California Mobile Usage Overview

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This brief report provides an overview of economic outcomes associated with mobile broadband technology as well as mobile subscriber trends in California and its major regions. The first section summarizes existing literature examining mobile broadband technology and related economic benefits primarily at the national level. The second section includes a recap of innovation indicators—federal funding, venture capital investment, and patents—for mobile-related activities in California over the past five years (2005 to 2010). The third section looks specifically at estimated mobile subscriber trends and characteristics in the state's major regions using a short time series (second quarter 2008 to first quarter 2011). Measures including total counts, share of subscribers, and proportion of population are presented for three groups of mobile users—those using voice only services, subscribers with voice and text messaging, and users that take advantage of advanced data applications. The third section also includes a snapshot of advanced data user phone type and device operating systems. In addition to the three main sections, a technical notes section is provided that lists the literature references and describes the data sources and methodologies utilized for the pieces of analysis in the report.

Published Studies

Several studies have established the benefits of broadband to the national economy based not only on how access to or actual use of the technology affects general economic outcomes, but also resulting from investments in technology deployment, consumer and producer surplus, and enhanced innovation and new services. In fact, the literature review included as part of the Qiang, Rossotto, and Kimura (2009) assessment of the economic impacts of broadband, which examines data from a number of both developed and developing countries, concluded that "all of these studies have found that broadband connectivity had positive impacts on job creation, company and community retention, retail sales, and tax revenues" (p. 39). The technology explored as part of the existing literature generally includes a mix of wired, wireless, and mobile access with little work isolating the benefits associated with individual access types. This distinction could prove to be important as subscribers become more exposed to mobile broadband options and begin to utilize this technology to an even greater extent. The few studies that have specifically addressed mobile broadband tend to focus on two key concepts—the potential substitution of mobile for fixed broadband services and the various economic impacts associated with mobile broadband technology.

GSMA's 2009 *Mobile Broadband Survey* demonstrated that mobile broadband technology is seen as an important tool for both consumers and businesses within the world's main industrial regions. The survey reported that workforce mobility is strategically important for companies with a notable share of the workforce being provided access to mobile broadband (pp. 5, 10). This is on top of the direct consumer access to the technology. Wallsten and Mallahan (2010) showed that nearly all of the nation's population lives in a census tract with mobile broadband coverage with many having access to multiple providers, where they found that the number of providers depends on both housing density and income levels (pp.7, 14). With widespread access and increasing importance values, Middleton and Given (2011) suggested that mobile broadband can be viewed as a disruptive technology where residents and businesses begin to see

mobile broadband as a substitute for wired technology even with superior speed and reliability in the next generation of wired broadband networks (pp. 43-44). In examining competition across providers, Wallsten and Mallahan also discussed the concept of competition between wired and mobile broadband where substitution could occur in certain cases. They contended that competitive pressure between wired and mobile broadband options "… will depend on changes in the nature of demand, improvements in wireless technologies, and costs" (2010, p. 9). Andes and Castro (2010) proposed that mobile devices allow users to benefit from some of the same functions as a personal computer or laptop for a reduced cost. Moreover, the authors stated that "mobile broadband can help close the digital divide by increasing access to the Internet for low-income individuals" as a considerably greater share of low-income households solely access the Internet using a mobile device compared to middle- and upper-income households (2010, p. 8). Overall, the literature indicates that the added benefit of mobility, ongoing improvements in network speed, and gains in device functionality enhance the potential substitutability of mobile broadband among households and businesses. The adoption of mobile broadband, reflected in data services, is clearly ramping up accounting for little to none of the wireless industry's revenues in 1999 to around 31 percent in 2010 (CTIA, 2010, p. 124).

In terms of economic benefits, only a handful of studies have specifically analyzed mobile broadband technology in the United States. Entner (2008), in an update to a prior study, found that "… the proliferation of mobile wireless technology and services in the United States, particularly wireless broadband, is having a massive impact on productivity of the entire U.S. economy…" (p. 2). The study focused on six areas where mobile broadband is said to have tangible benefits from reductions in labor costs within various industries including resources and inventory management and documentation; healthcare efficiency enhancements; field service automation; inventory loss reduction; sales force automation; and replacement of desk phones with mobile wireless devices. As a result of the productivity gains and cost savings within these six areas, Entner forecasted a savings of approximately $860 billion between 2005 and 2016 as mobile broadband services and applications become more prevalent (2008, p. 4). This forecast assumed that mobile broadband penetration across business employees will rise from 25 percent to 83 percent in the 10-year period. Cost savings within California alone were estimated at $5 billion in 2006, rising to over $16 billion in 2016 (Entner, 2008, p.14).

In addition to productivity and cost savings, investment in mobile broadband infrastructure has also been shown to generate economic benefits. While grouping first generation mobile broadband technologies in with satellite, Crandall and Singer (2010) estimated average annual investment at $11.6 billion between 2003 and 2009, equating to approximately 168,300 jobs created (p.2). This estimate assumed that the broadband share of all capital expenditures from wireless carriers for both business and residential markets jumped from 20 percent in 2003 to 60 percent in 2009. The benefits associated with upgrades to next generation mobile broadband technologies was pegged at $14.3 billion on an annual average basis in the 2010 to 2015 period with a related job impact of 205,000, assuming that the broadband investment share moves from 64 percent in 2010 to 85 percent in 2015 (Crandall & Singer, 2010, p. 4, 39). With the multiplier effect, the estimated GDP impact increased to an annual average of $40.3 billion over the same time period (2010, p.43). The Crandall and Singer job impact estimates are somewhat higher than those developed by Pollack (2011), who calculated that every $1 billion invested in wireless network infrastructure in a year creates around 12,000 jobs (p. 2). Pollack (2011) also estimated

that a national investment of $8 billion could generate between 8,000 and 14,000 jobs in California over a seven year period. Pearce and Pagano (2009) took a more comprehensive approach in studying the impacts of mobile broadband capital expenditures by estimating the direct effects of expenditures as well as indirect effects in the form of other economic benefits and total employment effects. The indirect effects accounted for "… benefits derived from greater productivity, increased revenue opportunities, a wider variety and easier accessibility of goods and services, improved information, etc…" and are based on parameters from other studies primarily focused on all broadband technology, not just mobile (2009, p. 24). Similarly, the total employment analysis made use of regression analysis from other broadband studies. The authors estimated that a $17.4 billion investment in wireless broadband translates to between $126.3 billion and $184.1 billion of GDP and 4.5 million and 6.3 million jobs over a 24-month period (2009, pp. 11-12). Several studies have also cursorily discussed new innovation empowered by mobile broadband in sectors such as education, healthcare, software, energy, transportation, and retail. For instance, distance education, telemedicine, and smart grid technology are transforming the way consumers interact with education, medical, and energy providers while telecommuting and online shopping have become prevalent practices, all of which could be enhanced through the use of mobile broadband. All in all, the literature shows that mobile broadband has the potential to improve economic outcomes through productivity gains, cost savings, and infrastructure investment, but most studies only examine isolated aspects of the technology or base findings on broadband generally rather than generating new analysis specific to the mobile arena.

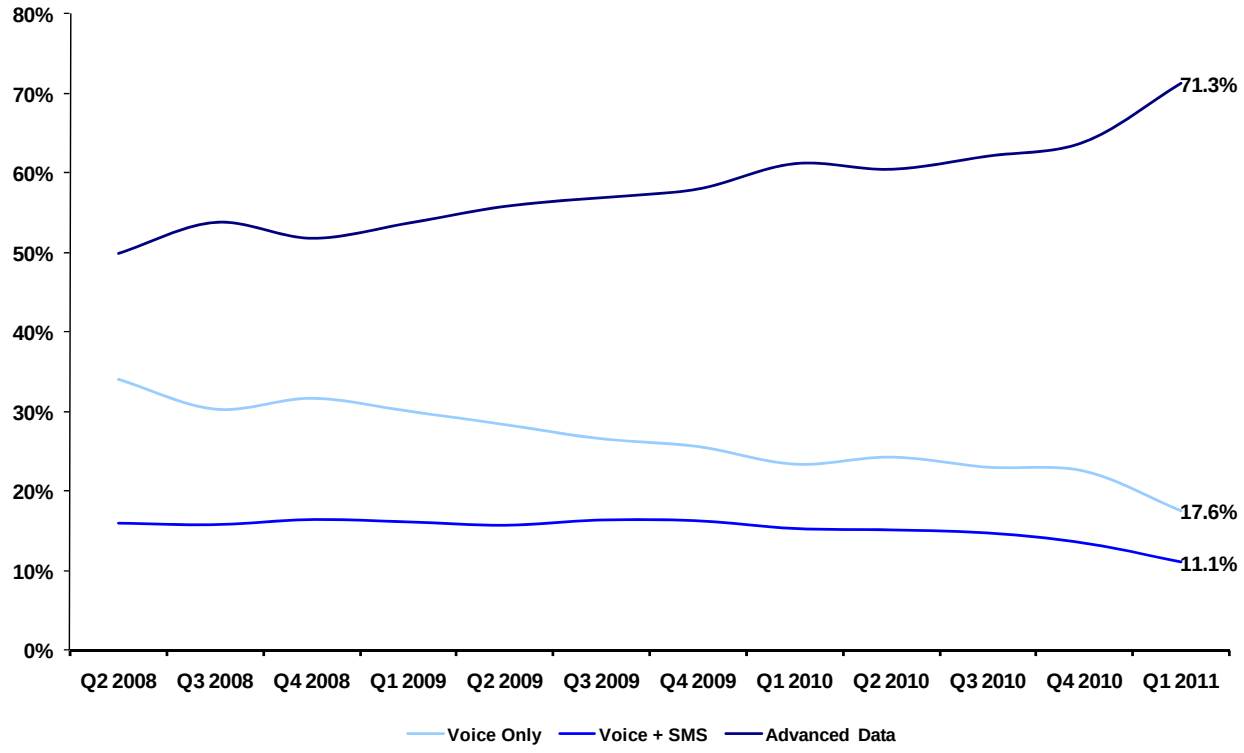
Industry Innovation

Indicators of innovation activity show a few notable outcomes in California over the past few years. Between 2005 and 2010, institutions in the major regions of the state received close to $49.8 million of federal funding for research and other projects related to wireless and mobile devices, networks, and services. Almost all the funding flowed into Los Angeles, Sacramento, San Diego, and the SF Bay Area with small shares also reaching the Bakersfield, Modesto, and Santa Barbara regions. During the same time period, more than $2.2 billion of venture capital investments, representing close to 300 deals, were provided to companies throughout the major regions of the state working on wireless telecommunications and mobile activities. This venture capital flow equates to about 5 percent of all transactions and 4 percent of the total investment amount in the state in the past five years. Around three-quarters of the related venture capital activity took place in the SF Bay Area with the Los Angeles and San Diego regions capturing another 10 percent each and the remainder taking place in Sacramento and Santa Barbara. In addition to federal funding and venture capital investment, over 400 patents were granted in the wireless telecommunications field to individuals and organizations within the major regions of the state between 2005 and 2010—over 70 percent were within the SF Bay Area, a little less than 30 percent granted in the Los Angeles and San Diego regions, and the remainder falling within Santa Barbara and Fresno. This represents less than 1 percent (approximately 0.3 percent) of the total number of patents granted in the state in the past five years

Mobile Subscriber Trends and Characteristics

Seven out of 10 mobile subscribers in the state in the first quarter of 2011 can be considered Advanced Data users (those that utilize devices to access the Internet and for other advanced data applications), a proxy for mobile broadband.[1] Figure 1 shows that this measure has increased in the past few years with around half of subscribers tagged as Advanced Data users in the second quarter of 2008 jumping to over 71 percent by the first quarter of 2011. Over the same time period, Voice Only users dropped from about 34 percent of subscribers in the state to nearly 18 percent. Another subset of subscribers, Voice + SMS users (those that primarily use voice and text messaging services), also declined in the share of all subscribers between the second quarter of 2008 to the first quarter of 2011, falling from about 16 percent to 11 percent.

FIGURE 1 - ESTIMATED STATEWIDE PROPORTION OF MOBILE SUBSCRIBERS

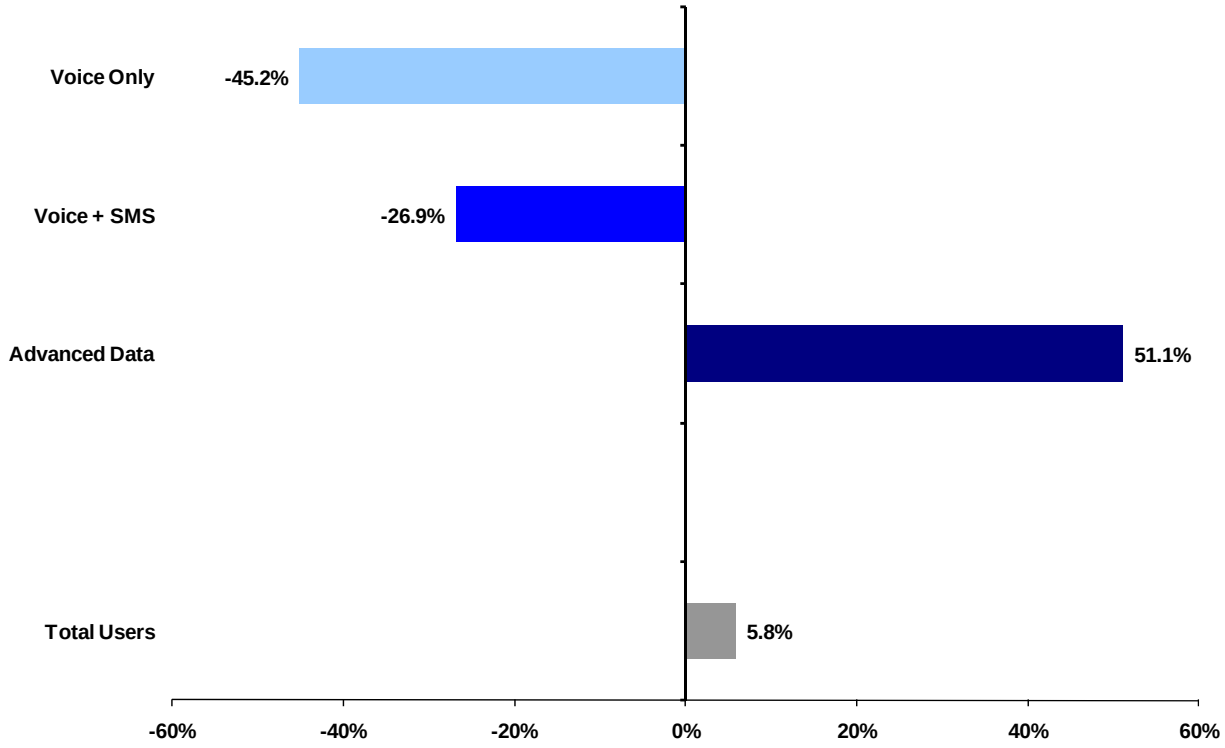


Center for Strategic Economic Research, August 2011
Data Sources: CSER analysis of The Nielsen Company information
Note: Statewide estimates reflects the sum of all measured regions

[1] Note: Statewide numbers based on aggregation of nine study regions.

As shown in Figure 3, the number of mobile subscribers in California grew by nearly 6 percent between the second quarter of 2008 and the first quarter of 2011. Much of this growth has been generated by Advanced Data users with the total number of subscribers in this user group increasing by over 51 percent over the same period (reaching close to 17.6 million). Significant declines were posted in the Voice Only and Voice + SMS user categories with decreases of approximately 45 percent and 27 percent, respectively.

FIGURE 2 - ESTIMATED STATEWIDE USER GROWTH, Q2 2008 TO Q1 2011



Center for Strategic Economic Research, August 2011
Data Sources: CSER analysis of The Nielsen Company information
Note: Statewide estimates reflects the sum of all measured regions

As of the first quarter of 2011, an estimated 83 percent of California's population (age 13 and above) were mobile subscribers. Over half of the population are Advanced Data users, a proportion which increased substantially from an estimated 41 percent in the second quarter of 2008. As mobile subscribers have become more prevalent in the state and many are becoming Advanced Data users, those considered Voice Only and Voice + SMS users have dropped off notably and now only close to 24 percent of the population fit into these user groups. As Figure 4 demonstrates, four regions in the state show a higher share of Advanced Data users among all subscribers than the statewide average including Bakersfield, Fresno, Los Angeles, and Modesto. The first three regions experienced a more pronounced shift in the share of Advanced Data users, leading, in part, to their notable share of users in this category. While nearly all regions saw the share of Voice Only and Voice + SMS users decline, the Modesto region posted a slight uptick in the proportion of Voice + SMS users between the second quarter of 2008 and the first quarter of 2011.

FIGURE 3 - REGIONAL PROPORTION OF MOBILE USERS

	Q1-11			*Shift Q2-08 to Q1-11*		
Region	*Voice Only*	*Voice + SMS*	*Advanced Data*	*Voice Only*	*Voice + SMS*	*Advanced Data*
Bakersfield	16.5%	7.4%	76.1%	-23.7%	-6.4%	30.1%
Fresno	11.7%	10.0%	78.2%	-15.2%	-9.6%	24.8%
Los Angeles	16.4%	10.7%	72.9%	-18.0%	-5.3%	23.3%
Modesto	15.4%	11.9%	72.7%	-16.8%	2.6%	14.3%
Sacramento	17.7%	13.1%	69.2%	-17.6%	-2.3%	20.0%
San Diego	18.1%	12.8%	69.1%	-13.2%	-3.8%	17.0%
Santa Barbara	22.1%	15.7%	62.2%	-16.2%	-1.5%	17.7%
SF Bay Area	20.9%	10.6%	68.5%	-13.9%	-5.7%	19.6%
Stockton	19.3%	12.3%	68.4%	-8.5%	-0.6%	9.0%
Total All Regions	17.6%	11.1%	71.3%	-16.4%	-5.0%	21.4%

Center for Strategic Economic Research, August 2011
Data Sources: CSER analysis of The Nielsen Company information

The Fresno, Modesto, Sacramento, SF Bay Area, and Stockton regions all show a greater share of their population (age 13 and above) as Advanced Data users than the statewide average, as illustrated in Figure 5. Most of the major regions in the state experienced a somewhat more accelerated shift in the proportion of the population classified as Advanced Data users between the second quarter of 2008 and the first quarter of 2011 with only Modesto, San Diego, and the SF Bay Area showing smaller shifts. Although the general statewide pattern has been a downward shift in the share of population listed as Voice Only and Voice + SMS users, four regions posted proportional gains in the Voice + SMS category including Modesto, Sacramento, Santa Barbara, and Stockton.

FIGURE 4 - REGIONAL PROPORTION OF POPULATION (AGE 13 AND ABOVE)

	Q1-11			*Shift Q2-08 to Q1-11*		
Region	*Voice Only*	*Voice + SMS*	*Advanced Data*	*Voice Only*	*Voice + SMS*	*Advanced Data*
Bakersfield	12.8%	5.7%	58.8%	-14.5%	-3.6%	27.6%
Fresno	9.4%	8.0%	62.5%	-11.7%	-7.4%	20.7%
Los Angeles	13.1%	8.6%	58.5%	-14.5%	-4.2%	18.6%
Modesto	13.3%	10.3%	62.6%	-12.8%	2.7%	15.5%
Sacramento	16.4%	12.1%	64.0%	-11.0%	0.2%	25.9%
San Diego	15.5%	10.9%	58.9%	-11.0%	-3.1%	15.0%
Santa Barbara	19.8%	14.1%	55.9%	-6.7%	2.1%	25.0%
SF Bay Area	18.2%	9.3%	59.6%	-12.7%	-5.3%	16.2%
Stockton	17.2%	10.9%	60.9%	-1.4%	2.3%	21.1%
Total All Regions	14.7%	9.2%	59.3%	-13.1%	-3.9%	18.6%

Center for Strategic Economic Research, August 2011
Data Sources: CSER analysis of The Nielsen Company and CA Department of Finance information

Figure 6 shows that the same regions that saw the share of population in the Voice + SMS category increase, counter to the statewide trend, also experienced an increase in the total number of users in this category (Modesto, Sacramento, Santa Barbara, and Stockton). The only regions to post slower growth in the number of Advanced Data users than the statewide average between the second quarter of 2008 and the first quarter of 2011 were Modesto, San Diego, and the SF Bay Area while all other regions posted stronger growth with Bakersfield seeing the number of users in this category more than double over this short time period. Advanced Data use adoption in these areas appears to be catching up to the more established regions, which adopted the technology earlier on.

FIGURE 5 - REGIONAL USER GROWTH

	Q1-11 (in thousands)			*Growth Q2-08 to Q1-11*		
Region	*Voice Only*	*Voice + SMS*	*Advanced Data*	*Voice Only*	*Voice + SMS*	*Advanced Data*
Bakersfield	89	40	410	-50.1%	-35.0%	100.5%
Fresno	87	75	583	-52.6%	-44.6%	59.3%
Los Angeles	2,065	1,350	9,199	-50.5%	-30.4%	52.6%
Modesto	59	45	277	-45.9%	44.2%	41.0%
Sacramento	301	222	1,173	-37.5%	5.8%	75.4%
San Diego	410	290	1,564	-39.6%	-19.5%	38.6%
Santa Barbara	72	51	202	-23.3%	20.8%	85.5%
SF Bay Area	1,170	594	3,831	-39.7%	-34.7%	40.6%
Stockton	99	63	352	-1.1%	36.2%	64.1%
Total All Regions	4,352	2,729	17,591	-45.2%	-26.9%	51.1%

Center for Strategic Economic Research, August 2011
Data Sources: CSER analysis of The Nielsen Company information

Technical Notes

Published Studies—References

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Data Analysis

Innovation indicators were collected via the Decision Data Resources Innovation Economy 360 database. Federal funding was gathered by county and individual project descriptions were

queried using related search terms such as mobile, wireless, and cellular—identified projects were further researched to isolate those applicable for this study. Venture capital investment and patents granted information was collected using a similar approach as the federal funding information with categories limited to mobile, wireless, telecommunications, and internet for venture capital and the major communications category for patents.

Mobile subscriber data was provided directly by The Nielsen Company. These data reflect users age 13 and above based on surveys conducted in the major regions of the state. Both raw survey data and projections of subscriber counts from population estimates were provided by Nielsen as part of the package. As a result of discussions with Nielsen representatives, users were grouped into three mutually exclusive categories as proxies for capacity demand—voice only, voice + SMS, and advanced data. Sample sizes in some of the smaller regions were limited for certain periods introducing potential margins of error, which are not necessarily reflected in the analysis presented in this report. As such, readers should use caution in interpreting the individual results for the smaller markets. Since statewide data were not available, the aggregated regional data set was used as a proxy for the state where the nine regions contain approximately 92 percent of the state's population. The regions included in the Nielsen data set were the basis for the geographies used throughout the report. As referenced in the map on page 2, these regions are defined by the following counties:

- ✓ Bakersfield—Kern County
- ✓ Fresno—Fresno and Madera Counties
- ✓ Los Angeles—Orange, Los Angeles, Riverside, San Bernardino, and Ventura Counties
- ✓ Modesto—Stanislaus County
- ✓ Sacramento—El Dorado, Placer, Sacramento, and Yolo Counties
- ✓ San Diego—San Diego County
- ✓ Santa Barbara—Santa Barbara County
- ✓ SF Bay Area—Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma Counties
- ✓ Stockton—San Joaquin County