household subscribes under IE and later drops out of the program it is still counted as a connection. Thus, it is an upper limit on the number of IE subscribers. Figure 2 shows connections under the Internet Essentials program as reported by Comcast. For our purposes, the number in 2011 is close to zero and the number is 500,000 in the middle of 2015.[6]

Figure 2: Cumulative Internet Essentials Connections



Source: Comcast, 5-year Progress Report, Comcast Announces New Internet Essential Program Milestones and Enhancements, Aug 15, 2017.

6 See, https://update.comcast.com/wp-content/uploads/sites/33/dlm_uploads/2019/07/IE-Progress-Report-1.pdf (Accessed 09/27/2019).

In recent years, other companies have begun their own low-income broadband programs. For example:

- Cox began the Connect2Compete program in 2012 with similar eligibility requirements.[7] It rolled out its program nationally in 2013 and reported about 15,000 households by mid 2014.[8]
- Charter (Spectrum) began a low-income broadband program, Spectrum Internet Assist, in 2016 as a result of a condition attached to its acquisition of Time Warner Cable.[9] It offers reduced price broadband to qualifying households for $14.99 per month.[10] Qualifications for Spectrum Internet Assist are similar, but not identical, to those for Comcast Internet Essentials.
- AT&T began a low-income broadband program in 2016 with prices from $5 - $10 per month.[11]

4. Empirical Analysis

This section describes the data we use to evaluate IE, our empirical methods, and results.

Data

Our data come from two sources, both public: the U.S Census Current Population Survey (CPS) biannual Computer and Internet Use Supplement and the FCC's National Broadband Map (NBM).[12]

The CPS supplement, combined with the demographic data provided in the standard CPS survey, includes questions on internet use and connectivity by household. We use data from 2011 and 2015, since IE began its rollout in 2011 and its impact is not be reflected in the 2011 survey (note the zero connections in Figure 2) but would be reflected in the 2015 data.

The NBM identifies ISP service areas at the census block level. Combining the CPS and NBM data provides information about households' demographics, their home internet use, and the broadband providers available to them, thereby making it possible to identify households in the IE target group: those that should be eligible for IE based on their demographic characteristics and residing in Comcast territory.

Unfortunately, the datasets do not match cleanly due to differences in geographic identifiers in the datasets. While the NBM includes data at the census block level, the public version of the CPS identifies households only at the county, core-based statistical area, or metropolitan statistical area code. In some instances, when households are not located near a major metropolitan area, the CPS excludes even these identifiers. As a result, our smallest common geographic unit of observation is a county.

The problem with counties as the geographic unit of observation is that in many cases multiple cable companies offer service in a county even though their service areas do not overlap within the county.

That means county-level observations can falsely imply head-to-head competition between cable ISPs that does not actually exist. We deal with this problem by calculating a continuous variable equal to the share of total county households served by each

7 https://www.cox.com/aboutus/connect2compete/about.html.
8 https://www.prnewswire.com/news-releases/cox-communications-closes-digital-divide-with-connect2compete-broadband-adoption-program-271892261.html.
9 Federal Communications Commission, Memorandum Opinion and Order "In the Matter of Applications of Charter Communications, Inc., Time Warner Cable Inc., and Advance/Newhouse Partnership For Consent to Assign or Transfer Control of Licenses and Authorizations," Rel. May 10, 2016.
10 https://www.spectrum.com/browse/content/spectrum-internet-assist.html. Price determined using Zip Code 63101 on December 28, 2018.
11 https://about.att.com/story/att_a_national_stakeholder_in_connecthome.html.
12 Note that the FCC decommissioned the NBM at the end of 2018. https://www.fcc.gov/news-events/blog/2018/12/07/decommissioning-national-broadband-map-and-its-apis.

cable ISP using their census block coverage.[13]

In addition to broadband cable providers, traditional telephone companies also provide broadband access. We calculate the share of county households served by each wireline telephone provider to capture any competition effects.

Because we have to exclude some households—those with no geographic identifiers in the CPS—and because we assign probabilistic indicators of which ISPs serve a given household, we examine how representative our sample is of national data.

Table 1: Summary Statistics

	Year	Our Data	Complete CPS
Number of households represented as implied by household weights	2011 2015	61.9m 69.0m	119m 123m
Number of households who meet IE criteria	2011 2015	6.1m 6.5m	10.0m 9.6m
Median (Mean) Income Census Categories (1-16) (Category 11 = $40k - 49.99k) (Category 12 = $50k - 59.99k)	2011 2015	11 (10.3) 12 (10.9)	11 (10.1) 11 (10.6)
Mean number of people in a household	2011 2015	2.5 2.5	2.5 2.5
Share households with Internet at home	2011 2015	74% 75%	72% 73%
Share households in metropolitan area	2015	98%	85%

Table 2: ISP Coverage in 2015

ISP	Share of sample passed	Share of population passed
Comcast	47%	35%
TWC	27%	21%
Charter	13%	9%
Cox	10%	7%
AT&T	44%	41%
Verizon	51%	22%

(ISP territories overlap, so totals exceed 100 percent. Population from National Broadband Map.)

Table 1 shows that after matching the datasets and dropping households without geographic identifiers we have a dataset that includes just over half of U.S. households as implied by the CPS weights. These seem fairly representative of the overall population in

13 For example, if Charter offers service in three of a county's six census blocks, we sum the number of households in each of Charter's census blocks and divide by the total number of households in a county, as reflected in housing statistics published by the Census Bureau following the 2010 census.

terms of income and household sizes. The share of households with internet in our sample is a bit higher than for the overall population because our sample is almost entirely urban. The urban nature of the sample is a function of the geographic identifiers we had to use, which prevented us from identifying most households in rural areas. The ISPs we include are over-represented as shown in Table 2 because their coverage is concentrated in urban areas. However, since we are looking at the effect of a program that is predominantly implemented in urban areas, it is good to have similar comparison areas. However, that means that the results may not necessarily apply to more rural settings.

Empirical Approaches

We explore the effects of IE in two ways. The first is a simple differences-in-differences approach in which we compare the 2011-2015 change in the relevant indicators among the eligible population in Comcast territory with the change among the eligible population in non-Comcast territory. The second is an econometric differences-in-differences analysis with the same comparison variables, but in which we control for other factors such as household size and competition. None of the major cable companies we use for the analysis had major changes in their service territories or significant buildout during the time period so changes in penetration are primarily due to take up of broadband on existing facilities as of 2011.

In order to be useful, the relevant indicators had to be included in both the 2011 and 2015 CPS Supplement. These include whether the household had an internet connection at home, in order to measure adoption; whether anyone in the household used the internet to apply for a job online and whether anyone in the household used the internet to take a course or obtain job training, in order to measure the effects of digital literacy training; and whether the household had a desktop or laptop, in order to measure whether the subsidized equipment affected the presence of computers in the household.

For both empirical approaches, we have to identify households that would be eligible to participate in IE. The observations in our dataset are at the household-level and for each household include demographics and the share of households in that household's county we estimate have access to a given ISP. As discussed earlier, one criterion determining eligibility is whether the household has school-age children who are eligible for free- or reduced-price lunches. Eligibility for that benefit is a function of household income and size. Because we have those data we can calculate whether a household would be eligible for the lunch benefit and, therefore IE.[14] For both approaches, the basic test is the same: did the relevant indicator change by more among the population eligible for IE in Comcast territory than among the population that would have been eligible but live in non-Comcast territory?

Recall that we do not know with certainty whether a household is in a provider's territory, only the share of the population in the Census Blocks of the household's county with access. We therefore do our analysis where a household is considered as being in a given provider's territory only if 100 percent of the county's population has access to the provider. For purposes of discussion, we use those results, since those present the cleanest comparison. As a robustness check, we loosen the criteria and consider a household to be within a provider's territory if at least 60 percent of the Census Blocks' population has access to the provider and present those results in

14 More accurately, the CPS provides us with an income range for each family. To determine whether the household would be eligible, we assume the household's income is at the highest end of the range and then whether that income is less than the threshold to be eligible for the lunch program given the number of people in the household. The threshold income levels for each year are available at https://www.fns.usda.gov/cnp/fr-032019

the appendix. We expect the results to be less apparent in the 60 percent sample as the effects, if real, would be attenuated by the smaller share of coverage.

Simple Difference-in-Difference Analysis

In this section we compare the change in home internet adoption rates among the eligible population in Comcast territory to the same population in non-Comcast territory. We also compare the change in adoption rates among households that would be eligible based on income but have no school-age children in Comcast territory to that population outside of Comcast territory. An increase in adoption by the eligible population in Comcast territory that exceeds the change for eligible populations in other territories would provide evidence that IE encouraged adoption.

As another test, we also examine the differences in the changes in households that would be eligible for IE based on income but have no school-age children.[15] Internet adoption in these households should not be affected by the presence of the IE plan since they would not be eligible, so we can use that as a check on the impact of IE. If IE had no effect, then we would expect to see faster growth in Comcast territory compared to others' territories among this group just as we did with IE.

Such a result would imply other reasons for the change in penetration being higher in Comcast territory such as higher quality, more advertising or other factors. However, as the right hand side of Table 3 and the corresponding blue bars in Figure 3 show, changes among internet adoption (and all of the other measures) are similar for the eligible but no school age children across all providers. It is interesting to note as seen in Table 3 that these non-eligible households start with higher internet penetration than the eligible households with children but have smaller increases in penetration over the four-year period. A possible reason for the higher starting adoption levels could be that they do not have school-age children, which allows them to spend resources differently than do households with school-age children.

Table 3 shows the simple comparison of difference in means when households in all census blocks of the observation have access to the provider. It shows that in Comcast territory the eligible population increased home broadband adoption by ten percentage points, while the increase among the same population in non-Comcast territory in our sample increased by 5.7 percentage points. The difference in changes across providers is small for the presence of a laptop or desktop and use of the internet for a job search. However, use of the internet for taking a course or job training increased among the eligible population by five percentage points from 2011 - 2015 while it decreased in other companies' territories.

15 We use the triple difference, which looks at changes over time, across territory, and between eligible and non-eligible populations as a robustness check. Using the non-eligible population difference in penetration could help factor out relative changes in service quality across territories.

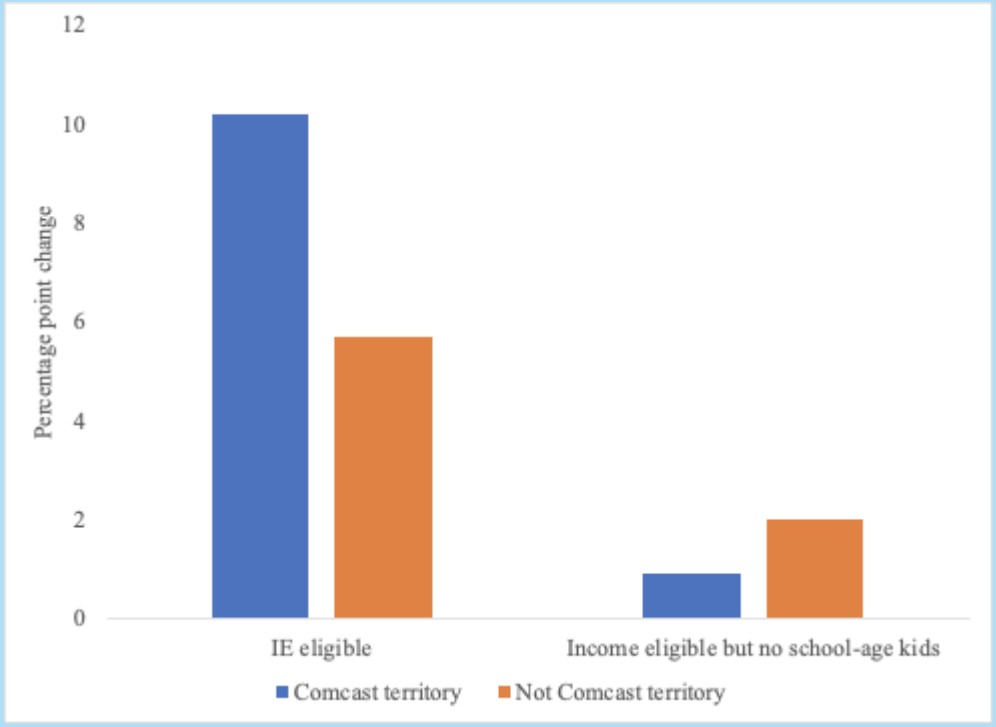
Table 3: Outcome Measures Among Households Income Eligible for IE
100 Percent of Population in Census Blocks with Access to Provider

	IE Eligible			Eligible by income, but no school-age kids		
	Comcast (n = 1,437)	**Not Comcast** (n = 2,063)	**Difference p-value**	**Comcast** (n = 15,687)	**Not Comcast** (n = 16,902)	**Difference p-value**
Internet at Home						
2011	0.638	0.625	0.65	0.725	0.700	0.002**
2015	0.740	0.682	0.030**	0.734	0.720	0.13
Difference	0.102	0.057	0.24	0.009	0.02	0.29
Laptop						
2011	0.497	0.488	0.80	0.623	0.604	0.076*
2015	0.517	0.500	0.50	0.579	0.561	0.054*
Difference	0.020	0.012	0.82	-0.044	-0.043	0.96
Desktop						
2011	0.650	0.595	0.12	0.622	0.624	0.90
2015	0.380	0.344	0.22	0.457	0.437	0.04*
Difference	-0.279	-0.251	0.68	-0.165	-0.187	0.14
Job Search						
2011	0.476	0.457	0.75	0.346	0.327	0.13
2015	0.371	0.301	0.32	0.264	0.237	0.024**
Difference	-0.105	-0.156	0.60	-0.082	-0.09	0.65
Took Class/Job Training						
2011	0.160	0.192	0.47	0.248	0.219	0.011**
2015	0.210	0.188	0.71	0.222	0.179	0.000***
Difference	0.050	-0.004	0.46	-0.025	-0.04	0.36

*** p<0.01; ** p<0.05; * p<0.10

The first set of bars to the left in Figure 3 below shows graphically that the simple differences reveal a larger increase in the adoption rate for the eligible population (red bars) in Comcast territory between 2011 and 2015 than for the territories of the other cable providers.

Figure 3: Change in Share of Households with Internet at Home, 2011-2015 In Comcast and Non-Comcast Territory



These simple comparisons of averages show a larger increase in Comcast territory among the eligible population relative to the other providers (and not among those otherwise eligible except for having kids), suggesting that IE increased adoption among the eligible population. The difference-in-difference comparison of means, however, does not yield statistically significant results, which is not surprising given the lack of any control variables.

The next section tests the question more rigorously through regression analysis that controls for other factors that might affect these indicators. As we shall see, the IE difference-in-difference effect is positive and statistically significant when controlling for other factors.

5. Econometric Analysis

In this section we test econometrically the effects of IE using our household-level data. Specifically, we estimate probit models where the dependent variable is whether the household has internet at home, a laptop, a desktop, or uses the internet to search for jobs or take classes or job training online.

The difference-in-difference specification is as follows:

$$Pr(Y_{it} = 1 \mid X) = \Theta\{(IE_{cpt}) + \gamma_i(2015) + \delta_{it}(IE_{cpt} * 2015) + \beta X_{it} + \varepsilon_{ct}\}$$

Where Θ is the cumulative distribution function of the normal distribution, Y_{it} is whether household *i* has internet at home in year *t* (2011 or 2015), IE_{cpt} is the share of households in county *c* with access to ISP *p* in year *t* who would be eligible for IE; $IE_{cpt} * 2015$ captures the difference in the treatment and control groups prior to the introduction of

CIE in 2011; *2015* is a dummy variable for the second time period, 2015, and captures aggregate factors that may have increased Internet adoption in low-income families with children absent IE; $\boldsymbol{X}_i$ is a vector of household- and region-specific controls including household income, number of people in the household, type of housing unit, metropolitan area fixed effects, and the share of households in county *c* with access to each competing ISP AT&T, Verizon, and Century Link. The estimate of the treatment effect is δ_{it}, which measures the difference in changes in Internet adoption rates for the target population in areas with and without IE (Comcast-served areas and non-Comcast-served areas) between 2011 and 2015.

We show the full regression results in the appendix. Because the coefficients themselves are difficult to interpret, here we instead show the estimated marginal effects of the program based on the probit results (Table 4). Table 4 shows the estimated diff-in-diff effect of IE to be 6.9 percent, with a 90 percent confidence interval of 0.6 percent to 13 percent. In other words, 6.9 percent of the 10.2 percent increase in adoption in the eligible population is due to IE. The statistical significance of the coefficient is the difference between penetration in Comcast territory compared to the other territories. None of the other measures show any statistical significance.

Table 4: Diff-in-Diff Estimate from Probit Regressions

Indicator	**Point Difference**	*90% Confidence Interval*	
Internet at home	0.069*	0.0064	0.13
	(0.070)		
Used internet for Job search	0.034	-0.11	0.17
	(0.69)		
Use internet to take classes for job	0.018	-0.095	0.13
	(0.79)		
Have laptop	0.029	-0.049	0.11
	(0.54)		
Have desktop	-0.013	-0.089	0.063
	(0.77)		
Have tablet	0.078	-0.014	0.170
	(0.17)		

p-values in parentheses.
*** statistically significant at p=0.01 or better
* statistically significant at 0.05 > p <= 0.10

We can use these results to answer several questions of interest: What is the increase in adoption attributable to IE? Similarly, how many of the 500,000 IE connections reported by Comcast are truly new broadband subscribers and how many switched from a competing ISP? How many of the IE subscribers who are truly new subscribed only because of IE? Table 5 shows these calculations. Note that while the table shows the calculations based on point estimates, in the discussion below, we round to the nearest ten thousand in order to avoid the illusion of more precision than our estimates truly provide.

Table 5: Incremental Effects of Internet Essentials

	Number eligible households in Comcast territory*	Share connected	Number connected	90% Confidence Interval (where appropriate)	
2011	2,889,215	63.8%	1,843,319		
2015	3,075,270	74.0%	2,275,700		
Increase in eligible connected households in Comcast territory (2015 - 2011)			432,380		
Number of IE cumulative IE connections in 2015 (Comcast report)			500,000		
Implied number switching to IE from other ISPs (500,000 - 432,380)			67,620		
Number attributable to IE (6.9 percentage points out of 10.2 percentage point increase from 2011 to 2015)			292,493	2,767	432,380**
Trend increase (Total increase in eligible connected - IE)			139,888	429,613	0

* Derived from National Broadband Map data and our estimates of eligibility.
** The upper limit of the 90% confidence interval is a 13% increase, which is larger than the total, 10.2% increase. The upper end of the confidence interval in this case, then, is that IE was responsible for all of the increase.

How many of the IE subscribers in 2015 would not have subscribed without IE?

The number of IE subscribers who subscribed because of IE, rather than switching from another provider or simply because of an overall upward trend in adoption, is given by the following equation:

> "Num households subscribing because of IE =" 0.069/0.102*("num new hhlds with internet")

This calculation shows that IE caused roughly 292,000 households to subscribe to broadband service between 2011 and 2015.

IE reported having connected 500,000 households by the end of 2015. We estimate that internet adoption by eligible households in Comcast territory increased by 10.2 percent between 2011 and 2015, of which 6.9 percent is attributable to IE. The total number of eligible households in Comcast territory connected increased by about 432,000 during that time period. If we take the number of connections as an upper limit on the number of subscribers, our estimates imply that about 68,000 of the 500,000 IE connections switched from another provider. This number decreases with the actual number of IE subscribers, which is unknown outside of Comcast. The share of the increase attributable to IE implies that about 292,000 new households are attributable to IE (or about 60 percent), while the remainder—about 140,000—would have adopted internet because of the overall upward trend.

These point estimates come with two caveats. First, we derive our starting numbers for this exercise—the number of eligible households in Comcast territory—from National Broadband Map. We do that because Comcast does not publish the number of homes, as opposed to the number of homes and businesses, it passes. If the NBM data are flawed, then so, too, are our estimates. Second, the number of IE subscribers at the end of 2015 was surely less than 500,000 given that Comcast reports number of connections but not disconnections.[16]

What is the elasticity of demand for broadband?

One important question for policy is how price sensitive people are for broadband, particularly low-income people. Given the price of IE, our estimates of its effect on adoption, and certain assumptions regarding prices absent IE, we can do a rough calculation of elasticity. We calculate the elasticity under the assumption that the broadband price available in the absence of the program would have been $28 per month, which was the cheapest of the broadband plans in the U.S. in September 2012 surveyed by Teligen and reported by the OECD.[17]

We also assume that all eligible households know about and are able take advantage of IE. If the price were $28 absent IE, then the effective price decrease was $18, or about 64 percent. The increase in adoption attributable to IE was 6.9 percent.

Thus, based on those numbers and assumptions, we estimate a price elasticity of demand of about 0.11 over this four-year period for eligible households who did not yet have internet at home. From Comcast's perspective, eligible households are somewhat more elastic, since Comcast benefits from households who switch from other providers, but policymakers should care about the overall elasticity.

This low revealed elasticity is consistent with experience in trying to get the last groups of people online. As Wallsten (2016) documented, one consistent outcome from a set of FCC experiments was that firms participating in the experiment were only able to sign up only about ten percent of the number expected regardless of how low the price was. Comcast's IE is another piece of evidence that getting the last group of people online is a challenge that extends beyond price.

What is the cost of the program to Comcast?

Comcast increased its subscribers by292,000 new subscribers and 68,000 subscribers from other providers. These customers represent new revenue that would not have accrued to Comcast in the absence of IE. At IE's price of $10 per month, these 360,000 subscribers yield $3.6M per month in revenue.

At the same time, we estimate that about 140,000 eligible households would have subscribed without the program due to increasing adoption trends by that population.

If those households would have paid a standard, but low, subscription price, which we will again assume to be $28, then these households cost Comcast $18, or about $2.5M total, per month compared to what they would have earned from those households.[18]

16 We can make a guess about the rounding as the previous reporting period had rounded the number of connected homes to 425,000. The number of connected is then likely bounded between 500,000 and 525,000 (assuming that Comcast would not "round up" from a number well below 500,000 due to fears of being accuse of overstating). If the total increase in the number of eligible households with internet had exceeded the number of IE subscribers, we would still know that (0.069/0.102) times the total number of new subscribers is attributable to IE, but we would be unable to determine how many of the households switched from another ISP.

17 OECD reports that the cheapest available plan was $27.49, which we round up to $28. OECD Communications Outlook 2013, OECD Publishing. 2013, p. 217.

18 If some or all of the 140,000 customers instead would have paid a more typical rate of $45, then the cost to Comcast would be higher.

As a result, Comcast revenue increased by a net $1.1 million per month, but with the cost of serving an additional 360,000 customers. We do not know the incremental cost of serving these customers nor the cost of implementing the program so cannot determine if the program was profitable or not for Comcast.

The net effect on consumer welfare is also ambiguous. If nothing else changes in response to IE, then consumer welfare increases with the new IE subscribers under the sensible assumption that they value their connection at least as much as they pay. But if Comcast changed the price of other plans because of IE's existence, then the effect on consumer welfare becomes less clear. While new low-income subscribers would still be better off than they were before, it is possible that the IE program could allow Comcast to increase the price of higher-tier plans.[19] In that case, the net effect would depend on the magnitude of the increases and decreases to welfare of the different groups.

Given that most subscribers do not qualify for IE, a small increase in price of non-IE plans could reduce overall consumer welfare even accounting for the gains for the qualifying households. However, presumably some or even most of this price discrimination ability already existed as Comcast and other cable internet service providers offered more than a single broadband service package. As a result, if producers had already segmented the market with, for example the $28 plan and a $45 plan, they would be less likely to increase the $45 plan in response to the new found ability to prevent some customers from gaining access to the $10 plan, especially since the $10 plan would likely mirror the $28 plan rather than the $45 plan. However, it could then raise the price of the $28 plan if some of the customers were planning to go to the $10 plan.

Additionally, as we noted earlier, other providers began to offer similar programs in the years following IE's launch. The various incentives those programs offer where they overlap with Comcast would affect switching behavior and Comcast's ability to attract new adopters. If Comcast expected other firms to match its low-income pricing programs, then it would not expect to gain customers from its rivals and it would not have all of the new subscribers. As a result, it might have less incentive to reduce prices. As a result, the effects we observed through 2015 for Comcast's profitability specifically may not hold going forward. However, these additional programs may increase the adoption of broadband by low-income households. In addition, the competition not only for low-income households, but competition for general broadband subscribers could also affect the price for the more standard broadband packages and affect the general welfare.

As a result, we find that there were gains for qualifying low-income households who signed up for IE. For the 290,000 who would not have subscribed without the program, the gains are between $0 and $18 per month or a total between zero and $62 million per year. For the 68,000 who switched from another provider, it is unclear how much benefit to attribute. For the 140,000 who would have subscribed in the absence of IE, the gain is a pure transfer from Comcast of at least $18 per month or a total of $30 million per year. Overall, the gain for IE subscribers is between $30 million and $100 million per year.

19 See Deneckere and McAfee (1996) for a discussion of this type of effect.

6. Discussion and Conclusion

The use of a private subsidy program for broadband internet access increased adoption among low-income households. However, even in a program that explicitly targeted consumers on the margin, much of the subsidy went to eligible households that would have, or already did, in the case of those who switched from another ISP, subscribed to internet service in the absence of the program.

As Ackerberg et al (2010) show, low-income households can have more elastic demand for telecommunications services. By providing an incentive for Comcast to price discriminate and charge a lower price to eligible households, the government conditions increased broadband penetration, despite a relatively inelastic demand, and transferred millions of dollars to other low-income households that would have paid the higher retail price.

Since 2015, other broadband providers have started to offer similar programs. We expect large benefits to eligible households in other geographic areas, both from increased adoption and more from lower prices. When competing firms in the same geographic areas offer similar programs, it is less clear how much benefit will accrue to customers as opposed to the second firm minimizing the business stealing effect. Empirical research may be able to shed light on the answer to this question.

Another area that remains to be investigated is the benefit from societal concerns such as the effectiveness of broadband in increasing civic engagement, education, health, and leveling access to resources and opportunity.

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Appendix: Regression Results and Tables

Internet at Home

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
In Comcast territory	-0.071	0.076	-0.930	0.354	-0.220	0.079
2015	0.098	0.065	1.500	0.132	-0.030	0.225
(Comcast Territory)*2015	***0.206***	***0.112***	***1.830***	***0.067***	***-0.014***	***0.426***
Race and Hispanic/Latino Ethnicity						
Black	-0.446	0.136	-3.280	0.001	-0.712	-0.179
Other	-0.361	0.177	-2.040	0.041	-0.707	-0.014
White	-0.355	0.131	-2.710	0.007	-0.613	-0.098
Hispanic	-0.440	0.062	-7.140	0.000	-0.561	-0.319
Income						
$5,000 TO 7,499	0.119	0.143	0.830	0.408	-0.163	0.400
$7,500 TO 9,999	0.077	0.148	0.520	0.602	-0.213	0.368
$10,000 TO 12,499	0.069	0.132	0.520	0.600	-0.190	0.329
$12,500 TO 14,999	0.137	0.139	0.990	0.323	-0.135	0.410
$15,000 TO 19,999	0.417	0.120	3.470	0.001	0.181	0.653
$20,000 TO 24,999	0.298	0.115	2.600	0.009	0.073	0.523
$25,000 TO 29,999	0.497	0.118	4.200	0.000	0.265	0.728
$30,000 TO 34,999	0.598	0.124	4.820	0.000	0.355	0.840
$35,000 TO 39,999	0.548	0.124	4.410	0.000	0.305	0.791
$40,000 TO 49,999	0.546	0.157	3.480	0.000	0.239	0.854
$50,000 TO 59,999	0.954	0.240	3.970	0.000	0.483	1.424
$60,000 TO 74,999	1.123	0.449	2.500	0.012	0.242	2.003
Size of metro area						
Nonmetropolitan	-0.323	0.184	-1.750	0.080	-0.684	0.039
100,000 - 249,999	0.098	0.102	0.970	0.334	-0.101	0.298
250,000 - 499,999	0.055	0.110	0.500	0.616	-0.161	0.271
500,000 - 999,999	-0.226	0.083	-2.720	0.007	-0.390	-0.063
1,000,000 - 2,499,999	-0.085	0.083	-1.030	0.302	-0.247	0.077
2,500,000 - 4,999,999	0.024	0.078	0.310	0.756	-0.129	0.177
Type of housing unit (house/apt/flat excl. cat.)						
Mobile home or trailer w no perm additions	-0.189	0.121	-1.560	0.118	-0.426	0.048
Mobile home or trailer w 1 or more perm rooms added	-0.217	0.370	-0.590	0.557	-0.942	0.507
Other	0.035	0.826	0.040	0.966	-1.583	1.654
Constant	0.629	0.152	4.140	0.000	0.332	0.927

Margins and contrast

	df	chi2	P>chi2
_at	1	3.29	0.0697

	Contrast	Delta-method Std. Err.	[95% Conf. Interval]	
_at (1 vs 2)	.0685137	.0377753	-.0055246	.142552

Laptops

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
In Comcast territory	-0.050	0.096	-0.510	0.607	-0.238	0.139
2015	0.032	0.072	0.440	0.657	-0.109	0.173
(Comcast Territory)*2015	***0.075***	***0.123***	***0.610***	***0.539***	***-0.165***	***0.316***
Race and Hispanic/Latino Ethnicity						
Black	-0.490	0.133	-3.690	0.000	-0.750	-0.230
Other	-0.461	0.176	-2.620	0.009	-0.805	-0.116
White	-0.280	0.126	-2.210	0.027	-0.527	-0.032
Hispanic	-0.328	0.067	-4.890	0.000	-0.459	-0.196
Income						
$5,000 TO 7,499	-0.227	0.165	-1.370	0.169	-0.550	0.097
$7,500 TO 9,999	-0.118	0.177	-0.670	0.503	-0.464	0.228
$10,000 TO 12,499	-0.153	0.154	-0.990	0.321	-0.454	0.149
$12,500 TO 14,999	-0.086	0.158	-0.540	0.587	-0.396	0.224
$15,000 TO 19,999	0.041	0.135	0.310	0.759	-0.223	0.306
$20,000 TO 24,999	0.073	0.130	0.560	0.575	-0.182	0.328
$25,000 TO 29,999	0.255	0.131	1.950	0.051	-0.001	0.512
$30,000 TO 34,999	0.261	0.134	1.950	0.051	-0.001	0.523
$35,000 TO 39,999	0.133	0.136	0.980	0.329	-0.134	0.400
$40,000 TO 49,999	0.153	0.160	0.950	0.340	-0.161	0.467
$50,000 TO 59,999	0.306	0.209	1.470	0.143	-0.103	0.715
$60,000 TO 74,999	1.177	0.417	2.820	0.005	0.358	1.995
Size of metro area						
Nonmetropolitan	0.088	0.206	0.430	0.671	-0.317	0.492
100,000 - 249,999	0.019	0.110	0.170	0.862	-0.197	0.235
250,000 - 499,999	0.155	0.125	1.240	0.214	-0.090	0.400
500,000 - 999,999	-0.007	0.091	-0.080	0.936	-0.186	0.171
1,000,000 - 2,499,999	0.021	0.089	0.240	0.812	-0.153	0.195
2,500,000 - 4,999,999	0.105	0.084	1.250	0.210	-0.059	0.269
Type of housing unit (house/apt/flat excl. cat.)						
Mobile home or trailer w no perm additions	-0.038	0.142	-0.270	0.787	-0.316	0.239
Mobile home or trailer w 1 or more perm rooms added	-0.398	0.361	-1.100	0.271	-1.106	0.310
Other	0.386	0.785	0.490	0.623	-1.153	1.924
Constant	0.312	0.161	1.930	0.053	-0.004	0.628

Margins and contrast

	df	chi2	P>chi2
_at	1	0.38	0.5385

	Contrast	Delta-method Std. Err.	[95% Conf. Interval]	
_at (1 vs 2)	.0290467	.0472276	-.0635177	.1216112

Desktops

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
In Comcast territory	0.105	0.098	1.060	0.287	-0.088	0.297
2015	-0.679	0.073	-9.260	0.000	-0.823	-0.535
(Comcast Territory)*2015	***-0.036***	***0.125***	***-0.290***	***0.770***	***-0.281***	***0.208***
Race and Hispanic/Latino Ethnicity						
Black	-0.161	0.132	-1.210	0.225	-0.420	0.099
Other	-0.145	0.179	-0.810	0.418	-0.495	0.206
White	-0.095	0.125	-0.760	0.447	-0.341	0.150
Hispanic	-0.289	0.069	-4.200	0.000	-0.424	-0.154
Income						
$5,000 TO 7,499	0.237	0.167	1.410	0.157	-0.091	0.565
$ 7,500 TO 9,999	-0.172	0.186	-0.920	0.355	-0.535	0.192
$10,000 TO 12,499	0.111	0.152	0.730	0.464	-0.187	0.410
$12,500 TO 14,999	0.081	0.155	0.520	0.602	-0.223	0.384
$15,000 TO 19,999	0.092	0.137	0.670	0.502	-0.177	0.361
$ 20,000 TO 24,999	0.021	0.130	0.160	0.873	-0.235	0.276
$25,000 TO 29,999	0.305	0.133	2.300	0.021	0.045	0.565
$30,000 TO 34,999	0.196	0.134	1.470	0.141	-0.065	0.458
$35,000 TO 39,999	0.315	0.138	2.280	0.023	0.044	0.585
$40,000 TO 49,999	0.357	0.162	2.200	0.027	0.040	0.674
$50,000 TO 59,999	0.639	0.218	2.920	0.003	0.211	1.067
$60,000 TO 74,999	1.145	0.458	2.500	0.012	0.248	2.043
$75,000 TO 99,999	1.122	0.780	1.440	0.150	-0.407	2.651
Size of Metro Area						
Nonmetropolitan	-0.609	0.215	-2.830	0.005	-1.031	-0.188
100,000 - 249,999	-0.272	0.111	-2.450	0.014	-0.490	-0.054
250,000 - 499,999	-0.152	0.130	-1.170	0.242	-0.406	0.102
500,000 - 999,999	-0.183	0.092	-1.980	0.047	-0.363	-0.002
1,000,000 - 2,499,999	-0.275	0.090	-3.040	0.002	-0.453	-0.098
2,500,000 - 4,999,999	-0.225	0.085	-2.630	0.008	-0.393	-0.058
Type of housing unit (house/apt/flat excl. cat.)						
Mobile home or trailer w no perm additions	0.129	0.141	0.910	0.362	-0.148	0.405
Mobile home or trailer w 1 or more perm rooms added	0.034	0.397	0.090	0.932	-0.745	0.813
Constant	0.484	0.162	2.990	0.003	0.167	0.801

Margins and contrast

	df	chi2	P>chi2
_at	1	0.08	0.7708

	Contrast	Delta-method Std. Err.	[95% Conf. Interval]	
_at (1 vs 2)	-.0134579	.0461865	-.1039818	.077066

Tablets

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
In Comcast territory	-0.269	0.169	-1.590	0.111	-0.600	0.062
2015	1.284	0.110	11.690	0.000	1.068	1.499
(Comcast Territory)*2015	***0.242***	***0.184***	***1.310***	***0.190***	***-0.120***	***0.603***
Race and Hispanic/Latino Ethnicity						
Black	-0.260	0.158	-1.650	0.099	-0.569	0.049
Other	0.179	0.203	0.880	0.378	-0.219	0.577
White	0.047	0.146	0.320	0.749	-0.240	0.334
Hispanic	-0.343	0.081	-4.240	0.000	-0.502	-0.185
Income						
$5,000 TO 7,499	0.016	0.214	0.080	0.939	-0.402	0.435
$7,500 TO 9,999	0.091	0.223	0.410	0.682	-0.346	0.529
$10,000 TO 12,499	-0.281	0.203	-1.390	0.165	-0.678	0.116
$12,500 TO 14,999	-0.031	0.200	-0.160	0.876	-0.422	0.360
$15,000 TO 19,999	-0.092	0.170	-0.540	0.588	-0.426	0.242
$20,000 TO 24,999	0.085	0.161	0.530	0.597	-0.231	0.401
$25,000 TO 29,999	0.117	0.163	0.720	0.474	-0.203	0.437
$30,000 TO 34,999	0.048	0.162	0.290	0.769	-0.270	0.365
$35,000 TO 39,999	-0.036	0.171	-0.210	0.834	-0.371	0.299
$40,000 TO 49,999	0.010	0.196	0.050	0.958	-0.375	0.395
$50,000 TO 59,999	0.199	0.239	0.830	0.405	-0.270	0.669
$60,000 TO 74,999	-0.348	0.428	-0.810	0.416	-1.187	0.491
$75,000 TO 99,999	1.990	0.670	2.970	0.003	0.677	3.302
Size of Metro Area						
Nonmetropolitan	-0.239	0.298	-0.800	0.423	-0.824	0.346
100,000 - 249,999	0.140	0.131	1.070	0.284	-0.116	0.396
250,000 - 499,999	0.314	0.146	2.160	0.031	0.029	0.600
500,000 - 999,999	-0.052	0.108	-0.480	0.632	-0.264	0.161
1,000,000 - 2,499,999	0.076	0.107	0.720	0.474	-0.133	0.285
2,500,000 - 4,999,999	-0.129	0.102	-1.260	0.207	-0.330	0.071
Type of housing unit (house/apt/flat excl. cat.)						
Mobile home or trailer w no perm additions	-0.050	0.167	-0.300	0.763	-0.377	0.277
Mobile home or trailer w 1 or more perm rooms added	0.451	0.376	1.200	0.230	-0.286	1.187
Constant	-1.606	0.213	-7.520	0.000	-2.024	-1.188

Margins and contrast

	df	chi2	P>chi2
_at	1	1.93	0.1651

	Contrast	Delta-method Std. Err.	[95% Conf. Interval]	
_at (1 vs 2)	.0779985	.0561873	-.0321266	.1881236

Used Internet to Search for Job

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
In Comcast territory	-0.023	0.160	-0.140	0.888	-0.337	0.291
2015	-0.370	0.150	-2.470	0.014	-0.665	-0.076
(Comcast Territory)*2015	***0.097***	***0.244***	***0.400***	***0.691***	***-0.381***	***0.574***
Race and Hispanic/Latino Ethnicity						
Black	0.220	0.251	0.880	0.380	-0.272	0.712
Other	0.191	0.330	0.580	0.562	-0.455	0.838
White	0.021	0.244	0.080	0.933	-0.457	0.498
Hispanic	-0.167	0.133	-1.260	0.209	-0.428	0.094
Income						
$5,000 TO 7,499	0.005	0.318	0.010	0.988	-0.619	0.628
$7,500 TO 9,999	-0.353	0.305	-1.160	0.247	-0.950	0.244
$10,000 TO 12,499	-0.146	0.297	-0.490	0.624	-0.728	0.437
$12,500 TO 14,999	-0.238	0.273	-0.870	0.385	-0.774	0.298
$15,000 TO 19,999	-0.191	0.240	-0.790	0.427	-0.661	0.280
$20,000 TO 24,999	-0.239	0.237	-1.010	0.312	-0.703	0.224
$25,000 TO 29,999	0.002	0.245	0.010	0.993	-0.477	0.482
$30,000 TO 34,999	-0.226	0.253	-0.890	0.372	-0.722	0.270
$35,000 TO 39,999	-0.296	0.253	-1.170	0.243	-0.792	0.201
$40,000 TO 49,999	-0.016	0.377	-0.040	0.965	-0.755	0.723
$50,000 TO 59,999	-0.869	0.520	-1.670	0.095	-1.889	0.151
$60,000 TO 74,999	-0.031	0.800	-0.040	0.969	-1.600	1.538
Size of metro area						
Nonmetropolitan	0.464	0.423	1.100	0.273	-0.365	1.293
100,000 - 249,999	0.125	0.224	0.560	0.578	-0.314	0.563
250,000 - 499,999	0.431	0.230	1.870	0.061	-0.021	0.882
500,000 - 999,999	0.224	0.179	1.250	0.210	-0.127	0.575
1,000,000 - 2,499,999	0.389	0.180	2.160	0.031	0.036	0.741
2,500,000 - 4,999,999	0.512	0.176	2.910	0.004	0.167	0.857
Type of housing unit (house/apt/flat excl. cat.)						
Mobile home or trailer w no perm additions	0.055	0.303	0.180	0.855	-0.539	0.650
Constant	-0.191	0.280	-0.680	0.495	-0.739	0.358

Margins and contrast

	df	chi2	P>chi2
_at	1	0.16	0.6889

	Contrast	Delta-method Std. Err.	[95% Conf. Interval]	
_at (1 vs 2)	.0339827	.0848898	-.1323982	.2003636

Used Internet to Take Course for Job

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
In Comcast territory	-0.109	0.188	-0.580	0.563	-0.477	0.260
2015	0.054	0.162	0.330	0.741	-0.264	0.371
(Comcast Territory)*2015	***0.072***	***0.273***	***0.260***	***0.791***	***-0.462***	***0.607***
Race and Hispanic/Latino Ethnicity						
Black	0.360	0.278	1.290	0.195	-0.185	0.905
Other	0.445	0.385	1.160	0.248	-0.310	1.200
White	0.185	0.273	0.680	0.496	-0.349	0.720
Hispanic	0.188	0.147	1.280	0.200	-0.099	0.476
Income						
$5,000 TO 7,499	0.109	0.349	0.310	0.756	-0.575	0.792
$ 7,500 TO 9,999	-0.361	0.335	-1.080	0.282	-1.018	0.297
$10,000 TO 12,499	-0.098	0.319	-0.310	0.759	-0.722	0.527
$12,500 TO 14,999	-0.360	0.325	-1.110	0.267	-0.997	0.276
$15,000 TO 19,999	-0.303	0.282	-1.070	0.283	-0.855	0.250
$ 20,000 TO 24,999	-0.197	0.274	-0.720	0.472	-0.734	0.340
$25,000 TO 29,999	-0.083	0.275	-0.300	0.762	-0.623	0.456
$30,000 TO 34,999	-0.571	0.303	-1.890	0.059	-1.165	0.022
$35,000 TO 39,999	-0.024	0.290	-0.080	0.935	-0.591	0.544
$40,000 TO 49,999	-0.180	0.398	-0.450	0.650	-0.960	0.599
$50,000 TO 59,999	0.157	0.545	0.290	0.773	-0.910	1.224
Size of metro area						
Nonmetropolitan	-0.150	0.511	-0.290	0.769	-1.151	0.851
100,000 - 249,999	-0.053	0.265	-0.200	0.842	-0.572	0.466
250,000 - 499,999	0.199	0.264	0.750	0.451	-0.318	0.716
500,000 - 999,999	0.025	0.209	0.120	0.904	-0.385	0.435
1,000,000 - 2,499,999	0.078	0.197	0.400	0.691	-0.307	0.463
2,500,000 - 4,999,999	0.121	0.201	0.600	0.546	-0.273	0.515
Type of housing unit (house/apt/flat excl. cat.)						
Mobile home or trailer w no perm additions	-0.736	0.473	-1.560	0.120	-1.663	0.191
Mobile home or trailer w 1 or more perm rooms added	0.171	0.673	0.250	0.799	-1.148	1.490
Constant	1.042	0.324	-3.220	0.001	-1.677	-0.407

Margins and contrast

	df	chi2	P>chi2
_at	1	0.07	0.7894

	Contrast	Delta-method Std. Err.	[95% Conf. Interval]	
_at (1 vs 2)	.0184234	.0689859	-.1167865	.1536333