

RECENT TECH ADOPTION TRENDS AND IMPLICATIONS
FOR THE DIGITAL DIVIDE

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Introduction

In recent years, there have been two developments in technology adoption that are in tension with one another. On the one hand, home broadband adoption has increased only modestly since 2009. On the other, there has been a very rapid increase the adoption of Smartphones. This development presents questions for policymakers and stakeholders interested in the digital divide, namely: Does the leveling off of home broadband adoption and accompanying growth in Smartphone adoption represent a substitution effect? That is, are those without broadband at home simply turning to Smartphones instead? If so, though users may be acquiring Smartphones instead of home broadband service, how do usage patterns compare for Smartphone-only users versus those with home broadband connections? Do those who have only Smartphone access to the internet do as much online as home broadband users? Are Smartphone-only users equally as confident as home broadband users in their ability to find information online?

Understanding the answers to these questions will be important to policymakers and those in the private sector interested in closing technology access gaps. The Federal Communications Commission has recently announced the Connect to Compete (C2) initiative, a public-private collaboration designed to provide low-cost home computers and broadband connections to qualified low-income people. The FCC is also exploring reforming the Lifeline/Link-Up program to provide support for broadband service to qualifying low-income households. In both cases, knowing whether Smartphones are substituting for home broadband connection – or how Smartphones impact overall usage patterns – is important to program design.

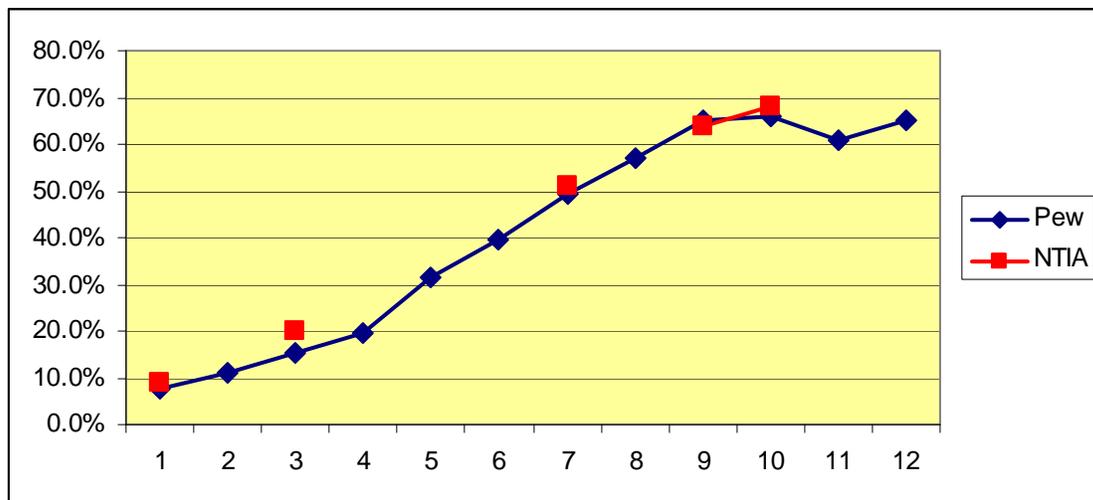
To address the questions identified above, this paper will rely on data drawn from a statewide telephone survey of Illinois residents fielded in February-March of 2012. The sample size of the survey is 3,500 respondents, which will permit analysis of these questions across demographic and geographic characteristics of respondents, which will be of interest to policymakers and other stakeholders. The survey explored in detail the following issues: How do people get online (e.g., home broadband, tablets, Smartphones)? What online activities they do (e.g., information searches, shopping, educational uses)? How do they view the usefulness of different access means for carrying out tasks online?

Background: Home Broadband Adoption Slows as Smartphones Take Off

Since 2009, home broadband adoption – a benchmark that policymakers have rightly focused on in the National Broadband Plan and in other contexts – has not changed very much. The FCC’s survey of Americans in the fall of 2009 found that 65% of Americans had broadband at home. Similarly, a February 2012 survey by the Pew Research Center’s Internet & American Life Project found that 65% of Americans have broadband at home. The National Telecommunications & Information Administration pegged home broadband adoption at 68% as of the fall of 2011. The picture is clear: Since 2009 there has not been much change in the percentage of Americans with broadband at home. The chart below shows how broadband adoption has leveled off since 2009.

Figure 1

Share of adults with broadband at home – 2001 to 2012



Several reasons are behind this plateau in broadband adoption. First, the last third of the population without broadband has all the characteristics associated with not adopting information technology. This group is older, less educated, and poorer. As the NTIA’s 2011 survey shows, just 43% of low-income (households with annual incomes below \$25,000) Americans have broadband at home and 46% of those without a high school degree have broadband, compared with the 68% average.

Second, the economic recession has contributed to the stalling of broadband adoption. A 2009 Pew survey found that 9% of Internet users said the recession had led them to cut back or cancel Internet access service during the previous 12 months – a figure that rose to 16% for low-income Americans (those whose household incomes are \$30,000 or less). Analyst Craig Moffett has pointed out how stagnating incomes – particularly for middle and lower income Americans – mean the days of consumers spending more and more on ICTs may be over. For the bottom two income quintiles of households (a number whose size corresponds roughly to the one-third of non-adopting broadband households), real incomes have been falling over the last five years. As Moffett notes, there is “virtually no headroom after paying for food, shelter, transportation, and healthcare” to buy home broadband or Smartphone service.¹

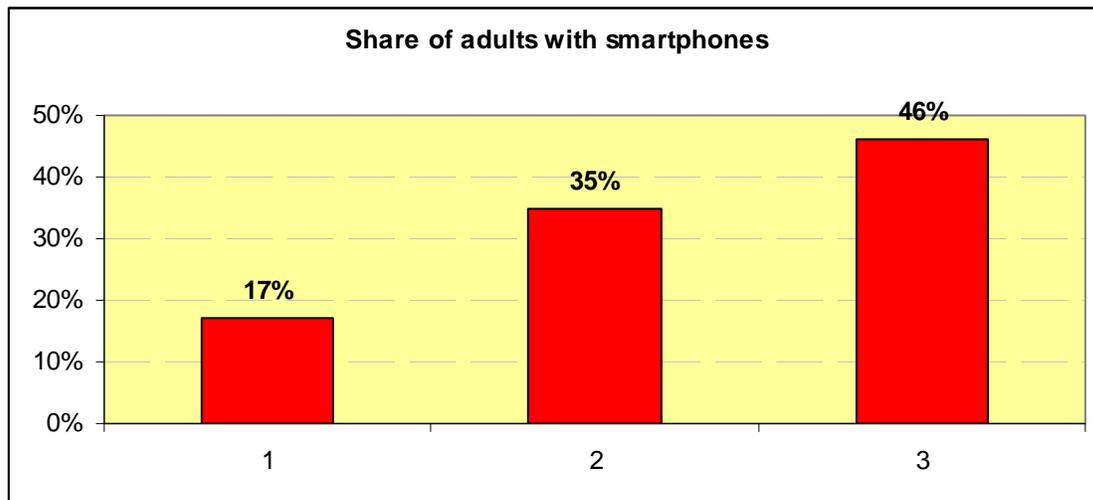
There are historical examples of bad economic times putting the breaks on tech adoption. During the Great Depression, the upward path of telephone adoption actually reversed, falling from 42% in 1929 to 31% in 1934. Electricity use at home leveled off at about 67% during the Great Depression before resuming its climb.

While home broadband adoption has stalled, the story for Smartphones has been very different. A survey by the Pew Research Center’s Internet & American Life Project found that nearly half (46%) of adult Americans by February 2012 had Smartphones (up from 17% in late 2009 and 35% in April 2011).² This adoption rate is stunning. It took roughly 9 years for 50% of Americans to subscribe to broadband at home. If we date the beginning of the Smartphone era to the release of the iPhone in mid-2007, Smartphones will hit the halfway mark in only 5 years. To take another point of comparison, home broadband adoption grew from 37% to 47% in two years’ time (2005 to 2007), while Smartphones have traveled that path in just 10 months.

¹ Craig Moffett, “When the Money Runs Out.” Bernstein Research, May 27, 2011, p. 2.

² Aaron Smith, “Nearly half of American adults are Smartphone owners.” Pew Research Center’s Internet & American Life Project, March 1, 2012. <http://www.pewinternet.org/Reports/2012/SmartphoneUpdate-2012.aspx>. " 2009 Smartphone usage figure of 17% comes from Cody Barbierri, Smartphone usage continues to grow in US, according to Forrester Research. Demo Beat, <http://demo.venturebeat.com/2010/01/05/smartphone-usage-continues-to-grow-in-us-according-to-forrester-research>.

Figure 2



The data from Illinois used for the analysis in this paper aligns with the national survey the Pew conducted. The February to April 2012 survey finds that 46% of Illinois residents surveyed were Smartphone users.

Thinking about Smartphone and Broadband Adoption

There could be another reason broadband adoption has hit a plateau. Intuitively, you might believe that people without a home broadband connection are choosing Smartphone Internet access.

This turns out not to be true. For the most part, people who have a Smartphone are adding to their portfolio of access tools. According to Pew's February 2012 survey, 83% of those with Smartphone also have broadband at home – about the same share recorded in April 2011, when 82% of Smartphone users said they had broadband at home. Put differently, in February 2012 just 23% of non-broadband users had a Smartphone, a somewhat higher figure than that registered in April 2011, when 16% said this.

These patterns suggest, in the context of slightly rising broadband adoption (in the Pew surveys, home broadband adoption was 61% of all adults in 2011 and 65% in 2012), that only a small increment of Smartphone adoption comes from people who use a Smartphone as their main means of online access. To be sure, if one were to add

“Smartphone only” users to broadband users, the overall figure from broadband adoption would rise from 65% to 73%, using Pew’s February 2012 numbers. However, although this 8 percentage point difference is notable, its significance is quite limited. Because carriers are instituting caps on the amount of data people may consume on a monthly basis, the Smartphone has limited utility as a means of sole online access. Additionally, the vast majority of Smartphones run on 3G networks, where speeds are a fraction of those available over wireline networks and highly variable depending on location and network congestion.

For Illinois, the story for Smartphone and home broadband adoption is much the same. The Illinois survey shows that 68% have broadband at home (tracking closely what the NTIA found for the state of Illinois in October 2010; the NTIA survey found that 68% of Illinois households had broadband at home). If “Smartphone only” adoption is added to the home broadband figures, 74% of those surveyed in Illinois have access either via home broadband or a Smartphone. Put differently, among non-home broadband users in Illinois, 21% have Smartphones.

Broadband, Smartphones, and Online Usage Patterns

1. Access

The rapid growth of Smartphone adoption has fed optimism that these devices may help close the digital divide. This is because groups that have traditionally trailed in home broadband adoption – such as African Americans and Hispanics – have quickly taken to Smartphones. In the Pew Internet Project’s 2012 national survey, 46% of all Americans had a Smartphone; for African Americans and Hispanics, that figure was 49% and for whites it was 45%. For Illinois, the difference is even more pronounced. Although 46% of all Illinois respondents have Smartphones, 52% of African Americans have one and 60% of Hispanics do.

From the perspective of access, Smartphones certainly do help close the digital divide. In Illinois, 56% of both Hispanics and African Americans report having broadband at home, meaning that Hispanics are slightly more likely to have a Smartphone than a home broadband subscription. The “access gain” due to Smartphones among African Americans and Hispanics is quite substantial. Adding home broadband to “Smartphone only” users means that 70% of African Americans have online access and 74% of

Hispanics do, according to the Illinois data. In Pew's national sample for February 2012, the figures are as follows:

- 51% of African Americans have a home broadband subscription and 66% have either home broadband or Smartphone access.
- 45% of Hispanics have a home broadband subscription and 64% have either home broadband or Smartphone access.
- 65% of all Americans have a home broadband subscription and 73% have either home broadband or Smartphone access.

In both the national and Illinois sample, the "access gain" due to Smartphone is about 15 percentage points for African Americans and close to 20 percentage points for Hispanics.

2. Usage

Smartphones allow people to go online with a wireless handheld device, so if people have such a device, without having a broadband subscription at home, it is unquestionably the case that Smartphones help close the access divide. However, Smartphones may or may not be as useful in carrying out online activities as traditional desktop or laptop computers. As noted above, most Smartphones have 3G access speeds, which are not as fast as home wireline connections and do not always run at advertised speeds (due to geography or user distance from towers). Data caps may also impact behavior. And, as Gerry Smith recently documented in a story at the Huffington Post, the limits of Smartphone only access are sometimes evident when users try to use the devices for homework or to fill out applications for financial aid or employment.³

The remainder of this paper examines this question empirically using data from Illinois that asks internet users – no matter what kind of access devices they use to go online – about the kinds of activities they do on the internet.

Online Use and Access Tools

³ Gerry Smith, "Smartphones Bring Hope, Frustration As Substitute For Computer." June 6, 2012. Available online at: http://www.huffingtonpost.com/2012/05/25/smartphones-digital-divide_n_1546899.html.

The analysis to follow relies on a survey of 3,506 residents of Illinois conducted by Princeton Survey Research Associates International from February 23 to April 24, 2012. The survey was conducted in English and Spanish, and it also included cell phones in the sampling frame. Some 54% of respondents were contacted on their cell phones and 46% on landlines; 30% of respondents said their household used a cell phone *only* for telephone service. The survey was commissioned by the Partnership for Connected Illinois (PCI), which is a non-profit organization that is the designated “state broadband initiative” to manage data collection for the National Broadband Map and other broadband initiatives.

The survey specifically focused on areas not in the greater Chicago area. That is because other survey work is available on broadband access in Chicago and because PCI was interested in robust geographical data on the downstate area in Illinois. Thus, the data is not a random sample of all of Illinois. As noted, though, the results are very consistent with other surveys on broadband and Smartphone access; overall broadband adoption in this survey is at 68%, which matches what the NTIA found for Illinois at the end of 2010. The Smartphone penetration figures for the PCI survey is similar to a national survey conducted by Pew in early 2012 (and tablet computing adoption figures for the Pew and PCI surveys are about the same).

The PCI questionnaire asked respondents standard demographic questions, and also questions about technology use and online behaviors. The survey asked people if they had broadband access at home and whether they had different access devices, such as a laptop or desktop computer, a cell phone (with follow-up questions to determine if the cell phone is a Smartphone), an e-reader (i.e., Kindle or Nook), or a tablet computer (e.g., an iPad). The survey also asked about different online activities respondents may have done.

Table 1

	% of all respondents who are ...	% of Whites	% of African Americans	% of Hispanics
All home broadband users	68%	69%	56%	56%
All Smartphone users	46	44	52	60
All Tablet users	19	19	18	18
Broadband <i>and</i> Smartphone users	39	38	37	42
Broadband-at-home <i>only</i> users	26	27	17	13
Broadband <i>and</i> Smartphone <i>and</i> Tablet users	14	13	14	14
Smartphone <i>only</i> users	7	6	15	18
Number of cases	3,506	3,108	178	170

Table 1 shows survey findings in general categories, such as the share of respondents with broadband at home, a Smartphone, and a tablet computer. Because worries about the digital divide tend to break along racial lines, those figures are reported as well. The table also shows the share of all respondents who have different configurations of access assets of interest. With a focus of this research on whether Smartphones substitute for home broadband access, the 7% of all respondents with “Smartphone only” access are of interest. For comparative purposes, so are those with both broadband *and* Smartphones, those with broadband service only, and (though perhaps to a lesser extent), the 14% of respondents with tablet computers in addition to a Smartphone and home broadband access.

It is also worth examining the demographic profiles of three groups: home broadband users, Smartphone users, and “Smartphone only” users. Table 2 below shows that broadband users are somewhat younger, wealthier, better educated, and whiter than the population at large among downstate Illinois residents. Smartphone users are younger than broadband users, generally, and about as well-off economically as broadband users. Noticeable differences emerge by racial classification, as Smartphone users are more likely to be African American or Hispanic.

The “Smartphone only” group is just 7% of the general population and is qualitatively different from the other groups. The group is twice as likely as the general Smartphone population to be African American or Hispanic, and is two-and-one-half times the general

Smartphone population to be low-income – defined here as a household whose income is below \$20,000 annually. The “Smartphone only” group has a lower level of education and is more likely to live in a rural part of Illinois.

Table 2

Demographic & socio-economic overview of respondents by access categories				
	All surveyed	Home Broadband Users	Smartphone Users	Smartphone Only Users
Male	49%	50%	52%	53%
Female	50	50	48	47
Parents with minor children at home	33	36	41	39
Ages 18-24	12	14	19	26
25-34	16	18	24	29
35-44	18	20	23	16
45-64	36	38	30	23
65+	16	10	5	6
Average Age	47	44	39	37
White (not Hispanic)	84	86	81	71
Black (not Hispanic)	8	6	9	17
Hispanic (English or Spanish speaking)	8	6	10	20
Less than high school	10	5	6	21
High school grad	28	22	24	31
Some college	32	35	34	32
College +	30	38	37	16
Household income				
Under \$20K	17	11	12	31
\$20K-\$30K	11	8	7	10
\$30K-\$40K	8	7	7	11
\$40K-\$50K	7	8	7	6
\$50K-\$75K	12	14	12	12
\$75K-\$100K	13	17	16	8
Over \$100K	16	21	25	5
Don't know/refused	16	14	14	17
Geography				
Urban	22	23	24	22
Suburban	49	52	52	40
Rural	18	15	14	23
Unclassified	12	10	10	15
Number of cases	3,506	2,622	1,158	225

Source: Partnership for Connected Illinois Survey, February-April 2012.

Table 3 below lists the online activities the survey queried and shows frequencies depending on the kinds of access assets respondents have. More is clearly better when it comes to access points and scope of online activities. The relatively elite set of respondents (14%) who have tablet computers, broadband at home, *and* a Smartphone do the most online. At the other end of the spectrum, those whose only form of online access is a Smartphone do, on average, one less online activity than Smartphone and home broadband users.

Table 3

	All home broadband users	Broadband and Smartphone and Tablet users	Broadband <i>and</i> Smartphone users	Broadband-at-home <i>only</i> users	Smartphone <i>only</i> users
Email	98%	100%	99%	96%	90%
Participate in social networks like Facebook or Linked In	82	89	89	74	82
Research consumer goods and services	87	94	91	84	71
Job search or look for employment opportunities	65	70	73	55	65
Research for education, training or school work	76	87	84	66	73
Search for medical or health-related information	86	91	88	84	70
Buy goods and services online	83	92	86	81	52
Average number of activities (out of 7)	5.8	6.2	6.1	5.4	5.0
Number of cases	2,232	378	1,158	999	225

As the preceding discussion of the demographic and socio-economic status of various groups indicates, there are substantial differences in the make up of those who are home broadband users and those whose only online access is through a Smartphone. Relative to home broadband users, “Smartphone only” users are younger, have lower levels of educational attainment, lower incomes, and are more likely to be African American or Hispanic. These factors – and not just access means – might explain differences in online usage patterns. In other words, a young Hispanic person might simply be less interested than an older white home broadband user in searching for health information online. That lower level of interest may explain the different likelihoods of looking for such information, not the means by which the two groups go online.

To disentangle these different effects, this paper employs regression analysis, which examines whether access means is linked to observed differences in the scope of online activities or other factors. A simple ordinary least squares model was specified that framed the number of online activities engaged in (on a linear scale of 1 to 7) as a function of various demographic factors (age, gender, parents with minor children at home, level of education), economic ones (household income), and access means (broadband only at home, broadband and a Smartphone, Smartphone only, and other gadgets such as tablet computers and e-readers). The model was run for all internet users in the sample (79%, which includes not just home broadband users, but dial-up users, Smartphone only users, and those who use the internet someplace other than home).

The model finds that there is no correlation between having Smartphone access as one's only online access tool and doing more online activities. Unsurprisingly, having broadband at home *only* has a positive and significant association with doing more online activities and having *both* broadband at home and a Smartphone has the strongest association. It is also worth noting that the model finds no link between race and the number of online activities when controlling for the factors identified above.

Access tools and attitudes about online applications

Not only do respondents with different access tools do a somewhat different configuration of online activities, they also have different attitudes how the internet can impact their lives. The survey asked internet users how the internet can help various parts of their lives, such as saving time, saving money, improving communication with family and friends, improving access to government services, reducing travel time for commuting or visiting others, and making it possible to commute at home. Table 4 below shows the responses for all internet users, broadband users, broadband *and* Smartphone users, Smartphone users, and those with *only* broadband as their sole access device.

Table 4

How important are the following possible benefits of the internet for your household?					
	All internet users	Home broadband users	Home broadband <i>and</i> Smart-phone users	All Smart-phone users	Smart-phone <i>only</i> users
% who said “very important”					
Saving time for day-to-day activities	33%	35%	44%	41%	21%
Saving money, for example through online shopping	27	28	34	33	22
Improving communication with family, friends, colleagues and others	52	54	63	61	50
Improving access to government services	27	27	32	31	30
Reducing travel time, for example for commuting or personal errands	27	28	35	34	26
Making it possible to work from home	35	37	46	44	26
Average number identified as “very important”	2.0	2.1	2.5	2.3	1.3
Number of cases	2,622	2,232	1,158	1,383	225

As with online activities, there are significant differences in how respondents with different access tools view the potential benefits of the internet. Those with both a home broadband connection *and* a Smartphone are much more likely to say the internet is very important to them in the listed areas as Smartphone only users.

A key difference when focusing on attitudes about the internet’s benefits versus online activities has to do with Smartphones. When analyzing online activities, broadband-at-home access and the combination of Smartphone and broadband access are both predictors of doing a wider scope of online activities. By contrast, doing similar regression analysis for attitudes, *only* the combination of having *both* a Smartphone and a home broadband subscription is positively associated with seeing the internet as being very important in the areas queried. The Smartphone, then, turns out to a key ingredient in shaping individuals’ view of the internet’s value.

Discussion

The preceding analysis shows that Smartphones are a strong compliment to online access tools. Those respondents with a Smartphone who also have broadband at home do the widest range of the online activities explored in the Illinois survey. For those who have *only* a Smartphone for accessing the internet, online access is less robust in that these users do fewer things online than broadband or broadband-plus-Smartphone users. The notion reported in the Huffington Post article cited above seems confirmed: the small screen, keyboard, and perhaps connectivity issues make it harder for Smartphone-only users to engage as deeply with the internet as home broadband users.

The Illinois survey offers another reason why Smartphone-only access has limits. The survey asked computer users (those with desktops or laptops) and mobile users how confident there were that they could *easily* find information online.

As Tables 5 and 6 show, respondents have a higher level of confidence in their ability to find information using a desktop or laptop than with a wireless device. The question on wireless was directed to those who have a tablet computer, wireless enabled laptop, or Smartphone. However, there were no significant differences in responses attributable to which device the respondent said he uses most often for wireless access. When looking at “Smartphone only”

Table 5

How confident are you that you can easily find the information you need on the internet using your desktop or laptop computer?			
	All desktop/laptop users	Home broadband users	Broadband and Smartphone users
Very confident	75%	78%	85%
Somewhat confident	21	19	14
Not too confident	3	2	1
Not at all confident	1	1	*
Number of cases	2,440	2,189	1,158

Table 6

How confident are you that you can easily find the information you need on the internet using your wireless device?			
	All users of the internet on a mobile device	Home broadband users	Smartphone only users
Very confident	63%	66%	51%
Somewhat confident	29	28	37
Not too confident	5	4	8
Not at all confident	2	1	3
Number of cases	1,422	1,238	225

Finally, the Illinois survey asked respondents about the barriers people face to having broadband service at home, such as cost of service, the cost of a computer, digital literacy (either they do not feel comfortable using a computer or worry about bad things in the online environment), or lack of relevance (they believe the internet is a waste of time or there is nothing they would like to see online). Table 7 below shows responses for “Smartphone only” respondents and all other non-broadband-at-home respondents.

Table 7

Main reasons cite for not having broadband at home		
	Smartphone only	All other non-broadband users
Cost	40%	37%
Cost sub-categories		
Monthly fee	29%	19%
Can't afford computer	6	13
Digital Literacy	17	18
Relevance	12	15
Number of cases	165	812

What is notable here is that, for Smartphone only users, cost looms larger than for other non-broadband-at-home users – mainly the month fee for broadband service at home. In sum, some cost conscious non-broadband users opt for Smartphones instead, but a consequence of that is a narrower scope of online usage and less confidence in their ability to find information online.

Conclusion

This paper has explored how – and how much – Smartphones close the digital divide. The data show that Smartphones, in a sample of Illinois residents (whose numbers generally track with national samples by the Pew Research Center), contribute modestly to increasing overall access numbers. Some 68% of Illinois residents have broadband service at home. Although overall 46% of Illinois residents have Smartphones, most (79%) of those with Smartphones also have broadband access. This means that some 21% of Smartphone users are “Smartphone only” online users, meaning that the only way they go online (leaving aside access they may have in the workplace) is with a Smartphone. Represented differently, the numbers show that 7% of Illinois residents surveyed are “Smartphone only” internet users.

For demographic groups of interest to many policymakers concerned with the digital divide – African Americans and Hispanics – the numbers are different. These groups have the highest incidence of Smartphone adoption, with 52% of African Americans and 60% of Hispanics with these devices. This translates into 15% of African Americans and 18% of Hispanics in Illinois having Smartphone only access. For these two groups, Smartphone access has a more substantial impact on closing online access gaps, though Smartphones still expand the access pie by less than 20%.

The Illinois survey allowed exploration of two additional questions beyond just Smartphones and their impact on online access.

- How do online activities of Smartphone users compare to internet users who have broadband or combinations of Smartphone and broadband access?
- How do Smartphones (and different access configurations) impact users’ attitudes about the benefits and uses of the internet?

On the first question, the data showed that Smartphones, along with home broadband access, expands access horizons. Respondents with broadband-at-home *and* Smartphones did a significantly wider range of online activities than those only with broadband at home. Both of those two groups also did a wider range of online activities than respondents with *only* Smartphone access. This suggests that Smartphone only access, while unquestionably useful to those for which it is the only access option, opens

to door to the benefits of the internet – just not as widely as it is for those with home broadband access.

With respect to attitudes, the findings there strengthen and deepen the lessons from the look at behaviors. When asked how important broadband is to realizing potential benefits such as saving time, money, working at home, and others, the key differentiator is broadband-at-home access *and* Smartphone access. Those with both access paths were more likely than those with only home broadband access or only Smartphone access to say internet access was “very important” to helping in areas queried. For attitudes, the combination of broadband-at-home and Smartphones was a significant “force multiplier” in thinking about broadband’s benefits – particularly in contrast to those with Smartphone access only.

For policymakers and other stakeholders, these findings suggest they should be cautious about claims that Smartphones are, by themselves, a solution to the digital divide. They play a valuable role for “Smartphone only” users, but examination of behaviors and attitudes of these users demonstrate their limits as a sole means of online access. But, for those wanting to increase overall home broadband access, the findings suggest opportunities. Relief on the price of monthly service might lure “Smartphone only” users to home broadband and thereby open them up to the affordances of broadband. Currently, initiatives aimed at expanding broadband adoption, such as Connect 2 Compete or Comcast’s Internet Essentials program, target families without broadband who have school-age children. This is a laudable target audience, to be sure, but the findings here suggest that expanding price relief to other populations (such as the “Smartphone only” segment) might result in quick adoption gains. Incentive bundling and price discrimination (e.g., low-income Smartphone users qualifying for cut-rate monthly broadband prices) might yield real benefits in terms of broadband adoption and usage.

Smartphones represent a fairly new form of online access. In combination with other access tools, they open up users to the world of the internet. Stakeholders should see Smartphones as an effective allure to deep internet use for consumers, not the solution in isolation.