THE WIRELESS INDUSTRY: THE ESSENTIAL ENGINE OF US ECONOMIC GROWTH

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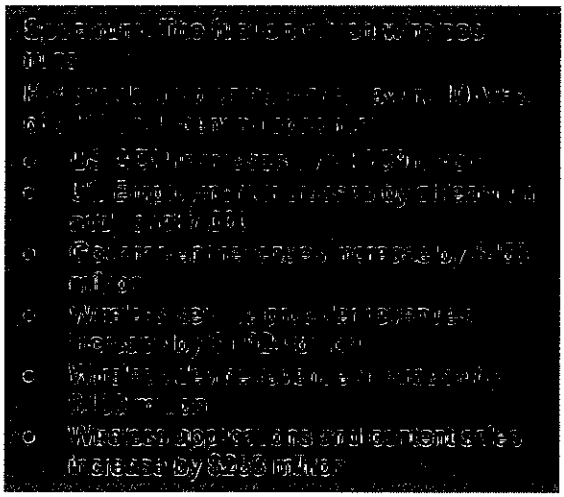
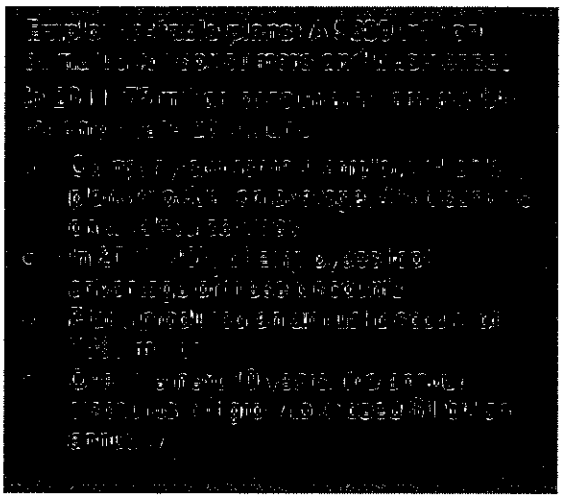
Executive summary

Recon Analytics undertook a comprehensive review of data related to the economic impact of the US wireless broadband industry on the US economy. We have concluded that the impact is broad and deep. In 2011, the economic impact includes the following highlights:

- The US wireless industry is responsible for 3.8 million jobs, directly and indirectly, an increase of more than 200,000 over the past six years; this accounts for 2.6% of all US employment.
- The wireless industry retained $146.2 billion in GDP in the US (and generated $195.5 billion in economic activity globally) in the 12 months from July 2010 to June 2011.[1]
- At $195.5 billion, the wireless broadband industry would rank as the 46th largest economy in the world, as measured by GDP.[2]
- The wireless industry is now larger than the publishing, agriculture, hotels and lodging, air transportation, motion picture and recording, and motor vehicle manufacturing industry segments and rivals the computer systems design services and oil and gas extraction industries.[3]
- The wireless industry and its direct and indirect employees paid $88.6 billion in taxes, including federal, state and local fees and taxes.[4]
- The consumer surplus, the difference between what end users are willing to pay and what they have to pay for services, was $502.7 billion in 2010.[5]
- According to Kantar Media, telecom has been the second largest advertising category in the United States for the last several years running and has two of the four largest advertisers in the country.
- The EU wireless penetration continues to outpace the US, with the EU reaching 126.2% at the end of 2009 and the US reaching 102.4% penetration in June 2011.
- After accounting for the higher EU subscriber penetration rates, the level of outbound and inbound minutes of use in the US is more than double the level seen in the EU (875 minutes versus 418 minutes).
- Average prices per minute of use in the US ($0.049 per minute) are a quarter of the EU price level ($0.167 per minute).





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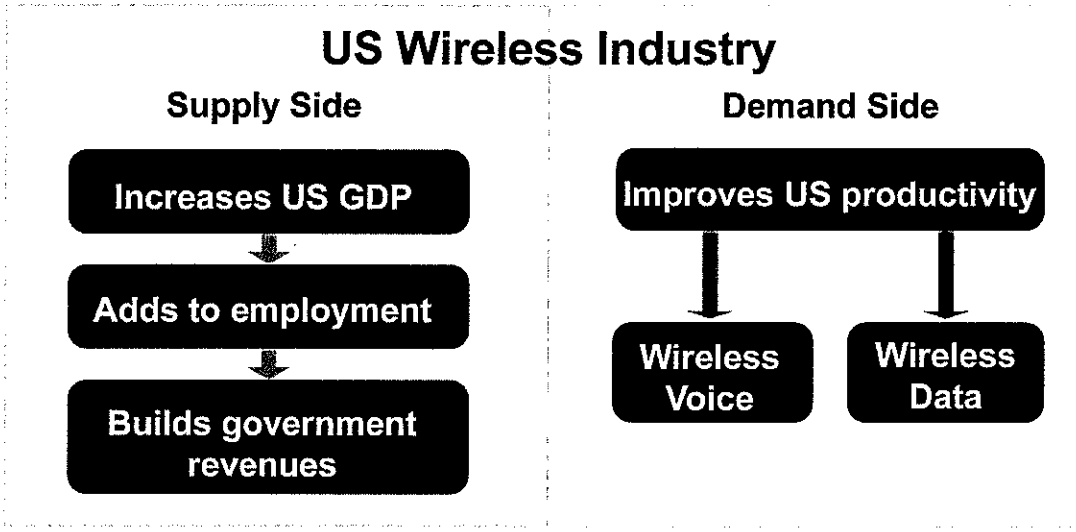
OVERVIEW

Recon Analytics undertook this in-depth report to determine the extent of the economic impact the wireless industry has on the US economy. We ran an independent analysis based on numerous sources, including data that covered wireless carriers, wireless handset and equipment manufacturers and the overall wireless broadband industry. In addition, we applied our own analysis to the data we collected.

There are two sides to the wireless industry—the supply side and the demand side. On the supply side, the wireless industry is responsible for increasing US GDP, employment and government revenues. On the demand side, the wireless industry improves the productivity of US businesses through wireless voice and data services.

Exhibit 1: How the Wireless Industry Impacts the US Economy in 2011



Source: Recon Analytics, 2011

We analyzed the economic impact of both the demand and supply sides and confirmed that in 2011, the US wireless industry:

- Had a broad economic impact in the US, contributing $146.2 billion to the US GDP
- Supported more than 3.8 million jobs in the US, including many jobs that earned a substantial amount more than average jobs in the US
- Contributed, through employees, employers and end users, $88.6 billion in income taxes, sales taxes and fees to the US and state governments
- Accounted for $33 billion in productivity improvements for US businesses in nine categories; over the next 10 years, these efficiency gains will grow to a total of more than $1.4 trillion
- Generated more than $164 billion in operator service revenues and spent approximately $26.8 billion in capital expenditures for the full year 2011[6]

The power of an additional 500 MHz of additional spectrum

Spectrum fuels the wireless industry and the impact of spectrum can have a deep economic benefit. The current administration has promised to make 500MHz of spectrum available over the next 10 years.

Such an infusion of spectrum will supercharge economy. Using the calculations we outlined in the Executive Summary, it is clear that this new spectrum would translate into:

- A $166 billion increase in US GDP
- At least 350,000 new US jobs
- An additional $23.4 billion in government revenues
- A $96.2 billion increase in wireless service provider revenues
- A $22 billion increase in wireless device revenues
- A $13.1 billion increase in wireless applications and content sales

1. THE SUPPLY-SIDE IMPACTS OF THE US WIRELESS INDUSTRY

Mapping out the value

To get a true picture of the impact the wireless industry has on the US economy, it's instructive to map it all out.

Using publicly available information, we investigated every component of the US wireless industry value chain, how much of the value of each component is kept in the US, and what the resulting retained value is. The picture that emerges is one that underscores the broad and deep impact the industry has on the US economy.

This report has been authored on behalf of CTIA. The author of this report wrote two similar reports for CTIA in 2005 and 2008. Compared to those two reports, we see a growing industry that has added 200,000 employees, paid hundreds of billions of dollars in taxes and fees to the US and state governments, and built a completely new applications market from nothing to $10 billion dollars in less than five years.

Wireless industry value chain

Growth, expansion, innovation

The value chain for the wireless industry has grown significantly since 2008.

At $146.2 billion[7], the industry's retained value in the US (i.e., the revenue, wages and profit that remain in the US) is a large and vital engine for the country's economy. An additional $49.3 billion was generated by operations outside the United States, for a total of $195.5 billion in economic activity.

We have divided the value chain into sixteen segments:

- Device and Accessories Manufacturers
- Device Component Suppliers
- Wireless Operators
- Advertising Agencies, PR, and Related
- TV, Radio, Print, Internet Ad Channels
- Network Equipment Suppliers
- Other Suppliers of Capital Equipment
- Professional Services
- Wireline Operators
- Platform and Component Suppliers
- Mobile Advertising Networks
- Content
- Application and Content Stores
- App Developers
- Retailers and Third Party Dealers
- MVNOs

The segments vary in size, but each one plays an important role in retaining value.

Wireless Operators alone retain $51.8 billion of the value they generate in the US. Professional Services providers retain $25.6 billion, Device and Accessories Manufacturers retain $15.3 billion, and Wireline Operators, mainly by providing backhaul, retain $0.8 billion.

Creating value from zero to $10 billion in 4 years

Fostering an entirely new business sector

Few industries have changed as much as wireless. And no industry has created so much where nothing existed a few short years ago. The wireless industry has fostered the creation of an entirely new business sector—the app sector. The old market research joke is that every market is forecast to be a $1 billion market in 5 years.

The app sector shows that some markets can grow to $10 billion in 4 years. With $8.2 billion coming from end users, $500 million from carriers, $2 billion from mobile advertising, and discounting the $100 million for transport of e-books, there are few, if any, markets that have prospered so well, so quickly.

In many ways, this market was unforeseen even a few years ago. Back then, a mobile device was used for calls and (maybe) texting. Now users have their devices (which are essentially very mobile computers) with them all the time. And while calling remains an important component of the mobile device, it has been joined by texting, listening to music, watching movies, playing games, using apps, navigation, taking photos, and shooting videos. For the average end consumer, the word "boredom" is barely a concern—if they have their mobile device with them, all is well.

Business usage explodes

Everyone in business needs to be connected. It's not just senior executives who need mobile devices anymore. The mobile revolution has enabled Americans to be connected to their work information practically everywhere and at any time. The productivity increases have also been staggering because of the increase in device and network capabilities that allow data and computation-intensive tasks to be completed in the palm of an employee's hand. With empowered employees, industries as varied as Agriculture, Professional Services, and Healthcare, and large and small businesses alike have all been able to take advantage of these productivity increases. We discuss this in detail later in this paper.

One other movement that has affected the wireless industry is the consumerization of IT. Not long ago, the most advanced technology was found inside the walls of the world's largest companies. As a result, IT organizations within these companies almost always gave their employees better wireless devices than consumers generally had access to. Now that situation has flipped. Consumers regularly carry the most advanced wireless devices well before a corporate IT department has authorized them for internal use. So users are storming the IT castle demanding to use their favorite consumer devices for work purposes—and IT is, in many cases, scrambling to keep up.

Exhibit 2: Wireless Industry Value Retained

Sector	Global Economic Activity	Value Retained in the US
Device and Accessories Manufacturers	$21.9 billion	$15.3 billion
Device Component Suppliers	$27.5 billion	$8.3 billion
Wireless Operators	$53.7 billion	$51.8 billion
Advertising Agencies, PR, and Related	$0.6 billion	$0.6 billion
TV, Radio, Print, Internet Ad Channels	$5.4 billion	$5.4 billion
Other suppliers of capital equipment	$14.4 billion	$8.6 billion
Professional Services	$32.0 billion	$25.6 billion
Network Equipment Suppliers	$6.2 billion	$1.9 billion
Wireline Operators	$0.8 billion	$0.8 billion
Platform and Component Suppliers	$10.2 billion	$6.1 billion
Mobile Advertising Networks	$0.5 billion	$0.5 billion
Content	$4.9 billion	$4.4 billion
Application and Content Stores	$2.8 billion	$2.8 billion
App Developers	$2.4 billion	$2.2 billion
Retailers & Third Party Dealers	$10.8 billion	$10.8 billion
MVNO	$1.4 billion	$1.1 billion
Total	$195.5 billion	$146.2 billion

Source: US Bureau of Economic Analysis, Recon Analytics analysis, 2011

Economic activity (in the center column in Exhibit 2) is a global figure that represents the sum of all economic value from US consumers in the form of sales of wireless products and services in the United States. The retained value figures (the right-hand column in Exhibit 2) represent economic activity that stays in the US (i.e., wages, profits, taxes, etc.).

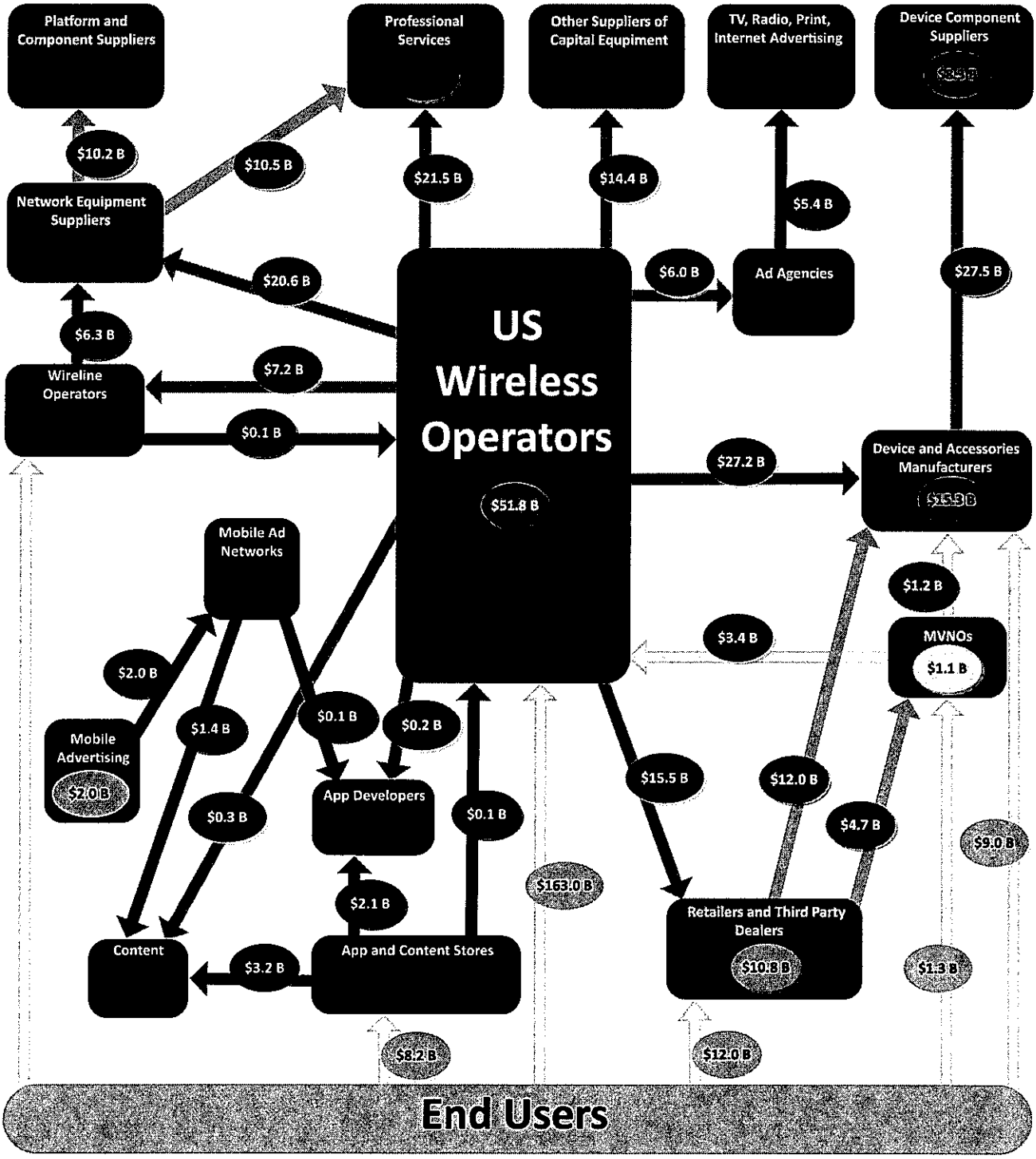
A picture is worth a thousand words (or $146.2 billion or $195.5 billion)

A vibrant, growing marketplace

We have translated the numbers from the table in Exhibit 2 into a visual representation that shows the impact of the wireless industry on the US economy (see Exhibit 3 for the domestic components of the value chain and Exhibit 4 for the global components of the value chain). A comparison with the previous value chain models we have created shows just how the wireless industry has changed. The value chain used to be about simple transactions, capital and service. An end user would buy a device, pay the reseller, dealer or operator and the value flowed fairly simply from there—to handset suppliers, support providers, wireline carriers and network equipment providers.

While those components remain strong, the value chain now includes components that it didn't have just a few short years ago. On page 10, between Exhibits 3 and 4, we review what the two value chain pictures share in common—the value that flows from point to point.

Exhibit 3
Domestic Components of the US Wireless Value Chain in Q3 2010 to Q2 2011



Source: Publicly available data, Recon Analytics analysis, 2011

What the two pictures have in common

The value flows just the same

Although the value retained varies slightly in some cases between the domestic components and the global components we outline in Exhibits 3 and 4, the value that flows between the points doesn't. To get a better understanding of those flows, let's walk through the value chain to see precisely what flows from and to each player in the wireless industry.

Starting in the center, let's examine how US Wireless Operators spread value. The $7.2 billion that Wireless Operators spend for wireline services includes not only payments for backhaul but also a myriad of other services that include, for example, the mobile carriers' interoffice networks. They include payments for connecting mobile switching networks, providing the synchronization of call record databases and other databases to a wide range of organizations that comprise telecom providers, cable providers, electric utilities, railroads and other organizations that provide private fiber or microwave transport networks and associated services. Wireless Operators are small recipients of call termination fees ($0.1 billion) from Wireline Operators. Wireline Operators then spend $6.3 billion with Network Equipment Suppliers to fulfill the demands of the Wireless Operators.

The US Wireless Operators also spend $20.6 billion with Network Equipment Suppliers on non-IT CAPEX (i.e., excluding all spend on equipment ranging from servers farms to laptops) such as network equipment. In turn, Network Equipment Suppliers spend $10.2 billion with Platform and Component Suppliers on the various components that make up the equipment they sell to the Wireless Operators and an additional $10.5 billion on Professional Services.

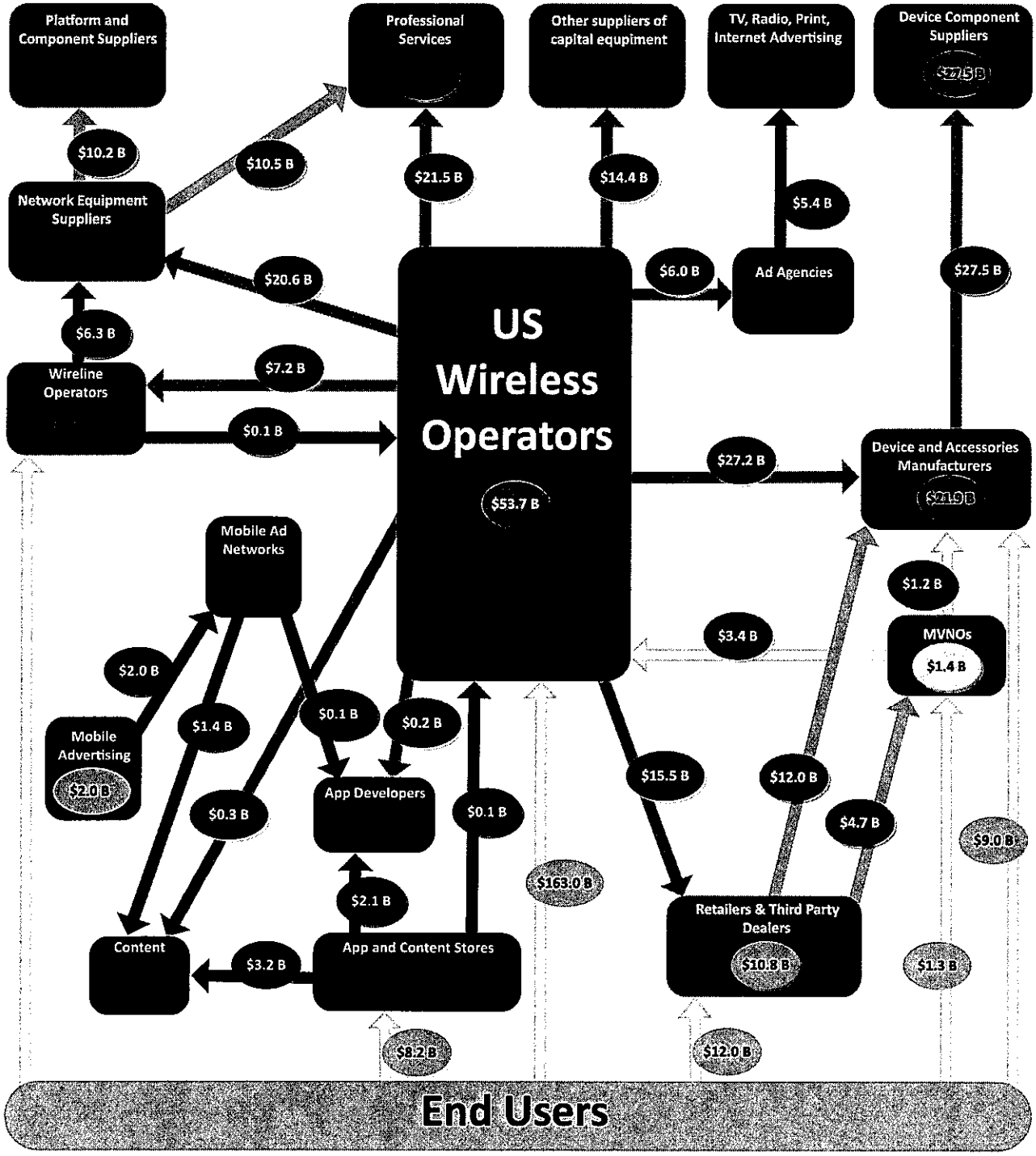
Wireless Operators also spend on Professional Services, in this case $21.5 billion for a variety of needs. Moving to the right on the value chain, Wireless Operators spend $14.4 billion with Other Suppliers of Capital Equipment for needs as diverse as laptops for employees to cell towers. Wireless Operators are prodigious advertisers and marketers, so they spend $6.0 billion, filtered through advertisers, which retain $0.6 billion and pass on $5.4 billion in the form of TV, Radio, Print, and Internet Advertising. Device and Accessories Manufacturers receive $27.2 billion from US Wireless operators in the form of direct payments and then spend $27.5 billion (they're not losing money here; they gain other value from other players we describe a bit later on this page) with the Device Component Suppliers for the parts that make up their devices.

Other outflows from Wireless Operators include $15.5 billion in commissions and revenue sharing to Retailers and Third Party Dealers, which then spend $12.0 billion with Device and Accessories Manufacturers and $4.7 billion with MVNOs (which then pay $3.4 billion with Wireless Operators and $1.2 billion with Device and Accessories Manufacturers). In addition, Wireless Operators paid $0.2 billion to app developers for basic apps that run on feature phones that usually get distributed through carrier-operated application stores. You need look no further than here for proof that smart phones—and the app market they have engendered—has grown at an astounding rate: The old carrier-owned application stores are dwarfed by the $8.2 billion smartphone app market. One more outflow for the Wireless Operators is the $0.3 billion it spends for sponsorships of content (such as major leagues sports, etc.).

Now let's look at the money End Users pump into the value chain, as well as the burgeoning app and advertising ecosystems. To start, End Users pay Wireless Operators $163.0 billion directly. They also pay $12.0 billion to Retailers and Third Party Dealers, an additional $1.3 billion to MVNOs, and $9.0 billion directly to Device and Accessories Manufacturers. End Users also spend $8.2 billion with Application and Content Stores, which then spend $3.2 billion on content, $2.1 billion with App developers and $0.1 billion directly to Wireless Operators.

Finally, Mobile Advertising pumps $2 billion into the value chain via Mobile Ad Networks, which then spend $1.4 billion on Content and $0.1 billion with App Developers.

Exhibit 4
Global Components of the US Wireless Value Chain in Q3 2010 to Q2 2011



Source: Publicly available data, Recon Analytics analysis, 2011

What the value chain numbers mean

An industry not resting on its laurels

A look at the retained value in Exhibit 3 shows a value chain that now includes Application and Content Stores ($2.8 billion), Content ($4.4 billion), App Developers ($2.2 billion), Mobile Advertising Networks ($0.5 billion), and Mobile Advertising ($2.0 billion), For the first time, we have also explicitly broken out revenue for ad agencies ($0.6 billion) and TV, Radio, Print and Internet advertising ($5.4 billion) because of the significance of the wireless industry to the advertising world.

According to Kantar Media, telecom has been the second largest advertising category in the United States for the last several years running and has two of the four largest advertisers in the country. In previous studies, the advertising efforts of wireless companies were a component of the professional services category.

Add that to Device and Accessories Manufacturers ($15.3 billion), Device Component Suppliers ($8.3 billion), Wireless Operators ($51.8 billion), Other Suppliers of Capital Equipment ($8.6 billion), Professional Services ($25.6 billion), Network Equipment Suppliers ($1.9 billion), Wireline Operators ($0.8 billion), Platform and Component Suppliers ($6.1 billion), Retailers and Third Party dealers ($10.8 billion), and MVNOs ($1.1 billion) and you get a picture of an industry that is robust and thriving.

In an era when many industries have been laid low by the economy, the wireless industry has thrived because it has focused on finding new ways to help consumers.

Not satisfied with providing great voice services, the industry branched out into providing convenient, easy to use text services. The utility of text is obvious, and end users have embraced it wholeheartedly. But the industry hasn't rested on its laurels.

Pushing functionality

The wireless industry has pushed functionality of devices beyond where anyone thought they could go. It has included apps that engage the user and provide valuable services. In short, the industry is no longer in the phone business. It's in the business of providing what consumers need at their fingertips.

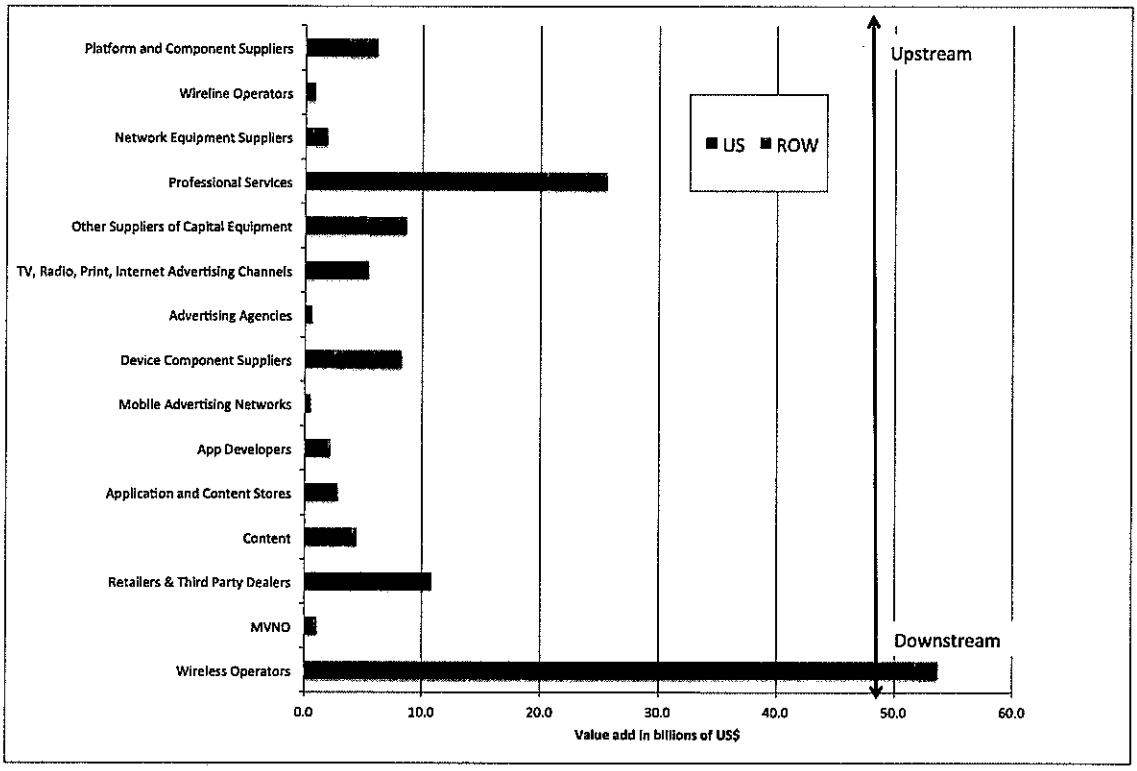
Certainly, being able to dial home from a device remains important and in more than a quarter of all cases dialing home means calling another wireless device. According to a CDC survey released in late 2011[8], more than 31% of American households have "cut the wire" and are wireless only. But consumers now want so much more from their devices. Texting, using apps, checking email, surfing the web, taking photos and videos are common things that people do every day with their phone. And, oh by the way, they can make calls as well (and in many cases while they're doing the other things they can do on their phones).

The economic principle of the virtuous cycle can easily be applied to the wireless industry. The proof is obvious in Exhibits 3 and 4. The wireless industry—a connected, cooperative, and competitive ecosystem if there ever was one—provides revenue opportunities for a wide swath of players. Entire new segments sparked by lightning-fast innovations spring up seemingly overnight and out of nowhere, generating billions of dollars of value in the process. And the end users get what they want (and even sometimes what they didn't know they wanted).

The picture is clear: a US wireless ecosystem with operators sitting at the center creating the impetus and fertile ground for a massive transformation of our every day lives and enabling it all.

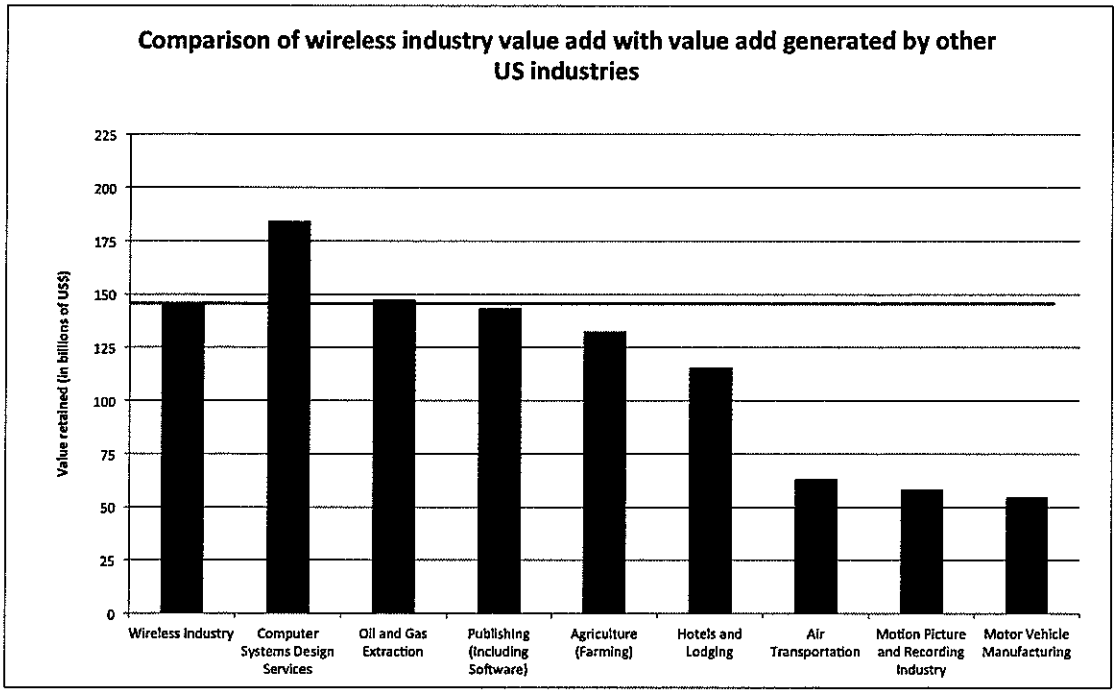
For additional views of this, we provide Exhibit 5, which shows the GDP distributed between the USA and the rest of the world, and Exhibit 6, which compares the US wireless industry with other industries.

Exhibit 5: GDP impact of the wireless industry



Source: US Bureau of Labor Statistics, Recon Analytics analysis, 2011

Exhibit 6: Comparing wireless industry value add to other industries



Source: US Bureau of Economic Analysis[3], Recon Analytics analysis, 2011

Wireless industry employment effects

Expanding an already broad employment base

The US wireless industry employs millions of people directly and indirectly (see Exhibit 7). Wireless Operators alone account for 1,044,123 direct, support and indirect jobs in the US. The next biggest sectors are, Professional Services Organizations adding 288,227 and Retailers and Third-Party Dealers adding 269,533.

All sectors together (accounting for the multiplier that we define and explain on the next page two pages) account for 3,785,293 direct, support and indirect jobs in the US.

Some sectors, such as Advertising Agencies, PR, and Related; TV, Radio, Print, Internet Ad Channels; Professional Services; and Content don't have any direct jobs. But they make up for it with hundreds of thousands of support and indirect jobs. Conversely, Mobile Advertising Networks don't have any indirect jobs.

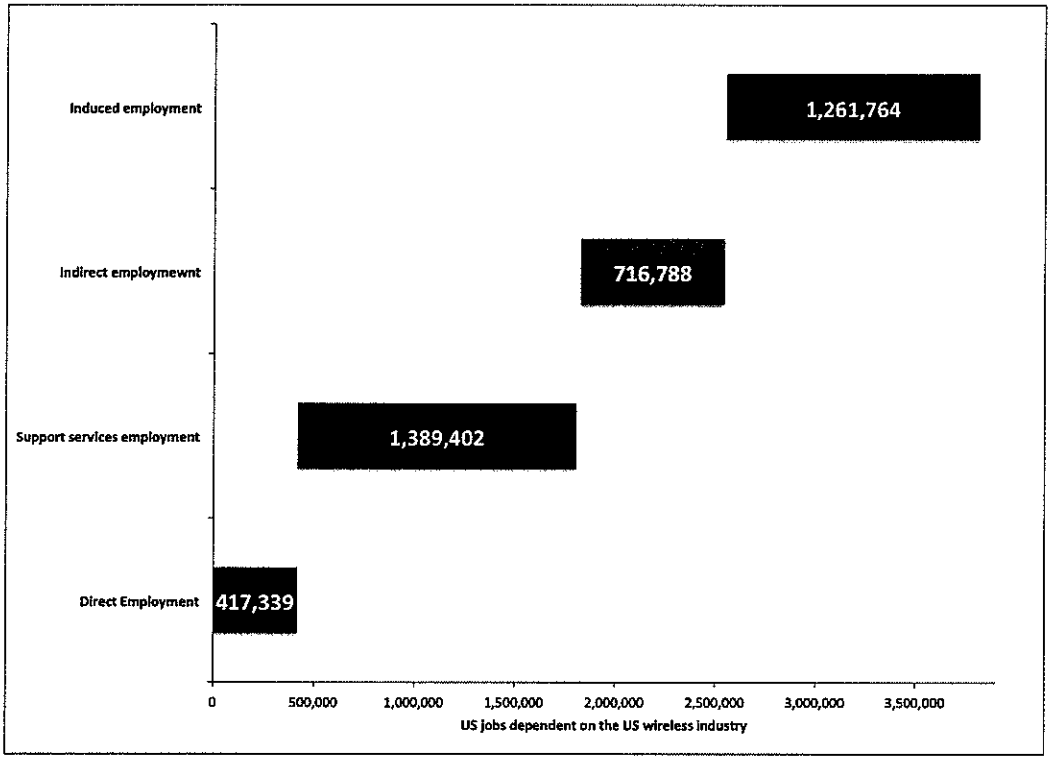
Exhibit 7 shows the direct, support and indirect jobs in the wireless industry; we provide an overall visual summary of our calculations in Exhibit 8.

Exhibit 7: Employment in the US generated by wireless services

Sector	Direct Jobs	Support Jobs	Indirect Jobs	Total Jobs
Device and Accessories Manufacturers	32,147	35,878	98,663	166,688
Device Component Suppliers	18,531	22,526	45,052	86,109
Wireless Operators	170,759	647,067	226,297	1,044,123
Advertising Agencies, PR, and Related	-	7,569	3,686	11,255
TV, Radio, Print, Internet Ad Channels	-	112,109	29,488	141,597
Other suppliers of capital equipment	15,929	58,977	137,613	212,519
Professional Services	-	267,681	20,546	288,227
Network Equipment Suppliers	4,049	15,236	1,693	20,978
Wireline Operators	10,14	4,369	1,092	15,565
Platform and Component Suppliers	7,732	6,963	16,710	31,405
Mobile Advertising Networks	4,942	3,823	-	8,765
Content	-	63,955	43,687	107,642
Application and Content Stores	1,680	21,406	41,284	64,370
App Developers	16,881	6,594	5,024	28,499
Retailers & Third Party Dealers	122,110	103,210	44,233	269,533
MVNO	12,473	12,041	1,720	26,235
Total	417,339	1,389,402	716,788	2,523,529
			Multiplier	1.5
			Grand Total	3,785,293

Source: US Bureau of Labor Statistics, Recon Analytics analysis, 2011

Exhibit 8
Employment in the US generated by wireless services



Source: US Bureau of Labor Statistics, Recon Analytics analysis, 2011

Arriving at the employment numbers

The effect multiplies

Each component of the sectors outlined above has three pieces: direct jobs, support jobs, and indirect jobs.

The direct jobs are positions that work directly for the employers and provide services that directly impact a customer's experience. The wireless industry has 417,339 such jobs in 2011, ranging from salespeople to RF technicians.

Supporting jobs in the wireless industry, ranging from contractors acquiring the permits for new cell sites to programmers creating the newest wireless apps, amount to an additional 1,389,402 positions.

Indirect jobs that rely on the wireless industry add up to 716,788 jobs.

We arrived at the estimates outlined in Exhibit 7 by dividing the value added for the US by the corresponding hourly wage rates, a calculation we show in detail in Exhibit 9.

To get at a more complete picture, we then applied a multiplier. The multiplier effect, an accepted economic principle, results in additional induced employment (i.e., jobs that, while not directly related to the wireless industry, exist because of the economic impact the industry has on the country and the spending power of the millions of people the industry employs directly or indirectly). The effect is fairly straightforward to understand.

For example, the 2,523,529 people in the US with jobs that depend directly or indirectly on the US wireless industry don't hoard their paychecks. The effects of the salaries they receive spread beyond the wireless sector into the neighborhoods where they live, the stores where they shop, the services they use, and many other parts of the economy. Like everyone, people with jobs that rely on the wireless industry spend money on restaurants, vacations, clothing, food, etc., which all supports additional employment.

Arriving at an accurate multiplier requires some important considerations. It's not an arbitrarily inflated figure that one pulls out of the air, just as it should not be kept artificially low. So to ensure we use the right multiplier, we consulted a number of sources:

- **The California Department of Labor**, in 2002, assumed a 4.63 multiplier for telecommunications jobs[9] (i.e., 3.63 additional jobs for every one job created).
- **The Scottish Government**, in 2007, assumed a 2.02 employment multiplier[10] (i.e., 1.02 additional jobs for every one job created).
- **The Employment Policy Institute**, in 2003, assumed a multiplier of 1.5 when estimating these effects[11] (i.e., .5 additional jobs for every one job created).

There are other calculations in similar industries that push the multiplier even higher than the 4.63 mark established by the California Department of Labor. That's perfectly understandable. Indeed, one can make a solid case that the wireless industry has such a broad (and expanding) presence in our society that a majority of *all* jobs and people depend on it.

However, for the purposes of this report we remain focused on employees with a direct or indirect reliance on the wireless industry, and the additional people who benefit from the economic impact they have on the US.

Therefore, we use the conservative 1.5 multiplier, which is in line with previous reports we produced for CTIA, to ensure we don't overstate the benefits. Using that approach, this multiplier increases the number of jobs dependent on the US wireless services industry from 2,523,529 to 3,785,293.[12]

The calculation is fairly simple, as illustrated below.

How the multiplier works

We take the number of direct, indirect and support jobs:	2,523,529
	x
Use the multiplier:	1.5
Arrive at the number of total jobs, including induced jobs	3,785,293

To keep things straightforward, we have applied the multiplier to the top line number (i.e., 2,523,529) but have not included calculations for induced employment for all the numbers of direct, support and indirect jobs.

For example, when we discuss the total number of jobs that sit within wireless operators (1,044,123), we are not including the multiplier. This would bring that number from 1,044,123 to 1,566,183. But for the sake of clarity, we only discuss induced employment in the context of the overall number.

Looking closely at the employment numbers

Significant expansion

One important note about jobs in the wireless sector: The number of those employed in direct jobs for wireless operators has gone down in the past few years. In 2005, data showed that 226,000 people were employed directly, with 113,000 in support roles and 137,000 in indirect jobs. Although the number of direct jobs has contracted since then (to 170,759), the overall number has grown rapidly to 1,044,123. This growth is attributable to the significant expansion in the support jobs category.

In 2005, the number of people employed in support jobs was a relatively modest 113,000. In 2011, that number has increased to 647,067.

The reason is simple. With outsourcing deals such as those between Sprint and Ericsson and Clearwire and Ericsson, the lion's share of those jobs have simply moved from one balance sheet to another—from direct employment for wireless operators to professional services. But the duties, job functions and day-to-day responsibilities of the people in those positions remain the same.

The porting of these jobs requires a completely different view of the overall employment numbers. Instead of looking at the individual components (which may go up or may go down slightly over time), it is instructive to look at the big picture.

Comparing the numbers from 2005 with those from 2011, the industry has lost about 71,000 direct and support jobs and gained 189,000 indirect jobs. For this report, we looked at 16 employment sectors related to the wireless industry, compared with just 10 in 2005. We did this because, as we noted earlier, entirely new areas have cropped up. So apples-to-apples comparisons are not always possible. But it is clear that, overall, in the past seven years, US-based jobs that rely on the wireless industry have grown by roughly 200,000, using the 1.5 multiplier (even without applying the multiplier, approximately 120,000 jobs were added).

To help readers gain a better understanding of the method we used to estimate the employment effect, we provide the overall results of our calculations in Exhibit 6.

For a full picture of the employment situation in the wireless industry we considered a number of different factors in our calculations across the 16 sectors we investigated. First, we considered the value add for each sector, then we calculated (1) the wage cost, (2) other OPEX costs, (3) and taxes, profit and interest.

Based on those factors, we arrived at a wage cost percentage for each of the three categories, an average wage for each category, and the percent of the value of those salaries that is retained in the US. Finally, using BLS data, we arrived at the number of employees in each of the categories.

Exhibit 9: Estimating employment from wireless broadband services industry in the US

Sector	Value Add		Wage Cost	Average Salary	In US	Employees
Device and Accessories Manufacturers	21.9	Wage Cost	40%	$81,750	30%	32,147
		Other Opex	30%	$36,625	20%	35,878
		Taxes, profit, Interest	30%	$36,625	55%	98,663
Device Component Suppliers	27.5	Wage Cost	40%	$59,360	10%	18,531
		Other Opex	30%	$36,625	10%	22,526
		Taxes, profit, interest	30%	$36,625	20%	45,052
Wireless Operators	51.8	Wage Cost	19%	$56,120	100%	170,759
		Other Opex	61%	$36,625	75%	647,067
		Taxes, profit, interest	20%	$36,625	80%	226,297
Advertising Agencies, PR, and Related	0.6	Wage Cost	60%	$60,700	100%	5,931
		Other Opex	10%	$36,625	100%	1,638
		Taxes, profit, interest	30%	$36,625	75%	3,686
TV, Radio, Print, Internet Ad Channels	5.4	Wage Cost	10%	$60,680	100%	8,899
		Other Opex	70%	$36,625	100%	103,210
		Taxes, profit, interest	20%	$36,625	100%	29,488
Other suppliers of capital equipment	14.4	Wage Cost	20%	$72,320	40%	15,929
		Other Opex	30%	$36,625	50%	58,977
		Taxes, profit, interest	50%	$36,625	70%	137,613
Professional Services	21.5	Wage Cost	80%	$58,435	70%	206,042
		Other Opex	15%	$36,625	70%	61,639
		Taxes, profit, interest	5%	$36,625	70%	20,546
Network Equipment Suppliers	6.2	Wage Cost	45%	$68,900	10%	4,049
		Other Opex	45%	$36,625	20%	15,236
		Taxes, profit, interest	10%	$36,625	10%	1,693
Wireline Operators	0.8	Wage Cost	75%	$59,380	100%	10,104
		Other Opex	20%	$36,625	100%	4,369
		Taxes, profit, interest	5%	$36,625	100%	1,092
Platform and Component Suppliers	10.2	Wage Cost	45%	$59,360	10%	7,732
		Other Opex	25%	$36,625	10%	6,963
		Taxes, profit, interest	30%	$36,625	20%	16,710
Mobile Advertising Networks	0.5	Wage Cost	60%	$60,700	100%	4,942
		Other Opex	40%	$36,625	70%	3,823
		Taxes, profit, interest	0%	$36,625	100%	-
Content	4	Wage Cost	3%	$70,517	100%	1,702
		Other Opex	57%	$36,625	100%	62,253
		Taxes, profit, interest	40%	$36,625	100%	43,687
Application and Content Stores	2.8	Wage Cost	6%	$100,000	100%	1,680
		Other Opex	40%	$36,625	70%	21,406
		Taxes, profit, interest	54%	$36,625	100%	41,284
App Developers	2.3	Wage Cost	75%	$81,750	80%	16,881
		Other Opex	15%	$36,625	70%	6,594
		Taxes, profit, interest	10%	$36,625	80%	5,024
Retailers & Third Party Dealers	10.8	Wage Cost	50%	$44,222	100%	122,110
		Other Opex	35%	$36,625	100%	103,210
		Taxes, profit, interest	15%	$36,625	100%	44,233
MVNO	1.4	Wage Cost	50%	$56,120	100%	12,473
		Other Opex	35%	$36,625	90%	12,041
		Taxes, profit, interest	15%	$36,625	30%	1,720

Source: US Bureau of Labor Statistics, Recon Analytics analysis, 2011

Wireless industry revenue and tax contributions

Arriving at the contributions using two methods

In this section, we calculate the taxes that the wireless industry pays to federal, state and local governments in the US. There are two ways to arrive at this figure.

A traditional approach is to take the value-add and break it into the component parts, then divide it by the average salary that the Bureau of Labor Statistics data shows matches the wireless industry. This top-down approach enabled us to come up with a very valid figure. It is the most common approach to solving this problem.

We also decided to calculate the amount in a second way. We took the Bureau of Labor Statistics figures, then estimated how many people work in each sector. We then multiplied that out—leaving out the value-add component—to arrive at the final tax figure.

How the two calculations work

Method one

1. Determine value add for each sector
2. Divide by BLS data for average salaries
3. Arrive at number of employees in each segment and determine status of employees (i.e., direct, support, indirect)
4. Multiply average salaries by number of employees
5. Arrive at income, FICA, Medicare tax on that income

Method two

1. Gather BLS data for employment in each sector
2. Figure percent that is attributable to wireless
3. Arrive at number of jobs attributable to wireless
4. Include mean annual salary
5. Total the direct income for each sector
6. Add all sectors together
7. Arrive at income, FICA, Medicare tax on that income

Something really interesting happened as we completed the separate calculations. The second calculation came up with a result that was within 5-10% of the result we got with the first calculation. This kind of congruity confirms that the figures we outline in Exhibits 7, 8 and 9 are accurate.

The tax bill

Measuring the industry's contributions

It's an inevitability. With jobs come taxes. In an industry that is responsible for millions of jobs, the calculation of the taxes (including local, state, and federal income, FICA and Medicare tax) is an important measure of the industry's contribution.

So, let's start at the beginning. The wireless industry had approximately 3.8 million direct, indirect and induced employees in 2011. Our research shows that the average wage for a direct wireless employee in the US was $57,507 annually. That compares with $40,330 for support positions and the average wage for all workers in the US of $36,625. So it is clear that wireless industry jobs pay far above the national average (65% higher, in fact).

The math holds one immutable truth: although the rates are the same, the higher-paying jobs end up pumping more money into the government coffers across the board.

In the US, the average worker paid 7.65% in FICA and Medicare taxes in 2010 (that amount went down to 6.65% in 2011). The income tax rate was steady at 13.8%. In addition, employers paid 7.5% of their employees' wages in FICA and Medicare taxes to the government (that amount was not reduced for employers in 2011).

Let's take a line item from Exhibit 10 apart.

A direct employee in the Device and Accessories Manufacturers category earns an average salary of $81,750. That employee, based on tax bracket, pays $17,980 in income tax to the federal government. According to data we collected from the BLS, there are 32,147 people in this category. Simple math shows that multiplying the number of employees by the tax each one pays arrives at $577,999,266 as the amount of federal income tax this group paid in 2011. But the story doesn't end there.

In addition to income tax, employees and employers are responsible for FICA and Medicare taxes. In the case of this direct employee group, the employers pay a total of $201,042,000 to FICA and Medicare while employees hand over another $174,762,000.

One group (support workers for wireless operators) pays more than $6.8 billion in taxes. It breaks out like this: Because support employees span the entire economy, we are using the average salary of a US employee, which is $36,625. This translates into an annual tax bill of $5,345. That might not seem like much, but when one considers that there are 647,067 support workers, it adds up to $3,458,481,746 in annual taxes, $1,812,935,250 in employer-paid FICA and Medicare and $1,575,950,250 in employee paid FICA and Medicare.

Exhibit 10: Wireless Tax Contributions

Sector	Type	Avg. Salary	Income Tax	Segment Size	Taxes	Employer FICA/Medicare	Employee FICA/Medicare
Device and Accessories Manufacturers	Direct	$81,750	$17,980	32,147	$577,999,266	$201,042,000	$174,762,000
	Support	$36,625	$5,345	35,878	$191,760,872	$100,521,000	$87,381,000
	Indirect	$36,625	$5,345	98,663	$527,342,397	$276,432,750	$240,297,750
Device Component Suppliers	Direct	$59,360	$11,711	18,531	$217,012,803	$484,150,000	$73,150,000
	Support	$36,625	$5,345	22,526	$120,397,807	$63,112,500	$54,862,500
	Indirect	$36,625	$5,345	45,052	$240,795,615	$126,225,000	$109,725,000
Wireless Operators	Direct	$56,120	$10,804	170,759	$1,844,812,880	$733,099,500	$637,269,500
	Support	$36,625	$5,345	647,067	$3,458,481,746	$1,812,935,250	$1,575,950,250
	Indirect	$36,625	$5,345	226,297	$746,028,596	$391,068,000	$339,948,000
Advertising Agencies, PR, and Related	Direct	$60,700	$12,086	5,931	$71,679,736	$27,540,000	$23,940,000
	Support	$36,625	$5,345	1,638	$8,756,204	$4,590,000	$3,990,000
	Indirect	$36,625	$5,345	3,686	$19,701,459	$10,327,500	$8,977,500
TV, Radio, Print, Internet Ad Channels	Direct	$60,680	$12,080	8,899	$107,505,208	$41,310,000	$35,910,000
	Support	$36,625	$5,345	103,210	$551,640,863	$289,170,000	$251,370,000
	Indirect	$36,625	$5,345	29,488	$157,611,675	$82,620,000	$71,820,000
Other suppliers of capital equipment	Direct	$72,320	$15,340	15,929	$244,347,611	$88,128,000	$76,608,000
	Support	$36,625	$5,345	58,977	$315,223,350	$165,240,000	$143,640,000
	Indirect	$36,625	$5,345	137,613	$735,521,151	$385,560,000	$335,160,000
Professional Services	Direct	$58,435	$11,452	206,042	$2,359,534,520	$921,060,000	$800,660,000
	Support	$36,625	$5,345	61,639	$329,452,182	$172,698,750	$150,123,750
	Indirect	$36,625	$5,345	20,546	$109,817,394	$57,566,250	$50,041,250
Network Equipment Suppliers	Direct	$68,900	$14,382	4,049	$58,237,707	$21,343,500	$18,553,500
	Support	$36,625	$5,345	15,236	$81,432,699	$42,687,000	$37,107,000
	Indirect	$36,625	$5,345	1,693	$9,048,078	$4,743,000	$4,123,000
Wireline Operators	Direct	$59,380	$11,716	10,104	$118,387,336	$45,900,000	$39,900,000
	Support	$36,625	$5,345	4,369	$23,349,878	$12,240,000	$10,640,000
	Indirect	$36,625	$5,345	1,092	$5,837,469	$3,060,000	$2,660,000
Platform and Component Suppliers	Direct	$59,360	$11,711	7,732	$90,553,524	$35,113,500	$30,523,500
	Support	$36,625	$5,345	6,963	$37,213,868	$19,507,500	$16,957,500
	Indirect	$36,625	$5,345	16,710	$89,313,283	$46,818,000	$40,698,000
Mobile Advertising Networks	Direct	$60,700	$12,086	4,942	$59,733,114	$22,950,000	$19,950,000
	Support	$36,625	$5,345	3,823	$20,431,143	$10,710,000	$9,310,000
	Indirect	$36,625	$5,345	N/A	N/A	N/A	N/A
Content	Direct	$70,517	$14,835	1,702	$25,244,530	$9,180,000	$7,980,000
	Support	$36,625	$5,345	62,253	$332,735,759	$174,420,000	$151,620,000
	Indirect	$36,625	$5,345	43,687	$233,498,778	$122,400,000	$106,400,000
Application and Content Stores	Direct	$100,000	$23,090	1,680	$38,791,200	$12,852,000	$11,172,000
	Support	$36,625	$5,345	21,406	$114,414,401	$59,976,000	$52,136,000
	Indirect	$36,625	$5,345	41,284	$220,656,345	$115,668,000	$100,548,000
App Developers	Direct	$81,750	$17,980	16,881	$303,515,596	$105,570,000	$91,770,000
	Support	$36,625	$5,345	6,594	$35,243,722	$18,474,750	$16,059,750
	Indirect	$36,625	$5,345	5,024	$26,852,359	$14,076,000	$12,236,000
Retailers & Third Party Dealers	Direct	$44,222	$7,472	122,110	$912,438,618	$413,100,000	$359,100,000
	Support	$36,625	$5,345	103,210	$551,640,863	$289,170,000	$251,370,000
	Indirect	$36,625	$5,345	44,233	$236,417,513	$123,930,000	$107,730,000
MVNO	Direct	$56,120	$10,804	12,473	$134,756,237	$53,550,000	$46,550,000
	Support	$36,625	$5,345	12,041	$64,358,101	$33,736,500	$29,326,500
	Indirect	$36,625	$5,345	1,720	$9,194,014	$4,819,500	$4,189,500

Source: Tax Foundation, US Bureau of Labor Statistics, Recon Analytics analysis, 2011

As we all know, income taxes don't end with federal taxes. In addition to the federal taxes we have calculated here, there are additional liabilities that employees must pay. Direct, support and indirect employees of the wireless industry also pay state and local taxes, amounting to $4.58 billion in 2011.

The fees and surcharges

Of course, even income taxes, FICA and Medicare, state and local taxes don't complete the picture. That's because the wireless industry also contributes a significant amount of money in the form of fees and surcharges. See Exhibit 11 for an overview.

Exhibit 11: Taxes, fees and surcharges

Type of Fee or Surcharge	Sales	Fee %	Fee Amount
Device equipment sales tax	$27.2 billion	13.1%	$3.6 billion
Universal Service Fee	N/A	5.05%[13]	$8.2 billion
Federal, state and local fees to end users	$164.5	18.1%	$26.6 billion
		Total	$38.4 billion

Source: CTIA's Wireless Industry Indices, Mid-Year 2011

The industry is responsible for paying average federal, state and local taxes, fees and surcharges of 18.1% on $164.5 billion in wireless service sales.

Also, on average, end-users paid sales tax of 13.1% on handset equipment sales of $27.2 billion, which amounts to $3.6 billion.

Fees, surcharges and taxes all told

The wireless industry contributes a large amount every year in fees, surcharges and taxes to federal, state and local authorities. To underscore this contribution, we have created Exhibit 12, which summarizes and adds up these charges.

Exhibit 12: All the contributions

Tax or fee	Fee
Employee income taxes[14]	$23.9 billion
Employee FICA and Medicare	$11.6 billion
Employer FICA and Medicare	$10.1 billion
State and local income taxes	$4.6 billion
Universal service fee	$8.2 billion
Federal, state and local fees to end users	$26.6 billion
State sales tax on devices	$3.6 billion
Total	**$88.6 billion**

Source: Various publicly available sources, 2011

Adding all the contributions together (including employee income taxes, employee FICA and Medicare, Employer FICA and Medicare, state and local income taxes, universal service fee, and state sales taxes on devices) the wireless industry contributes an impressive $88.6 billion to federal, state and local governments.

The value of wireless spectrum

Spectrum is the fuel on which wireless runs. Historic data indicates that for every 10 MHz of additional spectrum:

- US GDP increases by $1.739 billion
- US Employment increases by at least an additional 7,000
- Government revenues increase by $468 million
- Wireless service provider revenues increase by $1.924 billion
- Wireless device revenues increase by $439 million
- Wireless applications and content sales increase by $263 million

Without spectrum, especially in the hands of licensed operators, the wireless ecosphere could not have been created.

Deploying network technologies that are more spectrally efficient will take licensed operators only so far because we are getting closer to the physical limits of how much data can be transmitted over every Hertz. Wireless operators have spent billions of dollars acquiring spectrum in the United States and will have to continue to invest in buying more spectrum in order to satisfy customer demand. With so much at stake they are looking to get a positive return from their investments. In a symbiotic relationship, wireless service providers are creating the framework within which their customers derive the greatest possible utility, either directly from the service or through the device and application ecosphere that has been enabled through the existence of licensed wireless services.

At the time of the first report regarding the impact of the wireless industry on the US economy in 2004, the FCC had 196.5 MHz of spectrum made available to licensed wireless operators and was deployed or in the process of being deployed. The amount of spectrum licensed and deployed or deploying had increased by 311.5 MHz to 508 MHz by mid-2011.

Exhibit 13 shows the significant impact the additional spectrum had on the US economy.

Exhibit 13: Impact of Additional Spectrum on the US Economy

	2004	2011	Difference	Impact of 10 MHz incremental spectrum
Spectrum	196.5 MHz	508 MHz	311.5 MHz	
GDP (per year)	$92 billion	$146.2 billion	$54.2 billion	$1.739 billion
Total Wireless Employment	3.6 million	3.8 million	219,730	7,053
Combined Federal, State, Local and Sales Taxes	$15.5 billion	$30.1 billion	$14.6 billion	$468 million
Wireless Service	$104.4 billion	$164.5 billion	$60.5 billion	$1.924 billion
Wireless Devices	$12.4 billion	$26.1 billion	$13.7 billion	$439 million
Application and Content	$0.5 billion	$8.7 billion	$8.2 billion	$263 million

Source: Ovum, Recon Analytics 2012

In the seven years between 2004 and 2011, the wireless industry's contribution to the US GDP increased from $92 billion in 2004 to $146.2 billion per year by mid-2011. This indicates that every 10 MHz of spectrum provided to operators and put to good use creates an increase of $1.73 billion in additional GDP per year. During the same time, total and induced employment derived from the wireless industry increased from 3.6 million to 3.8 million, indicating that every 10 MHz of spectrum creates more than 7,000 jobs connected with the wireless industry.

As the US economy becomes more competitive through the use of advanced wireless technology and services, we would expect additional jobs to be created.

Furthermore, federal, state, local and sales taxes have increased as well. In 2004, these taxes amounted to $15.5 billion and almost doubled to $30.1 billion per year by mid-2011 as the overall tax burden of Americans and thereby government revenues decreased. Every 10 MHz that was put in the hands of wireless service providers generated $468

So, what would adding 500 MHz of additional spectrum do?

The potential for the addition of 500 MHz of spectrum as promised by the government could produce a windfall.

Spectrum is the fuel on which wireless runs. If historic relationships between spectrum and GDP, employment, taxes, and industry revenues hold, we can expect that:

- US GDP increases by $86.5 billion
- US Employment increases by at least an additional 350,000
- Government revenues increase by $23.4 billion
- Wireless service provider revenues increase by $96.2 billion
- Wireless device revenues increase by $22 billion
- Wireless applications and content sales increase by $13.1 billion

million per year for the government. Revenues for wireless services to wireless operators and resellers increased from $104.4 billion in 2004 to $150.3 billion per year by mid-2011.

This increase of $45.9 billion in service revenues translates into $3.378 billion per 10 MHz of additional spectrum. Wireless device manufacturers increased sales from $12.4 billion to $26.1 billion as completely new form factors were introduced. The iPhone and all the devices that its introduction has spawned would have been impossible or at least significantly less useful without functioning, high-speed wireless connectivity.

For wireless device providers, 10 MHz of addition spectrum results in $439 million of additional sales. At the same time, additional spectrum, faster data speeds and device capabilities allowed the wireless application and content market to flourish. Sales increased from about $500 million in 2004 to more than $8.7 billion per year by mid-2011. Because spectrum is indirectly also the fuel that makes this all possible, every 10 MHz of spectrum created $263 million in application and content revenues.

Exhibit 14: Spectrum Licensed and Deployed

Band	2004 Licensed and Deployed	Mid-2011 Licensed and Deploying	Mid-2011 Licensed
Cellular	50	50	50
PCS	120	130	130
SMR	26.5	18	18
700 MHz		46	62
AWS		70	90
EBS		194	194
Total	196.5	508	544

Source: Recon Analytics, FCC, 2012

Through the rebanding of the SMR band, Sprint Nextel had to give up 8.5 MHz in the SMR band and in exchange received 10 MHz of spectrum in the PCS-Block, the previously unlicensed G-Block.

In 2008, the FCC auctioned 62 MHz in the 700 MHz band. We have removed the 16 MHz from the D-Block and E-Block from the licensed and deploying segment. The 700 MHz D-Block, with 10 MHz bandwidth (2x5 MHz), received no bids, as its use was significantly restricted. As part of the 2012 payroll tax extension legislation, Congress agreed to incentive auctions for the broadcast TV spectrum. A part of the proceeds of the incentive auctions will be used to build a national public safety network.

The E-Block, which consists of 6 MHz bandwidth unpaired, is licensed to operate with up to 50 kW transmission power, which makes it ideal for broadcast purposes. Its current owner, Echostar, is a satellite broadcaster.

We have removed 20 MHz from the AWS-band, which is owned by SpectrumCo. The company is in the process of selling these licenses to Verizon Wireless, but is being held up in the FCC and Department of Justice review process. Once the spectrum transaction has been approved it would become part of the licensed and deploying category. Before their decision to sell these licenses to Verizon Wireless, SpectrumCo made no efforts to build out their licenses.

2. US PRODUCTIVITY GAINS FROM PROLIFERATION OF WIRELESS BROADBAND NETWORKS AND SERVICES

Summary

In this section, we examine the productivity gains that the US wireless industry generates.

The adoption of information technology, computers, and telecommunications has revolutionized businesses in the US and has enabled huge productivity gains. According to our research of BLS data, a whopping 75.8 million people (54.3% of the 139.4 million people in the US workforce as of June 2011) are in jobs that directly rely on wireless services.

In addition, wireless services accounted for $680 million in discounts for employee-liable plans in 2011 alone. Employee-liable plans extend the discounts that companies are receiving for their business lines to the private lines of employees and their dependents and provide a real boon to consumers.

Wireless services contribute to productivity gains in a number of categories, including fuel efficiency, sales and inventory, field service, medical, security, financial services, law enforcement, wholesale, and payroll.

In some ways, despite their continuing popularity, the fixed internet and non-mobile computers are starting to recede into the background as far as improving productivity goes.

CASE STUDY

Sprint: Ward Trucking cuts costs, improves efficiency

Impact: 20% growth without adding dispatchers

Savings: $1.5 million in annual fuel costs

Ward Trucking used to rely on the experience of dispatchers, manual data entry and verbal instructions for drivers. This approach required the dispatcher to know the pickup area very well and know which driver to assign to which deliveries. This system was inefficient. Ward realized that real-time automation opened the door to greater profitability. However, Ward lacked the basic technology infrastructure most vendors required to implement a logistics optimization and dispatch application.

So, with Sprint and Cheetah Software, Ward gained the tools it needed to improve productivity, customer service and profitability. Since implementing Cheetah, Ward has grown by over 20% without adding dispatchers. Ward's 450 trucks now make 10% more stops with 6% fewer miles driven – saving over $1.5 million per year in fuel costs alone.

Source: http://www.sprint.com/assets/pdfs/business_case_study/085481s-Ward-Trucking-cs.pdf

We're now seeing wireless take its place as an essential part of productivity gains for US businesses. Wireless voice plays a central role in enabling productivity growth, and it has been joined in recent years by SMS and data.

How Wireless Broadband Boosts Labor Productivity Growth

With the recent recession, there has been considerable discussion about productivity. And wireless technology is now a key part of the productivity equation, as we show in the accompanying case studies.

Several studies[15] have tried to isolate the how mobile service penetration affects GDP growth and hence labor productivity growth.

These studies found that:

- Differences in mobile penetration rates help explain differences in GDP growth rates. So the US, with a wireless penetration rate 10% higher than that of its neighbor Canada, might expect to enjoy GDP growth rates of 0.3% per annum higher as a result.
- The impact of higher mobile penetration rates on economic growth is greater in low and middle-income countries than in high-income countries. This reflects the fact that wireless broadband penetration take up of mobile phones increases the number of people with access to telecommunications more in middle and low income countries. In the EU and US fixed lines reach well over 90% of households and mobile phones offer an alternative means of telecommunications.

CASE STUDY

AT&T: Taylor Made Golf, Inc. gets end-to-end solution

Impact: Increased revenue of 15% per sales rep and 10%-20% per customer order, plus increased store owner satisfaction and loyalty

Savings: Reduced Inventory time up to 75%

While supply chain services such as taking inventory and documenting orders are a necessary part of being competitive when your customers are in the retail industry, performing those activities is not the most productive use of a sales representative's time.

Such efforts were requiring 60% of Taylor Made's 100+ wholesale representatives' in-outlet time.

TaylorMade went with AT&T to equip its sales representatives with Pocket PC-based devices. The reps, using their devices on the AT&T network, can now expedite the inventory process as well as wireless sales data entry and access. They use a barcode scanning feature on their mobile devices to quickly take in-store product inventories, which has reduced inventory time by up to 75%. Plus, Taylor Made has increased revenue significantly—15% per sales representative and 10–20% per customer order.

Source: http://www.wireless.att.com/businesscenter/en_US/pdf/TaylorMade_case_study_ATT.pdf

This type of analysis views the issue from the top-down econometric approach. We like to look at things from more than one angle, though and feel it is helpful to look at productivity from the bottom up via case studies, which we do in the following two sections.

Productivity gains from wireless voice services

It is clear that wireless voice services play a central role in enabling productivity growth. At mid-year 2011, there were more than 322 million wireless devices active in America—good for 102% penetration.

Employers of approximately 75 million US wireless consumers believed that the use of mobile wireless devices had such a significant impact on productivity that the employer paid at least part of their employee's wireless bill.

The reasons that companies subsidize or pay the entire monthly bill for some employees is simple:

- **A wireless phone can reduce unproductive travelling time.** Field engineers and sales staff can use wireless voice services to transform unproductive travel time into valuable time with customers, colleagues and suppliers. Now, they can conduct business, confirm appointments and follow-up on questions.
- **A wireless device can help improve logistics.** Companies can contact field staff armed with wireless devices to schedule meetings and reassign tasks more efficiently. Companies can communicate traffic and other travel related information in real-time while employees are in transit. The result enhances the employees' ability to travel between jobs and assignments along the most efficient route. Companies dependent on fleet management can also better coordinate deliveries, pick-ups and other logistical issues.

CASE STUDY

Verizon joins with Duke Energy to help reduce

Goal: Reduce energy use by 20%

Result: Avoid 220,000 metric tons of greenhouse gases by 2016

Verizon Wireless will provide the telecommunications network that will connect the digital meters, signs and media players that will be used in Envision: Charlotte, a first-of-its-kind, public-private collaboration to make the commercial buildings in Charlotte's urban core more energy efficient.

Using digital energy technologies connected by Verizon Wireless' 4G LTE network, Duke Energy will gather and aggregate energy usage data from about 70 participating buildings in Charlotte's 1.94 square mile I-277 inner-belt loop. The information will then be streamed to large interactive lobby-level screens provided by Cisco.

Building tenants will see the nearly real-time commercial energy consumption data for the community and suggested actions they can take to reduce their personal energy usage in the office.

Source:
http://news.verizonwireless.com/news/2011/03/pr2011-03-03d.html

- **A wireless device can enable faster and more efficient decision-making.** Employees can be in constant contact with each other no matter where they are or what time it is. Wireless devices make it easy to call, text or send data or maybe even hold an impromptu virtual meeting to arrive at time-sensitive, important decisions—even when one person is in the office and the other 5 people are scattered around the globe, in taxis, airports, or attending a child's soccer game. Without the mobility and immediate accessibility that wireless devices provide, such meetings might not happen and opportunities would be missed.
- **Wireless devices empower small businesses.** Small business people who are not in the same location all day have taken to carrying mobile devices to stay connected. This affordable virtual office has become an indispensable part of every small businessperson's arsenal of tools.

How can one quantify these types of effects? It may seem to be hard to figure the effect of a small businessperson being able to conduct business from anywhere, or the ability for any businessperson to gather colleagues and make swift decisions. And it might seem to be hard to pin down savings that accrue from logistics improvements. If a package arrives a few hours or a few days earlier, what's the benefit? Moreover, what is the benefit of improving the productivity of a sales person who's in between appointments?

Yes, they may seem to be hard to quantify. But the measure we have used—the consumer surplus from wireless services,

CASE STUDY

Verizon: Life Fitness sees productivity boost

Impact: Time to access corporate apps reduced from hours to minutes

Savings: Productivity boost of 225 hours a day for 150 field technicians

A few years ago, when the Life Fitness mobile workforce of salespeople and field engineers were out on the road, they were virtually isolated from their customers, other team members, and the home office. The only option for these busy team members to send email or access corporate applications was through a slow, tedious, and often-unsuccessful dial-up connection.

Life Fitness chose an enterprise solution that would ensure that the mobile workforce has the fast, reliable connectivity they need and the coverage they expect as they travel throughout the United States. After evaluating current wireless data options, Life Fitness chose Verizon Wireless and its Mobile Broadband (CDMA-based EV-DO) network, which allows the field force to stay connected while traveling across the city or across the country.

Every Life Fitness group that has moved to a wireless data environment is gaining recognizable results. For the field engineers, having access to the CRM system allows them to better manage their daily schedules so they can be more productive. Before adopting the new wireless environment, engineers picked their paperwork up at the central office. If a customer request arrived during the day, it would be put into the next day's queue. Each field technician is able to manage approximately five more work orders daily. The team estimates that technicians have gained about 90 minutes per day. Overall, this boost in productivity means that across the team, Life Fitness is resolving approximately 800 more customer work orders each day. The increase in productivity translates to higher customer satisfaction rates, as response time and resolution time decreases.

Source: http://b2b.vzw.com/assets/files/Life_Fitness_Case_Study.pdf

which we estimated earlier—shows a startling benefit to the economy of a cumulative $502.7 billion.

Productivity gains from wireless data services

To quantify the productivity gains US businesses receive or will receive from wireless broadband technology, we conducted a thorough bottom-up review based on the job classification data from the Department of Labor's Bureau of Labor Statistics.

To arrive at a baseline, we looked at the more than 10,000 different job types BLS tracks. These job types account for everyone employed in the US (as of June 2011, the Bureau of Labor Statistics showed that a seasonally adjusted 139.4 million people were employed in the US[16]). We then analyzed each job type to determine which ones benefit from the use of wireless. We identified nearly 5,000 job types (with 75.8 million employees) that would benefit from using wireless while conducting their jobs.

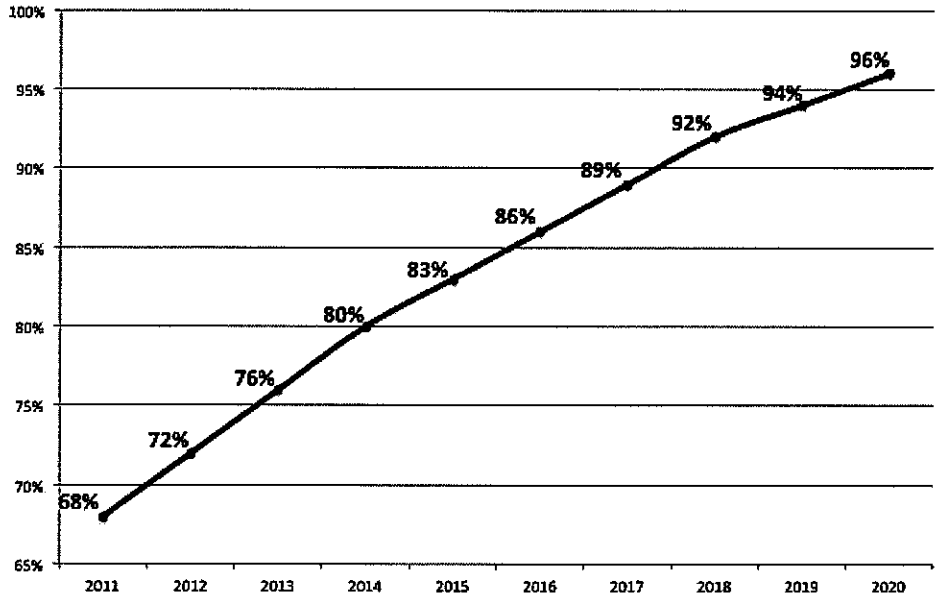
At the end of 2010, 75 million of these employees were actually using wireless.

In previous reports on this subject, the author has noted that estimates for employees with data access added up to about 10% of the overall wireless business users. This figure has skyrocketed in the past several years.

In 2011, 53% of all mobile phones have data access, compared with 43% last year[17]. Recon Analytics estimates that 68% of business users currently have data plans, as the devices they carry serve as a handheld office.

We forecast that data plans will continue to be more common among business users, reaching 96% penetration by 2020 (see Exhibit 15).

Exhibit 15: Wireless Data Penetration Forecast for Business Users



Source: Recon Analytics, 2011

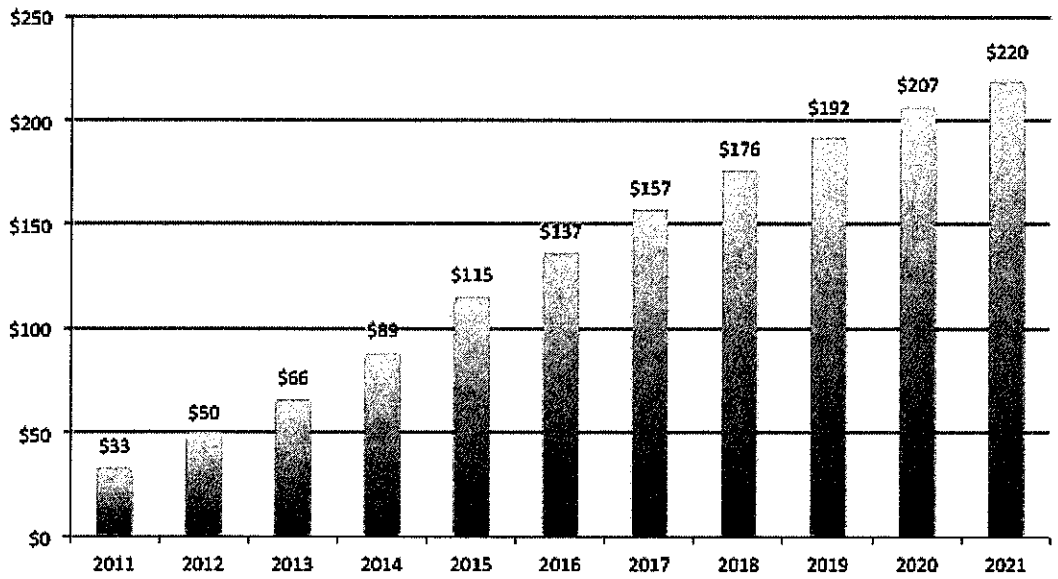
Wireless improves productivity for many segments

In 2011, the wireless industry accounted for $33 billion in productivity improvements for US businesses in nine categories:

- Fuel efficiency: $1.5 billion in productivity enhancements in 2011, and $70.7 billion over 10 years
- Sales and inventory: $6.1 billion in 2011 and $174.3 billion over 10 years
- Field service: $5.7 billion in 2011 and $161.7 billion over 10 years
- Medical: $11.2 billion in 2011 and $305.1 billion over 10 years
- Security: $2.7 billion in 2011 and $89.6 billion over
- Financial services: $.7 billion in 2011 and $21.1 billion over 10 years
- Law enforcement: $.3 billion in 2011 and $24.7 billion over 10 years
- Wholesale: $.1 billion in 2011 and $3.5 billion over 10 years
- Payroll: $.9 billion in 2011 and $26.8 billion over 10 years
- Employment: $4.2 billion in 2011 and $564.3 billion over 10 years

Over the next 10 years, these efficiency gains, examples of which are outlined in the case study sidebars on the previous 5 pages, will grow to a total of more than $1.4 trillion (see Exhibit 16).

Exhibit 16: Annual Efficiency gains from Use of Wireless (in $US billions)



Source: Recon Analytics, 2012

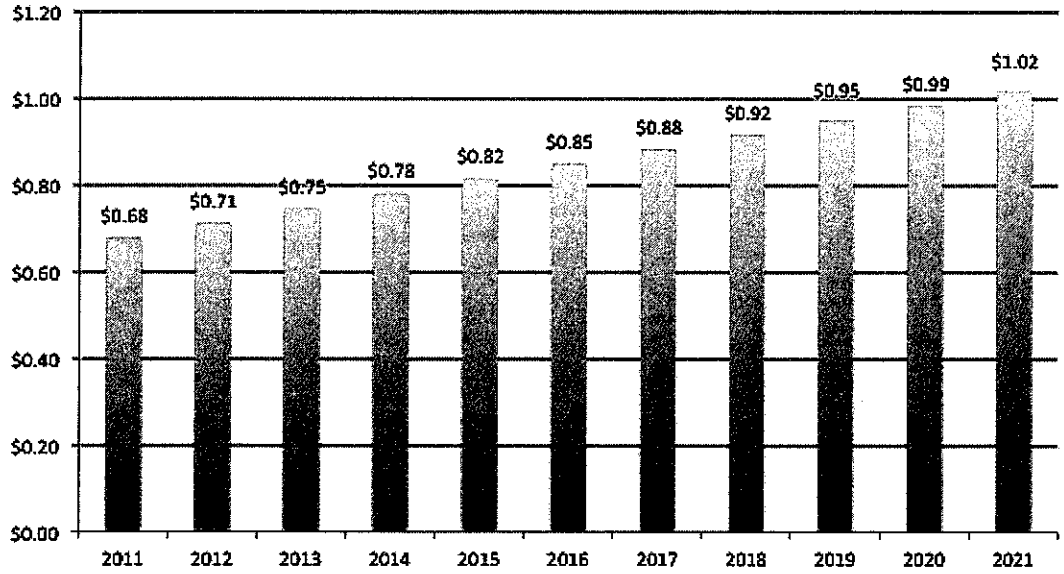
Employee-liable, or employer-sponsored, plans are economic stimulus for consumers and businesses

In 2011, 75 million consumers were eligible for employee-liable plans (These are plans that provide employer-sponsored discounts to employees. Employees are responsible for paying for the phone and the monthly bill, but might be able to expense all or part of it. Employees are also allowed to include plan family members in the plan, with the employees again responsible for the discounted cost of the phone and the monthly bill). These plans provide, on average, 4% discounts on wireless services. In 2011, 40% of employees took advantage of these discounts, producing a discount of $680 million.

Over the next 10 years, this figure will grow to exceed $1 billion annually, as more employees take advantage of these generous discounts. This is a win-win. Consumers gain cheaper access to services, operators gain valuable repeat customers and more money is freed up for consumers to spend elsewhere.

Exhibit 17 outlines our forecast for the next 10 years.

Exhibit 17: Annual employee-liable stimulus (in $US billions)



Source: Recon Analytics, 2012

3. THE CONSUMER SURPLUS FROM WIRELESS VOICE SERVICES

The consumer surplus measures the difference between what people actually spend versus what they are willing to spend. In 2010, the US wireless industry generated a consumer surplus of $502.7 billion[18], measured across voice minutes of use, SMS, and data usage. Let's break those figures into their individual components.

With 2.2 trillion minutes of use in 2010, voice added $917 million in consumer surplus (almost double the 2009 figure) to bring the voice consumer surplus to $454 billion. Texting is on the rise, so it's no surprise that, with 1.8 trillion texts in 2010, it added $2.7 billion to the consumer surplus to bring the text consumer surplus to $41.5 billion.

Nothing in the wireless industry is growing faster than data usage. The proof is in the numbers, with more than 56 billion megabytes per month in 2010 (nearly 59 petabytes[19]) of data consumed in 2010 (more than double, and almost triple the levels seen in 2009), which led to data adding $2.24 billion to the consumer surplus to bring it to $7.1 billion.

How we calculate the consumer surplus

To calculate the consumer surplus for US consumers and businesses enjoy as a result of using wireless services, we used the following calculation:

The price users are prepared to pay, on average, for wireless service

-

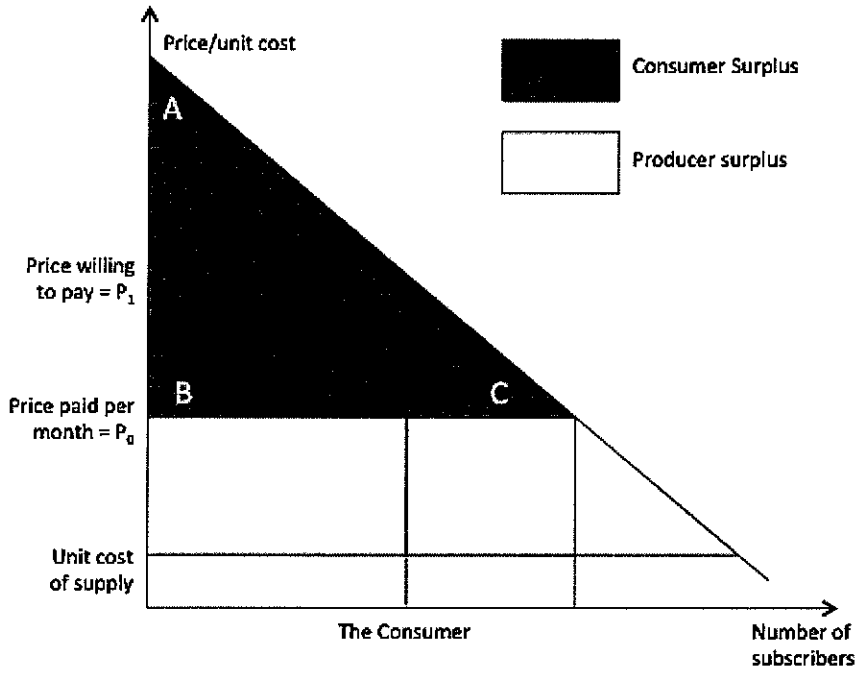
The price consumers actually pay

x

The number of subscribers

We have illustrated how the consumer surplus works in Exhibit 18, with A, B, and C representing the consumer surplus.

Exhibit 18: Defining the consumer surplus



Source: Recon Analytics analysis and interpretation of publicly available models, 2011

The consumer surplus we outline here is a measure of the combined social and commercial benefits that US consumers generate from purchasing wireless mobile services.

The chart in Exhibit 18 shows that the consumer[20] is willing to pay for mobile services at the level indicated by P_1 every month. In fact, the consumer pays at the level indicated by P_0. As a result, every month the consumer gains a consumer surplus of P_1 minus P_0. This translates into increased disposable income that the consumer can put back into the economy in the form of buying goods and services—or other types of investments. The green area (labeled A, B, and C) represents the total consumer surplus.

In addition, the use of mobile services generates a producer surplus – the other shaded area of Exhibit 18. This is the price paid per month less the cost of supply per month times the number of subscribers or, more simply, the profit to wireless operators from supplying service. Together the consumer and producer surplus measure the overall economic welfare that results from wireless services.

Past consumer surplus estimates

Similar to the employment multiplier, we reviewed the numerous authors that have estimated the consumer surplus from wireless broadband services in the past[21].

In particular:

- Jerry Hausman first estimated the consumer surplus for the US in 1997, using price elasticity models to establish the demand curve. He then estimated the consumer surplus, which he

updated in 2003. Hausman estimated the US consumer surplus was approximately $80 billion to $150 billion per year in mid-2002. The industry generated $77 billion in revenues in 2002.

- Thomas Hazlett testified before the US Senate that the estimated US consumer surplus was at least $80 billion per year in 2003.
- The UK's Radio Communications Agency also estimated a consumer surplus for wireless services there, using a willingness to pay survey. In 1999, wireless services generated revenues of £5.0 billion while the consumer surplus was estimated at £7.2 billion for the year.

Estimating today's consumer surplus

Based on the estimates discussed above, we estimate that the US wireless services generated a consumer surplus of $502.7 billion by the end of 2010. The surplus, which had been generated almost entirely from the provision and use of voice applications until a few years ago, now includes significant contributions from SMS and data.

Exhibit 19 outlines similar examples of calculating the consumer surpluses.

Exhibit 19: Current US consumer surplus for wireless services

Estimate	Annual Consumer Surplus	Annual Revenues	Consumer surplus/revenue
Hausman estimate, mid 2002	$115 billion	$77 billion	1.49
UK Radio Communications Agency estimate for UK	£7.2 billion	£5.0 billion	1.44
Estimate for end of 2010	$502.7 billion	$163 billion	3.08

Source: Various publicly available sources, 2011

To estimate the consumer surplus for voice, SMS and data, we looked at the following:

- Voice MOUs at 2010 prices against the average per-minute charge.
- The number of text messages multiplied by the average charge per SMS.
- The number of MBs consumed multiplied by the average charge per megabyte.

Underestimating the consumer surplus

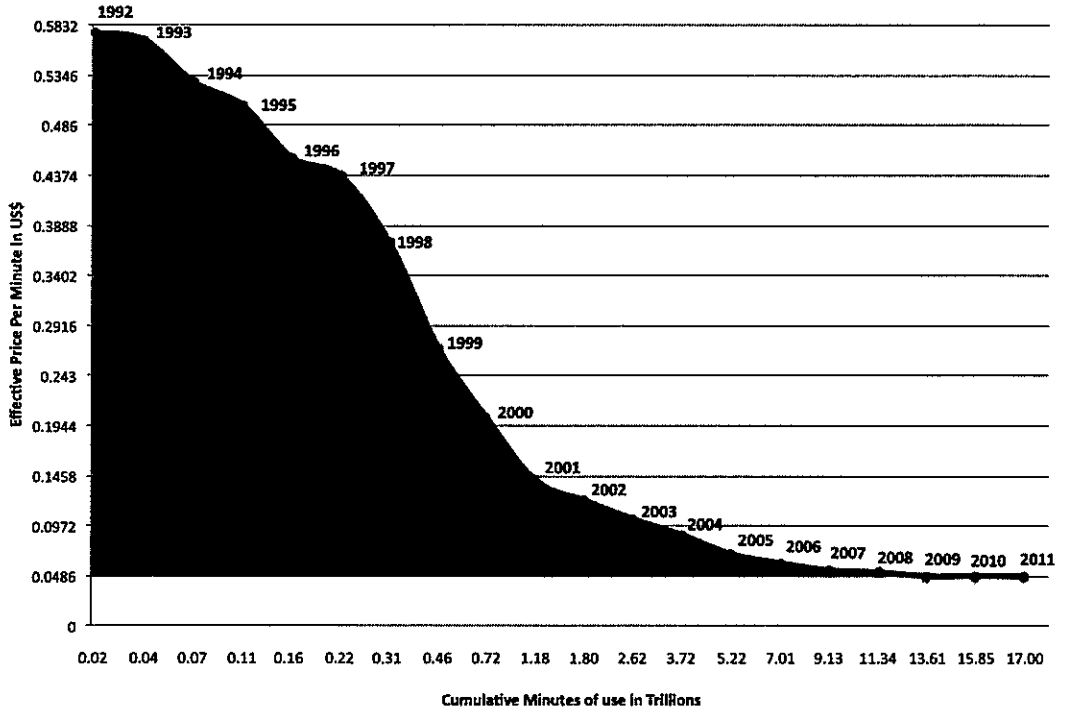
Subscribers who use voice, SMS and data are willing to pay at least the current price; that much is clear. For voice specifically, though, the true demand curve is likely to be to the right of that shown in Exhibit 20.

This warping of the demand curve arises from the diffusion effect. This effect comes from the ways in which people find new uses for their devices. Most people get a phone with a specific

reason in mind (maybe staying in touch with their kids while they're at school). But they quickly find other uses, such as texting friends and family or using the web and apps. So if there was no change from the 2000 price for wireless services, the volume of use by subscribers who joined before 2000 would have grown up to 2011 as these subscribers found new ways of using the services.

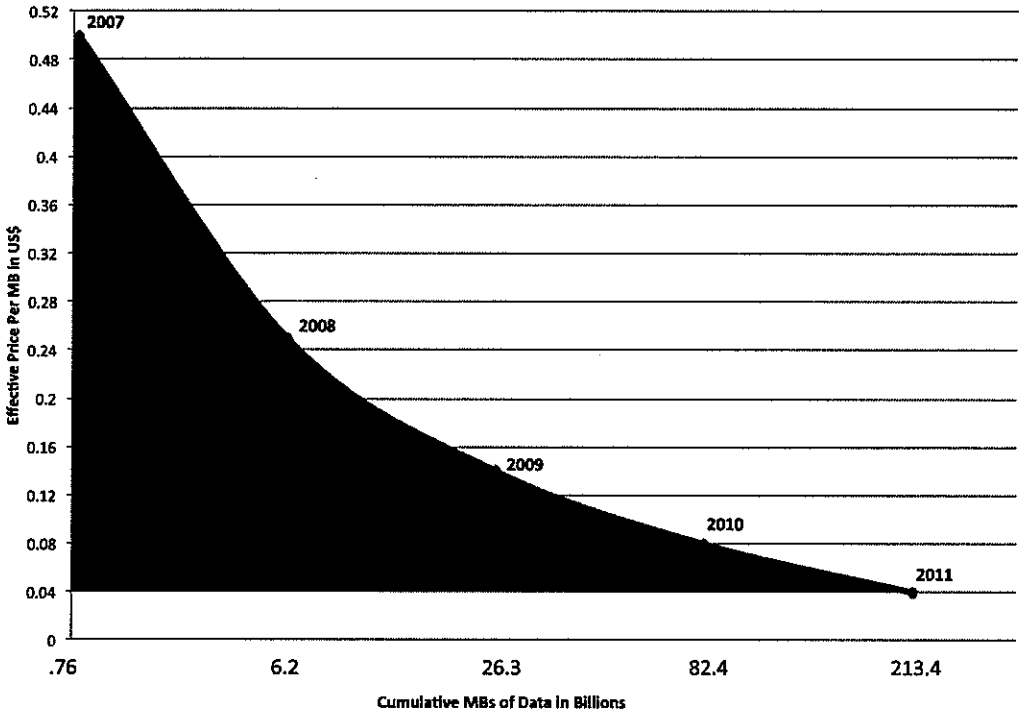
Therefore, the data point for 2000 on the current demand curve is to the right of that shown in Exhibit 20 (and the same holds true for 2007 onward in Exhibit 21 and from 2005 onward for Exhibit 22). This means that the areas under the curves of Exhibits 20, 21, and 22 represent a lower limit, and substantially underestimates the current consumer surplus.

Exhibit 20: Voice—Effective Price Per Minute and Cumulative Minutes



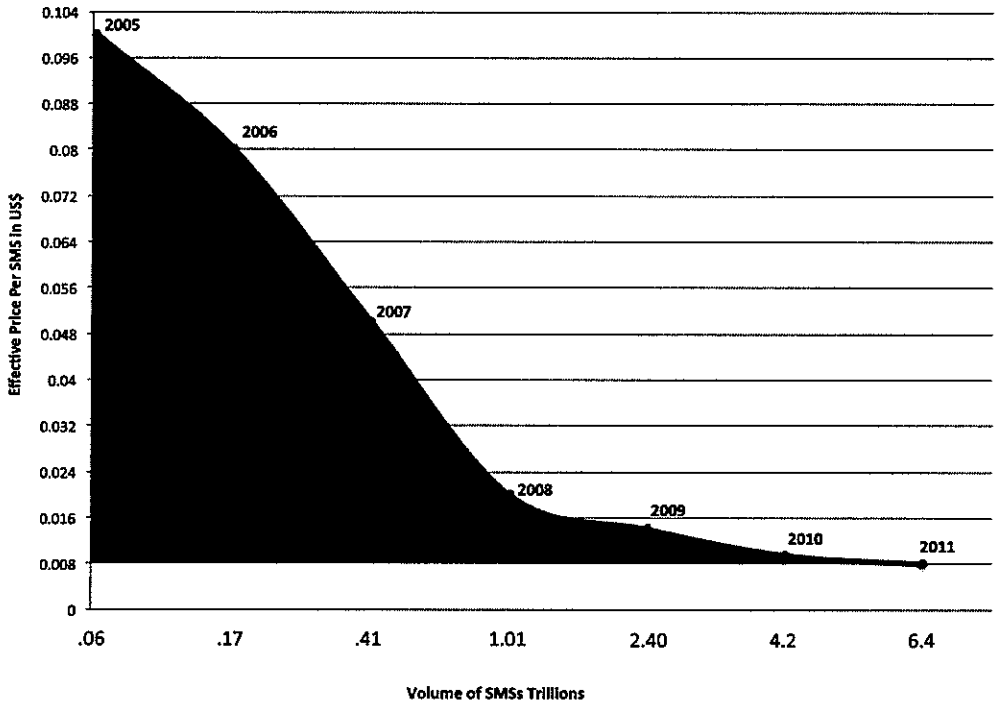
Source: Recon Analytics, Nielsen Customer Value Metrics, Q2 2011 (all years are Q2 numbers)

Exhibit 21: Data—Effective Price Per MB and Cumulative Data



Source: Recon Analytics, Nielsen Customer Value Metrics, Q2 2011 (all years are Q2 numbers)

Exhibit 22: SMS—Effective Price per SMS and Cumulative Volume of SMSs



Source: Recon Analytics, Nielsen Customer Value Metrics, Q2 2011 (all years are Q2 numbers)

The significance of the consumer surplus

The US consumer wireless surplus measures the extent to which commercial US businesses and US consumers value wireless services in excess of what they currently they pay. Is the consumer surplus a valid measurement? Is it a positive thing?

The answer to the question is fairly simple:

First, because our research on this subject for the wireless industry is original and groundbreaking, there is no research or evidence to the contrary. But, in general, such surpluses are viewed by economists as highly positive. A surplus gives consumers additional buying power, which is a powerful instrument. The gray areas under the curves in the previous three exhibits are a testament to that power.

Second, it makes sense to compare the US surplus with another similar region from around the world. The US consumer surplus would be reduced if the US wireless industry charged at EU price levels. Exhibit 23 compares mobile prices, minutes of use per subscriber per month and per capita per month, and levels of wireless penetration for the US and for the four biggest countries in the EU.

Exhibit 23: US and EU wireless services compared

	EU	US
Wireless Penetration	126.2%[22]	102.4%[23]
Outbound call price	$0.167[24]	$0.049
MOU per subscriber (outbound+inbound per month)	418	875
MOU per head of population (outbound+inbound per month)	331	857

Source: What's It Worth To You? Comparing Wireless Pricing in 14 Countries, Recon Analytics, 2011

We note the following:

- The EU wireless penetration continues to outpace the US, with the EU reaching 126.2% at the end of 2009 and the US reaching 102.4% penetration in June 2011.
- After accounting for the higher EU subscriber penetration rates, the level out bound and inbound minutes of use in the US is more than double the level seen in the EU (875 minutes versus 418 minutes).
- Average prices per minute of use in the US ($0.049 per minute) are a quarter of the EU price level ($0.167 per minute).

Therefore, although penetration might lag the EU, US users enjoy much lower prices and make substantially more use of their wireless mobile phones than EU users. As a result, the US consumer surplus per capita is substantially larger than it is for EU consumers.

TAKEAWAYS

The wireless industry is woven tightly into the economic prosperity of the United States. From its start more than two decades ago, it has grown to affect every aspect of life.

- As we outlined in this report, there are several key factors about the wireless industry that deserve note. The wireless industry:
- Is a large and vital engine, adding $146.2 billion to the US GDP in 2011
- Created an entirely new business sector—apps—that grew from almost zero to $8.2 billion in 4 years
- Is responsible for 3.8 million direct and indirect jobs in 2011, which is an increase of more than 200,000 over the past six years; this accounts for 2.6% of all US employment
- Contributed $88.6 billion in taxes, fees and surcharges in 2010
- Created significant value from newly auctioned off wireless spectrum with US GDP increasing by $3.3 billion and 7,000 jobs being added for every 10MHz of additional spectrum
- Is an important ingredient in productivity gains in the US, accounting for $33 billion in 2011, and more than $1.4 trillion over the next decade
- Enables $680 million in annual stimulus for consumers and businesses (in the form of the employee-liable discounted plans)
- Produced a consumer surplus of $502.7 billion in 2011

[1] Source: Industry revenue data compiled from publicly available sources and analyzed by Recon Analytics.
[2] Source: International Monetary Fund, World Economic Outlook Database, September 2011.
[3] Source: Bureau of Economic Analysis, Industry Data, http://www.bea.gov/scb/pdf/2011/12%20December/1211_indy_accts_Tables.pdf, Table 1
[4] Based on Recon Analytics analysis of Bureau of Labor Statistics data and publicly available data of tax rates, revenues, etc.
[5] Source: Recon Analytics analysis of publicly available data.
[6] Source: UBS Investment Research, Wireless 411: Version 43.0, 7 March 2012
[7] Global retained value is $195.5 billion, which is reflected in the second column of Exhibit 2, and in the amounts in Exhibit 3.
[8] http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201112.pdf
[9] Source: http://www.labor.ca.gov/panel/pdf/multipliers.pdf
[10] Source: http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/Input-Output/IOTIIMults9804
[11] 2003 EPI document
[12] It is, nonetheless, interesting to note that using the 4.64 multiplier from the California Department of Labor would push the number of induced jobs to more than 11,800,000.
[13] Source: http://mywireless.org/50-state-ranking-2010/
[14] Based on the induced employment figure of 3.8 million people
[15] For example: The impact of telecommunications on economic growth in developing countries, Waverman, Meschi and Fuss, March 2005, Vodafone Policy Paper 2; and Telecommunications Infrastructure and Economic Growth, Sridhar and Sridhar, National Institute of Public Finance and Policy, Working Paper 14, 2004
[16] Source: Bureau of Labor Statistics Data Retrieval, http://www.bls.gov/webapps/legacy/cpsatab1.htm
[17] Source: Nielsen's Customer Value Metrics
[18] The consumer surplus was $414.6 billion 5 years ago.
[19] There are a million gigabytes in a petabyte. A petabyte of data would hold 13.3 years of HD video, according to Mozy. The nearly 59 petabytes of data used in the US in 2010 would hold all of the written works of mankind since recorded history started, plus still have room for another 9 petabytes.
[20] For our purposes, the term "consumer" encompasses early adopters that usually spend more on wireless services as well as marginal consumers that may be tempted by the current prices.
[21] One note on the calculations and numbers: These types of calculations are not undertaken very often. The main reason is that the numbers are hard to get. Examples such as the ones we cite are hard to come by, so we have used our best judgment, based on decades of experience. In addition, we have been very conservative in how we use the calculations and the resulting numbers.
[22] Source: Commission for Communications Regulation, Irish Communications Market Quarterly Key data Report, Q4 2009, page 52, Figure 4.1.3 – European Penetration rates.
[23] Source: CTIA Advocacy: http://www.ctia.org/advocacy/research/index.cfm/aid/10323
[24] For every one outbound minute in the EU, there are roughly 1.5x inbound minutes.