Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
International Comparison Requirements Pursuant to the Broadband Data Improvement Act	)	
	)	
International Broadband Data Report	)	GN Docket No. 14-126
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	)	

FOURTH REPORT

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By the Chief, International Bureau:

TABLE OF CONTENTS

Heading Paragraph #

I. INTRODUCTION 1
II. BACKGROUND 2
III. DISCUSSION 11
A. Fixed Broadband Coverage (European Union (EU) countries) 12
B. Broadband Subscription (OECD Countries) 19
C. Fixed Broadband Speeds 23
D. Broadband Pricing Plans 29
E. Other Relevant Information and International Developments 42
IV. CONCLUSION 61
V. PROCEDURAL MATTERS 62
APPENDIX A: Country List
APPENDIX B: Broadband Price Dataset
APPENDIX C: Broadband Price Discussion and Tables
APPENDIX D: Demographics Dataset
APPENDIX E: Market and Regulatory Background
APPENDIX F: Comparing International Fixed Broadband Speeds
APPENDIX G: Broadband Deployment (European Union (EU) countries)

I. INTRODUCTION

1. This is the International Bureau's fourth International Broadband Data Report (IBDR or Report). Required under Section 103(b) of the Broadband Data Improvement Act (BDIA), the IBDR provides comparative international information on broadband services.[1] Through the presentation of this

[1] *See* 47 U.S.C. § 1303(b).

data, we have the opportunity to compare the state of broadband deployment in the United States and the country's broadband speeds and prices to the international community. International data can serve as useful benchmarks for progress in fixed and mobile broadband deployment and accessibility. The available international broadband data, though not fully comparable to data on the United States, continue to suggest that the United States may lag behind a number of other developed countries with regard to some broadband metrics, and leads in some other metrics. On the pages that follow and in the appendices, we present a number of data points, including fixed broadband deployment data in the United States and European Union (EU) with a focus on rural areas, advertised and actual fixed broadband speeds in 40 countries around the world, including the United States, and broadband prices (both fixed and mobile plans) across the same 40 countries.[2] As with previous Reports, we also have gathered demographic and regulatory/market data for the countries (to the extent available) included in this Report. The majority of this information is presented in the appendices to this Report.

II. BACKGROUND

2. The BDIA requires the Commission to include in its annual broadband progress report "information comparing the extent of broadband service capability (including data transmission speeds and price for broadband service capability) in a total of 75 communities in at least 25 countries for each of the data rate benchmarks for broadband service utilized by the Commission to reflect different speed tiers."[3] The BDIA directs the Commission to assess broadband capability in international communities comparable to the communities in the United States with respect to population size, population density, topography, and demographic profile.[4] The Commission is also directed to include "a geographically diverse selection of countries" and "communities including the capital cities of such countries."[5] The Commission must "identify relevant similarities and differences in each community, including their market structures, the number of competitors, the number of facilities-based providers, the types of technologies deployed by such providers, the applications and services those technologies enable, the regulatory model under which broadband service capability is provided, the types of applications and services used, business and residential use of such services, and other media available to consumers."[6] We comply with the BDIA's requirements, and include the highlights of our findings in this Report and

[2] The countries we have selected for this Report are largely the same as those we included in the *Third IBDR* (*International Comparison Requirements Pursuant to the Broadband Data Improvement Act, International Broadband Data Report*, IB Docket No. 10-171, GN Docket 11-121, Third Report, 27 FCC Rcd 9884 (2012) (*Third IBDR*)). We have included Brazil and India, two influential economies in their respective regions that have rapidly growing broadband markets in this Report, and we have dropped three countries (Cyprus, Latvia and Romania), which were only partially included in the *Third IBDR* – price and speed data had not been collected for them previously. The *Third IBDR*, released in 2012, presented mostly 2011 data. This report includes data from 2012 and 2013, as available (and 2014, with regard to certain broadband pricing data as well as market and regulatory information).

[3] 47 U.S.C. § 1303(b)(1). Several terms that we use in this Report, such as "broadband," "advanced telecommunications capability," and "availability" may have specialized meanings in other contexts, and nothing in this Report should be read to suggest that our use of terminology here is intended to affect the meanings of other specialized terms in the context of the *2015 Broadband Progress Report* or in other proceedings. *See, e.g., Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket Nos. 14-126, Broadband Progress Report and Notice of Inquiry on Immediate Action to Accelerate Deployment, FCC 15-10, para. 1 note 1 (rel. Feb. 4, 2015) (*2015 Broadband Progress Report*). The *2015 Broadband Progress Report* incorporates by reference this IBDR to fulfill the obligation imposed by Section 103(b) of the BDIA.

[4] *Id.* § 1303(b)(2).

[5] *Id.*

[6] *Id.* § 1303(b)(3).

present the detailed data and additional discussion in the relevant appendices.

3. In this Report, we focus our efforts on analysis of broadband deployment, speed, and price research. Following past practice and the BDIA's goal of developing a geographically diverse and detailed set of data on international broadband, we use two criteria to guide the selection of countries and communities for our research. The first is *inclusivity*: We attempt to capture as full an international profile as possible, embracing communities from all parts of the world, while also focusing on those countries that have more developed broadband markets. The second is *data availability*: We include only communities for which a substantial set of relevant information is available. These two criteria result in a dataset that exceeds the statutory minimum requirements of 25 countries and 75 communities comparable to U.S. communities, and includes communities from almost all nations with the most broadband deployment.[7]

4. The criteria we have used for choosing communities enable us to make reasonable international comparisons. In instructing us to include a "geographically diverse selection of countries,"[8] we do not believe that Congress intended for us to use a random sample of countries. Rather, the BDIA requires the Commission to choose communities that are similar to U.S. communities, which suggests communities with higher income and education levels, and better broadband service, than communities in poorer, less developed countries. To that end, we have focused our research on 40 countries, including the United States, all OECD countries, and two new countries, Brazil and India, which have growing broadband (fixed and mobile) markets.[9]

5. ***Comments and Data Sources***. The *2015 Broadband Progress Notice of Inquiry* sought comment on how we could make improvements to the IBDR.[10] Though we received no comments regarding potential improvements to the IBDR, Professor Christopher Yoo of the University of Pennsylvania submitted a research paper comparing United States and European broadband deployment in 2011 and 2012.[11]

6. As noted above, the BDIA requires that the Commission gather information concerning "the extent of broadband service capability (including data transmission speeds and price for broadband service capability)" in foreign communities.[12] As in previous years, we understand the responsibility of gathering information on "the extent of broadband service capability" to require an inquiry into the deployment and availability of broadband service, which in turn includes factors such as price, quality,

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[7] There are some differences in the countries included for each dataset contained in this Report. Those differences are primarily due to data availability. *See* Appendix A.

[8] 47 U.S.C. § 1303(b)(2)(A).

[9] *See e.g.*, "Mobile Data Use Doubles in India," Total Telecom, May 22, 2013, available at http://www.totaltele.com/view.aspx?ID=481392; "Brazil Hits 100mn Broadband Accesses Milestone in April, Says Telebrasil and Telefonica Head," BNAmericas, May 23, 2013, available at http://www.bnamericas.com/news/telecommunications/brazil-hits-100mn-broadband-accesses-milestone-in-april-says-telebrasil-and-telefonica-head.

[10] *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket No. 14-126, Tenth Broadband Progress Notice of Inquiry, 29 FCC Rcd 9747, 9771, para. 51 (2014) (*Tenth Broadband Progress Notice of Inquiry*).

[11] Comments of Christopher S. Yoo, John H. Chestnut Professor of Law, Communication, and Computer & Information Science, Founding Director of the Center for Technology, Innovation and Competition, University of Pennsylvania. (Prof. Yoo comments).

[12] 47 U.S.C. § 1303(b)(1).

and adoption.[13] In preparing this IBDR, we have reviewed a number of data sources and analyzed various rankings that compare broadband deployment and service capability in the United States and other countries.[14]

7. With respect to broadband coverage and subscription, the best currently available data comparing the United States to other countries is from the OECD, which collects data on broadband deployment, subscription, and usage and publishes rankings of its respective member countries. The European Union has published studies of fixed broadband coverage for 2011 and 2012. We compare this broadband coverage information for the European Union with the United States, including coverage by households and by rural and non-rural areas in Appendix G.

8. To comply with the BDIA's requirement to present information on "data transmission speeds" for broadband services, we use publicly available speed data sources and present our findings in Appendix F. To present data on both advertised and actual broadband speeds in different countries, we use the publicly available raw speed test data (for fixed broadband in 2012 and 2013) provided by Ookla, proprietor of speedtest.net, on their Net Index site.[15]

9. The previous IBDRs have compared broadband prices using exchange rates and purchasing power parity (PPP), but previous inquiries also have raised the question of whether prices should be compared to GDP per capita.[16] In this Report, we continue to use exchange rate and PPP as the bases for our price comparison.[17] We find that a comparison of prices to GDP per capita could have some value in demonstrating affordability across countries, but uneven income distribution might make comparisons less valuable. Median household income may be a better measure, but lack of comparable cross-country data prevents us from conducting such analysis.[18] With respect to pricing plans, we present data and discussion for broadband plans offered in 2012, 2013, and in some cases 2014, in Appendix C,

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[13] *Cf. 2015 Broadband Progress Report* at para. 65, Section IV.A.

[14] Differences between which countries are included for each dataset in this Report are primarily due to data availability. *See* Appendix A *infra*.

[15] *See* Appendix F for our discussion of the speed data.

[16] *International Comparison Requirements Pursuant to the Broadband Data Improvement Act, International Broadband Data Report*, IB Docket No. 10-171, Second Report, 26 FCC Rcd 7378, 7386 (2011) and *Third IBDR*, 27 FCC Rcd 9884, 9897. *See also Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket No. 12-228, Ninth Broadband Progress Notice of Inquiry, 27 FCC Rcd 10523, 10543, para. 53 (2012) (*Ninth Broadband Progress Notice of Inquiry*) (describing Commission methodology for comparing broadband prices and asking whether prices should be compared to GDP per capita). We note that no comments were filed in response to the *Ninth Broadband Notice of Inquiry*'s questions about comparisons of broadband prices. In addition, the Commission has not issued a Report arising out of the *Ninth Broadband Notice of Inquiry*.

[17] For further discussion of PPP, *see* Appendix C.

[18] With respect to available pricing data sources, we note that Google publishes open source broadband price data (which includes both fixed and mobile prices for 106 countries). *See* Google, Policy by the Numbers, http://policybythenumbers.blogspot.com/2014/03/international-broadband-pricing-study.html. We also note that Google has recommended Commission use of this data in connection with the preparation of the FCC's IBDRs. *See* Google Inc., reply comments at 2-3 filed in response to *Ninth Broadband Progress Notice of Inquiry*. Google's extensive price data is gathered through provider website research, the same way that we have gathered data on pricing plans for this Report. When we began researching prices for this Report in fall 2012, Google's price dataset was already a few months older, and our own data provided more detailed information on bundle pricing and promotional discounts than Google's dataset. We therefore continued with our original research. In the future, however, provided that Google's dataset is updated on a cycle that corresponds with preparation for and release of the IBDR, we may consider using Google's dataset as our primary source.

for major fixed and mobile broadband providers (typically at least three of each) in each of the 40 countries.[19] We provide the raw price data (consisting of price points for thousands of plans) in Appendix B, available only online on the FCC website.

10. Further, we present updated demographic data for the 39 surveyed foreign countries on a sub-national basis, including the latest figures for such indicators as population size, population density, gross domestic product (GDP), and educational attainment in Appendix D of this Report.[20] Finally, we provide a detailed update of regulatory and market developments since our last Report for the surveyed countries in Appendix E.

III. DISCUSSION

11. In this section, we present highlights of our findings. Our full presentation and discussion of the data, including tables, is in the relevant appendices.

A. Fixed Broadband Coverage (European Union (EU) countries)

12. In Appendix G, we compare broadband deployment in the United States and Europe[21] and find that high-speed broadband, as defined below, is more widely deployed in the United States. According to data from both 2011 and 2012, the broadband coverage gap between rural and non-rural areas remains large across Europe and the United States.[22]

13. Like the United States, the EU is tracking its progress in extending broadband coverage to all of its citizens.[23] One of the EU's Digital Agenda objectives is to provide "Next Generation Access" (referred to herein as "high-speed broadband"), meaning broadband speeds of at least 30 Mbps, by 2020.[24]

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[19] We gathered information on prices and features from the providers' websites (*e.g.*, monthly fees, activation charges, speeds, usage limits, promotional discounts, equipment charges) for stand-alone and bundled broadband packages.

[20] Using this sub-national data, one can draw comparisons across both international and domestic cities states and regions. As is the case in the United States, intra-country variations are greater than the inter-country differences. In particular, differences in population density, dispersion, and income may create significant variations. The lower population density and greater size of the United States present unique challenges. We did not have sub-national demographic data for Brazil, Hong Kong, India, and Singapore. *See* Appendix A. In this year's Report we changed the reported GDP data from current year dollars to a measure fixed in 2005 dollars. We made this change so that historical data did not vary from year to year depending on changes in exchange rates.

[21] The European study countries include Switzerland, Norway, and Iceland, plus the 28 EU member countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom. Croatia, which joined the EU on July 1, 2013, is included in the study's 2012 data but was not included in the study's 2011 data. As of July 1, 2013, the EU has 28 member countries with the accession of Croatia. As the European study was compiled prior to this date, for purposes of this Fourth IBDR, EU countries refer to the then-existing 27 members plus the three additional countries just noted.

[22] In this Report, we compare 2011 and 2012 data on broadband coverage in the United States and in the EU countries. As of November of 2014, the EU has not reported its 2013 coverage data. The most recent coverage data in the United States, including the data for 2013, can be found in the *2015 Broadband Progress Report.*

[23] *See 2015 Broadband Progress Report* at para. 6, Section I ("we also separately conclude that broadband is not being deployed in a reasonable and timely fashion because it is not yet available to the majority of rural and Tribal Americans and not becoming available quickly enough").

[24] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A Digital Agenda for Europe, 2010, available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0245:FIN:EN:PDF. Another Digital Agenda objective is to provide all EU citizens with basic broadband coverage (at least 144 kbps download speed) by the end of 2013.

For purposes of the comparison of high-speed broadband, we use the SBI[25] speed data for 25 Mbps, which most closely matches the 30 Mbps threshold in the European study.[26] Despite this difference, we think the comparison remains apt.[27]

14. In 2013, the European Commission (EC) issued a study (EU study) on broadband coverage in Europe in the years 2011 and 2012.[28] The EU study includes 30 countries (EU study countries) for 2011 and 31 countries for 2012 and data at a sub-national level – corresponding to counties, departments, or provinces.[29] The sub-national data enable us to determine broadband capability in international communities comparable to U.S. communities with respect to population size, population density, topography, and demographic profile, as called for by the BDIA.[30]

15. The 2011 and 2012 EU data show that, by the end of 2011, high-speed broadband was available to just over 50 percent of those homes. By the end of 2012, high-speed broadband reached 54 percent of total households in the EU study countries. The study also shows that broadband coverage lags in rural areas.[31] At the end of 2011, in EU study rural areas, high-speed broadband reached only 9 percent of total households.[32] By the end of 2012, that number had increased to 12 percent. To reach the EU's 2020 goal, the EU study concludes that considerable investment in rural areas will still be necessary.[33]

16. In the United States, different statistics are collected, but general comparisons can still be made.[34] In 2011, 72 percent of total U.S. households had high-speed broadband coverage. In 2012, high-

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Appendix G contains our discussion of the basic broadband coverage (including differences between the U.S. and European definitions of "basic broadband)."

[25] Since July 2009, the National Telecommunications & Information Administration (NTIA), in coordination with the Commission, has been collecting data concerning where broadband is deployed across the United States as part of the State Broadband Initiative (SBI) Grant Program. *See* Department of Commerce, NTIA, State Broadband Data and Development Grant Program, Docket No. 0660-ZA29, Notice of Funds Availability, 74 Fed. Reg. 32545 (July 8, 2009)at http://www.ntia.doc.gov/files/ntia/publications/fr_broadbandmappingnofa_090708.pdf. For purposes of this Report, we call this data "SBI Data."

[26] Chairman Wheeler has said that a "25 Mbps connection is fast becoming 'table stakes' in 21st century communications" and that today "about 80 percent of American homes have access to a broadband connection that delivers 25 Mbps or better," Prepared Remarks of FCC Chairman Tom Wheeler, "The Facts and Future of Broadband Competition", 1776 Headquarters, Washington, D.C., September 4, 2014, available at https://apps.fcc.gov/edocs_public/attachmatch/DOC-329161A1.pdf.

[27] *See* http://www.intel.com/content/dam/www/public/us/en/documents/case-studies/mission-possible-evolutionary-approach-to-docsis-whitepaper.pdf (accessed June 5, 2013).

[28] Broadband Coverage in Europe in 2012: Mapping Progress Towards the Coverage Objectives of the Digital Agenda, A Study prepared for the European Commission DG Communications Networks, Content & Technology, European Union, 2013, available at http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=3647.

[29] The population of these sub-national areas (called NUTS-3 level units) range from 150,000 to 800,000.

[30] 47 U.S.C. § 1303(b)(2).

[31] In the EU's 27 countries, 24 percent of the population lives in NUTS-3 regions classified as "predominantly rural," according to Europa statistics. According to U.S. census block data, the U.S. rural share of the population is similar: 19.3 percent of the U.S. population lives in rural areas.

[32] Statistics for 2011 are from the 2013 report. A redefinition of "rural" in the 2013 report caused a revision of the statistics for 2011.

[33] *See* EU study, p. 12.

[34] Because the European data in its study was from December 2011 and 2012, we also use U.S. data from December 2011 and 2012 for comparison. The U.S. data for December 2011 and December 2012 discussed here is the same

speed broadband coverage expanded to 80 percent of all U.S. households.

17. *Rural Coverage*. Between December 2011 and December 2012, Europe's high-speed broadband coverage grew from 55 to 61 percent for non-rural households and from 8 to 12 percent for rural households. The gap between non-rural and rural thus increased from 47 percentage points in 2011 to 49 percentage points in 2012. Between December 2011 and December 2012, high-speed broadband coverage in the United States increased from 81 to 89 percent for non-rural households and from 35 to 45 percent for rural households. The gap between non-rural and rural fell slightly from 46 percentage points to 44 percentage points. Although the gap between rural and non-rural high-speed broadband coverage is only a bit smaller in the United States than it is in the EU study countries, the absolute level of coverage of high-speed broadband is much higher in the United States in both rural and non-rural areas, and the United States is making slightly increased progress in closing the urban-rural gap for high-speed broadband.

18. ***Coverage Ranking by Country***. In 2011, with an overall 72 percent high-speed broadband coverage, the United States ranked higher than 24 of the 30 EU study countries. In 2012, with an overall 80 percent high-speed broadband coverage, the United States ranked higher than 25 of the 31 EU study countries. Similarly, the EU study includes data for 2011 and 2012 on the status of rural high-speed broadband coverage by country. Appendix G discusses in detail status of rural high-speed broadband coverage across the EU study countries and the United States. Only four EU countries (Cyprus, Belgium, Malta, and Poland) had higher rural high-speed broadband coverage than the United States in 2011, and six EU countries (Cyprus, Belgium, Luxembourg, Malta, Netherlands and Switzerland) had higher rural high-speed broadband coverage than the United States in 2012.

B. Broadband Subscription (OECD Countries)

19. The OECD's subscription metrics define transmission speeds of at least 256 kbps in one direction to be "broadband service" for both fixed (wired) and wireless Internet access.[35] This is considerably slower than the 25 Mbps download/3 Mbps upload speeds which the Commission considers as "advanced telecommunications capability" or "broadband" for purposes of the *2015 Broadband Progress Report*.[36] In this section of the Report, we use the OECD's broadband definition to present subscription statistics from OECD countries.

20. As the most populous member of the OECD, in terms of sheer number of wireless broadband subscribers, the United States ranked first out of OECD's 34 countries with 316,440,000 subscriptions with data plans in 2013, (compared to 280,153,000 subscriptions for the first place rank in 2012). By comparison, Japan ranked second with 142,595,498 wireless broadband subscriptions in 2013 (108,948,995 in 2012).[37] The United States also ranked first in 2013 in the sheer number of fixed (wired) broadband subscriptions with 93,618,000 subscribers (90,006,000 subscriptions in 2012). Again, by comparison, Japan ranked second with 35,785,203 fixed (wired) subscriptions (and 35,295,337 fixed

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broadband mapping deployment data the Commission relied on in the *2015 Broadband Progress Report* to present December 2011-2012 fixed deployment trends. *2015 Broadband Progress Report* at para. 69, Tbl 7. However, the Commission presented estimates for different speed tiers (3 Mbps/768 kbps, 10 Mbps/768 kbps, and 25 Mbps/3 Mbps).

[35] *See* OECD Broadband Portal, Broadband Methodology, http://www.oecd.org/sti/broadband/broadband-methodology.htm. OECD's definition of "fixed (wired) broadband includes DSL, Cable, Fiber, and other wired technologies such as broadband over powerline. OECD's definition of "wireless" broadband includes terrestrial fixed wireless, terrestrial mobile wireless, and satellite. *See* http://www.oecd.org/document/46/0,3746,en_2649_34225_39575598_1_1_1_1,00.html.

[36] *See 2015 Broadband Progress Report* at para. 3.

[37] OECD Broadband Portal, Table 1(d)(2) (Dec. 2012 and 2013).

(wired) subscriptions in 2012).[38]

21. The OECD's 2013 subscription data also rank countries based on technology.[39] With respect to subscription in terms of the percentage of population, the United States ranks 16th out of 34 countries for overall fixed (wired) broadband subscriptions, with 29.8 broadband subscriptions per 100 inhabitants (15th out of 34 countries, with 28.8 broadband subscriptions per 100 inhabitants in 2012).[40] Breaking the fixed (wired) subscription numbers down by technology, the U.S. ranking in these surveys ranges from 25th out of 34 in DSL subscription[41] to fourth out of 34 in cable modem subscription,[42] to 16th out of 34 in fiber-to-the-home (FTTH) subscription.[43] The United States ranks seventh overall out of the 34 OECD countries in total wireless broadband subscriptions, with 100.7 broadband wireless subscriptions per 100 inhabitants[44] (by comparison, Finland ranks first in 2013 with 123.8 wireless broadband subscriptions per 100 inhabitants[45]). The United States ranks sixth out of 34 countries in 2012 with 89.8 broadband wireless subscriptions per 100 inhabitants.[46]

22. As the OECD notes, subscription is measured using different indicators and different reference dates across various countries.[47] Further, where a particular country falls in these rankings may be influenced by population density and dispersion, income, and other factors. As noted in the *Third IBDR*, the United States has about one-quarter the population density of Europe, one-tenth that of Japan, and one-fifteenth that of South Korea.[48] We recognize the need for better data on these issues and have initiated efforts to improve available data, both domestically and internationally. In the last section of this Report, we provide an update on international efforts to improve data on broadband.[49]

C. Fixed Broadband Speeds

23. The BDIA requires the Commission to gather information on "data transmission speeds" for broadband services.[50] *Speed* is a quantitative description of the information transfer rate of a broadband Internet access service and can be defined as "data signaling rate," as expressed in bits per

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[38] OECD Broadband Portal, Table 1(d)(1) (Dec. 2012 and 2013).

[39] We reproduce the OECD's most recent broadband subscription rankings in Appendix E.

[40] OECD Broadband Portal, Table 1(d)(1) (Dec. 2012 and 2013).

[41] *Id*. The U.S. ranking in this category remains unchanged from last year.

[42] *Id*. The U.S. ranking in this category dropped one from last year, when the United States ranked third in cable modem subscribers.

[43] *Id*. Last year the United States ranked 15th in FTTH.

[44] OECD Broadband Portal, Table 1(d)(2) (December 2013). In the *2015 Broadband Progress Report*, the Commission did not include mobile or satellite in its broadband deployment determination under section 1302(b) and considered fixed wireless to be a fixed service, much like cable or DSL. *See 2015 Broadband Progress Report* at para. 7.

[45] OECD Broadband Portal, Table 1(d)(2) (December 2013).

[46] OECD Broadband Portal, Table 1(d)(2) (June 2012).

[47] *See* OECD Broadband Portal, notes for Tables 1(d)(1) and (2). To elaborate, comparisons between countries may not be precise when data is collected at different times or when countries use different methods of determining what constitutes a broadband subscription.

[48] *Third IBDR*, 27 FCC Rcd at 9892-93 para. 22, citing USTelecom comments.

[49] *See* Section III.E., para. 54, *infra*.

[50] BDIA § 103(b); 47 U.S.C. § 1303(b).

second.[51] Speed is an important indicator of the nature of broadband service. The *2015 Broadband Progress Report* determines the appropriate speed benchmark to be 25 Mbps for downloads and 3 Mbps for uploads, finding that "[t]rends in deployment and adoption, the speeds that providers are offering today, and the speeds required to use high-quality video, data, voice, and other broadband applications" warrant a change from the Commission's prior 4 Mbps down/1 Mbps up broadband benchmark.[52]

24. As with our previous IBDRs, we have gathered data on advertised speed from broadband providers' websites for this Report. We gathered advertised speeds from the publicly accessible websites of fixed broadband providers in 40 countries, and performed an analysis of actual speed data based on the publicly available data provided by Ookla, proprietor of speedtest.net, on its Net Index site.[53] In this report, we used Ookla data for 2012 and 2013. The 2012 data cover February 1 to December 5, including 40 countries with 3.8 million observations for 14,652 cities. For 2013, the data include 5.1 million observations for 16,372 cities from January 1 to December 15.

25. Appendix F contains our discussion of the actual fixed broadband speed data, which examines the data on both a country and city basis. We present fixed broadband speeds in 40 countries using Ookla data on actual speeds, as well as Ookla customer surveys of advertised speeds.[54] Using the aggregated data, we ranked 40 countries based on a weighted average of the city mean speeds, with weights determined by the number of tests per city, and using a stratified sample technique to offset changes in average speeds based on differences in city participation across countries.[55] We also compared the Commission's most recent Measuring Broadband America data for fixed broadband to the European Commission's actual broadband speed measurement data for Europe.

26. Based on the Ookla data, the United States ranked 25th of 40 countries in 2012 in terms of actual download speeds (14.50 Mbps) when weighted by sample size. In 2013, the United States ranked 26th with an average speed of 18.67 Mbps. Using the stratified sampling technique,[56] the United States ranked 26th (14.7 Mbps) in average weighted actual download speed in 2012. The ranking of the United States improved to 25th in 2013 using stratified sampling, with an average weighted download speed of 19.55 Mbps. We also compared the United States at the state level with the other IBDR countries in 2012 and 2013. Eight states appeared in the top quartile in 2012, a decrease of one from 2011. There were again eight states in the top quartile in 2013. The number of states in the bottom quartile was 13 in 2012 and 2013.

27. The Ookla shortfall index, or the median percentage difference between advertised and actual speed, remained stable in the United States, up slightly from 6.8 percent in 2011 to 6.9 percent in 2012. This number rose to 7.1 percent in 2013. Though this metric (which is based on self-reported data

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[51] *See Consumer and Governmental Affairs Bureau Seeks Comment on "Need for Speed" Information for Consumers of Broadband Services*, Public Notice, DA 11-661, n.1 (April 11, 2011).

[52] *2015 Broadband Progress Report*, para. 3.

[53] Since January 2008, Ookla has collected data on over 6.5 billion speed tests. *See* https://www.ookla.com/. Ookla's Net Index is available at http://www.netindex.com/.

[54] The Ookla data in our study consists of only fixed broadband connections. Mobile data is not included in the dataset we obtained from Ookla.

[55] We use sample weights (*i.e*. the number of tests taken) instead of population weights (population in a city). The advantage of using sample weights is that it puts greater weight on speed numbers when they are generated by more tests rather than a few tests. Using population weights would not achieve this.

[56] A stratified sampling approach divides the sample of cities into different non-overlapping bins according to their population level, and then draws a sample from each bin. If large cities have inherently different broadband characteristics from smaller and sparsely populated cities, then a stratified sample will achieve greater precision than an aggregate ranking.

from consumers) suggests that actual speeds do not typically meet or exceed advertised speeds in the United States (though to a lesser extent than most of the other countries surveyed), the Commission's most recent Measuring Broadband America report suggests otherwise.[57] Moreover, in the United States, broadband providers appear to be more effective than European providers in delivering (or exceeding) promised broadband speeds to consumers when comparing results of hardware-based speed tests.

28. In 2011, while jitter in the United States increased (as measured by Ookla), latency remained fairly constant, and packet loss decreased to 2.1 percent in 2012 from 3.4 percent in 2011.[58] In 2013, however, two of these metrics showed a reduction in performance, with jitter moving from 35.00 ms to 39.41 ms (ranking 35th), and latency from 75.49 ms to 80.33 ms (ranking 27th), though performance with respect to packet loss increased with packet loss decreasing to 1.39 percent, ranking fifth. A more detailed look at state measurements shows wide variations between states.[59]

D. Broadband Pricing Plans

29. The BDIA directs the Commission to collect information regarding the price of broadband service capability.[60] We recognize that the complexity in the pricing of residential broadband services makes any empirical analysis difficult. The features and quality of broadband service vary across countries and providers; service is often offered under a multi-part pricing scheme;[61] and broadband is frequently purchased as part of a bundle of services.[62] When broadband is bundled with other services, such as telephone or video service, it becomes even more difficult to identify the price of the broadband service. Promotional offers further complicate comparisons. In our research, we observed that broadband offerings around the world vary with respect to download and upload speeds; type of technology used to deliver broadband services; limitations on use, including limits on upload and download volumes; determinations of use limits (download traffic v. a combination of upload and download traffic v. download traffic at peak/non-peak usage times); and consequences of exceeding usage limits (*e.g.*, access speed reductions, surcharges, service cut-off).

30. In pursuit of a more comprehensive dataset to enable price comparisons, we gathered a dataset of publicly available advertised pricing information for residential broadband services in 40 countries (including the United States), most of which are members of the OECD. Our research this year generated a much richer dataset than those included previous *IBDRs*. In Appendix C, we list 1856 fixed plans for year 2012 and 2174 plans for year 2013. We list 2007 mobile plans for year 2012 and 2881

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[57] *2014 Measuring Broadband America Fixed Broadband Report: A Report on Consumer Fixed Broadband Performance in the U.S.*, FCC's Office of Engineering and Technology and Consumer and Governmental Affairs Bureau, rel. June 19, 2014, available at http://www.fcc.gov/reports/measuring-broadband-america-2014. This report found that ISPs (*i.e.*, those surveyed) serving the United States provide 101 percent of advertised speeds.

[58] Latency (also known as ping) refers to several types of delays typically incurred during network data processing, and is typically measured in milliseconds. Jitter refers to the variance of latency over time, and is measured by the average deviation from the mean latency of the network. When packets of data traveling across the network fail to reach their destination, the phenomenon is termed packet loss. We discuss all three of these characteristics of network quality in more detail in Appendix F.

[59] *See* Appendix F.

[60] *See* 47 U.S.C. § 1303(b)(1).

[61] For example, the broadband service price often includes an installation charge, a monthly service fee, and possibly equipment rental charges.

[62] *See, e.g.*, Scott Wallsten, *Understanding International Broadband Comparisons: 2009 Update (Technology Policy Institute Paper)* June 2009, available at, http://ssrn.com/abstract=1434570 (discussing difficulties in comparing broadband prices due to differing characteristics of broadband services and the tendency of consumers to purchase services in bundles).

plans for year 2013.[63]

31. The fixed dataset includes a range of residential broadband offers by all major Internet service providers for these 40 countries.[64] The mobile dataset includes smartphone plans, wireless USB stick modem plans, and tablet plans offered by all major mobile providers in the surveyed countries.[65] In Appendix C, we have converted all prices to U.S. dollars based on both purchasing power parity (PPP)[66] and exchange rates.[67] Converting prices through both methods enables more meaningful comparisons.[68]

32. For each broadband service offering (both fixed and mobile), the dataset includes upload and download speeds as available, allowances on data usage, and information on the types of technology offered, including DSL, cable, fiber-to-the-home, fixed wireless, satellite, and public WiFi, for fixed services, and 3G or 4G for mobile. The dataset includes information on advertised monthly recurring charges and nonrecurring charges such as connection and modem/equipment fees, to allow for a more complete pricing analysis of each broadband Internet access service offering. The dataset includes not only advertised price but also promotional discounts such as those associated with online sign-up and longer service contracts. Data on advertised and promotional prices may be helpful for analyzing competition because advertised prices are focused on winning new customers or keeping customers who may be considering switching providers. The fixed dataset also contains a number of offers that include services, such as voice or video, which are bundled with a broadband service. The mobile dataset also contains bundle offers, typically associated with smartphone plans, which have data, voice, and messaging components. Since fixed and mobile service bundles can have a wide assortment of

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[63] In this Report, "plans" mean advertised broadband service offerings to consumers. For fixed broadband plans, we gathered the data between September 2012 and December 2013 and between September 2013 and June 2014. For mobile broadband plans, we gathered the data between September 2012 and December 2012 and between November 2013 and August 2014. Although the collection of some of the data extended into 2014, for convenience purposes we refer to the collections as "2012" data and "2013" data. We assembled the data by visiting the websites of broadband providers serving the countries and communities in our sample. Our price data reflects only what a given provider was offering at the specific point in time we accessed its website.

[64] For each of the European countries in the dataset, we obtained a list of incumbent operators and their competitors from the European Commission's 2010 report on broadband Internet access prices. *See* Broadband Internet Access Cost (BIAC), *Final Report, prepared for the European Commission, Information Society and Media Directorate-General, by Van Dijk Management Consultants*, January 2010, Brussels, Belgium, available at http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/eda/biac_2009.pdf. This was supplemented with staff research into incumbent operators and their competitors, for both European and non-European countries.

[65] *Id*.

[66] PPPs are currency conversion rates that convert to a common currency and equalize the purchasing power of different currencies. In other words, they eliminate the differences in price levels between countries in the process of conversion. *See* OECD, Statistics Directorate webpage, available at http://oecd.org/department/0,3355,en_2649_34357_1_1_1_1_1,00.html; OECD, Statistics Directorate FAQ webpage, available at http://oecd.org/faq/0,3433,en_2649_34357_1799281_1_1_1_1,00.html#1799063.

[67] Exchange rates fluctuate on a daily basis. The exchange rates (2011 and 2012) were obtained from the World Bank: Official exchange rates (LCU per U.S.$, period average), available at http://data.worldbank.org/indicator/PA.NUS.FCRF. The PPP conversion factors (2012 and 2013) we used for each country are annual rates and factors obtained from the International Monetary Fund, World Economic Outlook Database, October 2012 and 2013.

[68] Meaningful international PPP price comparisons are easier to achieve when the prices paid are for the same or similar service in each country. Since broadband service varies in terms of upload and download speeds, non-recurring charges, and promotional discounts, we have assembled data on various service attributes and associated those attributes with the price data for our international price comparisons. We believe this approach enables more useful international price comparisons.

components, these variations present additional layers of complexity for comparison and analysis.

33. *Fixed Broadband*. Our price research is based on advertised prices. With regard to unlimited stand-alone fixed broadband pricing, our research indicates that U.S. plan prices tend to be higher than those in other countries surveyed. For plans with usage limits, however, U.S. plan prices divided by the number of GB of data allowed tend to be on the lower end.

34. The United States ranked 21st least expensive out of 34 countries in 2012 for unlimited standalone broadband plans and 31st least expensive out of 33 countries in 2013. The average advertised speed of the U.S. plans for unlimited standalone broadband plans, however, increased from 7.59 Mbps (28th of 34 countries) to 10.73 Mbps in 2013 (19th of 33). For all standalone plans with advertised download speeds of greater than 15 and up to and including 25 Mbps, the average price in the United States fell from $56.50 in 2011 to $50.02 in 2012. The average price in the United States in this category increased to $59.40 in 2013. While some countries also saw their standalone broadband prices fall from 2011 to 2012, a larger relative reduction in the United States increased its ranking in 2012 from 26th least expensive to 20th least expensive (out of 32 countries) by this measure.[69] In 2013, the United States ranked 24th least expensive of the 30 countries with plans of this type.

35. For standalone broadband plans with data usage limits and taking those limits into account by calculating price per GB of data allowed, the United States was the fifth least expensive in 2012 with a price of $1.25 per GB. It improved its ranking to fourth least expensive in 2013 with a price per GB of $1.65. By comparison, in 2013, New Zealand was the least expensive at $0.66 and Finland is the most expensive at $17.18 per GB. Many of the countries that have the lowest prices have much lower usage limits, thus becoming the most expensive on a price per GB basis.

36. Another useful metric for comparing broadband prices across different countries is the cost per unit of speed. Ookla's Home Value Index, based on hundreds of thousands of survey and speed test results from speedtest.net (its web-based service), compares and ranks countries by the median cost in U.S. dollars per Megabit per second (Mbps).[70] The average weighted price per Mbps in the United States fell from $6.14 in 2011 to $5.39 in 2012, and again in 2013 to $4.30. By this metric, the United States ranked 21st least expensive out of 37 countries in 2012 and 23rd least expensive out of 37 countries in 2013, showing improvement from its 2011 ranking of 25th least expensive out of 35 countries surveyed. Bulgaria and Lithuania had the least expensive price per unit of speed for 2011, 2012, and 2013. Brazil and India were the most expensive in 2012, while India and Chile were the most expensive in 2013.

37. *Mobile Broadband*. Any discussion of mobile broadband pricing data must be prefaced with a word of caution. Mobile broadband pricing plans are complex and every country has different reporting and advertising standards. For example, advertising about the speed of the broadband appears to vary widely across countries. Most foreign carriers only list the theoretical maximum available speeds, *i.e.*, they report 100 Mbps for 4G and 42.2 Mbps for 3G and HSPA+. In contrast, in the United States, the advertised speed for a 3G plan is often 3.1 Mbps and advertised speeds for 4G plans range from 5 Mbps to 42 Mbps. Moreover, 4G/LTE networks are more widespread in the United States than in most of the countries surveyed, but the data does not reflect that a provider's 4G service may have only limited availability (*e.g.*, in portions of a few cities). Plus, 3G and 4G/LTE plans are all grouped together. Device discounts and phone plans that have to be purchased along with data plans vary widely by country as well. Phone plans associated with broadband also vary in terms of the number of voice minutes and text messages included in the plans. Also, mobile broadband can be purchased in pre-paid or post-paid plans, and we focused only on post-paid plans for purposes of this Report. Given these issues, and other limitations, meaningful international comparisons of mobile pricing are extremely difficult. We provide

[69] Although there are 40 comparison countries in total, not all countries will be represented in every plan type and/or speed tier.

[70] *See* http://www.netindex.com/value for more information.

the data we have gathered on mobile broadband plans in the Appendix C. For the 40 countries we surveyed, the 2012 dataset includes 973 smartphone plans, 579 stick modem plans, and 455 tablet plans. The 2013 dataset includes 1,598 smartphone plans, 637 stick modem plans, and 646 tablet plans.

38. *Smartphone plans*. For smartphone plans with usage limits of less than 1 GB per month and limited voice minutes, the U.S. average monthly price of $60.74 was the second most expensive plan (out of 35 countries) for 2012, with an average usage limit of 0.3 GB. In 2012, Estonia had the lowest average monthly price at $4.48 for a 0.1 GB plan, and Greece had the highest at $66.57 with an average usage limit of 0.53 GB. Italy had the lowest average monthly price in 2013 at $5.79 with 0.25 GB of data, and Brazil had the highest average monthly price at $109.89 with an average usage limit of 0.46 GB. The United States did not have any plans in this category for 2013. For smartphone plans with data usage limits of 1<5 GB and unlimited minutes, the average monthly price for U.S. plans was $66.66 with an average usage limit of 3.33 GB (12th least expensive out of 20 countries). The average monthly price in the United States for a plan with 1<5 GB and unlimited minutes increased to $93.08 with an average usage limit of 2.38 GB in 2013 (second most expensive of 28 countries). Slovakia had the least expensive plans in this category in 2012 with an average monthly cost of $18.45 (for 1 GB) and Greece had the most expensive average cost at $165.29 (for 1.5 GB). In 2013, Lithuania had the least expensive average monthly price at $3.31 (for 1.5 GB), while Hungary had the most expensive plan at $129.26 with an average usage limit of 2.5 GB. The United States is one of a smaller group of countries that offer smartphone plans with unlimited data and unlimited minutes. Among countries with such plans, the United States ranked fifth least expensive out of nine countries in 2012 and fourth least expensive out of five countries in 2013. The average price for a smartphone plan with unlimited data and unlimited minutes in the United States in 2012 and 2013 was less expensive than the average price for surveyed plans that came with limits, except for plans with the most restrictive limits of less than 1 GB. The number of countries with plans with unlimited data and unlimited minutes decreased from nine to five, suggesting that many countries are moving away from fully unlimited plans; however, the number of plans sampled for the United States increased from eight to 13.

39. *Stick modem plans*. Among stick modem plans with data limits of 5 GB or more per month, the United States ranked 28th out of 40 countries in terms of average monthly price ($56.75) with an average data limit of 8.92 GB in 2012. In 2013, the average monthly price increased to $131.16 (making the United States the most expensive country); however, the average usage limit also increased to 16.74 GB. In terms of price per GB, the United States ranked 27th in 2012 with an average all-inclusive price of $6.52 per GB. In 2013, the United States ranked 35th (of 38 countries) with an average price per GB of $8.49.

40. *Tablet plans*. Among tablet plans with data limits of 5 GB or more per month, the United States ranked 29th out of 31 countries in terms of average monthly price ($68.92) with an average data limit of 9.13 GB in 2012. In 2013, the United States ranked last (of 37 countries) with an average monthly price of $112.39; however, the average usage limit increased to 16.2 GB. In terms of price per GB, the United States ranked 23rd (of 30 countries) with an average all-inclusive price of $7.98 per GB.[71] In 2013, the United States ranked 29th of 37 countries with an average price per GB of $7.45.

41. *Data Usage Limits*. For fixed broadband plans, the United States had the seventh highest maximum usage limit of 24 countries in 2012 and the highest of 25 countries in 2013, while its average usage limit was fourth highest in 2012 and second highest in 2013. This indicates that most of the limited data plans in the United States have relatively high usage limits, compared with other countries with limited data plans. For mobile broadband (smartphone plans), about half of the countries in the sample offered unlimited smartphone plans in both 2012 and 2013. The United States had the second highest number of unlimited plans in each year. The United States had the highest maximum usage limit at 50

[71] The all-inclusive per GB is calculated on an individual plan basis and then averaged. As a result, the average all-inclusive per GB is not identical to dividing the average monthly cost by the average data limit.

GB in 2012 and again in 2013 at 75 GB.

E. Other Relevant Information and International Developments

42. ***Community Level Comparison***. In addition to requiring the Commission to gather data on broadband service capability, the BDIA directs the Commission to compare broadband development in communities similar to U.S. communities in terms of population size, density, and topographic profile.[72] Consistent with our approach in previous reports, we provide the most recent publicly available data for each variable in the community dataset in Appendix D. Data for communities not covered by the OECD and Eurostat datasets are drawn from national statistical agencies, communications ministries, and communications regulators.[73]

43. ***Relevant Similarities and Differences***. The BDIA also directs the Commission, for the foreign communities selected, to identify "relevant similarities and differences" across several criteria.[74] For each foreign country included in this *IBDR*, Commission staff gathered, information on (1) topography, (2) the regulatory environment, including national broadband plans, (3) the market structure, including the number of competitors, (4) broadband penetration, and the types of network technologies deployed, (5) types of applications and services used, and (6) other media, specifically television and radio outlets, available to consumers. Appendix E contains the detailed information on the 39 foreign countries that we selected to use in this Report.

44. ***Defining Broadband Goals***. Many countries in our survey either define broadband service or set targets for certain levels of broadband service at speeds higher than the 4 Mbps download/1 Mbps upload standard that we used prior to increasing the benchmark to 25 Mbps/3 Mbps in the *2015 Broadband Progress Report*.[75] In 2011 for instance, Canada's Radio-Television and Telecommunications Commission (CRTC) set a target for broadband Internet access services across Canada, defining broadband as service with speed of at least 5 Mbps for downloads and 1 Mbps for uploads.[76] Canada expects that its entire population will have access to such service by 2015.[77] The EU defines a broadband connection as one that enables a download speed higher than 144 kbps.[78] The EU deems download

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[72] Specifically, the statute requires that "[t]he Commission shall choose communities for the comparison under this subsection in a manner that will offer, to the extent possible, communities of a population size, population density, topography, and demographic profile that are comparable to the population size, population density, topography, and demographic profile of the various communities within the United States." BDIA § 103(b)(3); 47 U.S.C. § 1303(b)(3).

[73] Eurostat is the Statistical Office of the European Communities, located in Luxembourg. Its task is to provide the European Union with statistics that enable comparisons between countries and regions. *See* http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/introduction.

[74] The statute provides that "[t]he Commission shall identify relevant similarities and differences in each community, including their market structures, the number of competitors, the number of facilities-based providers, the types of technologies deployed by such providers, the applications and services those technologies enable, the regulatory model under which broadband service capability is provided, the types of applications and services used, business and residential use of such services, and other media available to consumers." BDIA § 103(b); 47 U.S.C. § 1303(b). We take "other media" to mean other electronic video and audio news, information, and entertainment options, particularly television and radio. Section 103(b)(2) of the BDIA (47 U.S.C. § 1303(b)(2)) also directs the Commission to identify topography for selected foreign communities.

[75] *2015 Broadband Progress Report* at para. 3.

[76] CRTC sets speed target for broadband Internet and maintains obligation to provide basic home telephone service, May 3, 2011, http://www.crtc.gc.ca/eng/com100/2011/r110503.htm.

[77] *Id.*

[78] Digital Agenda Scoreboard 2014 Electronic Communications Market Indicators: Definitions, Methodology and Footnotes on Member State Data, available at https://ec.europa.eu/digital-agenda/en/pillar-4-fast-and-ultra-fast-

speeds above 144 Kbps and below 30 Mbps to be "basic broadband," download connections between 30 Mbps and 100 Mbps "fast broadband," and download connections above 100 Mbps "ultrafast broadband."[79] The Digital Agenda for Europe sets goals of covering the entire EU with fast broadband by 2020, and ensuring that 50 percent of the EU subscribes to ultrafast broadband by 2020.[80] Australia's government is committed to completing the National Broadband Network and providing 25 Mbps downloads to all premises and 50 Mbps downloads to 90 percent of premises as soon as possible.[81]

45. ***Next Generation Fixed Networks***. Public and private sector investment in next generation networks continues to make gigabit service a real choice for more consumers. Investment in high-speed fixed networks in the United States continues to rise, for example. At the time we released the *Third IBDR*, Google was readying the first affordable gigabit fiber network in the United States in Kansas City. Since then, Google Fiber has entered the market and offers symmetrical 1 Gbps broadband services in Kansas City, Austin, and Provo, Utah.[82] Cedar Falls, Iowa launched a municipal gigabit system, available to both business and residential customers, in May 2013.[83] Other gigabit systems are under development or already are operating in Vermont,[84] Phoenix, Las Vegas, and Omaha, among others.[85] In 2013, So-Net, an ISP affiliated with Sony, began offering 2 Gbps residential service to parts of Tokyo.[86] Several countries are developing government-backed fiber networks. The New Zealand government has pledged to invest up to NZ$1.35 billion (US$1.04 billion) to connect 75 percent of New Zealanders to ultra-fast broadband (100 Mbps download/50 Mbps upload) by 2020.[87] Singapore's government-backed

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internet-access. In 2010, the European Commission estimated that the minimum download speed provided by most broadband providers was 1-2 Mbps. *Id*.

[79] A Digital Agenda for Europe, European Commission, Brussels, 19.5.201, COM(2010)245 final, pp. 18, 40 available at http://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=2kpQJTlJ2nFyTnQGhNZ9HrBNMMBnHJjvwtGLdl0Kn36QSrNzhlQG!221141805?uri=CELEX:52010DC0245R(01). *See also* Digital Agenda for Europe, About our Goals, http://ec.europa.eu/digital-agenda/about-our-goals.

[80] *Id*.

[81] *See* Letter of Government Expectations from The Hon. Malcom Turnbull MP, Minister for Communication and Senator The Hon. Mathias Cormann to Dr. Ziggy Switkowski, Executive Chairman NBN Co. Limited, April 8, 2014, available at http://www.communications.gov.au/__data/assets/pdf_file/0014/221162/SOE_Shareholder_Minister_letter.pdf.

[82] Google Fiber, *Our Cities*, https://fiber.google.com/ourcities/ (last visited Jan. 5, 2015) (*Google Fiber Cities*).

[83] Google's Not the Only One with Super-High-Speed Internet Plans, CNN-Money, June 18, 2013, available at http://tech.fortune.cnn.com/2013/06/18/googles-not-the-only-one-with-super-high-speed-internet-plans/?section=money_topstories; Cedar Falls Leads Iowa with Online Speed; Offers 1 Gigabit-per-Second Downloads, DesMoinesRegister.com, May 29, 2013, available at http://www.desmoinesregister.com/article/20130529/BUSINESS04/305290045/.

[84] "Vermont Gets a Gigabit Network. And It Only Costs Residents $35 a Month," Gigaom, April 26, 2013, available at https://gigaom.com/2013/04/26/vermont-gets-a-gigabit-network-and-it-only-costs-residents-35-a-month/. *See also* website of Vtel, the telecommunications provider offering gigabit service (http://www.vermontel.com/internet).

[85] "Cox Will Start Its Gigabit Internet Rollout in Phoenix, Las Vegas and Omaha," Engadget, May 24, 2014, available at http://www.engadget.com/2014/05/24/cox-gigabit-cities/.

[86] "Sony-Backed ISP Unveils 2Gbps Internet Service in Japan," PC mag.com, April 16, 2013, available at http://www.pcmag.com/article2/0,2817,2417845,00.asp. *See also* http://www.so-net.ne.jp/access/hikari/nuro_hikari/.

[87] Statement to the Commerce Commission Concerning Incentives for Businesses to Invest in Ultra-fast Broadband Infrastructure, Oct. 13, 2011, available at http://www.med.govt.nz/sectors-industries/technology-

Next Generation Nationwide Broadband Network (with download speeds of up to 1 Gbps) was available to 95 percent of homes and businesses by July 2013.[88] Australia's National Broadband Network will use a combination of technologies (fiber, satellite, fixed wireless) in order to make 25 Mbps download service available to all Australians as soon as possible.[89] Korea's regulator, KCC, stated in 2009 that it would invest KRW34.1 trillion over five years (KRW1.3 trillion in government funds and the remainder from private sources) in the ultra broadband convergence network, with fixed download speeds of 1 Gbps and mobile download speeds of 10 Mbps.[90]

46. ***Mobile Broadband***. In the United States, mobile broadband network deployment[91] by multiple providers has continued to expand and, as of January 2014, 99.9 percent of the U.S. population lived in areas with coverage by at least one mobile broadband provider, up from approximately 98.5 percent in August 2010.[92] The percentage of the population covered by at least three mobile broadband providers increased from 82 percent in August 2010 to 93.4 percent in January 2014. The percentage of the population living in a census block with mobile wireless coverage by at least four providers has not changed significantly since 2012.[93]

47. In the *Third IBDR*, we reported on global 4G/LTE trends, noting that the United States

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communication/pdf-docs-library/communications/broadband-policy/UFB-Government-Policy-Statement.pdf; Ministry of Business, Innovation & Employment, Ultra-Fast Broadband Initiative, http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/ultra-fast-broadband-initiative.

[88] Next Generation Nationwide Broadband Network Fact Sheet, Infocomm Development Authority of Singapore, available at http://www.ida.gov.sg/~/media/Files/Infocomm%20Landscape/Infrastructure/Wired/NextGenNBNFACTSHEET.pdf; "Singapore is World No. 2 in Use of IT for Growth," Straits Times, April 13, 2013.

[89] *See* Letter of Government Expectations from The Hon. Malcom Turnbull MP, Minister for Communication and Senator The Hon. Mathias Cormann to Dr. Ziggy Switkowski, Executive Chairman NBN Co. Limited, April 8, 2014, available at http://www.communications.gov.au/__data/assets/pdf_file/0014/221162/SOE_Shareholder_Minister_letter.pdf. See also http://www.nbnco.com.au/about-the-nbn/network-technology.html#.VGvHL_nF_To.

[90] Telegeography GlobalComms Database: *South Korea* (2014) (accessed Nov. 19, 2014); Korea Communications Commission, Important Issues, http://eng.kcc.go.kr/user.do?page=E02010100&dc=E02010100.

[91] "Mobile broadband" for purposes of this section in this Report includes coverage and services offered using the following 3G and 4G technologies: EVDO, EVDO Rev A, WCDMA/HSPA, HSPA+, LTE, and mobile WiMAX. This is how the Commission defines mobile broadband in the *Seventeenth Mobile Wireless Competition Report*. *See* Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, *Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services*, WT Docket No. 13-135, Seventeenth Report, DA 14-1862, para. 46 (2014) (*Seventeenth Mobile Wireless Competition Report*).

[92] The Commission's census block analysis using 2013-2014 Mosaik Solutions®, Coverage Rights Data (Mosaik). Mosaik provides data to the Commission under contract on facilities-based providers in the form of coverage boundary maps. The data is based on the coverage boundaries that mobile wireless network operators provide to Mosaik. *See* Mosaik, About Us, http://www.mosaik.com/about-us/ (visited July. 7, 2014). This data likely overstate the coverage actually experienced by consumers, because the data set has certain limitations, including reflecting advertised coverage as reported by various mobile service providers, each of which uses a different definition or determination of coverage. *See Seventeenth Mobile Wireless Competition Report*, para. 47. The Commission estimates mobile deployment differently in the *2015 Broadband Progress Report*. *See 2015 Broadband Progress Report* at p. 60.

[93] The number of providers with coverage in a census block does not necessarily reflect the number of choices available to a particular individual or household for service subscription. *See Seventeenth Mobile Wireless Competition Report*, para. 47.

led the way in adoption of this mobile technology.[94] The United States still leads the world in 4G/LTE adoption, two years later. The global LTE subscriber base reached more than 66 million at the end of 2012,[95] with U.S. subscribers accounting for over half of all 4G/LTE subscriptions globally.[96] Pyramid predicts that by 2017, 70 percent of mobile subscriptions in the United States will be LTE (262 million).[97] A May 2013 GSM Association (GSMA) report indicates that more than 10 percent of U.S. wireless connections were LTE, in contrast to less than one percent of E.U. wireless connections, by late 2012.[98] At the end of 2013, U.S. consumers comprised 50 percent of the world's LTE connections, despite U.S. consumers representing only five percent of the world's wireless connections.[99] The United States, Japan, and Korea will account for 82 percent of global LTE subscriptions at the end of 2014, with the United States having 99.4 million LTE subscriptions.[100] According to Ovum, the number of global LTE subscribers reached 250 million in the first quarter of 2014, with Verizon Wireless and AT&T accounting for 35 percent of global LTE subscriptions.[101] The United Kingdom leads both Western Europe and all of Europe in LTE subscriptions with over 6 million, while Russia leads Eastern Europe with more than 2 million.[102] There are 96 LTE networks in Europe.[103]

48. Use of LTE networks is also on the rise. Cisco reports that global mobile data traffic in 2013 (1.5 exabytes/month) was up 81 percent over 2012 (820 petabytes/month, or 18 times the size of the entire Internet in 2000);[104] moreover, global mobile data traffic in 2012 was already up 70 percent over 2011.[105] Over half of all mobile data traffic in 2013 (53 percent) was mobile video.[106] Significantly,

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[94] We noted that by the end of 2011, U.S. LTE subscribers numbered 5.6 million, accounting for 64% of the roughly 9 million LTE subscribers worldwide. *See Third IBDR,* 27 FCC Rcd 9884, 9885 (2012).

[95] Telegeography Research: Wireless Subscribers by Region, available at http://www.telegeography.com/products/globalcomms/world-and-regional-totals/wireless-subscribers-by-region/index.html (accessed April 22, 2013).

[96] According to Informa Telecoms & Media World WCIS (World Cellular Information Service) data, at the end of 2012, the United States had approximately 35 million LTE subscribers. *See* http://www.informatandm.com/about/wcis/.

[97] Report: U.S. LTE Subscribers Will Make Up 70% of Connections by 2017, FierceWireless, June 11, 2013, available at http://www.fiercewireless.com/story/report-us-lte-subscribers-will-make-70-connections-2017/2013-06-11.

[98] Mobile Wireless Performance in the EU & the US, May 2013, GSMA and Navigant Economics, available at http://www.gsmamobilewirelessperformance.com/GSMA_Mobile_Wireless_Performance_May2013.pdf, at 21(GSMA Report).

[99] CTIA Mobile Sector Snapshot, Nov. 2013, http://blog.ctia.org/2013/11/13/mobile-sector-snapshot/.

[100] Informa Telecoms and Media, Smartphone use transforming with the rise of 4G and Wi-Fi, September 2014, http://www.telecomsacademy.com/download-the-smartphone-use-transforming-with-the-rise-of-4g-and-wi-fi-white-paper/.

[101] Ovum reveals global LTE subscriptions reach 250 million milestone, September 2014, Ovum, available at http://www.ovum.com/press_releases/ovum-reveals-global-lte-subscriptions-reach250-million-milestone/.

[102] *Id.*

[103] *Id.*

[104] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2013-2018, Feb. 5, 2014, available at http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html. (2014 Cisco VNI).

[105] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2012-2017, Feb. 6, 2013, p. 1, available at http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.pdf.

Cisco points out that 4G connections generated 14.5 times more traffic than non-4G connections, accounting for 30 percent of all mobile data traffic (even though 4G connections were only 2.9 percent of mobile connections in 2013).[107] In addition, Cisco anticipates that global mobile data will expand eleven-fold between 2013 and 2018.[108] By the end of 2014, Cisco predicts that the number of mobile-connected devices will exceed the world's population (1.4 devices per capita).[109] The GSMA reported that by the end of 2013, 256 LTE networks were in commercial operation in 100 countries (and GSMA predicts 500 LTE networks in 128 countries by 2017).[110]

49. The rise of smartphones appears to be directly related to the increase in world-wide mobile data traffic. A Pew Research Center study revealed that as of May 2013, more than half of all American adults (56 percent) owned a smartphone -- up from 35 percent in 2011 and 48 percent in 2012.[111] Cisco reports that smart devices handled 88 percent of global mobile data traffic in 2013, while representing only 21 percent of all mobile devices in use.[112] Further evidence of the importance of smartphones and mobile data can be seen in American consumers' spending habits. In 2012, for the first time, U.S. consumers spent more on mobile data, $94.8 billion (up from $71.1 billion in 2011), than on mobile voice services, $92.4 billion.[113] The International Data Corporation predicts that Americans will spend $118.6 billion on mobile data in 2013.

50. In the *Third IBDR*, we noted how the rise of the mobile app has been instrumental in the growth of mobile broadband. The mobile app sector continues to be strong. For example, Apple Computer's App Store had 20 billion downloads in 2012 alone,[114] and 50 billion total from the store's inception in 2008, to May 2013.[115] U.S.-created smartphone operating systems continue to dominate globally, with Android phones in 85 percent of worldwide smartphone shipments in the second quarter of 2014 (Apple's iOS worldwide share was second with 12 percent and Microsoft Windows platform held

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[106] 2014 Cisco VNI.

[107] 2014 Cisco VNI. Rapid expansion of LTE can be seen in the Verizon's recent history. In January 2013, Verizon reported that almost half of its data traffic travels over its LTE network, a marked increase from the previous October when 35 percent of Verizon's data moved across the LTE network. *See* Verizon: Almost 50 % of data traffic now goes over LTE network, *FierceWireless*, January 9, 2013, available at http://www.fiercewireless.com/story/verizon-almost-50-data-traffic-now-goes-over-lte-network/2013-01-09#ixzz2RObTX1Ds.

[108] *See* 2014 Cisco VNI.

[109] *See* 2014 Cisco VNI.

[110] GSMA REPORT: http://www.gsmamobileeconomy.com/GSMA_ME_Report_2014_R_NewCover.pdf, at p. 14.

[111] Smartphone Ownership 2013, Pew Internet & American Life Project, June 5, 2013, available at http://www.pewinternet.org/Reports/2013/Smartphone-Ownership-2013/Findings.aspx#.

[112] *See* 2014 Cisco VNI.

[113] Mobile Data Spending Outpaces Voice for First Time, Hayley Tsukayama, *Washington Post*, March 4, 2013, available at http://www.washingtonpost.com/business/technology/mobile-data-spending-outpaces-voice-for-first-time/2013/03/04/8bc6c542-84dd-11e2-98a3-b3db6b9ac586_story.html.

[114] "Apple App Store Hits 40 Billion Downloads; 20 Billion in 2012, Alone," CNET News, Jan. 7 2013, available at http://news.cnet.com/8301-13579_3-57562400-37/apple-app-store-hits-40-billion-downloads-20-billion-in-2012-alone/.

[115] "Apple Reached 50 Billionth App Download with Google on its Tail, Salvador Rodriguez, Los Angeles Times, May 16, 2013, available at http://www.latimes.com/business/technology/la-fi-tn-apple-50-billionth-app-download-google-20130516,0,3158946.story.

third place with 2.7 percent share).[116]

51. ***Usage Trends***. Sandvine, a provider of network equipment and traffic management systems, prepares The Global Internet Phenomena Report every six months, illustrating just how consumers are using broadband networks. These reports examine how people in different regions (Asia-Pacific, Europe, North America, and more recently Latin America and Africa) are using fixed and mobile broadband networks. For the first half of 2013, Sandvine reported that in Europe, monthly mobile data consumption (including both uploads and downloads) averaged 311 MB per subscriber, compared to 700.4 MB per subscriber in Asia-Pacific, and 390.1 MB per subscriber in North America.[117] For the first half of 2014, Sandvine reported increasing mean mobile data consumption figures for these regions: 394.4 MB per subscriber for Europe; 1.1 GB per subscriber for Asia-Pacific, and 465.2 MB per subscriber for North America.[118] Monthly data consumption (including both uploads and downloads) on fixed broadband networks in North America averaged 44.7 GB in the first half of 2013[119] and 51.4 GB for the first half of 2014.[120]

52. For the first half of 2014, monthly fixed broadband networks averaged 39.6 GB per customer in Asia-Pacific and 20.4 GB in Europe.[121] A large portion, over 63 percent during peak periods, of North American fixed data traffic is real-time entertainment (*e.g.*, Netflix and YouTube).[122] In Europe, 43.3 percent of peak download fixed traffic is real-time entertainment, though the depending on the country, the percentage ranges from 22 percent to 65 percent of downstream traffic.[123] Real-time entertainment accounts for around 50 percent of total downstream traffic during peak periods in Asia-Pacific.[124]

53. American consumers are supplementing their traditional viewing habits with online content (*e.g.*, via Netflix, Hulu, AmazonPrime). A growing number of consumers are turning to their broadband data connections for all video programming needs. In 2013, Nielsen reported that 5 million people in the United States no longer watch traditional television (that is, via over-the-air broadcast or

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[116] "The One-Horse Race: 85 percent Of The 300M Smartphones Shipped In Q2 Were Android," TechCruch, July 30, 2014, available at http://techcrunch.com/2014/07/30/the-one-horse-race-android-represented-85-of-the-300m-smartphones-shipped-in-q2/. (Android controlled 75 percent of worldwide smartphone shipments in the first quarter of 2013 (Apple's iOS worldwide market share was second with 17.3 percent and Microsoft Windows platform held third place with 3.2 percent market share). IDC: Android OEM Shipped 162M Smartphones in Q1, More than 4x Apple's Rate; Windows Phone Now in (Distant) Third, TechCrunch, May 16, 2013, available at http://techcrunch.com/2013/05/16/idc-android-oems-shipped-162m-smartphones-in-q1-more-than-4x-apples-rate-windows-phone-now-a-distant-third/.

[117] Global Internet Phenomena Report 1H 2013, Sandvine Intelligent Broadband Networks, 2013, pp. . 8, 16, 25, available at https://www.sandvine.com/downloads/general/global-internet-phenomena/2013/sandvine-global-internet-phenomena-report-1h-2013.pdf (*2013 Sandvine Report).*

[118] Global Internet Phenomena Report 2H 2012, Sandvine Intelligent Broadband Networks, 2014, pp. 8, 14, 26, available at https://www.sandvine.com/downloads/general/global-internet-phenomena/2014/1h-2014-global-internet-phenomena-report.pdf (*2014 Sandvine Report).*

[119] *2013 Sandvine Report*, p. 5. Sandvine did not provide aggregate fixed data use for Asia-Pacific in the first half of 2013. Europe's aggregate average fixed data consumption per customer was 13.4 GB per month, significantly less than the U.S. figure. *Id*. at p. 12.

[120] *2014 Sandvine Report*, p. 5

[121] *2014 Sandvine Report*, pp. 11, 24.

[122] *2014 Sandvine Report*, p. 5.

[123] *2014 Sandvine Report*, p. 11.

[124] *2014 Sandvine Report*, p. 24.

cable/satellite subscription) and instead obtain video programming via smartphones, tablets, set-top devices (such as a Roku box), or computers, and in some cases, even if the person has a cable or satellite subscription.[125]

54. ***Efforts to Improve International Broadband Data***. As we indicated in the previous reports, available data on international broadband are incomplete and generally challenging to compare because of significant gaps and variations in data collection methodologies across countries, limiting the conclusions we can draw from the data. In the *Third IBDR*, we detailed steps that the OECD and U.S. government have taken to standardize broadband metrics.[126] In a joint effort with the U.S. Departments of Commerce and State, the Commission's International Bureau initiated and advanced a U.S. government proposal within the OECD in mid-2011 to develop meaningful cross-sectional and longitudinal broadband data that can be used to gauge economic and societal impacts of broadband deployment and use within and across countries.

55. The OECD High Level meeting on the Internet Economy, held in June 2011 urged OECD member countries to develop a harmonized metrics framework for improving broadband benchmarking. The Ministers of OECD countries commended the U.S. initiative in proposing a new and revised set of metrics for broadband and the Internet Economy (the "Metrics Checklist") that could be used to better gauge the level of broadband penetration in member countries and the economic and societal effects it enables. In October 2011, the United States hosted an initial OECD workshop on metrics for broadband and the Internet economy with a view to accelerating the development of the new metrics framework. The workshop made significant progress in examining the current approaches to measuring the broadband metrics, in understanding the need for such metrics, and further developing the metrics checklist. The outcome of the workshop was reported to the meeting of the Information, Computer and Communications Policy (ICCP) Committee held in October 2011 and the December 2011 meetings of the ICCP Working Parties, (*i.e.*, Working Party on Communication Infrastructures and Service Policy (WPCISP), Working Party on the Information Economy, and Working Party on Indicators for the Information Society). At the December 2011 Working Party meetings, it was decided to hold a second workshop to further develop the work. The second workshop took place in London in June 2012. Following the second workshop, the technical papers were updated to include the recommendations.[127]

56. In the December 2012 meetings, the ICCP Working Parties discussed the arguments, recommendations, and conclusions of the second workshop papers. Each Working Party considered whether to accept the recommendations and how to take forward the future work. The recommendations included: (a) a new proposed definition of broadband (tiered); (b) a subset of meaningful cross-sectional and time-series data that can be implemented quickly and that describe the deployment of broadband services, who adopts them and what services are adopted; and (c) comparable cross-sectional and time-series data, both qualitative and quantitative, that identify the drivers of Internet usage and its impact on innovation, productivity and entrepreneurship within and across countries.

57. As a result, all 34 OECD members, including the United States, agreed to adopt the initial set of short-term broadband metrics recommended ((a) and (b), above). Most OECD members are planning to submit the new metrics (specifically, data available under item "(a)" as noted above) as part of the OECD's new flagship times-series publication, "The Digital Economy Outlook," planned for release in spring 2015.

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[125] "More Americans opting to Cut Cord on Traditional TV," CNET News, March 11, 2013, available at http://news.cnet.com/8301-1023_3-57573734-93/more-americans-opting-to-cut-cord-on-traditional-tv/.

[126] *Third IBDR*, 27 FCC Rcd at 9901-02 (2012).

[127] The papers are available at: http://stakeholders.ofcom.org.uk/internet/oecd/technical-workshop/. The second workshop was webcast and can be accessed at: http://stakeholders.ofcom.org.uk/internet/oecd/presentations/.

58. Work is still underway pertaining to topics listed under item "(b)," above. At the most recent OECD meeting of the WPCISP, held in June 2013, several OECD members suggested that a third technical metrics workshop be held to determine how best to assist members in their implementation of the short-term broadband metrics outlined above, as well as advance work in other areas, including, notably, metrics related to pricing of broadband services using hedonic indices.[128]

59. On September 12, 2014, the Commission hosted an OECD Roundtable entitled "Hedonic Price Analysis of Communication Services," bringing together FCC experts from several bureaus as well as academics, statisticians and data analysts from the U.S. government, universities and international institutions. The forthcoming OECD paper ("Triple- and quadruple-play bundles of communications services") served as the basis for the discussion. The aim of the workshop was two-fold: (i) to learn from past experiences in applying hedonic price analysis to goods and services other than communications and, (ii) to improve and develop tools for hedonic price analysis of communication services, including future research areas.

60. The set of longer-term metrics related to other macro-economic impacts of the Internet on national productivity (as described in "(c)," above) has yet to be finalized, but the OECD remains committed to continuing to focus on ICT metrics as it prepares for its next Ministerial in Mexico City in spring 2016.

IV. CONCLUSION

61. In conjunction with the Commission's adoption of the *2015 Broadband Progress Report*, the release of this Report fulfills the obligation imposed by Section 103(b) of the Broadband Data Improvement Act.[129]

V. PROCEDURAL MATTERS

62. IT IS ORDERED that, pursuant to Section 103(b) of the Broadband Data Improvement Act, 47 U.S.C. § 1303(b), and pursuant to authority delegated to the International Bureau in Section 0.261 of the Commission's rules, 47 C.F.R. § 0.261, this Report, with its associated Appendices A-G, is ADOPTED.

FEDERAL COMMUNICATIONS COMMISSION

Mindel De La Torre
Chief, International Bureau

[128] The OECD has been using the baskets methodology for comparing communication prices across countries for over 20 years. As concluded by the OECD project ("Towards a New OECD Metrics Checklist"), hedonic price analysis could complement the OECD baskets by adding a new perspective. A hedonic regression model estimates values for individual characteristics of a product or service. Hedonic models are based on the idea that products or services can be viewed as a bundle of characteristics that are valued by both buyers and sellers. Price represents the value of characteristics of the products or services. *See, e.g.*, Jack E. Triplett, *Economic Interpretation of Hedonic Methods,* Survey of Current Business, Bureau of Economic Analysis, Department of Commerce, January 1986, 36-40; *see also* OECD Glossary of Statistical Terms, available at http://stats.oecd.org/glossary/detail.asp?ID=1225.

[129] 47 U.S.C. § 1303(b).

FOURTH INTERNATIONAL BROADBAND REPORT
APPENDICES

APPENDIX A: Country List

APPENDIX B: Broadband Price Dataset

APPENDIX C: Broadband Price Discussion and Tables

APPENDIX D: Demographics Dataset

APPENDIX E: Market and Regulatory Background

APPENDIX F: Comparing International Fixed Broadband Speeds

APPENDIX G: Broadband Deployment (European Union (EU) countries)

APPENDIX A: Countries Included in the *IBDR*

COUNTRIES	Appendix B: Broadband Price Dataset	Appendix D: Demographics Dataset	Appendix E: Market and Regulatory Background	Appendix F: Actual Broadband Speeds
Australia	X	X	X	X
Austria	X	X	X	X
Belgium	X	X	X	X
Brazil	X		X	X
Bulgaria	X	X	X	X
Canada	X	X	X	X
Chile	X	X	X	X
Czech Republic	X	X	X	X
Denmark	X	X	X	X
Estonia	X	X	X	X
Finland	X	X	X	X
France	X	X	X	X
Germany	X	X	X	X
Greece	X	X	X	X
Hong Kong	X		X	X
Hungary	X	X	X	X
Iceland	X	X	X	X
India	X		X	X
Ireland	X	X	X	X
Israel	X	X	X	X
Italy	X	X	X	X
Japan	X	X	X	X
Korea	X	X	X	X
Lithuania	X	X	X	X
Luxembourg	X	X	X	X
Mexico	X	X	X	X
Netherlands	X	X	X	X

New Zealand	**X**	**X**	**X**	**X**
Norway	**X**	**X**	**X**	**X**
Poland	**X**	**X**	**X**	**X**
Portugal	**X**	**X**	**X**	**X**
Singapore	**X**		**X**	**X**
Slovakia	**X**	**X**	**X**	**X**
Slovenia	**X**	**X**	**X**	**X**
Spain	**X**	**X**	**X**	**X**
Sweden	**X**	**X**	**X**	**X**
Switzerland	**X**	**X**	**X**	**X**
Turkey	**X**	**X**	**X**	**X**
U.K.	**X**	**X**	**X**	**X**
USA	**X**	**X**		**X**

Appendix B: Broadband Price Dataset

This dataset can be found on the FCC website at http://www.fcc.gov/reports/international-broadband-data-report-fourth.

Appendix C

Broadband Price Discussion and Tables

1. Introduction

As we have noted in the previous IBDRs, complexity in the pricing of residential broadband services complicates any analysis of pricing across countries. The features and quality of broadband service vary across countries and providers; service is often offered under a multi-part pricing scheme,[1] and broadband is frequently purchased as part of a bundle of services.[2] Price comparisons are also difficult because different providers frequently have plans that differ in various components of "price." For example, it is not simple to compare an offering of unlimited broadband service with a maximum download speed of 5 Mbps for an up-front fee, a flat monthly recurring fee, and a two-year contract with an early termination fee, to a 5 Mbps offering from another provider that charges a different up-front fee, monthly recurring fees that vary with usage, and the ability to cancel service at any point with no penalty or termination fee.

In addition, broadband offerings around the world vary with respect to: download and upload speeds; limitations on use, including limits on upload and download volumes; determinations of usage limits (download traffic vs. a combination of upload and download traffic vs. download traffic at peak/non-peak usage times); and consequences of exceeding usage limits (*e.g.*, access speed reductions, surcharges, service cut-off). Price offerings can also vary based on the level of involvement of a government in a country's broadband deployment, through the use of taxes and subsidies. Further, identifying the price of broadband becomes even more complicated when broadband is bundled with other services, such as telephone or video service. Promotional offers further complicate comparisons. Additionally, data on subscribership is not available at the plan level, and any average price comparison implicitly assumes uniform subscribership of all plans.

Notwithstanding these inherent difficulties, this Appendix C provides a best-effort report on available fixed and wireless broadband plans for 40 countries, including all OECD countries,[3] the quality attributes of each plan, their advertised and promotional prices, and non-recurring charges associated with each plan.[4] In this Appendix C, we discuss the data on pricing plans in detail for fixed broadband and for

[1] For example, broadband service price often includes an installation charge, a monthly service fee, and possibly equipment rental charges.

[2] *See e.g.,* Scott Wallsten, Understanding International Broadband Comparisons: 2009 Update (Technology Policy Institute Paper, June 2009), available at http://ssrn.com/abstract=1434570 (discussing difficulties in comparing broadband prices due to differing characteristics of broadband services and the tendency of consumers to purchase services in bundles).

[3] The 40 countries we examined for this report include the same 38 covered in the price data in the *Third IBDR*, along with the addition of two new countries, India and Brazil. Staff gathered data on the same plans as those used in the *Third IBDR*. For cases where the provider's plan offerings changed, staff selected the most similar option to the previously selected plan. In addition to incorporating all previously gathered data on pricing plans, new plans were included to better represent the expanding selection of "high-end" plans.

[4] The Wireless Telecommunications Bureau's Seventeenth Annual Mobile Wireless Competition Report also provides an analysis of wireless service prices, though its focus is different than the IBDR's. *See Seventeenth Mobile Wireless Competition Report*. *See* Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, *Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services*, WT Docket No. 13-135, Seventeenth Report, DA 14-1862, (2014) (*Seventeenth Wireless Competition Report*). The *Seventeenth Wireless Competition Report*'s price analysis is primarily focuses on price rivalry and the various actions the providers have undertaken in the past years (*e.g*, introduction of equipment installment payment plans in lieu of the handset subsidy and contract plan approach). *Id*. at Section V., Pricing Levels and Trends.

mobile broadband. Our discussion of fixed broadband pricing plans includes breakdowns and rankings of prices by advertised speed, not actual speed. An analysis of broadband prices based on actual speeds would result in improved rankings for those countries whose actual speeds are closer to advertised speeds (*i.e.*, those countries with less gap between advertised and actual speeds would have better price rankings). For practical reasons, however, we are unable to independently determine actual speeds in each of the countries we researched, and providers are not uniform in disclosing actual speeds that customers experience. For fixed broadband, however, we evaluate prices per unit of speed, using Ookla's Home Value Index, and compare countries based on speed-adjusted prices.[5]

2. Data on Residential Fixed Broadband Prices

The dataset comes in two parts. The first, for 2012, includes 1,856 residential post-paid fixed broadband offers by all major Internet service providers for 40 countries, including 140 U.S. plans. Staff gathered this pricing information between September 2012 and December 2012.[6] The second part includes information on 2,174 residential post-paid plans, including 201 plans in the United States. This information was collected between September 2013 and June 2014.[7] The dataset includes information on advertised monthly recurring charges and nonrecurring charges for four types of plans: standalone broadband plans, double play packages, triple play packages, and quad play packages.[8]

The dataset includes information on advertised monthly recurring charges and nonrecurring charges, such as connection and modem fees, to allow for a more complete pricing analysis of each broadband Internet service offering. It also includes promotional discounts and rebates such as those associated with online sign-up and longer service contracts, and the duration of those promotions. Information on incidental and recurring costs (such as installation and equipment rental fees), and other charges also is included.[9] For each broadband service offering, the dataset includes upload and download speeds, limitations on data usage, and information on the types of technology offered. In the 2012 portion there are 597 DSL plans, 197 VDSL plans, 485 cable plans, 561 fiber plans, and 15 satellite plans.[10] The

[5] Ookla Home Value Index. *See* section 3 for more detail.

[6] We assembled the data by visiting websites of broadband providers serving the countries and communities in our sample. In order to mitigate the effects of variations in a particular broadband provider's prices over time, we visited the websites of providers and downloaded the relevant information at one specific point in time. Our price data reflects only what a given provider was offering at the specific point in time we accessed the website. For some countries in the dataset, we were able to determine whether the offerings were on a national or community level. Many advertised offerings were national in scope, though some were listed for particular cities or on an "as available" basis. Because we obtained the information for this dataset at specific points in time, we were not able to determine which offers are regularly available and which are significant departures from regularly available offers. Therefore, while ideally we would include only widely and regularly available offerings, it is possible we captured information on some non-standard offers such as special, promotional, or other limited offers.

[7] Although the collection of some of this data extended into 2014, for convenience purposes we refer to this collection as "2013" data in this report.

[8] Double play packages consist of broadband paired with either home telephone or video service. Triple play packages consist of broadband, home telephone, and video services. Quad play packages include broadband, home telephone, video, and mobile broadband services.

[9] We did not collect information on VATs (value added taxes) or sales tax. Provider websites varied regarding whether taxes were or were not included in their rates.

[10] The DSL category includes DSL, ADSL, ADSL2+, XDSL, SHDSL, DSLD, LAN, XDSL, and SIOL Telephony; VDSL includes VDSL and VDSL2; cable includes regular cable and the upgraded DOCSIS3 technology; fiber includes, regular fiber, FTTH and NGN. Some plans did not list some characteristics and were dropped from the final dataset. The raw dataset, with complete pricing information for every fixed and mobile plan, is available on the Commission website at http://www.fcc.gov/reports/international-broadband-data-report-fourth.

2013 portion includes information on 593 DSL plans, 124 VDSL plans, 418 cable plans, 731 fiber plans, and 21 satellite plans. Appendix C Table 1a shows the number of plans for each country, disaggregated by the type of broadband bundle.

To compare prices across countries, we first construct an annual or monthly price that reflects all rebates, charges, and fees associated with each plan. This price reflects all recurring and nonrecurring charges associated with the plan. To accomplish this, we first estimate the total amount that the customer pays over the life of the contract[11] using the following formula:[12]

> All-inclusive price for the contract term[13] = (promotional price * number of months promotion lasts) + (standard price * (contract term – number of months promotion lasts)) + installation fee + activation fee + equipment charges + modem rental charge + other fees (incl. line charges) – rebates.

We then calculate the monthly all-inclusive price by dividing it by the length of the contract. Next, we convert all prices to U.S. dollars based on both current exchange rates[14] and purchasing power parity (PPP) ratios.[15] We use both approaches since each methodology has its own advantages and limitations.[16] In the Appendix C Tables 1b-1e, we report average monthly all-inclusive prices calculated by both PPP and exchange rate. When computing the country price, we compute the simple average of all the prices as subscribership data at the plan level is unavailable. Thus caution must be taken when interpreting these simple average price comparisons.[17] Also, our data collection does not include details

[11] An alternative method would be to calculate the price a consumer would pay for the first 12 months of subscribing the fixed broadband service. However, this method may bias the resulting price variable as some of the one-time rebates will be deducted from the price over the first 12 month, rather than over the entire contract period, which is usually 18 months or more. This would bias the prices downward. Conversely, installation charges and other one-time fees will be added to the 12 month period rather than being spread out over the longer contract period. This would bias prices upwards.

[12] This is a modified version of the one year formula used by Scott Wallsten in his paper "Residential and Business Broadband Prices Part 1: An Empirical Analysis of Metering and Other Price Determinants," available at http://works.bepress.com/cgi/viewcontent.cgi?article=1109&context=scott_wallsten.

[13] The all-inclusive price includes both the monthly charges for data and voice usage paid by the consumer and the prorated amounts of any installation costs, set-up fees, and other one-time charges.

[14] Exchange rates fluctuate on a daily basis. The exchange rates were obtained from the World Bank: Official exchange rates (LCU per U.S.$, period average), available at http://data.worldbank.org/indicator/PA.NUS.FCRF. We used the World Bank's 2011 exchange rates for the 2012 pricing data and its 2012 exchange rates for the 2013 pricing data.

[15] The PPP conversion factors (2012) we used for each country were obtained from the International Monetary Fund, World Economic Outlook Database, October 2012. PPP conversion factors (2013) were obtained from the International Monetary Fund, World Economic Outlook Database, October 2013. PPPs are currency conversion rates that convert to a common currency and equalize the purchasing power of different currencies. In other words, they eliminate the differences in price levels between countries in the process of conversion. PPPs show the ratio of the prices in national currencies of the same good or service in different countries. The PPP conversion is an accepted method of equalizing purchasing power in different countries, thereby enhancing comparative studies. We believe that use of the exchange rates, unadjusted for purchasing power, provides a nominal measure of broadband service prices across countries, while the use of the PPP conversion factor not only converts the local currencies to a common currency but also measures value of broadband services at a uniform price level.

[16] *See* Rodney L. Ludema, "Nominal Prices, Real Prices and Faux Prices: The Perils of Comparing Individual Prices at Purchasing Power Parity Exchange Rates" (2010) available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1575745

[17] For example, the U.S. data includes a wider offering of fiber plans in 2013 as compared to 2012.

about variations in video offerings, such as number and types of channels. Thus, our ability to analyze pricing trends is limited by not having full knowledge of how non-broadband bundle components (*e.g.*, video or telephone options) may be affecting broadband price.

In addition to distinguishing fixed plans by their usage limits, we also classify them by advertised download speed, using the following distinctions: (1) up to and including 25 Mbps, (2) greater than 25 up to and including 50 Mbps, and (3) greater than 50 Mbps. The second and third speed categories are combined for limited data plans because the number of countries in each of these groupings is relatively small. To facilitate comparison with the *Third IBDR*, for standalone broadband plans, we create sub-groups of the first category of 1≤5 Mbps, greater than 5 up to and including 15 Mbps, and greater than 15 up to and including 25 Mbps.

2.1. Standalone Broadband Plans

Prices for different service tiers vary widely. Within the full sample of plans for 2012, the least expensive standalone broadband plan in the sample is DSL for $14.95 per month with a download speed of 768 Kbps and a data limit of 150 GB, while the most expensive plan in the sample is FTTP for $209.99 per month with a download speed of 300 Mbps and unlimited data.[18] For 2013, the least expensive plan was a cable plan with a 2 GB data limit and a download speed of 16 Mbps for $2.44 per month, while the most expensive plan is FTTP for $1600 for 1 Gbps symmetric with unlimited data.[19] In the United States, standalone broadband plans with unlimited data and advertised download speeds up to and including 25 Mbps had an average cost of $44 per month in 2012.[20] The average monthly cost increased to $69 in 2013 for broadband plans with unlimited data and advertised download speeds up to and including 25 Mbps. For the multi-country sample, average monthly standalone plan prices in 2012 for unlimited data ranged from $20 (Estonia), with an average advertised speed of those plans of 9.33 Mbps, to $194 (Switzerland), with an average advertised speed of those plans of 9.67 Mbps. While in 2013, the price range of the plans ran from $22 (Bulgaria with an average advertised speed of plans of 17.5 Mbps and Israel with an average advertised speed of plans of 11.75 Mbps) to $159 (India with an average advertised speed of plans of 4 Mbps). The United States ranked 21st least expensive out of 34 countries for unlimited standalone broadband plans in 2012 and 31st least expensive out of 33 countries in 2013. The average advertised speed of the U.S. plans in that category, however, increased from 7.59 Mbps (28th of 34 countries) to 10.73 Mbps in 2013 (19th of 33 countries).

For all standalone plans with advertised download speeds of greater than 15 up to and including 25 Mbps, the average price in the United States fell from $56.50 in 2011 to $50.02 in 2012.[21] This average price includes plans for all technology types, except satellite. The average price in the United States increased to $59.40 in 2013. While some countries also saw their standalone broadband prices fall from 2011 to 2012, larger relative reduction in the United States increased its ranking in 2012 from 26th

[18] Least expensive plan: AT&T DSL Direct Lite (United States); Most expensive plan: Verizon FiOS 300/65 (United States).

[19] Least expensive plan: TelstraClear 2GB (Australia); Most expensive plan: T-2 FTTH (1 Gbps Symmetric) (Slovenia). Prices reported using Monthly Net Price ($PPP).

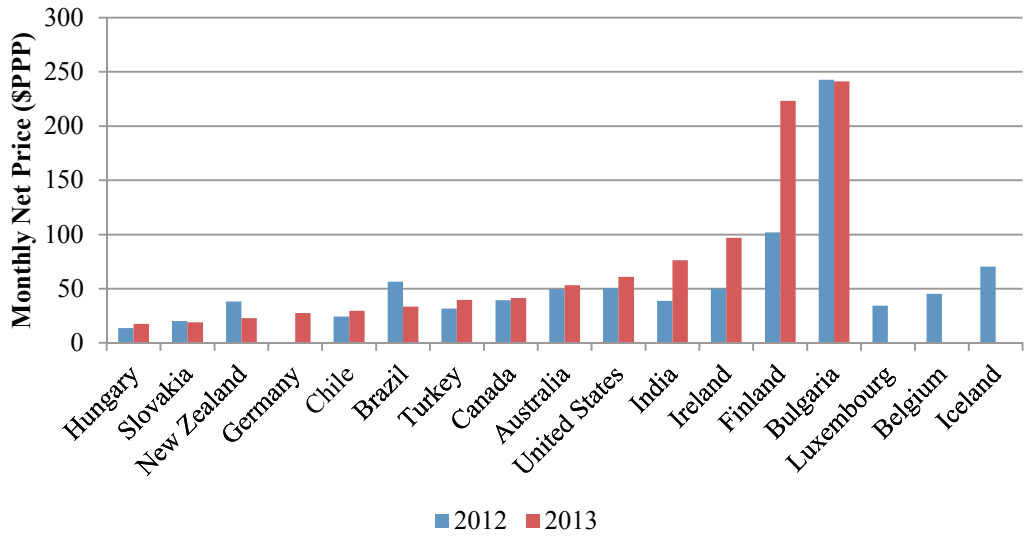
[20] *See* Appendix C Table 4e. Appendix C Tables 4f and 4g contain data on unlimited data plans with 25<50 Mbps and 50+ Mbps, respectively.

[21] *See* Appendix C Table 2c. Appendix Tables 2a, 2b, and 2d show the average monthly all-inclusive price of standalone broadband plans for 1≤5 Mbps, greater than 5 up to and including 15 Mbps, and greater than 25 up to and including 50 Mbps, respectively.

least expensive to 20th least expensive (out of 32 countries) by this measure.[22] In 2013, the United States ranked 24th least expensive of the 30 countries with plans of this type.

For all standalone broadband plans with data usage limits and an advertised download speed up to and including 25 Mbps,[23] the United States had an average monthly cost of around $50 in 2012.[24] The average cost increased to $61 in 2013. Bulgaria had the highest average monthly cost in both 2012 and 2013 at $243 and $241, respectively. Hungary had the lowest at just under $14 in 2012 and approximately $18 in 2013. The data usage limits varied widely by country.

Figure 1
Average Monthly Net Price ($PPP) of Residential Broadband, 2012-2013 Standalone Plans with Limited Data and Advertised Download Speed up to and Including 25 Mbps



Note: Average prices exclude satellite. Plans included in this figure have data usage limits and their average advertised download speed is up to and including 25 Mbps. Austria, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, South Korea, Lithuania, Mexico, Netherlands, Norway, Poland, Portugal, Singapore, Slovenia, Spain, Sweden, Switzerland, and United Kingdom are excluded because they do not have plans in this category.

Taking data usage limits into account by calculating price per GB of data, the United States ranked fifth least expensive in 2012 with a price of $1.25 per GB and improved its ranking to fourth least expensive in 2013 with a price per GB of $1.65.[25] In 2013, New Zealand is the least expensive at $0.66 and Finland is the most expensive at $17.18. All data for standalone broadband plans with speeds up to and including 25 Mbps are presented in Appendix C Table 4a. Data for plans with speeds greater than 25 Mbps are presented in Appendix C Table 4b.[26] Many of the countries that have the lowest prices have

[22] Although there are 40 comparison countries in total, not all countries will be represented in every plan type and/or speed tier.

[23] This includes all standalone broadband plans with speeds up to and including 25 Mbps (as opposed to restricting the sample to 15<25 Mbps).

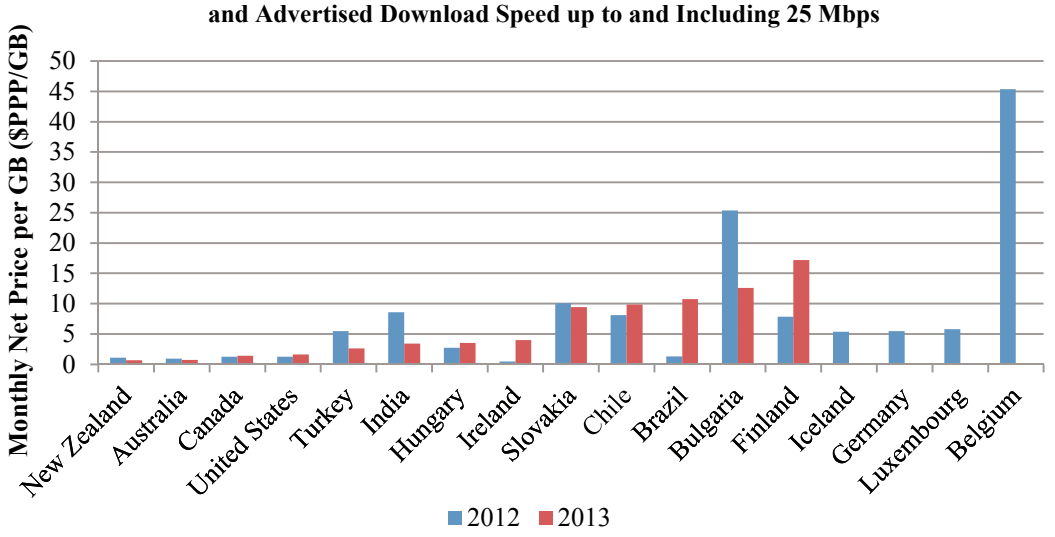
[24] *See* Figure 1.

[25] *See* Figure 2.

[26] Speed groupings more easily comparable to the previous IBDR are available in Appendix Tables 4c-4d.

much lower usage limits, thus becoming the most expensive on a price per GB basis. Slovakia in 2012, for example, had the second least expensive offerings, but the third most expensive on a per GB basis.

Figure 2
Average Monthly All-Inclusive Price per GB ($PPP/GB) of Residential Broadband, 2012-2013 Standalone Plans with Limited Data and Advertised Download Speed up to and Including 25 Mbps



Note: The monthly all-inclusive price per GB reflects the average price per month, including rebates, installation charges, equipment charges (*e.g.*, modem rentals) and other fees, divided by the average usage limit. Average prices exclude satellite. Plans included in this figure have data usage limits and their average advertised download speed is less than 25 Mbps. Austria, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, South Korea, Lithuania, Mexico, Netherlands, Norway, Poland, Portugal, Singapore, Slovenia, Spain, Sweden, Switzerland, and United Kingdom are excluded because they do not have plans in this category.

For all standalone broadband plans with advertised download speeds greater than 25 Mbps up to and including 50 Mbps, the United States had an average cost of $70.17 in 2012, which decreased slightly to $68.65 in 2013. In both years the average advertised download speed of the plans was 45 Mbps. In 2012, Austria had the least expensive average cost at $20.76 with an average advertised download speed of 38 Mbps. Lithuania and Denmark had the least expensive plans in this category in 2013 at $20.03 (at 48 Mbps) and $20.60 (at 30 Mbps), respectively. India had the most expensive average cost in both years at $161.15 in 2012 and $135.93 in 2013. Appendix C Table 2d illustrates the data on all countries included in our pricing plans gathering effort for all standalone broadband plans with advertised download speeds greater than 25 Mbps up to and including50 Mbps.

For plans with unlimited usage and advertised download speeds greater than 25 Mbps up to and including 50 Mbps, the United States ranked 24th out of 29 countries with an average monthly cost of $74.25 (average advertised download speed of 44 Mbps) in 2012. In 2013, the United States again ranked 24th out of 30 countries with an average monthly cost of $69.08 (average advertised download speed of 45 Mbps). Lithuania had the least expensive plan in this category in both years at $13.75 in 2012 and $20.03 in 2013. India had the most expensive average monthly cost in 2012 at $161.15, while Turkey had the most expensive monthly cost at $236.56 in 2013. Appendix C Table 4f illustrates the data on all countries, for plans with unlimited usage and advertised download speeds greater than 25 Mbps up to and including 50 Mbps.

As more video content becomes available over the Internet, more consumers are choosing to give up subscription television service and subscribe only to broadband Internet (rather than a double or triple

play package). In November 2012, market research firm, TGD, reported that 11 million U.S. households did not subscribe to paid TV services.[27] This represents approximately 12.5 percent of all broadband subscribers, an increase over the 11.2 percent of broadband subscribers that did not subscribe to paid TV services in 2011.

2.2. Double Play Plans

Double play plans consist of Internet paired with either home telephone or video (television) service. The average price for greater than 15 up to and including 25 Mbps double play plans with telephone service, fell from $73.52 in 2011 to $65.94 in 2012 in the United States, but then rose to $69.08 in 2013 (see Appendix C Table 3a).[28] Most countries had similarly-sized decreases in plan price in 2012; however, prices remained relatively flat (or increased) in 2013. For double play plans with video service, the average price increased or remained constant in the United States for all speed tiers from 2011 to 2012. For example, the 2012 average price of $107.96 for a double play plan with video and advertised download speeds greater than 15 up to and including 25 Mbps in the United States changed little from 2011's figure of $105.99. In 2013, however, the average price of a double play video plan with download speeds greater than 15 up to and including 25 Mbps fell sharply in 2013 for the United States to $85.20. The number of countries offering double play plans with video increased from 14 to 17. Although double play video plan prices generally changed little between 2011 and 2012, many countries varied from this trend. Mexico had the largest reduction with an average plan costing $131.54 in 2011 and $88.63 in 2012. Italy had the largest increase in average price moving from $26.47 in 2011 to $54.71 in 2012.

Using the metric of average monthly price, the United States ranked 13th least expensive out of 14 countries with a price of $82 for a residential double play broadband plan (either type) with limited data and advertised download speed up to and including 25 Mbps in 2012. The average price in the United States decreased to $78 in 2013. Turkey had the least expensive average monthly cost in 2012 ($32), while India had the most expensive ($181).[29] In 2013, Austria had the least expensive plans ($23) and India remained the most expensive plan ($89) with limited data and an advertised download speed up to and including 25 Mbps. Again, the picture is different when data limits are taken into account. Figure 3 presents the average monthly net price per GB for double play broadband packages of both types (telephone and video service). The United States ranked 2nd least expensive, with an average monthly price per GB of $1.19 in 2012 and 3rd least expensive in 2013 with an average monthly price per GB of $1.58.[30] Italy and Belgium were the most expensive in 2012, while New Zealand and Italy were the most expensive in 2013.

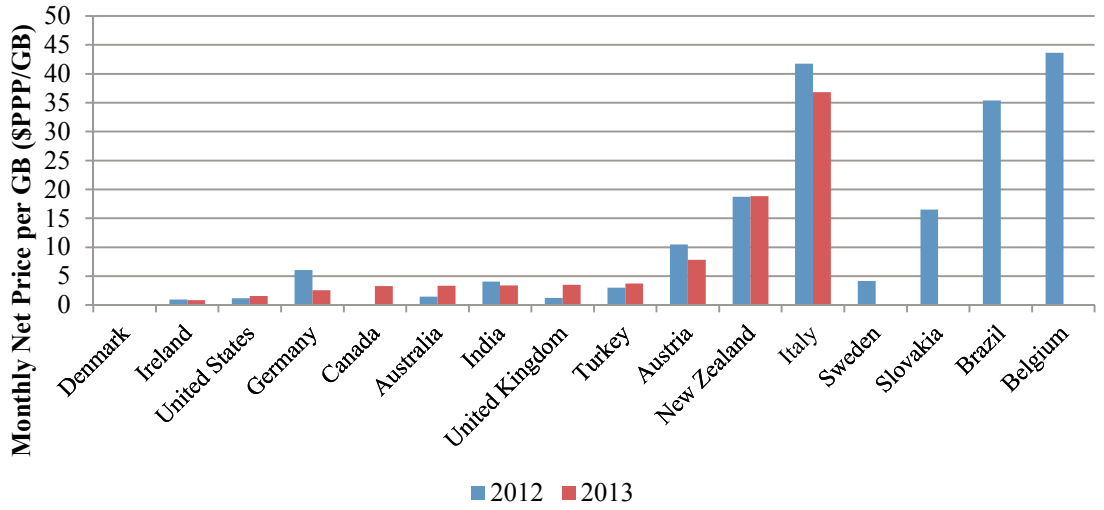
[27] For more information *see* http://tdgresearch.com/pay-tv-refugees-now-account-13-us-broadband-households/

[28] *See* Appendix C Table 3a.

[29] *See* Appendix C Table 4h.

[30] *Id.*

Figure 3
Average Monthly Net Price per GB ($PPP/GB) of Residential Broadband, 2012-2013, Double Play Plans with Limited Data and Advertised Download Speed up to and Including 25 Mbps



Note: The monthly all-inclusive price per GB reflects the average price per month, including rebates, installation charges, equipment charges (e.g., modem rentals) and other fees, divided by the average usage limit. Average prices exclude satellite. Plans included in this figure have data limits and their advertised download speed is up to and including 25 Mbps. Bulgaria, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hong Kong, Hungary, Iceland, Israel, Japan, South Korea, Lithuania, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Singapore, Slovenia, Spain, and Switzerland are excluded from the above figure because they do not have plans in this category.

When using the same speed category (up to and including 25 Mbps of advertised download speed) with unlimited data, the average monthly cost of a double play plan (broadband with telephone or video) in the United States was $67 in 2012, giving the United States a rank of 23rd least expensive out of 28 countries.[31] The average monthly cost increased to $87 in 2013; however, the average advertised download speed for those plans also increased from 10.7 GB to 13 GB. In 2012, Estonia had the least expensive average double play plan with unlimited data ($26) and India had the most expensive ($92). Estonia's average advertised download speed is 3.67 Mbps, while India's average download speed is 7.29 Mbps. In 2013, South Korea had the least expensive average monthly cost ($23) with an average advertised download speed of 10 Mbps and Chile had the most expensive average cost at $91 with an average advertised download speed of 15 Mbps.

For all double play phone plans with advertised download speeds greater than 25 Mbps up to and including 50 Mbps, the United States had an average monthly cost of $78.96 in 2012. The average monthly cost decreased slightly to $77.06 in 2013. Hong Kong had the least expensive average monthly cost in both 2012 and 2013 at $25.10 and $24.45, respectively. In 2012, Brazil had the most expensive plans with an average monthly cost of $149.71. In 2013, Mexico had the most expensive average monthly cost at $110.29.[32]

For all double play video plans with advertised download speeds greater than 25 Mbps up to and including 50 Mbps, the United States had an average monthly cost of $112.76 in 2012. The average cost

[31] *See* Appendix C Table 4l.

[32] *See* Appendix Table 3a for data on all sample countries.

decreased in 2013 to $104.32 for the United States. Bulgaria had the least expensive plans in this category with an average cost of $26.50 in 2012, while Mexico had the most expensive at $125.47. In 2013, Denmark had the least expensive plans at $32.88 and Chile had the most expensive with an average monthly cost of $113.73.[33]

For double play plans with unlimited usage and advertised download speeds greater than 25 Mbps up to and including 50 Mbps, the United States ranked 21st out of 23 countries with an average monthly cost of $109.21 in 2012. While the United States ranked 22nd of 24 countries in 2013, the average monthly cost decreased to $97.62. In 2012, Bulgaria had the least expensive average monthly cost at $26.50 and Brazil had the most expensive at $149.71. Germany had the least expensive plans in 2013 with an average monthly cost of $29.01, while Chile had the most expensive plans at $113.73. For data on all countries, refer to Appendix Table 4m.

2.3 Triple Play Plans

Triple play plans include Internet, video, and telephone services. The average monthly all-inclusive price of a triple play plan in the United States increased for plans with advertised download speeds 1≤5 Mbps from $86.87 in 2011 to $98.45 in 2012 but fell in 2013 to $90.12, including those with and without usage limits. For plans with advertised download speeds greater than 5 Mbps up to and including 15 Mbps, the average monthly price in the United States increased from $118.20 in 2011 to $122.91 in 2012, but then decreased slightly to $120.10 in 2013. The price decreased for plans with advertised download speed greater than 15 Mbps up to and including 25 Mbps from $95.97 in 2011 to $80.61 in 2012 and then went up to $112.81 in 2013.[34] Of the 11 countries in our survey, average triple play plan prices remained relatively stable for most countries, although the average triple play plan price in Germany increased from $38.29 in 2011 to $51.31 in 2012 and in Hungary decreased from $64.71 in 2011 to $37.47 in 2012.

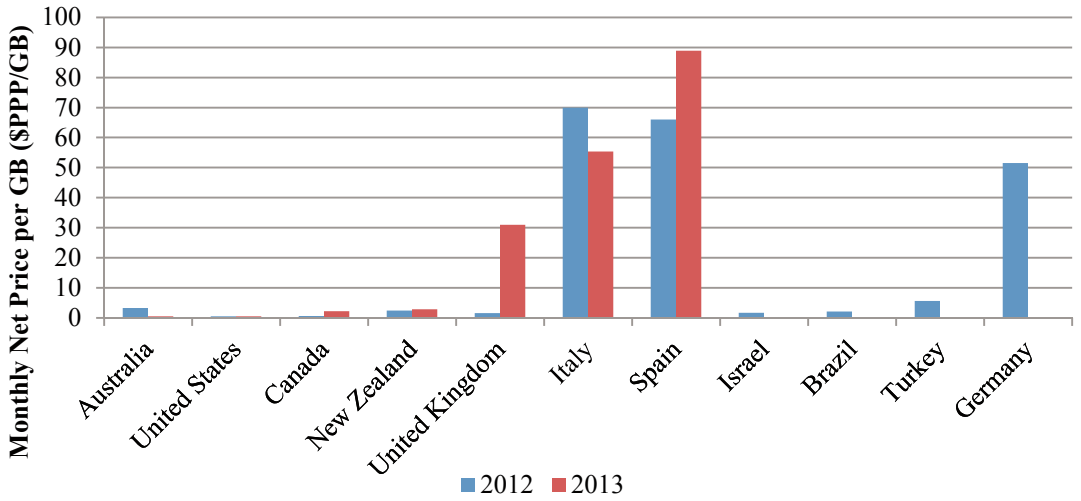
For plans with usage limits and advertised download speed up to and including 25 Mbps, the United States ranked 7th out of the 11 countries in 2012, with an average monthly price of $81.[35] The average price in the United States for those plans increased to $105 in 2013. The United Kingdom was the least expensive in 2012 ($42), while Brazil was the most expensive ($135), in terms of average monthly cost for a plan with limited data allowance and advertised download speed up to and including 25 Mbps. In 2013, the United Kingdom continued to have the least expensive average monthly price at $62. Taking the data limits into account, however, with an average monthly all-inclusive price of $0.54 per GB in 2012, the United States ranked least expensive in terms of price per GB for plans of this type. The price per GB in the United States decreased to $0.52 in 2013; however, Australia surpassed the United States with a slightly lower price of $0.50 per GB (see Figure 4).

[33] *See* Appendix Table 3b for data on all sample countries.

[34] *See* Appendix C Table 3c. We note these are probably not entirely representative averages since the number of data points is fairly limited. Within the sample there are only 3 triple play plans in the 5<15 Mbps category for the United States. One of these plans is a U-Verse Triple Play (12 Mbps down) that has a monthly price of $160, which pulls up the average.

[35] *See* Appendix C Table 4o. Appendix C Table 4p contains data on double play broadband plans with advertised download speeds of greater than Mbps. Speed groupings more easily comparable to the previous IBDR are available in Appendix C Tables 4q-4r.

Figure 4
Average Monthly Net Price per GB ($PPP/GB) of Residential Broadband, 2012, Triple Play Plans with Limited Data and Download Speed up to and Including 25 Mbps



Note: The monthly all-inclusive price per GB reflects the average price per month, including rebates, installation charges, equipment charges (e.g., modem rentals) and other fees, divided by the average usage limit. Average prices exclude satellite. Plans included in this figure have data limits and their advertised download speed is up to and including 25 Mbps. Austria, Belgium, Bulgaria, Chile, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hong Kong, Hungary, Iceland, Ireland, India, Japan, South Korea, Lithuania, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Singapore, Slovakia, Slovenia, Sweden, and Switzerland are excluded from the above figure because they do not have plans in this category.

For triple play plans with unlimited data and advertised download speeds up to and including 25 Mbps, the United States ranked 25th least expensive out of 26 countries with an average monthly price of $118 in 2012.[36] In 2013, the average monthly price decreased to $101; however, the United States remained being the second most expensive country in our sample (21st least expensive out of 22 countries). The average download speed for U.S. triple play plans was 11 Mbps both 2012 and 2013, which ranked 16th fastest of 28 countries in 2012 and 11th fastest of 22 countries in 2013. Brazil was more expensive than the United States in both years. In Brazil, the average monthly price decreased from $131 per month in 2012 to $113 per month. Hungary had the least expensive average monthly price for an unlimited triple play plan in 2012 ($30), while Italy had the least expensive plan in 2013 at $27.

For all plans with download speeds greater than 25 Mbps up to and including 50 Mbps, the average monthly price in the United States was $100.28 in 2012. The average price increased to $131.57 in 2013. The United Kingdom had the least expensive average monthly price in 2012 at $34.10, while Mexico had the most expensive plans at $166.77. Bulgaria had the least expensive plans in 2013 with an average monthly price of $39.60 and Belgium had the most expensive at $208.96.[37]

For triple play plans with unlimited data and download speeds greater than 25 Mbps up to and including 50 Mbps, the average monthly price in the United States for this type of plan in 2012 was $112.96. The average monthly price within the United States for this type of plan increased to $128.65 in 2013. Slovakia had the least expensive plan in 2012 at $36.83, while Bulgaria had the least expensive

[36] *See* Appendix C Table 4s. Appendix C Tables 4t and 4u contain data on unlimited data plans with 25<50 Mbps and 50+ Mbps, respectively.

[37] *See* Appendix Table 3c for data on all countries.

plan in 2013 at $39.60. Mexico had the most expensive plan in this category in 2012 at $166.77. In 2013, Belgium had the most expensive average monthly cost at $249.96.[38]

3. Speed-Adjusted Prices

As the earlier discussion suggests, advertised speeds may not equate to the speeds consumers actually receive, and the gap between advertised and actual speeds may differ between countries. Thus, another useful metric for comparing broadband prices across different countries is the cost per unit of speed. Ookla's Home Value Index, based on hundreds of thousands of survey and speed test results from speedtest.net (its web-based service), compares and ranks countries by the median price in U.S. dollars per Megabit per second.[39] In contrast to our web-scraped[40] data, the Ookla data also has the advantage that all reported speeds are for actual plans with subscribers, and the number of reports may roughly correspond to the share of various speed plans across different countries.[41]

While Ookla data is the best available for international prices based on actual speeds, some caveats have to be noted when interpreting this data. First, the prices reported in Ookla are derived from surveys that are administered to people who take the speed test and are therefore subject to misreporting. Second, when asked about the price of a broadband plan, consumers may often report the recurring monthly charges and exclude non-recurring charges such as installation fees. Thus, if there are some countries with high non-recurring costs, this variation will not be captured in the Ookla price data. Third, we do not know whether the reported prices are for standalone broadband or broadband purchased as part of a bundle, nor do we have information on non-speed plan attributes like monthly usage limits. Thus, we cannot disaggregate by the bundling characteristics or usage limits, as we did earlier, but only compare average prices.

Figure 5 shows the average weighted prices (in U.S. dollars) per Mbps of download speed for consumers for 2011 through 2013.[42] Bulgaria and Lithuania continued to have the least expensive price per unit of speed for 2011 through 2013. Brazil and India were the most expensive in 2012, while India and Chile were the most expensive in 2013. The average weighted price per Mbps in the United States fell from $6.14 in 2011 to $5.39 in 2012, and again in 2013 to $4.30. Data for all countries is presented in Appendix C Table 5. By this metric, the United States ranked 21st least expensive out of 37 countries in 2012 and 23rd least expensive out of 37 countries in 2013, showing improvement from its 2011 ranking of 25th least expensive out of 35 countries surveyed.

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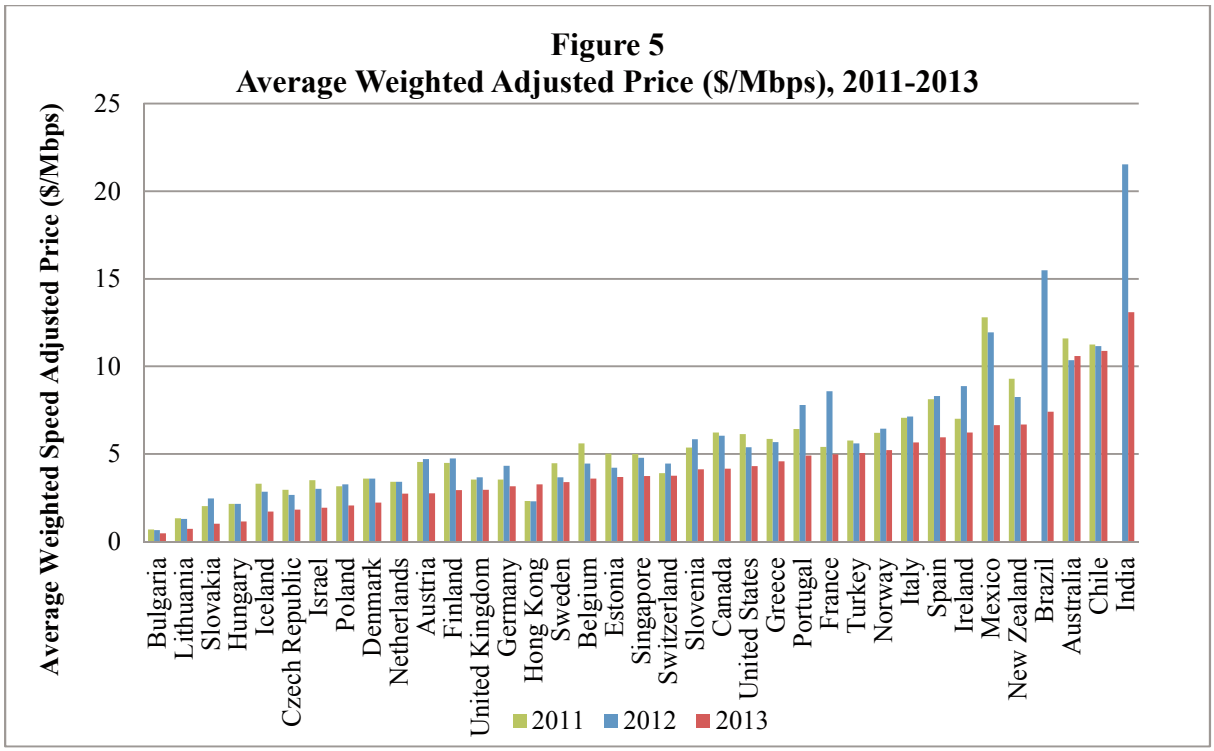
[38] *See* Appendix Table 4t for data on all sample countries.

[39] *See* http://www.netindex.com/value for more information on data.

[40] Web-scraped refers to the pricing data collection process. Information on broadband plans (*i.e.*, pricing, contract length, minutes, data limits) is extracted from provider websites and compiled into spreadsheets for further analysis.

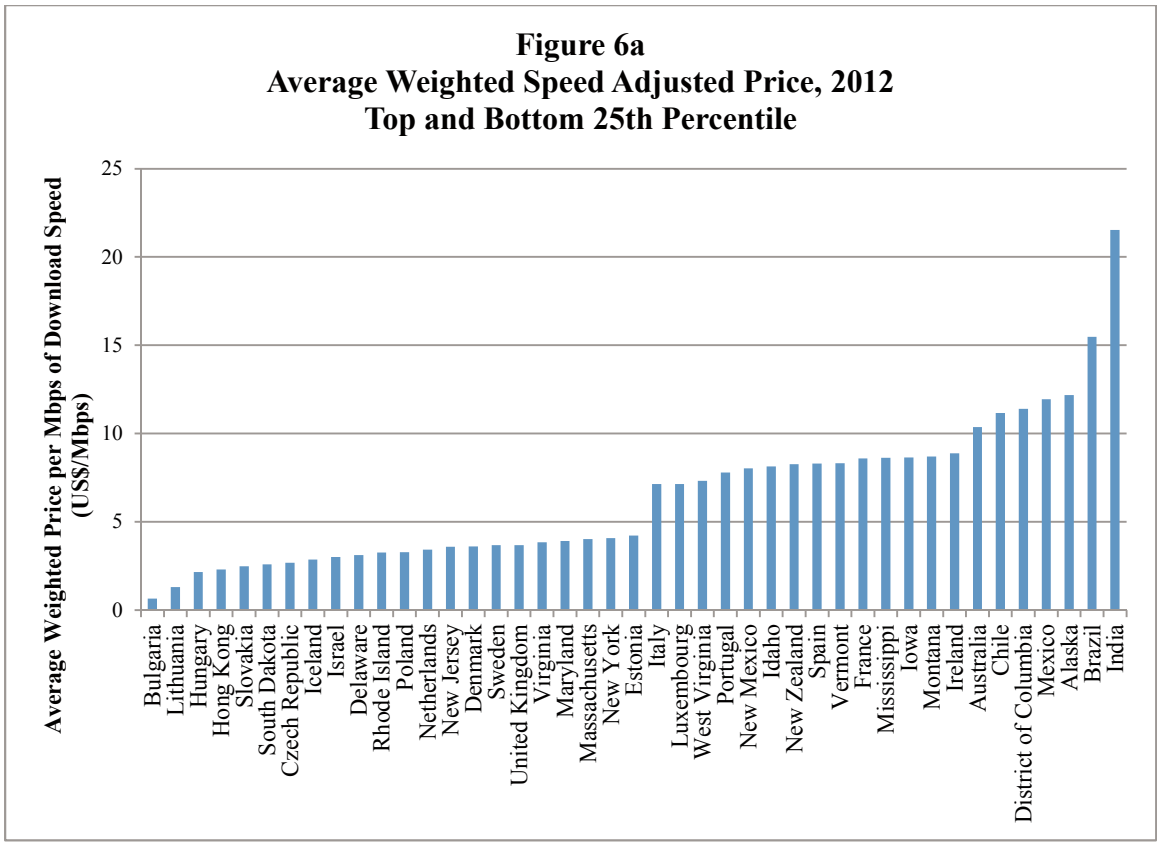
[41] One potential bias is that, with this metric, more expensive plans (*e.g.*, $100+ for 100 Mbps) may look cheaper than lower-price plans. That also means that to the extent the United States has a bias toward lower-speed plans and slow speed DSL plans relative to other countries, this figure will also show a bias toward higher prices.

[42] The Ookla data reports the median price per Mbps on a daily basis for each city in the dataset. We calculate the average of these prices. The Net Index price data does not include Japan, South Korea, or Luxembourg. Brazil and India were not comparison countries in the *Third IBDR*; thus, 2011 data is not presented for them.



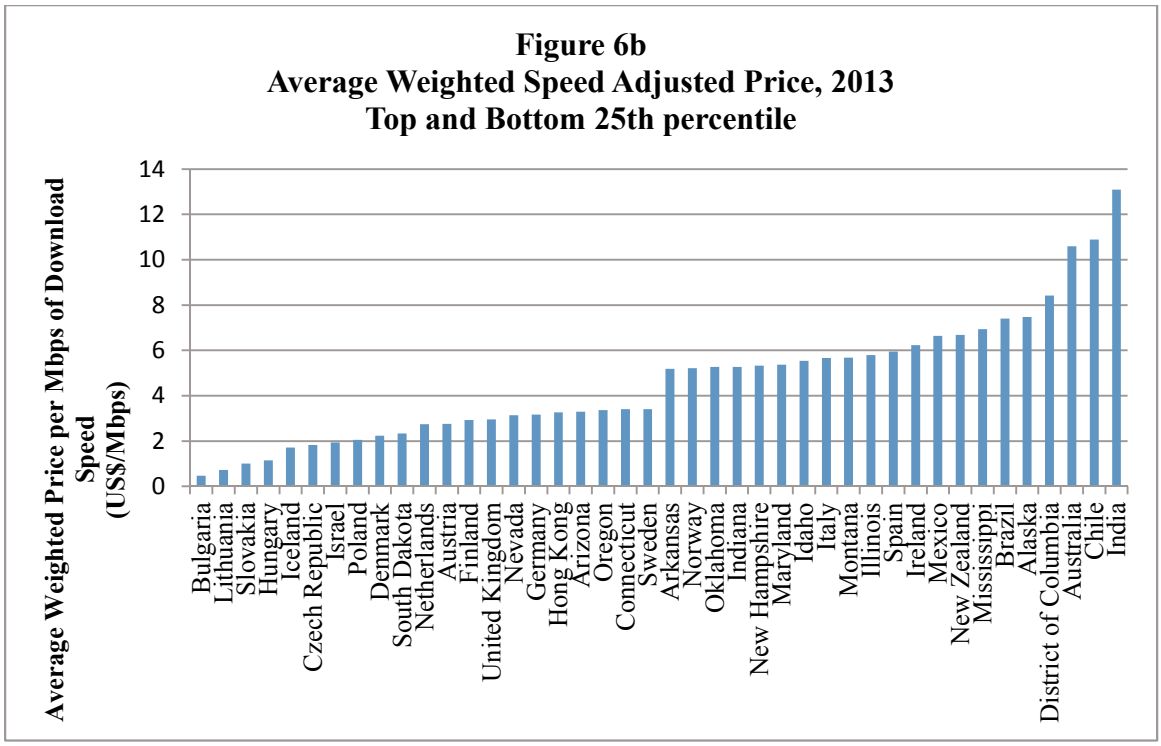
Source: Based on the Value Index from the Ookla Net Index database (data drawn on Dec. 6, 2012 and Dec. 15, 2013). The price per Mbps is weighted by the sample size for each city when constructing the country average. Japan and South Korea are not in this dataset. Brazil and India were not comparison countries in the *Third IBDR*, so data for 2011 was not calculated.

The data presented in the figure above obscures the heterogeneity among U.S. states in speed adjusted prices. Figure 6a shows the top and bottom quartiles of countries and U.S. states for 2012. South Dakota, Delaware, and Rhode Island continue to be the U.S. states with the lowest price per Mbps, while Washington, D.C. and Alaska are on the top end of the distribution. It should be noted that these rankings do not control for the type of cities (and their respective population densities) that are generating data. Data for all countries and U.S. states are shown in Appendix C Table 6.



Source: Value Index from the Ookla Net Index database provided by Ookla (data drawn on Dec. 6, 2012). Japan and South Korea are not in this dataset.

Figure 6b shows the top and bottom quartiles of countries and U.S. states for 2013. South Dakota continues to be the U.S. state with the lowest price per Mbps. Nevada, Arizona, and Connecticut join the upper quartile, while Washington, D.C. and Alaska remain on the top end of the distribution. Data for all countries and U.S. states are shown in Appendix C Table 6.



Source: Value Index from the Ookla Net Index database provided by Ookla (data drawn on Dec. 15, 2013). Japan and South Korea are not in this dataset.

4. Mobile Broadband Pricing

Mobile broadband pricing plans are complex and every country has different reporting and advertising standards. Usage limits, differing peak and off-peak speeds, all affect price comparisons. For example, advertising about the speed of the broadband appears to vary widely across countries. Most carriers only list the theoretical maximum available speeds, *i.e.*, they report 100 Mbps for 4G and 42.2 Mbps for 3G HSPA+. In contrast, in the United States, the advertised speed for a 3G plan is often 3.1 Mbps and advertised speeds for 4G plans range from 5 Mbps to 42 Mbps. Some carriers also list typical speeds; however, due to limited reporting of typical download speeds, we gathered maximum advertised speeds. These are reported in Appendix C tables. Device discounts and phone plans that have to be purchased along with data plans vary widely by country as well. Phone plans associated with broadband also vary in terms of the number of voice minutes and text messages included in the plans.

Given these issues, meaningful international comparisons of mobile pricing are extremely difficult. Below we compare pricing for mobile plans offering broadband, while controlling for voice minutes (when applicable) and data limits. We use both average monthly plan price and price per GB of data as metrics. These data should be treated with caution, however. It is challenging to estimate the true cost of a GB of data when promotions are in terms of increasing usage limits.[43] Additionally, usage patterns may be relevant when attempting to calculate a volume-adjusted price, *i.e.*, instead of dividing the price by the usage limit, one could divide price by the amount of data used. In that case, two countries may have very different GB limits but the same effective price (or volume-adjusted price) given different usage.

[43] In cases where the promotion increases the usage limit for a limited period in the contract (*e.g.*, three months), we construct a weighted average usage limit. More specifically, the weighted average usage limit is based on the following formula. Final Usage Limit = {(Promo Usage Limit * Promo Length) + [Usage Limit * (Contract Length – Promo Length)]} / Contract Length

In addition, the comparisons below do not account for differences in speeds offered in different countries, nor were we able to account for device discounts. For example, 3G and 4G plans are grouped together. Thus, comparing prices in a country where 4G service is widely available with a country with limited or possibly no 4G service is not an apples to apples comparison. Similarly, comparing prices in a country where operators subsidize devices, for example offering a free device for a contractual commitment, with a country where operators charge the full price for a device or customers buy their device separately is also not an apples to apples comparison. Given these and other limitations, the data should be treated with caution. We nevertheless provide this detailed data on mobile broadband plans as an initial step for future analysis and encourage other parties to use our data, which includes information on the technology used and device charges, to conduct their own price analyses.

For this Report, we have compiled an updated dataset of publicly available advertised pricing information for mobile broadband services in 40 countries (including the United States), most of which are members of the OECD. We gathered this pricing information between September 2012 and December 2012 and between November 2013 and August 2014.[44] While efforts were made to include the same plans as previous years, many carriers changed their offerings or modified the data limits of existing plans between the previous IBDR and this Report, leading to some potential incomparability. These datasets include information on advertised monthly recurring charges and nonrecurring charges such as connection fees for three types of devices (smartphones, stick modems, and tablets), to allow for a more complete pricing analysis of each mobile broadband offering. For 2012, we have fairly complete information on 2,007 mobile plans for the 40 countries, out of which 127 are United States plans. There are 973 smartphone plans, 579 stick modem plans, and 455 tablet plans. Netbook plans, though analyzed in the last IBDR, were not analyzed this time due to declining popularity and limited offerings of netbook plans by carriers during this round of data collection. The 2013 dataset includes information on 2,881 mobile plans for the 40 countries, including data on 322 plans in the United States. There are 1,598 smartphone plans, 637 stick modem plans, and 646 tablet plans.

The dataset also includes information on promotional discounts and rebates such as those associated with online sign-up and longer service contracts, and the duration of those promotions. Additionally, information on device charges (such as the cost of a smart phone or modem) is included. This allows for a more nuanced analysis of the price that a customer pays for a mobile broadband plan. The dataset includes advertised upload and download speeds,[45] limitations on data usage, and information on the type of technology, *e.g.*, whether it is 3G, GSM, and 4G.[46] Additionally, the usage limits on each plan and the consequences of reaching those limits, such as the extra charges customers may incur, or

[44] Although the collection of some of the data extended into 2014, for convenience purposes we refer to the collections as "2012" data and "2013" data. We assembled the data by visiting the websites of broadband providers serving the countries and communities in our sample. In order to mitigate the effects of variations in a particular broadband provider's prices over time, we visited the websites of providers and downloaded the relevant information at one specific point in time. Our price data reflects only what a given provider was offering at the specific point in time we accessed its website. For some countries in the dataset, we were able to determine whether the offerings were on a national or community level. Many advertised offerings were national in scope, though some were listed for particular cities or on an "as available" basis. Because we obtained the information for the dataset at specific points in time, we were not able to determine which offers are regularly available and which are significant departures from regularly available offers. Therefore, while ideally we would include only widely and regularly available offerings, it is possible we captured information on some non-standard offers such as special, promotional, or other limited offers.

[45] In some cases, providers did not indicate upload speeds on their websites.

[46] We generally only collect "the best" advertised technology; the technology actually in use by any customer at any time depends on a number of factors (*e.g.*, location, spectrum band, network congestion) – so customers on a 4G plan could easily spend most of their time using the 3G network.

whether they experience a slowdown of their speeds, are reported. The dataset also includes the number of voice minutes associated with the plan, if applicable.

To compare prices across countries, we first construct an annual or monthly price that reflects all the rebates, charges and fees associated with each plan. To accomplish this, we calculate what the customer pays over the life of the contract, using the formula discussed earlier in the report for fixed broadband prices.[47] We do not include the device charges that accompany the costs of the plan (data, voice and SMS) in the calculation. We do not include VAT or sales tax. If a plan incorporates the cost of the device into the monthly charge, the price for bandwidth will appear to be more expensive than a plan that charges the customer a flat fee upfront for the device. We then calculate the monthly all-inclusive price by dividing the total contract amount by the length of the contract. Next, we convert all prices to U.S. dollars based on both purchasing power parity (PPP) and current exchange rates.[48]

Plans that are advertised as unlimited data plans but that have customer speeds slowed down after a certain data limit is reached are classified as plans with usage limits. For example, the "Unlimited Mobiilinet M" plan by Tele 2 Estonia states that this particular plan is unlimited; however, there is a reasonable use policy in place and after reaching 30 GB, download speed is reduced to 200 Kbps and upload speed is reduced to 64 Kbps. The usage limit in this case would be 30 GB. Only those "unlimited" plans that have no overage charges or speed slowdowns are classified as unlimited.[49]

4.1. Smartphone Plans

Approximately one-half of the countries in the full sample had unlimited smartphone plans in both 2012 and 2013. Switzerland had the highest number of unlimited plans in 2012 with 19 plans in the sample. Both the United States and Hong Kong had 12 unlimited plans. South Korea had the largest number of unlimited plans in 2013, followed by the United States and Japan. For limited data plans, the United States had the highest maximum usage limit in 2012 at 50 GB. A large number of countries had maximum monthly usage limits around 30 GB, including Chile, Estonia, and Iceland. Estonia and Luxembourg have the highest average usage limits (15.52 GB and 11.33 GB, respectively).[50] Usage limits increased for most countries in 2013. The United States remained at the top with a usage limit of 75 GB, although this is most likely due to the increase in shared data plans. In 2013, Sweden and Luxembourg had maximum usage limits of 50 GB and 60 GB, respectively. Analysis for all countries is available in Appendix C Table 10b.

Because the datasets contained information about both usage limits and minutes, we were able to construct illustrative groupings for comparing mobile broadband prices across countries. Plans were grouped into four levels of data limits: (1) less than 1 GB, (2) 1-5 GB inclusive, (3) greater than 5 GB, and (4) unlimited data. Smartphone plans in the United States tended to have either limits of around 450

[47] All-inclusive price for the contract term = (promotional price * number of months promotion lasts) + (standard price * (contract term – number of months promotion lasts)) + installation fee + activation fee + modem rental charge + other fees (incl. line charges) – rebates. In the case of smartphones, the all-inclusive price does not include the device price. While we collected information on device prices, not all carriers offered the same devices. We excluded device price information to ensure that the all-inclusive prices would be comparable.

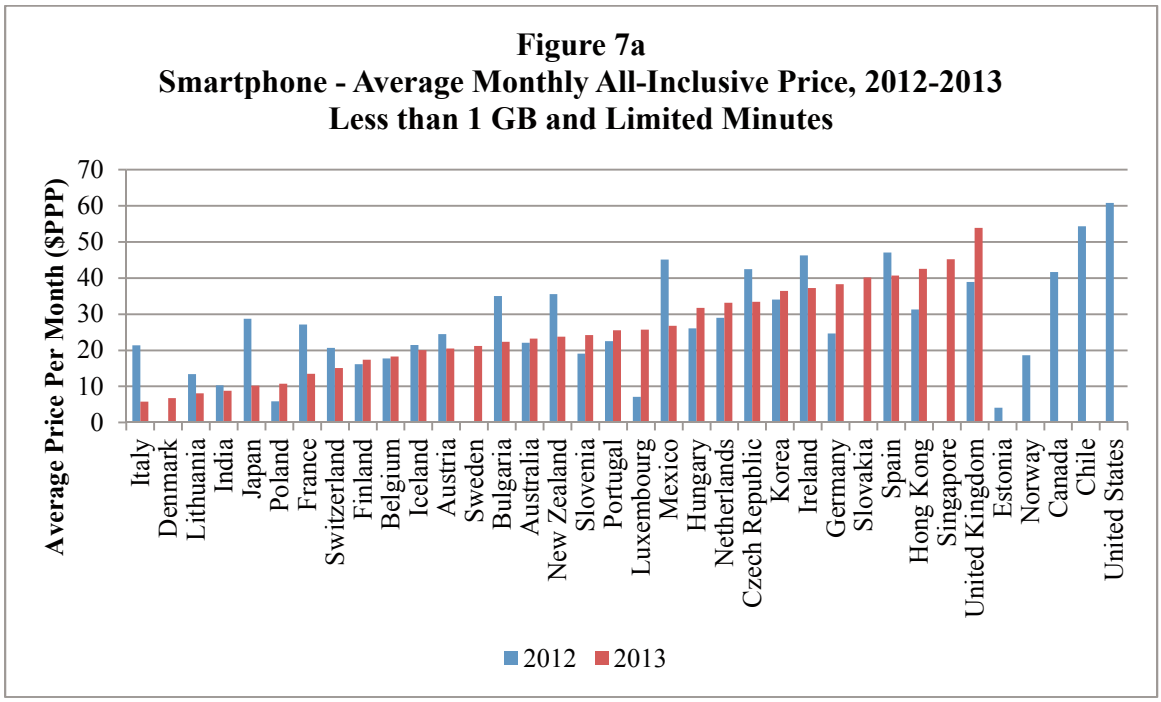
[48] The discussion below focuses only on the prices derived using the PPP conversion.

[49] Unlimited plans are compared solely on the basis of average monthly price.

[50] Usage limit comparisons are calculated using only limited data plans. In addition to the maximum and minimum, a simple mean usage limit is calculated. An important caveat to interpreting the mean usage limit: there is no subscriber information, so the "average usage limit" does not accurately reflect what consumers actually have. Rather, it reflects the mean of the distribution of usage limits among plans.

voice minutes or unlimited voice minutes in 2012. In 2013, however, none of the smartphone plans for the United States have limited minutes. We divided each of the data usage limit categories into those with limited and unlimited minutes.

Figure 7a shows the average monthly price for smartphone plans that have a usage limit of less than 1 GB and limited minutes. The U.S. average monthly price of $60.74 was the second most expensive plan (out of 35 countries) for 2012, with an average usage limit of 0.3 GB. In 2012, Estonia had the lowest average monthly price at $4.48 for a 0.1 GB plan and Greece had the highest at $66.57 with an average usage limit of 0.53 GB. Italy had the lowest average monthly price in 2013 at $5.79 with 0.25 GB of data and Brazil had the highest average monthly price at $109.89 with an average usage limit of 0.46 GB. The United States did not have any plans in this category for 2013,.[51]



Note: The monthly all-inclusive price reflects the average price per month, including rebates and other fees, but excluding the cost of the device. Plans included in this figure have data limits of less than 1 GB and limited minutes. Greece, Brazil, and Turkey have been excluded from this figure because their data are inconsistent from year to year.

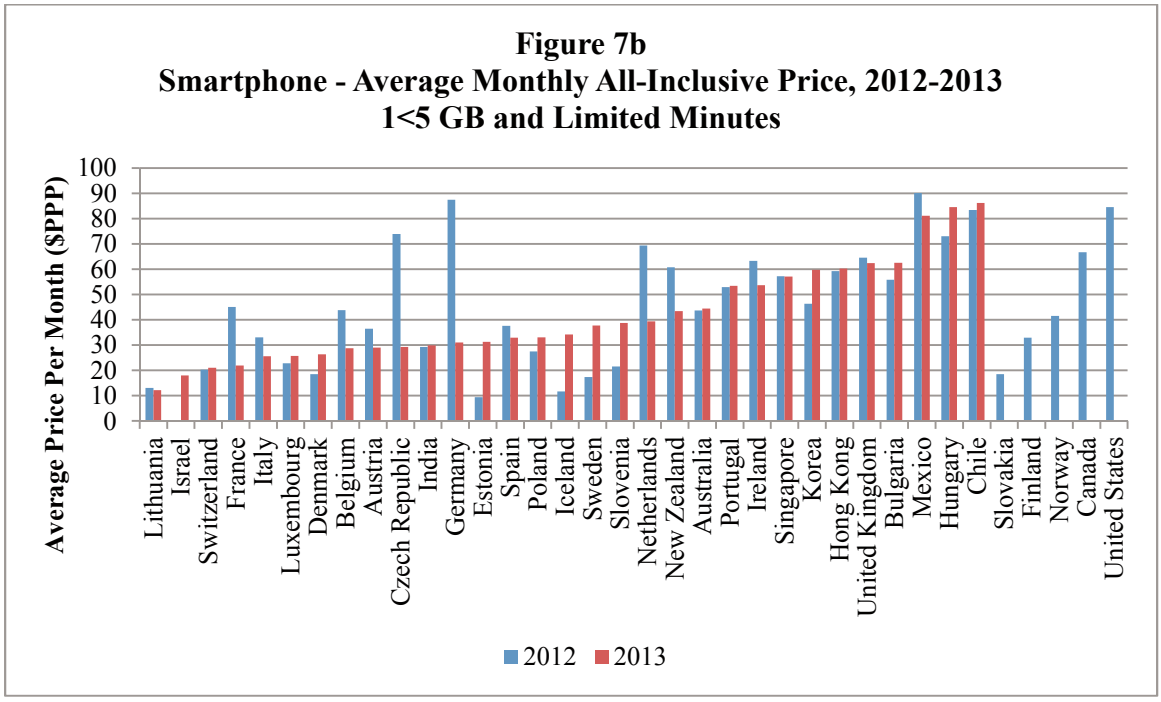
For plans with less than 1 GB of data and unlimited minutes, the United States had the most expensive average monthly price in 2012 at $47.50 with an average usage limit of 0.23 GB. In 2013, the average monthly price for the United States increased to $70.12 with an average usage limit of 0.38 GB. The number of plans offered in this category within the United States increased from two to 18.[52] Slovakia had the least expensive average monthly price in both years. The average monthly price increased slightly from $20.15 in 2012 to $21.90 in 2013 (this average is based on one plan with a data cap of 0.5 GB).

Figure 7b presents the average monthly price for smartphone plans with 1<5 GB of data and

[51] *See* Appendix C Table 7b for data on all sample countries. Appendix C Tables 7a and 7c present data on plans with average data limits of less than 1 GB and less than 450 minutes or unlimited voice minutes, respectively.

[52] An important caveat is that while every effort is made to ensure that the datasets for each year are representative, the number of plans offered may not have increased; rather, more plans were captured in the 2013.

limited minutes. For this category, plans in the United States had an average monthly price of $84.54 for an average of 3.28 GB and 450 minutes in 2012. Estonia has the least expensive average monthly price at $9.40 for 1.5 GB and 126 minutes, while Greece has the most expensive plan at $103.31 for 1.38 GB and 838 minutes. The United States did not have any plans in this category for 2013. Country rankings were also calculated using average monthly all-inclusive price per GB of data.[53]



Note: The monthly all-inclusive price reflects the average price per month, including rebates and other fees, but excluding the cost of the device. Plans included in this figure have data limits of 1<5 GB and limited minutes. Greece, Brazil, and Turkey have been excluded from this figure because their data are inconsistent from year to year.

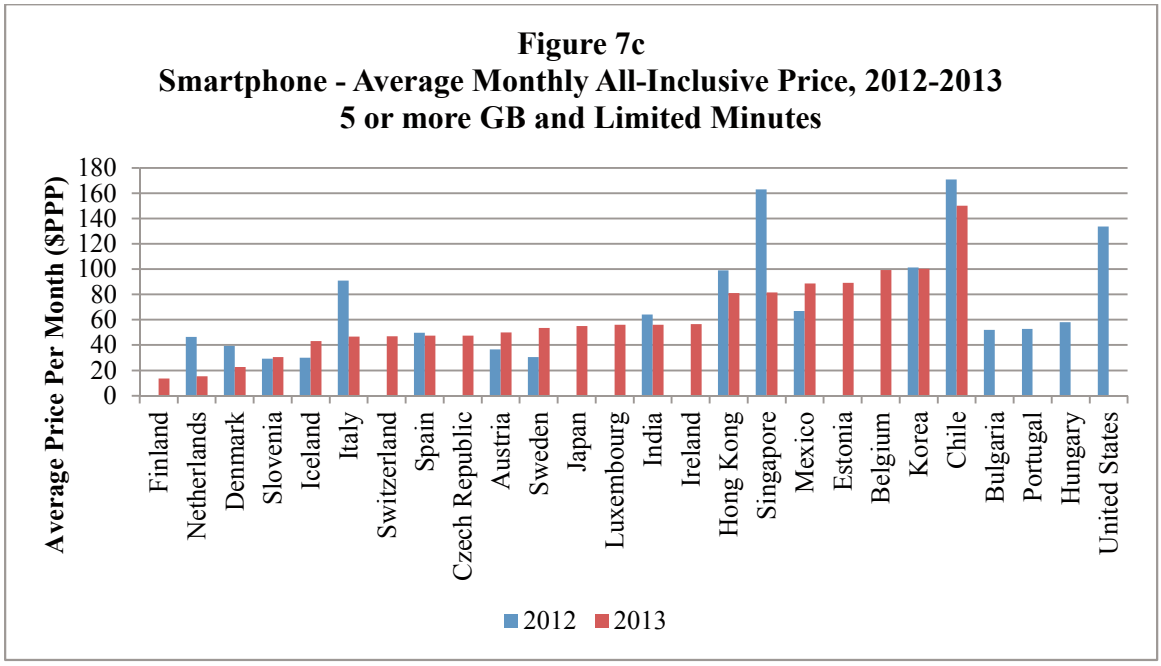
For plans with 1<5 GB and unlimited minutes, the number of plans included in the sample for the United States increased from 9 to 50. In 2012, the average monthly price for U.S. plans was $66.66 with an average usage limit of 3.33 GB. The average monthly price in the United States for a plan with 1<5 GB and unlimited minutes increased to $93.08 with an average usage limit of 2.38 GB. The average download speed for U.S. plans in this category decreased from 24.6 Mbps in 2012 to 15.6 Mbps. Slovakia had the least expensive plans in this category in 2012 with an average monthly cost of $18.45 (for 1 GB at 12.6 Mbps) and Greece had the most expensive average cost at $165.29 (for 1.5 GB at 42.2 Mbps). In 2013, Lithuania had the least expensive average monthly price at $3.31 (for 1.5 GB with an unknown download speed), while Hungary had the most expensive plan at $129.26 with an average usage limit of 2.5 GB (at 105 Mbps).[54]

Figure 7c displays the average monthly price for plans with 5 or more GB of data (excluding unlimited data) and limited minutes. For the United States in 2012, the average monthly price is $133.59 with an average usage limit of 8.5 GB and download speed of 16.7 Mbps. The United States has no plans in this category within the 2013 dataset. Slovenia had the least expensive average monthly price in 2012 at $29.32 (for 15 GB at 42 Mbps), while Chile had the most expensive at $170.85 (for 32 GB at 8 Mbps). In 2013, the Netherlands had the least expensive average monthly price at $15.28 for an average usage

[53] *See* Table 7c

[54] *See* Table 7d for data on all sample countries.

limit of 10 GB and download speed of 50 Mbps. Greece had the most expensive average monthly price in 2013 at $289.86 for an average 10 GB usage limit (the download speed is unknown).[55]



Note: The monthly all-inclusive price reflects the average price per month, including rebates and other fees, but excluding the cost of the device. Plans included in this figure have data limits of 5+ GB and limited minutes. Greece, Brazil, and Turkey have been excluded from this figure because their data are inconsistent from year to year.

In the category of plans with 5 or more GB of data and unlimited minutes, the average monthly price in the United States increased from $114.99 in 2012 to $225.84 in 2013. The average usage limit also more than doubled in the United States from 10 GB to 22.7 GB during this same time period. In 2012, the least expensive plans were in Belgium with an average monthly price of $51.42 with an average usage limit of 33.75 GB, while Korea had the most expensive average monthly price at $155.01 and an average usage limit of 25 GB. Denmark had the least expensive average monthly price in 2013 of $30.36 with an average usage limit of 13 GB. The United States had the most expensive plans in 2013.

For high end plans with unlimited data and unlimited minutes, the average monthly cost in the United States increased from $60.00 in 2012 to $83.88 in 2013. Thus, the average price for a smartphone plan with unlimited data and unlimited minutes in the United States in 2012 and 2013 was less expensive than the average price for plans that came with limits, except for plans with the most restrictive limits of less than 1 GB. The least expensive plans were in Hong Kong with an average monthly price of $21.85 in 2012, while the most expensive average monthly price was in Portugal ($150.07). In 2013, Switzerland had the lowest average monthly price at $56.96, while Korea had the most expensive average monthly price at $106.20. The number of countries with plans in this category decreased from nine to five, suggesting that many countries are moving away from fully unlimited plans; however, the number of plans sampled for the United States increased from eight to 13. In 2012, the United States ranked 5th least expensive out of 9 countries and 4th least expensive out of 5 countries in 2013.

4.2. Stick Modem Plans

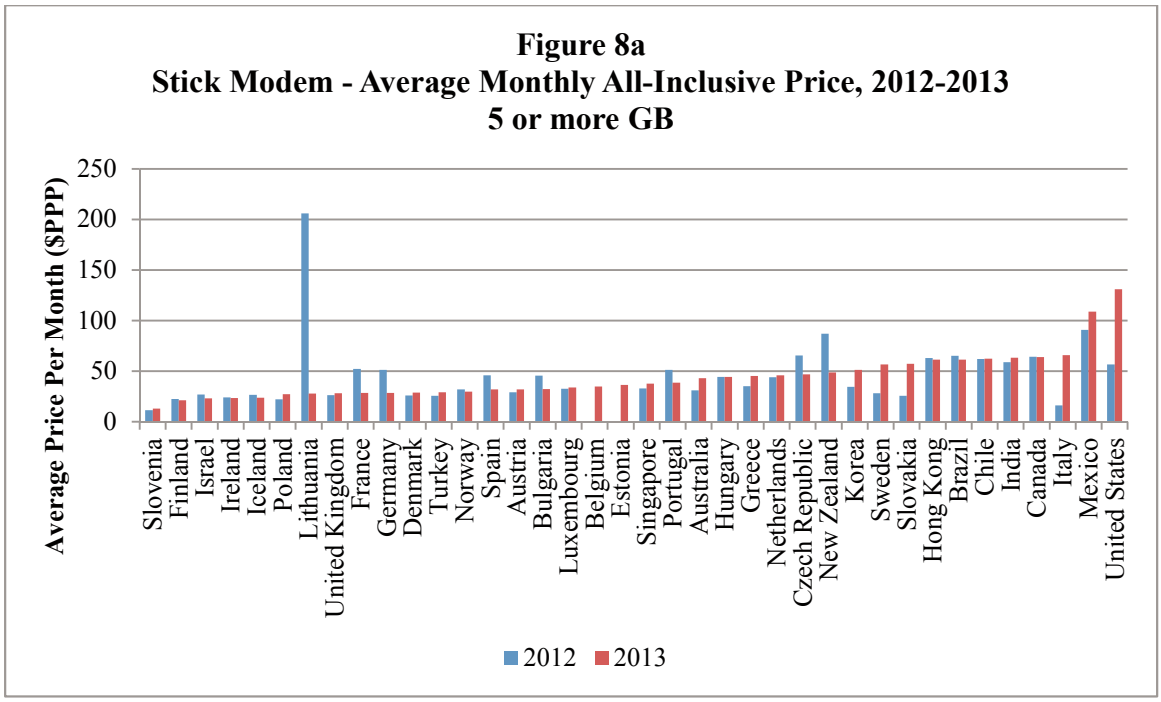
Estonia, Finland, and Switzerland had the largest number of unlimited data plans in 2012,

[55] *See* Table 7e for data on all sample countries.

although only 10 countries had unlimited stick modem data plans. In 2013, Finland and Hong Kong had the largest number of unlimited plans. While there were no unlimited data plans for stick modem in 2012, the United States had two plans in the dataset in 2013. The average monthly price was $85.92. Comparatively, Italy had the least expensive plan at a price of $10.42 per month, while Portugal surpassed the United States with an average monthly price of $110.15. The United States had the second highest number of limited data plans at 35 plans in 2012. Poland surpassed the United States with 36 limited data plans for stick modems in 2012. In 2013, the number of United States plans captured in the sample increased to 59.

Because of the wide range in the data limits of stick modem plans, we distinguish limited plans from unlimited plans in this Report. Plans with data limits were divided into two groups: (1) Less than 5 GB and (2) 5 or more GB.[56] In addition, some countries offer stick modem data plans with unlimited data; however, U.S. carriers did not offer this type of plan in 2013. Data and country rankings for each category are presented in Appendix C Tables 8a-8c.

Figure 8a shows the average monthly price for stick modem limited data plans with at least 5 GB of data. Slovenia and Italy had the lowest prices in 2012, with an average price of $14 per month. Slovenia remained the least expensive in 2013 with an average monthly price of $13. The United States ranked 28th out of 40 countries in terms of average monthly price ($56.75) with an average data limit of 8.92 GB in 2012. In 2013, the average monthly price increased to $131.16 (making the United States the most expensive country); however, the average usage limit also increased to 16.74 GB.

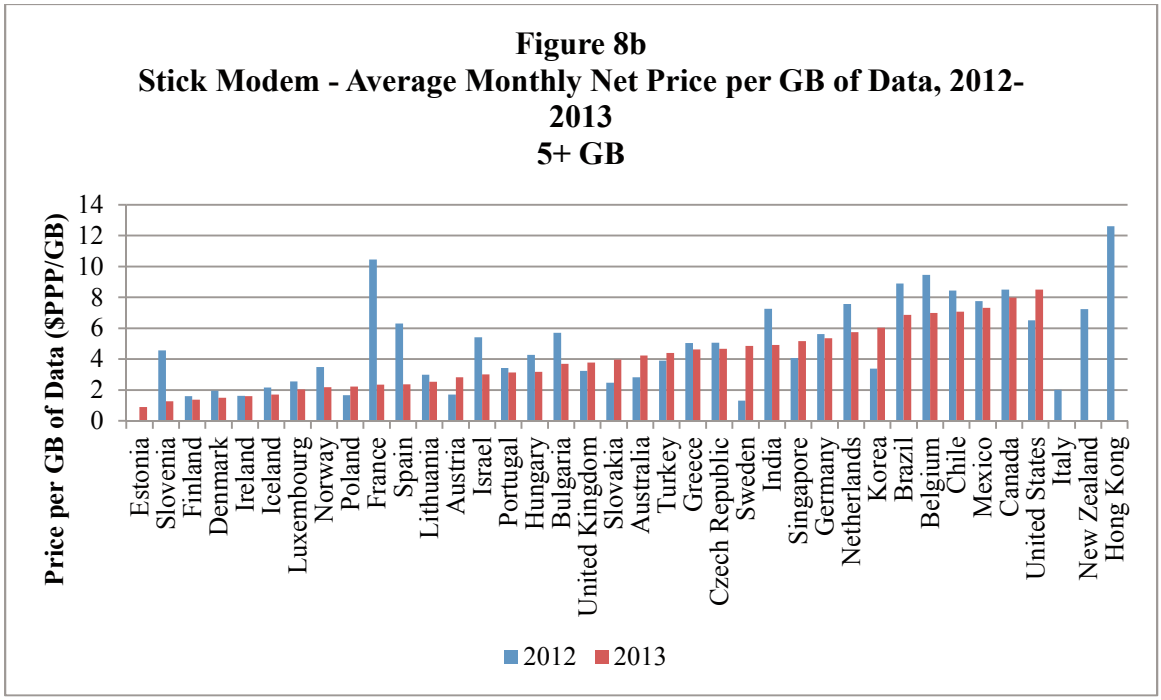


Note: The monthly all-inclusive price reflects the average price per month, including rebates and other fees, but excluding the cost of the device. Plans included in this figure have data limits of at least 5 GB, but not unlimited data. Belgium, Estonia, Singapore, and Switzerland are excluded from the above figure because they do not have plans in this category. Japan charges by the amount of packets sent, so we assumed 1 packet = 128 bytes.

Country rankings in terms of price per GB for both 2012 and 2013 are shown in Figure 8b. In

[56] While technically unlimited, we also consider plans with "soft" data caps (where slower speeds are implemented when the user reaches the monthly limit) to be limited.

terms of price per GB, the United States ranked 27th in 2012 with an average all-inclusive price of $6.52 per GB. In 2013, the United States ranked 35th (of 38 countries) with an average price per GB of $8.49. Sweden has the lowest price per GB at $1.31 in 2012, although the top six countries all had an average all-inclusive price per GB under $2. In 2013, Estonia had the lowest price per GB at $0.89. Hong Kong was the most expensive in both 2012 and 2013 at $12.60 per GB (average monthly cost was $63) and $12.28 per GB (average monthly cost was $61), respectively.



Note: The monthly all-inclusive price reflects the average price per month, including rebates and other fees, but excluding the cost of the device, divided by the average data usage limit. Plans included in this figure have data limits of at least 5 GB, but not unlimited data. Belgium, Estonia, Singapore, and Switzerland are excluded from the above figure because they do not have plans in this category. Japan charges by the amount of packets sent, so we assumed 1 packet = 128 bytes.

4.3 Tablet Data Plans

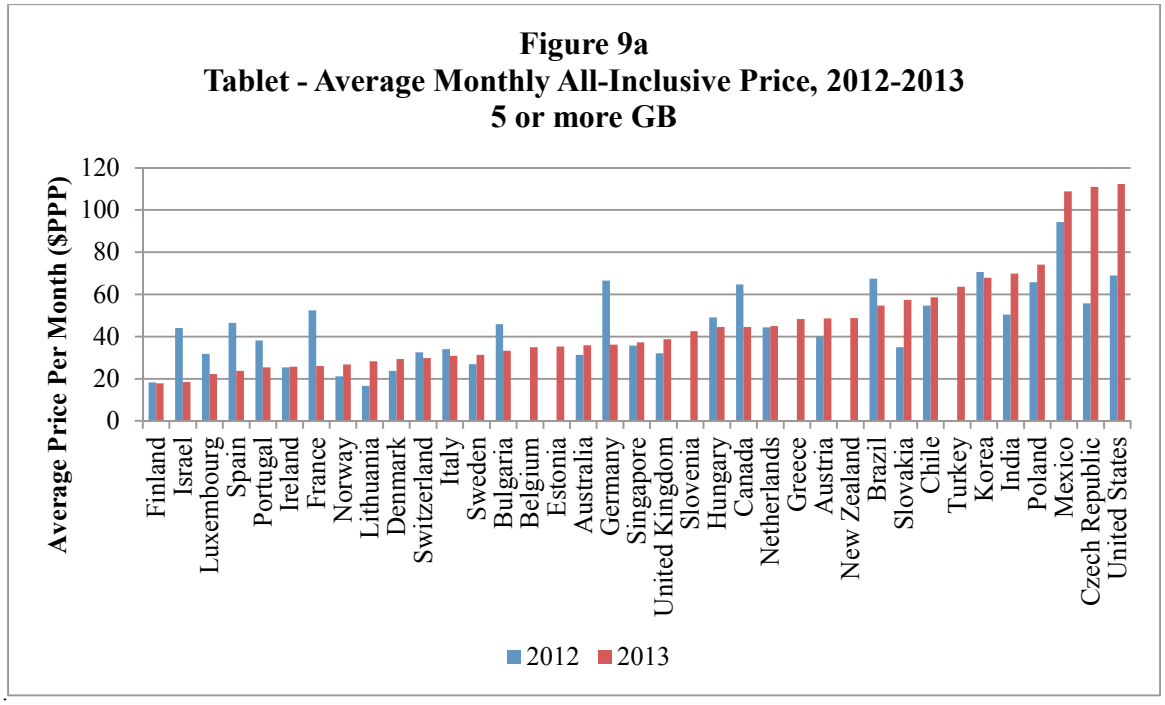
Relatively few countries have unlimited data plans for tablets. In our sample, Switzerland and Estonia had the largest number of plans with unlimited data for tablets in 2012. Finland and Portugal had the largest number of such plans in 2013. In 2012, our sample did not include any unlimited data plans for tablets in the United States. In 2013, however, there were two plans in this category. The United States had the largest number of limited data plans in both years with 34 plans and 76 plans, respectively. The average monthly price for U.S. unlimited data plans in 2013 was $85.92. Luxembourg had the least expensive average monthly cost at $18.69 in 2013.

Because of the wide range in the data limits of tablet plans, we report limited plans and unlimited plans separately. Similar to the stick modem plans, we report tablet plans with data limits in two groups: (1) Less than 5 GB and (2) 5 or more GB.[57] Data and country rankings for each category are presented in Appendix C Tables 9a-9c.

Figure 9a shows the average monthly price for limited data plans with at least 5 GB of data for

[57] While technically unlimited, we also consider plans with "soft" usage limits (where slower speeds are implemented when the user reaches the monthly limit) to be limited.

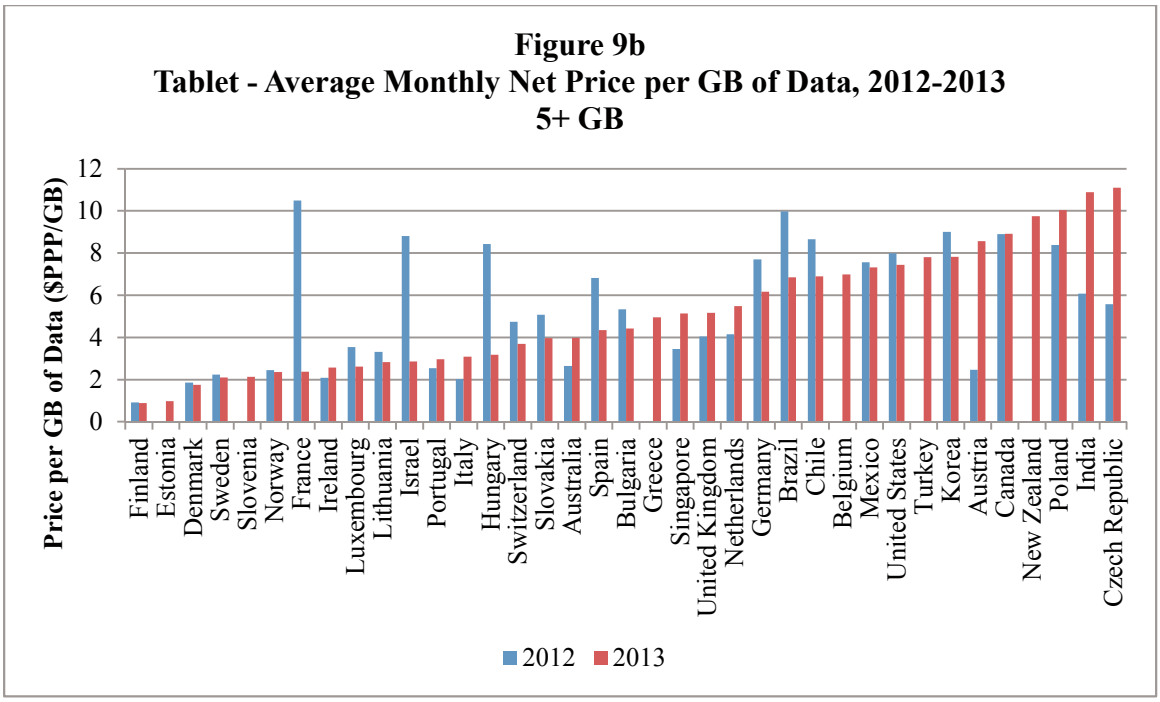
both 2012 and 2013. Lithuania and Finland had the lowest average monthly price in 2012 at $16.57 and $18.21, respectively. In 2013, Finland and Israel had the least expensive plans with an average monthly price of $17.86 and $18.39, respectively. The United States ranked 29th out of 31 countries in terms of average monthly price ($68.92) with an average data limit of 9.13 GB in 2012. In 2013, the United States ranked last (of 37 countries) with an average monthly price of $112.39; however, the average usage limited increased to 16.2 GB.



Note: The monthly all-inclusive price reflects the average price per month, including rebates and other fees, but excluding the cost of the device. Plans included in this figure have data limits of at least 5 GB, but not unlimited data. Hong Kong, Iceland, and Japan are excluded from the above figure because they do not have plans in this category.

Country rankings in terms of price per GB are shown in Figure 9b. In terms of price per GB, the United States ranked 23rd (of 30 countries) with an average all-inclusive price of $7.98 per GB.[58] In 2013, the U.S ranked 29th of 37 countries with an average price per GB of $7.45. Finland had the lowest price per GB in both 2012 and 2013 at $0.91 and $0.89 respectively. France was the most expensive at $10.50 per GB (average monthly cost was $52.48) in 2012 and the Czech Republic was the most expensive in 2013 at $11.10 per GB (average monthly cost was $110.96).

[58] The all-inclusive per GB is calculated on an individual plan basis and then averaged. As a result, the average all-inclusive per GB is not identical to dividing the average monthly cost by the average data limit.



Note: The monthly all-inclusive price reflects the average price per month, including rebates and other fees, but excluding the cost of the device, divided by the average data cap. Plans included in this figure have data limits of at least 5 GB, but not unlimited data. Hong Kong, Iceland, and Japan are excluded from the above figure because they do not have plans in this category.

5. Broadband Plan Usage Limits

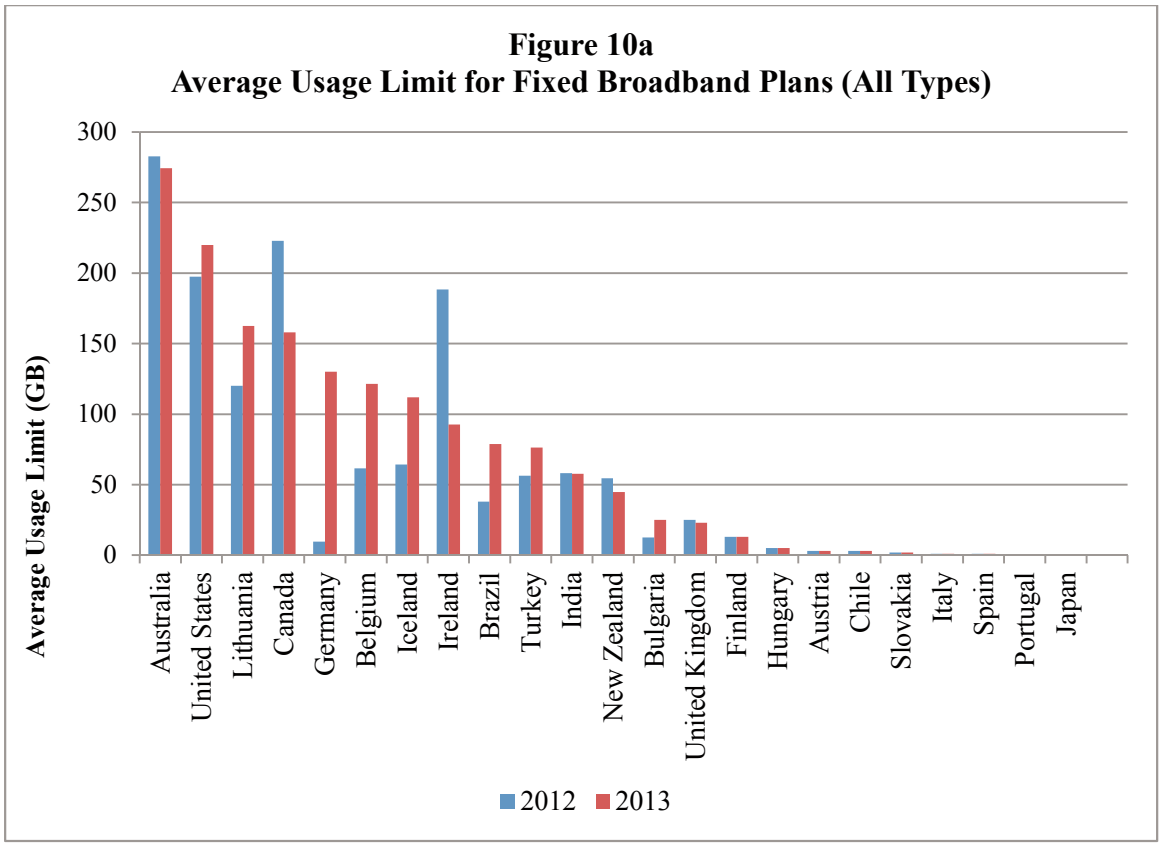
Our broadband price research yielded a rich data set, containing details for thousands of fixed and mobile broadband plans. These details include information about data consumption and whether data use is limited or capped.[59] In addition to comparing broadband plans on price, we believe that consumers may also benefit from learning how countries compare with regard to the amount of data broadband customers may use on a monthly basis.

Fixed Broadband. In 2012, in our sample, South Korea and Norway had the largest number of unlimited data plans (132 for Korea and 121 for Norway). Slovenia and Luxembourg had the largest offering of unlimited data plans in 2013 at 113 and 108 plans, respectively. In the United States, there was a fairly equal balance of unlimited and limited plan offerings in both 2012 and 2013. Australia and New Zealand had only limited data plans in both years. Iceland did not have unlimited plans in 2012, but had 20 unlimited plans in 2013.

The United States had the 7th highest maximum usage limit of 24 countries in 2012 and the highest of 25 countries in 2013, while its average usage limit was 4th highest in 2012 and second highest in 2013.[60] This indicates that most of the limited data plans in the United States have relatively high usage limits, compared with other countries with limited data plans.

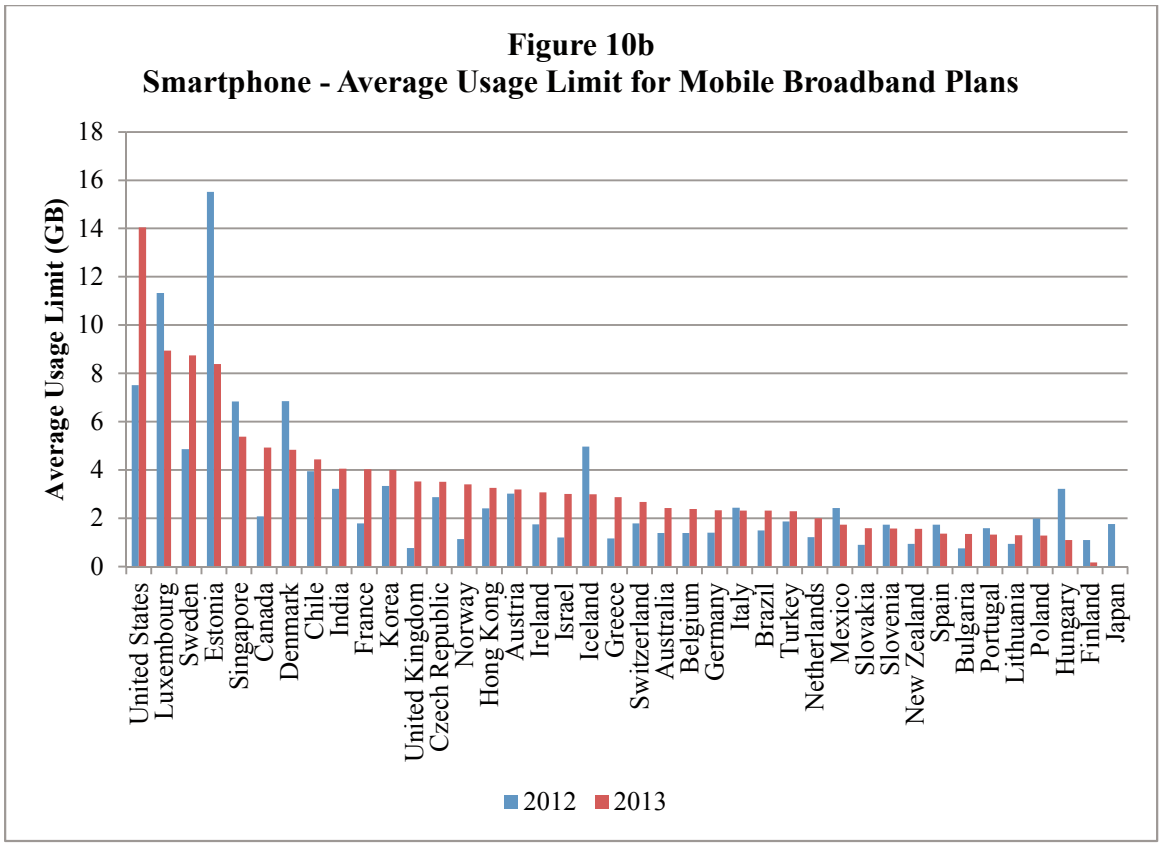
[59] There are several "Share Everything" data plans (*i.e.*, plans that permit multiple users to share in the monthly allotment of data) in the sample that have very large usage limits (30, 40, or 50 GB limits), but we do not have subscriber numbers for any plans. These high-cap shared plans may be contributing to higher averages where present. Usage limits for shared plans are reported as the cap for all sharing phones rather than dividing up the data allotment on a per phone basis.

[60] Figure 10a.



Mobile Broadband – Smartphones. About half of the countries in the sample had unlimited smartphone plans in both years. The United States had the second highest number of unlimited plans in each year. The United States had the highest maximum usage limit at 50 GB in 2012 and again in 2013 at 75 GB. From 2012 to 2013, maximum usage limits increased for the majority of countries. Estonia and Luxembourg had the highest average usage limits in 2012 (15.52 and 11.33 GB, respectively). In 2013, the United States had the highest average usage limit at 14.05 GB.[61]

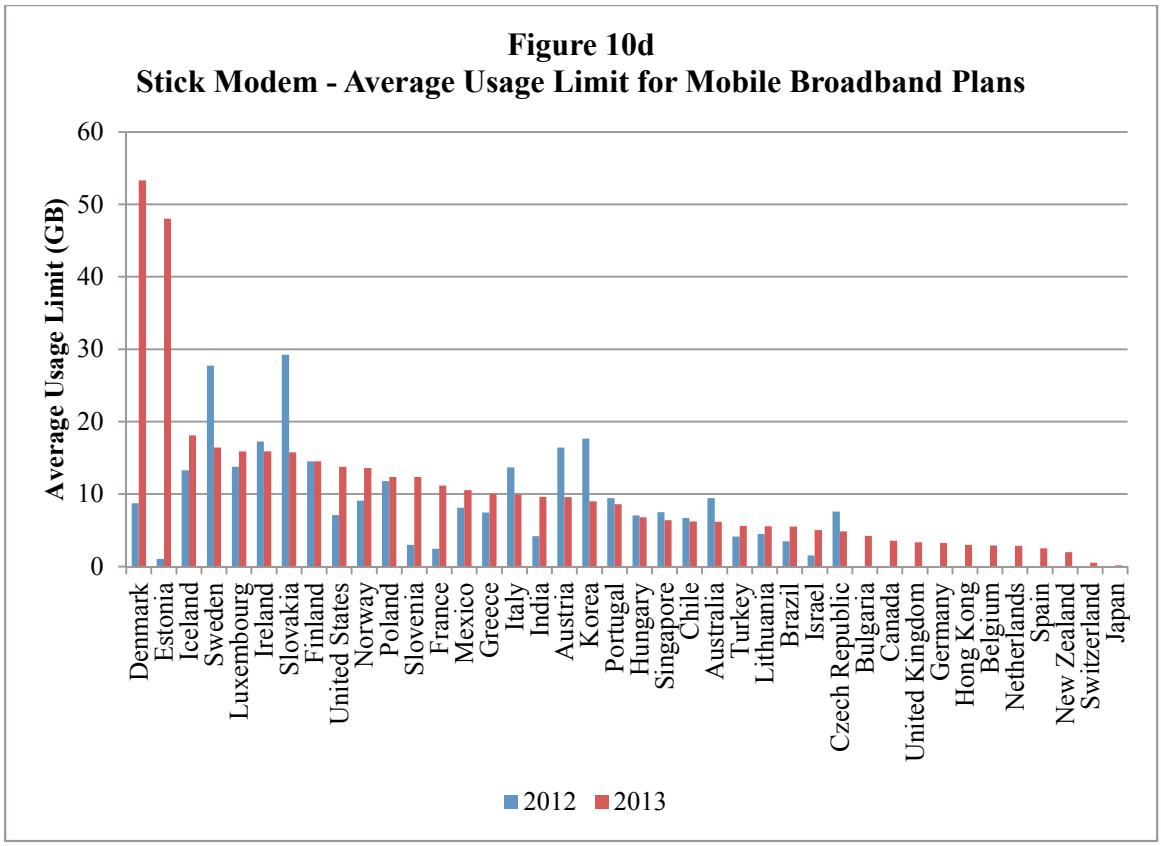
[61] Figure 10b.



Mobile Broadband – Stick Modems. Estonia, Finland, and Switzerland had the largest number of unlimited data plans in 2012, while Finland and Hong Kong had the largest number in 2013. In 2012, ten countries had unlimited stick modem plans. This number increased to 11 in 2013. The United States had the second highest number of limited data plans at 35 in 2012 (surpassed by Poland at 36). In 2013, the number of plans offered in the United States increased to 61.

Slovakia and Sweden had the highest maximum usage limits in 2012 at 100 GB and 80 GB, respectively. In 2013, Denmark had the highest maximum usage limit at 500 GB with Estonia following at 120 GB. The United States falls in the middle in terms of both maximum usage limit and average usage limit for both 2012, but moves to the upper one-third in 2013.[62]

[62] Figure 10d.



Mobile Broadband – Tablets. In 2012, in our sample, Switzerland and Estonia had the largest number of unlimited data plans for tablets. Norway and Luxembourg had the largest number of unlimited plans in 2013 at seven and six, respectively. Only nine countries offered unlimited data plans in 2012. This number increased to 12 in 2013. Our sample did not have any unlimited data plans for tablets for the United States in 2012 and had only two such plans for 2013.

The United States had the largest number of limited data plans for tablets and ranked in the middle for both the maximum and average usage limits for both 2012 and 2013. Italy had the highest maximum usage limit at 50 GB in 2012, while Denmark had the highest maximum usage limit at 500 GB in 2013. Austria had the highest average usage limit in 2012 (18.33 GB). In 2013, Denmark had the highest average usage at 65.9 GB.[63]

[63] Figure 10c.

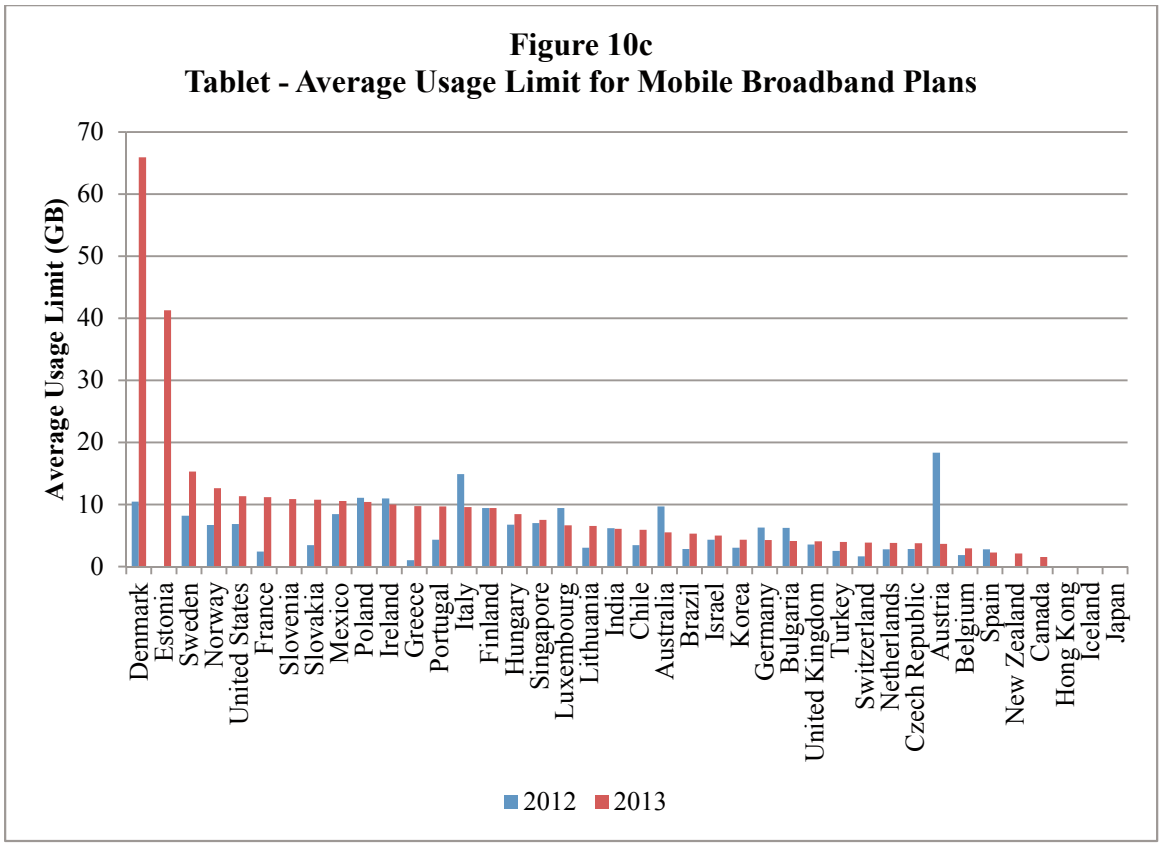


Figure 10c
Tablet - Average Usage Limit for Mobile Broadband Plans
Average Usage Limit (GB)
70
60
50
40
30
20
10
0
Denmark
Estonia
Sweden
Norway
United States
France
Slovenia
Slovakia
Mexico
Poland
Ireland
Greece
Portugal
Italy
Finland
Hungary
Singapore
Luxembourg
Lithuania
India
Chile
Australia
Brazil
Israel
Korea
Germany
Bulgaria
United Kingdom
Turkey
Switzerland
Netherlands
Czech Republic
Austria
Belgium
Spain
New Zealand
Canada
Hong Kong
Iceland
Japan
2012
2013

Appendix C
Table 1a
Number of Total, Unbundled, and Bundled Broadband Plans

2012

Country	Total Number of Plans in the Sample	Number of Standalone Broadband Plans	Number of Double Play Plans	Number of Triple Play Plans	Number of Quad Play Plans
Australia	69	49	10	10	
Austria	26	13	8	5	
Belgium	21	9	9	3	
Brazil	121	29	35	57	
Bulgaria	24	11	7	6	
Canada	29	25		4	
Chile	38	18	10	10	
Czech Republic	33	21	12		
Denmark	37	10	22	5	
Estonia	21	10	5	6	
Finland	21	17	4		
France	16	1		15	
Germany	22	2	16	4	
Greece	24	3	15	4	2
Hong Kong	30	19	9	2	
Hungary	21	9		12	
Iceland	22	22			
India	44	20	24		
Ireland	37	12	22	3	
Israel	23	20		3	
Italy	28	7	16	5	
Japan	74	74			
Korea	137	71	33	24	9
Lithuania	45	45			
Luxembourg	56	17	18	21	
Mexico	29	7	15	6	1
Netherlands	41	10	17	14	
New Zealand	35	5	25	5	
Norway	121	26	35	60	
Poland	77	24	40	12	1
Portugal	28	4		14	10
Singapore	68	14	3	51	
Slovakia	30	17	8	5	
Slovenia	86	48		38	
Spain	20		9	9	2
Sweden	55	22	21	12	
Switzerland	63	18	14	11	20
Turkey	62	46	11	5	
United Kingdom	33		11	18	4
United States	140	67	49	24	
Total	**1907**	**842**	**533**	**483**	**49**

Table 1a (continued)

2013

Country	Total Number of Plans in the Sample	Number of Standalone Broadband Plans	Number of Double Play Plans	Number of Triple Play Plans	Number of Quad Play Plans
Australia	108	58	38	12	
Austria	28	11	11	6	
Belgium	43	11	15	17	
Brazil	48	21	3	24	
Bulgaria	30	22	4	4	
Canada	46	29	4	12	1
Chile	34	16	8	10	
Czech Republic	21	11	7	3	
Denmark	25	4	16	5	
Estonia	27	13	8	6	
Finland	19	15	4		
France	58	7	12	39	
Germany	19	3	16		
Greece	32	4	20	6	2
Hong Kong	27	16	9	2	
Hungary	21	9		12	
Iceland	25	25			
India	48	22	26		
Ireland	60	22	31	7	
Israel	18	10	2	6	
Italy	42	12	23	7	
Japan	62	62			
Korea	80	54	21	5	
Lithuania	61	61			
Luxembourg	108		50	58	
Mexico	35	11	17	7	
Netherlands	37	6	17	14	
New Zealand	38	7	26	5	
Norway	52	17	35		
Poland	65	12	40	12	1
Portugal	23		4	14	5
Singapore	66	12	3	51	
Slovakia	27	17	6	4	
Slovenia	113	66		47	
Spain	45		10	21	14
Sweden	46	26	9	11	
Switzerland	45	19	13	13	
Turkey	55	48	6	1	

United Kingdom	40	5	11	16	8
United States	197	56	95	46	
Total	**1974**	**820**	**620**	**503**	**31**

Appendix C
Table 1b
Average Monthly All-Inclusive Price of a Standalone Broadband Package in U.S. Dollars (PPP and Exchange Rate Conversion)

2012

Country	Price $ (PPP)	Price $ (Ex. Rate)	Rank (PPP)	Rank (Ex. Rate)
Germany	18.85	21.91	1	2
France	22.98	29.17	2	7
Austria	25.49	30.62	3	9
Lithuania	27.43	19.35	4	1
Italy	28.10	33.40	5	10
Hungary	29.97	21.96	6	3
Netherlands	33.96	40.52	7	14
Slovakia	35.12	26.65	8	5
Estonia	35.15	29.34	9	8
Poland	36.04	24.13	10	4
Sweden	36.96	53.90	11	20
Korea	37.99	27.64	12	6
Finland	40.28	55.00	13	21
Japan	40.44	52.65	14	19
Greece	42.51	42.87	15	15
Denmark	47.28	76.50	16	31
Ireland	47.62	57.01	17	23
Czech Republic	47.73	36.43	18	11
Australia	50.18	81.37	19	33
Belgium	50.28	62.99	20	26
Luxembourg	50.60	71.75	21	27
Mexico	52.06	37.54	22	12
New Zealand	54.46	74.22	23	30
Hong Kong	56.90	40.48	24	13
Israel	58.87	60.68	25	24
Chile	60.79	51.49	26	18
United States	60.86	60.86	27	25
Iceland	63.02	73.14	28	29
Turkey	63.90	50.74	29	17
Brazil	74.91	84.19	30	34
Canada	76.27	96.27	31	35
Portugal	80.25	76.57	32	32
Singapore	86.76	72.08	33	28
Norway	90.27	169.12	34	37
India	104.90	45.14	35	16
Bulgaria	106.11	56.66	36	22
Slovenia	124.16	105.97	37	36
Switzerland	147.75	273.52	38	38

Table 1b (continued)
2013

Country	Price $ (PPP)	Price $ (Ex. Rate)	Rank (PPP)	Rank (Ex. Rate)
Poland	31.60	20.18	4	1
Lithuania	32.64	22.14	7	2
Korea	32.41	23.65	6	3
Slovakia	34.08	24.80	9	4
Hungary	40.09	26.33	13	5
Estonia	34.93	28.38	10	6
Austria	25.87	29.99	2	7
New Zealand	22.71	30.58	1	8
Germany	28.66	31.96	3	9
Czech Republic	48.05	33.50	20	10
Bulgaria	66.82	34.23	26	11
Israel	33.10	35.08	8	12
Greece	39.24	35.95	12	13
India	104.71	40.41	37	14
Italy	35.92	41.21	11	15
Hong Kong	61.57	45.12	23	16
Japan	43.12	45.15	15	17
United Kingdom	44.44	47.17	17	18
Denmark	31.86	49.29	5	19
France	43.78	52.84	16	20
Chile	65.86	54.94	25	21
Mexico	82.47	58.09	34	22
Finland	45.82	60.96	19	23
Turkey	86.53	61.17	35	24
Sweden	45.61	64.01	18	25
Belgium	54.45	65.57	22	26
Brazil	73.43	67.26	29	27
Singapore	81.97	69.83	33	28
Iceland	64.49	72.08	24	29
Switzerland	42.55	74.87	14	30
United States	75.47	75.47	30	31
Netherlands	68.48	78.83	27	32
Australia	54.40	81.40	21	33
Slovenia	103.52	85.91	36	34
Ireland	77.91	90.51	32	35
Canada	77.62	93.01	31	36
Norway	69.07	126.05	28	37

Appendix C
Table 1c
Average Monthly All-Inclusive Price of a Double Play Package in U.S. Dollars
(PPP and Exchange Rate Conversion)

2012

Country	Price $ (PPP)	Price $ (Ex. Rate)	Rank (PPP)	Rank (Ex. Rate)
Bulgaria	29.29	15.64	1	1
Singapore	31.48	26.16	2	2
Estonia	32.27	26.93	3	4
Germany	35.27	41.00	4	9
Korea	36.27	26.39	5	3
Finland	39.04	53.30	6	17
Denmark	41.64	67.36	7	22
Italy	42.17	50.13	8	12
Czech Republic	42.21	32.22	9	6
Slovakia	42.42	32.20	10	5
Austria	42.44	50.99	11	15
Sweden	43.37	63.24	12	20
United Kingdom	44.12	47.64	13	11
Turkey	47.71	37.88	14	8
Hong Kong	48.49	34.50	15	7
Greece	50.26	50.68	16	13
Netherlands	51.16	61.03	17	19
Australia	52.23	84.69	18	26
Spain	54.68	57.41	19	18
Norway	58.00	108.66	20	30
Belgium	58.22	72.93	21	24
Ireland	59.52	71.26	22	23
Luxembourg	62.25	88.27	23	27
Poland	66.98	44.85	24	10
New Zealand	68.86	93.84	25	29
Mexico	72.59	52.34	26	16
Switzerland	73.79	136.60	27	31
Chile	78.45	66.45	28	21
Brazil	79.34	89.16	29	28
United States	84.12	84.12	30	25
India	117.97	50.76	31	14

Table 1c (continued)

2013

Country	Price $ (PPP)	Price $ (Ex. Rate)	Rank (PPP)	Rank (Ex. Rate)
Bulgaria	31.26	16.02	3	1
Korea	27.92	20.37	1	2
Estonia	32.13	26.11	4	3
Israel	30.03	31.83	2	4
India	87.20	33.65	33	5
Turkey	51.04	36.09	10	6
Slovakia	52.85	38.45	12	7
Germany	34.62	38.61	6	8
Czech Republic	55.99	39.03	15	9
Austria	33.81	39.19	5	10
Poland	66.60	42.52	26	11
Hong Kong	61.30	44.92	21	12
Italy	41.83	47.99	9	13
Mexico	71.04	50.04	29	14
Singapore	59.72	50.88	20	15
Finland	38.30	50.95	8	16
Portugal	56.79	51.27	18	17
Spain	52.87	51.66	13	18
United Kingdom	51.41	54.57	11	19
Denmark	36.43	56.36	7	20
Greece	67.22	61.58	27	21
Ireland	56.58	65.73	17	22
Brazil	74.76	68.48	30	23
Luxembourg	53.12	75.46	14	24
Belgium	64.11	77.20	23	25
France	64.46	77.80	24	26
Netherlands	69.88	80.44	28	27
Chile	104.96	87.56	35	28
United States	88.55	88.55	34	29
Sweden	63.42	89.01	22	30
Australia	66.19	99.05	25	31
Switzerland	56.52	99.45	16	32
Canada	85.84	102.86	32	33
Norway	57.49	104.92	19	34
New Zealand	81.71	110.03	31	35

Appendix C
Table 1d
Average Monthly All-Inclusive Price of a Triple Play Package in U.S. Dollars
(PPP and Exchange Rate Conversion)

2012

Country	Price $ (PPP)	Price $ (Ex. Rate)	Rank (PPP)	Rank (Ex. Rate)
Korea	34.52	24.12	1	2
Estonia	38.00	31.72	2	4
France	38.03	48.28	3	9
Hungary	39.49	28.93	4	3
United Kingdom	41.64	44.97	5	7
Bulgaria	41.99	22.42	6	1
Sweden	42.20	61.54	7	13
Germany	51.31	59.64	8	12
Slovakia	52.76	40.04	9	5
Austria	52.94	63.60	10	14
Denmark	53.34	86.30	11	24
Luxembourg	57.88	82.07	12	22
Hong Kong	59.41	42.27	13	6
Italy	59.41	70.63	14	19
Turkey	59.85	47.52	15	8
Switzerland	59.99	111.06	16	29
Netherlands	60.81	72.55	17	20
Spain	62.35	65.46	18	15
Slovenia	67.32	57.46	19	11
Greece	68.33	68.90	20	16
Norway	72.38	135.60	21	33
Portugal	72.75	69.42	22	17
Belgium	75.32	94.36	23	25
Australia	76.34	123.78	24	30
Poland	84.18	56.37	25	10
Ireland	85.85	102.78	26	27
Singapore	87.61	72.79	27	21
Mexico	97.39	70.23	28	18
New Zealand	99.20	135.18	29	31
Chile	99.20	84.02	30	23
United States	99.53	99.53	31	26
Israel	100.44	103.52	32	28
Canada	114.01	143.91	33	34
Brazil	120.43	135.34	34	32

Table 1d (continued)

2013

Country	Price $ (PPP)	Price $ (Ex. Rate)	Rank (PPP)	Rank (Ex. Rate)
Turkey	36.40	25.74	1	1
Hungary	39.59	26.00	4	2
Bulgaria	50.83	26.04	7	3
Korea	39.56	28.86	3	4
Estonia	37.31	30.32	2	5
Slovakia	49.08	35.71	6	6
Czech Republic	58.82	41.00	14	7
Hong Kong	57.88	42.42	10	8
Poland	83.27	53.17	23	9
Italy	48.80	55.99	5	10
Slovenia	69.78	57.91	17	11
Spain	62.51	61.08	15	12
Mexico	91.45	64.42	25	13
Austria	56.84	65.88	9	14
France	54.94	66.30	8	15
Greece	73.21	67.07	19	16
Singapore	88.71	75.57	24	17
United Kingdom	72.02	76.45	18	18
Netherlands	67.33	77.51	16	19
Israel	76.74	81.34	21	20
Sweden	58.60	82.24	13	21
Ireland	74.90	87.01	20	22
Chile	104.90	87.51	28	23
Portugal	98.12	88.59	27	24
Denmark	57.91	89.60	11	25
Switzerland	58.45	102.85	12	26
Brazil	114.68	105.05	31	27
Luxembourg	81.03	115.12	22	28
United States	124.97	124.97	32	29
Canada	111.09	133.11	30	30
Australia	94.06	140.75	26	31
New Zealand	108.98	146.75	29	32
Belgium	224.55	270.41	33	33

Appendix C
Table 1e
Average Monthly All-Inclusive Price of a Quad Play Package in U.S. Dollars
(PPP and Exchange Rate Conversion)

2012

Country	Price $ (PPP)	Price $ (Ex. Rate)	Rank (PPP)	Rank (Ex. Rate)
Korea	28.71	20.89	1	1
Greece	37.05	37.36	2	2
United Kingdom	59.98	64.77	3	3
Portugal	98.89	94.36	4	6
Mexico	105.94	76.39	5	4
Spain	112.30	117.92	6	7
Poland	119.46	79.99	7	5
Switzerland	125.73	232.76	8	8

2013

Country	Price $ (PPP)	Price $ (Ex. Rate)	Rank (PPP)	Rank (Ex. Rate)
Greece	38.99	35.72	1	1
Poland	114.19	72.91	5	2
Spain	77.41	75.65	2	3
United Kingdom	97.02	102.99	4	4
Canada	92.56	110.92	3	5
Portugal	129.40	116.83	6	6

Appendix C
Table 2a
Average Monthly All-Inclusive Price of a Standalone Broadband Plan ($ PPP)
by Technology
Advertised Download Speed ≥1 to ≤5 Mbps

2012

Country	All†	DSL	Cable	Fiber	Hybrid	Satellite	Average Download Speed
Lithuania	13.75	13.75					2.33
Poland	15.07	15.07					1.00
Hong Kong	21.08			21.08			1.50
Czech Republic	23.44	37.02	16.66	16.66			1.33
Slovakia	23.96	23.96					5.00
Canada	24.58		20.77	28.38			4.00
Hungary	24.89	24.89					2.95
Mexico	25.00		25.00				3.67
Estonia	26.20	26.62	25.78	26.62			4.00
Sweden	26.29	26.29					2.00
Finland	26.82	26.70	27.08				2.33
Ireland	28.07	28.07					2.33
Singapore	29.37		29.37				3.00
Luxembourg	29.51	29.51					5.00
Chile	35.13	39.04	29.27				2.20
Japan	35.57	39.01	28.68				1.17
Turkey	40.91	40.91					2.17
Belgium	47.21	47.21					2.50
Brazil	47.48	50.72	34.52				2.60
Slovenia	48.73		50.99		45.84		2.63
Australia	54.81	54.81					1.50
Norway	57.73	34.99		91.83			3.20
India	65.30	65.30					2.36
Israel	66.09		89.43	19.42			5.00
Switzerland	98.86	30.61			303.63		3.00

†The simple average is calculated by excluding satellite.

Table 2a (continued)

2013

Country	All†	DSL	Cable	Fiber	Hybrid	Satellite	Average Download Speed
Brazil	36.73		39.19		54.20		2.11
Bulgaria						208.28	2.00
Canada	30.89		21.03	30.75			4.33
Chile	37.50	40.53	34.47				2.25
Czech Republic	33.17	33.17					2.00
Estonia	25.73	26.14	25.32	26.14			4.00
Finland	26.32	26.19	26.57				2.33
France	32.99			32.99			1.00
Hong Kong	20.54			20.54			1.50
Hungary	36.69				36.69		5.00
India	60.77	60.77					2.57
Ireland	50.67	50.67					4.00
Israel	16.53			16.53			5.00
Japan	44.04	51.48	29.16				1.17
Lithuania	38.65	19.22			41.42		2.88
Mexico	26.93		26.93				3.00
Norway	37.54	38.57		34.46			4.00
Poland	19.77	19.77					4.00
Slovakia	25.51	25.51					5.00
Slovenia	44.02	70.93	52.75		42.40		2.50
Switzerland	25.42	25.42					4.25
Turkey	68.06	68.06					4.00
United States	48.45	53.64	39.41	56.12		93.16	3.00

†The simple average is calculated by excluding satellite.

Appendix C
Table 2b
Average Monthly All-Inclusive Price of a Standalone Broadband Plan ($ PPP)
by Technology
Advertised Download Speed >5 to ≤15 Mbps

2012

Country	All	DSL	Cable	Fiber	Hybrid	Satellite	Average Download Speed
Bulgaria	19.71	19.71		19.71		242.68	10.67
Austria	22.31	21.22	23.94				8.84
France	22.98	22.98					8.00
Portugal	23.60		23.60				15.00
Lithuania	24.46	28.04		20.88			10.00
Finland	25.67	25.79	29.23	18.21		101.92	9.71
Denmark	25.71		26.33	25.10			15.00
Poland	26.09	30.16	22.19	25.75			11.40
Sweden	27.44	30.15	25.84	25.54			8.70
Italy	28.10	26.96		31.54			8.75
Netherlands	30.07	30.07					8.00
Japan	30.74	30.11	38.31				10.46
Hungary	33.49	43.45		13.58			11.67
Slovakia	34.89	39.66		20.59			11.25
Korea	37.78				37.78		10.00
New Zealand	38.23			38.23			15.00
Czech Republic	42.10	61.75	30.54	25.91			10.20
Luxembourg	42.63	42.63					11.25
Canada	43.09		44.96	35.59			10.80
Australia	43.13			43.13			12.00
Singapore	43.69		43.69				8.00
Israel	44.14	27.77	93.22	22.34			11.71
Hong Kong	45.65	62.09		29.21			9.00
Ireland	46.08	46.08					7.65
Chile	51.94	52.11	51.24				10.20
Slovenia	52.32		44.79	35.83	58.63		9.75
Turkey	52.35	52.35					8.00
Belgium	60.14	60.14					12.00
Norway	68.72	33.24		87.35	48.31		11.00
Brazil	69.71	68.14	74.41				11.25
Iceland	70.10	70.10					11.14
Mexico	70.47		70.47				8.00
India	131.09			131.09			9.60
Switzerland	279.77			26.21	343.17		8.80
Greece						66.32	10.00

Table 2b (continued)

2013

Country	All	DSL	Cable	Fiber	Hybrid	Satellite	Average Download Speed
Australia	46.11			46.11			12.00
Austria	22.70	22.74	22.64				8.84
Brazil	51.81	51.17	54.38				12.00
Bulgaria	20.93	20.93		20.93		168.54	13.60
Canada	56.09		59.53	38.86			10.67
Chile	53.09	50.22	56.25		55.64		11.25
Denmark	22.90	32.68	31.58	22.90			15.00
Finland	26.47	25.30	41.61	14.87		223.37	9.67
France	45.58	48.10			32.99		8.23
Greece						69.78	10.00
Hong Kong	28.46			28.46			10.00
Hungary	37.14			17.63	46.90		13.33
Iceland	58.32	58.32					11.40
India	103.98			103.98			9.33
Ireland	56.85	56.85				134.55	9.25
Israel	24.40	24.56	28.46	20.19			14.00
Italy	30.89	30.89					8.33
Japan	38.85	38.84	38.95				10.67
Korea	33.84				33.84		10.00
Lithuania	36.38	25.45		8.50	52.96		11.00
Mexico	48.70		48.70				11.25
Netherlands	42.10	42.10					8.00
New Zealand	22.71		22.71				15.00
Norway	36.26	32.46		40.05			10.00
Poland	25.10		24.88	25.31			13.50
Slovakia	24.78	37.34		19.14	15.04		11.00
Slovenia	51.05	56.00	82.98	36.80			9.57
Sweden	30.56			30.73	30.05		10.00
Switzerland	33.15	80.51		26.42			10.00
Turkey	55.68	55.68					8.00
United States	60.69	63.90	50.09	61.17		94.37	10.67

Appendix C
Table 2c
Average Monthly All-Inclusive Price of a Standalone Broadband Plan ($ PPP)
by Technology
Advertised Download Speed between >15 to ≤25 Mbps

2012

Country	All	DSL	Cable	Fiber	Hybrid	Satellite	Average Download Speed
Austria	18.87	26.18			4.25		16.26
Hungary	22.06			22.06			25.00
Bulgaria	22.37	22.37		22.37			20.00
Netherlands	24.92			24.92			21.67
Germany	25.76		25.76				16.00
Korea	25.98				25.98		20.00
Italy	28.08	28.08					20.00
Poland	30.21	32.04	24.70				20.00
Greece	30.61	30.61					24.00
Israel	31.72	36.58		26.86			20.00
Finland	31.78	31.78					20.00
Sweden	33.89	34.74	32.18				20.83
Estonia	36.18	33.28	39.08				20.00
Denmark	36.30	36.30					20.00
Turkey	39.97	38.96		40.52			18.59
Singapore	43.02		48.72	37.32			20.50
Canada	44.75		45.33	43.59			21.00
Norway	45.08	41.09			53.07		20.33
Australia	49.46	50.64		46.31			23.55
Slovakia	53.02	53.02					20.00
Ireland	59.65	59.65					24.00
Chile	61.01	61.03	61.00				20.00
Czech Republic	65.05	74.93			45.29		18.83
Slovenia	65.15		64.33	45.60	72.20		20.00
Hong Kong	69.31	69.31					18.00
Luxembourg	72.21	72.21					20.00
Iceland	73.41	73.41					16.00
Mexico	78.03		78.03				20.00
India	86.46			86.46			16.00
Brazil	101.01		101.01				20.00
Switzerland	141.92			37.99	245.84		21.25

Table 2c (continued)

2013

Country	All	DSL	Cable	Fiber	Hybrid	Satellite	Average Download Speed
Australia	46.11			46.11			12.00
Austria	22.70	22.74	22.64				8.84
Brazil	51.81	51.17	54.38				12.00
Bulgaria	20.93	20.93		20.93		168.54	13.60
Canada	56.09		59.53	38.86			10.67
Chile	53.09	50.22	56.25		55.64		11.25
Denmark	22.90			22.90			15.00
Estonia	32.13	32.68	31.58				11.00
Finland	26.47	25.30	41.61	14.87		223.37	9.67
France	45.58	48.10			32.99		8.23
Greece						69.78	10.00
Hong Kong	28.46			28.46			10.00
Hungary	37.14			17.63	46.90		13.33
Iceland	58.32	58.32					11.40
India	103.98			103.98			9.33
Ireland	56.85	56.85				134.55	9.25
Israel	24.40	24.56	28.46	20.19			14.00
Italy	30.89	30.89					8.33
Japan	38.85	38.84	38.95				10.67
Korea	33.84				33.84		10.00
Lithuania	36.38	25.45		8.50	52.96		11.00
Mexico	48.70		48.70				11.25
Netherlands	42.10	42.10					8.00
New Zealand	22.71		22.71				15.00
Norway	36.26	32.46		40.05			10.00
Poland	25.10		24.88	25.31			13.50
Slovakia	24.78	37.34		19.14	15.04		11.00
Slovenia	51.05		82.98	36.80	56.00		9.57
Sweden	30.56			30.73	30.05		10.00
Switzerland	33.15	29.41		26.42	51.09		10.00
Turkey	55.68	55.68					8.00
United States	60.69	63.90	50.09	61.17		94.37	10.67

Appendix C
Table 2d
Average Monthly All-Inclusive Price of a Standalone Broadband Plan ($ PPP)
by Technology
Advertised Download Speed between >25 to ≤50 Mbps

2012

Country	All	DSL	Cable	Fiber	Hybrid	Satellite	Average Download Speed
Austria	20.76		27.77	25.92	8.58		38.33
Slovakia	26.57			26.57			30.00
Lithuania	27.44		30.86	13.75			50.00
Bulgaria	29.69			29.69			40.00
Sweden	30.52			30.52			30.00
Hungary	31.09			31.09			50.00
Netherlands	32.03	38.80		29.77			47.50
Poland	34.38	32.27	28.49	39.00			38.33
Japan	35.96	34.55	52.94				40.85
Korea	37.13			37.13			50.00
Estonia	39.00		44.72	33.28			50.00
Denmark	39.18		38.87	39.49			40.00
Belgium	42.65		42.65				30.00
Finland	42.71		42.71				35.00
Hong Kong	43.59	69.31	17.88				40.00
Czech Republic	47.10			34.47	59.73		40.00
Portugal	47.16		47.16				30.00
Iceland	49.32			49.32			50.00
Ireland	49.59			49.59			50.00
Australia	50.27		46.67	52.67			42.00
Luxembourg	55.05			55.05			36.67
Canada	61.25		60.57	64.01			38.00
Israel	62.12	39.29	104.21	31.44			34.00
Switzerland	62.34			55.91	81.61		40.00
Singapore	67.58		77.92	46.89			36.67
Turkey	68.08			68.08			50.00
Chile	71.38	69.96	75.65				37.50
Norway	78.23			99.16	50.33		35.71
Slovenia	89.98		84.69	63.52	105.86		40.00
Brazil	139.52				139.52		42.50
India	161.15			161.15			40.00

Table 2d (continued)

2013

Country	All	DSL	Cable	Fiber	Hybrid	Satellite	Average Download Speed
Australia	57.60		58.63	56.67			36.32
Austria	30.43			30.43			30.00
Belgium	42.63		42.63				34.29
Brazil	88.14	56.91	74.63	132.86			38.33
Bulgaria	27.31		26.36	27.55			42.00
Canada	78.71		85.87	42.91			40.00
Chile	71.99	70.19	80.45		65.33		40.00
Czech Republic	47.61	51.72		30.91	76.89		42.50
Denmark	20.60			20.60			30.00
Estonia	38.48		41.01	35.95			40.00
Finland	39.51		39.51				40.00
Germany	32.88	32.88					50.00
Greece	36.23	36.23					50.00
Hong Kong	23.54				23.54		50.00
Hungary	24.44			24.44			30.00
Iceland	65.79	59.24		73.97			50.00
India	135.93	134.46		138.88			37.33
Ireland	44.97	47.09		42.86			40.00
Israel	31.64	30.83	39.72	24.37			36.67
Japan	45.22	44.15	53.82				42.11
Korea	27.42			29.07	26.59		50.00
Lithuania	20.03			39.63	13.49		47.50
Mexico	103.13		103.13				43.33
Netherlands	63.68	53.63		73.72			45.00
Norway	50.43	50.16		51.25			35.00
Poland	29.31	28.88	29.84	29.65			40.00
Singapore	62.51		62.51				50.00
Slovakia	30.97	39.22		26.84			46.67
Slovenia	93.30	102.40	84.59	65.60			43.33
Sweden	39.08	84.82			39.08		50.00
Switzerland	62.45	84.82		54.99			36.25
Turkey	108.28			177.90			44.38
United Kingdom	41.61		39.68	43.54			34.00
United States	68.65	43.60	69.23	132.26			45.00

Appendix C
Table 3a
Average Monthly All-Inclusive Price of a Double Phone Broadband Plan ($ PPP)
by Speed Tier

2012

Country	<5 Mbps	≥5 to <15 Mbps	≥15 to ≤25 Mbps	>25 to ≤50 Mbps
Australia			52.23	
Austria		35.09	57.36	33.11
Belgium	46.38	60.24		61.83
Brazil	58.63	81.01	86.33	149.71
Bulgaria		34.35		
Chile	63.44	68.93	77.48	80.53
Czech Republic			49.73	
Denmark		25.58	34.49	46.90
Estonia	18.29	28.27		36.59
Germany	34.78	29.23	37.34	36.38
Greece	47.39		41.03	58.99
Hong Kong				25.10
India	56.14	122.36	192.91	
Ireland	58.96	54.39	67.32	58.87
Italy		43.31	36.06	
Korea		26.66		
Luxembourg		36.00	68.67	60.42
Mexico	44.26	72.00	88.63	125.47
Netherlands		34.92	22.85	39.79
New Zealand			73.96	
Norway		52.56	59.22	68.75
Poland			50.38	91.63
Slovakia		40.58		42.16
Spain		44.15	35.65	51.88
Sweden	25.16	37.40	34.54	44.91
Switzerland			35.94	41.72
Turkey		64.56	40.00	
United Kingdom		35.28	41.29	40.43

Table 3a (continued)

2013

Country	<5 Mbps	≥5 to <15 Mbps	≥15 to ≤25 Mbps	>25 to ≤50 Mbps
Australia		58.67	65.85	69.06
Austria		29.48	30.71	35.92
Belgium		34.17	26.36	58.11
Chile		78.03	87.71	
Chile			87.71	
Denmark		33.37	36.33	36.15
Estonia	17.96	31.60		35.93
France		107.25	43.05	
Germany		36.92	28.57	39.47
Greece	78.69		56.56	86.31
Hong Kong				24.45
India	84.09	85.82	123.77	
Ireland	58.08	50.22	81.31	47.29
Israel		28.94		31.12
Italy		42.38	36.12	
Korea		26.29		
Luxembourg		43.69	48.23	48.59
Mexico	43.24	65.46		110.29
Netherlands		34.60	22.64	51.76
New Zealand		81.71		
Norway		51.60	50.79	64.78
Poland			51.06	87.12
Portugal	29.40	44.10	127.93	
Spain		50.38	47.86	51.19
Sweden		40.36		
Switzerland				
Turkey			41.65	58.69
United Kingdom			38.24	51.27
United States	65.46	72.39	69.08	77.06

Appendix C
Table 3b
Average Monthly All-Inclusive Price of a Double Video Broadband Plan ($ PPP)
by Speed Tier

2012

Country	<5 Mbps	≥5 to <15 Mbps	≥15 to ≤25 Mbps	>25 to ≤50 Mbps
Austria		28.93		44.67
Bulgaria		29.03	21.11	26.50
Chile		82.97	92.73	
Czech Republic	24.06	32.95	48.09	42.76
Denmark		22.91	28.67	40.18
Estonia		31.61		
Hong Kong				52.18
Italy		54.71	54.71	
Korea		35.96		
Luxembourg		42.90	75.56	62.81
Mexico	45.09	55.70	88.63	125.47
Netherlands		46.94	49.48	58.18
New Zealand			43.01	
Norway		39.79	46.46	55.98
Poland		56.49	66.09	70.58
Slovakia				38.44
Sweden		41.63		

Table 3b (continued)

2013

Country	<5 Mbps	≥5 to <15 Mbps	≥15 to ≤25 Mbps	>25 to ≤50 Mbps
Austria		31.19		
Belgium				56.33
Brazil		35.34		
Bulgaria		28.87		35.63
Chile		87.71	100.72	113.73
Czech Republic			45.21	49.38
Denmark			27.12	32.88
Estonia		30.82		
France		72.50	33.71	
Hong Kong				50.84
Ireland				67.43
Italy		40.32	40.32	
Korea		38.81		
Luxembourg				56.92
Mexico		55.49		104.08
Netherlands		46.50	77.28	94.64
Norway		59.16	59.16	73.15
Poland		55.50	67.32	72.20
Portugal	25.72			41.88
Sweden		41.35		
Switzerland	33.11	42.31	54.57	66.83
United States	81.81	106.40	85.20	104.23

Appendix C
Table 3c
Average Monthly All-Inclusive Price of a Triple Play Broadband Plan ($ PPP)
by Speed Tier

2012

Country	<5 Mbps	≥5 to <15 Mbps	≥15 to ≤25 Mbps	>25 to ≤50 Mbps
Australia			74.43	74.43
Austria		48.41	36.73	54.07
Brazil	69.64	149.32	141.53	162.07
Bulgaria		45.01	33.75	39.81
Canada		87.99	120.02	160.05
Chile	79.31	95.79	101.28	109.01
Denmark			51.46	54.59
Estonia	18.29	38.70		42.86
France			36.05	
Germany			51.31	
Greece	62.44		74.21	
Hong Kong				59.41
Hungary		27.77	37.47	39.65
Ireland				82.95
Israel		91.04		95.97
Italy		52.43	69.90	
Korea		31.44		
Luxembourg		42.62	58.43	58.71
Mexico	61.39	78.77	119.88	166.77
Netherlands		51.51	38.71	57.53
New Zealand			82.97	
Norway		64.54	71.21	80.81
Poland		74.77	80.71	85.31
Portugal		53.83	66.15	52.06
Singapore		81.30	65.49	78.05
Slovakia				36.83
Slovenia	61.41	67.89	84.34	97.56
Spain		47.65	33.33	41.20
Sweden		40.52		41.84
Switzerland		50.49	57.19	75.20
Turkey		64.29	42.11	
United Kingdom		24.36	33.89	34.10

Table 3c (continued)

2013

Country	<5 Mbps	≥5 to <15 Mbps	≥15 to ≤25 Mbps	>25 to ≤50 Mbps
Australia			94.06	94.06
Austria		35.03	32.35	
Belgium				208.96
Brazil	84.05	117.00	120.94	117.46
Bulgaria		44.77		39.60
Canada		94.58	109.83	130.10
Chile	77.23	99.82	103.14	127.35
Czech Republic				45.38
Denmark			66.81	43.53
Estonia	17.96	38.01	42.09	45.74
France			56.52	53.76
Greece	74.38		67.19	78.06
Hong Kong				57.88
Hungary		27.84	37.57	39.75
Ireland				69.43
Israel				64.15
Italy		23.03	55.15	
Korea		38.18		
Luxembourg		74.46	100.84	72.57
Mexico		73.06		137.43
Netherlands		49.88	30.57	67.12
New Zealand			95.38	
Poland		74.50	80.43	83.87
Portugal				84.69
Singapore		79.70	64.20	76.51
Slovakia				42.44
Slovenia	60.04	67.23	74.67	81.12
Spain		69.71	57.74	59.66
Sweden		48.41		52.48
Switzerland	42.31	38.23	60.70	63.58
Turkey			36.40	
United Kingdom			53.74	61.63
United States	90.12	120.10	112.81	131.57

Appendix C
Table 4a
Standalone Broadband Plans with Usage Limits – Download Speed <25 Mbps

2012

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	11	Ireland	0.49	50.14	12.33	166.7	6
2	10	Australia	0.93	49.74	16.57	236.5	27
3	6	New Zealand	1.10	38.23	15.00	40.0	3
4	8	Canada	1.24	39.47	11.11	73.3	9
5	12	United States	1.25	50.42	9.10	169.3	29
6	13	Brazil	1.31	56.45	7.88	52.5	4
7	1	Hungary	2.72	13.58	10.00	5.0	1
8	14	Iceland	5.38	70.32	11.47	54.1	15
9	4	Turkey	5.49	31.82	13.55	21.5	20
10	5	Luxembourg	5.78	34.22	6.67	172.3	3
11	15	Finland	7.84	101.92	10.00	13.0	1
12	3	Chile	8.13	24.39	1.00	3.0	1
13	7	India	8.61	38.77	2.50	5.5	4
14	2	Slovakia	10.09	20.18	6.67	2.0	3
15	16	Bulgaria	25.35	242.68	8.50	12.5	4
16	9	Belgium	45.36	45.36	1.00	1.0	1

2013

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	3	New Zealand	0.66	22.71	15.00	36.00	7
2	9	Australia	0.71	53.30	18.22	305.74	27
3	8	Canada	1.44	41.42	9.44	52.22	9
4	10	United States	1.65	61.04	9.27	156.67	25
5	7	Turkey	2.75	40.37	19.76	28.88	17
6	11	India	3.42	76.21	8.40	48.07	15
7	1	Hungary	3.53	17.63	15.00	5.00	1
8	12	Ireland	4.01	96.79	14.93	45.71	14
9	4	Germany	5.48	27.42	16.00	5.00	1
10	2	Slovakia	9.45	18.91	12.50	2.00	4
11	5	Chile	9.88	29.63	1.00	3.00	1
12	6	Brazil	10.75	33.48	3.50	25.50	4
13	14	Bulgaria	12.61	241.39	11.50	25.00	4
14	13	Finland	17.18	223.37	10.00	13.00	1

Appendix C
Table 4b
Standalone Broadband Plans with Usage Limits – Download Speed ≥25 Mbps

2012

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	7	Australia	0.10	51.54	112.00	500.0	1
3	11	Canada	0.40	88.16	97.86	322.1	14
4	1	Lithuania	0.47	31.14	103.75	120.0	16
5	9	Turkey	0.57	76.44	75.00	208.3	6
6	10	New Zealand	0.64	78.81	100.00	125.0	2
7	3	Luxembourg	0.68	47.01	50.00	75.0	2
8	6	Denmark	0.68	50.72	53.18	372.5	22
9	12	Brazil	1.45	218.03	100.00	150.0	1
10	5	Iceland	1.49	49.32	50.00	67.5	8
11	2	Japan	170.04	34.01	100.00	0.2	2
12	4	Belgium	218.10	48.59	54.00	70.4	5

2013

Price per GB rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	1	Lithuania	0.21	30.61	185.00	162.50	8
2	10	United States	0.27	73.95	67.50	275.00	8
3	5	Belgium	0.39	41.65	36.00	110.00	5
4	11	Canada	0.41	84.99	92.50	279.21	14
5	8	Turkey	0.65	65.35	56.36	148.50	11
6	7	Australia	1.02	55.36	46.45	316.77	31
7	12	Brazil	1.04	165.77	70.00	150.00	3
8	6	Ireland	1.19	43.63	60.00	93.33	6
9	9	Iceland	1.61	70.29	100.00	112.00	5
10	2	Germany	2.19	32.88	50.00	15.00	1
11	13	India	2.32	166.89	86.17	90.83	6
12	4	Slovakia	19.61	39.22	50.00	2.00	1
13	3	Japan	108.05	34.58	100.00	0.32	2

Appendix C
Table 4c
Standalone Broadband Plans with Unlimited Usage – Download Speed <10 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Poland	15.07	1.00	1
2	Lithuania	15.18	3.75	4
3	Austria	21.22	8.06	3
4	France	22.98	8.00	1
5	Hungary	24.89	2.95	3
6	Estonia	26.20	4.00	4
7	Finland	26.45	3.75	4
8	Slovakia	27.94	5.00	2
9	Sweden	28.11	6.38	4
10	Ireland	29.00	3.87	3
11	Netherlands	30.07	8.00	1
12	Luxembourg	30.71	5.00	2
13	Japan	32.60	4.54	10
14	Singapore	34.15	4.50	2
16	Italy	38.30	7.50	2
17	Czech Republic	38.77	4.00	5
18	Chile	40.83	3.67	6
19	Hong Kong	41.58	4.75	2
20	Slovenia	47.01	2.59	20
21	Mexico	48.38	5.00	5
22	Belgium	49.06	4.00	1
23	Brazil	50.72	3.00	4
24	Israel	54.92	5.75	4
25	Norway	57.73	3.20	5
26	Turkey	64.95	6.83	12
27	India	78.71	3.00	8
28	Switzerland	205.64	4.33	6

Table 4c (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Israel	16.53	5.00	1
2	Poland	19.77	4.00	1
3	Hong Kong	20.54	1.50	1
4	Iceland	22.62	6.00	1
5	Austria	22.74	8.06	3
6	Switzerland	25.42	4.25	4
7	Slovakia	25.51	5.00	1
8	Estonia	25.73	4.00	4
9	Finland	25.95	3.75	4
10	Czech Republic	33.17	2.00	1
11	Hungary	36.69	5.00	1
12	Norway	37.54	4.00	4
13	Lithuania	37.60	3.70	10
14	Mexico	39.15	5.50	2
15	Chile	41.29	3.50	4
16	Brazil	41.84	2.50	6
17	Netherlands	42.10	8.00	1
18	Slovenia	42.83	2.79	30
19	Japan	43.71	4.58	6
20	Italy	44.21	7.50	2
21	France	45.58	5.90	6
22	Turkey	63.61	7.00	12
23	United States	63.78	3.40	5
24	India	159.15	4.00	1

Appendix C
Table 4d
Standalone Broadband Plans with Unlimited Usage – Download Speed ≥10 to ≤25 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Austria	20.90	13.75	5
2	Bulgaria	21.04	17.50	4
3	Portugal	23.60	15.00	1
4	Italy	24.02	16.00	5
5	Netherlands	24.92	21.67	3
6	Germany	25.76	16.00	1
7	Lithuania	26.12	10.67	3
8	Finland	26.75	11.67	6
9	Poland	27.92	15.22	9
10	Denmark	29.24	16.67	3
11	Sweden	30.55	16.50	5
12	Japan	30.95	12.00	8
13	Korea	35.01	12.35	17
14	Estonia	36.18	20.00	2
15	Hungary	36.32	16.67	3
16	Greece	42.51	19.33	3
17	Slovakia	43.00	13.75	4
18	Israel	43.88	14.25	8
19	Singapore	44.83	17.00	3
20	Turkey	48.41	17.60	5
21	Hong Kong	49.26	14.00	2
23	Czech Republic	53.03	16.44	9
24	Luxembourg	56.85	15.83	6
25	Chile	57.59	15.80	5
26	Slovenia	58.76	14.62	13
27	Norway	59.86	14.50	8
28	Belgium	60.14	12.00	1
29	Mexico	61.29	15.00	2
30	Brazil	68.14	11.67	3
31	India	135.08	11.20	5
32	Switzerland	161.16	16.43	7

Table 4d (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Bulgaria	21.38	18.33	9
2	Israel	24.40	14.00	3
3	Poland	24.64	15.67	3
4	Germany	25.67	20.00	1
5	Austria	26.08	13.60	5
6	Finland	27.74	12.00	5
7	Korea	28.02	14.29	7
8	Hong Kong	28.46	10.00	1
9	United Kingdom	30.04	16.00	1
10	Denmark	30.46	17.50	2
11	Sweden	32.96	12.80	5
12	France	32.99	15.00	1
13	Lithuania	33.11	14.40	5
14	Estonia	34.21	14.00	3
15	Italy	35.52	18.57	7
16	Japan	36.59	12.00	6
17	Norway	39.90	14.40	5
18	Greece	40.24	19.33	3
19	Switzerland	40.40	14.44	9
20	Slovakia	42.51	15.00	3
21	Czech Republic	46.93	20.00	3
22	Singapore	47.20	25.00	2
23	Ireland	48.57	24.00	1
24	Hungary	50.30	16.67	3
25	Brazil	51.81	15.00	5
26	Mexico	57.87	14.25	4
27	Chile	58.80	15.80	5
28	Slovenia	59.53	14.85	20
29	Iceland	64.61	12.40	10
30	United States	68.86	18.00	7
31	Turkey	78.60	18.00	4
32	Canada	98.71	18.33	3

Appendix C
Table 4e
Standalone Broadband Plans with Unlimited Usage – <25 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Lithuania	19.87	6.71	7
2	Austria	21.02	11.62	8
3	Bulgaria	21.04	17.50	4
4	Netherlands	22.98	16.00	3
5	France	22.98	8.00	1
6	Portugal	23.60	15.00	1
7	Germany	25.76	16.00	1
8	Finland	26.63	8.50	10
9	Poland	26.63	13.80	10
10	Italy	28.10	13.57	7
11	Ireland	29.00	3.87	3
12	Denmark	29.24	16.67	3
13	Sweden	29.46	12.00	9
14	Estonia	29.53	9.33	6
15	Japan	31.87	7.86	18
16	Hungary	32.31	6.77	5
17	Korea	35.01	12.35	17
18	Slovakia	37.98	10.83	6
19	Singapore	41.37	8.75	4
20	Greece	42.51	19.33	3
21	United States	44.11	7.59	17
22	Hong Kong	45.42	9.38	4
23	Israel	47.56	11.42	12
24	Czech Republic	47.64	11.00	13
25	Chile	48.45	9.18	11
26	Luxembourg	50.32	13.13	8
27	Slovenia	51.64	7.33	33
28	Mexico	52.06	7.86	7
29	Belgium	54.60	8.00	2
30	Brazil	58.18	6.71	7
31	Norway	59.53	8.92	12
32	Turkey	60.09	10.00	17
33	India	100.39	6.15	13
34	Switzerland	194.09	9.67	12

Table 4e (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Bulgaria	21.59	17.50	8
2	Israel	22.43	11.75	4
3	Poland	23.42	12.75	4
4	Hong Kong	24.50	5.75	2
5	Austria	24.82	11.52	8
6	Germany	25.67	20.00	1
7	Finland	26.94	8.33	9
8	Korea	28.02	14.29	7
9	Estonia	29.37	8.29	7
10	United Kingdom	30.04	16.00	1
11	Denmark	30.46	17.50	2
12	Sweden	32.96	12.80	5
13	Switzerland	35.79	11.31	13
14	Lithuania	36.11	7.27	15
15	Italy	37.45	16.11	9
16	Slovakia	38.26	12.50	4
17	Norway	38.85	9.78	9
18	Japan	40.15	8.29	12
19	Greece	40.24	19.33	3
20	Netherlands	42.10	8.00	1
21	Czech Republic	43.49	15.50	4
22	Hungary	43.50	10.00	3
23	France	43.78	7.20	7
24	Brazil	45.57	6.50	10
25	Ireland	48.57	24.00	1
26	Slovenia	49.19	7.26	49
27	Chile	51.02	10.33	9
28	Mexico	51.63	11.33	6
29	Iceland	60.79	11.82	11
30	Turkey	67.36	9.75	16
31	United States	68.62	10.73	11
32	Canada	83.92	15.00	2
33	India	159.15	4.00	1

Appendix C
Table 4f
Standalone Broadband Plans with Unlimited Usage – Download Speed ≥25 to ≤50 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Lithuania	13.75	50.00	1
2	Austria	20.76	38.33	3
3	Slovakia	26.57	30.00	2
4	Bulgaria	29.69	40.00	2
5	Sweden	30.52	30.00	1
6	Hungary	31.09	50.00	1
7	Netherlands	32.03	47.50	4
8	Poland	34.38	38.33	6
9	Japan	35.96	40.85	13
10	Korea	37.13	50.00	7
11	Estonia	39.00	50.00	2
12	Denmark	39.18	40.00	4
13	Finland	42.71	35.00	2
14	Hong Kong	43.59	40.00	2
15	Czech Republic	47.10	40.00	4
16	Portugal	47.16	30.00	1
17	Ireland	49.59	50.00	1
18	Belgium	55.03	30.00	1
19	Luxembourg	61.52	40.00	2
20	Israel	62.12	34.00	5
21	Switzerland	62.34	40.00	4
22	Singapore	67.58	36.67	3
23	Chile	71.38	37.50	4
25	Turkey	75.34	50.00	1
26	Norway	78.23	35.71	7
27	Slovenia	89.98	40.00	4
28	Brazil	139.52	42.50	2
29	India	161.15	40.00	1

Table 4f (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Lithuania	20.03	47.50	4
2	Denmark	20.60	30.00	1
3	Hong Kong	23.54	50.00	1
4	Hungary	24.44	30.00	1
5	Slovakia	26.84	45.00	2
6	Bulgaria	27.31	42.00	5
7	Korea	27.42	50.00	9
8	Poland	29.31	40.00	4
9	Austria	30.43	30.00	1
10	Israel	31.64	36.67	3
11	Greece	36.23	50.00	1
12	Estonia	38.48	40.00	4
13	Sweden	39.08	50.00	2
14	Finland	39.51	40.00	2
15	United Kingdom	41.61	34.00	2
16	Japan	45.22	42.11	9
17	Czech Republic	47.61	42.50	4
18	Norway	50.43	35.00	4
19	Belgium	51.00	40.00	3
20	Switzerland	62.45	36.25	4
21	Singapore	62.51	50.00	1
22	Netherlands	63.68	45.00	2
23	Iceland	65.79	50.00	9
24	United States	69.08	45.00	4
25	Chile	71.99	40.00	3
26	Slovenia	93.30	43.33	6
27	Brazil	94.89	42.50	2
28	Mexico	103.13	43.33	3
29	Canada	143.84	50.00	1
30	Turkey	236.57	42.50	2

Appendix C
Table 4g
Standalone Broadband Plans with Unlimited Usage – Download Speed >50 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Lithuania	27.78	147.62	21
2	Korea	40.10	105.58	43
3	Hungary	41.41	120.00	1
4	Slovakia	42.57	90.00	6
5	Sweden	43.11	182.92	12
6	Japan	43.81	112.49	37
7	Czech Republic	47.57	93.33	3
8	Switzerland	48.10	100.00	1
9	Estonia	48.15	100.00	2
10	Poland	49.05	95.00	8
11	Austria	50.47	100.00	2
12	Bulgaria	53.00	100.00	1
13	Netherlands	53.36	90.00	2
14	Finland	57.80	190.00	4
15	Hong Kong	62.48	440.77	13
16	Ireland	67.00	125.00	2
17	Luxembourg	68.96	110.00	2
18	Denmark	88.42	87.50	2
19	Israel	98.74	100.00	3
21	Portugal	125.12	80.00	2
22	Chile	125.69	100.00	2
23	Singapore	134.84	275.00	6
24	Canada	158.66	175.00	2
25	Norway	171.99	130.00	6
26	India	238.34	90.00	2
27	Brazil	301.31	100.00	1
28	Turkey	373.76	550.00	2
29	Slovenia	387.13	252.00	10

Table 4g (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Austria	27.80	75.00	2
2	Italy	31.32	100.00	3
3	Lithuania	33.07	210.00	34
4	Korea	34.40	175.79	38
5	Poland	42.07	90.00	4
6	Slovakia	42.97	183.33	6
7	Hungary	43.72	140.00	3
8	Bulgaria	43.84	112.50	4
9	Japan	43.98	206.69	39
10	Denmark	45.92	90.00	1
11	Switzerland	46.65	112.50	2
12	Estonia	47.28	100.00	2
13	Finland	47.46	183.33	3
14	Ireland	48.57	70.00	1
15	Israel	48.79	100.00	3
16	Sweden	49.63	376.84	19
17	United Kingdom	54.46	80.00	2
18	Czech Republic	54.72	153.33	3
19	Hong Kong	70.19	440.77	13
20	Belgium	79.24	96.67	3
21	Netherlands	80.48	133.33	3
22	Singapore	91.86	311.11	9
23	Chile	116.36	93.33	3
24	Canada	124.12	175.00	2
25	Mexico	144.01	100.00	2
26	United States	147.33	192.86	7
27	Norway	155.71	147.50	4
28	Brazil	210.92	100.00	1
29	Slovenia	379.72	254.00	10
30	Turkey	598.59	550.00	2

Appendix C
Table 4h
Double Play Broadband Plans with Usage Limits – Download Speed <25 Mbps

2012

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	10	Ireland	0.94	58.35	11.00	177.1	14
2	13	United States	1.19	82.45	12.48	190.5	20
3	9	Australia	1.47	52.23	24.00	242.5	10
4	5	United Kingdom	2.22	34.91	15.50	25.0	4
5	1	Turkey	2.98	31.88	17.33	29.8	6
6	14	India	4.14	181.72	11.71	88.2	7
7	7	Sweden	4.18	41.78	8.50	10.0	4
8	2	Germany	6.07	31.91	16.00	16.3	4
9	4	Austria	11.34	34.03	8.00	3.0	1
10	3	Slovakia	16.53	33.06	6.67	2.0	3
11	12	New Zealand	19.24	68.86	15.00	36.8	11
12	11	Brazil	35.36	66.38	4.25	4.4	16
13	6	Italy	41.76	41.76	15.00	1.0	4
14	8	Belgium	43.61	43.61	1.00	1.0	1

2013

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	2	Denmark	0.14	27.12	15.00	200.00	1
2	8	Ireland	0.84	53.76	8.73	115.45	11
3	10	United States	1.59	78.21	9.85	196.00	30
4	5	Germany	2.58	37.40	12.50	135.00	4
5	7	Canada	3.29	49.39	5.00	15.00	1
6	9	Australia	3.36	62.58	19.33	243.94	18
7	12	India	3.41	89.46	6.76	55.36	25
8	3	United Kingdom	3.53	35.27	16.00	10.00	1
9	6	Turkey	3.71	46.51	16.00	28.00	2
10	1	Austria	7.79	23.38	8.00	3.00	1
11	11	New Zealand	18.84	81.71	12.00	41.46	26
12	4	Italy	36.83	36.83	15.00	1.00	4

Appendix C
Table 4i
Double Play Broadband Plans with Usage Limits – Download Speed ≥25 Mbps

2012

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	6	United States	0.32	80.30	35	250.0	4
2	5	Ireland	0.32	66.71	75	283.3	3
3	3	Belgium	0.55	54.97	30	100.0	2
4	4	Turkey	0.65	65.04	75	100.0	2
5	2	United Kingdom	1.01	40.43	38	40.0	1
6	1	Italy	29.21	29.21	100	1.0	3

2013

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP/GB)	Average Download Speed	Data Limit	Plan Count
1	3	Denmark	0.04	39.01	63.33	1200.00	3
2	9	United States	0.34	87.05	36.67	252.78	18
3	5	Belgium	0.45	52.58	30.00	120.00	5
4	7	Ireland	1.02	54.29	66.67	136.67	12
5	6	Turkey	1.07	53.31	50.00	121.25	4
6	10	Canada	1.07	97.99	28.33	93.33	3
7	2	Germany	1.09	37.98	54.17	205.00	6
8	4	United Kingdom	1.19	47.66	38.00	40.00	1
9	8	Australia	2.50	69.44	28.25	198.50	20
10	1	Italy	28.94	28.94	100.00	1.00	3

Appendix C
Table 4j
Double Play Broadband Plans with Unlimited Usage – Download Speed <10 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Denmark	21.38	6.00	1
2	Czech Republic	24.06	1.00	2
3	Estonia	26.06	3.67	3
4	Singapore	28.61	6.00	1
5	Finland	29.40	4.00	1
6	Germany	31.08	5.00	3
7	Luxembourg	32.55	5.00	2
8	Austria	34.24	8.06	3
9	Sweden	38.31	6.80	5
10	Netherlands	40.93	8.00	2
11	Slovakia	44.99	5.00	1
12	Italy	45.64	7.60	5
13	Greece	47.39	2.00	2
14	Norway	48.28	5.00	7
16	Belgium	49.15	4.00	1
17	Mexico	54.92	5.20	10
18	Ireland	55.10	8.00	1
19	Chile	64.05	5.00	2
20	Brazil	69.48	5.00	3
21	Turkey	77.22	8.00	2
22	India	81.18	4.62	13

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Portugal	27.56	2.00	2
2	Finland	28.84	4.00	1
3	Estonia	29.23	4.33	6
4	India	30.54	0.51	1
5	Austria	31.04	8.00	5
6	Luxembourg	34.98	7.57	7
7	Switzerland	39.24	6.00	3
8	Netherlands	40.55	8.00	2
9	Italy	46.33	7.60	5
10	Mexico	48.57	5.00	6
11	Norway	52.51	5.00	7
12	United States	69.82	3.17	6
13	Greece	78.69	4.00	3
14	France	86.40	5.64	5

Appendix C
Table 4k
Double Play Broadband Plans with Unlimited Usage – Download Speed ≥10 to ≤25 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Bulgaria	26.40	16.25	4
2	Sweden	29.38	17.00	2
3	Italy	30.35	20.00	2
4	Denmark	31.67	16.09	11
5	Singapore	32.92	12.50	2
6	Korea	34.92	10.00	14
7	Czech Republic	40.52	13.75	4
8	Greece	41.03	24.00	6
9	Germany	41.69	16.00	5
10	Spain	42.03	13.00	4
11	Finland	42.25	14.67	3
12	Netherlands	45.04	20.00	6
13	United Kingdom	48.03	15.00	2
14	Turkey	49.02	16.00	1
15	Norway	54.47	15.00	14
16	Slovakia	58.72	10.00	1
17	Luxembourg	59.24	15.00	4
18	Poland	59.87	16.80	25
19	Austria	59.92	18.00	2
20	Belgium	60.24	12.00	1
21	Ireland	66.71	24.00	1
22	Switzerland	79.13	20.42	12
23	Chile	80.77	15.00	5
24	United States	80.83	18.00	9
25	Brazil	83.67	12.50	6
26	Mexico	96.26	16.67	3
27	India	125.06	16.00	4

Table 4k (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Korea	23.47	10.00	8
2	Germany	24.84	16.00	3
3	Israel	28.94	12.00	1
4	Bulgaria	29.80	15.00	3
5	Austria	30.71	20.00	2
6	Denmark	35.34	15.83	6
7	Brazil	35.34	10.00	1
8	Italy	35.94	20.00	8
9	France	38.96	15.83	6
10	United Kingdom	39.72	16.00	2
11	Sweden	40.86	10.00	2
12	Finland	41.45	14.67	3
13	Czech Republic	45.21	20.00	2
14	Spain	49.12	15.00	4
15	Greece	50.42	24.00	10
16	Luxembourg	51.30	19.07	28
17	Norway	51.58	15.00	14
18	Switzerland	54.57	15.00	2
19	Poland	59.65	16.31	26
20	Singapore	63.47	15.00	1
21	Netherlands	68.17	20.00	6
22	Mexico	69.64	10.57	7
23	United States	82.95	17.95	19
24	Portugal	86.01	15.00	2
25	Chile	90.98	15.00	5

Appendix C
Table 4l
Double Play Broadband Plans with Unlimited Usage – Download Speed <25 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Estonia	26.06	3.67	3
2	Bulgaria	28.14	13.33	3
3	Denmark	30.81	15.25	12
4	Singapore	31.48	10.33	3
5	Korea	34.92	10.00	14
6	Czech Republic	35.03	9.50	6
7	Sweden	35.76	9.71	7
8	Germany	37.71	11.88	8
9	Finland	39.04	12.00	4
10	Italy	41.27	11.14	7
11	Spain	42.03	13.00	4
12	Greece	42.62	18.50	8
13	Netherlands	44.01	17.00	8
14	Austria	45.54	12.04	5
15	United Kingdom	48.03	15.00	2
16	Luxembourg	50.34	11.67	6
17	Slovakia	51.86	7.50	2
18	Norway	52.41	11.67	21
19	Belgium	54.69	8.00	2
20	Poland	59.87	16.80	25
21	Ireland	60.90	16.00	2
22	Mexico	64.46	7.85	13
23	United States	67.10	10.67	12
24	Turkey	67.82	10.67	3
25	Chile	76.00	12.14	7
26	Brazil	78.94	10.00	9
27	Switzerland	83.06	20.00	11
28	India	91.73	7.29	17

Table 4l (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Korea	23.47	10.00	8
2	Germany	24.84	16.00	3
3	Israel	28.94	12.00	1
4	Bulgaria	29.80	15.00	3
5	Austria	30.71	20.00	2
6	Denmark	35.34	15.83	6
7	Brazil	35.34	10.00	1
8	Italy	35.94	20.00	8
9	France	38.96	15.83	6
10	United Kingdom	39.72	16.00	2
11	Sweden	40.86	10.00	2
12	Finland	41.45	14.67	3
13	Czech Republic	45.21	20.00	2
14	Spain	49.12	15.00	4
15	Greece	50.42	24.00	10
16	Luxembourg	51.30	19.07	28
17	Norway	51.58	15.00	14
18	Switzerland	54.57	15.00	2
19	Poland	59.65	16.31	26
20	Singapore	63.47	15.00	1
21	Netherlands	68.17	20.00	6
22	Mexico	69.64	10.57	7
23	United States	82.95	17.95	19
24	Portugal	86.01	15.00	2
25	Chile	90.98	15.00	5

Appendix C
Table 4m
Double Play Broadband Plans with Unlimited Usage – Download Speed >25 to ≤50 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Bulgaria	26.50	50.00	1
2	Germany	36.38	38.00	3
3	Estonia	36.59	40.00	1
4	Hong Kong	38.64	50.00	2
5	Austria	38.89	35.00	2
6	Slovakia	40.30	30.00	2
7	Switzerland	41.72	50.00	2
8	Czech Republic	42.76	40.00	2
9	Denmark	44.02	40.71	7
10	Sweden	44.91	30.00	3
11	Netherlands	47.14	42.00	5
12	Ireland	51.04	50.00	1
13	Spain	51.88	36.67	3
14	Greece	58.99	44.29	7
15	Luxembourg	61.45	38.57	7
16	Belgium	65.26	30.00	4
17	Italy	65.57	30.00	2
18	Norway	66.38	35.00	14
19	Poland	77.60	42.22	9
20	Chile	80.53	35.00	2
21	United States	109.21	44.00	10
22	Mexico	125.47	30.00	2
23	Brazil	149.71	42.50	6

Table 4m (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Germany	29.01	50.00	1
2	Israel	31.12	30.00	1
3	Bulgaria	35.63	50.00	1
4	Austria	35.92	32.50	2
5	Estonia	35.93	40.00	1
6	Denmark	36.15	39.00	5
7	Hong Kong	37.65	50.00	2
8	Slovakia	41.88	50.00	1
9	Czech Republic	49.38	45.00	2
10	Luxembourg	49.98	33.33	6
11	Spain	51.19	38.33	3
12	United Kingdom	52.47	35.33	3
13	Ireland	59.00	50.00	2
14	Belgium	62.50	38.75	8
15	Norway	65.90	35.00	14
16	Switzerland	66.83	30.00	2
17	Netherlands	68.91	42.00	5
18	Italy	69.59	30.00	3
19	Sweden	77.50	50.00	1
20	Poland	77.79	43.75	8
21	Greece	86.31	44.29	7
22	United States	97.62	46.92	13
23	Mexico	107.18	40.00	4
24	Chile	113.73	40.00	1

Appendix C
Table 4n
Double Play Broadband Plans with Unlimited Usage – Download Speed >50 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Brazil	8.86	100.00	3
2	Germany	25.76	100.00	1
3	Bulgaria	36.48	125.00	2
4	Korea	37.26	100.00	19
5	Estonia	46.57	150.00	1
6	Sweden	51.22	232.86	7
7	Hong Kong	51.31	337.14	7
8	Slovakia	55.90	60.00	1
9	Czech Republic	56.21	93.33	3
10	Ireland	59.74	125.00	2
11	United Kingdom	60.46	118.00	2
12	Netherlands	70.47	190.00	4
13	Luxembourg	77.65	98.00	5
14	Denmark	79.36	91.67	3
15	Poland	80.66	76.67	6
16	Spain	84.17	100.00	2
17	United States	89.99	75.00	1
18	Chile	91.51	80.00	1

Table 4n (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Korea	30.65	100.00	13
2	Germany	36.45	150.00	2
3	Estonia	45.74	150.00	1
4	Denmark	45.92	90.00	1
5	Slovakia	55.04	200.00	5
6	Spain	59.54	100.00	3
7	Austria	60.01	150.00	1
8	United Kingdom	61.42	78.00	4
9	Switzerland	62.37	108.33	6
10	Ireland	65.52	130.00	6
11	Czech Republic	67.59	153.33	3
12	Hong Kong	68.05	337.14	7
13	Sweden	68.60	243.17	6
14	Luxembourg	74.97	235.56	9
15	Poland	81.80	76.67	6
16	Netherlands	88.32	190.00	4
17	Brazil	94.46	150.00	2
18	Belgium	99.36	85.00	2
19	France	107.80	1000.00	1
20	Chile	135.52	115.00	2
21	United States	137.24	127.78	9

Appendix C
Table 4o
Triple Play Broadband Plans with Usage Limits – Download Speed <25 Mbps

2012

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	7	United States	0.54	81.45	12.17	208.3	6
2	10	Canada	0.67	98.67	13.33	150.0	3
3	1	United Kingdom	1.63	26.85	16.00	20.0	6
4	9	Israel	1.75	91.04	12.00	52.0	1
5	11	Brazil	2.15	134.76	9.42	68.3	12
6	8	New Zealand	2.47	82.97	15.00	40.0	3
7	6	Australia	3.31	74.43	20.00	226.3	4
8	2	Turkey	5.65	48.12	10.67	9.7	3
9	3	Germany	51.51	51.51	16.00	1.0	3
10	4	Spain	66.01	66.01	10.00	1.0	1
11	5	Italy	69.90	69.90	20.00	1.0	1

2013

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	4	Australia	0.50	94.06	20.00	266.67	3
2	7	United States	0.52	104.66	11.33	225.00	6
3	5	Canada	2.30	94.58	8.33	88.33	3
4	6	New Zealand	2.84	95.38	15.00	40.00	3
5	1	United Kingdom	30.99	61.98	16.00	2.00	1
6	2	Italy	55.36	63.27	20.00	1.00	3
7	3	Spain	88.92	65.63	20.00	1.08	4

Appendix C
Table 4p
Triple Play Broadband Plans with Usage Limits – Download Speed ≥25 Mbps

2012

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	5	United States	0.35	87.09	43.75	250	4
2	7	Canada	0.40	160.05	50.00	400	1
3	1	United Kingdom	0.85	34.10	38.00	40	1
4	6	New Zealand	1.01	123.55	100.00	125	2
5	3	Australia	2.30	77.61	53.33	267.5	6
6	2	Italy	61.14	61.14	100.00	1	2
7	4	Spain	79.23	79.23	100.00	1	1

2013

Price per GB Rank	Average Monthly Price Rank	Country	Price per GB ($PPP/GB)	Average Monthly Price ($PPP)	Average Download Speed	Data Limit	Plan Count
1	1	Turkey	0.49	36.40	25.00	75.00	1
2	7	Australia	0.50	94.06	28.33	266.67	9
3	6	Belgium	0.55	73.30	37.50	137.50	4
4	11	United States	0.57	151.18	65.00	268.18	11
5	9	Canada	0.98	114.84	30.63	151.25	8
6	10	New Zealand	1.06	129.38	100.00	125.00	2
7	3	United Kingdom	1.32	52.94	38.00	40.00	1
8	5	Ireland	2.30	69.00	85.00	30.00	2
9	2	Italy	49.00	49.00	100.00	1.00	2
10	4	Spain	124.13	61.60	46.43	0.71	7
11	8	Singapore		109.52	200.00		1

Appendix C
Table 4q
Triple Play Broadband Plans with Unlimited Usage – Download Speed <10 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Estonia	23.28	3.00	2
2	Luxembourg	36.23	5.00	3
3	Portugal	38.50	6.00	1
4	Sweden	40.52	8.33	6
5	Switzerland	43.80	5.00	1
6	Austria	48.41	9.00	1
7	Netherlands	50.35	8.00	1
8	Italy	52.43	7.50	2
9	Slovenia	59.37	2.23	23
10	Greece	62.44	2.00	2
11	Norway	62.63	5.00	12
12	Mexico	74.42	5.50	4
13	Turkey	77.44	8.00	2
14	Chile	83.38	4.00	3
15	Brazil	83.51	2.00	2
16	Singapore	84.14	6.00	8

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Estonia	22.86	3.00	2
2	Italy	23.03	7.00	1
3	Austria	35.03	8.00	1
4	Switzerland	39.25	5.75	4
5	Netherlands	49.88	8.00	1
6	Slovenia	57.74	2.54	21
7	Mexico	57.96	5.50	2
8	Luxembourg	65.62	5.25	12
9	Greece	74.38	4.00	2
10	Chile	77.23	2.67	3
11	Singapore	82.48	6.00	8
12	Brazil	84.05	2.00	2
13	United States	99.79	3.50	6

Appendix C
Table 4r
Triple Play Broadband Plans with Unlimited Usage – Download Speed ≥10 to ≤25 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Spain	31.32	16.00	2
2	Korea	31.44	10.00	10
3	Hungary	34.24	18.33	6
4	France	36.05	23.00	5
5	Austria	36.73	25.00	1
6	Bulgaria	37.51	18.33	3
7	United Kingdom	44.79	15.33	3
8	Netherlands	45.69	15.00	2
9	Estonia	49.13	12.00	1
10	Germany	50.71	16.00	1
11	Denmark	51.46	17.50	2
12	Luxembourg	55.30	17.56	9
13	Switzerland	55.85	17.00	5
14	Portugal	63.05	13.00	3
15	Singapore	66.49	14.44	9
16	Norway	68.83	15.00	24
17	Greece	74.21	24.00	2
18	Slovenia	75.48	13.69	13
19	Poland	77.74	15.00	6
21	Chile	100.87	15.00	3
22	Mexico	119.88	20.00	1
23	Brazil	137.47	13.00	15

Table 4r(continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Netherlands	30.57	20.00	1
2	Italy	30.81	20.00	1
3	Austria	32.35	25.00	1
4	Hungary	34.33	18.33	6
5	Korea	38.18	10.00	2
6	Bulgaria	44.77	10.00	1
7	Estonia	48.25	12.00	1
8	Sweden	48.41	10.00	1
9	United Kingdom	51.68	16.00	4
10	Spain	55.85	15.00	4
11	France	56.52	16.18	17
12	Switzerland	60.70	15.00	2
13	Singapore	65.18	14.44	9
14	Denmark	66.81	20.00	1
15	Greece	67.19	24.00	2
16	Slovenia	73.31	15.94	18
17	Poland	77.46	15.00	6
18	Mexico	83.12	10.67	3
19	Luxembourg	92.42	15.28	25
20	United States	101.27	16.70	10
21	Chile	102.04	15.00	3
22	Brazil	117.47	11.76	17
23	Canada	130.54	25.00	1

Appendix C
Table 4s
Triple Play Broadband Plans with Unlimited Usage – Download Speed <25 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Hungary	30.14	15.00	4
2	Spain	31.32	16.00	2
3	Korea	31.44	10.00	10
4	Estonia	31.90	6.00	3
5	France	34.90	20.00	2
6	Bulgaria	39.68	15.00	2
7	Sweden	40.52	8.33	6
8	United Kingdom	44.79	15.33	3
9	Netherlands	47.24	12.67	3
10	Austria	48.41	9.00	1
11	Luxembourg	50.53	14.42	12
12	Germany	50.71	16.00	1
13	Denmark	51.46	17.50	2
14	Italy	52.43	7.50	2
15	Portugal	56.91	11.25	4
16	Switzerland	56.93	13.00	5
17	Slovenia	65.19	6.37	36
18	Norway	66.76	11.67	36
19	Greece	68.33	13.00	4
20	Singapore	74.79	10.47	17
21	Turkey	77.44	8.00	2
22	Poland	77.74	15.00	6
23	Mexico	83.52	8.40	5
24	Chile	92.12	9.50	6
25	United States	118.16	11.00	6
26	Brazil	131.12	11.71	17

Table 4s (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Italy	26.92	13.50	2
2	Hungary	30.22	15.00	4
3	Estonia	31.32	6.00	3
4	Austria	35.03	8.00	1
5	Korea	38.18	10.00	2
6	Netherlands	40.22	14.00	2
7	Bulgaria	44.77	10.00	1
8	Switzerland	46.40	8.83	6
9	Sweden	48.41	10.00	1
10	United Kingdom	51.68	16.00	4
11	Spain	55.85	15.00	4
12	France	56.52	16.18	17
13	Slovenia	64.66	8.30	38
14	Denmark	66.81	20.00	1
15	Greece	70.79	14.00	4
16	Mexico	73.06	8.60	5
17	Singapore	73.32	10.47	17
18	Poland	77.46	15.00	6
19	Luxembourg	83.73	12.03	37
20	Chile	89.63	8.83	6
21	United States	100.52	10.87	15
22	Brazil	113.13	9.06	17

Appendix C
Table 4t
Triple Play Broadband Plans with Unlimited Usage – Download Speed ≥25 to ≤50 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Slovakia	36.83	30.00	1
2	Hungary	39.65	40.00	4
3	Bulgaria	39.81	50.00	1
4	Spain	41.20	40.00	2
5	Sweden	41.84	30.00	3
6	Estonia	42.86	45.00	2
7	Portugal	52.06	36.67	3
8	Austria	54.07	50.00	2
9	Denmark	54.59	36.67	3
10	Netherlands	57.53	37.50	4
11	Luxembourg	58.71	38.00	5
12	Hong Kong	59.41	50.00	1
13	Switzerland	75.20	50.00	3
14	Singapore	78.05	50.00	12
15	Norway	80.81	35.00	24
16	Ireland	82.95	50.00	2
17	Poland	85.31	33.33	3
18	Israel	95.97	30.00	1
19	Slovenia	97.56	30.00	1
20	Chile	109.01	36.67	3
22	Brazil	162.07	42.50	18
23	Mexico	166.77	30.00	1

Table 4t (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Bulgaria	39.60	50.00	1
2	Hungary	39.75	40.00	4
3	Estonia	42.09	45.00	2
4	Slovakia	42.44	50.00	1
5	Denmark	43.53	35.00	2
6	Czech Republic	45.38	40.00	1
7	Spain	48.78	50.00	2
8	Sweden	52.48	50.00	1
9	France	53.76	50.00	7
10	Hong Kong	57.88	50.00	1
11	United Kingdom	63.37	34.80	5
12	Switzerland	63.58	31.67	3
13	Israel	64.15	30.00	4
14	Netherlands	67.12	36.00	5
15	Ireland	71.43	50.00	1
16	Luxembourg	72.57	32.67	15
17	Singapore	76.51	50.00	12
18	Greece	78.06	40.00	2
19	Slovenia	81.12	50.00	5
20	Poland	83.87	33.33	3
21	Portugal	84.69	30.00	5
22	Brazil	117.46	32.00	5
23	Chile	127.35	40.00	2
24	United States	128.65	47.14	7
25	Mexico	137.43	40.00	2
26	Belgium	249.96	35.00	10

Appendix C
Table 4u
Triple Play Broadband Plans with Unlimited Usage – Download Speed >50 Mbps

2012

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Brazil	8.86	100.00	9
2	Korea	36.73	100.00	13
3	France	39.02	100.00	10
4	Sweden	45.89	60.00	3
5	Estonia	46.57	150.00	1
6	Bulgaria	49.80	125.00	2
7	United Kingdom	53.27	76.00	2
8	Hungary	54.92	120.00	2
9	Switzerland	55.65	100.00	2
10	Slovakia	56.74	95.00	4
11	Hong Kong	59.41	130.00	1
12	Netherlands	68.50	140.00	7
13	Austria	71.41	100.00	1
14	Luxembourg	78.89	97.50	4
15	Spain	90.28	100.00	3
16	Portugal	90.67	140.00	7
17	Ireland	91.65	100.00	1
18	Poland	95.92	86.67	3
19	Singapore	102.72	188.64	22
20	Chile	112.26	80.00	1
21	Slovenia	113.84	80.00	1
22	Israel	114.31	100.00	1

Table 4u (continued)

2013

Rank	Country	Average Monthly Price ($PPP)	Average Download Speed	Plan Count
1	Korea	40.48	100.00	3
2	Estonia	45.74	150.00	1
3	Slovakia	51.30	166.67	3
4	France	53.69	318.67	15
5	Hungary	55.07	120.00	2
6	Hong Kong	57.88	130.00	1
7	Bulgaria	59.47	125.00	2
8	Sweden	60.41	194.44	9
9	Czech Republic	65.54	180.00	2
10	Denmark	67.84	105.00	2
11	Austria	68.42	137.50	4
12	Switzerland	72.68	125.00	4
13	Spain	74.51	100.00	4
14	Netherlands	75.23	152.86	7
15	Ireland	78.71	115.00	4
16	Luxembourg	85.53	270.00	6
17	Poland	94.30	86.67	3
18	Israel	101.93	100.00	2
19	United Kingdom	102.78	77.60	5
20	Portugal	105.58	144.44	9
21	Singapore	107.15	188.10	21
22	Slovenia	113.97	86.67	3
23	Chile	128.26	115.00	2
24	United States	157.57	129.17	6
25	Belgium	341.49	96.67	3

Appendix C
Table 5
Average Price (US$) per Mbps of Download Speed by Country, 2011-2013

Country	$/Mbps 2011	$/Mbps 2012	$/Mbps 2013
Australia	11.6	10.36	10.60
Austria	4.55	4.71	2.76
Belgium	5.61	4.45	3.59
Brazil		15.48	7.41
Bulgaria	0.69	0.65	0.48
Canada	6.22	6.05	4.16
Chile	11.25	11.15	10.88
Czech Republic	2.96	2.67	1.82
Denmark	3.59	3.59	2.23
Estonia	5.02	4.22	3.69
Finland	4.49	4.75	2.93
France	5.4	8.59	4.98
Germany	3.54	4.33	3.16
Greece	5.87	5.67	4.58
Hong Kong	2.31	2.3	3.27
Hungary	2.16	2.15	1.14
Iceland	3.3	2.85	1.71
India		21.53	13.10
Ireland	7.02	8.87	6.23
Israel	3.51	3.01	1.93
Italy	7.06	7.14	5.66
Lithuania	1.33	1.29	0.72
Mexico	12.8	11.94	6.65
Netherlands	3.41	3.42	2.74
New Zealand	9.3	8.26	6.68
Norway	6.21	6.45	5.22
Poland	3.15	3.27	2.06
Portugal	6.43	7.8	4.91
Singapore	5.01	4.79	3.75
Slovakia	2.03	2.47	1.01
Slovenia	5.36	5.84	4.12
Spain	8.13	8.3	5.95
Sweden	4.48	3.67	3.40
Switzerland	3.91	4.46	3.77
Turkey	5.77	5.61	5.06
United Kingdom	3.54	3.67	2.95
United States	6.14	5.39	4.30

Appendix C
Table 6
Average Weighted Price (US$) per Mbps of Download Speed by U.S. States and International Countries

2012

Lowest 25th Price Percentile		Middle 50 Percent				Highest 25th Price Percentile	
Country	**Price US$/Mbps**	**Country**	**Price US$/Mbps**	**Country**	**Price US$/Mbps**	**Country**	**Price US$/Mbps**
Bulgaria	0.65	Germany	4.33	North Dakota	5.43	Wyoming	7.07
Lithuania	1.29	Belgium	4.45	Nebraska	5.49	Italy	7.14
Hungary	2.15	Switzerland	4.46	Georgia	5.53	Luxembourg	7.14
Hong Kong	2.30	Washington	4.52	Kansas	5.53	West Virginia	7.32
Slovakia	2.47	Wisconsin	4.54	Turkey	5.61	Portugal	7.80
South Dakota	2.59	Minnesota	4.63	Utah	5.64	New Mexico	8.02
Czech Republic	2.67	Oregon	4.63	Greece	5.67	Idaho	8.13
Iceland	2.85	Austria	4.71	Slovenia	5.84	New Zealand	8.26
Israel	3.01	Connecticut	4.74	Louisiana	5.88	Spain	8.30
Delaware	3.11	Finland	4.75	Nevada	5.93	Vermont	8.32
Rhode Island	3.26	Florida	4.78	Canada	6.05	France	8.59
Poland	3.27	Singapore	4.79	Ohio	6.05	Mississippi	8.62
Netherlands	3.42	Arizona	4.96	Indiana	6.09	Iowa	8.63
New Jersey	3.58	Colorado	5.08	Michigan	6.13	Montana	8.69
Denmark	3.59	New Hampshire	5.10	Pennsylvania	6.23	Ireland	8.87
Sweden	3.67	Hawaii	5.12	Missouri	6.27	Australia	10.36
United Kingdom	3.67	Tennessee	5.13	Alabama	6.28	Chile	11.15
Virginia	3.83	California	5.16	Norway	6.45	District of Columbia	11.39
Maryland	3.91	Kentucky	5.27	Illinois	6.49	Mexico	11.94
Massachusetts	4.02	North Carolina	5.29	Oklahoma	6.52	Alaska	12.17
New York	4.08	South Carolina	5.36	Arkansas	6.72	Brazil	15.48

Table 6 (continued)

2013

Lowest 25th Price Percentile		Middle 50 percent				Highest 25th Price Percentile	
Country	**Price US$/Mbps**	**Country**	**Price US$/Mbps**	**Country**	**Price US$/Mbps**	**Country**	**Price US$/Mbps**
Bulgaria	0.48	Minnesota	3.46	Florida	4.21	Arkansas	5.19
Lithuania	0.72	New Jersey	3.50	Georgia	4.23	Norway	5.22
Slovakia	1.01	Wisconsin	3.53	Kentucky	4.31	Oklahoma	5.27
Hungary	1.14	Rhode Island	3.53	California	4.44	Indiana	5.28
Iceland	1.71	Washington	3.54	West Virginia	4.45	New Hampshire	5.32
Czech Republic	1.82	Virginia	3.54	Texas	4.50	Maryland	5.38
Israel	1.93	New York	3.55	Ohio	4.52	Idaho	5.54
Poland	2.06	Hawaii	3.55	Louisiana	4.53	Italy	5.66
Denmark	2.23	Belgium	3.59	Alabama	4.55	Montana	5.68
South Dakota	2.34	Estonia	3.69	Greece	4.58	Illinois	5.80
Netherlands	2.74	Singapore	3.75	Nebraska	4.62	Spain	5.95
Austria	2.76	Switzerland	3.77	Maine	4.65	Ireland	6.23
Finland	2.93	Tennessee	3.77	New Mexico	4.75	Mexico	6.65
United Kingdom	2.95	North Carolina	3.82	Iowa	4.85	New Zealand	6.68
Nevada	3.13	Wyoming	3.86	Massachusetts	4.88	Mississippi	6.93
Germany	3.16	South Carolina	3.88	Portugal	4.91	Brazil	7.41
Hong Kong	3.27	Colorado	3.91	North Dakota	4.94	Alaska	7.47
Arizona	3.30	Utah	3.92	Pennsylvania	4.97	District of Columbia	8.41
Oregon	3.37	Slovenia	4.12	France	4.98	Australia	10.60
Connecticut	3.40	Canada	4.16	Turkey	5.06	Chile	10.88
Sweden	3.40	Missouri	4.20	Michigan	5.07	India	13.10
				Kansas	5.11		

Appendix C
Table 7a
Smartphone Data Plans with Usage Limits: <1 GB and Limited Minutes

2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Average Minutes	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	2	Poland	18.45	5.86	0.37	100.00	80.00	2.52	7.56	3
2	15	Portugal	37.51	22.50	0.60	7.20	100.00	22.50	22.50	1
3	1	Estonia	40.77	4.08	0.10	21.60	136.00	4.08	4.08	1
4	12	Italy	55.30	21.42	0.42	14.40	333.33	11.68	33.88	3
5	20	Japan	57.36	28.68	0.50		50.00	28.68	28.68	1
6	5	India	64.55	10.31	0.34	7.28	10.00	4.98	24.85	6
7	11	Switzerland	65.49	20.68	0.37	7.20	65.00	0.00	37.51	6
8	19	France	65.58	27.17	0.44	13.23	82.11	10.83	43.65	19
9	4	Turkey	70.10	7.41	0.19	7.20	228.57	2.26	21.80	7
10	14	Australia	78.99	22.11	0.39	5.00	237.75	8.91	31.81	8
11	18	Hungary	82.64	26.03	0.37	5.50	157.00	3.78	58.38	10
12	21	Netherlands	86.48	29.03	0.35	4.40	0.00	7.28	44.33	7
13	26	Brazil	91.24	36.04	0.38	2.54	240.00	7.98	132.45	13
14	31	Ireland	96.59	46.27	0.51	19.47	200.00	23.58	64.86	14
15	32	Spain	97.47	47.04	0.52	6.49	144.38	10.58	119.05	16
16	3	Luxembourg	97.94	7.10	0.16		65.00	0.98	19.59	4
17	13	Iceland	108.86	21.45	0.29	7.20	443.75	0.67	59.59	8
18	30	Mexico	118.73	45.10	0.41	20.00	485.00	22.21	81.38	6
19	8	Belgium	119.73	17.74	0.38	7.20	112.50	8.87	26.61	4
20	35	Greece	134.02	66.57	0.53	30.53	1100.00	61.98	75.76	3
21	27	United Kingdom	137.21	38.86	0.33	6.28	341.30	19.29	60.83	23
22	29	Czech Republic	138.53	42.40	0.34	21.85	65.00	17.69	73.96	4
23	17	Germany	140.15	24.63	0.21	21.47	95.00	8.96	44.44	6
24	33	Chile	143.09	54.28	0.43	2.00	142.50	45.11	63.44	2
25	9	Norway	152.94	18.65	0.30	41.00	238.33	11.33	26.57	6
26	25	New Zealand	169.34	35.50	0.34	6.88	162.31	14.64	86.96	13
27	34	United States	202.47	60.74	0.30	31.00	450.00	51.49	69.99	2
28	7	Finland	207.10	16.17	0.17	16.00	300.00	14.14	18.21	2
29	28	Canada	226.19	41.61	0.27	125.00	1000.00	36.81	44.81	3
30	16	Austria	244.94	24.49	0.10	12.50	1000.00	15.88	33.11	2
31	24	Bulgaria	254.59	35.01	0.29	34.36	805.45	15.71	93.21	11
32	10	Slovenia	387.08	19.07	0.25	14.34	254.04	4.89	64.50	25
33	22	Hong Kong	1335.53	31.25	0.29	23.07	1630.77	14.45	50.56	13
34	6	Lithuania	1778.56	13.38	0.11	21.00	335.56	3.43	29.05	9

35	23	Korea	2074.17	34.06	0.30	75.00	3128.14	6.20	76.14	28

2013

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Average Minutes	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	4	India	17.16	8.84	0.53	21.00	666.67	5.89	12.53	6
2	2	Denmark	22.49	6.75	0.30	71.00	30.00	6.11	7.54	3
3	1	Italy	23.15	5.79	0.25	14.40	120.00	5.79	5.79	1
4	6	Poland	38.64	10.74	0.34		82.31	2.37	24.73	13
5	16	New Zealand	39.55	23.75	0.60	7.20	266.00	17.66	35.93	5
6	8	Switzerland	58.51	15.13	0.34	83.78	12.22	6.13	26.98	9
7	11	Iceland	59.49	20.03	0.35	7.20	150.00	13.84	25.56	4
8	14	Bulgaria	65.71	22.38	0.40	42.00	783.00	10.58	34.30	10
9	27	Slovakia	80.27	40.14	0.50	40.10	125.00	36.50	43.78	2
10	15	Australia	81.29	23.23	0.32	8.00	251.20	16.13	32.26	5
11	30	Singapore	90.35	45.18	0.50	112.50	350.00	26.56	63.79	2
12	22	Netherlands	92.77	33.14	0.42	25.73	179.17	7.21	57.96	12
13	20	Mexico	100.89	26.81	0.28	18.50	85.00	21.01	44.24	4
14	13	Sweden	102.89	21.21	0.35	27.73	72.22	5.36	53.49	9
15	25	Ireland	107.20	37.26	0.39	21.00	260.00	21.71	51.43	10
16	18	Portugal	108.27	25.55	0.30	12.00	105.00	18.82	36.62	4
17	21	Hungary	110.38	31.72	0.31	80.90	85.00	21.71	50.98	6
18	32	Greece	115.94	86.96	0.75		1500.00	86.96	86.96	3
19	10	Belgium	123.59	18.25	0.26	20.00	156.00	9.92	31.97	5
20	28	Spain	126.06	40.67	0.41	10.54	115.00	12.23	80.22	10
21	17	Slovenia	128.04	24.21	0.27	42.00	189.64	6.40	55.99	28
22	26	Germany	133.89	38.31	0.38	24.70	137.50	31.00	51.57	8
23	31	United Kingdom	141.38	53.84	0.42		300.00	50.56	55.96	3
24	24	Korea	158.91	36.46	0.45	150.00	122.56	13.77	81.37	41
25	7	France	187.49	13.46	0.23	89.06	120.00	5.49	20.62	14
26	23	Czech Republic	217.48	33.44	0.17	70.29	102.86	10.92	36.58	14
27	9	Finland	218.98	17.37	0.17	100.00	0.00	14.87	19.86	2
28	34	Brazil	250.23	109.89	0.46	2.60	354.50	35.90	283.04	20
29	12	Austria	256.99	20.46	0.08	2.67	1000.00	12.88	32.81	3
30	19	Luxembourg	941.33	25.70	0.22	3.60	50.00	4.67	32.71	6
31	3	Lithuania	1239.86	8.06	0.17	18.00	186.67	2.83	28.82	12
32	33	Turkey	2941.31	103.58	0.29	21.60	1100.00	26.00	203.55	16
33	29	Hong Kong	4634.88	42.55	0.30	15.50	1461.54	17.24	78.82	13
34	5	Japan	8793.42	10.26	0.00		0.00	3.82	20.55	6

Appendix C
Table 7b
Smartphone Data Plans with Usage Limits: <1 GB and Unlimited Minutes

2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	1	Slovakia	20.15	10.07	0.50	0.51	10.07	10.07326	1
2	2	Italy	38.16	10.51	0.33	14.40	5.84	14.01869	3
3	5	Israel	60.74	30.37	0.50	7.20	26.84	33.89371	2
4	8	France	78.95	39.48	0.50	9.60	27.33	50.21882	6
5	6	Korea	110.37	31.45	0.37		18.60	42.16348	7
6	9	Germany	117.88	44.94	0.43	11.70	35.84	61.21814	4
7	7	Poland	148.69	37.17	0.25	21.60	37.17	37.17238	1
8	10	United States	217.48	47.50	0.23	42.00	40.00	54.99	2
9	4	Luxembourg	1208.78	10.77	0.15		0.98	27.42409	4
10	3	Japan	1290.03	10.73	0.01		3.75	20.21174	6

2013

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	1	Slovakia	21.90	10.95	0.50	14.40	10.95	10.95	1
2	10	Spain	59.44	47.55	0.80	1.50	47.55	47.55	2
3	5	Switzerland	67.44	33.72	0.50	100.00	33.72	33.72	1
4	7	Slovenia	75.21	37.60	0.50	100.00	37.60	37.60	1
5	8	Iceland	87.73	43.87	0.50	7.20	43.87	43.87	2
6	4	France	97.51	25.01	0.41	72.18	13.19	31.62	10
7	12	Canada	106.70	53.35	0.50	129.55	18.74	81.04	11
8	13	Hungary	135.59	67.80	0.50	64.00	40.77	95.23	3
9	3	Italy	188.66	21.99	0.18	14.40	10.42	33.56	2
10	14	United States	193.98	70.12	0.38	16.03	5.00	125.00	18
11	9	Germany	222.47	46.73	0.37	16.89	16.06	67.54	14
12	6	Czech Republic	243.85	36.58	0.15	100.00	36.58	36.58	1
13	11	Portugal	256.62	51.32	0.20		51.32	51.32	1
14	2	Norway	494.82	13.90	0.09	6.00	9.23	18.56	2

Appendix C
Table 7c
Smartphone Data Plans with Usage Limits: ≥1 to <5 GB and Limited Minutes

2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Average Minutes	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	2	Iceland	5.58	11.69	3.00	7.20	400.00	8.10	16.27	6
2	1	Estonia	7.34	9.40	1.50	11.80	125.50	8.24	10.57	2
3	7	Switzerland	7.43	20.28	3.00		0.00	9.12	30.41	6
4	4	Sweden	8.36	17.42	2.40	13.70	1221.60	4.74	59.07	10
5	6	Denmark	8.62	18.50	3.00	47.00	312.00	11.40	24.54	5
6	5	Slovakia	9.23	18.47	2.00	1.02	0.00	18.47	18.47	1
7	3	Lithuania	9.93	13.05	1.58	21.00	80.83	2.29	28.00	12
8	11	India	11.55	29.32	2.51	11.03	6.67	12.45	124.44	18
9	10	Poland	11.80	27.46	2.67	25.08	373.33	15.07	39.82	6
10	8	Slovenia	14.27	21.58	1.88	30.15	920.88	2.44	43.97	17
11	9	Luxembourg	17.14	22.85	1.33		81.67	9.79	34.28	3
12	14	Austria	17.42	36.50	2.50	15.33	2250.00	21.66	50.56	8
13	25	Singapore	19.05	57.19	3.00	37.20	240.00	37.86	95.60	5
14	19	France	19.10	45.02	2.50	28.20	60.00	38.18	54.60	4
15	22	Brazil	19.31	50.14	3.33	2.67	257.78	22.87	148.40	9
16	12	Finland	19.43	32.96	2.00	16.00	950.00	25.33	40.59	2
17	15	Spain	22.60	37.62	1.78	5.93	162.22	19.84	69.94	9
18	13	Italy	22.77	33.08	1.63	18.51	968.75	5.84	68.93	8
19	21	Turkey	22.78	47.33	2.45	7.20	1709.09	7.14	112.03	11
20	17	Australia	26.88	43.75	1.73	16.67	425.54	21.63	63.61	13
21	16	Norway	28.50	41.57	1.65	41.00	1650.00	33.24	57.05	4
22	20	Korea	28.79	46.36	1.69	75.00	4423.85	12.40	68.21	13
23	35	United States	30.10	84.54	3.28	21.50	450.00	50.00	119.99	9
24	24	Bulgaria	31.02	55.79	2.44	36.75	1531.25	13.32	133.02	8
25	30	Canada	31.14	66.72	3.00	42.00	0.00	56.04	80.06	3
26	18	Belgium	33.40	43.79	1.50	14.40	317.50	33.26	53.22	4
27	28	Ireland	34.23	63.24	2.39	19.03	459.09	31.45	92.81	22
28	26	Hong Kong	37.03	59.23	2.40	57.75	3066.67	51.82	72.05	3
29	23	Portugal	37.88	52.89	1.33	54.80	298.33	23.60	90.04	3
30	37	Mexico	42.39	90.12	2.79	20.00	792.50	27.80	232.08	12
31	34	Chile	46.23	83.44	2.40	8.00	338.00	48.80	102.47	5
32	32	Hungary	48.60	72.97	1.86	12.40	364.29	17.64	141.81	7
33	31	Netherlands	49.24	69.33	1.55	12.04	0.00	31.28	148.43	29
34	27	New Zealand	51.56	60.76	1.64	6.27	66.67	28.96	96.04	9
35	33	Czech Republic	55.48	73.96	1.60	42.00	75.00	36.94	110.98	2
36	36	Germany	60.21	87.45	1.50	100.00	120.00	65.95	108.96	2

37	29	United Kingdom	64.54	64.54	1.00	7.20	975.00	53.41	75.67	4
38	38	Greece	75.18	103.31	1.38	15.95	837.50	75.76	137.74	4

2013

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Average Minutes	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	2	Israel	3.61	18.03	5.00		300.00	18.03	18.03	1
2	1	Lithuania	6.49	12.22	2.24	18.00	480.00	5.67	28.20	14
3	12	Germany	10.85	31.00	3.50	42.20	100.00	31.00	31.00	4
4	13	Estonia	11.90	31.31	3.70	7.15	386.00	8.79	60.39	5
5	11	India	12.35	29.89	2.60	20.78	855.17	12.52	66.20	29
6	5	Italy	13.77	25.65	2.18	40.08	363.64	10.42	56.71	11
7	3	Switzerland	14.37	20.99	1.64	53.60	17.14	9.20	40.87	7
8	9	Austria	14.89	29.07	2.33	9.00	1333.33	21.43	38.62	3
9	6	Luxembourg	14.95	25.70	2.50	7.20	45.00	9.35	42.06	4
10	8	Belgium	15.39	28.81	2.00	34.87	208.00	13.23	49.61	15
11	16	Iceland	16.76	34.18	3.67	21.87	66.67	16.04	61.37	6
12	24	Singapore	18.22	57.07	3.13	112.50	290.00	33.31	94.11	8
13	10	Czech Republic	18.28	29.25	2.00	42.00	0.00	25.58	32.91	2
14	17	Sweden	18.68	37.72	2.80	43.71	166.67	10.84	93.96	15
15	7	Denmark	19.14	26.30	1.70	56.00	222.00	20.60	36.31	10
16	4	France	21.99	21.99	1.00	42.00	120.00	21.99	21.99	2
17	14	Spain	25.41	32.91	1.38	7.20	200.00	14.01	45.86	9
18	15	Poland	25.79	33.04	1.36		381.82	7.43	56.94	11
19	19	Netherlands	27.86	39.41	2.11	25.29	211.11	10.67	72.09	9
20	18	Slovenia	28.38	38.76	1.75	42.00	757.50	14.40	135.19	16
21	21	Australia	30.01	44.44	1.72	24.00	571.44	25.81	67.10	9
22	28	Bulgaria	31.59	62.54	2.39	42.00	2508.89	34.42	132.44	9
23	20	New Zealand	32.44	43.38	1.31	5.40	483.33	23.75	72.47	9
24	26	Hong Kong	33.57	60.21	2.40	57.75	1750.00	19.35	114.00	8
25	22	Portugal	36.94	53.38	1.80	21.60	2098.00	24.85	102.79	5
26	23	Ireland	38.00	53.71	1.50	21.00	250.00	44.57	62.86	4
27	30	Hungary	38.10	84.59	2.33	60.00	400.00	40.84	131.98	3
28	25	Korea	38.23	59.79	1.81	117.86	166.38	38.81	143.96	36
29	31	Chile	42.97	86.18	2.25	9.12	463.08	48.38	145.20	13
30	33	Brazil	44.22	118.51	3.00	3.91	301.82	75.44	176.71	11
31	32	Turkey	49.18	88.58	2.51	14.15	1998.65	28.23	259.29	74
32	29	Mexico	53.46	81.15	1.63	18.36	669.17	31.01	155.50	24
33	34	Greece	56.28	122.43	2.45	7.20	2605.26	72.46	173.91	19
34	27	United Kingdom	62.35	62.35	1.00		1200.00	62.35	62.35	1

Appendix C
Table 7d
Smartphone Data Plans with Usage Limits: ≥1 to <5 GB and Unlimited Minutes

2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	2	Luxembourg	3.92	19.59	5.00		19.59	19.59	1
2	4	Denmark	8.85	34.21	4.00	25.00	30.18	38.24	2
3	5	Japan	15.83	47.50	3.00	75.00	47.50	47.50	1
4	16	Belgium	16.63	83.15	5.00		83.15	83.15	1
5	6	Australia	17.92	53.75	3.00	40.00	43.89	63.61	2
6	1	Slovakia	18.45	18.45	1.00	12.56	12.80	29.29	4
7	17	Ireland	18.47	92.37	5.00	7.20	92.37	92.37	1
8	11	France	21.14	60.80	3.10	33.72	32.80	83.04	20
9	12	United States	24.89	66.66	3.33	24.60	50.00	94.99	9
10	3	Israel	25.64	32.81	1.67	7.20	29.56	36.61	3
11	9	Poland	29.48	58.96	2.00	2.49	22.68	100.30	9
12	15	Germany	30.36	76.90	2.50	35.55	56.74	97.06	2
13	18	Brazil	31.56	92.45	3.50	1.00	87.13	97.77	2
14	13	Spain	31.60	68.34	2.17	7.20	46.30	92.59	3
15	10	Canada	32.10	60.19	2.60	120.00	51.22	68.83	5
16	8	Korea	40.92	57.87	1.50		52.08	66.97	3
17	7	Italy	42.11	57.63	1.83	14.40	11.68	133.18	6
18	14	United Kingdom	48.10	73.26	1.69	5.12	54.90	97.92	8
19	19	Portugal	77.95	155.91	2.00	150.00	155.91	155.91	1
20	20	Greece	110.19	165.29	1.50	42.20	82.64	241.05	3

2013

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	1	Lithuania	2.20	3.31	1.50		3.31	3.31	1
2	7	France	9.55	32.88	3.60	80.35	21.99	50.59	20
3	2	Denmark	11.03	21.80	2.85	71.00	19.45	24.80	13
4	3	Estonia	11.83	23.66	2.00	3.50	23.66	23.66	1
5	6	Switzerland	12.65	29.09	3.00	7.20	18.80	40.87	3
6	5	Israel	13.07	24.95	2.50	4.00	18.03	31.09	4
7	4	Norway	14.76	24.56	2.00	14.29	18.56	32.55	7
8	14	Belgium	16.93	57.54	3.50	37.72	35.28	82.69	8
9	13	Australia	16.97	57.51	3.71	14.40	41.94	86.45	7
10	9	Austria	17.03	41.05	3.00	16.71	18.61	67.17	7
11	15	Ireland	17.19	59.43	3.50	21.00	56.00	62.86	4
12	22	Korea	17.21	78.86	4.67	75.00	63.84	86.37	3
13	17	Slovakia	21.34	62.65	2.67	36.13	14.60	100.35	3
14	10	Slovenia	21.36	42.39	2.25	61.33	31.98	47.20	4

15	11	Italy	26.15	48.96	2.18	76.27	17.25	97.80	11
16	12	United Kingdom	27.15	51.05	2.45		30.93	76.58	11
17	19	Iceland	28.89	65.84	2.88	7.20	51.19	80.48	4
18	8	Spain	32.76	40.92	1.63	4.92	27.17	68.99	7
19	20	Poland	33.27	71.84	2.29		39.64	98.61	11
20	24	New Zealand	36.19	83.78	2.57	6.15	60.29	109.01	7
21	18	Canada	36.36	65.61	2.36	121.15	22.79	105.35	39
22	16	Czech Republic	38.08	62.30	2.06	76.92	51.24	73.23	26
23	21	Germany	39.13	78.05	2.86	77.46	24.99	111.89	14
24	25	Netherlands	47.31	91.40	2.29	38.57	69.13	134.08	7
25	27	United States	48.80	93.08	2.38	15.60	35.00	145.00	50
26	28	Hungary	53.29	129.26	2.50	105.00	122.45	136.07	2
27	23	Portugal	60.18	80.74	2.00		58.68	102.79	4
28	26	Singapore	75.05	91.93	1.25	75.00	82.55	101.31	2

Appendix C
Table 7e
Smartphone Data Plans with Usage Limits: ≥5 GB and Limited Minutes

2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Average Minutes	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Coun t
1	3	Sweden	1.48	30.48	29.38	44.38	637.69	10.56	69.63	16
2	1	Slovenia	1.95	29.32	15.00	42.00	51.00	29.32	29.32	1
3	2	Iceland	1.96	30.02	17.25	7.20	325.00	23.70	37.08	4
4	6	Poland	2.39	46.32	21.00	100.00	0.00	25.15	80.59	5
5	11	Hungary	3.15	58.03	22.50	27.30	187.50	41.58	79.09	4
6	5	Denmark	3.41	39.34	11.67	61.67	1840.00	34.42	47.56	3
7	10	Portugal	3.52	52.84	15.00	100.00	0.00	48.39	57.30	2
8	14	Italy	4.54	90.83	20.00	21.60	3000.00	90.83	90.83	1
9	16	Hong Kong	4.81	99.13	22.50	100.00	3000.00	90.10	108.16	2
10	7	Spain	4.96	49.60	10.00	21.75	15.00	46.30	52.91	2
11	9	Bulgaria	5.19	51.93	10.00	42.00	0.00	51.93	51.93	1
12	4	Austria	5.29	36.65	8.00	2.00	1500.00	24.70	48.60	2
13	20	Chile	5.34	170.85	32.00	8.00	1200.00	170.85	170.85	1
14	8	Turkey	6.48	51.88	8.00		500.00	51.88	51.88	1
15	13	Mexico	6.69	66.87	10.00	20.00	60.00	66.87	66.87	1
16	12	India	7.03	64.23	9.20	12.72	6.00	42.33	79.62	5
17	17	Korea	9.08	101.24	12.73	75.00	1781.82	76.89	148.81	11
18	15	Brazil	9.30	93.04	10.00	6.00	0.00	93.04	93.04	1
19	18	United States	16.21	133.59	8.50	16.75	450.00	121.46	141.46	4
20	19	Singapore	16.23	163.04	10.00	54.00	1566.67	95.27	197.67	3

2013

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Average Minutes	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	2	Netherlands	1.53	15.28	10.00	50.00	300.00	15.28	15.28	1
2	13	Luxembourg	1.69	56.07	35.00	53.60	100.00	51.40	65.42	3
3	4	Slovenia	1.78	30.64	17.50	42.00	0.00	29.28	32.00	2
4	3	Denmark	2.75	22.67	9.20	71.00	108.00	17.15	34.41	5
5	5	Iceland	2.87	43.06	15.00	50.00	100.00	43.06	43.06	1
6	7	Switzerland	4.70	47.01	10.00		30.00	37.81	56.20	2
7	8	Spain	4.76	47.55	10.00	42.00	150.00	47.55	47.55	1
8	9	Czech Republic	4.76	47.57	10.00	100.00	0.00	47.57	47.57	1
9	19	Estonia	5.32	89.26	18.33	83.33	316.67	71.85	102.88	3

10	11	Sweden	5.58	53.52	19.73	52.53	666.67	21.77	98.34	15
11	16	Hong Kong	6.05	81.13	18.33	57.75	2514.29	34.83	159.92	7
12	6	Italy	6.66	46.64	7.00	100.00	0.00	46.64	46.64	2
13	14	India	7.31	56.08	7.98	22.88	1062.50	36.85	72.18	16
14	10	Austria	8.35	50.07	6.00	42.00	3000.00	50.07	50.07	1
15	21	Korea	8.61	100.35	13.11	140.63	711.11	57.58	150.22	18
16	18	Mexico	8.87	88.70	10.00	20.00	40.00	88.70	88.70	1
17	17	Singapore	8.95	81.66	9.17	27.60	503.33	39.62	179.73	6
18	15	Ireland	14.29	56.65	6.00		391.67	29.04	85.71	6
19	20	Belgium	16.54	99.23	6.00	86.00	250.00	99.23	99.23	1
20	22	Turkey	17.71	106.24	6.00	7.20	6000.00	92.87	110.70	4
21	23	Chile	18.13	150.04	8.50	9.26	1042.86	116.15	169.40	7
22	25	Greece	28.99	289.86	10.00		10000.00	289.86	289.86	2
23	24	Brazil	34.94	209.62	6.00	5.00	612.50	141.27	293.16	8
24	1	Finland		13.63		12.32	60.00	4.89	19.76	5
25	12	Japan		54.94		75.00	0.00	29.16	71.34	10

Appendix C
Table 7f
Smartphone Data Plans with Usage Limits: ≥5 GB and Unlimited Minutes

2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	1	Luxembourg	1.57	51.42	33.75	21.47	29.38	73.46	4
2	2	Denmark	3.73	52.63	15.00	25.00	44.00	61.27	2
3	8	Korea	6.20	155.01	25.00		155.01	155.01	1
4	4	Austria	7.36	73.57	10.00	42.00	73.57	73.57	1
5	3	Japan	8.59	60.13	7.00	75.00	57.60	62.66	2
6	6	United States	11.50	114.99	10.00	42.00	104.99	124.99	2
7	7	Germany	12.10	120.96	10.00	50.00	120.96	120.96	1
8	5	France	16.41	98.46	6.00	42.00	98.46	98.46	1

2013

$ per GB Rank	Average Monthly Charge Rank	Country	Price Per GB of Data ($PPP/GB)	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	1	Denmark	2.99	30.36	13.00	71.00	25.20	36.31	6
2	4	Switzerland	4.31	43.12	10.00	7.20	36.79	49.46	2
3	5	Norway	5.95	44.21	7.50	35.00	37.22	55.87	4
4	3	Austria	6.14	39.60	6.67	61.33	30.06	55.80	3
5	7	Australia	6.45	64.52	10.00	8.00	64.52	64.52	1
6	6	United Kingdom	6.99	59.40	11.33		53.02	69.22	3
7	11	Czech Republic	8.99	89.85	10.00	76.92	88.18	109.88	13
8	12	France	10.05	101.89	10.50	108.94	52.79	182.61	16
9	9	Ireland	10.13	69.29	7.33	21.00	62.86	80.00	8
10	14	Korea	10.15	104.84	11.19	75.00	73.86	123.93	8
11	8	Belgium	10.84	65.05	6.00		65.05	65.05	1
12	13	Canada	11.47	103.26	9.87	135.00	55.21	149.92	30
13	15	Germany	11.52	115.19	10.00	75.00	95.23	134.41	4
14	17	United States	12.00	225.84	22.69	17.09	75.00	601.46	96
15	10	Netherlands	14.01	84.05	6.00	50.00	83.33	84.78	2
16	16	Singapore	17.13	205.59	12.00	112.50	185.74	225.44	2
17	2	Hong Kong		37.41		14.40	32.72	43.98	3

Appendix C
Table 7g
Smartphone Data Plans with Usage Limits: Unlimited Data and Limited Minutes

2012

Average Monthly Charge Rank	Country	Average Monthly Charge	Advertised Average Download Speed	Average Minutes	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	Finland	12.56	21.25	0.00	4.98	20.14	2
2	Lithuania	13.96		21.43	2.86	28.57	7
3	Estonia	23.60	9.45	57.50	10.57	41.51	6
4	Slovakia	33.56	16.40	0.00	23.79	43.94	3
5	Hungary	38.01		600.00	38.01	38.01	1
6	Switzerland	46.73	27.28	30.00	5.47	138.76	5
7	Italy	47.12	14.40	1466.67	22.20	70.09	3
8	United Kingdom	51.93		1500.00	50.45	53.41	2
9	Luxembourg	53.87		13.00	24.49	73.46	5
10	Ireland	54.24		420.00	29.48	94.34	5
11	Japan	55.92		50.00	52.55	57.60	3
12	Hong Kong	56.08	28.75	3044.44	17.70	79.27	9
13	Norway	56.10	80.00	0.00	56.10	56.10	1
14	Korea	78.89		550.00	53.32	116.57	8
15	United States	94.99	25.00	450.00	79.99	109.99	2
16	Portugal	145.56	150.00	0.00	145.56	145.56	1

2013

Average Monthly Charge Rank	Country	Average Monthly Charge	Advertised Average Download Speed	Average Minutes	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	Poland	20.43		182.50	14.82	29.73	4
2	Luxembourg	23.36		0.00	23.36	23.36	1
3	Portugal	23.59	83.33	0.00	19.30	28.95	3
4	Lithuania	28.34		0.00	28.34	28.34	1
5	United States	50.00		0.00	40.00	60.00	6
6	Korea	56.98	139.29	365.44	11.02	117.67	38
7	United Kingdom	57.44		1666.67	54.49	60.38	3
8	Hong Kong	64.92		0.00	52.60	77.23	2
9	Austria	78.71	100.00	400.00	78.71	78.71	1

Appendix C
Table 7h
Smartphone Data Plans with Usage Limits: Unlimited Data and Unlimited Minutes

2012

Average Monthly Charge Rank	Country	Average Monthly Charge	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	Hong Kong	21.85	14.40	17.03	28.59	3
2	Sweden	32.33	30.00	32.33	32.33	1
3	Japan	42.47		13.73	56.85	4
4	Switzerland	52.91	19.83	19.26	116.59	15
5	United States	60.00	42.00	40.00	89.99	8
6	Belgium	66.52	7.20	66.52	66.52	1
7	United Kingdom	75.67	7.20	75.67	75.67	1
8	Ireland	112.03		112.03	112.03	1
9	Portugal	150.07	7.20	150.07	150.07	1

2013

Average Monthly Charge Rank	Country	Average Monthly Charge	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	Switzerland	56.96	40.86	33.72	103.62	10
2	Slovenia	63.59	71.00	63.20	63.98	2
3	United Kingdom	69.71		69.71	69.71	1
4	United States	83.88	29.16	60.00	111.50	13
5	Korea	106.20	195.00	63.84	155.22	6

Appendix C
Table 8a
Stick Modem Data Plans with Usage Limits: <5 GB

2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	2	Switzerland	2.03	6.08	3.0		6.08	6.08	1
2	12	Finland	4.04	12.11	3.0	16.00	12.11	12.11	1
3	6	Sweden	4.88	9.75	2.0	15.67	8.34	10.45	3
4	10	Poland	5.17	11.30	2.3	19.14	4.99	20.11	8
5	11	Lithuania	5.77	11.80	2.2	15.12	5.14	16.93	5
6	4	Austria	6.74	6.74	1.0	2.00	6.74	6.74	1
7	5	Iceland	8.10	8.10	1.0	7.20	8.10	8.10	2
8	19	Singapore	8.61	17.22	2.0	41.10	11.48	22.97	2
9	20	Slovakia	8.69	17.38	2.0	7.20	17.38	17.38	1
10	8	Norway	9.29	9.90	1.5	24.35	3.71	18.95	4
11	14	Slovenia	9.77	14.12	1.7	42.00	8.14	19.54	3
12	21	Turkey	10.22	17.44	2.3	7.20	14.29	26.32	5
13	9	Ireland	10.94	10.94	1.0	18.80	9.27	11.77	3
14	24	Australia	11.24	22.35	2.8	28.33	12.69	32.30	4
16	22	India	12.33	18.98	1.7	11.68	4.98	37.35	20
17	13	Korea	12.40	12.40	1.0		12.40	12.40	1
18	26	Belgium	13.39	23.37	1.8	12.00	0.00	40.65	5
19	7	Denmark	13.76	9.79	1.5	42.33	5.64	15.60	6
20	18	Greece	13.77	17.22	1.5	42.20	10.33	20.66	3
21	23	Bulgaria	14.24	19.00	1.4	42.00	9.79	31.96	6
22	35	Portugal	14.62	26.78	2.5	3.50	20.46	33.46	4
23	34	New Zealand	17.41	26.50	1.9	7.43	11.59	46.38	7
24	30	Germany	18.72	24.68	1.5	9.77	11.95	46.23	7
25	15	Luxembourg	19.96	15.13	1.6	7.20	3.92	34.28	5
26	3	Estonia	22.44	6.16	1.1	11.80	4.08	8.24	2
27	38	Czech Republic	22.81	32.38	2.1	11.68	22.50	39.39	5
28	39	Chile	23.18	42.07	2.1	5.00	31.49	63.22	6
29	29	Spain	23.31	24.18	1.3	9.21	10.58	33.07	13
30	37	Mexico	24.69	30.31	1.8	20.00	22.21	44.54	8
31	25	France	30.07	23.33	1.4	35.65	5.47	40.48	12
32	27	Netherlands	31.04	23.98	1.2	13.17	11.64	36.99	7
33	31	Brazil	34.27	24.87	1.2	1.43	7.98	47.82	10
34	28	United Kingdom	35.13	24.10	1.3	4.00	11.13	39.32	8
35	17	Hungary	35.21	16.02	1.8	7.83	3.78	25.39	7

$ per GB Rank	Average Monthly Charge Rank	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
36	40	Hong Kong	44.96	44.96	1.0	100.00	44.96	44.96	1
37	1	Italy	58.41	5.84	0.1	21.60	5.84	5.84	1
38	36	Canada	81.19	29.47	1.1	107.00	18.39	42.41	6
39	33	Israel	228.76	26.12	0.4	9.67	16.00	46.37	3
40	16	Japan	807.82	16.00	0.0		16.00	16.00	1

2013

$ per GB Rank	Average Monthly Charge	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	8	Finland	3.96	11.88	3.00	16.00	11.88	11.88	1
2	3	Lithuania	4.63	8.85	1.89	57.33	1.70	16.70	9
3	6	Italy	4.68	11.09	2.50	50.00	10.42	11.77	2
4	1	Slovenia	5.51	3.73	1.33	24.13	0.00	16.00	9
5	13	Poland	6.09	13.85	2.40	61.80	7.38	16.01	5
6	22	France	7.33	21.99	3.00	131.25	16.49	27.49	2
7	11	Israel	7.56	12.27	2.00		10.43	14.11	2
8	12	United Kingdom	8.05	13.14	1.79	7.20	0.00	29.46	14
9	10	Ireland	8.28	11.99	1.50	21.00	9.13	14.85	4
10	7	Norway	8.29	11.77	1.50	7.65	9.62	13.92	2
11	9	Denmark	9.33	11.89	1.92	34.67	7.54	15.21	6
12	16	Belgium	9.45	17.32	2.00	58.65	11.03	33.07	7
13	19	Australia	10.30	19.96	2.69	27.00	12.90	32.79	16
14	20	Singapore	10.32	20.64	2.00	150.00	20.64	20.64	1
15	4	Turkey	10.40	10.40	1.00	21.60	10.40	10.40	1
16	17	India	10.67	17.98	1.83	21.53	4.42	33.17	15
17	5	Bulgaria	13.56	10.88	1.23	42.00	3.84	18.41	12
18	18	New Zealand	13.66	19.14	1.65	76.41	9.14	30.45	20
19	28	Greece	14.49	28.99	2.00		28.99	28.99	3
20	15	Spain	14.97	17.28	1.07	7.20	0.00	47.55	7
21	27	Czech Republic	15.99	27.88	2.25	54.00	19.72	37.32	6
22	29	Chile	16.82	29.74	2.09	8.00	21.78	38.48	8
23	23	Germany	17.54	22.26	1.35	27.05	5.35	33.58	13
24	36	Sweden	18.90	67.19	3.25	47.33	10.83	201.71	4
25	24	Brazil	22.33	24.00	1.39	2.18	0.00	36.41	11
26	26	Mexico	27.66	27.68	1.50	20.00	22.12	33.23	3

$ per GB Rank	Average Monthly Charge	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
27	25	Netherlands	29.21	25.30	1.23	40.22	9.80	46.08	10
28	33	United States	33.39	47.49	2.19	26.53	22.25	85.00	12
29	2	Luxembourg	41.08	7.01	0.75	5.40	0.93	14.02	8
30	14	Austria	41.21	16.69	2.03	9.00	10.97	22.42	3
31	32	Hong Kong	43.81	43.81	1.00	100.00	43.81	43.81	1
32	34	Iceland	47.53	47.53	1.00	8.40	47.53	47.53	1
33	37	Hungary	69.20	71.64	1.38	31.40	21.03	142.19	13
34	31	Switzerland	72.35	36.17	0.50	7.20	36.17	36.17	1
35	30	Portugal	94.90	32.22	0.53	64.40	16.07	43.97	3
36	21	Canada	231.30	21.16	0.78	116.67	8.10	37.65	9
37	35	Japan	1710.81	50.46	0.16	42.00	13.80	81.68	4

Appendix C
Table 8b
Stick Modem Data Plans with Usage Limits: ≥5 GB
2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	12	Sweden	1.31	28.22	33.82	48.96	15.73	42.13	11
2	4	Finland	1.60	22.58	18.33	32.33	13.02	32.45	3
3	5	Ireland	1.63	24.04	20.31	18.36	11.59	35.37	16
4	3	Poland	1.67	22.25	16.00	16.67	7.56	40.27	14
5	13	Austria	1.70	29.13	17.82	40.07	7.89	72.61	14
6	8	Denmark	1.96	26.02	15.00	54.71	11.40	38.63	7
7	2	Italy	2.01	16.13	16.40	21.60	10.61	23.36	6
8	10	Iceland	2.17	26.84	16.00	7.20	14.79	38.56	9
9	6	Slovakia	2.47	25.63	38.33	54.33	21.96	27.47	3
10	16	Luxembourg	2.57	32.84	22.43	15.76	24.39	58.67	7
11	14	Australia	2.82	31.05	11.36	12.00	15.87	70.47	14
12	36	Lithuania	2.99	205.84	8.33	18.36	16.57	834.29	5
13	9	United Kingdom	3.24	26.33	10.00	12.43	22.26	37.09	4
14	18	Korea	3.39	34.72	21.00	75.00	18.60	62.01	5
15	24	Portugal	3.43	51.39	15.00	71.47	40.93	61.40	3
16	15	Norway	3.50	31.98	12.44	43.18	14.19	66.67	9
17	7	Turkey	3.91	25.75	6.50	7.20	18.05	36.84	4
18	17	Singapore	4.07	32.96	8.42	19.76	0.00	66.03	12
19	21	Hungary	4.28	44.48	12.36	20.03	31.76	62.29	7
20	1	Slovenia	4.56	11.40	5.00	42.00	0.00	29.32	4
21	19	Greece	5.05	35.10	11.00	35.20	30.99	41.32	5
22	33	Czech Republic	5.07	65.47	16.67	21.93	55.82	74.04	3
23	11	Israel	5.42	27.09	5.00	2.80	27.09	27.09	1
24	25	Germany	5.62	51.46	10.44	47.21	23.89	87.45	8
25	22	Bulgaria	5.70	45.65	10.00	32.80	35.09	55.06	6
26	23	Spain	6.31	46.08	8.00	26.94	38.58	52.91	5
28	34	New Zealand	7.25	86.96	12.00	7.20	86.96	86.96	1
29	28	India	7.25	59.07	8.73	9.47	37.35	79.62	11
30	20	Netherlands	7.57	44.17	6.00	18.00	44.11	44.24	2
31	35	Mexico	7.75	90.92	12.73	20.00	47.89	189.66	11
32	29	Chile	8.45	62.25	9.78	14.27	24.17	97.40	15
33	31	Canada	8.50	64.23	8.33	94.50	50.81	82.83	6
34	32	Brazil	8.90	65.12	7.50	2.30	31.91	106.33	4
35	26	France	10.45	52.25	5.00	42.00	21.77	72.21	5
36	30	Hong Kong	12.60	63.02	5.00	100.00	63.02	63.02	1

Table 8b (continued) 2013

$ per GB Rank	Average Monthly Charge Rank	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	19	Estonia	0.89	36.37	48.00	44.90	12.17	81.70	5
2	1	Slovenia	1.27	13.02	23.33	48.58	0.00	80.00	9
3	2	Finland	1.38	21.23	18.33	32.33	10.00	31.84	3
4	11	Denmark	1.50	29.07	87.56	71.00	16.00	47.82	9
5	4	Ireland	1.60	23.55	20.00	20.47	11.42	39.99	14
6	5	Iceland	1.70	24.00	20.25	7.65	7.98	38.01	8
7	17	Luxembourg	2.04	33.84	26.00	32.69	18.69	70.00	12
8	13	Norway	2.19	30.01	16.63	47.41	18.94	46.93	8
9	6	Poland	2.23	27.20	15.11	56.41	0.00	45.75	18
10	9	France	2.35	28.53	14.40	77.70	16.39	43.89	5
11	14	Spain	2.38	32.16	7.50	102.40	0.00	57.07	6
12	7	Lithuania	2.54	27.85	13.75	57.33	16.46	39.12	4
13	15	Austria	2.84	32.19	13.33	59.83	12.65	59.54	6
14	3	Israel	3.01	23.26	8.00		20.64	25.87	2
15	21	Portugal	3.14	38.59	16.67	150.00	25.72	51.46	3
16	23	Hungary	3.18	44.54	16.86	61.43	27.16	65.00	7
17	16	Bulgaria	3.69	32.41	10.17	42.00	18.41	52.85	6
18	8	United Kingdom	3.78	28.34	8.75		22.09	44.18	4
19	30	Slovakia	3.97	57.46	15.75	42.00	32.83	89.40	4
20	22	Australia	4.23	43.09	10.14	32.20	29.03	71.50	14
21	12	Turkey	4.41	29.16	6.75	32.40	17.83	43.83	4
22	24	Greece	4.63	45.38	11.67	42.00	21.59	65.22	15
23	26	Czech Republic	4.68	46.79	10.00	80.67	37.02	55.79	3
24	29	Sweden	4.85	56.87	19.21	43.68	13.02	223.58	19
25	34	India	4.91	63.29	79.05	23.79	33.17	212.21	19
26	20	Singapore	5.18	37.65	7.50	150.00	28.05	47.20	4
27	10	Germany	5.36	28.63	5.75	81.38	11.90	44.30	10
28	25	Netherlands	5.75	45.86	8.33	50.00	32.87	57.61	3
29	28	Korea	6.04	51.32	9.00	75.00	37.55	62.59	4
30	32	Brazil	6.86	61.57	10.56	4.11	45.06	80.96	9
31	18	Belgium	6.98	34.91	5.00	31.30	33.08	38.59	3
32	33	Chile	7.08	62.45	9.50	8.80	38.48	86.89	10
33	37	Mexico	7.33	108.81	16.00	20.00	49.91	188.84	5
34	35	Canada	7.99	63.92	8.60	120.00	52.67	86.27	5
35	38	United States	8.49	131.16	16.74	20.19	32.25	390.00	47
36	36	Italy	8.74	66.03	11.40	52.32	0.00	288.97	10
37	27	New Zealand	9.74	48.72	5.00	150.00	48.72	48.72	2
38	31	Hong Kong	12.28	61.40	5.00	100.00	61.40	61.40	1

Appendix C
Table 8c
Stick Modem Data Plans with Unlimited Usage

2012

Rank	Country	Average Monthly Charge	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	Finland	22.70	42.00	10.07	43.44	8
2	Estonia	38.02	27.89	8.30	166.39	12
3	Switzerland	38.50	27.28	5.47	138.76	10
4	India	47.31	14.40	47.31	47.31	2
5	Hong Kong	48.45	24.76	34.13	82.88	9
6	Sweden	50.58	48.00	24.18	76.98	2
7	Portugal	60.03	82.20	43.65	72.77	8
8	Lithuania	60.55	21.60	33.98	87.12	2
9	Slovakia	63.78	42.00	43.02	86.06	3
10	Slovenia	247.56	42.00	247.56	247.56	1

2013

Rank	Country	Average Monthly Charge	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	Italy	10.42	50.00	10.42	10.42	1
2	Finland	19.45	37.85	4.89	39.84	10
3	Luxembourg	23.36		23.36	23.36	1
4	Lithuania	30.19	12.00	26.67	33.71	2
5	Austria	31.55	40.00	19.52	53.89	4
6	Slovakia	33.44	23.40	23.70	43.78	3
7	Japan	39.20	42.00	38.18	40.21	2
8	Hong Kong	45.77	47.80	14.43	80.75	7
9	Turkey	51.26	28.80	43.83	58.69	3
10	United States	85.92	21.60	82.25	89.59	2
11	Portugal	110.15	80.40	43.97	146.91	4

Appendix C
Table 9a
Tablet Data Plans with Usage Limits: <5 GB

2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	1	Lithuania	4.48	8.29	2.00	21.00	5.14	11.43	2
2	5	Finland	5.71	11.09	2.33	16.40	9.05	12.11	3
3	9	Australia	8.68	16.13	2.20	22.50	12.09	25.07	5
4	10	Sweden	8.98	16.44	1.75	26.50	3.06	29.46	6
5	3	Denmark	10.52	10.15	1.25	80.00	7.27	13.02	2
6	28	Israel	11.66	34.98	3.00	10.00	34.98	34.98	1
7	2	Ireland	12.40	9.03	0.83	17.75	5.79	11.77	4
8	11	Norway	13.28	17.29	1.17	43.00	7.52	36.10	3
9	18	Hungary	13.53	27.39	2.17	8.80	10.12	54.24	6
10	13	India	13.60	23.18	1.93	19.11	12.45	37.35	7
11	7	Bulgaria	14.15	15.73	1.21	42.00	7.86	26.63	4
12	15	Portugal	14.46	26.49	2.50	16.80	19.09	33.46	6
13	14	Belgium	15.32	25.94	1.83	14.40	11.09	40.65	6
14	4	Switzerland	17.74	10.95	1.13	7.20	3.04	23.72	7
15	8	Greece	18.37	16.07	1.00	42.20	6.89	27.55	3
16	30	Singapore	19.14	38.28	2.00	48.00	38.28	38.28	2
17	12	Spain	22.42	22.47	1.21	12.13	11.90	33.07	12
18	6	Luxembourg	25.57	13.06	0.93		9.79	19.59	3
19	27	Chile	26.83	34.54	1.88	22.00	24.17	43.69	4
20	21	Italy	27.29	31.22	1.33	14.40	23.56	35.05	3
21	29	Slovakia	27.98	37.65	1.38	26.40	10.99	73.24	4
22	20	France	29.71	28.92	1.56	37.24	5.47	57.99	16
23	16	Mexico	31.12	26.68	1.20	20.00	22.21	33.38	5
24	26	Korea	36.58	34.41	1.82	75.00	6.20	66.97	22
25	33	Germany	36.74	42.31	1.50	9.77	30.40	59.22	7
26	19	Brazil	37.40	28.53	1.31	2.18	0.00	58.46	14
27	25	Turkey	40.88	32.81	2.10	7.20	11.28	66.45	14
29	31	Czech Republic	50.41	39.60	1.00	11.90	22.50	59.18	4
30	24	United Kingdom	54.46	32.81	1.39	3.98	15.15	45.99	9
31	17	New Zealand	431.10	27.25	0.83	7.43	16.91	46.38	7
32	23	Canada	514.75	32.01	0.66	90.75	18.39	44.04	8
33	22	Netherlands	1028.35	31.56	1.16	6.17	5.82	156.76	16

Table 9a (continued) 2013

$ per GB Rank	Average Monthly Charge Rank	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	2	Finland	5.60	10.88	2.33	16.40	8.88	11.88	3
2	10	Lithuania	5.65	16.96	3.00		16.96	16.96	1
3	4	Sweden	5.77	11.92	2.40	68.00	5.36	21.77	5
4	15	France	6.18	18.55	3.00	131.25	16.49	20.62	2
5	11	Belgium	7.35	17.64	2.30	70.37	0.00	33.07	10
6	5	Israel	7.56	12.27	2.00		10.43	14.11	2
7	13	Australia	8.24	18.06	2.88	40.00	12.90	29.30	12
8	17	Italy	8.87	21.51	2.50	31.90	10.42	34.72	4
9	1	Norway	9.23	9.23	1.00	6.00	9.23	9.23	1
10	14	Denmark	10.51	18.29	2.15	71.00	11.39	22.90	13
11	6	Bulgaria	10.60	13.09	1.55	42.00	7.81	18.41	13
12	28	Korea	13.45	34.69	2.71	135.00	15.65	56.33	12
13	3	Switzerland	14.13	11.83	1.15	69.07	4.60	22.48	5
14	24	Greece	14.49	28.99	2.00		28.99	28.99	3
15	9	Portugal	15.38	15.38	1.00	85.00	14.69	16.07	2
16	22	Chile	15.39	28.85	2.24	10.40	21.78	38.48	5
17	23	United Kingdom	16.29	28.92	1.97		7.36	54.49	15
18	18	New Zealand	18.70	21.75	1.29	129.60	12.18	30.45	7
19	21	Brazil	21.56	27.87	1.67	2.39	17.72	36.41	9
20	27	Netherlands	22.93	31.14	1.68	30.71	5.77	51.13	7
21	12	Slovakia	26.01	17.95	0.75	14.40	16.12	19.77	2
22	29	Turkey	27.10	42.15	2.18	7.20	11.14	76.52	11
23	20	Mexico	27.66	27.68	1.50	20.00	22.12	33.23	3
24	26	Spain	28.01	30.55	1.20	38.93	8.22	57.54	10
25	25	United States	32.16	30.45	1.86	19.70	10.00	76.20	26
26	30	India	42.03	63.53	1.67	15.60	11.06	198.90	6
27	8	Slovenia	44.59	14.73	1.11	21.90	6.40	21.96	12
28	19	Austria	54.34	27.45	2.22	10.20	12.88	44.34	10
29	7	Luxembourg	55.61	13.27	0.92	7.20	0.93	42.06	5
30	32	Germany	67.57	85.09	1.50	71.87	5.35	232.98	9
31	33	Hungary	146.18	146.90	1.92	31.43	10.14	809.34	9
32	31	Czech Republic	177.77	82.52	1.51	74.62	19.72	133.21	42
33	16	Canada	497.65	19.11	0.63	100.00	4.05	44.57	12

Appendix C
Table 9b
Tablet Data Plans with Usage Limits: ≥5 GB

2012

$ per GB Rank	Average Monthly Charge Rank	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	2	Finland	0.91	18.21	20.00	21.00	18.21	18.21	2
2	4	Denmark	1.87	23.72	15.00	52.00	11.40	36.05	4
3	11	Italy	2.03	33.99	21.67	24.80	22.38	52.57	6
4	5	Ireland	2.09	25.44	15.00	15.36	20.03	34.79	10
5	6	Sweden	2.24	26.94	12.44	29.00	15.73	36.85	9
6	3	Norway	2.45	21.20	10.00	58.00	14.19	28.48	5
7	15	Austria	2.46	40.01	18.33	39.83	19.23	73.57	6
8	14	Portugal	2.55	38.20	15.00	43.20	38.20	38.20	1
9	7	Australia	2.65	31.38	12.36	12.00	15.87	63.24	14
10	1	Lithuania	3.31	16.57	5.00	21.00	16.57	16.57	1
11	13	Singapore	3.44	35.66	10.33	12.60	28.61	40.20	3
12	8	Luxembourg	3.55	31.78	13.67	7.20	24.39	58.67	6
13	9	United Kingdom	4.04	32.15	10.00	3.90	22.26	37.09	3
14	17	Netherlands	4.15	44.40	11.67	14.40	26.68	71.02	3
15	10	Switzerland	4.74	32.58	5.00		23.72	37.00	3
16	12	Slovakia	5.08	35.01	7.50	31.50	31.58	38.44	2
17	18	Bulgaria	5.33	45.84	11.25	42.00	35.09	55.06	4
18	24	Czech Republic	5.58	55.82	10.00	2.20	55.82	55.82	1
19	21	India	6.08	50.39	8.82	16.20	18.25	79.62	11
20	19	Spain	6.82	46.50	7.50	33.30	40.51	52.91	4
21	31	Mexico	7.56	94.30	13.57	20.00	47.89	189.66	7
22	27	Germany	7.71	66.47	10.44	47.21	41.75	98.21	8
24	26	Poland	8.38	65.84	11.08	29.33	45.31	90.99	12
25	20	Hungary	8.42	49.15	5.75	21.00	37.27	61.03	2
26	23	Chile	8.66	54.68	6.50	22.00	48.58	60.78	2
27	16	Israel	8.81	44.06	5.00	25.00	40.40	47.72	2
28	25	Canada	8.90	64.70	8.17	94.50	50.42	82.44	6
29	30	Korea	9.01	70.69	8.40	75.00	60.77	97.97	5
30	28	Brazil	9.97	67.40	7.00	2.33	44.68	106.33	5
31	22	France	10.50	52.48	5.00	42.00	21.82	72.21	5

Table 9b (continued) 2013

$ per GB Rank	Average Monthly Charge Rank	Country	Price per GB	Average Monthly Charge	Data Cap	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	1	Finland	0.89	17.86	20.00	21.00	17.86	17.86	2
2	16	Estonia	0.97	35.29	41.25	44.90	12.17	81.70	8
3	10	Denmark	1.75	29.40	112.00	71.00	16.00	47.82	22
4	13	Sweden	2.10	31.34	20.67	69.00	16.30	54.58	12
5	21	Slovenia	2.14	42.50	23.89	50.46	24.00	66.76	9
6	8	Norway	2.37	26.82	14.29	58.57	16.70	37.22	7
7	7	France	2.38	26.06	14.40	77.70	7.22	38.49	5
8	6	Ireland	2.57	25.70	10.00		22.85	34.27	6
9	3	Luxembourg	2.62	22.20	13.75	7.20	18.69	28.04	4
10	9	Lithuania	2.83	28.30	10.00		28.30	28.30	1
11	2	Israel	2.86	18.39	6.50	25.00	13.52	25.87	4
12	5	Portugal	2.97	25.42	14.00	111.67	0.00	51.46	6
13	12	Italy	3.08	30.81	13.13	40.53	9.26	58.06	8
14	22	Hungary	3.18	44.54	16.86	55.86	27.16	65.00	7
15	11	Switzerland	3.69	29.77	8.33	100.00	21.46	37.81	3
16	29	Slovakia	3.97	57.46	15.75	42.00	32.83	89.40	4
17	17	Australia	3.99	35.90	9.00	40.00	29.03	61.56	9
18	4	Spain	4.35	23.76	7.50	102.40	11.51	32.61	3
19	14	Bulgaria	4.42	33.38	8.25	42.00	18.41	46.23	8
20	25	Greece	4.95	48.31	11.67		28.99	65.22	12
21	19	Singapore	5.13	37.20	7.50	112.50	28.14	47.20	4
22	20	United Kingdom	5.17	38.78	9.17		22.09	61.86	6
23	24	Netherlands	5.49	44.99	8.67	50.00	16.15	62.67	6
24	18	Germany	6.17	36.18	7.00	50.67	11.90	118.69	9
25	28	Brazil	6.85	54.77	8.89	3.67	19.75	80.96	9
26	30	Chile	6.89	58.65	9.00	12.00	38.48	72.37	6
27	15	Belgium	6.98	34.91	5.00	31.30	33.08	38.59	3
28	35	Mexico	7.33	108.81	16.00	20.00	49.91	188.84	5
29	37	United States	7.45	112.39	16.20	25.64	32.25	346.46	50
30	31	Turkey	7.81	63.71	8.75	7.20	29.72	97.33	4
31	32	Korea	7.82	67.91	9.00	112.50	37.55	98.89	4
32	26	Austria	8.56	48.62	6.00	69.67	30.06	72.90	6
33	23	Canada	8.91	44.57	5.00	100.00	36.47	60.78	3
34	27	New Zealand	9.74	48.72	5.00	150.00	48.72	48.72	2
35	34	Poland	10.04	74.08	10.40	38.10	29.68	108.97	20
36	33	India	10.88	69.86	9.00	13.60	11.94	309.54	9
37	36	Czech Republic	11.10	110.96	10.00	78.33	37.02	151.68	15

Appendix C
Table 9c
Tablet Data Plans with Unlimited Usage

2012

Rank	Country	Average Monthly Charge	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	Luxembourg	19.23	7.20	18.51	19.59	3
2	Finland	22.89	43.00	13.12	30.42	5
3	Austria	35.16	10.00	35.16	35.16	1
4	Estonia	42.98	30.66	8.30	166.39	10
5	Switzerland	43.41	27.28	5.47	138.77	11
6	Portugal	43.65	28.80	43.65	43.65	2
7	Israel	56.40	20.00	53.96	61.28	3
8	Hong Kong	59.41	15.50	39.73	71.87	4
9	India	69.30	14.40	68.05	70.54	2

2013

Rank	Country	Average Monthly Charge	Advertised Average Download Speed	Min. Average Monthly Charge	Max. Average Monthly Charge	Plan Count
1	Luxembourg	18.69		18.69	18.69	1
2	Finland	22.46	43.00	12.87	29.84	5
3	Switzerland	23.91	44.80	5.52	42.31	4
4	Lithuania	33.97		33.97	33.97	1
5	Slovakia	35.41	31.50	31.76	39.06	2
6	Portugal	38.22	20.00	14.69	44.10	5
7	Hong Kong	60.76	15.50	43.98	70.02	3
8	Netherlands	74.51	50.00	67.14	83.72	3
9	Austria	78.71	100.00	78.71	78.71	1
10	United States	85.92	21.60	82.25	89.59	2

Appendix C
Table 10a
Number of Unlimited and Limited Data Plans for Residential Fixed Broadband Plans with Data Cap Comparisons for Limited Data Plans

2012

Country	Number of Unlimited Data Plans	Number of Limited Data Plans	Minimum Data Cap (GB)	Maximum Data Cap (GB)	Average Data Cap (GB)
Korea	132	0			
Norway	121	0			
Slovenia	85	0			
Poland	77	0			
Brazil	72	33	0.5	150	37.9
United States	71	69	10	400	197.4
Singapore	68	0			
Japan	68	2	0.2	0.2	0.2
Switzerland	63	0			
Sweden	51	4	10	10	10
Luxembourg	51	5	2	500	133.4
Netherlands	41	0			
Chile	37	1	3	3	3
Denmark	36	1	500	500	500
Czech Republic	33	0			
India	33	11	2.5	250	58.1
Hong Kong	30	0			
Mexico	29	0			
Lithuania	29	16	10	310	120
Portugal	28	0			
Austria	25	1	3	3	3
Turkey	25	37	1	500	56.4
Greece	24	0			
Slovakia	24	6	2	2	2
Israel	22	1	52	52	52
Estonia	21	0			
Hungary	20	1	5	5	5
Bulgaria	20	4	4	25	12.5
Finland	20	1	13	13	13
Italy	18	10	1	1	1
Spain	18	2	1	1	1
France	16	0			
Germany	14	7	1	50	9.7
Ireland	14	23	10	500	188.3
United Kingdom	13	12	10	40	25
Belgium	9	9	0.05	150	61.6
Canada	2	27	5	1024	222.9
New Zealand	0	21	1	150	54.5
Iceland	0	23	1	140	64.3
Australia	0	69	5	1000	282.8

Table 10a (continued) 2013

Country	Number of Unlimited Data Plans	Number of Limited Data Plans	Minimum Data Cap (GB)	Maximum Data Cap (GB)	Average Data Cap (GB)
Slovenia	113	0			
Luxembourg	108	0			
United States	103	94	10	400	219.8
Korea	80	0			
Singapore	66	0			
Poland	65	0			
Japan	60	2	0.32	0.32	0.32
France	58	0			
Lithuania	53	8	50	300	162.5
Norway	52	0			
Sweden	46	0			
Switzerland	45	0			
Brazil	41	7	1	200	78.9
Netherlands	37	0			
United Kingdom	36	4	2	40	23
Mexico	35	0			
Chile	33	1	3	3	3
Italy	32	10	1	1	1
Greece	32	0			
Belgium	29	14	100	150	121.4
Austria	27	1	3	3	3
Hong Kong	27	0			
Estonia	27	0			
Bulgaria	26	4	8	50	25
Denmark	25	0			
Slovakia	22	5	2	2	2
Spain	22	23	0.2	2	0.93
Turkey	21	34	4	250	76.2
Czech Republic	21	0			
Portugal	20	3	0.04	1	0.41
Hungary	20	1	5	5	5
Iceland	20	5	10	250	112
Israel	18	0			
Finland	18	1	13	13	13
Ireland	15	45	8	350	92.7
Germany	11	8	5	300	130
Canada	7	39	10	1024	158.1
India	2	46	3	250	57.6
New Zealand	0	38	2	160	44.7
Australia	0	108	1	1000	274.4

Appendix C
Table 10b
Number of Unlimited and Limited Data Plans for Smartphone Data Plans with Data Cap Comparisons for Limited Data Plans

2012

Country	Number of Unlimited Data Plans	Number of Limited Data Plans	Minimum Data Cap (GB)	Maximum Data Cap (GB)	Average Data Cap (GB)
Switzerland	19	11	0.15	5	1.79
Hong Kong	12	26	0.002	30	2.41
United States	12	46	0.1	50	7.51
Korea	8	62	0.005	25	3.34
Ireland	6	37	0.3	5	1.75
Japan	6	11	0.004	7	1.76
Chile	5	14	0.25	32	3.95
Estonia	3	6	0.1	30	15.52
Finland	3	4	0.04	3	1.09
Italy	3	18	0.25	20	2.43
United Kingdom	3	37	0.1	3	0.76
Lithuania	2	24	0.002	5	0.93
Portugal	2	9	0.6	5	1.58
Belgium	1	9	0.025	5	1.39
Germany	1	15	0.05	10	1.40
Hungary	1	23	0.03	26	3.21
Luxembourg	1	19	0.005	50	11.33
Spain	1	35	0.1	11	1.73
Sweden	1	21	0.1	20	4.86
Australia	0	30	0.05	4	1.39
Austria	0	12	0.1	10	3.02
Brazil	0	24	0.15	5	1.49
Bulgaria	0	19	0.005	5	0.75
Canada	0	11	0.1	5	2.07
Czech Republic	0	20	0.15	30.3	2.87
Denmark	0	13	1	20	6.85
France	0	50	0.2	6	1.79
Greece	0	10	0.35	1.5	1.16
Iceland	0	18	0.015	30	4.96
India	0	29	0.1	12	3.21
Israel	0	5	0.5	3	1.20
Mexico	0	19	0.2	10	2.42
Netherlands	0	33	0.2	2.5	1.21
New Zealand	0	22	0.05	4.5	0.94
Norway	0	11	0.05	4	1.13
Poland	0	26	0.1	5	1.98
Singapore	0	12	2	12	6.83
Slovakia	0	5	0.5	1	0.90
Slovenia	0	47	0.01	20.03	1.73
Turkey	0	28	0.01	8	1.86

Table 10b (continued) 2013

Country	Number of Unlimited Data Plans	Number of Limited Data Plans	Minimum Data Cap (GB)	Maximum Data Cap (GB)	Average Data Cap (GB)
Korea	25	125	0.01	25	4.0
United States	19	164	0.25	75	14.0
United Kingdom	4	18	0.25	20	3.5
Portugal	3	14	0.2	5	1.3
Switzerland	2	32	0.1	10	2.7
Slovenia	1	52	0.05	20	1.6
Luxembourg	1	13	0.005	50	8.9
Lithuania	1	27	0.002	5	1.3
Germany	0	44	0.1	500	27.3
Hungary	0	14	0.15	4	1.1
Norway	0	13	0.02	10	3.4
Slovakia	0	6	0.5	4	1.6
Czech Republic	0	57	0.15	10	3.5
Hong Kong	0	33	0.002	30	3.3
Australia	0	22	0.2	10	2.4
Denmark	0	37	0.3	20	4.8
Italy	0	27	0.1	7	2.3
Belgium	0	30	0.05	6	2.4
Iceland	0	17	0.3	15	3.0
India	0	51	0.3	12	4.0
Spain	0	29	0.2	10	1.4
Chile	0	20	1	10	4.4
Bulgaria	0	19	0.1	5	1.3
Netherlands	0	31	0.2	10	2
France	0	62	0.02	16	4.0
Israel	0	5	1	5	3
Estonia	0	9	1.5	25	8.4
Ireland	0	32	0.2	10	3.1
Greece	0	24	0.75	10	2.9
Brazil	0	39	0.3	6	2.3
Austria	0	18	0.05	8	3.2
Finland	0	7	0.04	0.3	0.2
Mexico	0	29	0.2	10	1.7
Canada	0	80	0.5	15	4.9
Japan	0	16	0.0005	0.005	0.001
Poland	0	39	0.025	4	1.3
Turkey	0	94	0.01	6	2.3
Singapore	0	20	0.5	12	5.4
New Zealand	0	21	0.5	4	1.6
Sweden	0	39	0.1	60	8.7

Appendix C
Table 10c
Number of Unlimited and Limited Data Plans for Stick Modem Data Plans with Data Cap Comparisons for Limited Data Plans

2012

Country	Number of Unlimited Data Plans	Number of Limited Data Plans	Minimum Data Cap (GB)	Maximum Data Cap (GB)	Average Data Cap (GB)
Estonia	12	2	0.1	2	1.05
Finland	10	6	3	30	14.5
Switzerland	10	1	3	3	3
Hong Kong	9	2	1	5	3
Portugal	8	11	1	15	9.44
Slovakia	3	4	2	100	29.25
Sweden	2	33	2	80	27.71
India	2	31	0.3	15	4.19
Lithuania	2	10	1	10	4.5
Slovenia	1	7	1	5	3
Poland	0	36	1	38	11.79
United States	0	35	1	20	7.1
Chile	0	21	1	15	6.7
Brazil	0	20	0.15	10	3.48
Ireland	0	19	1	60	17.26
Mexico	0	19	0.5	30	8.11
Australia	0	18	1	20	9.44
Spain	0	18	0.5	10	3.17
France	0	17	0.1	5	2.47
Austria	0	15	1	40	16.42
Germany	0	15	0.5	30	6.27
Hungary	0	14	0.03	26	7.06
Singapore	0	14	2	10	7.5
Denmark	0	13	0.2	30	8.75
Norway	0	13	1	30	9.08
Bulgaria	0	12	0.5	20	5.71
Canada	0	12	0.1	15	4.73
Luxembourg	0	12	0.1	50	13.76
United Kingdom	0	12	0.25	15	4.23
Iceland	0	11	1	30	13.27
Netherlands	0	9	0.2	7	2.3
Turkey	0	9	1	8	4.14
Czech Republic	0	8	0.5	30	7.56
Greece	0	8	0.5	30	7.44
New Zealand	0	8	0.512	12	3.16
Italy	0	7	0.1	50	13.68
Korea	0	7	1	50	17.67
Belgium	0	5	1	4	1.8
Israel	0	4	0.05	5	1.53
Japan	0	2	0.02	0.02	0.02

Table 10c (continued) 2013

Country	Number of Unlimited Data Plans	Number of Limited Data Plans	Minimum Data Cap (GB)	Maximum Data Cap (GB)	Average Data Cap (GB)
Australia	0	30	1	15	6.2
Austria	0	13	0.1	30	9.6
Belgium	0	10	1	5	2.9
Brazil	0	20	0.3	20	5.5
Bulgaria	0	18	0.1	20	4.2
Canada	0	14	0.01	15	3.6
Chile	0	18	1	16	6.2
Czech Republic	0	9	1	10	4.8
Denmark	0	15	0.5	500	53.3
Estonia	0	5	15	120	48
Finland	0	14	3	30	14.5
France	0	7	3	32	11.1
Germany	0	23	0.5	10	3.3
Greece	0	18	2	20	10.1
Hong Kong	0	9	1	5	3
Hungary	0	20	0.2	30	6.8
Iceland	0	9	1	32	18.1
India	0	34	0.3	1215	45.0
Ireland	0	18	1	60	15.9
Israel	0	4	1	10	5
Italy	0	13	2	30	9.9
Japan	0	6	0.00267	0.4272	0.2
Korea	0	4	5	13.5	9
Lithuania	0	15	1	30	5.5
Luxembourg	0	21	0.005	50	15.9
Mexico	0	8	0.5	30	10.6
Netherlands	0	13	0.25	10	2.9
New Zealand	0	22	0.5	5	2.0
Norway	0	10	1	30	13.6
Poland	0	23	1	35	12.3
Portugal	0	10	0.3	30	8.6
Singapore	0	5	2	10	6.4
Slovakia	0	7	6	25	15.8
Slovenia	0	18	0.1	45	12.3
Spain	0	13	0.5	10	2.5
Sweden	0	23	2	60	16.4
Switzerland	0	1	0.5	0.5	0.5
Turkey	0	8	1	10	5.6
United Kingdom	0	18	1	15	3.3
United States	0	61	0.3	50	13.8

Appendix C
Table 10d
Number of Unlimited and Limited Data Plans for Tablet Data Plans with Data Cap Comparisons for Limited Data Plans

2012

Country	Number of Unlimited Data Plans	Number of Limited Data Plans	Minimum Data Cap (GB)	Maximum Data Cap (GB)	Average Data Cap (GB)
Switzerland	11	10	0.1	5	1.61
Estonia	10	0			
Finland	5	5	1	20	9.40
Hong Kong	4	0			
Luxembourg	3	9	0.3	30	9.42
Israel	3	3	3	5	4.33
India	2	18	1	15	6.14
Portugal	2	7	1	15	4.29
Austria	1	6	5	30	18.33
United States	0	34	0.25	20	6.85
Korea	0	27	0.1	15	3.04
Netherlands	0	25	0.01	15	2.77
France	0	21	0.1	5	2.38
Australia	0	19	1	20	9.68
Brazil	0	19	0.15	10	2.81
Spain	0	16	0.5	10	2.78
Germany	0	15	0.5	30	6.27
Sweden	0	15	0.5	16	8.17
Turkey	0	15	0.1	8	2.49
Canada	0	14	0.01	15	3.88
Ireland	0	14	0.3	30	10.95
Mexico	0	12	0.5	30	8.42
Poland	0	12	5	35	11.08
United Kingdom	0	12	0.25	15	3.54
Denmark	0	10	0.5	30	10.42
Hungary	0	10	0.5	40	6.75
Italy	0	9	1	50	14.89
Bulgaria	0	8	0.6	20	6.23
Norway	0	8	1	20	6.69
New Zealand	0	7	0.02	2	0.83
Belgium	0	6	1	4	1.83
Chile	0	6	0.5	8	3.42
Slovakia	0	6	0.5	10	3.42
Czech Republic	0	5	0.5	10	2.80
Singapore	0	5	2	11	7.00
Greece	0	3	0.5	2	1
Lithuania	0	3	1	5	3.00

Table 10d (continued) 2013

Country	Number of Unlimited Data Plans	Number of Limited Data Plans	Minimum Data Cap (GB)	Maximum Data Cap (GB)	Average Data Cap (GB)
United States	2	78	0.1	50	11.3
Czech Republic	0	57	0.15	10	3.7
Denmark	0	35	1	500	65.9
United Kingdom	0	21	0.5	15	4.0
Bulgaria	0	21	0.5	12	4.1
Slovenia	0	21	0.1	45	10.9
Australia	0	21	1	15	5.5
Poland	0	20	5	35	10.4
Germany	0	18	0.5	13	4.3
Brazil	0	18	0.5	20	5.3
Austria	1	17	0.05	8	3.6
Sweden	0	17	1	60	15.3
Korea	0	16	1	15	4.3
Hungary	0	16	0.5	30	8.5
Netherlands	3	16	0.25	10	3.8
India	0	15	1	15	6.1
Greece	0	15	2	20	9.7
Turkey	0	15	1	15	3.9
Canada	0	15	0.01	5	1.5
Portugal	5	13	1	30	9.7
Belgium	0	13	1	5	2.9
Spain	0	13	0.5	10	2.3
Italy	0	12	2	30	9.6
Switzerland	4	12	0.25	10	3.8
Chile	0	11	1	15	5.9
Luxembourg	1	10	0.005	25	6.6
Finland	5	10	1	20	9.4
New Zealand	0	9	0.5	5	2.1
Mexico	0	8	0.5	30	10.6
Estonia	0	8	15	120	41.3
Norway	0	8	1	30	12.6
Slovakia	2	8	0.5	25	10.8
France	0	7	3	32	11.1
Ireland	0	6	10	10	10
Israel	0	6	1	10	5
Singapore	0	4	5	10	7.5
Lithuania	1	3	3	10	6.5
Hong Kong	3	3			

Appendix D: Demographics Dataset

Below is a concise version of the demographics dataset, containing only the most recent data available for the countries surveyed. A complete version containing historical data going back several years is available at http://www.fcc.gov/reports/international-broadband-data-report-fourth.

Community	% Households with broadband	Population Total	Population density (persons per square kilometer)	GDP total (US$m), PPP (purchasing power parity) (constant real prices 2005)	GDP per cap, (US$) PPP (constant real prices 2005)	Education (% of labor force with tertiary education)
ALA0 Australia	**77**	**23127747**	**3**	**844925**	**37187**	**40**
ALA1 New South Wales	75	7407682	9	261109	35741	42
ALA2 Victoria	77	5737615	25	188456	33464	43
ALA3 Queensland	78	4658557	3	162653	35602	34
ALA4 South Australia	75	1670834	2	52723	31832	35
ALA5 Western Australia	79	2517165	1	136997	56234	37
ALA6 Tasmania	72	513012	8	13865	27070	30
ALA7 Northern Territory	79	239507	0.2	10658	45312	36
ALA8 Australian Capital Territory	85	383375	160	18466	49226	57
AT0 Austria	**80**	**8451860**	**103**	**303700**	**36136**	**21**
AT11 Burgenland	78	286691	78	6932	24331	17
AT12 Lower Austria	74	1618592	86	48032	29797	18
AT13 Vienna	83	1741246	4408	79104	46148	32
AT21 Carinthia	75	555473	59	17188	30789	18
AT22 Styria	81	1210971	75	37971	31365	18
AT31Upper Austria	81	1418498	121	51432	36409	17
AT32 Salzburg	78	531898	75	22182	41717	21
AT33 Tyrol	83	715888	57	26484	37299	19
AT34 Vorarlberg	83	372603	147	14260	38548	19
BE0 Belgium	**79**	**11161642**	**368**	**364167**	**33104**	**40**
BE1 Brussels Capital Region	76	1174624	7296	68931	60637	47

BE2 Flemish Region	81	6404726	479	209426	33107	40
BE3 Wallonia	75	3582292	213	85571	24185	37
BG0 Bulgaria	**54**	**7284552**	**67**	**50827**	**6864**	
BG3 Severna I iztochna Bulgaria	48	3693421	55	19042	5148	No Data
BG4 Yugozapadna I yuzhna tsentralna Bulgaria	60	3591131	86	31784	8844	No Data
Canada	**77**	**35158304**	**4**	**1554950**	**44741**	
CA1 Newfoundland And Labrador	76	526702	1	28905	54864	27
CA2 Prince Edward Island	79	145237	26	4741	32661	20
CA3 Nova Scotia	73	940789	18	32819	34727	21
CA4 New Brunswick	75	756050	11	26961	35616	25
CA5 Quebec	76	8155334	6	305875	37837	20
CA6 Ontario	78	13537994	15	576506	42984	24
CA7 Manitoba	72	1265015	2	49784	39826	30
CA8 Saskatchewan	72	1108303	2	66609	61247	22
CA9 Alberta	77	4025074	6	266590	68554	22
CA10 British Columbia	82	4581978	5	188037	41388	24
Yukon Territory	No data	36700	0.1	2249	62041	No Data
Northwest Territories	No Data	43537		3996	91607	No Data
Nunavut	No data	35591		1879	54137	34
Chile	**36**	**17556815**	**24**	**215238**	**12368**	**32**
CL01 Tarapaca	38	336121	8	5265	16008	39
CII Antofagasta	54	594555	5	23017	39136	27
CIII Atacama	32	286642	4	5646	19836	28
CIV Coquimbo	25	749374	18	6874	9299	36
CV Valparaiso	38	1814079	111	17660	9834	24
CVI O'Higgins	18	908553	55	9654	10725	20
CVII Maule	16	1031622	34	7599	7423	28
CVIII Bio-Bio	25	2074094	56	17049	8270	23
CIX Araucania	17	994380	31	4816	4882	29
CX Los Lagos	23	867315	18	5464	6376	28
CXI Aisen	21	107915	1	1096	10250	39
CXII Magallanes y Anta(a)rtica	33	160164	1	1823	11417	41
CRMS Santiago	50	7069645	459	105121	15001	24
CL14 Los Rios	21	382741	21	2739	7174	29
CL15 Arica Y Parinacota	49	179615	11	1417	7811	No data

CZ0 Czech Republic	**63**	**10516125**	**136**	**252993**	**24125**	**21**
CZ01 Prague	70	1246780	2569	62924	50990	40
CZ02 Central Bohemian Region	65	1291816	120	27444	21695	20
CZ03 Southwest	61	1209298	71	25248	20917	19
CZ04 Northwest	58	1128490	133	21115	18649	13
CZ05 Northeast	67	1507980	123	29841	19779	18
CZ06 Southeast	66	1679857	122	36555	21812	23
CZ07 Central Moravia	57	1225302	134	23943	19480	17
CZ08 Moravia-Silesia	61	1226602	231	25923	20995	19
DK0 Denmark	**84**	**5627235**	**130**	**174065**	**31192**	**32**
DK01 Capital (DK)	86	1749405	680	68508	39956	42
DK02 Zealand	82	816726	113	18457	22566	27
DK03 Southern Denmark	80	1202509	98	34450	28676	27
DK04 Central Jutland	85	1277538	98	36760	29020	30
DK05 North Jutland	86	581057	74	15890	27397	26
Estonia	**79**	**1320174**	**30**	**24389**	**18198**	**39**
FI0 Finland	**88**	**5426674**	**18**	**172735**	**32135**	**39**
FI13 Western Finland	85	1370384	24	39517	29056	37
FI18 Helsinki-Uusimaa	92	1566835	172	65199	42550	47
FI19 Southern Finland	88	1161486	37	32688	28238	36
FI1A Eastern and Northern Finland	86	1299468	6	34175	26342	35
FI20 Åland	64	28501	18	1074	38363	32
France	**78**	**65588117**	**103**	**1958737**	**31056**	**35**
FR1 Île de France	85	11978363	995	595674	50256	45
FR2 Bassin Parisien	77	10802440	74	265970	24698	No Data
FR3 Nord - Pas-de-Calais	74	4052156	326	98173	24288	34
FR4 Est	77	5389583	112	133820	24890	No Data
FR5 Ouest	76	8710169	102	217975	25356	No Data
FR6 Sud-Ouest	78	6990946	67	178876	25929	No Data
FR7 Centre-Est	78	7749100	111	221630	29031	No Data
FR8 Méditerranée	79	7986851	118	210564	26652	No Data
FR 9 Departements d'outre-mer	67	1928509	22	No Data	No Data	No Data
DE0 Germany	**85**	**82020578**	**230**	**2744846**	**34640**	**28**
DE1 Baden-Württemberg	83	10840832	303	398172	38885	30

DE2 Bayern	85	12669492	180	478436	39747	29
DE3 Berlin	88	3545685	3994	109439	31922	37
DE4 Brandenburg	71	2491514	85	58849	24642	30
DE5 Bremen	91	663543	1583	29631	44562	27
DE6 Hamburg	87	1814597	2403	102143	57136	32
DE7 Hessen	84	6114686	290	244538	40720	31
DE8 Mecklenburg-Vorpommern	75	1627901	70	37863	23595	27
DE9 Niedersachsen	89	7916913	166	238182	30939	24
DEA Nordrhein-Westfalen	87	17848113	524	607845	35028	26
DEB Rheinland-Pfalz	85	3998702	201	120377	31355	26
DEC Saarland	83	1009506	393	32255	33816	23
DED Sachsen	79	4132291	224	101658	25108	33
DEE Sachsen-Anhalt	81	2295657	112	55159	24078	26
DEF Schleswig-Holstein	86	2841433	180	79232	29054	24
DEG Thüringen	87	2209713	137	51068	23738	30
GR0 Greece	**55**	**11062508**	**85**	**252068**	**22287**	**30**
GR1 Northern Greece	50	3559848	63	62373	17373	28
GR2 Central Greece	40	2396346	45	43917	17696	23
GR3 Athens	68	3920124	1030	121261	29475	39
GR4 Aegean Islands and Crete	47	1186190	68	24516	21812	23
HU0 Hungary	**71**	**9908798**	**107**	**171943**	**17219**	**25**
HU10 Central Hungary	80	2953883	427	83949	28254	35
HU21 Central Transdanubia	73	1074702	97	16555	15131	20
HU22 Western Transdanubia	73	985279	87	17436	17529	19
HU23 Southern Transdanubia	66	925180	65	10761	11441	22
HU31 Northern Hungary	66	1189441	89	12186	10200	20
HU32 Northern Great Plain	63	1491659	84	16219	10945	20
HU33 Southern Great Plain	63	1288654	70	14837	11339	21
Iceland	**93**	**325671**	**3**	**10696**	**33587**	**31**
IS01 Capital Region	93	208752	197			41
IS02 Other Regions	91	116919	1			25
Ireland	**65**	**4591087**	**67**	**36173**	**39911**	**43**

IE01 Border - Midlands and Western	59	1236009	39	24076	27766	38
IE02 Southern and Eastern	70	3355078	92	40664	44392	45
Israel	71	**7984500**	**369**	No Data	No Data	**58**
IL01 Jerusalem	54	987400	1512	No Data	No Data	46
IL02 Northern	61	1320800	295	No Data	No Data	39
IL03 Haifa	69	939000	1084	No Data	No Data	47
IL04 Central	78	1931000	1492	No Data	No Data	48
IL05 Tel Aviv	77	1318300	7665	No Data	No Data	50
IL06 Southern	71	1146600	81	No Data	No Data	40
IT0 Italy	**68**	**59685227**	**202**	**1644465**	**27125**	**19**
ITC1 Piemonte	65	4374052	176	131104	29413	18
ITC2 Aosta Valley	67	127844	39	4503	35120	17
ITC3 Liguria	64	1565127	294	45781	28316	22
ITC4 Lombardia	71	9794525	430	350826	35374	19
ITD1 Province of Bolzano-Bozen	74	509626	69	20014	39423	15
ITD2 Province of Trento	71	530308	86	17234	32551	18
ITD3 Veneto	74	4881756	278	155587	31509	17
ITD4 Friuli-Venezia Giulia	70	1221860	162	38113	30840	19
ITD5 Emilia-Romagna	75	4377487	203	148389	33478	19
ITE1 Toscana	72	3692828	163	110310	29417	18
ITE2 Umbria	73	886239	107	22406	24717	21
ITE3 Marche	72	1545155	162	42534	27172	19
ITE4 Lazio	71	5557276	329	179227	31286	23
ITF1 Abruzzo	69	1312507	123	31292	23311	19
ITF2 Molise	59	313341	72	6674	20870	18
ITF3 Campania	60	5769750	431	97430	16700	18
ITF4 Puglia	60	4050803	211	72810	17797	16
ITF5 Basilicata	65	576194	59	11179	19028	19
ITF6 Calabria	59	1958238	133	34395	17100	18
ITG1 Sicilia	58	4999932	197	87359	17295	17
ITG2 Sardegna	70	1640379	69	34416	20542	16
JP0 Japan	**75**	**127297000**	**341**	**4063407**	**31732**	**35**
JPA Hokkaido/Tohoku	61	5431000	65	151082	27440	27
JPB Tohoku	62	9095000	137	254218	27233	23
JPC Northern-Kanto,	68	9870000	279	308024	30799	29

Koshin						
JPD Southern-Kanto	90	35793000	2730	1311822	36830	46
JPE Hokoriku	69	5360000	164	168435	30945	27
JPF Toukai	74	15050000	674	507227	33565	33
JPG Kansai Region	81	20802000	793	632683	30268	38
JPH Chugoku	66	7470000	238	227803	30121	32
JPI Shikoku	59	3905000	209	110165	27707	29
JPJ Kyushu, Okinawa	60	14521000	332	391948	26851	28
KR0: Korea	**84**	**50219669**	**505**	..	..	**42**
KR01: Capital region	90	24887674	2126	660105	26718	47
KR02: Gyeongnam region	78	7813967	634	244771	31348	38
KR03: Gyeonbuk region	73	5113686	257	134183	26209	38
KR04: Jeolla region	76	5083414	248	142716	28058	37
KR05: Chungcheong region	88	5255702	317	172990	33124	38
KR06: Gangwon region	74	1504986	91	34496	22953	33
KR07: Jeju	72	560240	303	13175	23582	40
Lithuania	**64**	**2971905**	**48**	**40865**	**13464**	
Luxembourg (Grand-Duché)	**70**	**537039**	**203**	**34997**	**68374**	**43**
Mexico	**28**	**118395053**	**60**	**1522414**	**13006**	**21**
ME01 Aguacalienetes	34	1252265	223	16430	13315	23
ME02 Baja California Norte	43	3381080	47	42867	12878	20
ME03 Baja California Sur	47	718196	10	11253	16181	22
ME04 Campeche	25	880299	15	76746	88583	22
ME05 Coahuila	29	2890108	19	51589	18074	25
ME06 Colima	37	698295	124	8645	12614	22
ME07 Chiapas	11	5119186	69	27607	5466	14
ME08 Chihuahua	31	3635966	15	41803	11616	19
ME09 Distrito Federal	48	8893742	5993	249685	28018	33
ME10 Durango	18	1728429	14	18739	10960	19
ME11 Guanajuato	23	5719709	187	59454	10489	15
ME12 Guerrerro	14	3523858	55	21799	6229	16
ME13 Hidalgo	16	2806334	135	25355	9157	16
ME14 Jalisco	31	7742303	98	95106	12442	21

ME15 Mexico	27	16364210	733	139894	8686	20
ME16 Michoacan	15	4529914	77	35532	7905	15
ME17 Morelos	30	1874188	383	17813	9624	20
ME18 Nayarit	27	1178403	42	9774	8459	21
ME19 Nuevo Leon	44	4941059	77	108946	22376	28
ME20 Oaxaca	12	3959042	42	24977	6354	14
ME21 Puebla	22	6067607	177	49426	8235	18
ME22 Queretaro	301	1943889	167	30554	15973	23
ME23 Quintana Roo	36	1484960	35	22811	15840	20
ME24 San Luis Potosi	24	2702145	44	29781	11132	20
ME25 Sinaloa	32	2932313	51	31556	10860	26
ME26 Sonora	42	2851462	16	44623	15881	23
ME27 Tabasco	23	2334493	94	53039	22970	21
ME28 Tamaulipas	33	3461336	43	45304	13249	23
ME29 Tlaxcala	16	1242734	311	8499	6940	19
ME30 Veracruz	24	7923198	110	82048	10441	18
ME31 Yucatan	23	2064151	52	22386	10991	19
ME32 Zacatecas	20	1550179	21	18376	11959	17
NL0 Netherlands	**83**	**16779575**	**498**	**618703**	**37146**	**33**
NL1 Northern Netherlands	85	1718485	207	63543	36992	29
NL2 Eastern Netherlands	87	3553582	366	109980	31146	30
NL3 Western Netherlands	88	7914606	916	309484	39525	36
NL4 Southern Netherlands	85	3592902	509	129715	36265	30
NZ0 New Zealand	**75**	**4470800**	**17**	**114128**	**25745**	**38**
NZ1 North Island	75	3422000	30	87866	25889	38
NZ2 South Island	75	1048200	7	26262	25288	36
NO0 Norway	**88**	**5109056**	17	**180247**	**47102**	**38**
NO01 Oslo and Akershus	92	1210220	238	56428	48160	50
NO02 Hedmark and Oppland	90	382253	8	9980	26078	30
NO03 South-Eastern Norway	86	969519	29	26802	27815	34
NO04 Agder and Rogaland	84	751850	31	28133	37003	35
NO05 Western Norway	86	875741	19	30898	35874	36
NO06 Trøndelag	91	441339	11	13541	31141	36
NO07 Northern	85	478134	4	14465		33

Norway						
PL0 Poland	**69**	**38533299**	**123**	**692212**	**17966**	**30**
PL1 Centralny	69	7826411	146	197035	25230	No Data
PL2 Poludniowy	70	7969947	290	144442	18119	No Data
PL3 Wschodni	67	6768287	90	84999	12514	No Data
PL4 Pólnocno-Zachodni	71	6206918	93	105860	17091	No Data
PL5 Poludniowo-Zachodni	64	3924565	134	73999	18808	No Data
PL6 Pólnocny	70	5837171	96	88878	15250	No Data
PT0 Portugal	**58**	**10487289**	**114**	**228780**	**21640**	**20**
PT11 North (PT)	61	3666234	172	65074	17615	18
PT15 Algarve	55	444390	89	9562	21190	18
PT16 Central Portugal	72	2298938	82	42285	18144	17
PT17 Lisbon	51	2818388	939	84990	30106	28
PT18 Alentejo	66	748699	24	14785	19495	17
PT20 Azores (PT)	64	247549	107	4965	20124	14
PT30 Madeira (PT)	58	263091	328	6873	25641	18
SK0 Slovakia	**55**	**5410836**	**110**	**112773**	**20913**	**21**
SK01 Bratislava	70	612682	298	31100	51839	38
SK02 West Slovakia	72	1838136	123	36804	20015	17
SK03 Central Slovakia	73	1348611	83	22105	16383	19
SK04 East Slovakia	65	1611407	102	22766	14189	18
Slovenia	**74**	**2058821**	**102**	**51602**	**25169**	**30**
ES0 Spain	**69**	**46727890**	**93**	**1240303**	**26874**	**36**
ES11 Galicia	64	2761989	94	66311	24231	36
ES12 Asturias	70	1067797	101	26638	25236	42
ES13 Cantabria	74	590036	112	15118	26128	41
ES21 Basque Counry	72	2177006	302	76881	35920	52
ES22 Navarra	71	638948	62	21508	34572	43
ES23 La Rioja	64	318647	63	9467	30230	38
ES24 Aragón	67	1338316	28	39482	30026	37
ES30 Comunidad de Madrid	78	6414620	806	223380	35072	47
ES41 Castile and León	66	2518560	27	65589	26326	37
ES42 Castile-la Mancha	63	2094406	27	43993	21495	28
ES43 Extremadura	61	1100970	27	20097	18552	28
ES51 Catalonia	71	7480921	234	230303	31404	36
ES52 Valencia	67	4987011	216	117794	23538	33
ES53 Balearic Island	68	1110112	222	30782	28279	27

ES61 Andalusia	66	8393175	97	167854	20330	29
ES62 Murcia	66	1461983	129	32215	21943	30
ES63 Ceuta	82	84539	4380	1777	23453	25
ES64 Melilla	65	83620	6240	1586	21409	28
ES70 Canary Islands	67	2105234	283	48267	22982	29
SE0 Sweden	**79**	**9555893**	**23**	**329417**	**34986**	**35**
SE11 Stockholm	84	2127006	326	99623	48494	44
SE12 East Middle Sweden	79	1589821	41	47234	30100	34
SE21 Småland with Is	75	815792	25	24905	30686	28
SE22 South Sweden	80	1415403	102	41667	29835	36
SE23 West Sweden	79	1904563	65	61953	32957	35
SE31 North Middle Sweden	78	826272	13	24312	29405	27
SE32 Central Norrland	73	368182	5	11891	32198	29
SE33 Upper Norrland	76	508854	3	17739	34926	33
CH0 Switzerland	**81**	**8039060**	**201**	**311067**	**39525**	**37**
CH01 Lake Geneva Region	82	1519189	183	60300	40642	38
CH02 Espace Mitteland	79	1788791	183	59700	34004	34
CH03 Northwestern Switzerland	83	1091302	560	47031	43921	39
CH04 Zurich	83	1408575	848	68016	49536	44
CH05 Eastern Switzerland	81	1123672	99	36602	33165	30
CH06 Central Switzerland	81	765879	179	27445	36619	34
CH07 Ticino	69	341652	125	11872	35571	33
TUR Turkey	**46**	**75627384**	**98**	**994251**	**13486**	**19**
TR10 Istanbul	63	13854740	2666	270017	20370	26
TR21 Thrace	63	1593247	85	26937	17706	18
TR22 Southern Marmara - West	41	1654422	68	21302	12967	17
TR31 Izmir	57	4005459	333	65614	16616	22
TR32 Southern Aegean	39	2808243	87	34662	12654	14
TR33 Northern Aegean	32	2965800	66	35697	11877	11
TR41 Eastern Marmara - South	55	3682037	129	63545	17674	20
TR42 Eastern Marmara - North	54	3376330	167	62458	19241	22

TR51 Ankara	55	4965542	203	85822	17985	34
TR52 Central Anatolia - West and South	40	2287705	48	23306	10374	16
TR61 Mediterranean region - West	50	2763541	77	39535	14722	18
TR62 Mediterranean region - Middle	36	3808483	130	39347	10540	17
TR63 Mediterranean region - East	38	3038983	130	25746	8569	14
TR71 Central Anatolia - Middle	44	1501311	48	15362	10267	17
TR72 Central Anatolia - East	40	2351714	39	22735	9662	19
TR81 Western Black Sea - West	49	1020108	107	12706	12276	13
TR82 Western Black Sea – Middle and East	37	745525	28	7086	9536	13
TR83 Middle Black Sea	35	2717970	72	26743	9758	13
TR90 Eastern Black Sea	35	2545274	72	24239	9633	14
TRA1 Northeastern Anatolia - West	28	1071878	26	9154	8568	17
TRA2 Northeastern Anatolia - East	41	1154277	38	6641	5858	9
TRB1 Eastern Anatolia - West	41	1673852	47	13869	8534	13
TRB2 Eastern Anatolia - East	15	2082470	50	10362	5124	10
TRC1 Southeastern Anatolia - West	31	2519139	165	17535	7261	15
TRC2 Southeastern Anatolia - Middle	20	3354242	99	20100	6296	11
TRC3 Southeastern Anatolia - East	28	2085092	80	13733	6916	14
UK0 United Kingdom	**87**	**63256141**	**261**	**2063148**	**33002**	**39**
UKC North East	77	2618012	305	62450	23870	31
UKD North West	85	7033454	499	193854	27862	35
UKE Yorkshire and The Humber	84	5336192	346	140164	26334	34
UKF East Midlands	89	4545216	291	120826	26872	34
UKG West Midlands	82	5564350	428	147184	26916	33
UKH Eastern	89	5907790	309	173229	29542	36
UKI London	94	8136284	5175	459903	58344	56
UKJ South East	90	8665938	4540	297299	34727	42

UKK South West	93	5330841	224	152190	28748	37
UKL Wales	83	3034975	146	70400	23379	35
UKM Scotland	85	5268247	68	160615	30661	44
UKN Northern Ireland	87	1814842	134	44053	24429	34
US0 United States	**73.4**	**313873685**	**35**	**13637131**	**43442**	**27**
US01 Alabama	63.5	4817528	37	160802	33347	21
US02 Alaska	79	730307	0.5	45433	62113	25
US04 Arizona	73.9	6551149	23	233818	35680	25
US05 Arkansas	60.9	2949828	22	95981	32545	19
US06 California	77.9	37999878	95	1755208	46139	28
US08 Colorado	79.4	5189458	20	240088	46281	34
US09 Connecticut	77.5	3591765	287	200900	55956	34
US10 Delaware	74.5	917053	183	57807	63033	27
US11 Dist. of Columbia	73.4	633427	4066	96187	152118	48
US12 Florida	74.3	19320749	140	680858	35246	25
US13 Georgia	72.2	9915646	67	379841	38291	25
US15 Hawaii	78.6	1390090	84	63449	45571	27
US16 Idaho	73.2	1595590	8	51026	31976	23
US17 Illinois	74	12868192	89	609084	47307	29
US18 Indiana	69.7	6537782	71	261619	40019	21
US 19 Iowa	72.2	3075039	21	133546	43441	24
US 20 Kansas	73	2885398	14	121734	42182	27
US 21 Kentucky	68.5	4379730	43	151970	34693	20
US 22 Louisiana	64.8	4602134	41	213119	46311	20
US 23 Maine	72.9	1328501	17	47007	35365	26
US 24 Maryland	78.9	5884868	234	278311	47295	34
US 25 Massachusetts	79.6	6645303	330	353781	53231	36
US 26 Michigan	70.7	9882519	67	350874	35501	24
US 27 Minnesota	76.5	5379646	26	258206	48001	31
US 28 Mississippi	57.4	2986450	25	88913	29787	18
US 29 Missouri	69.8	6024522	34	226758	37655	24
US 30 Montana	72.1	1005494	3	35413	35232	27
US 31 Nebraska	72.9	1855350	9	87220	47006	27
US 32 Nevada	75.6	2754354	10	117030	42419	20
US 33 New Hampshire	80.9	1321617	57	56680	42916	32
US 34 New Jersey	79.1	8867749	463	445051	50206	34
US 35 New Mexico	64.4	2083540	7	70612	33858	23
US 36 New York	75.3	19576125	161	1056491	53985	31
US 37 North Carolina	70.8	9748364	78	399469	40962	25

US 38 North Dakota	72.5	701345	4	40314	57622	25
US 39 Ohio	71.2	11553031	109	446269	38657	23
US 40 Oklahoma	66.7	3815780	22	141008	36963	21
US 41 Oregon	77.5	3899801	16	174079	44643	27
US 42 Pennsylvania	72.4	12764475	110	526434	41245	26
US 44 Rhode Island	76.5	1050304	389	44642	42504	29
US 45 South Carolina	66.6	4723417	61	154380	32682	23
US 46 South Dakota	71.1	834047	4	37202	44641	24
US 47 Tennessee	67	6454914	61	242706	37592	22
US 48 Texas	71.8	26060796	39	1224207	46978	24
US 49 Utah	79.6	2854871	14	114316	40037	27
US 50 Vermont	75.3	625953	26	23913	38200	32
US 51 Virginia	75.8	8186628	81	390623	47719	32
US 53 Washington	78.9	6895318	40	329170	47726	29
US 54 West Virginia	64.9	1856680	30	60782	32760	17
US 55 Wisconsin	73	5724554	41	229137	40014	25
US 56 Wyoming	75.5	576626	2	33661	58397	22

Appendix D Sources

	% households with broadband	Population Total	Population density	GDP total	GDP per cap, PPP	Education
Australia	2013, OECD	2013, OECD	2013, OECD	2012, OECD	2012, OECD	2013, OECD
Austria	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
Belgium	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
Bulgaria	2013, Eurostat	2013, Eurostat	2012, Eurostat	2011, Eurostat	2011, Eurostat	
Canada	2013, CRTC	2013, OECD	2013, OECD	2012, OECD	2012, OECD	2013, OECD
Chile	2012, OECD	2013, OECD	2013, OECD	2012, OECD	2012, OECD	2013, OECD
Czech Republic	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
Denmark	2013, OECD	2014, OECD	2013, OECD	2012, OECD	2012, OECD	2013, OECD
Estonia	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
Finland	2013, OECD for Aland, 2007, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
France	2013, Eurostat	2013, Eurostat	2012, Eurostat	2011, OECD	2009, OECD	2013, OECD
Germany	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
Greece	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
Hungary	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
Iceland	2012, OECD	2014, OECD	2013, OECD	2011, OECD	2011, OECD	2012, OECD
Ireland	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
Israel	2012, OECD	2013, OECD	2013, OECD			2013, OECD
Italy	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD
Japan	2012, OECD	2013, OECD	2013, OECD	2010, OECD	2010, OECD	2010, OECD
Korea	2009, KCC	2013, OECD	2013, OECD	2012, OECD	2012, OECD	2013, OECD
Lithuania	2013, Eurostat	2013, Eurostat	2012, Eurostat	2011, Eurostat	2011, Eurostat	
Luxembourg	2013, OECD	2013, OECD	2013, OECD	2011, OECD	2011, OECD	2013, OECD

Mexico	**2013, OECD**	**2013, OECD**	**2013, OECD**	**2012, OECD**	**2012, OECD**	**2010, OECD**
Netherlands	**2013, OECD**	**2013, OECD**	**2013, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
New Zealand	**2012, OECD**	**2013, OECD**	**2013, OECD**	**2012, OECD**	**2012, OECD**	**2012, OECD**
Norway	**2013, OECD**	**2014, OECD**	**2013, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
Poland	**2013, Eurostat**	**2013, Eurostat**	**2012, Eurostat**	**2011, OECD**	**2011, OECD**	**2013, OECD**
Portugal	**2013, OECD**	**2013, OECD**	**2013, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
Slovakia	**2013, OECD**	**2013, OECD**	**2013, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
Slovenia	**2013, OECD**	**2013, OECD**	**2013, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
Spain	**2013, OECD**	**2013, OECD**	**2013, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
Sweden	**2012, OECD**	**2013, OECD**	**2013, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
Switzerland	**2011, OECD**	**2013, OECD**	**2013, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
Turkey	**2013, OECD**	**2013, OECD**	**2013, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
United Kingdom	**2013, OECD**	**2012, OECD**	**2012, OECD**	**2011, OECD**	**2011, OECD**	**2013, OECD**
United States	**2013, Census Bureau**	**2013, OECD**	**2013, OECD**	**2012, OECD**	**2012, OECD**	**2012, OECD**

Appendix E
Market and Regulatory Background

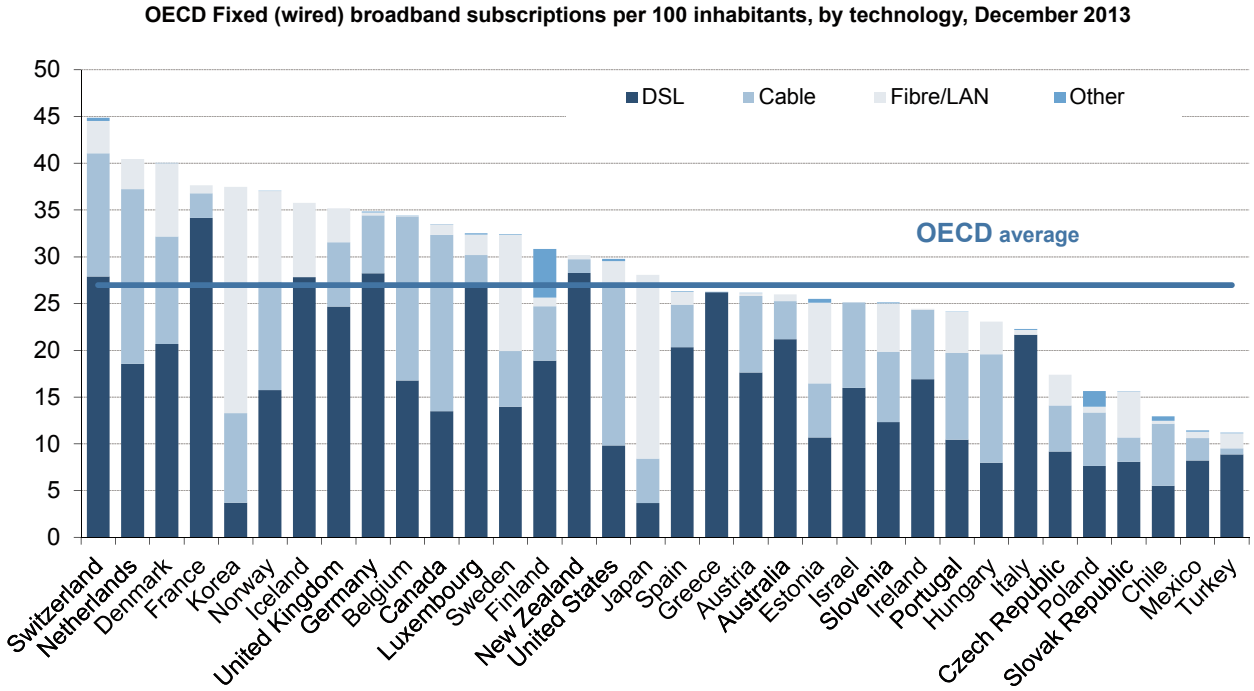
This Appendix contains updated information on regulatory and market developments for the 39 countries for which we obtained pricing data in Appendix C.[1] We also include topography and broadcast information in this Appendix for Brazil and India, the two countries included here that were not included in the Appendix E of the *Third IBDR*.

In our previous *IBDR*s, we included in Appendix E market and regulatory background information as well as information about topography and television and radio broadcast stations of various foreign countries. Much of the information reported in Appendix E of our earlier *IBDR*s has not changed. We incorporate by reference Appendix E from both the *Second* and *Third IBDRs* as supplemented by the new information contained herein.

Table 1: OECD Rankings[2]

Fixed (Wired) Broadband Subscriptions per 100 Inhabitants by Technology (December 2013)

Source: OECD Broadband Portal Table 1d(1)

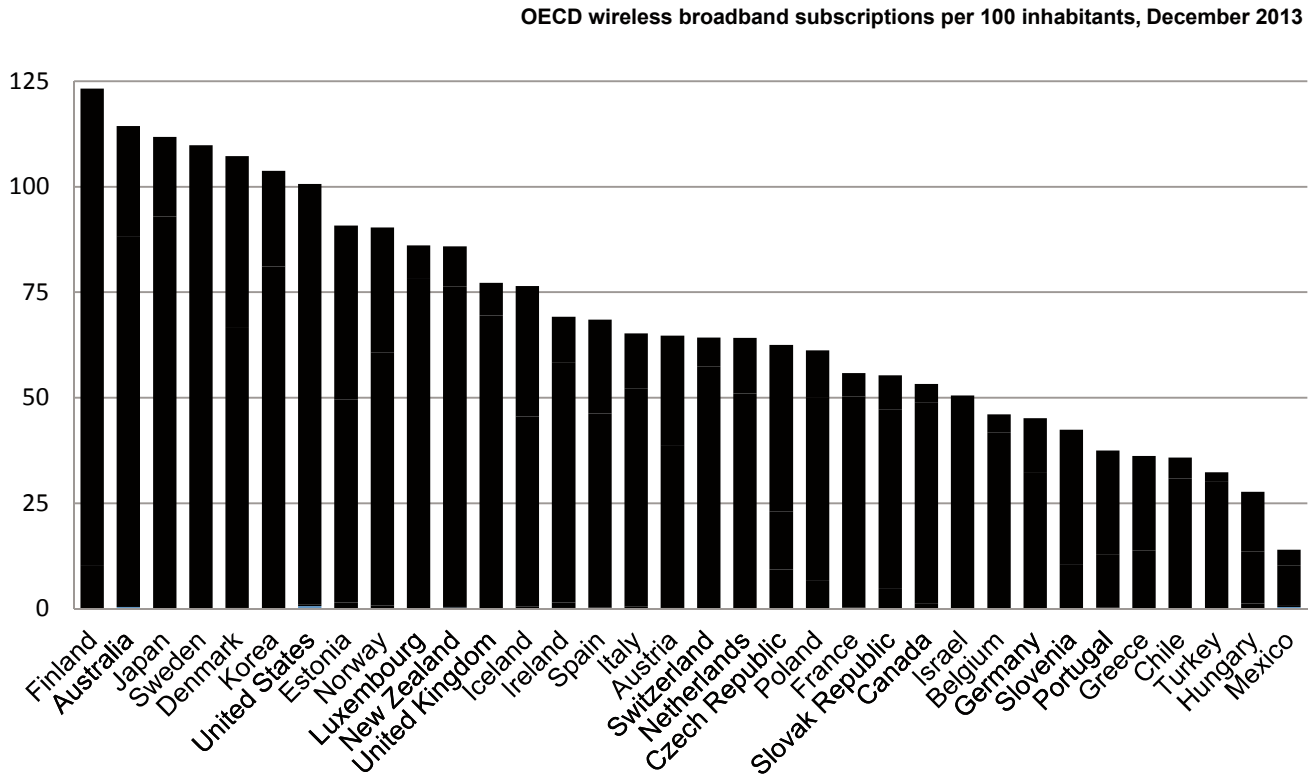


[1] Because we only include countries for which we obtained pricing data in this Appendix, we have dropped three countries from this Appendix E that were included in previous reports: Cyprus, Latvia and Romania.

[2] Although this Appendix E includes information on 39 countries, OECD Rankings Tables provide information only for the OECD member states. *See* OECD Broadband Portal at http://www.oecd.org/sti/broadband/oecd

broadbandportal.htm.

Table 2: **OECD Rankings**
Wireless Broadband Subscriptions per 100 inhabitants (December 2013)
Source: OECD Broadband Portal Table 1d(2)



1. Australia

Regulation: The development and roll-out of the National Broadband Network (NBN) has dominated the Australian telecommunications arena in recent years.[3] Initiated in 2009, the NBN is an Australia-wide project to upgrade the existing fixed line phone and Internet network infrastructure.[4] In April 2010, the Australian government established the National Broadband Network Company (NBN Co) to design, build, and operate the NBN.[5] The change of government in September 2013 from the Labour Party to the Coalition government had a significant impact on the NBN. While the original NBN relied almost solely on fiber-to-the-premises (FTTP) connections, a strategic review conducted by the Ministry of Communications in February 2014 recommended a switch to a mixed technology approach.[6] In April 2014, the new Coalition government officially changed the focus of the NBN to this mixed technology approach, which combines FTTP technology with newly-built fiber-to-the-node (FTTN) technology and existing hybrid fiber coaxial (HFC) infrastructure. The Australian government

[3] Telegeography GlobalComms Database: *Australia* (2014) (accessed Sept. 16, 2014).

[4] National Broadband Network Co. (NBN Co), *Learn About the NBN*, http://www.nbnco.com.au/about-the-nbn.html#.VBhRDfldXTo (accessed Sept. 16, 2014).

[5] NBN Co, *About NBN Co*, http://www.nbnco.com.au/corporate-information/about-nbn-co.html#.VBhTrPldXTo (accessed Sept. 16, 2014).

[6] Telegeography GlobalComms Database: *Australia* (2014) (accessed Sept. 16, 2014).

expects that the mixed technology approach will allow 91percent of Australians in the fixed line rollout area to get downlink speeds of up to 50 Mbps by 2019.[7]

In October 2012, the Australia Communications & Media Authority (ACMA), the telecommunications regulatory agency, announced it would make available 10 megahertz of spectrum in the 800 MHz band for the deployment of a nationally interoperable public safety mobile broadband network and 50 megahertz of spectrum in the 4.9 GHz band for nationwide use by public safety agencies.[8] In January 2013, the Department of Broadband, Communications, and the Digital Economy (DBCDE) published its schedule for restacking UHF television channels 52 to 69 to free 126 megahertz of 700 MHz band spectrum. The process is scheduled to end by December 31, 2014.[9]

In April 2013, ACMA auctioned spectrum in the 700 MHz and the 2.5 GHz bands, which are both currently occupied by television providers. ACMA auctioned the bands together due to their complementary nature (700 MHz spectrum excels at penetrating buildings, while 2.5 GHz spectrum is more efficient for high-speed traffic).[10]

Market and Competition: In December 2013, Telstra, Australia's dominant wireless, fixed line, and broadband provider, reported that its 4G network reached 85 percent of the population and it aimed to switch its focus to LTE-Advanced (LTE-A) deployment in 2014.[11] To this end, in February 2013, Telstra renewed its longstanding partnership with Ericsson to develop LTE infrastructure and conduct a trial launch of LTE-A carrier aggregation and LTE heterogeneous networks, as well as a subsequent commercial deployment of LTE-A in the 900 MHz and 1800 MHz bands.[12] In May 2014, Telstra and Ericsson deployed LTE-A carrier aggregation, using combined spectrum in the 1800 MHz and 2600 MHz bands to achieve download speeds of 450 Mbps.[13]

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[7] Telegeography CommsUpdate, *NBN Project Officially Switched to Multi-Technology Mix Approach* (Apr. 10, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/04/10/nbn-project-officially-switched-to-multi-technology-mix-approach/ (accessed Sept. 16, 2014).

[8] Telegeography CommsUpdate, *ACMA Outlines Plans For Emergency Spectrum Allocation* (Oct. 29, 2012), http://www.telegeography.com/products/commsupdate/articles/2012/10/29/acma-outlines-plans-for-emergency-spectrum-allocation/ (accessed Jan. 14, 2014).

[9] DBCDE Summary, *Achieving the Digital Dividend – Channel Changes*, http://www.dbcde.gov.au/television/ achieving_the_digital_dividend_-_restack (accessed Jan. 14, 2014).

[10] ACMA Summary, *Digital Dividend Auction*, http://engage.acma.gov.au/digitaldividend/ (accessed Jan. 14, 2014).

[11] Telegeography CommsUpdate, *Telstra Switches on 3,500th 4G Base Station to Reach 85% Population Coverage* (Dec. 19, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/12/19/telstra-switches-on-3500th-4g-base-station-to-reach-85-population-coverage/ (accessed Jan. 14, 2014).

[12] Telegeography CommsUpdate, *Telstra and Ericsson Renew LTE partnership, Trial LTE Broadcast, Expand Fibre Backbone* (Feb. 26, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/02/26/telstra-and-ericsson-renew-lte-partnership-trial-lte-broadcast-expand-fibre-backbone/ (accessed Jan. 14, 2013).

[13] Telegeography CommsUpdate, *Telstra Notches Download Speeds of 450Mbps in LTE-A Carrier Aggregation Test* (May 15, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/15/telstra-notches-download-speeds-of-450mbps-in-lte-a-carrier-aggregation-test/ (accessed Oct. 21, 2014).

In February 2013, NBN Co updated its three-year rollout plan to improve Australia's broadband infrastructure. The plan aimed to increase broadband rural access speeds to 25 Mbps/5 Mbps for fixed-wireless users by mid-2013 and for rural satellite users by 2015. NBN Co rolled out a 1 Gbps wholesale service at the end of 2013.[14] Alongside these broadband improvements, NBN Co planned to set the same wholesale price for ISPs reselling NBN Co services to rural broadband users as for fiber users in cities.[15] In June 2013, a number of alternative ISPs launched plans offering speeds of 25 Mbps over the fixed-wireless network element of the NBN. As of June 2014, NBN Co reports that over 604,000 premises were covered by broadband services.[16]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[17]	26.0	0.7	4.1	21.2	0.0
Fixed broadband subs (Dec. 2013)[18]	6,009,000				
% of households with fixed broadband access (2013)[19]	77.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[20]	114.4				
Mobile wireless broadband subs (Dec. 2013)[21]	26,460,000				

2. Austria

Regulation: In September 2013, Austria's digital dividend auction of 28 blocks of spectrum in the 800 MHz, 900 MHz, and 1800 MHz bands raised EUR2.01 billion (US$2.75 billion), nearly four times their minimum target price. A1 Telekom Austria paid a total of EUR1.03 billion (US$1.41 million) for 2×20 megahertz blocks in the 800 MHz band, 2×15 megahertz blocks in the 900 MHz band, and 2×35 megahertz blocks in the 1800 MHz band. Deutsche Telekom's T-Mobile Austria paid EUR655 million (US$893.62 million) for 2×10 megahertz blocks in the 800 MHz band, 2×15 megahertz blocks in the 900 MHz band, and 2×20 megahertz blocks in the 1800 MHz band. Lastly, Hutchison Drei Austria (formerly H3G) paid EUR330 million (US$450.22

[14] Global TD-LTE Initiative, *NBN Co Launches 1 Gbps Service*, http://www.lte-tdd.org/news/ind/2013-12-18/1831.html (accessed Jan. 31, 2014).

[15] Telegeography GlobalComms Database: *Australia* (2014) (accessed Jan. 14, 2014).

[16] NBN Co, *National Broadband Network – Rollout Information*, http://www.nbnco.com.au/content/dam/nbnco2/ documents/nbnco-rollout-metrics-04092014.pdf (accessed Sept. 16, 2014).

[17] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[18] *Id*.

[19] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[20] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014). This figure includes satellite, which could be fixed or mobile, and terrestrial fixed wireless, which is generally not a mobile service but is included by the OECD in its mobile broadband statistics. This figure does not include mobile broadband-equipped handsets that do not subscribe to a data package for a separate fee and did not make an Internet data connection via IP in the previous three months.

[21] *Id*.

million) for 2×5 megahertz blocks of 900 MHz band spectrum and 2×20 megahertz of 1800 MHz band spectrum. The licenses are all technology-neutral, although Austria's regulator, the Regulatory Authority for Telecoms and Broadcasting (Rundfunk & Telekom Regulierungs, or RTR) has stipulated that they should be used for FDD duplex technologies. A1 Telekom Austria acquired one frequency block in the 800 MHz band that includes a coverage obligation requiring the provision of broadband download speeds of at least 1 Mbps to 360 specified municipalities within three years.[22]

In August 2013, prior to the auction, T-Mobile Austria filed a legal challenge relating to the terms of the auction, arguing that it currently holds the usage rights of some of the frequencies available at the auction, through 2019.[23] Austrian courts are expected to take around two years to rule on T-Mobile's challenge, during which time the winning operators will move ahead with plans to build their LTE networks on the frequencies in question with the risk that they may be reallocated in the future.[24] Following the auction, Hutchison Drei Austria announced its intention to appeal the results, asserting the auction was illegal in form and substance and caused financial harm due to the exorbitant prices paid.[25] On July 29, 2014, Hutchison Drei Austria confirmed that it decided not to appeal the result of the multi-band spectrum auction, though it maintains that the auction was illegal.[26]

Market and Competition: The rapid uptake of mobile broadband in Austria continues. Fixed line operators are finding that they need to upgrade their networks and service portfolios to counter pressure from the country's increasingly data-centric cell companies, leading to widespread fixed-mobile substitution. As of March 2014, former fixed line monopoly A1Telekom Austria remained the dominant provider, accounting for 56.6 percent of the market. The country's second-largest provider, UPC Austria (with a 17.6 percent market share), utilizes cable and fiber optic networks to provide cable television, telephone and Internet services reaching 1.299 million homes across Austria. The third notable operator in the market is Tele2 Austria (with a 6 percent market share), the local division of the Swedish telecom group of the same name. Its market share has declined in recent years (118,000 broadband subscribers as of December 2013, down from a peak of 179,000 in March 2008) as popular service bundles from fixed line competitors and mobile broadband operators have eroded its customer base.[27]

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[22] Telegeography GlobalComms Database: *Austria* (2014) (accessed Sept. 3, 2014).

[23] Telegeography CommsUpdate, *T-Mobile Challenges Rules of Upcoming Spectrum Auction* (Aug. 5, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/08/05/t-mobile-challenges-rules-of-upcoming-spectrum-auction/ (accessed Oct. 22, 2014).

[24] Telegeography GlobalComms Database: *Austria* (2014) (accessed Sept. 3, 2014).

[25] Telegeography CommsUpdate, *H3G to Spearhead Austrian Spectrum Appeal* (Nov. 28, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/11/28/h3g-to-spearhead-austrian-spectrum-appeal/ (accessed Oct. 22, 2014).

[26] Telegeography CommsUpdate, *Hutch Withdraws Austrian Spectrum Appeal* (July 29, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/07/29/hutch-withdraws-austrian-auction-appeal/ (accessed Oct. 22, 2014).

[27] Telegeography GlobalComms Database: *Austria* (2014) (accessed Sept. 3, 2014).

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[28]	26.1	0.3	8.2	17.6	0.0
Fixed broadband subs (Dec. 2013)[29]	2,214,428				
% of households with fixed broadband access (2013)[30]	80.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[31]	64.7				
Mobile wireless broadband subs (Dec. 2013)[32]	5,481,818				

3. Belgium

Regulation: In November 2013, Belgium concluded its 800 MHz digital dividend auction, during which Belgium's three mobile network operators all won spectrum licenses: incumbent Belgacom, Orange's Mobistar, and KPN's BASE all won 2×10 megahertz paired licenses for EUR120 million (US$161.25 million) each. All three 20-year licenses were sold for the reserve price after one round of bidding. The Belgian government netted EUR360 million (US$491.8 million). All three licenses require the operators to offer mobile broadband speeds of at least 3 Mbps to 30 percent of the population within two years, and to 98 percent of the population in six years. Mobistar's license includes an additional obligation that requires Mobistar to cover 98 percent of underserved rural regions (where no operator currently has satisfactory 3G coverage) within three years.[33]

Strong mobile competition and adverse macroeconomic conditions appeared to have discouraged new entrants from participating in the 800 MHz auction.[34] Cable operator Telenet did not participate in the auction, and its mobile plans seem to have stalled, despite winning a 3G license in 2011 in the 2100 MHz band with fellow cable operator Tecteo. Other operators that did not participate in the 800 MHz auction included BUCD and Craig Wireless Belgium, which both participated in the 2011 auction, when BUCD won 45 megahertz of TDD spectrum.
In April 2013, the Belgian Institute for Post and Telecommunication (BIPT), Belgium's regulator, confirmed that it had fined the joint venture between Telenet and Tecteo (Tecteo Telenet Bidco, or TTB) for failure to launch commercial services over its own network by January 15, 2013 as required by its license conditions.[35] In June 2014, BIPT announced it will redistribute the 75 megahertz of unused 2G and 3G spectrum in the 900 MHz and 1800 MHz bands held by TTB. BIPT will allocate the spectrum among the three existing main players (Proximus, Mobistar, and

[28] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[29] *Id.*

[30] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[31] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[32] *Id.*

[33] IHS Global Insight: *Europe - Belgium: Analyst Commentary* (accessed Dec. 16, 2013).

[34] *Id.*

[35] Telegeography GlobalComms Database: *Belgium* (2014) (accessed Sept. 3, 2014).

BASE Company) or hold an auction pending interest from potential new entrants.[36]

Market and Competition: Belgium's broadband market benefits from widely deployed DSL and cable networks. DSL remains the most popular access technology among high-speed Internet users, with Belgacom, the former Belgian monopoly, providing virtually universal coverage. Cable broadband is gaining market share; by mid-2012, cable accounted for an estimated 46 percent of all high-speed Internet connections in Belgium. Belgacom's principal competitor is cable network operator Telenet. As of March 2014, Belgacom led the market with 1.692 million subscribers (44.5 percent market share) followed by Telenet with 1.481 million subscribers (38.9 percent).[37]

In October 2012, Belgian fixed line incumbent Belgacom and French-U.S. vendor Alcatel-Lucent announced a partnership to conduct large-scale customer trials of VDSL2 vectoring technology, the next generation VDSL2 broadband network.[38] In December 2013, after the conclusion of the trial, Belgacom began using the technology in Mechelen. By the beginning of 2014, Belgacom had activated a nationwide broadband access network based on VDSL2 vectoring. Belgacom plans to initially use the network to boost data rates on its copper infrastructure from 30 to 70 Mbps via vectored VDSL2 and its new modem, the B-BOX3. Belgacom expects to complete the nationwide rollout in 2016.[39]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[40]	34.4	0.0	17.6	16.8	0.0
Fixed broadband subs (Dec. 2013)[41]	3,819,393				
% of households with fixed broadband access (2013)[42]	79.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[43]	46.0				
Mobile wireless broadband subs (Dec. 2013)[44]	5,113,490				

[36] Telegeography CommsUpdate, *Belgium's Bidco Set to Lose Unused 2G and 3G Spectrum* (June 11, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/11/belgiums-bidco-set-to-lose-unused-2g-and-3g-spectrum/ (accessed Oct. 22, 2014).

[37] Telegeography GlobalComms Database: *Belgium* (2014) (accessed Sept. 3, 2014).

[38] *Id.*

[39] *Belgacom Switches on VDSL2 Vectoring Network* (Feb. 20, 2014), http://www.lightwaveonline.com/articles/ 2014/02/belgacom-switches-on-vdsl2-vectoring-network.html (accessed Oct. 22, 2014).

[40] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[41] *Id*.

[42] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[43] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[44] *Id*.

4. Brazil

Regulation: The Ministério das Comunicações (Ministry of Communications) is the executive agency responsible for the development of policies for telecommunications, broadcasting, and postal services. The Ministry of Communications oversees auctions for radio and TV licenses, regulates broadcasting services, implements policies aimed at universal access to telecommunications services, and generally oversees the activities of the regulator, Agência Nacional de Telecomunicações (Anatel).[45] Anatel, an independent agency, regulates the national telecommunications sector and manages the national radio spectrum. Anatel was created in 1997 in conjunction with a unified regulatory framework that established the conditions for privatization of the state-owned incumbent Telecomunicações Brasileiras (Telebrás), and is responsible for licensing, enforcement of compliance with applicable laws and regulations, and all technical aspects related to regulation of the telecommunications sector.[46]

The telecommunications sector was fully liberalized in January 2002. In May 2010, Brazil announced its National Broadband Plan.[47] The goal of the plan, known as Plano Nacional da Banda Larga (PNBL), is to provide high-speed Internet access to 40 million households (about 60 percent of the population) by 2014 by, among other things, adding over 28,000 kilometers of fiber optic lines to Brazil's existing fiber optic backbone. The government will ensure that broadband service with speeds up to 1 Mbps is available for no more than approximately US$20 per month. By June 2011, four of the country's main providers (Oi, Telefónica, Algar Telecom and Sercomtel) committed to the goals of the National Broadband Plan, and as of October 2011, were delivering broadband services at a minimum speed of 1 Mbps for approximately US$18 per month in 344 municipalities.[48] By January 2012, 692 municipalities had low-cost wireline broadband services.[49] As of August 2013, this low-cost basic wireline broadband service was available in 3,214 municipalities.[50] As of March 2014, the PNBL covered 4,633 out of 5570 municipalities (83 percent of municipalities).[51] Communications Minister Paulo Bernardo mentioned in 2012 that the government plans to launch PNBL v.2.0 in 2014, the goal of which is to provide 90 percent of all households with high-speed broadband access of at least 4-5 Mbps within the next five years.[52]

In June 2012, Anatel concluded a spectrum auction of the 450 MHz and 2.5 GHz bands for 4G

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[45] Ministry of Communications, http://www.mc.gov.br/o-ministerio (accessed Mar. 19, 2014).

[46] Anatel, http://www.anatel.gov.br (accessed Mar. 19, 2014).

[47] InfoDev, *Broadband in Brazil: A Multipronged Public Sector Approach to Digital Inclusion* (2011), http://www.infodev.org/en/Document.1128.pdf (accessed Mar. 19, 2014).

[48] Telegeography GlobalComms Database: *Brazil* (2014) (accessed Mar. 19, 2014).

[49] *Id.*

[50] Ministry of Communications, *Programa Nacional de Banda Larga (PNBL)*, http://www.mc.gov.br/acoes-e-programas/programa-nacional-de-banda-larga-pnbl (accessed Dec. 11, 2013).

[51] Ministry of Communications, *Programa Nacional de Banda Larga (PNBL) – Balanço Junho 2014*, http://www.mc.gov.br/programa-nacional-de-banda-larga-pnbl (accessed Sept. 16, 2014).

[52] Telesintese, *Bernardo Quer PNBL Com Velocidade Mínima de 10 Mbps em 2014* (Aug. 29, 2012), http://www.telesintese.com.br/bernardo-quer-pnbl-com-velocidade-minima-de-10-mbps-em-2014/ (accessed Sept. 16, 2014).

mobile broadband use.[53] Anatel and the Ministry of Communications committed to ensuring the deployment of 4G technology before Brazil hosted the 2014 World Cup. President Dilma Rousseff announced in September 2011 that the Brazilian government had earmarked US$117 million to ensure that the 12 host cities for the 2014 World Cup would be able to offer 4G/LTE services.[54] By the start of the World Cup in June 2014, all 12 host cities had LTE services. Anatel concluded the auction of the 700 MHz band on September 30, 2014, and licenses were won by the three main mobile operators, Vivo, TIM Brasil and Claro.[55] The 700 MHz band is currently used by television broadcasters, who are under pressure to complete the digital television migration by 2018. The Minister of Communications has expressed the government's desire to have the analog switch-off within a year of the 700 MHz auction so that 4G services can be deployed in the band.[56]

Brazil is leading the efforts of the Union of South American Nations (UNASUR) countries to construct and install a fiber optic broadband ring for South America in order to integrate the region, increase broadband connection speeds, and decrease connection costs. It is estimated that 75-85 percent of data circulating in South America, including local content, is routed through Miami. In October 2012, Alcatel-Lucent entered into a consortium with Seaborn Networks to build the first direct U.S.-Brazil submarine cable network, called Seabras-1, which is expected to be launched in 2015.[57]

Market and Competition: The main mobile broadband providers are Claro, Vivo, TIM Brasil and Oi, and other providers include CTBC and Sercomtel Celular. Claro is the market leader in terms of subscriptions to WCDMA handsets and in M2M terminals (i.e., credit card machines, security systems) while Vivo leads in broadband data terminals.[58] Since the 4G auction in June 2012 and as of August 2014, 38.8 percent of the population had access to 4G services. Claro is the market leader in 4G coverage, with a 4G network that can reach 36.8 percent of the population, followed by Vivo (35.4 percent), and TIM and Oi (each with 31 percent).[59] The main fixed broadband access technologies are DSL (60.5 percent) and cable (33 percent).[60] As of June 2014, Claro held 30.6 percent of the fixed broadband market, followed by Oi (26.7

[53] Anatel, *Concorrentes oferecem R$ 2,7 bilhões no primeiro dia da licitação de 2,5 GHz e de 450 MHz* (June 12, 2012), http://www.anatel.gov.br/Portal/exibirPortalNoticias.do?acao=carregaNoticia&codigo=25623 (accessed Mar. 19, 2014).

[54] Telegeography GlobalComms Database: *Brazil* (2014) (accessed Mar. 19, 2014).

[55] Telegeography CommsUpdate, *700 MHz Spectrum Auction Underwhelms; Two Lots Go Unsold* (Oct. 1, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/10/01/700mhz-spectrum-auction-underwhelms-two-lots-go-unsold/ (accessed Oct. 3, 2014).

[56] Tecnologia, *4G: O Governo quer 700 MHz Livre em Grandes Regiões em Um Ano* (May 16, 2014), http://tecnologia.terra.com.br/4g-governo-quer-700-mhz-livre-em-grandes-regioes-em-um-ano,2db1b87cd9106410VgnCLD2000000ec6eb0aRCRD.html (accessed Oct. 3, 2014).

[57] Seaborn Networks, *Seaborn Networks Receives Coface Guarantee for Brazil-US Cable Project* (Oct. 21, 2013), http://www.seabornnetworks.com/pdf/press_releases/en/211013-seaborn-press-release-en.pdf (accessed Dec. 11, 2013).

[58] Teleco Report, *3G: 3rd Generation Cellular in Brazil* (Nov. 2012), http://www.teleco.com.br/en/en_3g_brasil.asp (accessed Dec. 17, 2012).

[59] Teleco Report, *4G: 4th Generation Cellular in Brazil* (Sept. 10, 2014), http://www.teleco.com.br/4g_cobertura.asp (accessed Sept. 16, 2014).

[60] Telegeography GlobalComms Database: *Brazil* (2014) (accessed Sept. 16, 2014).

percent), Telefônica (17.9 percent), Global Village Telecom (GVT) (12.8 percent), and Algar Telecom (1.7 percent).[61] More than 50 percent of the population have access to fixed Internet access in their homes at speeds above 2 Mbps.[62] Given Brazil's vast geography and its dispersed communities in its more remote northern parts, the government is also encouraging the use of satellite-based broadband delivery systems to improve Internet access. Global satellite services provider O3B Networks is seeking to extend broadband coverage to remote areas of Brazil by partnering with Telebrás, the state-owned telecommunications entity that was revived in 2010 by the Ministry of Communications to be the entity responsible for the infrastructure supporting Brazil's National Broadband Plan.[63] Brazil is planning the launch of its first geostationary satellite by 2016, led jointly by Telebrás and Embraer, which would make broadband access available to the entire country using the Ka-band.[64]

Other Media: Media ownership in Brazil is highly concentrated. National conglomerates, such as Globo, Brazil's largest broadcaster, lead the market and run television and radio networks, newspapers, and pay-TV operations. Globo reports that it is the most ubiquitous broadcaster in the country, covering 98.5 percent of the Brazilian territory and reaching 99.5 percent of the population.[65] There are more than 200 TV channels and more than 10,000 radio stations in operation.[66]

Topography: Brazil is the largest country in South America, and occupies an area that is slightly smaller than the United States. The terrain is mostly flat with rolling lowlands and the Amazon rainforest in the north, a tropical savanna and wetland in the central west part, highlands in the center, and a narrow coastal belt of beaches that feature mangroves, lagoons and dunes.

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[67]	10.08	n/a	n/a	n/a	n/a

[61] *Id*.

[62] Teletime, *Mais da metade dos brasileiros tem acesso fixo com mais de 2 Mbps* (Dec. 19, 2013), http://www.teletime.com.br/19/12/2013/mais-da-metade-dos-brasileiros-tem-acesso-fixo-com-mais-de-2-mbps/tt/364760/news.aspx (accessed Dec. 29, 2013).

[63] Telegeography CommsUpdate, *Satellite Provider O3B Seeking to Extend Broadband Coverage to Remote Parts of Brazil* (July 8, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/07/08/satellite-provider-o3b-seeking-to-extend-broadband-coverage-to-remote-parts-of-brazil/ (accessed Oct. 22, 2014).

[64] Veja, *Brasil lançará satellite para levar banda larga a todo país* (Mar. 28, 2012), http://veja.abril.com.br/noticia /vida-digital/brasil-lancara-satelite-para-levar-banda-larga-a-todo-pais (accessed Aug. 2, 2013). *See also* Conexão MiniCom, *Brasil constrói seu primeiro satélite geoestacionário* (July 6, 2012), http://www.conexaominicom.mc. gov.br/materias-especiais/946-brasil-constroi-seu-primeiro-satelite-geoestacionario (accessed Aug. 2, 2013); Ministry of Communications, *Satélite geoestacionários* (Feb. 20, 2014), http://www.mc.gov.br/ infraestrutura/satelites-geoestacionarios (accessed Sept. 16, 2014).

[65] *See* Rede Globo, http://redeglobo.globo.com/Portal/institucional/foldereletronico/ingles/g_tv_globo.html (accessed Mar. 19, 2014).

[66] Teleco Statistics, http://www.teleco.com.br (accessed Mar. 19, 2014).

[67] *See* ITU, *ICT Statistics Database* (2014), http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx (ITU Statistics Database) (accessed Oct. 28, 2014).

Fixed broadband subs (2013)[68]	20,190,871
% of households with fixed broadband access (2014)[69]	35.8
Wireless	
Mobile wireless broadband subs per 100 inhabitants[70]	52.0
Mobile wireless broadband subs (2014)[71]	104,277,000

5. Bulgaria

Regulation: Under the European Union's (EU) Radio Spectrum Policy Program, member states were expected to free up the "digital dividend" 800 MHz band for electronic communications services via the transition from analog to digital television by the start of 2013, but Bulgaria missed the deadline. Bulgaria received permission to delay the frequency relocation until 2017, as part of the 800 MHz band is occupied by the military.[72] The country's first regular digital broadcast started on March 1, 2013, and analog signals in Bulgaria officially ceased on September 30, 2013. Terrestrial TV broadcasting in Bulgaria is now digital-only.[73]

Market and Competition: Bulgaria's former fixed line incumbent Vivacom (formerly, the Bulgarian Telecommunications Company) reported having over 4.23 million subscribers as of June 30, 2013, 1.6 million of which subscribed to its fixed network, including roughly 450,000 fixed broadband subscribers.[74]

The total number of mobile user accounts in Bulgaria reached 10.68 million at the end of March 2014, down by 7.5 percent in the last 12 months. The three licensed mobile operators are MobilTel (M-Tel), Cosmo Bulgaria (GloBul) and Vivacom. Competition has led to lower prices and bundled discount offers involving various combinations of cellular voice/data, fixed broadband, fixed telephony and pay-TV services. The availability of mobile number portability (MNP) has helped the newest licensee, Vivacom, gain 300,000 users between June 2012 and 2013. By the end of March 2014, M-Tel had 38.5 percent of the market in terms of subscribers followed by GloBul (37.2 percent), and Vivacom (24.3 percent). The entry of a new market player, WiMAX operator Max Telecom, which introduced LTE services at the end of May 2014, is likely to shake up the market.[75]

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[68] *Id*.

[69] Telegeography GlobalComms Database: *Brazil* (2014) (accessed Oct. 29, 2014).

[70] ITU World Telecommunication/ICT Indicators 2014, Economy Tables (accessed Oct. 29, 2014).

[71] *Id*.

[72] European Commission, *Press Release: Europeans Suffering Because Most Member States Are Too Slow Delivering 4G Mobile Broadband Spectrum* (July 23, 2013), http://europa.eu/rapid/press-release_IP-13-726_en.htm (accessed Oct. 22, 2014).

[73] NURTS, *DVB-T (Digital Video Broadcasting – Terrestrial)*, http://nurts.bg/en/uslugi/цифрова-ефирна-телевизия-dvb-t (accessed Feb. 7, 2014).

[74] Telegeography GlobalComms Database: *Bulgaria* (2014) (accessed Apr. 15, 2014).

[75] *Id*.

In January 2012, M-Tel began rolling out a test LTE network in the 1800 MHz band, after receiving a temporary concession from Bulgaria's regulator, the Communications Regulation Commission (CRC). M-Tel began offering LTE services to business customers in the capital, Sofia, at the end of March 2012. Although the operator pledged to gradually increase the number of covered locations throughout 2012, and to introduce commercial LTE data services in Q3 2012, this did not occur. [76] In July 2012, M-Tel announced that it had increased transmission speeds throughout its network to up to 42 Mbps in 19 cities.

In January 2012, Vivacom received permission from the CRC to conduct LTE testing in the 1800 MHz band. At that time, Vivacom said it would begin rolling out trial infrastructure in Sofia.[77] In March 2013, Vivacom stated that its 1800 MHz band LTE network was in deployment, but stopped short of announcing a prospective launch for commercial services.[78]
In January 2013, the CRC granted Bulsatcom a mobile license. Bulsatcom announced that it would launch its 4G LTE mobile broadband services by the end of 2013. However, the company missed that deadline and has not set a new timeframe for its launch.[79]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[80]	18.97	n/a	n/a	n/a	n/a
Fixed broadband subs (2011)[81]	1,370,098				
% of households with fixed broadband access (2013)[82]	54				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[83]	58.57				
Mobile wireless broadband subs (2014)[84]	4,230,000				

6. Canada

Regulation: In March 2012, Industry Canada announced that the government would exempt telecommunications network operators with less than 10 percent share of total telecommunications market revenue from foreign investment restrictions. Previously, non-Canadians were restricted from owning more than 46.7 percent voting shares of a Canadian telecommunications operator. This proposed amendment to the Telecommunications Act became

[76] *Id.*

[77] *Id.*

[78] *Id.*

[79] *Id.*

[80] ITU Statistics Database (accessed Oct. 28, 2014).

[81] *Id.*

[82] Eurostat, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_r_broad_h&lang=en (accessed Oct. 28, 2014).

[83] ITU World Telecommunication/ICT Indicators 2014, Economy Tables (accessed Oct. 29, 2014).

[84] *Id.*

effective in June 2012. In addition, the government applied spectrum caps in the January 2014 4G auction of the 700 MHz band and intends to apply spectrum caps in the 2015 auction of the 2.5 GHz band so that prime spectrum can be reserved for new entrants and smaller regional providers. Furthermore, rural rollout obligations will apply to operators purchasing more than one regional block of 700 MHz spectrum.[85] Seeking to improve competition in the mobile sector, Industry Canada also passed a new wireless spectrum license transfer framework in June 2013, which would promote at least four wireless providers in every region of the country.[86] Currently, over 99 percent of Canadians households have broadband access at speeds of 1.5 Mbps. In July 2014, Industry Canada launched the Digital Canada 150 program; one of the program's main goals is to extend broadband access at speeds of at least 5 Mbps to 98 percent of Canadian households, mainly in rural and remote communities, by 2017.[87]

Market and Competition: As of June 2014, there were five main companies providing broadband services in Canada. The largest broadband provider, by subscribers, is Bell Canada, with 17.9 percent market share, followed by Rogers Communications (16.3 percent), Shaw Communications (15.6 percent), Telus Communications (11.6 percent), and Videotron (11.5 percent).[88]

In July 2011, Rogers Communications launched Canada's first commercial 4G LTE mobile broadband network in Ottawa using the 1700/2100 MHz bands, which it subsequently expanded to Toronto, Montreal and Vancouver in September 2011, reaching 35 percent of the country's population in April 2012. By December 2012 Rogers Communications' 4G LTE service reached 60 percent of Canada's population, and in March 2013 the company announced that it plans to expand its 4G LTE mobile network to 44 additional markets in mid-2013, reaching a total of 95 markets by the end of 2013.[89] Bell Canada introduced its commercial 4G LTE service in the 2100 MHz band in Greater Toronto in September 2011, and Telus Communications started its commercial 4G LTE services in February 2012, also using the 2100 MHz band. As of October 2013, Telus Communications' 4G LTE service covered approximately 80 percent of the population.[90]

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[85] Government of Canada, *Harper Government Takes Action to Support Canadian Families* (Mar. 14, 2012), http://news.gc.ca/web/article-eng.do?nid=662619 (accessed Oct. 23, 2014).

[86] Market Wired, *Harper Government Releases Spectrum Licence Transfer Framework* (June 28, 2013), http://www.marketwired.com/press-release/harper-government-releases-spectrum-licence-transfer-framework-1806992.htm (accessed Dec. 11, 2013).

[87] Government of Canada, *Digital Canada 150: Connecting Canadians*, http://www.ic.gc.ca/eic/site/028.nsf/eng/h_00587.html (accessed Sept. 16, 2014).

[88] Telegeography GlobalComms Database: *Canada* (2014) (accessed Sept. 16, 2014).

[89] Telegeography CommsUpdate, *Rogers Posts 3% Revenue Growth* (Feb. 15, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/02/15/rogers-posts-3-revenue-growth/ (accessed Oct. 23, 2014).

[90] Telegeography CommsUpdate, *Telus Nearing 80% LTE Coverage* (Oct. 31, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/10/31/telus-nearing-80-lte-coverage/ (accessed Oct. 23, 2014).

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[91]	33.5	1.1	18.8	13.5	0.0
Fixed broadband subs (Dec. 2013)[92]	11,675,481				
% of households with fixed broadband access (2013)[93]	77.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[94]	53.3				
Mobile wireless broadband subs (Dec. 2012)[95]	18,581,921				

7. Chile

Regulation: In May 2012, Chilean telecommunications regulator, the Sub-Secretaria de Telecomunicaciones (Subtel), announced the completion of its public-private initiative to deliver broadband services to remote rural communities. The project, launched in December 2009, rolled out wireless broadband networks to 1,474 towns and villages providing easier Internet access to three million Chileans. The project cost US$110 million, with Entel providing US$65 million, and US$45 million coming from the Telecommunications Development Fund (FDT) and the Ministry of Transport and Telecommunications (MTT).[96]

In October 2013, Subtel launched a tender for 4G licenses in the 700 MHz band, which resulted in the award of spectrum licenses in March 2014 to three mobile operators, Entel, Movistar and Claro.[97] Under the terms of their licenses, auction winners must deploy mobile telephony and Internet services in 1,281 remote communities. Upon completion of the deployment, mobile voice and Internet services are expected to cover 98 percent of Chile's population, including inhabitants in remote and isolated areas. Winners of the 700 MHz license must also provide data transmission and public Internet services to 503 educational institutions free of charge for two

[91] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[92] *Id*.

[93] Canadian Radio-television and Telecommunications Commission (CRTC), *CRTC Communications Monitoring Report*, Fig. 5.3.14 (2014), http://www.crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2014/cmr.htm (accessed Nov. 21, 2014).

[94] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[95] *Id.*

[96] Telegeography CommsUpdate, *Subtel and Entel Complete Rural Connectivity Project* (May 16, 2012), http://www.telegeography.com/products/commsupdate/articles/2012/05/16/subtel-and-entel-complete-rural-connectivity-project/ (accessed Oct. 29, 2012).

[97] Subtel, *Subtel Publica Llamado a Concurso Público para Banda de 700 MHz* (Oct. 2, 2013), *available at* http://www.subtel.gob.cl/images/stories/apoyo_articulos/concurso_700/llamado_concurso_700_mhz.pdf (accessed Dec. 11, 2013). *See also* Subtel, *Licitación 700 MHz: Subtel Define Frecuencias para Subtel, Movistar y Claro* (Feb. 28, 2014), http://www.subtel.gob.cl/noticias/5246-licitacion-700-mhz-subtel-define-frecuencias-para-entel-movistar-y-claro (accessed Mar. 19, 2014).

years.[98]

In May 2014, the Chilean Senate announced plans to discuss legislation that would guarantee minimum Internet speeds for fixed and mobile connections. Pursuant to the legislation, fixed Internet service providers must guarantee 70 percent of their advertised speeds for national connections and 50 percent in the case of international connections. Mobile ISPs must guarantee 60 percent of their advertised speeds for national connections and 40 percent for international connections. Subtel would be in charge of determining the minimum speeds and implementing the initiative.[99]

Chile is in the midst of creating a new agency, the Superintendency of Telecommunications. The legislation to create the new Superintendency of Telecommunications was submitted to the Senate in June 2013,[100] approved by the Committee of Transportation and Telecommunications of the Senate upper house on January 22, 2014, and has been sent to the Finance Committee of the upper house for approval.[101] The new Superintendency of Telecommunications will not replace Subtel, but exist alongside it. The new legislation will delineate the responsibilities of the new regulator vis à vis the existing consumer protection authority, the National Consumer Service (Sernac), and will include a new framework for sanctions and financial penalties. The Superintendency of Telecommunications will be responsible for all technical issues, while Sernac will continue to handle matters relating to consumer law.[102]

Market and Competition: As of June 2014, Telefónica Chile (Movistar) was the largest fixed broadband provider in terms of subscribers, with 38.6 percent market share, followed by VTR (38.2 percent), Claro Chile (11.6 percent), Grupo GTD (7.8 percent) and Entel (1.4 percent).[103] As of June 2014, the top three mobile operators by subscribers were Movistar (39 percent), Entel PCS (38.4 percent), and Claro Chile (21.7 percent). In July 2012, Subtel awarded spectrum in the 2.6 GHz band to these three operators to provide 4G services. Under the terms of the concession, they each had 12 months to roll out their networks and a maximum of 24 months to start offering services in 543 specific locations, chosen for their geographic isolation and lack of Internet

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[98] Telecompaper, *Chile 700 MHz Spectrum Tender to Benefit 186,000 Users* (Nov. 15, 2013), http://www.telecompaper.com/news/chile-700-mhz-spectrum-tender-to-benefit-186000-users--979710 (accessed Oct. 23, 2014).

[99] BNAmericas, *Chile to Legislate to Guarantee Internet Speeds* (May 7, 2014), http://subscriber.bnamericas.com/Subscriber/index.jsp?idioma=I&tipoContenido=detalle&pagina=content&idContenido=644989&tipoDocumento=1 (accessed Sept. 18, 2014).

[100] Estrategia Online, *Comisión Aprueba Proyecto que Crea Superintendencia de Telecomunicaciones* (Jan. 17, 2013), http://www.estrategia.cl/detalle_noticia.php?cod=71696. *See also* Telegeography CommsUpdate, *New Regulator Bill Gets Green Light* (June 5, 2013), http://www.telegeography.com/products/commsupdate/ articles/2013/06/05/new-regulator-bill-gets-green-light/ (accessed Dec. 11, 2013).

[101] Subtel, *Comisión de Transportes y Telecomunicaciones del Senado despachó proyecto que crea la Superintendencia de Telecomunicaciones* (Jan. 22, 2014), http://www.subtel.gob.cl/noticias/139-superintendencia/5236-comision-de-transportes-y-telecomunicaciones-del-senado-despacho-proyecto-que-crea-la-superintendencia-de-telecomunicaciones (accessed Oct. 23, 2014).

[102] Telegeography CommsUpdate, *New Regulator Due in 2013* (Oct.16, 2012), http://www.telegeography.com/products/commsupdate/articles/2012/10/16/new-regulator-due-in-early-2013/ (accessed July 23, 2013).

[103] Telegeography GlobalComms Database: *Chile* (2014) (accessed Sept. 18, 2014).

connectivity.[104] Claro was the first to launch an LTE network in Chile in June 2013, followed by Movistar in November 2013.[105] Entel launched its LTE network in March 2014, after delaying its LTE launch until it could acquire a license to provide 4G services in the 700 MHz band in addition to the 2.6 GHz band.[106]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[107]	12.9	0.3	6.6	5.5	0.0
Fixed broadband subs (Dec. 2013)[108]	2,271,420				
% of households with fixed broadband access (2012)[109]	36.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[110]	35.8				
Mobile wireless broadband subs (Dec. 2013)[111]	6,282,872				

8. Czech Republic

Regulation: In November 2012, the national regulator, the Czech Telecommunication Office (CTU), announced plans to auction spectrum suitable for 4G services in the 800 MHz, 1800 MHz, and 2600 MHz bands. However, in March 2013, CTU stopped the auction after bids rose beyond the US$1 billion mark. CTU explained that, given the exorbitant price of the spectrum, it had concerns over the competitive pricing of new services and the speed at which operators would be able to launch them.[112]

A few months later, the auction began again, with prospective bidders given until the end of September 2013 to submit their applications. The three incumbent GSM operators – T-Mobile Czech Republic, Telefonica O2 Czech Republic, and Vodafone Czech Republic – submitted applications, as well as two new potential market entrants: Revolution Mobile and Sazka Communications (formerly known as Tasciane). CTU approved all five bidders' applications in October 2013, and the auction began in November 2013. Under the terms and conditions of the

[104] Telegeography CommsUpdate, *Subtel Allocates 4G Spectrum* (July 31, 2012), http://www.telegeography.com/products/commsupdate/articles/2012/07/31/subtel-allocates-4g-spectrum/ (accessed Oct. 23, 2014).

[105] Telegeography GlobalComms Database: *Chile* (2014) (accessed Sept. 18, 2014).

[106] *Id.*

[107] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[108] *Id*.

[109] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[110] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[111] *Id*.

[112] Czech Telecommunication Office (CTU), *Press Release: Czech Telecommunication Office Announces the Conditions of the New Frequency Auction* (Apr. 8, 2013), http://www.ctu.eu/164/download/Press_releases/pr25_ 08042013_an.pdf (accessed Oct. 22, 2014).

auction, CTU reserved spectrum in the 800 MHz and 1800 MHz bands for a new entrant, leading to criticism from the three incumbents. In the end, the three incumbents all won spectrum, allowing them to launch LTE services; however, the auction failed to bring new competition to the market as intended, since the two would-be newcomers decided not to bid on the reserved spectrum blocks.[113]

In April 2014, CTU published the rules governing the auction of the 3600-3800 MHz band.[114] CTU intends to auction this spectrum for the provision of electronic communication services, in particular mobile broadband. CTU plans to hold a simultaneous multiple-round auction. At the auction stage, CTU will accept offers within three 40 MHz blocks (8×5 megahertz) and one 80 MHz block (16×5 megahertz).[115] Then, CTU will allow winning bidders to reach an agreement on the allocation of the individual 5 megahertz blocks within these sections. If the winning bidders cannot come to an agreement, CTU will determine individual block placement by drawing lots. CTU will set out the coverage conditions linked to the frequency awards, including a requirement that winners establish commercial services within five years of the allocation.[116]

Market and Competition: At the end of 2013, CTU reported that the development of the fiber optic broadband segment is beginning to gain traction, albeit from a very small base. Operators such as Telefonica O2 Czech Republic are rolling out FTTH networks, which are being used exclusively for providing their own retail services. CTU notes there are currently more than 100 local optical network operators offering their services through FTTx, usually in metropolitan optical networks. There were an estimated 180,000 fiber-based subscribers at the end of 2013, up from 167,000 a year before.[117]

The Czech fixed broadband Internet access market declined slightly for the first time in 2013, reflecting the growing popularity of high-speed mobile connectivity.[118] All three main cellular operators – T-Mobile Czech Republic, Telefonica O2 Czech Republic, and Vodafone Czech Republic – have deployed LTE 4G networks which provide peak speeds of around 70 Mbps in many of the country's major urban areas.[119]

At the end of December 2013, fixed line incumbent operator Telefonica O2 Czech Republic had 910,000 broadband Internet subscribers, down from 928,400 12 months before. The operator

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[113] Telegeography GlobalComms Database: *Czech Republic* (2014) (accessed Sept. 3, 2014).

[114] Telegeography CommsUpdate, *CTU Sets Out Stall to Auction Off 3.6 GHz-3.8 GHz Band for Broadband Services* (June 3, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/03/ctu-sets-out-stall-to-auction-off-3-6ghz-3-8ghz-band-for-broadband-services/ (accessed Oct. 22, 2014).

[115] CTU, *The Basic Principles of Awarding Rights for the Use of Radio Frequencies for Providing Electronic Communication Networks in the 3600-3800 MHz Frequency Band* (Apr. 29, 2014), http://www.ctu.eu/164/download/News-Events/basic_principles_29_04_2014_radio_frequencies_3600-3800_mhz.pdf (accessed Dec. 2, 2014).

[116] Telegeography CommsUpdate, *CTU Sets Out Stall to Auction Off 3.6 GHz-3.8 GHz Band for Broadband Services* (June 3, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/03/ctu-sets-out-stall-to-auction-off-3-6ghz-3-8ghz-band-for-broadband-services/ (accessed Oct. 22, 2014).

[117] Telegeography GlobalComms Database: *Czech Republic* (2014) (accessed Sept. 4, 2014).

[118] *Id.*

[119] *Id.*

upgraded its broadband networks with high-speed VDSL technology which delivers peak download speeds of 40 Mbps, and was available to 87 percent of the addressable xDSL residential customer base at end of 2013. The company said that it had 362,000 VDSL customers at that date, up by 102,000 on a year earlier. Additionally, the total number of Telefonica O2 TV customers grew to 156,000 (from 141,400 at the end of 2012), while its IP telephony users increased from 76,700 to 86,400.[120]

High-speed cable growth has been slow but steady over the last few years. According to the Council for Radio and Television Broadcasting (RRTV, the Czech agency responsible for administering radio and television broadcasting licenses), 87 operators offered cable TV services in the Czech Republic, with most also providing broadband Internet. UPC Ceska Republika (UPC), the market leader, operates in almost 100 cities and towns throughout the country, including the Brno, Northern Bohemia Ostrava, Pilsen, and Prague. UPC offers triple-play services (TV, Internet and voice telephony) through its hybrid-fiber coaxial (HFC) network, which passed 1.36 million homes as of December 2013. By the end of December 2013, 92.5 percent of UPC's networks had been upgraded to two-way capability. At the end of 2013, UPC had the majority (440,000) of the country's broadband cable modem subscribers, of an estimated 471,000 cable television users in the country. In September 2009, UPC launched UPC Fiber Power, its next generation broadband Internet service with download speeds of up to 100 Mbps, utilizing EuroDOCSIS 3.0 technology, and by February 2014 the peak rate had been increased to 240 Mbps.[121]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[122]	17.4	3.3	4.9	9.2	0.0
Fixed broadband subs (Dec. 2013)[123]	1,826,726				
% of households with fixed broadband access (2013)[124]	63.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[125]	62.5				
Mobile wireless broadband subs (Dec. 2013)[126]	6,574,264				

9. Denmark

Regulation: Consistent with the Queen of Denmark's October 3, 2011 Resolution, the National IT and Telecom Agency (NITA) closed in 2012, and the agency's functions were largely

[120] *Id.*

[121] *Id.*

[122] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[123] *Id.*

[124] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[125] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[126] *Id.*

transferred to the Danish Business Authority (DBA), the new independent regulator.[127] DBA is responsible for further market development, growth, and innovation, and for guaranteeing that all citizens have easy access to wireless communication technologies.[128] DBA plans to meet its obligations mainly by releasing available spectrum to the market through auctions.[129] DBA also offers advice to businesses and consumers about marketing and ICT equipment.[130]

In March 2012, DBA announced plans to auction the 800 MHz digital dividend spectrum for mobile services.[131] In June 2012, TDC and TT-Netvaerket (a joint mobile venture between Telia and Telenor) won 60 megahertz of spectrum. Specifically, incumbent TDC won 2×20 megahertz, and TT-Netvaerket won 2×10 megahertz of spectrum.[132] The auction generated 739.3 million Danish kroner (US$124.3 million).[133] The 22-year licenses were sold without usage restrictions, and the frequencies were made available beginning in 2013.[134] The licenses are subject to mobile broadband coverage requirements, which stipulate that the operators must provide 99.8 percent indoor coverage and 98 percent outdoor coverage with a download rate of at least 10 Mbps by the end of 2014.[135]

In March 2013, the Danish government introduced a new national broadband strategy, setting out 22 initiatives for the improvement of broadband services and mobile coverage.[136] The strategy calls for 100 percent access at minimum download speeds of 100 Mbps and minimum upload speeds of 30 Mbps by 2020.[137] DBA conducts annual broadband mapping to track broadband deployment.[138] Beginning in 2014, DBA plans to implement interactive broadband mapping to provide a more comprehensive overview of coverage at the local level.[139]

Market and Competition: Denmark's telecommunications market is characterized by slow revenue and subscriber growth in the mobile and broadband sectors, declining subscriptions in the fixed line sector, and low margins across all services.[140]

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[127] Telegeography GlobalComms Database: *Denmark* (2014) (accessed Sept. 2, 2014).

[128] Danish Business Authority, *Telecom and Spectrum,* http://danishbusinessauthority.dk/telecom-and-spectrum (accessed Sept. 2, 2014).

[129] *Id.*

[130] *Id.*

[131] Danish Business Authority, *800 MHz Auction*, http://danishbusinessauthority.dk/800-mhz-auction (accessed Sept. 2, 2014).

[132] *Id.*

[133] *Id.*

[134] *Id.*

[135] Telegeography GlobalComms Database: *Denmark* (2014) (accessed Sept. 2, 2014).

[136] Danish Business Authority, *Broadband Mapping 2013*, http://w2l.dk/file/475201/broadband-mapping.pdf (accessed Sept. 2, 2014).

[137] *Id.*

[138] Danish Business Authority, *Broadband Mapping*, http://danishbusinessauthority.dk/broadband_mapping_ coverage (accessed Sept. 2, 2014).

[139] *Id.*

[140] IHS Global Insight, *Denmark Telecoms Report* (2014) (accessed Sept. 2, 2014).

Denmark has four major mobile operators. As of March 2014, TDC had a 41 percent market share of mobile subscribers followed by Telenor (24 percent), TeliaSonera (20 percent), and Hutchison Whampoa's Hi3G Access Denmark (14 percent).[141] All four operators acquired the spectrum from the June 2012 800 MHz digital dividend auction to boost their LTE coverage.[142] Denmark has one of the highest fixed broadband penetration rates in the world, so all four had to cut prices to stay competitive.[143]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[144]	40.0	7.8	11.5	20.7	0.0
Fixed broadband subs (Dec. 2013)[145]	2,245,593				
% of households with fixed broadband access (2013)[146]	84.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[147]	107.3				
Mobile wireless broadband subs (Dec. 2013)[148]	6,021,411				

10. Estonia

Regulation: In June 2012, the European Commission (EC) directed Estonia to comply with EU rules mandating a clear separation between bodies that regulate the telecommunications sector and companies providing telecommunications services.[149] The EC expressed concern that the Estonian Ministry of Economic Affairs and Communications (MEAC), which manages radio frequencies, numbering resources and the provision of universal service, also controlled local state-owned WiMAX provider Levira.[150] In September 2013, the EC brought an action against Estonia before the European Court of Justice (ECJ), arguing that Estonia had failed to ensure the impartiality of regulatory bodies.[151] In April 2014, the ECJ closed the case but ordered Estonia to pay the costs, reprimanding Estonia for taking steps to comply with its obligations only after the EC initiated a formal action.[152]

[141] Telegeography GlobalComms Database: *Denmark* (2014) (accessed Sept. 2, 2014).

[142] *Id.*

[143] *Id.*

[144] OECD Broadband Portal, Table 1(d)(1) (December 2012) (accessed July 23, 2013).

[145] *Id*.

[146] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[147] OECD Broadband Portal, Table 1(d)(2) (December 2012) (accessed July 23, 2013).

[148] *Id*.

[149] Telegeography GlobalComms Database: *Estonia* (2014) (accessed Sept. 3, 2014).

[150] *Id.*

[151] *European Commission v. Republic of Estonia* (Case C-493/13).

[152] Order of the President of the Court (Case C-493/13), April 4, 2014.

Market and Competition: Currently, broadband access is available via ADSL2+, FTTH, cable, WiFi, WiMAX and mobile networks.[153] There are three major fixed line providers: the incumbent, Elion, and its main competitors, Starman and STV, that together serve 86 percent of fixed broadband customers.[154] Elion provides primarily ADSL services, while Starman and STV provide mainly high-speed access over cable modem and fiber solutions.[155]

With respect to mobile broadband, between May 2013 and January 2014, three mobile operators obtained 800 MHz licenses that helped them improve their rollout of 4G services. In May 2013, Eesti Mobiiltelefon (EMT-TeliaSonera) paid the Estonian Technical Surveillance Authority (ETSA) an upfront fee of EUR1 million (US$1.3 million) for 2×10 megahertz blocks of 800 MHz spectrum.[156] In August 2013, ETSA granted a second batch of 800 MHz spectrum licenses to Estonian telecom company Elisa.[157] At a competitive auction in January 2014, Tele2 Eesti won the third and last block of digital dividend 800 MHz spectrum.[158] In March 2014, ETSA announced that it will refarm spectrum in the 1800 MHz band among the three companies in order to make more efficient use of the band for the provision of 4G LTE services.[159]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[160]	25.5	8.6	5.8	10.7	0.4
Fixed broadband subs (Dec. 2013)[161]	341,465				
% of households with fixed broadband access (2013)[162]	79.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[163]	90.8				
Mobile wireless broadband subs (Dec. 2013)[164]	1,216,637				

[153] *Id.*

[154] *Id.*

[155] *Id.*

[156] *Id.*

[157] Telegeography CommsUpdate, *Elisa Bags 800 MHz Spectrum from ETSA* (Aug. 9, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/08/09/elisa-bags-800mhz-spectrum-from-etsa/ (accessed Sept. 3, 2014).

[158] Telegeography CommsUpdate, *Tele2 Wins Third 800 MHz LTE Block* (Jan. 10, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/01/10/tele2-wins-third-800mhz-lte-block/ (accessed Sept. 3, 2014).

[159] Telegeography CommsUpdate, *Tele2 Estonia Bags New 2100 MHz Spectrum; ETSA Reallocates 1800 MHz Band for Faster LTE* (Mar. 12, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/03/12/tele2-estonia-bags-new-2100mhz-spectrum-etsa-reallocates-1800mhz-band-for-faster-lte/ (accessed Sept. 3, 2014).

[160] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[161] *Id.*

[162] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[163] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[164] *Id.*

11. Finland

Regulation: In October 2013, after nine months of bidding, the Finnish Communications Regulatory Authority (FICORA), the independent regulatory body, completed the 800 MHz digital dividend auction, generating EUR108.01 million (US$148.5 million).[165] Six paired 2×5 megahertz blocks of spectrum were sold to the country's three existing mobile network operators: DNA Finland paid EUR33.57 million (US$44.1 million) for its two blocks, Elisa Corporation paid EUR33.34 million (US$43.8 million) for its two blocks, and TeliaSonera Finland paid EUR41.10 million (US$53.9 million) for the last two blocks.[166] The licenses are valid for 20 years starting in 2014, and they cover the whole of Finland (excluding the Åland islands).[167] The license conditions associated with the acquired spectrum stipulate that the winning operators must launch operations within two years, and provide coverage to 95 percent of the mainland population within three years.[168]

Market and Competition: Finland's four major wireline broadband operators – Elisa, TeliaSonera, DNA, and the Finnet Group – together account for more than 95 percent of the market.[169] DSL connections remain the most popular broadband access technology, with over 60 percent of all subscribers, but cable modem connections, making up around 19 percent of subscriptions, continue to rise in popularity.[170]

In 2008, the Ministry of Transport and Communications introduced the "Broadband 2015" initiative, aimed at increasing high-speed broadband connections around the country by the end of 2015.[171] By the end of 2013, FICORA had dedicated EUR38.4 million (US$50.4 million) to the initiative, leading to a significant increase in broadband access, particularly in rural areas.[172] Of approximately 1.7 million total subscribers, 16 percent had access to speeds of 100 Mbps or more, up from 10 percent in 2012 and 6 percent in 2011.[173]

DNA, Elisa, and TeliaSonera have all used spectrum in the 800 MHz band to improve 4G LTE coverage.[174] In May 2014, Finnish start-up Ukko Mobile announced that, beginning in late 2014, it would launch the world's first 4G LTE wireless broadband network using the 450 MHz

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[165] Finnish Communications Regulatory Authority, *End of 4G Spectrum Auction*, https://www.viestintavirasto.fi/en/ficora/news/2013/endof4gspectrumauction.html (accessed Sept. 3, 2014).

[166] *Id.*

[167] Telegeography CommsUpdate, *Finland Concludes Long-Running 800 MHz Auction* (Oct. 31, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/10/31/finland-concludes-long-running-800mhz-auction/ (accessed Sept. 3, 2014).

[168] *Id.*

[169] Telegeography GlobalComms Database: *Finland* (2014) (accessed Sept. 3, 2014).

[170] *Id.*

[171] *Id.*

[172] Finnish Communications Regulatory Authority, *Building of Broadband Networks in Rural Areas Is Proceeding Fast*, https://www.viestintavirasto.fi/en/ficora/news/2014/buildingofbroadbandnetworksinruralareasisproceedingfast.html (accessed Sept. 3, 2014).

[173] Telegeography GlobalComms Database: *Finland* (2014) (accessed Sept. 3, 2014).

[174] *Id.*

band.[175]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[176]	30.8	0.9	5.8	18.9	5.2
Fixed broadband subs (Dec. 2013)[177]	1,676,400				
% of households with fixed broadband access (2013)[178]	88.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[179]	123.3				
Mobile wireless broadband subs (Dec. 2013)[180]	6,704,800				

12. France

Regulation: In January 2012, French regulator Autorité de Régulation des Communications Électroniques et des Postes (ARCEP) completed its 800 MHz band digital dividend spectrum auction. Bouygues Telecom, Orange France and SFR each won 4G-capable licenses.[181] In March 2014, France's Constitutional Council (Conseil d'Etat) restored ARCEP's power to issue sanctions. The Constitutional Council had previously decided that ARCEP's ability to sanction telecommunications operators violated the principle of separation of powers. Moving forward, ARCEP will employ a new procedure; in order to ensure the separation of investigative and sanctioning powers, different members of the Executive Board will handle different tasks.[182] In May 2014, ARCEP launched an investigation into all four of France's mobile network operators, Bouygues Telecom, Free Mobile, Orange, and SFR. ARCEP will assess whether the mobile providers have met their existing commitments with respect to 3G rollouts in rural areas.[183]

[175] Telegeography CommsUpdate, *Ukko Aims for LTE-450 World-First Launch* (June 19, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/19/ukko-aims-for-lte-450-world-first-launch/ (accessed Sept. 3, 2014).

[176] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[177] *Id*.

[178] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[179] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[180] *Id.*

[181] ARCEP, *Press Release: ARCEP Issues Licenses to the Digital Dividend Spectrum Winners (800 MHz)* (Jan. 17, 2012), http://www.arcep.fr/ (accessed Oct. 10, 2014).

[182] Telegeography CommsUpdate, *Arcep Regains Power to Sanction; Indoor FTTH Regulations Clarified* (Mar. 17, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/03/17/arcep-regains-power-to-sanction-indoor-ftth-installation-regulations-clarified/ (accessed Oct. 7, 2014).

[183] Telegeography CommsUpdate, *Arcep Launches Five Inquiries into 3G Rollouts, QoS* (May 28, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/28/arcep-launches-five-inquiries-into-3g-rollouts-qos/ (accessed Oct. 7, 2014).

Market and Competition: For the past few years, France has been focusing on the development of ultra-high speed broadband networks, defined by ARCEP as connections of 30 Mbps and above.[184] In February 2013, President Francois Hollande introduced "France Tres Haut Debit" (FTHD), a plan to spur economic growth by investing nearly EUR20 billion (US$25.2 billion) in the rollout of high-speed networks over the next decade. According to the plan, very high-speed networks are expected to be available to 50 percent of the population by 2017 and to 100 percent of the population by 2023.[185] ARCEP reported that at year end 2013, there were more than 2 million broadband subscriptions with maximum download speeds equal to or higher than 30 Mbps, a 27.6 percent year-on-year increase.[186]

French operators have also increased the pace of their FTTH rollout. As of September 30, 2013, 2.74 million homes had access to an FTTH service, 40 percent more than the year before, and 1.4 million of these homes had a choice between at least two providers (or 49 percent more than in 2011) due to network sharing arrangements required by the French regulatory framework. According to ARCEP, 492,000 of these 2.74 million homes are not in very high-density areas.[187] Bouygues Telecom launched its first LTE trial network in Lyon in mid-2012, while Orange France launched its pilot LTE network in the coastal city of Marseilles at the same time. SFR launched commercial LTE services in Lyon in November 2012. A debate over LTE antenna emission levels delayed the rollout of LTE services in Paris. After months of uncertainty, the dispute was resolved in September 2012, after the city of Paris reached an agreement on emission levels with the four major mobile operators.[188] SFR and Orange launched LTE service in parts of Paris beginning in January 2013.[189] As of April 2014, Bouygues' 4G network covered 69 percent of the French population, Orange's network covered 55 percent, and SFR's network covered 40 percent.[190] Free Mobile launched LTE services in December 2013 but lags behind its competitors.[191]

According to a December 2013 ARCEP study, France is seeing a swift rise in the use of mobile devices for Internet access at home, both among users employing WiFi (33 percent of people surveyed) or cellular service (27 percent). Half of French consumers use two or more devices to access the Internet from home.[192]

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[184] Telegeography GlobalComms Database: *France* (2014) (accessed Oct. 7, 2014).

[185] *Id.*

[186] *Id.*

[187] ARCEP, *Press Release: Broadband and Superfast Broadband Market* (Nov. 23, 2013), http://www.arcep.fr/ (accessed Oct. 21, 2014).

[188] Le Monde, *Le Conseil de Paris adopte sa charte sur les antennes-relais* (Oct. 16, 2012), http://www.lemonde.fr/planete/article/2012/10/16/le-conseil-de-paris-adopte-sa-charte-sur-les-antennes-relais_1776236_3244.html?xtmc=4g&xtcr=4 (accessed Oct. 10, 2014).

[189] ZDNet, *Paris Gets Its First LTE Coverage* (Jan. 29, 2013), http://www.zdnet.com/paris-gets-its-first-lte-coverage-7000010477/ (accessed Mar. 10, 2014).

[190] Telegeography GlobalComms Database: *France* (2014) (accessed Oct. 7, 2014).

[191] *Id.*

[192] ARCEP, *Press Release: Use of Information and Communication Technologies in French Society - Findings for 2013* (Dec. 10, 2013), http://www.arcep.fr/ (accessed Jan. 15, 2014).

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[193]	37.6	0.8	2.6	34.2	0.0
Fixed broadband subs (Dec. 2013)[194]	24,751,000				
% of households with fixed broadband access (2013)[195]	78.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[196]	55.9				
Mobile wireless broadband subs (Dec. 2013)[197]	36,733,000				

13. Germany

Regulation: In November 2012, two years after its 800 MHz band auction, Bundesnetzagentur (BNetzA), the German telecommunications regulator, announced that all mobile network operators had met the coverage requirements that were part of their license conditions. In particular, winning bidders had been required to roll out mobile broadband to 90 percent of lower-population areas before higher-populations areas could be served.[198] After meeting these licensing requirements, all three operators, Deutsche Telekom (DT), Vodafone D2, and Telefónica Germany, were free to use their 800 MHz spectrum to roll out 4G services nationally.[199]

In recent years, Germany has been proactive in promoting transparency and ensuring consumer protection. In May 2012, the German Parliament passed a series of amendments to the Telecommunications Act aimed at enhancing transparency in the telecommunications market.[200] Among the provisions, the amendments required BNetzA to help consumers measure and compare the quality of Internet services. From June to December 2012 and July to December 2013, BNetzA conducted quality measurement campaigns designed to study the service quality of

[193] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[194] *Id*.

[195] Eurostat, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_r_broad_h&lang=en (accessed Oct. 15, 2014).

[196] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014

[197] *Id*.

[198] GSMA, *Making Sense of the Digital Dividend Spectrum Auctions*, http://www.gsma.com/spectrum/wp-content/uploads/DigitalDividend/DDtoolkit/auctions-summary.html (accessed Mar. 26, 2014).

[199] Bundesnetzagentur (BNetzA), *Coverage Requirement Now Also Met for 800 MHz Band in Schleswig Holstein* (Dec. 28, 2013), http://www.bundesnetzagentur.de/cln_1912/SharedDocs/Pressemitteilungen/EN/2011/111228 BroadbandExpansionSchleswigHolstein.html?nn=214432 (accessed Dec. 3, 2012).

[200] BNetzA, *Measures Aimed at Promoting Transparency for Consumers and on Measuring Procedures* (May 10, 2013), http://www.bundesnetzagentur.de/SharedDocs/Downloads/EN/BNetzA/Areas/Telecommunications/TelecomRegulation/TransparencyForConsumers/DocTransparencyForConsumers.pdf?__blob=publicationFile&v=2 (accessed Oct. 21, 2014).

broadband Internet access.[201] In early 2014, BNetzA introduced a permanent web-based measurement tool that allows consumers to test their fixed or mobile broadband speeds.[202]

Market and Competition: In early September 2014, the EC approved Telefónica Deutschland's EUR8.6 billion (US$11.9 billion) acquisition of E-Plus.[203] The merger will decrease the number of German wireless network operators from four to three, making Telefónica Deutschland (Telefónica) the leader of the mobile marketplace with the highest number of subscribers ahead of current front runners Telekom Deutschland (the mobile arm of incumbent Deutsche Telekom (DT)) and Vodafone Germany. Because the merger might affect the competitive position of mobile virtual network operators (MVNOs) and reduce competition in Western Europe's largest mobile market, the merger raised concerns at both the national and EU levels.[204] As a result, Telefónica agreed to sell up to 30 percent of the merged company's network capacity to German MNVOs. Telefónica also will divest some of its mobile spectrum in the 900 MHz and 1800 MHz bands and extend wholesale 4G services.

In December 2013, BNetzA reported that as fixed broadband penetration has grown in Germany, DT's competitors' share of the broadband market has grown to nearly 60 percent.[205] As of June 2014, DT leads the market with 42.5 percent of subscribers, followed by Vodafone Germany (17.8 percent), United Internet (12.7 percent), Unitymedia KabelBW (9.4 percent), Telefónica (7.5 percent), and a variety of other providers (10.1 percent).[206] BNetzA attributes the growth in competition to the increasing popularity of cable operators in Germany.[207] Quad-play packages (TV, Internet, home, and mobile phone) are becoming increasingly common in Germany.[208]
In addition, BNetzA reported that the growth in German broadband connections has slowed in the last several years, as the market has become saturated.[209] As for mobile broadband networks, BNetzA notes that extensive LTE network expansion continues, spurred by Germany's successful completion of its 2010 digital dividend auction.[210]
Before the approval of Telefónica and E-Plus merger in early September 2014, there were four mobile operators in Germany. As of June 2014, DT had the most subscribers, with 32.7 percent

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[201] *Initiative Netzqualitaet*, http://www.initiative-netzqualitaet.de (accessed Jan. 15, 2014).

[202] *Id.*

[203] Telegeography CommsUpdate, *EC Gives Telefonica/E-Plus Deal Final Approval* (Sept. 1, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/09/01/ec-gives-telefonicae-plus-deal-final-approval/ (accessed Oct. 21, 2014).

[204] Telegeography CommsUpdate, *FCO Warns That Telefonica/E-Plus Deal Could Harm Consumers* (June 16, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/16/fco-warns-that-telefonicae-plus-deal-could-harm-consumers/ (accessed Oct. 10, 2014).

[205] BNetzA, *Activity Reports Telecommunication and Post 2012/2013*, http://www.bundesnetzagentur.de/cln_1932/ SharedDocs/Pressemitteilungen/EN/2013/131216_ActivityReports_2012-2013.html?nn=404530 (accessed Mar. 10, 2014).

[206] Telegeography GlobalComms Database: *Germany* (2014) (accessed Oct. 10, 2014).

[207] *Id.*

[208] *Id.*

[209] BNetzA, *Press Release: Bundesnetzagentur Announces Positive Competition Development in Telecommunications Sector*, http://www.bundesnetzagentur.de/cln_1932/SharedDocs/Pressemitteilungen/ EN/2011/111215_ActivityReportPostTK.html?nn=214432 (accessed Oct. 10, 2014).

[210] *Id.*

of Germany's 110 million wireless subscribers, followed closely by Vodafone Germany (28.9 percent), E-Plus (20.8 percent), and Telefónica (17.5 percent). The German mobile sector also has more than 75 MVNOs that resell services utilizing the infrastructure of the four largest facilities-based operators. Notably, some MVNOs are extended operations for other major European network operators, including British Telecom, Tele2, and Turkcell.[211]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[212]	34.8	0.3	6.2	28.2	0.0
Fixed broadband subs (Dec. 2013)[213]	28,603,463				
% of households with fixed broadband access (2013)[214]	85.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[215]	45.1				
Mobile wireless broadband subs (Dec. 2013)[216]	37,057,293				

14. Greece

Regulation: In March 2014, Greece's independent regulator, the Hellenic National Telecommunications & Post Commission (EETT), presented its 2014 Action Plan.[217] Among its priority areas, the EETT planned to improve internal efficiency, enhance e-business initiatives, contribute to the EU debate on regulatory issues, and hold auctions for the 800 MHz, 2.6 MHz, and 3.4-3.8 GHz bands.[218]

The EETT held its digital dividend auction of spectrum in the 800 MHz and 2600 MHz bands in October 2014.[219] Cosmote (the mobile subsidiary of incumbent operator Hellenic Telecommunications Organization (OTE)), Vodafone, and Wind Hellas each acquired two paired 5 megahertz blocks (2×10 megahertz) in the 800 MHz band, paying EUR103 million (US$128.6 million), EUR103.1 million (US$128.8 million), and EUR103.01 million (US$128.7 million), respectively.[220] Additionally, the three companies shared 14 paired blocks of 2 × 5 megahertz in

[211] *Id.*

[212] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[213] *Id.*

[214] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[215] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014

[216] *Id.*

[217] Hellenic Telecommunications & Post Commission, *Presentation of EETT's Action Plan for 2014*, http://www.eett.gr/opencms/opencms/admin_EN/News/news_0251.html (accessed Sept. 4, 2014).

[218] *Id.*

[219] Telegeography CommsUpdate*, 800 MHz, 2600 MHz Auction Results Announced* (Oct. 14, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/10/14/800mhz-2600mhz-auction-results-announced/ (accessed Oct. 16, 2014).

[220] *Id.*

the 2600 MHz band, each paying EUR4.70 million (US$5.9 million) per block. Vodafone and Cosmote each also acquired two unpaired 10 megahertz blocks in the 2600MHz band, priced at EUR1.3 million (US$1.6 million) per block.[221]

Market and Competition: OTE has rolled out ADSL infrastructure to 99 percent of its network.[222] OTE, with a 44 percent market share, reported 1.25 million broadband subscribers as of September 2013.[223] Other retail operators that provide fixed broadband services primarily via unbundled local loop access include: ForthNet (19 percent market share), Hellas Online (15 percent), and Wind Hellas (11 percent).[224] Broadband services delivered over technologies other than xDSL represent a very small fraction of total connections, less than 0.5 percent of overall subscribers, the smallest percentage among EU Member States.[225] Overall, Greece continues to rank near the bottom among western European countries in terms of broadband adoption.[226] As of June 2014, Cosmote led the mobile sector with a 45 percent market share, followed by Vodafone (30 percent), and Wind Hellas (25 percent).[227] In November 2011, Greece's three wireless operators, Cosmote, Vodafone, and Wind Hellas, acquired technology-neutral spectrum licenses in the 900 MHz and 1800 MHz bands.[228] The new licenses allowed the three companies to expand 3G services and launch 4G LTE services. In November 2012, Cosmote launched the country's first commercial LTE network, providing coverage to 80 percent of Athens and 90 percent of Thessaloniki by the end of September 2013.[229] In June 2013, Vodafone rolled out its own 4G network, expanding coverage to the majority of both cities.[230]

The effects of Greece's debt crisis and economic austerity measures have led to less disposable income for consumers and a reduction in demand for new mobile subscriptions; nevertheless, mobile broadband subscriber levels have increased modestly over the last few years.[231] Cosmote, the segment leader, reported approximately 300,000 mobile broadband users at the end of December 2013, up from 182,000 only four years earlier.[232]

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[221] *Id.*

[222] Telegeography GlobalComms Database: *Greece* (2014) (accessed Sept. 3, 2014).

[223] *Id.*

[224] *Id.*

[225] *Id.*

[226] OECD Broadband Portal, Table 1(c) (Dec. 2013) (accessed Sept. 4, 2014).

[227] Telegeography GlobalComms Database: *Greece* (2014) (accessed Sept. 4, 2014).

[228] *Id.*

[229] *Id.*

[230] *Id.*

[231] *Id.*

[232] *Id.*

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[233]	26.2	0.0	0.0	26.2	0.0
Fixed broadband subs (Dec. 2013)[234]	2,910,074				
% of households with fixed broadband access (2013)[235]	55.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[236]	36.2				
Mobile wireless broadband subs (Dec. 2013)[237]	4,016,512				

15. Hong Kong

Regulation: Hong Kong's new converged regulator, the Office of the Communications Authority (OFCA), began official operations in April 2012 following the merger of the Office of the Telecommunications Authority (OFTA) and the Broadcasting Division of the Television and Entertainment Licensing Authority (TELA).[238] OFCA regulates the telecommunications and broadcasting industries and manages spectrum.[239]

In the past few years, Hong Kong has held several spectrum auctions directed at the development of 4G networks. In January 2009, OFTA held a technology-neutral Broadband Wireless Access (BWA) auction of the 2600 MHz band.[240] As a result of this auction, four of Hong Kong's main mobile network operators (CSL New World Mobility, China Mobile Hong Kong, 3 and PCCW) all launched LTE services between 2010 and 2012. In February 2011, to meet the need for capacity expansion in light of the rapid growth of mobile usage, OFTA allocated nearly 30 megahertz of technology-neutral spectrum in the 850 MHz, 900 MHz, and 2000 MHz bands.[241] Then, in February 2012, OFTA auctioned an additional 90 megahertz of 4G-suitable spectrum in the 2.3 GHz band.[242]

As its first major act, in March 2013, OFCA successfully auctioned a total of 50 megahertz in the 2.5/2.6 GHz bands.[243] Genius Brand, SmarTone, China Mobile Hong Kong, and CSL won 4G

[233] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[234] *Id*.

[235] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[236] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[237] *Id.*

[238] Telegeography GlobalComms Database: *Hong Kong* (2014) (accessed Sept. 9, 2014).

[239] *Id.*

[240] *Id.*

[241] *Id.*

[242] *Id.*

[243] Telegeography CommsUpdate, *Incumbent Cellcos Win 2.5 GHz/2.6 GHz Spectrum* (Mar. 20, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/03/20/incumbent-cellcos-win-2-5ghz2-6ghz-spectrum/ (accessed Jan. 6, 2014).

spectrum licenses at that auction.[244]

In November 2013, OFCA announced that the existing term of assignments for the spectrum in the 1.9 GHz and 2.2 GHz bands (3G spectrum), totaling 120 megahertz, will expire in October 2016. OFCA will reassign 40 megahertz of this 3G spectrum,) currently held by four incumbent network operators, through an auction to be held in 2016.[245] Although OFCA will allow the four incumbents to participate in the auction, the auction is primarily intended to facilitate the entry of a fifth operator in Hong Kong's mobile market. The frequencies are expected to be reassigned on a technology-neutral basis, making them usable for 3G, 4G, or other services.[246]

Market and Competition: Hong Kong's telecommunications operators have made a concerted effort to roll out advanced networks and, as a result, virtually all businesses and households now have access to some form of broadband connectivity.[247] Despite the large number of fixed network operators, the former incumbent PCCW remains the dominant broadband provider, with around 57 percent of all subscribers as of June 2014.[248] In addition to PCCW, the main fixed line network operators are Hong Kong Broadband Network (25.5 percent), Hutchison Global Communications (8.4 percent), and i-Cable (7.1 percent).[249]

The mobile market is split among four operators: as of June 2014, PCCW lead the market with a 38.1 percent market share, followed by Hutchinson Telephone Company (26.6 percent), China Mobile Hong Kong (19.4 percent), and SmarTone (15.9 percent).[250] This competitive balance differs significantly from previous years, in which CSL dominated the mobile market – in May 2014, Hong Kong Telecommunications Limited (HKT), part of PCCW, bought 100 percent of CSL, previously Hong Kong's largest mobile provider, subject to a number of conditions imposed by OCFA.[251]

In August 2012, SmarTone became the last Hong Kong mobile operator to launch commercial 4G LTE mobile services, utilizing the 1800 MHz band for its LTE services, in contrast to other companies that use the 2.5/2.6 GHz bands.[252] Also in August 2012, CSL launched what it claimed was the world's first commercial 1800/2600 MHz dual-band 4G LTE network. Although CSL originally launched LTE services in the 2.5/2.6 GHz bands in November 2010, its latest network upgrade is based on software defined radio technology, allowing the use of dual-band LTE frequencies (1800 and 2600 MHz) in a single radio cell.[253] Building upon this development,

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[244] *Id.*

[245] Telegeography CommsUpdate, *OFCA Releases Official Statement on 3G Reallocation* (Dec. 9, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/12/09/ofca-releases-official-statement-on-3g-reallocation/ (accessed Jan. 6, 2014).

[246] *Id.*

[247] Telegeography GlobalComms Database: *Hong Kong* (2014) (accessed Sept. 16, 2014).

[248] *Id.*

[249] *Id.*

[250] *Id.*

[251] Telegeography CommsUpdate, *PCCW's Acquisition of CSL Approved by Regulator, With Conditions* (May 6, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/06/pccws-acquisition-of-csl-approved-by-regulator-with-conditions/ (accessed Sept. 16, 2014).

[252] Telegeography GlobalComms Database: *Hong Kong* (2014) (accessed Sept. 16, 2014).

[253] Telegeography CommsUpdate, *CSL Claims First 1800 MHz/2600 MHz Dual-Band LTE Launch* (Aug.

CSL, with the help of ZTE Corp, activated Hong Kong's first LTE-A network in September 2013 and reached access speeds of 300 Mbps.[254] In May 2014, PCCW launched Hong Kong's first commercial Voice-over-LTE (VoLTE) service.[255]

In addition to advanced LTE deployment, Hong Kong's mobile carriers are also investing in other services. In July 2013, PCCW launched HKT Enterprise Cloud, a carrier-grade cloud service for enterprise customers in Hong Kong, which also offers cross-border services tailored to customers with a presence in Hong Kong and mainland China.[256] In December 2013, Hutchison announced plans to offer a total of 16,000 public WiFi hotspots in early 2014.[257]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[258]	30.75	n/a	n/a	n/a	n/a
Fixed broadband subs (2013)[259]	2,215,475				
% of households with fixed broadband access (July 2014)[260]	83				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[261]	95.44				
Mobile wireless broadband subs (2014)[262]	6,875,000				

16. Hungary

Regulation: In July 2012, in an effort to generate much-needed government revenue, Hungary introduced a new tax on phone calls and text messages.[263] The new tax charged customers 2

24, 2012), http://www.telegeography.com/products/commsupdate/articles/2012/08/24/csl-claims-first-1800mhz2600mhz-dual-band-lte-launch/index.html (accessed Jan. 6, 2014).

[254] Telegeography CommsUpdate, *ZTE and CSL Demo 300 Mbps-Capable LTE-A Network* (Sept. 11, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/09/11/zte-and-csl-demo-300mbps-capable-lte-a-network/ (accessed Jan. 6, 2014).

[255] Telegeography CommsUpdate, *PCCW (HKT) Launches VoLTE; 3 HK Not Far Behind* (May 16, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/16/pccw-hkt-launches-volte-3-hk-not-far-behind/ (accessed Sept. 16, 2014).

[256] Telegeography CommsUpdate, *HKT Launches Carrier-Grade Enterprise Cloud Service in Partnership with HP* (July 18, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/07/18/hkt-launches-carrier-grade-enterprise-cloud-service-in-partnership-with-hp/ (accessed Jan. 6, 2014).

[257] Telegeography CommsUpdate, *Hutchison Aims For 16,000 Wi-Fi Hotspots* (Dec. 18, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/12/18/hutchison-aims-for-16000-wi-fi-hotspots/ (accessed Jan. 6, 2014).

[258] ITU Statistics Database (accessed Oct. 28, 2014).

[259] *Id*.

[260] *See* http://www.ofca.gov.hk/en/media_focus/data_statistics/key_stat/ (accessed Oct. 28, 2014).

[261] ITU World Telecommunication/ICT Indicators 2014, Economy Tables (accessed Oct. 29, 2014).

[262] *Id.*

[263] Telegeography GlobalComms Database: *Hungary* (2014) (accessed Oct. 20, 2014).

forints (HUF) (US$0.0082) a minute (or per text message) and overlapped with a pre-existing "crisis tax," levied in 2010 on various sectors, including telecommunications.[264] The crisis tax charged telecommunications operators as much as 6.5 percent on gross revenues and generated over HUF180 billion (US$814 million) while in effect from 2010 to 2012.[265] The EC criticized both the new tax and the crisis tax as unfair to foreign-owned telecom companies.[266] In January 2013, the EC threatened to bring a case against Hungary at the ECJ over the new tax, but in July 2013, it dropped plans to initiate legal action.[267] In November 2013, the Hungarian government suggested it would decrease or eliminate the controversial tax on phone calls and text messages, but no additional steps have been taken as of May 2014.[268]

Market and Competition: Hungary has three major mobile networks operators – Deutsche Telekom-owned Magyar, which operates under the T-Mobile brand; Telenor Hungary (formerly Pannon); and Vodafone.[269] T-Mobile launched commercial LTE services in Hungary in January 2012, covering approximately 45 percent of the population by March 2014.[270] Telenor launched LTE services in July 2012 and has continued to expand its 3G and 4G networks, spending over HUF10 billion (approximately US$41 million) in 2014 to increase mobile Internet speeds and improve coverage in rural areas.[271]

In November 2013, the government of Hungary abandoned plans to enter the domestic mobile phone market via a new state-owned company. Previously, as part of an effort to further increase competition in the domestic market, the Hungarian regulator, the National Media and Infocommunications Authority (NMHH), planned to auction spectrum licenses for wireless broadband services and create a new company, MPVI Mobil, to serve as the fourth mobile network operator in the country.[272] A January 2012 spectrum auction awarded certain spectrum to MPVI; however, the Budapest Metropolitan Court annulled the results of the frequency auction, a decision later upheld by Hungary's Supreme Court.[273] In April 2013, MPVI Mobil suspended its operations.[274] In September 2013, because of the unfavorable court decisions, NMHH extended the 900 MHz and 1800 MHz licenses of the three mobile network operators (Magyar Telekom, Telenor, and Vodafone) until 2022.[275] Following the suspension of its operations in April 2013, MPVI Mobile merged with Magyar Posta, and its HUF500 million (US$2.3 million) start-up capital was returned to its other two shareholders.[276]

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[264] *Id.*

[265] *Id.*

[266] *Id.*

[267] *Id.*

[268] *Id.*

[269] IHS Global Insight, *Hungary Telecoms Report* (2012) (accessed Sept. 4, 2014).

[270] Telegeography GlobalComms Database: *Hungary* (2014) (accessed Sept. 4, 2014).

[271] *Id.*

[272] Telegeography GlobalComms Database: *MVPI Mobile* (2013) (accessed Sept. 8, 2014).

[273] *Id.*

[274] *Id.*

[275] *Id.*

[276] *Id.*

In May 2014, NMHH announced plans to auction 20-year mobile broadband licenses in the 800 MHz, 900 MHz, 1800 MHz, and 2600 MHz bands.[277] By June 2014, four companies submitted applications to bid – Magyar Telekom, Telenor, Vodafone, and broadband Internet provider DIGI Telecommunications.[278] In September 2014, these four applicants won licenses; Hungary raised a total of HUF130.6 billion (approx. US$531 million) with this auction.[279]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[280]	23.1	3.5	11.6	8.0	0.0
Fixed broadband subs (Dec. 2013)[281]	2,282,133				
% of households with fixed broadband access (2013)[282]	71.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[283]	27.7				
Mobile wireless broadband subs (Dec. 2013)[284]	2,738,282				

17. Iceland

Regulation: In November 2012, Iceland's Parliament adopted a four-year Telecommunications Implementation Plan. The plan sets out a number of short-term and long-term goals, including: 90 percent of homes and businesses must have access to a 30 Mbps connection by 2014 (100 percent by 2022); 70 percent of homes and businesses must have access to a 100 Mbps connection by 2014 (99 percent by 2022); and 98 percent of homes and businesses must have access to high-speed mobile networks by 2014 (99.9 percent by 2022).[285]
In February 2013, Iceland's regulatory agency, the Post and Telecom Administration (PTA), launched an auction of spectrum in the 800 MHz and 1.8 GHz bands for 4G services.[286] In mid-March 2013, the country's four major mobile providers all won spectrum: 365 Media won 30

[277] Telegeography CommsUpdate, *NMHH Announces Tender for Multiband Mobile Broadband Licenses* (May 23, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/23/nmhh-announces-tender-for-multiband-mobile-broadband-licences/ (accessed Sept. 8, 2014).

[278] Telegeography CommsUpdate, *NMHH Receives Four Applications for Mobile Broadband Frequencies* (June 18, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/18/nmhh-receives-four-applications-for-mobile-broadband-frequencies/ (accessed Sept. 8, 2014).

[279] Telecoms, *Hungary Generates €418 Million through Spectrum Auction* (Sept. 29, 2014), http://www.telecoms.com/288312/hungary-generates-e418-million-through-spectrum-auction/ (accessed Oct. 27, 2014).

[280] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[281] *Id*.

[282] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[283] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[284] *Id*.

[285] Telegeography GlobalComms Database: *Iceland* (2014) (accessed Sept. 8, 2014).

[286] *Id.*

megahertz in the 800 MHz band (2×15 megahertz);[287] Vodafone Iceland won 20 megahertz (2×10 megahertz) in the 800 MHz band and 10 megahertz (2×5 megahertz) in the 1.8 GHz band; Siminn won 30 megahertz (2×15 megahertz) in the 1.8 GHz band, and Nova won 20 megahertz (2×5 megahertz) in the 800 MHz band and 10 megahertz (2×5 megahertz) in the 1.8 GHz band.[288] In sum, the auction generated ISK225.2 million (approximately US$1.775 million) in government revenue.[289] Licensees are required to provide broadband access at minimum speeds of 2 Mbps to 93.5 percent of the population by December 2014, 10 Mbps by December 2016, and 30 Mbps by December 2020.[290]

In March 2014, PTA initiated a public consultation on a proposal to authorize the shared use of frequencies in the 800 MHz, 900 MHz, 1800 MHz, and 2100 MHz bands among mobile network operators Vodafone and Nova, the current license holders.[291] Under the proposed spectrum-sharing agreement, Vodafone and Nova would participate in a joint venture, but the partnership would only cover a certain part of the network infrastructure.[292] In July 2014, the PTA approved the Vodafone-Nova spectrum sharing agreement.[293]

Market and Competition: Broadband adoption in Iceland remains among the highest in the world. Stimulated by government policies, FTTH has been expanded in the capital and major outlying towns.[294] Fiber is the standard technology used in new constructions and redevelopments, providing an important stimulus for high-end IP-delivered services.[295] The incumbent operator, Siminn, is the principal provider of fixed broadband services.[296] It operates a comprehensive ADSL network in addition to an extensive fiber optic network, which reaches more than 50 percent of households in the capital and over one third of the remaining countryside.[297] Vodafone is Siminn's chief competitor, offering DSL packages at speeds of up to 12 Mbps.[298] Vodafone is also Iceland's largest fiber-based access provider, accounting for approximately 75 percent of all fiber connections at the end of 2013.[299]

There are three key players in Iceland's mobile market: Siminn (35 percent market share),

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[287] *Id.*

[288] *Id.*

[289] *Id.*

[290] *Id.*

[291] *Id.*

[292] *Id.*

[293] Telegeography CommsUpdate, *PTA approves Vodafone-Nova Frequency Sharing Deal* (July 4, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/07/04/pta-approves-vodafone-nova-frequency-sharing-deal/ (accessed Nov. 1, 2014).

[294] Business Wire, Research and Markets*, Iceland – Telecoms, IP Networks, Digital Media and Forecasts* (Feb. 2014), http://www.researchandmarkets.com/research/bxxg4r/iceland_telecoms (accessed Sept. 8, 2014).

[295] *Id.*

[296] Telegeography GlobalComms Database: *Iceland* (2014) (accessed Sept. 8, 2014).

[297] *Id.*

[298] *Id.*

[299] *Id.*

Vodafone (27 percent), and Nova (33 percent), which rolled out Iceland's first commercial 4G network in April 2013.[300] Over the past year, all three companies have taken proactive steps to expand 4G LTE coverage.

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[301]	35.8	7.9	0.0	27.8	0.0
Fixed broadband subs (Dec. 2013)[302]	115,826				
% of households with fixed broadband access (2013)[303]	93.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[304]	76.5				
Mobile wireless broadband subs (Dec. 2013)[305]	247,690				

18. India

Regulation: India's communications policymaking powers are split between two regulatory bodies: (1) the Ministry of Communication and Information Technology (MoCIT), which sets telecommunications policy, manages spectrum, and manages government investment in telecommunications companies, and (2) the Telecommunications Regulatory Authority of India (TRAI), an independent regulator with jurisdiction over interconnection tariffs, quality of service, cable TV prices, and cable TV advertising.[306] In 2002, to help combat the digital divide created by India's large rural population and high poverty levels, MoCIT introduced a Universal Service Obligation Fund (USOF).[307]

In April 2012, following two years of consultation, the Indian government released the country's National Telecom Policy (NTP 2012).[308] The NTP 2012 includes plans to eliminate roaming charges and to expand the scope of number portability. It also sets a target of 175 million broadband connections by 2017 and 600 million subscriptions with 2 Mbps access by 2020. Immediately following the passage of the NTP 2012, the government approved the construction of a National Optical Fiber Network (NOFN), first proposed by TRAI in its Recommendation on a National Broadband Plan in 2010.[309] A newly created state-owned company, Bharat Broadband Network Limited (BBNL), manages the national fiber network. In February 2014, BBNL secured

[300] *Id.*

[301] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[302] *Id*.

[303] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[304] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[305] *Id*.

[306] Telegeography GlobalComms Database: *India* (2014) (accessed Sept. 16, 2014).

[307] Ministry of Communication & Information Technology, *Universal Service Obligation Fund*, http://www.usof.gov.in/usof-cms/usof_home_contd.htm (accessed Sept. 16, 2014).

[308] Telegeography GlobalComms Database: *India* (2014) (accessed Sept. 16, 2014).

[309] *Id.*

USOF assistance for the five-year deployment of a fiber optic transport network capable of providing 100 Mbps of bandwidth to 250,000 small villages and towns.[310] To complement the NTP, India's Prime Minister Narendra Modi has made an ambitious "Digital India" agenda a top priority for his new government. The specific goals of Digital India include investing in infrastructure (like the NOFN) and ensuring broadband connectivity down to the village level. The government plans to roll out the program in phases through 2018.

ndia's recent spectrum auction, originally planned for January 2014, was delayed slightly due to an ongoing disagreement between DoT and TRAI over pricing recommendations for the 800 MHz band.[311] In February 2014, MoCIT's Department of Telecommunications (DoT) moved forward with an auction of spectrum in the 900 MHz and 1800 MHz bands.[312] The auction raised more than US$9 billion in government revenue.[313] Airtel secured frequencies in both bands, which it plans to use to expand its 4G network. Similarly, newcomer Reliance Jio Infocomm, which already owns rights to pan-India 4G frequencies, acquired additional 4G-suitable spectrum in the 1800 MHz band.[314]

Market and Competition: At the end of March 2014, there were 134 active ISPs operating in India.[315] Despite the large number of access providers, the fixed broadband market remains dominated by the two state-owned domestic incumbents, Mahanahar Telephone Nigam Ltd. (MTNL), which provides services principally in Delhi and Mumbai, and Bharat Sanchar Nigam Ltd. (BSNL), which provides services to the rest of India.[316] As of June 2014, BSNL led the broadband market with 65 percent of subscribers. Other top providers include Bharti Airtel, the country's largest privately owned company and second largest ISP overall (9.9 percent market share), and Reliance Communications (1.2 percent).[317]

India's mobile market is more competitive, with 13 active operators providing wireless services as of March 2014.[318] Only four operators have a pan-India footprint – Bharti Airtel (22.9 percent market share), Vodafone (18.6 percent), Idea Cellular (15.2 percent), and Aircel (8.0 percent).[319] In 2012, Bharti Airtel launched the nation's first LTE service in Kolkata, Bangalore and Pune, with minimum download speeds of 10-15 Mbps.[320] Aircel, with the help of China's ZTE

[310] *Id.*

[311] Telegeography CommsUpdate, *TRAI Refuses to Issue Recommendations on 800 MHz Pricing* (Nov. 19, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/11/19/trai-refuses-to-issue-recommendations-on-800mhz-pricing/ (accessed Sept. 16, 2014).

[312] Telegeography CommsUpdate, *Spectrum Auction Nets USD9.9bn for Govt.* (Feb. 14, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/02/14/spectrum-auction-nets-usd9-9bn-for-govt-/ (accessed Sept. 16, 2014).

[313] *Id.*

[314] *Id.*

[315] Telegeography GlobalComms Database: *India* (2014) (accessed Sept. 16, 2014).

[316] *Id.*

[317] *Id.*

[318] *Id.*

[319] *Id.*

[320] Telegeography CommsUpdate, *Bharti Launches India's First LTE Network* (Apr. 10, 2012), http://www.telegeography.com/products/commsupdate/articles/2012/04/10/bharti-launches-indias-first-lte-network/ (accessed Jan. 6, 2014).

Corporation, is expected to deploy its LTE network in late 2014.[321]
To increase efficient network use, India's telecom providers have utilized infrastructure sharing arrangements. In December 2013, mobile provider Bharti Airtel entered a pan-India infrastructure sharing deal with 4G startup Reliance Jio Infocomm.[322] The partnership is reported to extend to jointly laying fiber optic cable and other infrastructure. Likewise, state-owned operators BSNL and MTNL entered a deal to share infrastructure and jointly provide services to corporate customers to cut costs and alleviate pressure from private competition.[323] In June 2014, MoCIT requested that the government consider a merger of BSNL and MTNL due to both companies' ongoing financial difficulties.[324]

Other Media: India's public TV network operates about 20 national, regional, and local services; however, there are an increasing number of privately-owned TV stations distributed by cable and satellite service providers.[325] By the end of 2012, approximately 650 channels were available for viewing throughout India and more than 100 million homes had access to cable and/or satellite TV offerings. Traditionally, radio broadcasting has been a primary medium for entertainment, information and education for the masses, primarily due to the affordability of radio receivers.[326] All India Radio (AIR), the public broadcaster, has a network comprised of 237 stations that provide radio coverage to 99.1 percent of the population and reaches 91.8 percent of the country.[327] FM Radio reaches about 40 percent of the country, and as of December 2012, there were approximately 242 private FM stations in operation in 86 cities.[328]

Topography: India is slightly more than one-third the size of the United States. The country's population density is 954 people per square mile, and approximately 72 percent of the population lives in rural areas. The terrain is upland plain (the Deccan Plateau) in the south, flat to rolling plain along the Ganges River, deserts in the west, and the Himalayas mountain range in the north.

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[321] Telegeography CommsUpdate, *Aircel Taps ZTE For LTE Deployment* (Jan. 3, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/01/03/aircel-taps-zte-for-lte-deployment/ (accessed Jan. 6, 2014).

[322] Telegeography CommsUpdate, *Jio and Airtel in Surprise 4G Tie-Up* (Dec. 11, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/12/11/jio-and-airtel-in-surprise-4g-tie-up/ (accessed Jan. 6, 2014).

[323] Telegeography CommsUpdate, *State-Owned Operators Ink Infrastructure Sharing Deal* (Sept. 24, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/09/24/state-owned-operators-ink-infrastructure-sharing-deal/ (accessed Jan. 10, 2014).

[324] Telegeography CommsUpdate, *DoT Preparing Request for BSNL, MTNL Merger* (June 26, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/26/dot-preparing-request-for-bsnl-mtnl-merger/ (accessed Sept. 16, 2014).

[325] Telecom Regulatory Authority of India (TRAI), *Consultation on Issues Related to Media Ownership* (Feb. 15, 2013), http://www.trai.gov.in/Content/ConsultationDescription.aspx?CONSULT_ID=675&qid=13 (accessed Aug. 2, 2013).

[326] *Id*.

[327] *Id.*

[328] *Id.*

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[329]	1.16	n/a	n/a	n/a	n/a
Fixed broadband subs (2013)[330]	14,540,000				
% of households with fixed broadband access (2014)[331]	6.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[332]	3.25				
Mobile wireless broadband subs (2014)[333]	40,660,000				

19. Ireland

Regulation: In August 2012, the Ministry of Communications, Energy and Natural Resources announced its new national broadband plan, which aims to bring connectivity at speeds of at least 30 Mbps to every home in the country by 2015.[334] The plan sets out three goals for broadband availability: by 2015, 50 percent of the population will have access to download speeds of 70-100 Mbps, 20 percent will be offered 40 Mbps or faster download speeds, and the remaining 30 percent of the population, no matter how rural or remote, will have minimum speeds of 30 Mbps.[335] In April 2014, the Ministry updated the plan and announced a major state-led fiber build-out to rural areas.[336] The Ministry is currently conducting a comprehensive mapping project, already identifying over 1,000 locations as proposed locations for the fiber-based connections.[337]

In November 2012, Ireland's regulator, the Commission for Communications Regulation (ComReg), held an auction of 800 MHz, 900 MHz, and 1800 MHz band spectrum.[338] The auction released approximately 140 megahertz of paired spectrum for LTE use and raised EUR854.6 million (US$1.09 billion).[339] Eircom's mobile arm Meteor, Hutchison Whampoa's 3 Ireland, Telefónica's O2 Ireland, and Vodafone Ireland won spectrum licenses.[340] Vodafone, the

[329] ITU Statistics Database (accessed Oct. 28, 2014).

[330] *Id*.

[331] Telegeography GlobalComms Database: *India* (2014) (accessed Oct. 29, 2014).

[332] ITU World Telecommunication/ICT Indicators 2014, Economy Tables (accessed Oct. 29, 2014).

[333] *Id.*

[334] Ministry of Communications, Energy & Natural Resources, *The National Broadband Plan: Delivering a Connected Society* (Aug. 30, 2012), http://www.dcenr.gov.ie/NR/rdonlyres/1EA7B477-741B-4B74-A08E-6350135C32D2/0/NBP.pdf (accessed Sept. 8, 2014).

[335] *Id.*

[336] Ministry of Communications, Energy & Natural Resources, *National Broadband Plan: Update April 2014*, http://www.dcenr.gov.ie/Communications/Communications+Development/Next+Generation+Broadband/National+Broadband+Plan+Update+April+2014.htm (accessed Sept. 8, 2014).

[337] *Id.*

[338] *Id.*

[339] *Id.*

[340] *Id.*

leading mobile provider in Ireland, won the most spectrum, with 2 paired blocks (2×10 megahertz) in the 800 MHz and 900 MHz bands, as well as a paired (2×15 megahertz) block and a paired (2×25 megahertz) block in the 1800 MHz band.[341] Under the license terms, licensees must provide coverage to at least 70 percent of the population within 3 years.[342]
In November 2013, ComReg held another auction for spectrum in the 1800 MHz band that remained unassigned following the previous year's multi-band auction.[343] In January 2014, however, ComReg reported that it received no bids; because the license in question will expire in July 2015, ComReg will not re-auction this spectrum.[344]

In February 2014, Parliament passed the Electronic Communications Network Bill, designed to allow electricity operator ESB to partner with a mobile operator to deploy fiber-based broadband networks via underground ducts.[345] ESB has since entered into an exclusive agreement with Vodafone, with the goal of expanding high-speed Internet connectivity to 450,000 homes and businesses across Ireland.[346]

Market and Competition: Vodafone is the leading mobile operator in Ireland with a 40 percent share of subscribers at the end of June 2014, followed by Telefónica's O2 (29 percent), Eircom's Meteor (20 percent), and 3 Ireland (11 percent).[347] In June 2013, in an effort to reduce debt, Telefónica agreed to sell O2 to Hutchison Whampoa for EUR850 million (US$1.1 billion).[348] The proposed merger would reduce the number of MNOs in the country from four to three, and make 3 Ireland the second-leading mobile operator. Amidst concerns about competition, the EC began an extensive investigation into the merger in late 2013.[349] In February 2014, the EC presented 3 Ireland with a list of objections,[350] which Hutchinson Whampoa responded to by

[341] *Id.*

[342] *Id.*

[343] *Id.* In the November 2013 auction, the 1800 MHz licenses were split by both frequency and time. Although Hutchinson Wampoa's 3 Ireland acquired the license for the second time segment (July 2015 through July 2030), no one acquired the license for the first shorter time segment (from November 2012 through July 2015), so ComReg re-auctioned this license.

[344] Telegeography CommsUpdate, *Irish Operators Shun 1800 MHz Spectrum* (Jan. 8, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/01/08/irish-operators-shun-1800mhz-spectrum/ (accessed Sept. 8, 2014).

[345] Telegeography GlobalComms Database: *Ireland* (2014) (accessed Sept. 8, 2014).

[346] *Id.*

[347] *Id.*

[348] Telegeography CommsUpdate, *Telefonica Sells O2 Ireland to Hutch in USD1.1bn Deal* (June 24, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/06/24/telefonica-sells-o2-ireland-to-hutch-in-usd1-1bn-deal/ (accessed Sept. 8, 2014).

[349] Telegeography CommsUpdate, *EC to Probe Hutch Ireland Merger Plan* (Nov. 7, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/11/07/eu-to-probe-hutch-ireland-merger-plan/ (accessed Sept. 8, 2014).

[350] Telegeography CommsUpdate, *EC Hits 3 Ireland With List of Objections to O2 Buyout* (Feb. 4, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/02/04/ec-hits-3-ireland-with-list-of-objections-to-o2-buyout/ (accessed Sept. 8, 2014).

offering several concessions, including setting-up a new market entrant.[351] In May 2014, the EC gave formal approval for the merger.[352] In response to the EC's decision, ComReg has expressed concern that the merger will negatively impact Irish consumers, and Vodafone has threatened legal action.[353]

In September 2013, Eircom became the first Irish operator to launch LTE service, quickly followed by market leader Vodafone less than a month later.[354] The launch of LTE by O2 and 3 Ireland is likely to be significantly delayed by their merger plans, with the O2 brand set to be phased out by mid-2015.[355]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[356]	24.4	0.1	7.4	16.9	0.0
Fixed broadband subs (Dec. 2013)[357]	1,121,551				
% of households with fixed broadband access (2013)[358]	65.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[359]	69.2				
Mobile wireless broadband subs (Dec. 2013)[360]	3,175,008				

20. Israel

Regulation: In October 2011, the Israeli government announced that it was seeking an investor to help build a 25,000 kilometer fiber optic network to bring ultra-high speed Internet to Israel and increase competition in the broadband sector.[361] Under the plan, the investor would take a 51

[351] Telegeography CommsUpdate, *Hutch Looks Set to Get EU "Thumbs Up" for O2 Ireland Merger* (May 19, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/19/hutch-looks-set-to-get-eu-thumbs-up-for-o2-ireland-merger/ (accessed Sept. 8, 2014).

[352] Telegeography CommsUpdate, *EU Approves Hutch's Takeover of O2* Ireland (May 29, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/29/eu-approves-hutchs-takeover-of-o2-ireland/ (accessed Sept. 8, 2014).

[353] Telegeography CommsUpdate, *Vodafone Reacts Angrily to EU's Decision to Approve 3 Ireland's O2 Takeover* (May 30, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/30/vodafone-reacts-angrily-to-eus-decision-to-approve-3-irelands-o2-takeover/ (accessed Sept. 8, 2014).

[354] Telegeography GlobalComms Database: *Ireland* (2014) (accessed Sept. 8, 2014).

[355] *Id.*

[356] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[357] *Id*.

[358] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[359] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[360] *Id*.

[361] Reuters, *Israel Seeks Investor for New Fiber Optic Network* (Oct. 9, 2011), http://www.reuters.com/article/2011/10/09/israel-telecom-idUSL5E7L90AT20111009 (accessed Aug. 2, 2013).

percent ownership interest in a new private company in partnership with the Israel Electric Corporation (IEC).[362] Original projections estimated that approximately 65 percent of the population would be able to access the Internet at speeds of 100 Mbps by 2018, with the remainder of the country receiving coverage by 2020.[363] After languishing for over a year, the IEC finally received the Ministry of Finance's approval in January 2013 and it partnered with Swedish communications operator ViaEuropa to establish a high-speed fiber network alongside the nationwide electric grid.[364] Deployment was scheduled to start at the end of 2013 but no updates are available as of June 2014.

Market and Competition: In August 2012, Israel's fixed line incumbent Bezeq confirmed plans to invest in upgrading its infrastructure by replacing its copper wire network over the course of the next five to eight years with an FTTP network. Investment for the project was to be approved in stages, depending on Bezeq's ability to deploy the network coupled with customer demand. The company began rolling out its upgraded network in October 2012; the first locales to benefit from the new network were densely populated apartment blocks and business parks.[365] By the end of 2013, Bezeq said it had connected approximately 400,000 premises to the infrastructure, up from 200,000 a year earlier. Bezeq has said it expects to have approximately one million households, representing around 40 percent of the population, connected to the FTTP network by the end of 2014.[366]

Wireless broadband services meanwhile have yet to make a significant impact in Israel. The Ministry of Communications (MoC), the Israeli telecommunications regulator, has not yet auctioned wireless broadband spectrum or established a regulatory framework or timetable for the rollout of such services.[367]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[368]	25.1	0.0	9.1	16.0	0.0
Fixed broadband subs (Dec. 2013)[369]	2,024,000				
% of households with fixed broadband access (2012)[370]	71.0				
Wireless					

[362] *Id.*

[363] Telegeography GlobalComms Database: *Israel* (2014) (accessed Sept. 5, 2014).

[364] Reuters, *Viaeuropa Wins Deal for High-Speed Israeli Fibre Optic Network* (June 16, 2013), http://www.reuters.com/article/2013/06/16/israel-fibreoptics-idUSL5N0ES0KG20130616 (accessed Aug. 2, 2013).

[365] The Times of Israel, *Bezeq Joins Fiber Optic Fray* (Oct. 4, 2012), http://www.timesofisrael.com/bezeq-joins-fiber optic-cabling-fray/ (accessed Oct. 22, 2014).

[366] Telegeography GlobalComms Database: *Israel* (2014) (accessed Sept. 5, 2014).

[367] *Id.*

[368] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[369] *Id*.

[370] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

Mobile wireless broadband subs per 100 inhabitants[371]	50.5
Mobile wireless broadband subs (Dec. 2013)[372]	4,070,000

21. Italy

Regulation: In March 2013, Autorita per le Garanzie nelle Comunicazioni (AGCOM), Italy's communications regulator, reduced the wholesale broadband prices that Telecom Italia, the former incumbent, could charge other operators for using its network.[373] After several months of study, in December 2013, the EC asked AGCOM to amend or withdraw the proposed price reduction because it "would not provide the regulated operator with a reasonable return on its investment in broadband networks" and may negatively impact alternative or next generation infrastructure investments.[374]

Market and Competition: Italy is one of Western Europe's least developed broadband markets.[375] The EU Digital Scoreboard reported in June 2013 that 37 percent of Italians have never used the Internet and 53 percent do not use the Internet on a regular basis, among the lowest in the EU on both measures.[376] Moreover, Italy also lags behind the rest of Europe in terms of broadband speed; according to the EC, just over 18 percent of broadband lines in Italy offer speeds of 10 Mbps or more, compared to an EU average of 66 percent.[377] ADSL remains the dominant technology, accounting for approximately 93 percent of Italy's million broadband subscriptions as of June 2014.[378] Telecom Italia is the broadband market leader with 48.9 percent of subscribers, followed by Wind Telecomunicazioni (15.4 percent), FastWeb (14.0 percent), Vodafone Italy (12.7 percent), Tiscali (3.4 percent), and other providers (5.6 percent).[379]
In May 2012, AGCOM warned that the delay in the rollout of broadband was costing Italian gross domestic product (GDP) between 1-1.5 percent.[380] Italian fixed line operators appeared to have answered the government's call for concern. In September 2012, FastWeb announced that it

[371] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[372] *Id.*

[373] Telegeography CommsUpdate, *Agcom Approves Wholesale Fibre Rates* (Mar. 7, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/03/07/agcom-approves-wholesale-fibre-rates/ (accessed Oct. 7, 2014).

[374] European Commission, *Press Release: Commission Formally Requests Italian Telecoms Regulator to Amend or Withdraw its Proposal for Wholesale Broadband Price Reductions* (Dec. 12, 2013), http://europa.eu/rapid/press-release_IP-13-1247_en.htm (accessed Mar. 13, 2014).

[375] La Gazzetta del Mezzogiorno, *"Digital Divide" Separates Italians from EU* (Feb. 11, 2014), http://www.lagazzettadelmezzogiorno.it/english/digital-divide-separates-italians-from-eu-no693458/ (accessed Feb. 14, 2014).

[376] European Commission, *Commission Staff Working Document: Digital Scoreboard December 2013*, http://ec.europa.eu/digital-agenda/sites/digital-agenda/files/DAE%20SCOREBOARD%202013%20-%20SWD%202013%20217%20FINAL.pdf (accessed Jan. 15, 2014).

[377] Telegeography GlobalComms Database: *Italy* (2014) (accessed Oct. 7, 2014).

[378] *Id.*

[379] *Id*.

[380] IHS Global Insight, *Italy Telecoms Report* (2014) (accessed Oct. 7, 2014).

would invest EUR400 million (US$513 million) over the next three years to expand its fiber optic infrastructure in Italy.[381] FastWeb will accomplish part of its fiber expansion by partnering with Telecom Italia, which launched its first fiber-based services in Rome, Naples, and Turin in December 2012. The two operators will share passive infrastructure and coordinate build out to reduce environmental disruptions. Telecom Italia plans to roll out fiber-to-the-street cabinets in 100 cities by the end of 2014.[382] After acquiring Verizon's 23 percent stake in Vodafone Italy, Vodafone has increased its infrastructure investment plan in Italy, planning FTTH connections with speeds of at least 30 Mbps in 27 Italian cities.[383]

Italy's mobile market had over 89 million subscribers at the end of June 2014, second only to Germany in terms of active mobile subscriptions. Analysts estimate that, of these subscribers, over 38 million Italians were connected to 3G networks as of June 2014, making Italy one of the largest 3G markets in Europe.[384] The mobile market leader, by subscribers, is Telecom Italia with 34.3 percent, followed by Vodafone Italy (30.1 percent), Wind Telecomunicazioni (24.5 percent), and 3 Italia (11.0 percent). Investment in LTE continues to grow in Italy. Vodafone, TIM, and 3 Italia all deployed LTE in late 2012, and WIND began offering 4G services in March 2014.[385]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[386]	22.3	0.5	0.0	21.7	0.0
Fixed broadband subs (Dec. 2013)[387]	13,597,570				
% of households with fixed broadband access (2013)[388]	68.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[389]	65.3				
Mobile wireless broadband subs (Dec. 2013)[390]	39,840,597				

[381] Telegeography GlobalComms Database: *Italy* (2014) (accessed Oct. 7, 2014).

[382] Telecom Italia, *Press Release: Announcing Launch of Ultra-Broadband Services Over Fibre Optics* (Dec. 4, 2012), http://www.telecomitalia.com/tit/en/archivio/media/comunicati-stampa/telecom-italia/mercato/consumer/ 2012/12-04.html (accessed Oct. 7, 2014)

[383] ZDNet, *Vodafone Aims $10bn 'Project Spring' War Chest at Italy's 4G, Fibre Market* (Sept. 6, 2013),

http://www.zdnet.com/vodafone-aims-10bn-project-spring-war-chest-at-italys-4g-fibre-market-7000020325/ (accessed Jan. 15, 2014).

[384] Telegeography GlobalComms Database: *Italy* (2014) (accessed Oct. 7, 2014).

[385] *Id.*

[386] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[387] *Id*.

[388] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[389] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[390] *Id*.

22. Japan

Regulation: Japan's regulator, the Ministry of Internal Affairs and Communications (MIC), continues to license spectrum by the "beauty contest" method. In 2012, the Japanese government introduced legislation creating an auction-based system, but the administration of Prime Minister Shinzo Abe suspended consideration of the bill, and it is unlikely that Japan will adopt spectrum auctions in the near term.[391]

In February 2012, MIC granted SoftBank Mobile spectrum in the 900 MHz band, which the carrier utilized to expand its 4G LTE services. In June 2012, NTT DoCoMo and KDDI, both of whom already had LTE frequencies in the 800 MHz band, were awarded spectrum in the 700 MHz band. MIC also awarded spectrum in the 700 MHz band to eAccess' subsidiary, eMobile, which provides 4G services in the 1700 MHz band. The 700 MHz band spectrum licenses commence on January 1, 2015.[392]

In July 2013, MIC also initiated a public consultation on revising its spectrum usage fees for the 2014-2017 fiscal periods. Under the proposed changes, wireless providers' spectrum usage fees would be halved. MIC hopes the reduction will contribute to the promotion of new wireless technologies. The comment period ended in August 2013.[393] Also in August 2013, MIC allocated additional spectrum in the 2.5 GHz band, which is authorized only for standards that are TD-LTE compliant, to KDDI's joint venture UQ Communications.[394]

Market and Competition: Nippon Telephone and Telegraph (NTT), the largest telecommunications company in the world in terms of revenue, dominates the Japanese market. DSL subscribership continues to rapidly decline, while the number of FTTH connections continues to grow.[395] NTT leads the fiber sector with a share of 71.1 percent, far ahead of competitors KDDI (12.8 percent) and Softbank (9.9 percent).[396] A government-appointed panel is overseeing plans to spread fiber access to all homes by 2015.[397]

In May 2014, NTT announced plans to launch its "Hikari collaboration model," under which NTT East and NTT West will provide access to their core networks on a wholesale basis. According to NTT, the move represents the world's first full-scale wholesaling of fiber access

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[391] Email communication with Japanese Embassy (Aug. 18, 2014).

[392] Telegeography CommsUpdate, *700 MHz LTE Spectrum Granted to Three Japanese Cellcos* (June 28, 2012),

http://www.telegeography.com/products/commsupdate/articles/2012/06/28/700mhz-lte-spectrum-granted-to-three-japanese-cellcos/index.html (accessed Jan. 10, 2014).

[393]Telegeography CommsUpdate, *Japan To Reduce Spectrum Usage Fees* (July 19, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/07/19/japan-to-reduce-spectrum-usage-fees/ (accessed Jan. 10, 2014).

[394] Telegeography CommsUpdate, *Japan Awards Additional Spectrum in the 2.5 GHz Band to UQ Communications* (Aug. 13, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/08/13/japan-awards-additional-spectrum-in-the-2-5ghz-band-to-uq-communications/ (accessed Mar. 20, 2014).

[395] Telegeography GlobalComms Database: *Japan* (2014) (accessed Oct. 7, 2014).

[396] *Id.*

[397] *Id.*

services.[398]

As of March 2014, Japan has 99 million 3G subscribers (down from 102 million in December 2013) and 45 million 4G LTE subscribers (up from 39 million in December 2013). With a market share of 43.8 percent, NTT DoCoMo remains the market leader followed by KDDI (28.1 percent), Softbank Mobile (24.9 percent), and eMobile (3.1 percent).[399]
In May 2014, NTT DoCoMo announced that it would partner with several equipment vendors, including Swedish vendor Ericsson, to begin experimenting with next-generation 5G technology. NTT DoCoMo plans to commercially launch the 5G platform by 2020, in time for the Tokyo Olympics.[400]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[401]	28.1	19.6	4.8	3.7	0.0
Fixed broadband subs (Dec. 2013)[402]	35,785,203				
% of households with fixed broadband access (2012)[403]	75.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[404]	111.8				
Mobile wireless broadband subs (Dec. 2013)[405]	142,595,498				

23. Korea

Regulation: In the wake of South Korea's 2012 legislative elections, South Korea's new administration under the newly elected President Geun-hye Park initiated a plan to restructure the South Korean government. In April 2013, the new administration created the Ministry of Science, ICT and Future Planning (MSIP), which is responsible for telecommunication policy and regulation, the ICT manufacturing industry, spectrum policy, broadband infrastructure, and cyber security. Previously, the Korean Communications Commission (KCC) carried out these duties, as well as regulating broadcasting. In the wake of these regulatory changes, MSIP has assumed primary policy and regulatory responsibility for network licensing matters, regulating mergers and acquisitions, setting technical standards, and establishing rates, terms, and practices for telecom service providers. KCC retains final authority over terrestrial TV networks and will now

[398] *Id.*

[399] *Id.*

[400] Telegeography CommsUpdate, *NTT DOCOMO to Conduct Trials of "5G" Technology with Six Vendors* (May 8, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/08/ntt-docomo-to-conduct-trials-of-5g-technology-with-six-vendors/ (accessed Sept. 16, 2014).

[401] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) accessed Oct. 28, 2014).

[402] *Id*.

[403] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[404] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[405] *Id*.

play a key role in protecting service users in the broadcast and telecom markets.[406]
As part of its new responsibilities, MSIP assumed control over South Korea's frequency allocation plans. On January 2, 2014, MSIP announced plans to quadruple Korea's mobile bandwidth by 2023. Under the plan, an additional 1190 megahertz of spectrum is expected to be freed, in addition to the 390 megahertz currently in use.[407] In August 2013, MSIP allocated 115 megahertz in the 1800 MHz and 2.6 GHz bands for LTE-based services through a complex, two-round auction.[408] Spectrum allocated through the auctions included license conditions aimed at reclaiming 2G spectrum.

Market and Competition: South Korean broadband providers offer services through a variety of technologies. LAN/FTTx connections account for the largest proportion of users, more than 60 percent by the end of 2013, followed by HFC and xDSL, respectively.[409] The top three carriers of both fixed line and wireless services are KT Corp. (40.4 percent), SK Telecom (23.6 percent) and LG Uplus (15.1 percent).[410]

All three wireless companies achieved nationwide 4G LTE coverage by mid-2013, and subsequently focused on the provision of faster speeds through more advanced technology.[411] In June 2013, SKT launched the world's first commercial LTE-A service for smartphones, attracting more than 150,000 subscribers.[412] LG Uplus announced its LTE-A network in July 2013, and KT Corp completed its nationwide LTE-A rollout in September 2013.[413]
South Korea is intent on becoming a leader in the development of 5G services. In January 2014, MSIP announced plans to invest approximately KRW1.6 trillion (US$1.5 billion) in rolling out trial 5G services by 2017, with the goal of a commercial launch in December 2020.[414]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[415]	37.5	24.2	9.6	3.7	0.0
Fixed broadband subs (Dec. 2013)[416]	18,737,125				
% of households with fixed broadband access (2009)[417]	83.8				

[406] Telegeography GlobalComms Database: *South Korea* (2014) (accessed Sept. 18, 2014).

[407] *Id.*

[408] *Id.*

[409] *Id.*

[410] *Id.*

[411] *Id.*

[412] *Id.*

[413] *Id.*

[414] Telegeography CommsUpdate, *Ministry Outlines USD1.5bn 5G Investment Plan* (Jan. 23, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/01/23/ministry-outlines-usd1-5bn-5g-investment-plan/ (accessed Sept. 18, 2014).

[415] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[416] *Id.*

[417] KCC. The data for Korea available in the OECD Broadband Portal Table 2a (97.5%) includes mobile broadband access.

Wireless	
Mobile wireless broadband subs per 100 inhabitants[418]	103.8
Mobile wireless broadband subs (Dec. 2013)[419]	51,892,608

24. Lithuania

Regulation: In October 2013, Lithuania's regulator, the Communications Regulatory Authority (RRT), announced the results of its 800 MHz digital dividend spectrum auction. Bite Lithuania won 2×10 megahertz in the 791-801 MHz and 832-842 MHz bands with a bid of LTL1.01 million (US$0.4 million), while Omnitel won 2×5 megahertz in the 801-806 MHz and 842-847 MHz bands and a further 2×5 megahertz in the 806-811 MHz and 847-852 MHz bands for a total of LTL5.1 million (US$2.02 million). Tele2 won spectrum in the 811-816 MHz and 852-857 MHz bands and the 816-821 MHz and 857-862 MHz bands for a total of LTL2 million (US$0.79 million). As a condition of its license, Bite Lithuania must provide maximum download speeds of up to 2 Mbps to 30 percent of sub-districts within three years and 80 percent of sub-districts within five years; by 2020, Bite Lithuania must provide 4 Mbps speeds to 95 percent of Lithuanian households.[420]

Market and Competition: According to FTTH Council Europe, Lithuania leads the continent in terms of FTTH penetration, with 31.3 percent of all households connected to a fiber network at the end of 2012 (most recent figure).[421] FTTx/LAN surpassed xDSL as the dominant access technology in mid-2009, and by the end of September 2013, fiber accounted for 61.4 percent of fixed broadband subscribers.[422] With 48.5 percent of fixed broadband subscribers and an FTTH network covering 67 percent of households, the incumbent TEO LT leads the market as of June 2014.[423] The remainder of the market is extremely competitive, with approximately 102 Internet service providers vying for customers, but none of these operators has more than a 9 percent market share.[424]

Three mobile network operators are active in Lithuania: Omnitel, Tele2 Lithuania, and Bite Lithuania. As of June 2014, Tele2 had 41.4 percent of mobile subscribers, followed by Omnitel (34.8 percent) and Bite Lithuania (24 percent).[425] There are also four MVNOs, all operating on Bite Lithuania's network, and six licensed resellers; nevertheless, the top three operators account for approximately 99 percent of all mobile subscribers.[426] In March 2012, all three network operators were awarded spectrum in the 2.5/2.6 GHz bands and have begun constructing and

[418] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[419] *Id*.

[420] Communications Regulatory Authority (RRT), *RTT Announces Auction Winners* (Oct. 11, 2013), http://www.rrt.lt/en/press-release/rrt-announces-auction-winners.html (accessed Oct. 6, 2014).

[421] Telegeography GlobalComms Database: *Lithuania* (2014) (accessed Oct. 6, 2014).

[422] *Id.*

[423] *Id.*

[424] *Id.*

[425] *Id.*

[426] *Id.*

expanding their LTE networks.[427] In June 2014, Omnitel announced that its 4G LTE network covered 50 percent of the population.[428]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[429]	22.01	n/a	n/a	n/a	n/a
Fixed broadband subs (2013)[430]	664,063				
% of households with fixed broadband access (2013)[431]	64				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[432]	53.85				
Mobile wireless broadband subs (2014)[433]	1,624,000				

25. Luxembourg

Regulation: In 2010, the government introduced the "National Strategy for Very High Speed Networks," a plan for the nationwide deployment of ultra-high speed broadband by 2020.[434] According to the plan, 100 percent of the population should have access to minimum download speeds of 2 Mbps by the end of 2010, rising to 100 Mbps by the end of 2015, and 1 Gbps by the end of 2020. The strategy also set the following interim targets: 95 percent of the population should have access to 25 Mbps download speeds by 2011, 80 percent to 100 Mbps speeds by 2013, and 50 percent to 1 Gbps speeds by 2015.[435]

In 2011, a new Electronic Communications Act came into effect. According to the Institut Luxembourgeois de Regulation (ILR), the main goals of the Act include: fostering competition in the telecommunications sector; providing for the regulation of networks, including interconnection practices, and ensuring cross-network interoperability; introducing universal service obligations; and maintaining a complete separation between regulatory functions and network operations.[436]

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[427] *Id.*

[428] Telegeography CommsUpdate, *Omnitel 4G Reaches 50% of Lithuanians* (Jun. 9, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/09/omnitel-4g-reaches-50-of-lithuanians/ (accessed Oct. 6, 2014).

[429] ITU Statistics Database (accessed Oct. 28, 2014).

[430] *Id*.

[431] Eurostat, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_r_broad_h&lang=en (accessed Oct. 28, 2014).

[432] ITU World Telecommunication/ICT Indicators 2014, Economy Tables (accessed Oct. 29, 2014).

[433] *Id.*

[434] European Commission: Digital Agenda for Europe, *Country Information – Luxembourg*, https://ec.europa.eu/digital-agenda/en/country-information-luxembourg (accessed Oct. 6, 2014).

[435] Telegeography GlobalComms Database: *Luxembourg* (2014) (accessed Oct. 6, 2014).

[436] Institut Luxembourgeois de Regulation (ILR), *Electronic Communications*, http://www.ilr.public.lu/communications_electroniques/index.html (accessed Oct. 6, 2014).

To spur broadband deployment, ILR held several spectrum auctions between May 2012 and November 2013, issuing or extending 4G-suitable licenses in the 800 MHz, 900 MHz, 1800 MHz, and 2.1/2.6 GHz bands.[437]

Market and Competition: In September 2013, P&T Luxembourg, the telecommunications incumbent, and its mobile arm LuxGSM merged and officially rebranded as Post Luxembourg (Post). Wholly state-owned, Post dominates the broadband market, with 68.5 percent of subscribers as of June 2014. In 2011, Post launched "LuxFibre" FTTH, and it continues to roll out its nationwide fiber network. In October 2013, motivated by the government's ambitious national broadband strategy, Post unveiled its first 1 Gbps broadband package, LuxFibre XL.[438] With just over 50 percent of wireless subscribers, Post also leads the mobile market.[439] Luxembourg also has two other mobile network operators, Tango (with a 33.3 percent market share) and Orange (15.1 percent).[440] In recent years, the three companies have launched 4G LTE services. Tango began offering commercial LTE services in October 1, 2012, extending coverage to 90 percent of the population by the end of that year.[441] Just weeks later, on October 29, 2012, Orange launched its 4G LTE services.[442] In June 2014, Orange announced that its network served 74 percent of Luxembourg, with plans for 90 percent LTE coverage by the end of 2015.[443] Finally, Post introduced 4G LTE in September 2013, in conjunction with its rebranding.[444]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[445]	32.5	2.2	3.4	26.8	0.1
Fixed broadband subs (Dec. 2013)[446]	177,300				
% of households with fixed broadband access (2013)[447]	70.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[448]	86.1				

[437] European Commission: Digital Agenda for Europe, *Country Information – Luxembourg*, https://ec.europa.eu/digital-agenda/en/country-information-luxembourg (accessed Oct. 6, 2014).

[438] Telegeography GlobalComms Database: *Luxembourg* (2014) (accessed Oct. 6, 2014).

[439] *Id.*

[440] *Id.*

[441] *Id.*

[442] *Id.*

[443] Telegeography CommsUpdate, *Orange Achieves 74% LTE Coverage* (June 20, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/20/orange-achieves-74-lte-coverage/ (accessed Oct. 6, 2014).

[444] Telegeography GlobalComms Database: *Luxembourg* (2014) (accessed Oct. 6, 2014).

[445] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[446] *Id.*

[447] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[448] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

Mobile wireless broadband subs (Dec. 2013)[449]	469,300

26. Mexico

Regulation: In March 2013, President Peña Nieto submitted a bill to amend the Mexican Constitution that contained significant reforms to Mexico's telecommunications and broadcasting sectors. Approved by Congress in April, the law was ratified by the Mexican states and was signed into law in June 2013. The Constitutional amendment establishes that the state will guarantee the right of access to information and communications technologies, including broadband and the Internet. The law also created a new entity, the Federal Institute of Telecommunications (IFT) the independent regulator as well as the sole antitrust authority for the telecommunications and broadcasting sectors. IFT has the power to grant and revoke licenses and promote competition by enforcing asymmetric measures against dominant carriers. The new law also opens up direct foreign investment in Mexico's telecommunications and satellite sectors to 100 percent. Direct foreign investment in broadcasting will be limited up to 49 percent, subject to reciprocity.

In January 2012, the government announced that it was aiming to promote adoption of high-speed Internet through the sale of concessions that would allow winning bidders to utilize state-owned fiber optic lines held by utility Comisión Federal de Electricidad (CFE), as well as fiber links running along the federal highway network, to build networks in areas of the country currently without access to broadband services. The government planned to launch 1,000 new access points on CFE's fiber optic network and to increase the current 20,000 kilometers of fiber to 30,000 kilometers. However, pursuant to the new law, the CFE will now transfer its license to install and operate the public telecommunications network to another state-owned entity, Telecomunicaciones de México (Telecomm), which will use CFE's fiber optic network to develop the envisioned nationwide backhaul network and provide services directly to underserved communities.

Mexico's constitutional reforms mandate that 90 megahertz of the 700 MHz band, which will be freed as a result of the DTV transition in 2015, is to be utilized for the installation and operation of a shared public wireless broadband network to be operated by an independent wholesaler. The government will consider public and private investments to fund construction of this "carrier of carriers" network, but has not yet articulated the details on how the network will be licensed and operated.[450] In October 2013, the Secretariat of Communications and Transportation (SCT) announced that the government had reached a deal with the concessionaries to recover 130 megahertz in the 2.5 GHz band, which the government can auction for 4G services.[451]
To complement the constitutional reform of the telecommunications sector, and to implement the public policies and actions related to the constitutional right of access to ICT, President Enrique Peña Nieto announced the launch of a new National Digital Strategy in November 2013, with the goal of making the best use of technology for Mexico's development. The National Digital Strategy focuses on five pillars of digital development; e-government, e-commerce, education,

[449] *Id*.

[450] Pacto por Mexico, *Reforma en material de telecomunicaciones* (Mar. 11, 2013), http://pactopormexico.org/reforma-telecomunicaciones/.

[451] BNAmericas, *MVS, 10 Other Concessionaries Return 130 MHz of the 2.5 GHz band* (Oct. 15, 2013), http://subscriber.bnamericas.com/Subscriber/index.jsp?idioma=I&tipoContenido=detalle&pagina=content&idContenido=629369&tipoDocumento=1 (accessed Dec. 12, 2013).

healthcare, and public safety.[452]

Market and Competition: In terms of fixed broadband, Telmex, Mexico's incumbent PSTN operator and owner of the country's largest fiber optic network, connects over 90 percent of the population and holds a 63.3 percent subscriber market share as of June 2014. Megacable, the country's largest cable broadband provider and second largest broadband ISP has a 7.7 percent market share, followed by Cablemas (5.4 percent), Cablevision (5 percent), and Axtel (3.6 percent).[453]

As of June 2014, Telcel led the mobile market with a 69.3 percent market share, followed by Telefónica Mexico (Movistar) (19.7 percent), Iusacell (8.2 percent), and Nextel de Mexico (2.8 percent).[454]

Nextel de Mexico officially launched its nationwide 3G network in September 2012, and in October 2012, Movistar rolled out the first stage of its LTE network in Mexico City, Jalisco and Nuevo León.[455] Telcel was the second to launch LTE services in November 2012, and as of August 2014, it has the most extensive 4G network covering 39 cities. In November 2013, Nextel Mexico announced that it plans to launch 4G LTE services in mid-2014,[456] which had not yet happened as of September 2014.

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[457]	11.4	0.7	2.4	8.2	0.1
Fixed broadband subs (Dec. 2013)[458]	13,533,448				
% of households with fixed broadband access (2013)[459]	28.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[460]	14.0				
Mobile wireless broadband subs (Dec. 2013)[461]	16,558,806				

[452] Mexico Office of the President, *Enrique Peña Nieto: We are Determined to Transform Mexico and Place It at the Cutting-Edge of Technology and Knowledge* (Nov. 25, 2013), http://en.presidencia.gob.mx/articles-press/estamos-decididos-a-transformar-a-mexico-y-colocarlo-en-la-frontera-de-la-tecnologia-y-el-conocimiento-enrique-pena-nieto/ (accessed Dec. 12, 2013).

[453] Telegeography GlobalComms Database: *Mexico* (2014) (accessed Sept. 22, 2014).

[454] *Id*.

[455] *Id*.

[456] BNAmericas, *Nextel Mexico Upgrades 4G Network, Plans to Launch LTE in 2014* (Nov. 29, 2013), http://subscriber.bnamericas.com/Subscriber/index.jsp?idioma=I&tipoContenido=detalle&pagina=content&idContenido=633107&tipoDocumento=1 (accessed Dec. 12, 2013).

[457] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[458] *Id*.

[459] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[460] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[461] *Id*.

27. Netherlands

Regulation: In May 2012, the Netherlands became the first European country to adopt a Telecommunications Act codifying net neutrality into law. The law specifies that no service provider can impose fees or special terms and conditions for any Internet service, nor can they determine what sites end users can visit.[462]

In February 2013, the Dutch parliament approved the merger of three separate agencies – the Netherlands Consumer Authority, the Independent Post and Telecommunications Authority of the Netherlands, and the Netherlands Competition Authority – into one new independent regulatory body, the Netherlands Authority for Consumers and Markets (ACM).[463] The ACM, which officially launched operations on April 1, 2013, regulates most aspects of the telecommunications sector in the Netherlands, including competition and consumer protection. The Agentschap Telecom (AT), part of the Ministry of Economic Affairs, retains responsibility for spectrum policy and management.[464]

Previously, in October 2012, AT launched an auction for advanced wireless services in the 800 MHz, 900 MHz, 1800 MHz, 1900 MHz, 2.1 GHz, and 2.6 GHz bands. Four operators won spectrum in the auction, including current mobile operators KPN Mobile, T-Mobile, and Vodafone, as well as new entrant Tele2 Netherlands. The auction generated EUR3.8 billion (US$4.75 billion) in government revenue.[465]

In June 2014, the government of the Netherlands introduced a new draft bill designed to protect the country's telecommunications infrastructure. The bill requires any company or group interested in taking over the incumbent KPN Telecom (Royal KPN) to first secure a "certificate of no objection" from the Ministry of Economic Affairs. The bill comes in the wake of America Movil's failed attempt to take over Royal KPN in late 2013. The government plans to introduce the final bill to Parliament in the spring of 2015, following consultation with the EC.[466]

Market and Competition: The Dutch broadband and mobile markets are reaching saturation because of high penetration and subscription rates.[467] Meanwhile, Dutch consumers are demanding faster broadband Internet connections. An increase in fiber connectivity has positively affected Internet access speeds; according to the ACM, around 12 percent of total broadband subscribers had a connection of at least 100 Mbps.[468] Forecasts predict that there will

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[462] Authority for Consumers & Markets (ACM), *Press Release: Green Light for the Netherlands Authority for Consumers and Markets* (Feb. 26, 2013), https://www.acm.nl/en/publications/publication/11216/Green-light-for-the-Netherlands-Authority-for-Consumers-en-Markets/ (accessed Oct. 6, 2014).

[463] *Id.*

[464] Telegeography GlobalComms Database: *Netherlands* (2014) (accessed Oct. 6, 2014).

[465] *Id.*

[466] Telegeography CommsUpdate, *Dutch Govt Issues Bill to Protect National Telecoms Infrastructure; Seeks Assurances on Any KPN Sale* (June 11, 2014), http://www.telegeography.com/products/commsupdate/ articles/2014/06/11/dutch-govt-issues-bill-to-protect-national-telecoms-infrastructure-seeks-assurances-on-any-kpn-sale/ (accessed Oct. 6, 2014).

[467] Business Monitor International, *Netherlands Telecommunications Report* (January 2014).

[468] Telegeography GlobalComms Database: *Netherlands* (2014) (accessed Oct. 6, 2014).

be more than 3 million fiber lines in service by 2017.[469] Incumbent KPN Telecom is working with joint venture partner Reggefiber to facilitate a phased nationwide rollout of FTTH services, at a total cost of EUR6 billion to EUR7 billion (US$8.2 billion to US$9.6 billion) over the next several years. Other key players in the broadband market include Zesko Holding (28.8 percent market share as of June 2014) and UPC Netherlands (16.0 percent).[470]
Within the mobile market, three main network operators and over 65 MVNOs provide service. As of June 2014, KPN Mobile had 50.8 percent of mobile subscribers, followed by Vodafone (27.1 percent) and T-Mobile (22.1 percent). By the end of 2013, each launched 4G services, and the companies have since focused on the introduction of LTE-A technology.[471] In June 2014, Vodafone announced its plans to deploy LTE-A by the end of the year.[472]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[473]	40.4	3.2	18.7	18.6	0.0
Fixed broadband subs (Dec. 2013)[474]	6,794,000				
% of households with fixed broadband access (2013)[475]	83.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[476]	64.2				
Mobile wireless broadband subs (Dec. 2013)[477]	10,787,000				

28. New Zealand

Regulation: Since 2008, the government of New Zealand has pursued two parallel plans to improve broadband services in the country. Through the Ultra-Fast Broadband (UFB) Initiative, the government will partner with private industry to construct a national fiber optic network designed to offer download speeds of at least 100 Mbps to 75 percent of the country by 2020.[478]

[469] *Id.*

[470] *Id.*

[471] *Id.*

[472] Telegeography CommsUpdate, *Vodafone NL Sets out Stall to Deploy LTE-A By Year-End* (June 12, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/12/vodafone-nl-sets-out-stall-to-deploy-lte-a-by-year-end/ (accessed Oct. 7, 2014).

[473] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct.28, 2014).

[474] *Id*.

[475] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[476] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[477] *Id*.

[478] Ministry of Business, Innovation & Employment, *Ultra-Fast Broadband Initiative*, http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/ultra-fast-broadband-initiative (accessed Sept. 18, 2014).

The Rural Broadband Initiative (RBI) will deliver broadband access at speeds of at least 5 Mbps to 86 percent of rural homes and businesses.[479] To help fund the RBI, the government established a new annual Telecommunications Development Levy (TDL), a tax on public network operators.[480] Beyond the UFB and the RBI, New Zealand has also issued a Five Point Broadband Action Plan that provides an overview of the government's efforts to support faster broadband in five key sectors (health, business, education, community, and e-government).[481]

In October 2013, the New Zealand Communications and Information Technology Ministry auctioned nine 2×5 megahertz blocks of 700 MHz spectrum acquired by the government during New Zealand's digital switchover. Mobile providers Spark (formerly Telecom Mobile), Vodafone New Zealand, and Two Degrees Mobile (2degrees) each won blocks of the 700 MHz band.[482] The government did not set aside any spectrum for either emergency services or Maori groups, despite the latter's expectations. In February 2013, however, the government outlined plans to establish a US$25 million ICT development fund intended in part to help the Maori benefit from new ICT technologies.[483] This fund is distinct from New Zealand's TDL, which is intended to pay for the supply of rural services generally.

Market and Competition: In February 2014, incumbent Telecom New Zealand dealt with a steady decline in traditional fixed line earnings by rebranding as Spark and emphasizing its operations in other sectors, including mobile and Internet.[484] Spark led the fixed broadband market with 49.2 percent market share as of June 2014, followed by Vodafone New Zealand (31.0 percent), CallPlus (8.0 percent), and Orcon (5.1 percent).[485]

Three carriers comprise the mobile market: Vodafone New Zealand (with 37.9 percent market share), followed by Spark (32.7 percent), and budget-priced newcomer 2degrees (29.4 percent). In February 2013, Vodafone launched New Zealand's first commercial 4G LTE services, which had an estimated 350,000 subscribers by the end of March 2014.[486] Spark rolled out its LTE

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[479] Ministry of Business, Innovation & Employment, *Rural Broadband Initiative*, http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/rural-broadband-initiative (accessed Sept. 18, 2014).

[480] Commerce Commission, *Telecommunications Development Levy (TDL)*, http://www.comcom.govt.nz/regulated-industries/telecommunications/industry-levy-and-service-obligations/telecommunications-development-levy-tdl/ (accessed Sept. 18, 2014).

[481] Ministry of Business, Innovation & Employment, *Government Action Plan for Broadband*, http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/government-action-plan-for-broadband (accessed Sept. 18, 2014).

[482] Telegeography CommsUpdate, *Telecom, Vodafone, 2degrees Scoop 700 MHz Spectrum* (Oct. 30, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/10/30/telecom-vodafone-2degrees-scoop-700mhz-spectrum/ (accessed Jan. 13, 2014).

[483] Telegeography CommsUpdate, *New Zealand Outlines Plans to Offer 700 MHz Spectrum* (Feb. 21, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/02/21/new-zealand-outlines-plans-to-offer-700mhz-spectrum/ (accessed Jan. 13, 2014).

[484] IT News, *Telecom NZ Exits Australia, Rebrands as Spark* (Feb. 21, 2014), http://www.itnews.com.au/News/372972,telecom-nz-exits-australia-rebrands-as-spark.aspx (accessed Sept. 18, 2014).

[485] Telegeography GlobalComms Database: *New Zealand* (2014) (accessed Sept. 18, 2014).

[486] Telegeography CommsUpdate, *Vodafone Launches LTE in Auckland* (Feb. 28, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/02/28/vodafone-launches-lte-in-auckland/ (accessed Jan. 13, 2014).

network in November 2013,[487] and 2degrees introduced 4G LTE in June 2014.[488]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[489]	30.2	0.5	1.5	28.3	0.0
Fixed broadband subs (Dec. 2013)[490]	1,341,846				
% of households with fixed broadband access (2012)[491]	75.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[492]	85.9				
Mobile wireless broadband subs (Dec. 2013)[493]	3,816,733				

29. Norway

Regulation: Norway developed a national digital agenda in line with the European Digital Agenda published in 2012.[494] Entitled "ICT Policy for Economic Growth and Value Creation," the document was published and presented to parliament in March 2013 and approved by the Council of State on the same day. The goal of Norway's national digital agenda is for 100 percent of households to have access to good basic quality broadband, with at least 2 Mbps download speeds.

In November 2012, the Norwegian Post and Telecommunications Authority (NPT) completed its spectrum auction in the 1920-1980 and 2110-2170 MHz bands.[495] New entrants were encouraged to participate; however, the three existing mobile operators – Telenor, TeliaSonera's NetCom, and Tele2 Norge – were the only winning bidders in the auction. Each operator won 2×20 megahertz of spectrum.[496] NPT auctioned additional spectrum in the 800 MHz, 900 MHz, and

[487] Telegeography CommsUpdate, *Telecom Mobile Clarifies LTE Launch Date; Confirms Participation in 700 MHz Auction* (Oct. 7, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/10/07/telecom-mobile-clarifies-lte-launch-date-confirms-participation-in-700mhz-auction/ (accessed Jan. 14, 2013).

[488] Telegeography GlobalComms Database: *Two Degrees Mobile Ltd (2degrees)* (2014) (accessed Sept. 18, 2014).

[489] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[490] *Id*.

[491] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[492] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[493] *Id.*

[494] European Commission, *Implementation of the Digital Agenda for Europe*, http://www.daeimplementation.eu/indicator.php?id_country=28&action_n=46 (accessed Aug. 2, 2013).

[495] Telegeography GlobalComms Database: *Norway* (2014) (accessed Sept. 18, 2014).

[496] Cellular-News, *Norwegian Radio Spectrum Auction Ends after Just One Round* (Nov. 19, 2012), http://www.cellular-news.com/story/57412.php (accessed Aug. 2, 2013).

1800 MHz bands in December 2013, with a cap for those operators that already have significant spectrum holdings. The three winners of the auction were Telenor, TeliaSonera's NetCom, and Telco Data. Both Telenor and NetCom won 2×10 megahertz in the 800 MHz band, 2×5 megahertz in the 900 MHz band and 2×10 megahertz in the 1800 MHz band. Telco won 2×10 megahertz in the 800 MHz band, 2×5 megahertz in the 900 MHz band and 2×20 megahertz in the 1800 MHz band.

The 800 MHz band licenses include a coverage obligation; all three winners are required to provide mobile broadband services offering average access speeds of at least 2 Mbps to 40 percent of the population within four years of receiving the licenses. In addition, NetCom's license requires it to provide 98 percent of the population with access to mobile broadband services with average speeds of at least 2 Mbps within five years of receiving its license, primarily through the use of the 800 MHz band.[497]

In July 2014, the NPT announced that it will hold an auction in January 2015 for the three vacant blocks of spectrum in the 1800 MHz band that were not sold in the December 2013 auction.[498]

Market and Competition: Norway currently has close to 100 percent basic broadband coverage.[499] At the end of 2013, fixed broadband covered 98 percent of the population in major cities, and 89 percent of the population in rural areas.[500] Fixed line incumbent Telenor remained the leading broadband provider with 43.8 percent of the market as of June 2014, followed by Altibox (17.4 percent), Get (12.8 percent), NextGenTel (7.1 percent), and Broadnet (3.6 percent).[501]

As of June 2014, the principal mobile operators were Telenor Norge (54.6 percent), Netcom (25.6 percent), Tele2 Norge (17.9 percent) and ice.net (formerly Nordisk Mobiltelefon) (1.9 percent). Multiple MVNOs and service resellers are their competitors. Netcom was the first wireless carrier to launch LTE service in 2009 in the major Nordic cities of Bergen, Oslo, Trondheim, and Stavanger. Telenor Norge, the largest mobile operator in terms of subscribers, inaugurated its LTE network in October 2012, rolling out services in 11 cities.[502] Its LTE network covered over 52 percent of the population as of March 2014.[503] Overall, at the end of 2013, LTE was available

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[497] Telegeography CommsUpdate, *NPT Announces Winners of 800 MHz, 900 MHz, and 1800 MHz Frequency Auction* (Dec. 6, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/12/06/npt-announces-winners-of-800mhz-900mhz-and-1800mhz-frequency-auction/ (accessed Dec. 12, 2013).

[498] Telegeography CommsUpdate, *NPT to Re-Auction 1800 MHz Spectrum in January 2015* (Jul. 3, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/07/03/npt-to-re-auction-1800mhz-spectrum-in-january-2015/ (accessed Sept. 23, 2014).

[499] Ministry of Government Administration, Reform and Church Affairs, *Digital Agenda for Norway, Sec. 3*, http://www.regjeringen.no/en/dep/fad/documents/government-propositions-and-reports-/reports-to-the-storting-white-papers/2012-2013/meld-st-23-20122013-2/3.html?id=729012 (accessed Dec. 12, 2013).

[500] European Commission: Digital Agenda for Europe, *Country Information – Norway,* https://ec.europa.eu/digital-agenda/en/scoreboard/norway (accessed Sept. 25, 2014).

[501] Telegeography GlobalComms Database: *Norway* (accessed Sept. 23, 2014).

[502] *Id*.

[503] Telenor Group, *Telenor Opens 1000 New 4G Base Stations* (Mar. 12, 2014), http://www.telenor.com/media/articles/2014/telenor-opens-1000-new-4g-base-stations/ (accessed Sept. 23, 2014).

to 68 percent of the population.[504]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[505]	37.0	9.7	11.6	15.7	0.0
Fixed broadband subs (Dec. 2013)[506]	1,881,610				
% of households with fixed broadband access (2013)[507]	88.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[508]	90.4				
Mobile wireless broadband subs (Dec. 2013)[509]	4,590,444				

30. Poland

Regulation: Poland's broadband plan, which was released on January 8, 2014, is fully aligned with the Digital Agenda for Europe, and requires 100 percent coverage at speeds greater than 30 Mbps downlink by 2020 and 50 percent coverage at speeds greater than 100 Mbps by 2020 for all households and businesses.[510]

In February 2013, the Polish regulator, the Office of Electronic Communications (UKE), announced the results of its 1800 MHz spectrum auction: mobile operator P4 won three of the five blocks that were auctioned, and Polska Telefonia Cyfrowa (PTC) won the other two blocks. The winners committed to rolling out 3,200 base stations within 24 months. UKE had planned to auction LTE-suitable frequencies in the 800 MHz and 2.6 GHz band in 2014,[511] but the auction was cancelled in February 2014 after UKE decided that it needed to renew the auction process to ensure more transparency and legal certainty.[512]

As part of the Polish Eastern Broadband Network program, in May 2014, the government announced construction of 1,400 kilometers of fiber optic cable in the eastern province of

[504] European Commission: Digital Agenda for Europe, *Country Information – Norway,* https://ec.europa.eu/digital-agenda/en/scoreboard/norway (accessed Sept. 25, 2014).

[505] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[506] *Id*.

[507] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[508] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[509] *Id*.

[510] European Commission: Digital Agenda for Europe, *Country Information – Poland,* https://ec.europa.eu/digital-agenda/en/country-information-poland (accessed Sept. 25, 2014).

[511] Office of Electronic Communications, *Public Consultation on Auction in the 800 MHz and 2.6 GHz Bands* (Aug. 21, 2013), http://en.uke.gov.pl/public-consultation-on-auction-in-the-800-mhz-and-26-ghz-bands-12833 (accessed Dec. 17, 2013).

[512] Telegeography CommsUpdate, *UKE Cancels 4G Frequency Sale* (Feb. 13, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/02/13/uke-cancels-4g-frequency-sale/ (accessed Sept. 23, 2014).

Swietokrzyskie, the least connected province of the country. Currently, approximately 60 percent of the 1.3 million inhabitants of Swietokrzyskie are connected to the Internet, and the fiber optic cable is expected to make Internet services available to 90 percent of the Swietokrzyskie population when it is deployed by 2015. The government also announced that a similar project will soon be launched in the Podkarpackie (Subcarpathian) province to lay a total of 10,000 kilometers of fiber across eastern Poland over the next 20 months.[513]

Market and Competition: Poland's fixed broadband market is quite competitive, with several operators providing broadband Internet access via multiple technologies. DSL is still the predominant access technology; however, cable and fiber based technologies are competitive alternatives. At the end of 2013, fixed broadband covered about 88 percent of the population in major cities and 75 percent of the population in rural areas, and fixed broadband household penetration reached 69 percent.[514] As of June 2014, incumbent Orange Poland (formerly Telekomunikacja Polska) had 40.3 percent of the country's broadband subscribers, followed by cable operator UPC Poland (16.9 percent), Netia (14.6 percent), Multimedia Polska (9.1 percent), and Vectra (8.5 percent). Other small operators held the remaining 11.6 percent.[515]
There are four major mobile operators, a few smaller network operators, and approximately 300 MVNOs in Poland. The major wireless providers are PTC, which operates as T-Mobile Poland, France Telecom's Orange Poland, Polkomtel and P4 (formerly Netia Mobile). As of June 2014, T-Mobile Poland was the leading mobile operator (27.5 percent of subscribers), followed by Orange (27.2 percent), Polkomtel (24.1 percent), and P4 (19.8 percent).[516] The remaining 1.5 percent was split among other providers.

Privately owned operator Aero2, which primarily provides infrastructure services to other carriers, was the first operator to launch 4G LTE services.[517] As of May 2013, Aero2's LTE services covered about 48 percent of the population.[518] Polkomtel launched LTE services in October 2012, and covered 50 percent of the population by February 2013 and 62 percent by November 2013.[519] T-Mobile Poland launched LTE services in June 2014, and its 4G network covers approximately 50 percent of the population.[520]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[521]	15.6	0.6	5.7	7.7	1.7

[513] Telegeography CommsUpdate, *Eastern Poland to Benefit from Fibre Broadband Project* (May 14, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/14/eastern-poland-to-benefit-from-fibre-broadband-project/ (accessed Sept. 25, 2014).

[514] European Commission: Digital Agenda for Europe, *Country Information - Poland*, https://ec.europa.eu/digital-agenda/en/scoreboard/poland (accessed Sept. 25, 2014).

[515] Telegeography GlobalComms Database: *Poland* (2014) (accessed Oct. 23, 2014).

[516] *Id*.

[517] *Id.*

[518] *Id.*

[519] *Id.*

[520] Telegeography CommsUpdate, *Go Ahead and Jump: T-Mobile Poland Prepares LTE Launch* (Jun. 4, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/06/04/go-ahead-and-jump-t-mobile-poland-prepares-lte-launch/ (accessed Sept. 25, 2014).

[521] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

Fixed broadband subs (Dec. 2013)[522]	6,022,651
% of households with fixed broadband access (2013)[523]	69.0
Wireless	
Mobile wireless broadband subs per 100 inhabitants[524]	61.3
Mobile wireless broadband subs (Dec. 2013)[525]	23,594,131

31. Portugal

Regulation: On December 31, 2012, the Portuguese government published its new national Digital Agenda, designed to align its national priorities with the EC's Digital Agenda for Europe. The new plan is also in line with two of Portugal's national plans – the National Strategic Program for Entrepreneurship and Innovation, which was launched in December 2011, and the 2011 Overall Strategic Plan to Rationalize and Reduce ICT Costs in Public Administration. The key objectives of the Digital Agenda include: (1) promoting broadband development so that citizens have access to broadband speeds of 30 Mbps or more by 2020; (2) ensuring that 50 percent of households have access to broadband speeds of 100 Mbps or more by 2020; (3) increasing the use of ecommerce by 50 percent by 2016; (4) having 50 percent of the population use online public services by 2016; and (5) promoting the use of new technologies and reducing the number of people who have never used the Internet by 30 percent by 2016.[526]

Market and Competition: As of June 2014, the main fixed broadband providers were MEO (Portugal Telecom) (49.7 percent market share), Nos (merger of Zon and Optimus) (34.8 percent), Vodafone Portugal (9.1 percent), and Cabovisão (5.7 percent).[527]
As of June 2014, Portugal Telecom's wireless subsidiary, MEO (formerly Telecomunicações Móveis Nacionais (TMN)), was the wireless market leader with 47.1 percent of subscribers, followed by Vodafone Portugal (32.5 percent) and Nos (20.4 percent). By year end 2013, LTE was available to 91 percent of the population.[528] As of June 2014, MEO had the most extensive 4G network coverage reaching 93 percent of the population, while Nos and Vodafone both covered about 90 percent of the population.[529]

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[522] *Id*.

[523] Eurostat, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_r_broad_h&lang=en (accessed Oct. 15, 2014).

[524] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[525] *Id*.

[526] Agenda Portugal Digital, http://www.portugaldigital.pt/objetivos/ (accessed Dec. 19, 2013). *See also* Anacom, *Digital Agenda for Portugal* (Jan. 18, 2013), http://www.anacom.pt/render.jsp?contentId=1150167 (accessed Dec. 19, 2013).

[527] Telegeography GlobalComms Database: *Portugal* (2014) (accessed Sept. 25, 2014).

[528] European Commission: Digital Agenda for Europe, *Country Information - Portugal*, https://ec.europa.eu/digital-agenda/en/scoreboard/portugal (accessed Sept. 25, 2014).

[529] Telegeography GlobalComms Database: *Portugal* (2014) (accessed Sept. 25, 2014).

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[530]	24.1	4.4	9.3	10.5	0.0
Fixed broadband subs (Dec. 2013)[531]	2,528,604				
% of households with fixed broadband access (2013)[532]	58.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[533]	37.5				
Mobile wireless broadband subs (Dec. 2013)[534]	3.932,347				

32. Singapore

Regulation: In order to promote efficiency and competitiveness, Singapore's Info-communications Development Authority (IDA) issued new regulations in 2012 and established a "dominant" and "non-dominant" licensing scheme. As of March 2014, the dominant licensees were Singapore Telecommunications (SingTel), CityNet Infrastructure Management, OpenNet, and StarHub Cable vision.[535]

In June 2013, IDA allocated additional 4G radio frequencies in the 1800 MHz and 2500 MHz bands to Singapore's "Big Three" mobile operators: SingTel Mobile, StarHub, and M1 Limited.[536] The 4G licenses are valid from 2015 to 2030 and require the operators to provide nationwide street-level coverage for LTE by June 2016.

Market and Competition: Three operators dominate the broadband market: as of June 2014, SingTel led the market with 40.9 percent market share, followed by StarHub (32.2 percent), and M1 Limited (6.6 percent). Start-up operator MyRepublic, founded in February 2012, has challenged the "Big Three" in recent years and currently holds about 5 percent of the market.[537] Due to the government's Next Generation Nationwide Broadband Network (NGNBN) project initiated in 2009, fixed broadband infrastructure is near ubiquitous in Singapore.[538] Technology preferences are shifting as ultra-high speed Fiber/LAN options replace cable and ADSL.[539] Additionally, between one and two million people regularly access the web through WiFi

[530] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[531] *Id*.

[532] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[533] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[534] *Id*.

[535] Telegeography GlobalComms Database: *Singapore* (2014) (accessed Sept. 19, 2014).

[536] Telegeography CommsUpdate, *IDA Allocates Additional 4G to Singapore's "Big Three"* (July 1, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/08/23/citynet-to-buy-opennet-subject-to-approval/ (accessed Jan. 14, 2014).

[537] Telegeography GlobalComms Database: *Singapore* (2014) (accessed Sept.19, 2014).

[538] *Id.*

[539] *Id.*

hotspots or Wireless@SG zones. Initiated in February 2005, the Wireless@SG initiative emerged from the government's 10-year ICT agenda, Intelligent Nation 2015 (iN2015). By the end of 2013, there were at least 7,500 public hotspots in Singapore.[540]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[541]	25.70	n/a	n/a	n/a	n/a
Fixed broadband subs (2013)[542]	1,390,800				
% of households with fixed broadband access (2013)[543]	87				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[544]	136.64				
Mobile wireless broadband subs (Q1 2013)[545]	7,394,000				

33. Slovak Republic

Regulation: The Slovak Republic adopted its National Strategy for Broadband Access (Broadband Strategy) in March 2011, setting as a primary objective the release of digital dividend spectrum in the 800 MHz band for the development of mobile broadband services by 2013 and access to high-speed Internet connection of at least 30 Mbps for all households by the end of 2020.[546] In March 2012, the Telecommunications Regulatory Authority of the Slovak Republic (TUSR) completed its consultation on its proposed auction of the 800 MHz, 1800 MHz, and 2600 MHz bands. The tender process began in August 2013.[547] Four operators won licenses: SWAN acquired 2×15 megahertz in the 1800 MHz band; Orange Slovensko acquired 2×10 megahertz in the 800 MHz, 2×4.8 megahertz in the 1800 MHz and 2×30 megahertz in the 2600 MHz bands; Slovak Telekom acquired 2×10 megahertz in the 800 MHz, 2×40 megahertz in the 2600 MHz FDD and 50 megahertz in the 2600 MHz TDD bands; and Telefónica O2 Slovakia won 2×10 megahertz in the 800 MHz and 2×0.6 MHz in the 1800 MHz bands. Licenses were issued in December 2013, and most operators launched 4G services in the first half of 2014, with Orange planning a full scale launch by the end of the year. The 800 MHz band licenses required licensees to cover 25 percent of the Slovak population by December 2015, 50 percent by

[540] *Id.*

[541] ITU Statistics Database (accessed Oct. 28, 2014).

[542] *Id*.

[543] *See* http://www.ida.gov.sg/Infocomm-Landscape/Facts-and-Figures/Infocomm-Usage-Households-and-Individuals#2b.

[544] ITU World Telecommunication/ICT Indicators 2014, Economy Tables (accessed Oct. 29, 2014).

[545] *Id.*

[546] Telegeography GlobalComms Database: *Slovakia* (accessed Nov. 2, 2012).

[547] Telecommunications Regulatory Authority, *An Invitation to Submit Bids for a Tender to Issue Individual Permits to Use Frequencies From the 800 MHz, 1800 MHz and 2600 MHz Frequency Bands in the Form of an Electronic Auction* (Aug. 27, 2013), http://www.teleoff.gov.sk/data/files/35571.pdf (accessed Dec. 19, 2013).

December 2017, and 70 percent by the end of 2018.[548] The 1800 and 2600 MHz licensees, in turn, are required to cover 25 percent of the population by December 2015 and 50 percent by December 2018.

In December 2013, the Slovak Republic's Parliament passed a law merging the Telecommunications Regulatory Authority with the Postal Regulatory Authority, creating a new Regulatory Office for Electronic Communications and Postal Service which began operations in January 2014.[549]

Market and Competition: As of June 2014, Slovak Telecom, the country's sole provider of ADSL infrastructure-based services, remained the dominant fixed broadband provider, with a market share of 38.6 percent. Orange Slovensko, the leading mobile operator, was the second largest broadband provider with a 10.4 percent market share, and, UPC Slovakia, the largest cable company, was the third largest broadband provider with a 9.8 percent market share.[550]
The Slovak Republic's mobile market is divided among three major mobile operators. As of June 2014, Orange Slovensko had a 42 percent market share by subscribers, followed by Slovak Telecom's mobile arm (33.7 percent), and Spanish-owned O2 Slovakia (24.2 percent).[551] Slovak Telecom was the first operator to launch a nationwide 4G LTE network in the Slovak Republic in November 2013.[552] Orange Slovensko launched its LTE network in July 2014.[553] O2 Slovakia plans to launch its LTE network in December 2014.[554] At the end of 2013, 4G LTE was available to 24 percent of the population.

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[555]	15.6	4.9	2.6	8.1	0.0
Fixed broadband subs (Dec. 2013)[556]	845,997				
% of households with fixed broadband access (2013)[557]	55.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[558]	55.3				

[548] *Id*.

[549] Telegeography GlobalComms Database: *Slovakia* (2014) (accessed Oct. 3, 2014).

[550] *Id.*

[551] *Id*.

[552] *Id.*

[553] Telegeography CommsUpdate, *Orange Slovakia Launches 4G in Three Cities* (Jul. 8, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/07/08/orange-slovakia-launches-4g-in-three-cities/ (accessed Oct. 3, 2014).

[554] Telegeography CommsUpdate, *O2 Schedules Full-Blown LTE Launch for December; Expands 3G Coverage* (Sept. 29, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/09/29/o2-schedules-full-blown-lte-launch-for-december-expands-3g-coverage/ (accessed Oct. 3, 2014).

[555] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[556] *Id*.

[557] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[558] OECD Broadband Portal, Table 1(d)(2) (December 2012) (accessed Oct. 28, 2014).

Mobile wireless broadband subs (Dec. 2013)[559]	2,992,742

34. Slovenia

Regulation: In December 2012, Slovenia became the second country in Europe (after the Netherlands) to adopt net neutrality legislation. Article 203(1) of the Electronic Communications Act directs the Slovenian government to promote an "open and neutral" Internet and affirms that consumers should have the opportunity to make their own choices about their Internet access and use. Article 203(3) prohibits ISPs from throttling Internet traffic. Finally, Article 203(5) prevents the anticompetitive use of data caps.[560]

In March 2013, during the license renewal process, Slovenia's regulator, the Post and Electronic Communications Agency (APEK), reassessed the value of the 900 MHz concessions of Telekom Slovenije and Si.Mobil (a subsidiary of Telekom Austria) (each issued 15-year licenses (2x12.5 megahertz of spectrum) in 1998). APEK determined that the current value of the 900 MHz spectrum was an estimated 10 percent higher than it was in 1998; the new license terms would be technology neutral and allow for the provision of 3G UMTS and 4G LTE technologies, compared to the original licensing terms, which only allowed 2G GSM-based services. APEK calculated a final cost value of EUR 5,256 (approx. US$6,650) per 1 megahertz per month, and proposed that operators pay the total fees for their renewed license in a single installment.[561]
Additional 1800 MHz and 2100 MHz band frequencies, suitable for LTE or other mobile broadband, were auctioned in Q2 2013. Spectrum that was auctioned included eight 2×5 megahertz sub-bands in the 1800 MHz range (1710-1720 and 1755-1785 MHz paired with 1805 - 1815 MHz and 1850 -1880 MHz) valid until January 3, 2016; plus two 2×5 megahertz sub-bands in the 2100 MHz band (1955-1965 MHz paired with 2145-2155 MHz) valid until September 21, 2021. Telekom Slovenije, Si.Mobil and Tusmobil each had their bids approved.[562]
In July 2013, the EC did not approve Slovenia's request to delay issuing the 800 MHz digital dividend wireless broadband spectrum to the first half of 2014. The EU-wide deadline for issuing the 800 MHz spectrum was January 1, 2013. The EC noted in its refusal of the request that Slovenia's delay was "due to the organization of the authorization process and not to exceptional circumstances preventing the availability of the band." The EC did not mention potential penalties for the delay in its announcement.[563]

In September 2013, the APEK announced that a 4G auction of multi-band (800 MHz, 900 MHz, 1800 MHz, 2100 MHz, and 2600 MHz) frequency licenses would commence on March 25, 2014. APEK proposed to offer the entirety of the available frequencies in these bands, as well as all remaining unlicensed spectrum in the 2100 MHz range, all under technology-neutral licenses. On December 30, 2013, APEK announced that it was accepting bids and that 500 megahertz would be available for auction. APEK also announced various coverage obligations associated

[559] *Id*.

[560] For an English translation of the relevant provisions of the law, see *Slovenia Net Neutrality Law 2012*, http://www.scribd.com/doc/144614369/Slovenia-Net-Neutrality-law-2012. *See also Slovenia Reinforces Net Neutrality Principles* (Jan. 3, 2013), http://radiobruxelleslibera.wordpress.com/2013/01/03/slovenia-reinforces-net-neutrality-principles/ (accessed Nov. 3, 2014).

[561] Telegeography GlobalComms Database: *Slovenia* (2014) accessed Sept. 4, 2014).

[562] *Id.* As of June 2014, APEK has not announced the winners of each particular packet of spectrum.

[563] *Id.*

with particular licenses. Existing Slovenian mobile network operators acquiring 800 MHz and/or 900 MHz licenses must cover 25 percent of the population in one year, 50 percent in two years and 75 percent in three years. New entrants that win 800 MHz and/or 900 MHz licenses must cover 25 percent of the population in two years, 50 percent in three years and 75 percent in five years. In addition, APEK specified that the winner of a particular block of 800 MHz frequencies must provide mobile and/or fixed wireless broadband services capable of 10 Mbps (outdoor coverage) data speeds to 95 percent of the population in three years, although it may use any combination of its spectrum bands to achieve this target. Additionally, the operator assigned the specified 800 MHz block must also provide coverage to approximately 300 rural settlements/areas (with coverage of 75 percent of these listed areas within three years). For 1800 MHz and 2600 MHz licensees, APEK required the winner to cover 25 percent of the population in three years and 40 percent within five years. The auction was estimated to yield up to EUR200 million.[564]

In January 2014, APEK was renamed the Agency for Communications Networks and Services (AKOS). On April 28, 2014 AKOS announced the results of the multi-band spectrum auction. AKOS raised a total of EUR148.741 million (US$206 million). The only three bidders were existing operators Telekom Slovenije, Si.Mobil, and Tusmobil. All available spectrum was allocated except 20 megahertz in the 1800 MHz band and 10 megahertz in the 2100 MHz FDD band. Frequencies issued in the 800 MHz, 2100 MHz and 2600 MHz bands will be available immediately after the official decision on issuance of licenses. New 900 MHz and 1800 MHz concessions are valid beginning January 2016. All licenses last for 15 years except for those in the 2100 MHz band, which are valid until September 2021.[565]

Market and Competition: Slovenia's former monopoly, Telekom Slovenije, is the country's dominant provider of broadband services via its Si.OL Internet service provider division, but its competitors are steadily increasing their market share. In March 2014, Telekom Slovenije held 37.0 percent of the broadband market, followed by Telemach (17.8 percent), T-2 (17.2 percent), Amis (12.1 percent), and Tus Telekom (1.7 percent). According to APEK, there were 74 broadband access providers in Slovenia as of October 2013.[566]
Fiber-based alternatives including FTTH and fiber-to-the-building (FTTB) have emerged as viable competitive broadband access technologies, accounting for 97,000 high-speed connections, or 18.6 percent of the country total, by mid-2013, up from 16.9 percent the previous year. The largest proponent of FTTx is domestically-owned quad-play operator T-2 which, according to APEK, represented 50.6 percent of the fiber access market by mid-2013, followed by Telekom Slovenije (37.0 percent). With these two operators leading the rollout, FTTH/FTTB coverage has reached approximately 50 out of 210 municipalities, mostly concentrated in cities and larger settlements.[567]

In the mobile sector, Telekom Slovenije's mobile division, Mobitel, was the dominant wireless carrier with a market share of 54.5 percent, followed by Si.Mobil (30.0 percent), Tusmobile (12.7 percent) and T-2 (2.7 percent), as of June 2014. Prior to APEK's decision to allocate limited frequencies for LTE testing in October 2012, Si.Mobil began testing LTE on its existing 1800 megahertz spectrum in 2011. In July 2012, Si.Mobil launched Slovenia's first commercial 4G

[564] *Id.*

[565] *Id.*

[566] *Id.*

[567] *Id.*

LTE mobile broadband services covering parts of Ljubljana, Brnik and Bled. LTE users are promised data rates of 30-80 Mbps, with a theoretical peak of 100 Mbps.[568] Mobitel launched LTE-1800 services in March 2013.[569]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[570]	25.1	5.2	7.5	12.3	0.1
Fixed broadband subs (Dec. 2013)[571]	502,157				
% of households with fixed broadband access (2013)[572]	74.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[573]	42.4				
Mobile wireless broadband subs (Dec. 2013)[574]	873,168				

35. Spain

Regulation: In 2013, Spain overhauled and merged several of its federal agencies, including its independent regulator, Comisión del Mercado de las Telecomunicaciones (CMT). As of October 7, 2013, all activities and functions of the CMT were integrated into the new Comisión Nacional de los Mercados y la Competencia (CNMC). As a result, CNMC is now responsible for the telecommunications, emergency, transportation, and postal sectors .[575]

In May 2013, the CNMC's predecessor, CMT, announced plans to cut the prices for wholesale access to Telefónica's broadband networks. The EC subsequently opened an investigation into the proposed rate change to determine whether it would discourage foreign broadband investment in Spain or pose obstacles to the EU's single market initiatives. The EC directed Spain to work with the Body of European Regulators of Electronic Communications (BEREC) to resolve the case.[576] In October 2013, the EC concluded its investigation and urged the CNMC to amend or withdraw its proposed setting of broadband prices for Telefónica, the dominant market player.[577]

[568] *Id.*

[569] *Id.*

[570] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[571] *Id.*

[572] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[573] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[574] *Id.*

[575] Comisión Nacional de los Mercados y la Competencia (CNMC), *Sobre la CNMC*, http://www.cnmc.es/es-es/cnmc/sobrelacnmc.aspx (accessed Oct. 7, 2014).

[576] European Commission, *Press Release: Commission Questions Spanish Regulator's Price Regulation of Wholesale Broadband Access* (June 27, 2013), http://europa.eu/rapid/press-release_IP-13-621_en.htm (accessed Oct. 7, 2014).

[577] European Commission, *Press Release: European Commission Urges Spanish Regulator to Amend or Withdraw Wholesale Broadband Access Fees Proposal* (Oct. 28, 2013), http://europa.eu/rapid/press-release_IP-13-1001_en.htm (accessed Oct. 7, 2014).

In May 2014, the Spanish Parliament approved a new General Telecommunications Act. The amendments to the bill are intended to enhance guarantees of users' rights; consolidate and clarify the powers of the telecommunications regulatory agency, the CNMC; and facilitate the expansion of broadband access.[578] The Act commits the government to ensuring that the entire population has access to broadband speeds of 10 Mbps by 2017. In line with the EU-wide Digital Agenda for Europe, the Act also sets out the following broadband target: by 2020, 100 percent of the Spanish population will have access to download speeds of at least 30 Mbps, and 50 percent of homes will have access to download speeds of at least 100 Mbps.[579]

Market and Competition: Telefónica Espana (Movistar) led the broadband market with 46.2 percent of subscribers as of June 2014, followed by Orange Espana (14.4 percent), Grupo Corporativo ONO (12.4 percent), Jazz Telecom (11.7 percent), and Vodafone Spain (8.5 percent).[580] Pending approval from the EC, Vodafone and ONO are preparing a merger, with Vodafone set to acquire ONO for EUR7.2 billion (US$9.9 billion).[581] In recent years, the launch of fiber networks has stimulated Spain's otherwise stagnating broadband market.[582]
As of June 2014, Telefónica Espana (35.4 percent) led the mobile market, followed by Orange Espana (30.4 percent), Vodafone Spain (26.2 percent), and Xfera Moviles (8.0 percent).[583] Before the federal agency overhaul, CMT auctioned LTE-suitable spectrum in August 2011, and all four of Spain's major network operators won some spectrum. Between May and October 2013, all four companies launched 4G services.[584] In Spain's struggling economy, mobile operators are attempting to encourage cost-conscious consumers to adopt 4G services by offering those services at no extra charge over 3G services.[585] In December 2013, Vodafone announced that it was testing LTE-A technology,[586] with Orange following suit in March 2014.[587]

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[578] Telegeography CommsUpdate, *Spain Approves New General Telecommunications Act* (May 2, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/02/spain-approves-new-general-telecommunications-act/ (accessed Oct. 7, 2014).

[579] *Id.*

[580] Telegeography GlobalComms Database: *Spain* (2014) (accessed Oct. 7, 2014).

[581] Telegeography CommsUpdate, *Vodafone, ONO to Launch Joint Product Bundles from September; EC Merger Approval Expected in July* (June 11, 2014), http://www.*telegeography*.com/products/commsupdate/articles/2014/ 06/11/vodafone-ono-to-launch-joint-product-bundles-from-september-ec-merger-approval-expected-in-july/ (accessed Oct. 7, 2014).

[582] *Telegeography* GlobalComms Database: *Spain* (2014) (accessed Oct. 7, 2014).

[583] *Id.*

[584] *Id.*

[585] Reuters, *Analysis: Spanish Telecom Firms Show Peril of Pinning Hopes on 4G* (Oct. 1, 2013), http://www.reuters.com/article/2013/10/01/us-spain-4g-analysis-idUSBRE9900QS20131001 (accessed Oct. 7, 2014).

[586] Telegeography CommsUpdate, *Vodafone Spain Carrying Out LTE-Advanced Tests in Madrid* (Dec. 11, 2013), http://www.telegeography.com/products/commsupdate/articles/2013/12/11/vodafone-spain-carrying-out-lte-advanced-tests-in-madrid/ (accessed Oct. 7, 2014).

[587] Telegeography CommsUpdate, *Orange Espana Carrying Out Trials of LTE-A* (Mar. 24, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/03/24/orange-espana-carrying-out-trials-of-lte-a/ (accessed Oct. 7, 2014).

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[588]	26.3	1.4	4.6	20.3	0.0
Fixed broadband subs (Dec. 2013)[589]	12,080,540				
% of households with fixed broadband access (2013)[590]	69.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[591]	68.5				
Mobile wireless broadband subs (Dec. 2013)[592]	31,468,383				

36. Sweden

Regulation: In February 2014, the Swedish regulator, the Post and Telecom Authority (PTS), invited public comment on a new spectrum strategy.[593] PTS plans to increase the availability of usable spectrum by utilizing the "least restrictive" technical conditions in assigning spectrum usage rights and by promoting shared use and secondary market trading of usage rights.[594]

Market and Competition: TeliaSonera Sweden is the market leader for both fixed broadband access and mobile services.[595] On the fixed side, TeliaSonera (36.7 percent) competes with Telenor Sweden (20.4 percent), Com Hern (18.0 percent), and several other smaller providers.[596] DSL remains the most popular broadband technology (with 42.6 percent of subscribers), but fiber connections continue to grow steadily (38.6 percent of subscribers).[597]
In the mobile sector, TeliaSonera leads the market (44.8 percent), followed by Tele2 (25.6 percent), Telenor (17.0 percent), Hi3G Access Sweden (11.7 percent), and Net 1 Sweden (0.9 percent).[598] As of February 2014, the combined 4G networks of Telenor and Tele2 covered approximately 99 percent of the Swedish population.[599]

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[588] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[589] *Id*.

[590] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[591] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[592] *Id*.

[593] Swedish Post and Telecom Authority, *PTS Spectrum Strategy*, http://www.pts.se/en-GB/Documents/Consultations/2014/PTS-Spectrum-Strategy/ (accessed Sept. 8, 2014).

[594] Telegeography GlobalComms Database: *Sweden* (2014) (accessed Sept. 8, 2014).

[595] *Id.*

[596] *Id.*

[597] *Id.*

[598] *Id.*

[599] *Id.*

Wired	Total	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[600]	32.4	12.4	6.0	14.0	0.1
Fixed broadband subs (Dec. 2013)[601]	3,113,400				
% of households with fixed broadband access (2012)[602]	79.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[603]	109.8				
Mobile wireless broadband subs (Dec. 2013)[604]	10,545,000				

37. Switzerland

Regulation: In March 2012, the Federal Council published a report evaluating the telecommunications market.[605] The report recommended a review of the Law of Communications (LTC), originally established for copper networks, to ensure that the legislation keeps pace with technological developments.[606] In March 2014, the Federal Office of Communications (OfCom) announced it had revised the LTC to include next-generation technologies, such as fiber, as a basis for its cost-based wholesale access calculations, instead of exclusively copper-based infrastructure.[607] The changes to the pricing scheme go into effect in July 2014, but they will be phased in over a period of three years.[608]

Switzerland's telecommunications regulator, the Swiss Federal Communications Commission (ComCom), completed its 800 MHz digital dividend auction in February 2012.[609] The country's three mobile network operators, Swisscom, Orange Switzerland, and Sunrise, each won 2×20 megahertz licenses.[610] ComCom also approved the re-farming of spectrum in the 900 MHz and 1800 MHz bands in 2015 and 2017, respectively.[611]

Market and Competition: Incumbent Swisscom is the market leader for both fixed broadband access and mobile services.[612]

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[600] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[601] *Id*.

[602] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[603] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[604] *Id*.

[605] Federal Office of Communications, *Evolution of the Swiss Telecommunications Market: Supplementary Report*, http://www.bakom.admin.ch/dokumentation/gesetzgebung/00512/03498/index.html?lang=en (accessed Sept. 8, 2014).

[606] Telegeography GlobalComms Database: *Switzerland* (2014) (accessed Sept. 8, 2014).

[607] *Id.*

[608] *Id.*

[609] IHS Global Insight, *Switzerland Telecoms Report* (2014) (accessed Sept. 8, 2014).

[610] *Id.*

[611] *Id.*

[612] Telegeography GlobalComms Database: *Switzerland* (2014) (accessed Sept. 8, 2014).

On the fixed side, Swisscom (54.2 percent) competes with Cablecom (20.5 percent), Sunrise (9.6 percent), and several other smaller providers.[613] DSL (with 60.7 percent of subscribers) and cable connections (with 31.6 percent of subscribers) remain the most prevalent broadband technologies.[614]

In the mobile sector, Swisscom leads the market (55.9 percent), followed by Sunrise (21.5 percent) and Orange Switzerland (18.9 percent).[615] In addition to the three mobile network operators, Switzerland boasts a large number of mobile virtual network operators (MVNOs) delivering specialized services to niche markets.[616]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[617]	44.9	3.4	13.2	27.9	0.3
Fixed broadband subs (Dec. 2013)[618]	3,597,000				
% of households with fixed broadband access (2011)[619]	81.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[620]	64.2				
Mobile wireless broadband subs (Dec. 2013)[621]	5,151,300				

38. Turkey

Regulation: The Turkish broadband and wireless markets are regulated by the Bilgi Teknolojileri ve Iletisim Kurumu (BTK), also known as the Information and Communication Technologies Authority (ICTA).[622]

In terms of the introduction of 4G Long Term Evolution (LTE) technologies, as of February 2014, no steps had been taken regarding the issuance of commercial licenses to Turkey's cellular companies. However, on December 20, 2012, Avea was granted permission to test LTE-A technology, and began to test its network on April 4, 2013.[623]

[613] *Id.*

[614] *Id.*

[615] *Id.*

[616] *Id.*

[617] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[618] *Id.*

[619] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[620] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[621] *Id.*

[622] Telegeography GlobalComms Database: *Turkey* (2014) (accessed Sept. 4, 2014).

[623] *Id.*

ICTA was expected to begin issuing licenses for the operation of broadband fixed wireless access (BFWA) networks in the 2.4 GHz and 3.5 GHz bands, including WiMAX, as early as 2009, but the process was delayed for unspecified reasons. As of February 2014, the government has yet to award commercial frequencies for BFWA.[624]

Market and Competition: Fixed line operators, such as incumbent Turk Telekom and competitor Turkcell, are currently building out their fiber networks.[625] Turk Telekom plans to roll out nationwide fiber optic services by the end of 2015.[626]

As of February 2014, the Turkish government owned 31.68 percent of Turk Telekom. As of March 2014, Turk Telekom was the dominant provider of fixed broadband services with a 75 percent market share, followed by Turkcell Superonline (10.5 percent), Turksat (5.7 percent), D-Smart Net (4.3 percent), and Millenicom Turkey (1.2 percent).[627]

In the wireless market Turkcell remained the market leader as of March 2014, with a 49.8 percent share, followed by Vodafone (28.3 percent) and Avea (21.9 percent). While Turkcell's position remains strong, it is gradually losing ground to its two smaller competitors, seeing a year-on-year decrease in its market share of 1.3 percentage points at the end of 2013.[628]
In terms of mobile broadband services, growth has continued unabated, with the number of 3G accesses in Turkey increasing to 30.25 million (end-2011) and 39.25 million (end-2012), before reaching an estimated 48.75 million at the end of 2013.[629]

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[630]	11.2	1.6	0.6	8.9	0.1
Fixed broadband subs (Dec. 2013)[631]	8,382,811				
% of households with fixed broadband access (2013)[632]	46.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[633]	32.3				
Mobile wireless broadband subs (Dec. 2013)[634]	24,183,723				

[624] *Id.*

[625] Telegeography GlobalComms Database: *Turkey* (2014) accessed Mar. 27, 2013).

[626] IHS Global Insight: *Middle East and North Africa - Turkey*: *Analyst Commentary* (accessed Dec. 11, 2012).

[627] Telegeography GlobalComms Database: *Turkey* (2014) (accessed Sept. 4, 2014).

[628] *Id.*

[629] *Id.*

[630] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[631] *Id*.

[632] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[633] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[634] *Id*.

39. United Kingdom

Regulation: In July 2012, Ofcom, the United Kingdom's telecommunications regulatory agency, announced plans for its largest-ever auction of mobile broadband-capable spectrum in the 800 MHz and 2.5/2.6 GHz bands. After discussions with British TV broadcasters resulted in an accelerated timetable for clearance of terrestrial broadcasting spectrum, the auction, originally planned for early 2013, was moved to the end of 2012. Completed in 2013, the auction raised GBP2.34 billion (US$3.87 billion), considerably less than the expected GBP3.5 billion (US$5.79 billion).[635]

In May 2014, Ofcom published its new spectrum management strategy, outlining its priorities for the next 10 years.[636] The strategy document identifies several priority areas, namely: grappling with future mobile data demand, addressing the 700 MHz band and the evolution of free-to-view TV, supporting the release of public sector spectrum, enabling the growth of Machine-to-Machine (M2M) applications, and supporting emergency services.[637]

Market and Competition: Ofcom reports that as of the beginning of 2013, nine out of every 100 people in the United Kingdom (5.7 million people) subscribed to superfast broadband (at least 30 Mbps), putting the United Kingdom ahead of France, Germany, Italy, and Spain.[638] As of June 2014, fixed line incumbent BT Group led the broadband market with a 33.0 percent share of subscribers, followed by BSkyB (23.4 percent), Virgin Media (20.2 percent), TalkTalk (18.8 percent), and EE (3.4 percent).[639]

The United Kingdom's largest mobile network operator by subscribers, EE (a joint-venture between Orange and T-Mobile), was the first mobile provider to commercially launch a 4G network in the country.[640] EE launched its 4G network well in advance of its UK competitors because Ofcom gave EE special permission to launch 4G services on EE's existing spectrum ahead of the 4G auction.[641] By March 2013, EE had covered the homes and businesses of 50 percent of the UK population and was working to further expand its 4G footprint. By the end of 2013, O2, Vodafone, and Hutchison 3G had also launched 4G networks. As of June 2014, EE has the greatest market share by subscribers with 34.4 percent, followed by O2 UK (32.0 percent), Vodafone UK (22.4 percent), and Hutchison 3G (11.1 percent).[642]

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[635] Telegeography GlobalComms Database: *United Kingdom* (2014) (accessed Oct. 7, 2014).

[636] Telegeography CommsUpdate, *Ofcom Publishes Spectrum Management Strategy* (May 1, 2014), http://www.telegeography.com/products/commsupdate/articles/2014/05/01/ofcom-publishes-spectrum-management-strategy/ (accessed Oct. 7, 2014).

[637] Ofcom, *Spectrum Management Strategy* (Apr. 30, 2014), http://stakeholders.ofcom.org.uk/binaries/consultations/ spectrum-management-strategy/statement/statement.pdf (accessed Oct. 7, 2014).

[638] Ofcom, *The European Broadband Scorecard*, http://stakeholders.ofcom.org.uk/binaries/research/broadband-research/scorecard/European_Broadband_Scorecard_2014.pdf (accessed Oct. 7, 2014)

[639] Telegeography GlobalComms Database: *United Kingdom* (2014) (accessed Oct. 7, 2014).

[640] BBC News, *UK's First 4G Mobile Service Launched in 11 Cities by EE* (Oct. 29, 2012), http://www.bbc.co.uk/news/technology-20121025 (accessed Oct. 7, 2014).

[641] Id.

[642] Telegeography GlobalComms Database: *United Kingdom* (2014) (accessed Oct. 7, 2014).

Wired	**Total**	Fiber	Cable	DSL	Other
Fixed broadband subs per 100 inhabitants[643]	35.2	3.7	6.9	24.7	0.0
Fixed broadband subs (Dec. 2013)[644]	22,559,353				
% of households with fixed broadband access (2013)[645]	87.0				
Wireless					
Mobile wireless broadband subs per 100 inhabitants[646]	77.2				
Mobile wireless broadband subs (Dec. 2013)[647]	49,470,645				

[643] OECD Broadband Portal, Table 1(d)(1) (Dec. 2013) (accessed Oct. 28, 2014).

[644] *Id*.

[645] OECD Stat Extracts, stats.oecd.org (accessed Oct. 9, 2014).

[646] OECD Broadband Portal, Table 1(d)(2) (Dec. 2013) (accessed Oct. 28, 2014).

[647] *Id*.

Appendix F
Comparing International Fixed Broadband Speeds

Broadband speeds are often illustrated using three metrics: the advertised speed, the actual speed, and the divergence between the advertised and actual speed. Advertised speeds for a given consumer can generally be obtained either from the ISP serving that consumer or directly from the consumer. The latter approach may create some error (when consumers are not certain of the speed tier that they have subscribed to). Actual speed is measured primarily by two methods: (i) by installing special hardware on an end user's computer that enables the hardware to measure actual download and upload speeds, and (ii) software based tests.[1]

For international cities, the most widely collected speed data are based primarily on software-based tests conducted by Ookla using speedtest.net. These data can be useful in providing an international comparison but certain caveats should be noted. For instance, because this is a software-based test, the physical distance of the end user to the server may be one factor influencing speed measurement. Another point worth noting is that the actual speeds that are observed in each country are a combination of availability and usage. For example, a low average download speed for a country could be a reflection of either more people subscribing to low-speed broadband or poor performance and availability of high-speed broadband. But despite these shortcomings, the Ookla speed data helps in constructing international comparisons because of its large geographic scope and vast number of speed tests.[2] Additionally, the data provide other metrics of network quality that may be used to evaluate broadband performance across countries.

We are aware that other international broadband speed surveys are available. For example, Akamai released its "State of the Internet" report for the second quarter of 2014 in September 2014. According to this report, the United States has an average connection speed of 11.4 Mbps (ranking 14th in the world);[3] however, this measurement cannot be readily compared

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[1] Installing special hardware on an end user's computer is usually preferred as the speed measurement is not biased by the subscriber's computer configuration, the type of connection between the end user and the Internet service provider's (ISP) network, and the physical distance of the end user from the testing server. For example, SamKnows (a company that measures broadband performance and provides related analytics) conducts such hardware based tests for the United States and the United Kingdom (see https://www.samknows.com/#). For the United States, the Federal Communication Commission teamed up with SamKnows to measure the advertised and actual speeds, and the results are summarized in FCC's Report titled "Measuring Broadband America – A Report on Consumer Wireline Broadband Performance in the U.S," available at http://www.fcc.gov/measuring-broadband-america. The FCC releases these reports on a regular basis, most recently in June 2014 (*see* http://data.fcc.gov/download/measuring-broadband-america/2014/2014-Fixed-Measuring-Broadband-America-Report.pdf). For information about the U.K. speed testing, see http://consumers.ofcom.org.uk/internet/broadband-speeds/broadband-speeds-april-14/. However for broad-based international data, software-based tests such as Ookla's speedtest.net are the best available data source.

[2] Since January 2008, Ookla has collected data on over 6.5 billion speed tests. *See* https://www.ookla.com/. In this report, we used data for 2012 and 2013. The 2012 data covers February 1 to December 5, including 40 countries with 3.8 million observations for 14,652 cities. For 2013, the data include 5.1 million observations for 16,372 cities from January 1 to December 15. We excluded January 2012 observations from our data due to unusually high levels of January observations for some countries in comparison to the rest of the year. The end date of the collection period for both 2012 and 2013 corresponds the date Ookla collected the data.

[3] Akamai's State of the Internet, Q2 2014, September 2014, p. 32, available at http://www.akamai.com/html/awe/login.html?WT.mc_id=soti_Q214&campaign_id=F-MC-

to the analysis of the Ookla data presented in this appendix. Akamai calculates its average speeds based on a user request for a specific file, taking into account the file size and the time required to complete delivery of the file.[4] Ookla measures maximum sustainable throughput between the user computer and the nearest server selecting a file size based on a bit test estimate of connection speed. This method measures the speed of the broadband connection when multiple computers or programs are using it.[5] Essentially, more data are used to test the faster connections than slower ones, ensuring the speed data reflect the actual speed experienced by the typical consumer.[6] In addition, Akamai excludes slower connections, *i.e.*, users with a connection speed slower than 4 Mbps. Because this Ookla dataset is aggregated at the city level on a daily basis, we cannot identify individual connection speeds. Thus, the following analysis includes all connection speeds above 256 Kbps.

1. Aggregate Country Rankings Based on Ookla Data

Figure 1a shows the 2012 and 2013 rankings based on average download speed (Mbps) for 40 countries. Data from 2011 is also included in the figure for comparison. The countries included are identical to those included in the Third IBDR with the addition of India and Brazil. These rankings are based on weighted average speed, i.e., the average speed obtained by averaging across cities using the sample size in each city as weights.

The United States ranked 25th of the 40 countries included in the IBDR sample in 2012, with an average download speed of 14.5 Mbps, a 2.86 Mbps improvement from 2011. From 2011 to 2012, the United Kingdom moved from 25th to 22nd with an increase in average download speed from 11.24 Mbps to 16.87 Mbps. As a result, the United State ranked 25th, moving from 24th to 25th of the 40 countries included in this Report. In 2012, Brazil and India ranked 35th and 40th with average download speeds of 6.80 Mbps and 2.27 Mbps, respectively. Our inclusion of data on Brazil and India does not affect the ranking of the United States; however, it does increase the number of comparison countries from 38 in the Third IBDR to 40 in this Report.

Based on the 2013 speed data, the United States ranked 26th of 40 countries, with an average download speed of 18.67 Mbps. Since 2012, Ireland has moved from 28th to 25th,

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22494&curl=/dl/whitepapers/akamai-soti-q214.pdf. South Korea holds the number one position in the Akamai rankings, with an average download speed of 24.6 Mbps. *Id*. at 20. By comparison, Akamai ranks Delaware the fastest state in the United States with an average speed of 16.2 Mbps (globally, Hong Kong ranks second behind South Korea with 15.7 Mbps). *Id*. at 26, 20.

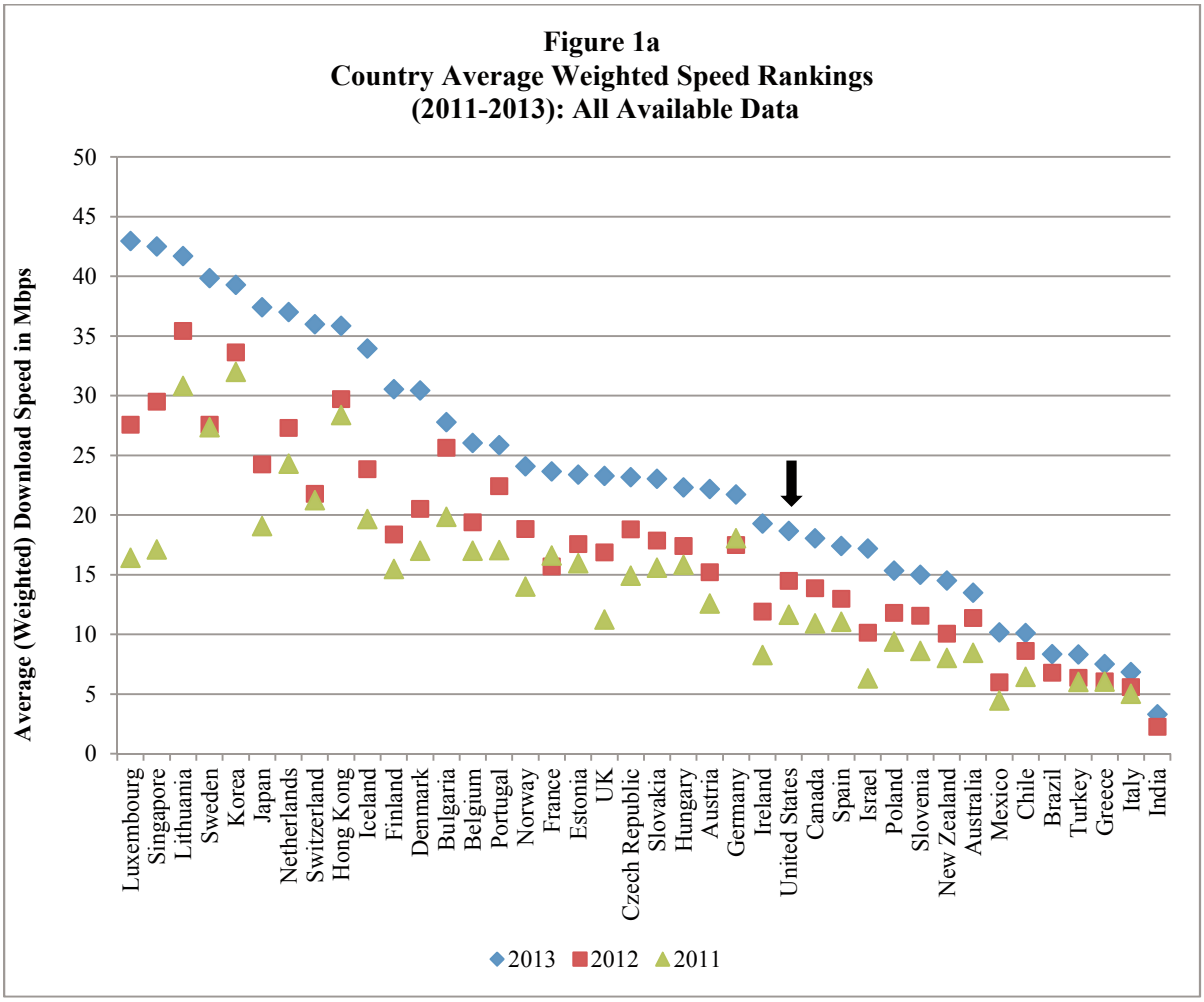
[4] Akamai's methodology for determining connection speed is explained in further detail at https://blogs.akamai.com/2011/11/the-future-internet.html and https://blogs.akamai.com/2013/04/clarifying-state-of-the-internet-report-metrics.html.

[5] This is done by using multiple threads (simultaneous transfers of data) and carefully "right-sizing" the transferred payload." Frequently Asked Questions, Version 1.02, May 26, 2010, pp. 2 – 3.

[6] According to Professors Bauer, Clark and Lehr of MIT, "the Ookla/Speedtest approach – which typically results in higher measured data rates than the other approaches reviewed – was the best of the currently available data sources for assessing the speed of ISP's broadband access service. One of the key differences that accounts for this is that the Ookla/Speedtest tools utilize multiple TCP connections to collect the measurement data which is key to avoiding the receive window limitation. These tests are also much more likely to be conducted to a server that is relatively close to the client running the test." Steve Bauer, David Clark, William Lehr, Massachusetts Institute of Technology, "Understanding Broadband Speed Measurements", http://mitas.csail.mit.edu/papers/Bauer_Clark_Lehr_Broadband_Speed_Measurements.pdf.

reflecting an increase in average download speed from 11.93 Mbps to 19.28 Mbps. In 2013, Brazil fell one spot to 36th, while India's ranking did not change.

Average download speeds in both years increased for the majority of countries in the sample. The data are shown in Figure 1a.[7]



Source: Actual Download Speeds from Net Index by Ookla, weighted by total number of tests. 2011 data was drawn on Dec. 15, 2011; 2012 data was drawn on Dec. 6, 2012; and 2013 data was drawn on Dec. 16, 2013. Brazil and India were not included as sample countries in the Third IBDR (2011).

The median weighted download speed for the United States based on 2012 data was 14.31 Mbps and the United States maintained its ranking of 25th of 40 countries based on the median.[8] This is slightly below the average download speed of 14.5 Mbps. In 2013, the median weighted download speed for the United States increased to 18.43 Mbps, but its ranking fell to 26th of 40 countries. Similar to the United States, most countries have means and medians that

[7] Throughout this Appendix C, references to "figures" signify charts or diagrams within this narrative. References to "tables" refer to the detailed data tables that are collected at the end of this Appendix.

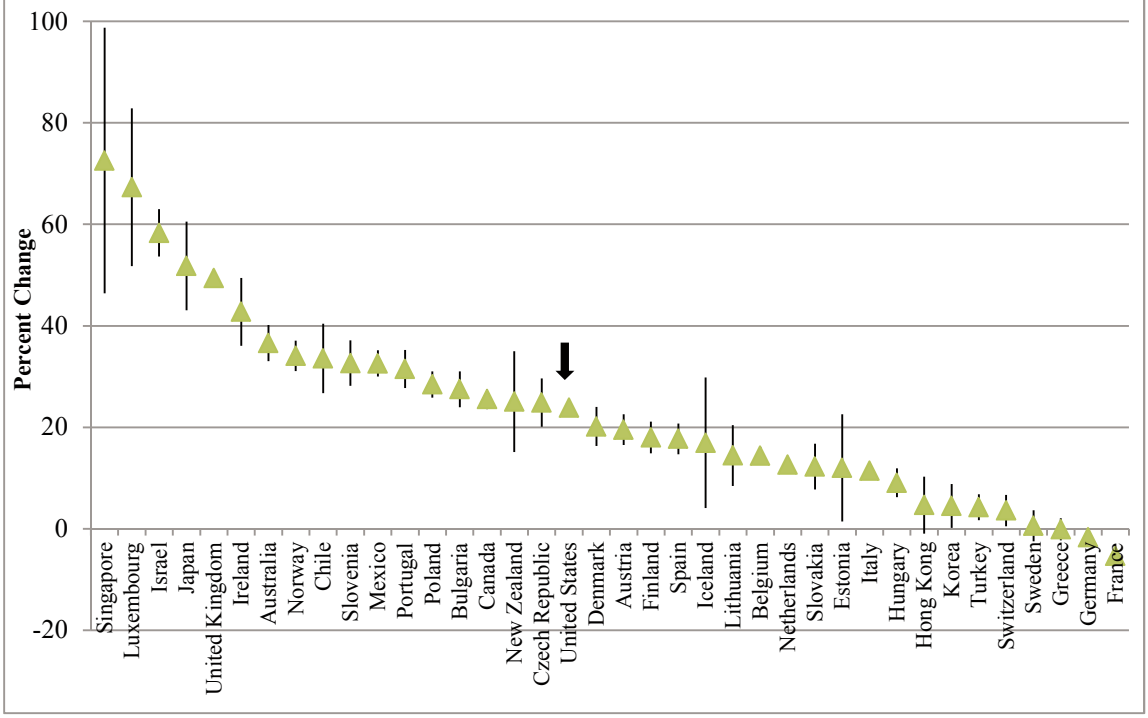
[8] Because the data are aggregated at the city level and do not have individual speed test records, we cannot compute a true median. Here, median refers to the median of the aggregated (average) daily city speed tests weighted by sample size.

are fairly close together, in both the 2012 and 2013 data. Exceptions to this are Luxembourg and Hong Kong, whose 2013 average download speeds exceed their 2013 median download speeds by 8.20 Mbps and 7.34 Mbps respectively. Median speeds are also shown in Appendix F Table 1a.

Figure 1b includes 95 percent confidence interval bands for the percent change in average weighted download speeds between 2011 and 2012. The confidence interval bands measure the margin of error associated with the calculated percent change at a 95 percent confidence level (i.e., that 95 percent of the intervals would include the percent change parameter). Countries where the bounds are close to the estimated percent change have smaller variation in the change from the previous year and smaller overall variance in the average download speeds.

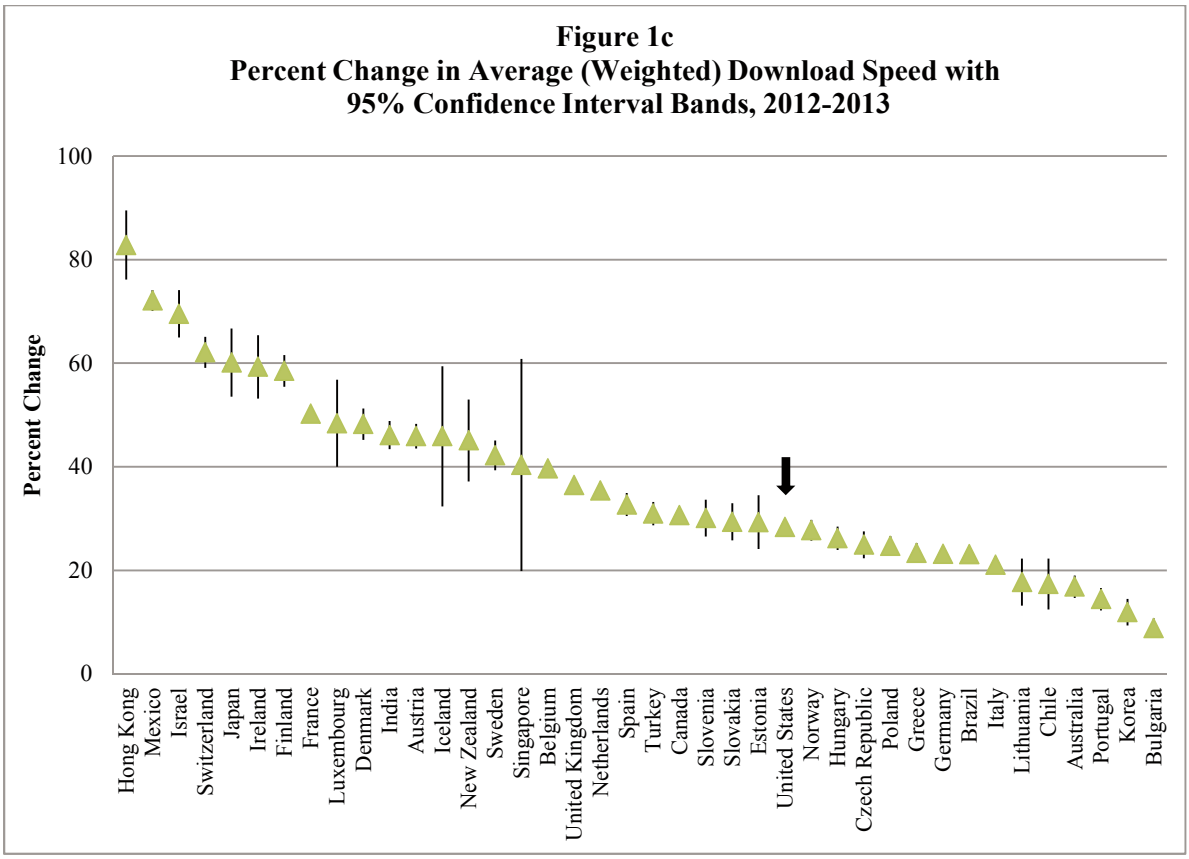
In 2012, the average download speed increase in the United States of 23.87 percent had a lower bound of 23.24 percent and an upper bound of 24.50 percent. Most countries had a positive percent increase. Singapore, Luxembourg, New Zealand, Iceland, and Estonia have the widest confidence interval bands, indicating substantial variation in the percent change from 2011 to 2012. All percent change data are presented in Appendix F Table 1b.

Figure 1b
Percent Change in Average (Weighted) Download Speed with 95% Confidence Interval Bands, 2011-2012



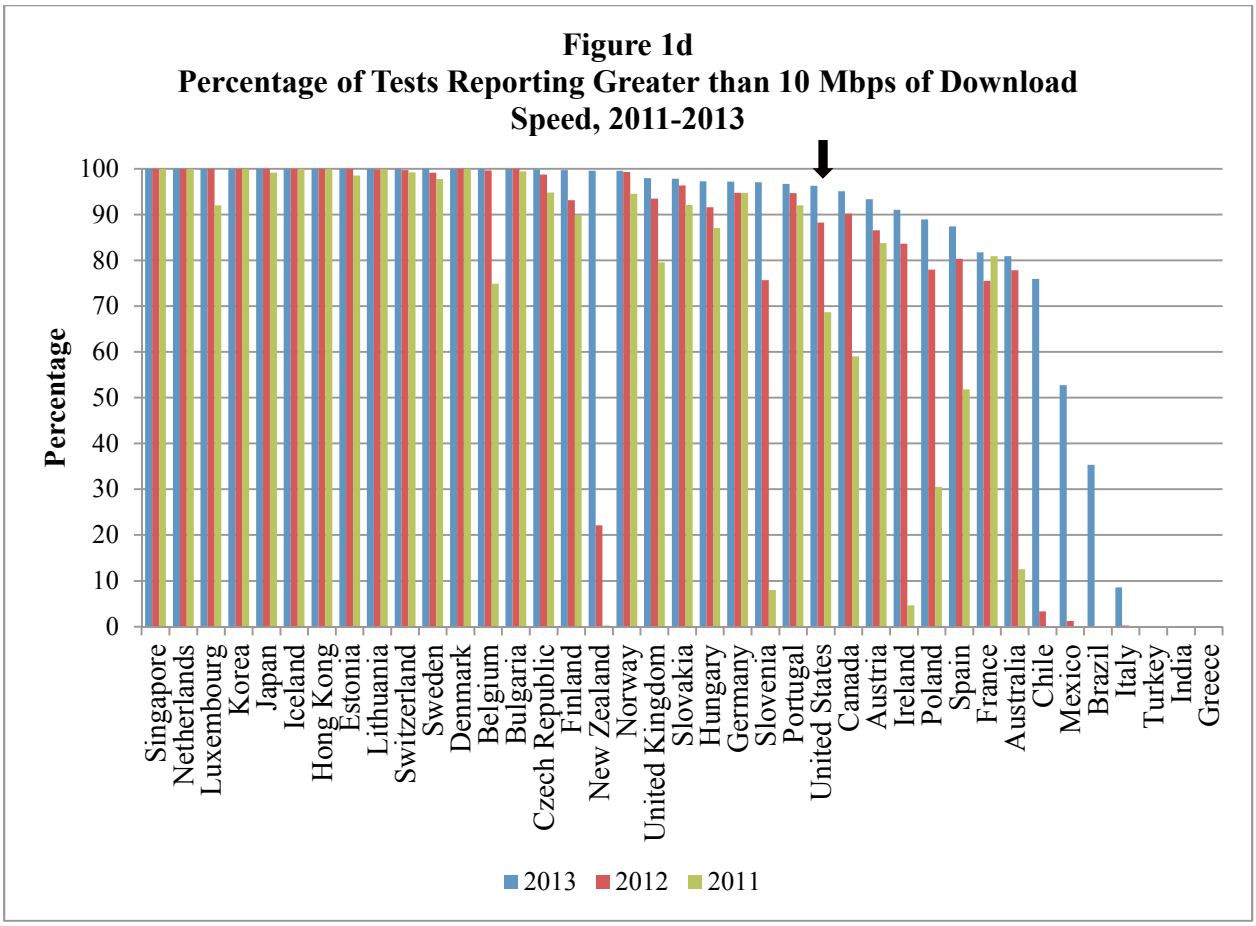
Source: Actual Download Speeds from Net Index by Ookla, weighted by sample size (Data drawn on Dec. 6, 2012). Brazil and India were not included as sample countries in the Third IBDR (2011).

Figure 1c includes 95 percent confidence interval bands for the percent change in average weighted download speeds between 2012 and 2013. The average download speed increase in United States was 28.34 percent, with lower and upper bounds of 27.87 percent and 28.81 percent, respectively. Every country in this report had a positive percent increase. Luxembourg, Iceland, and Singapore had the widest confidence interval bands, indicating substantial variation in the percent change from 2012 to 2013.



Source: Actual Download Speeds from Net Index by Ookla, weighted by sample size (Data drawn on Dec. 16, 2013).

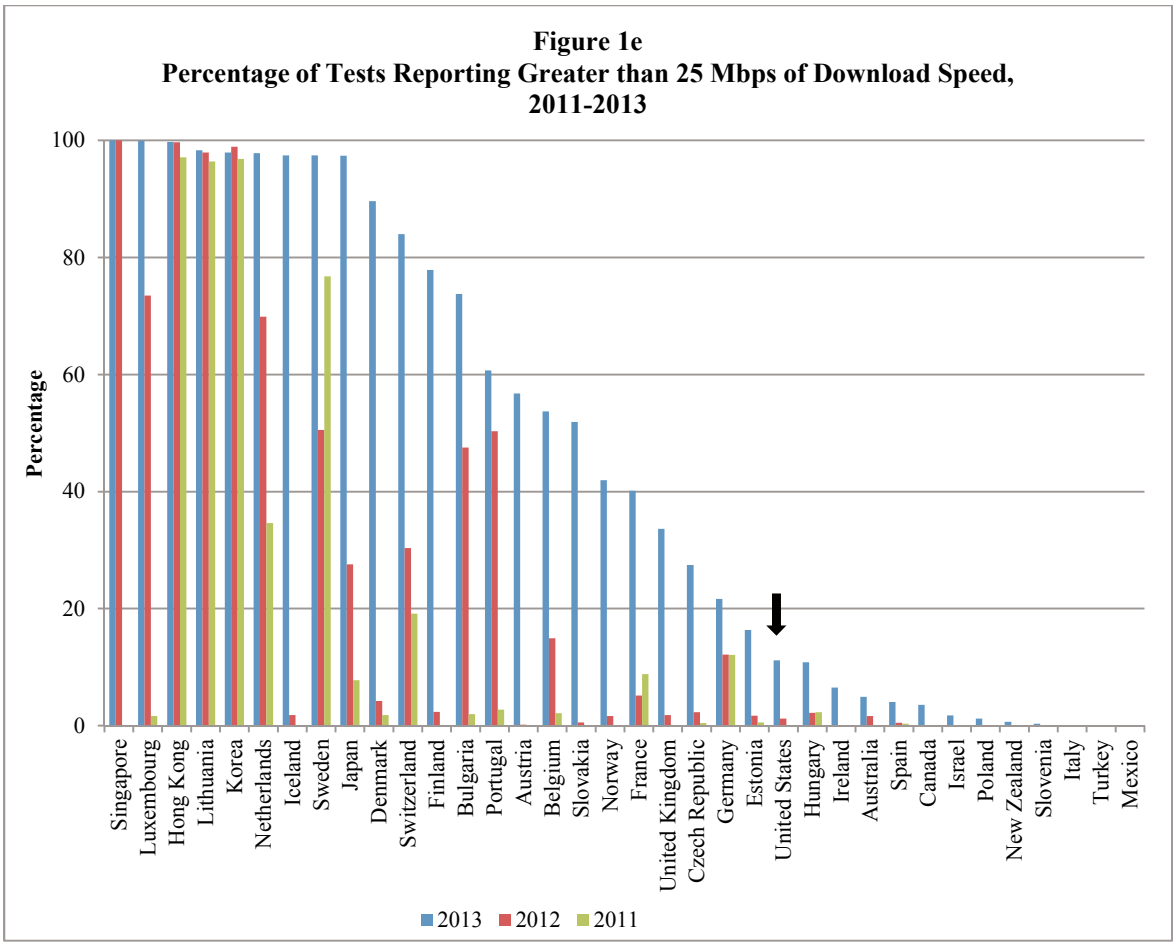
Figure 1d shows the percentage of tests with actual download speeds exceeding 10 Mbps. Many countries saw large increases in the 10 Mbps speed tier from 2011 to 2012, including the United States, where 88 percent of tests met or exceeded this speed in 2012, compared to 69 percent in 2011. Several European countries, including Ireland, Luxembourg, Slovenia, Switzerland, and the United Kingdom saw substantial increases between 2011 and 2012 in the percentage of tests with download speeds greater than 10 Mbps. The United States continued this improvement in 2013, with 96 percent of its tests showing speeds greater than 10 Mbps. Similarly, Australia and New Zealand more than doubled their respective percentages of tests exceeding this speed. In 2013, New Zealand and Slovenia saw substantial increases in their percentage of tests showing speeds greater than 10 Mbps, while the Latin American countries included in this report—Brazil, Chile, and Mexico—each grew by a factor greater than 32 times their 2012 mark and were among the most improved countries in this regard.



Source: Actual Download Speeds from Net Index by Ookla (Data drawn on Dec. 16, 2013).

Figure 1e shows the percentage of tests with actual download speeds exceeding 25 Mbps. Download speed tests reporting 25 Mbps or greater were limited in the United States with only 1.2 percent of tests reporting in this speed tier in 2012. Several countries, including Bulgaria, Luxembourg, and the Netherlands, had large increases in this speed tier from 2011 to 2012. The United States saw improvement in 2013, with 11.2 percent of such tests exceeding 25 Mbps download speed, an increase of nearly tenfold from 2012.[9] Many European countries experienced tremendous growth in this speed tier; Austria, Denmark, Finland, Iceland, Norway, and the United Kingdom all improved at least 20 times their 2012 mark and were among the most improved countries in this regard.

[9] Note that this metric is a reflection of the number of *tests* exceeding 25 Mbps, and does not necessarily reflect the number of consumers who actually subscribe to service with at least 25 Mbps download service.

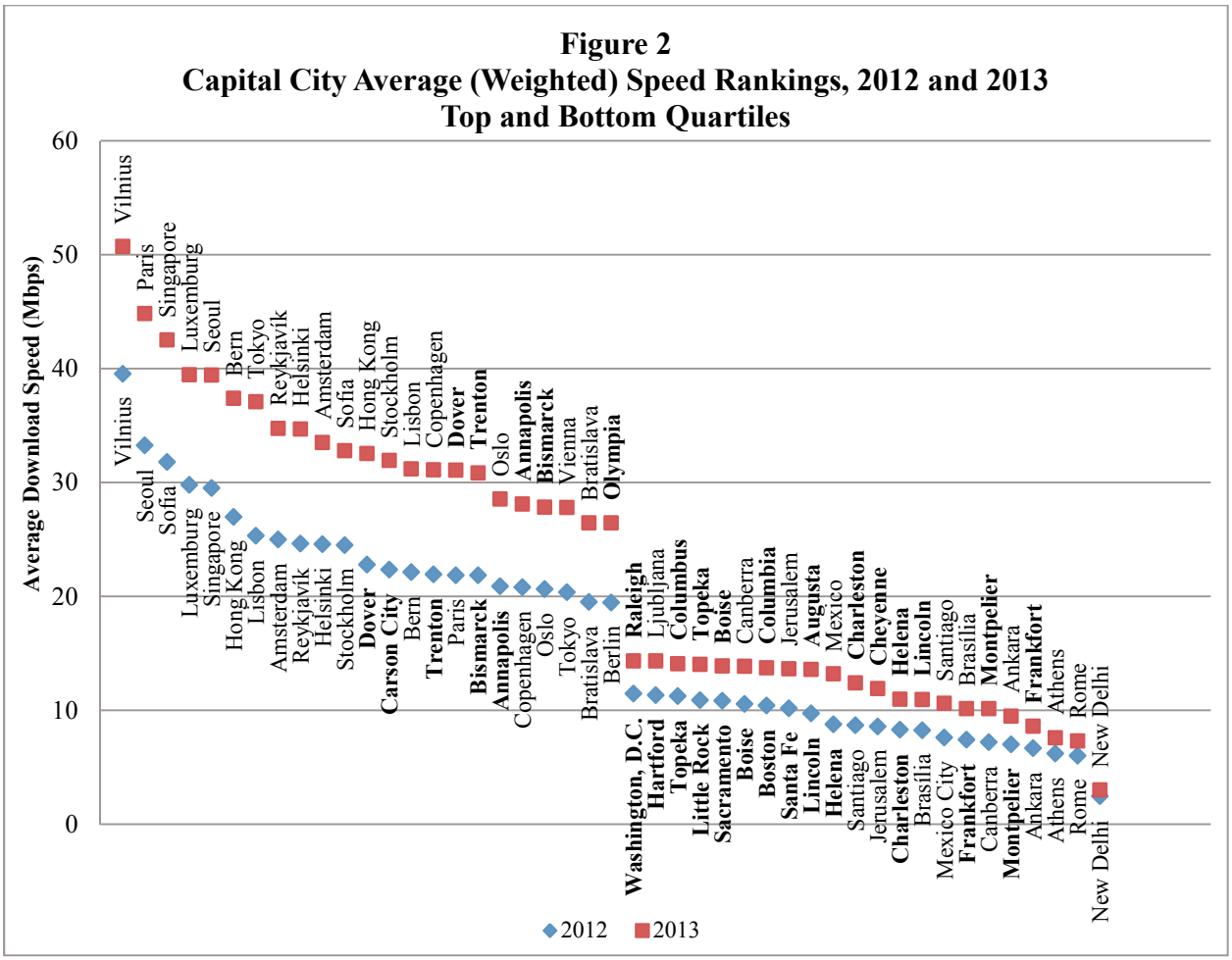


Source: Actual Download Speeds from Net Index by Ookla (Data drawn on Dec. 16, 2013). Countries not listed in this figure did not have tests meeting this speed level for any of the three years. Some countries have missing data in earlier years, *e.g.*, Singapore is does not have data for 2011.

2. Speed Comparisons at the City Level

The following analysis compares the capital cities of all 40 countries, including Washington, D.C., and all U.S. state capitals. Figure 2 shows the ranking of capital cities for the top and bottom quartiles of the mean download speed distribution (weighted by sample size). The rankings of all capital cities can be found in Appendix F Table 2.

In 2012, Carson City (Nevada) and Trenton (New Jersey) improved their ranking to compare favorably with international capital cities and increased the number of U.S. cities in the top quartile from four to five. Olympia (Washington) fell from the top quartile. The number of U.S. cities in the bottom quartile (excluding Juneau, Alaska due to data availability) decreased from 15 to 13. In 2013, Olympia rejoined the top quartile, but Carson City fell out of it, keeping the number of cities in the top quartile at four. The number of U.S. cities in the bottom quartile decreased from 13 to 12, of which half were new to the bottom quartile.



Source: Actual Download Speeds from Net Index by Ookla, weighted by sample size (Data drawn for 2012 on Dec. 6, 2012 and 2013 on Dec. 16, 2013). Capital cities consist of 40 country capitals (including Washington, D.C.) and 49 state capitals for the United States (Juneau is no longer an active host for Speedtest.net).

3. Speed Comparisons Using a Stratified Sampling Technique

We chose to keep the cities in the stratified sample identical to those selected in the Third IBDR because it allows for cleaner comparison between the three years of data—2011, 2012, and 2013. The stratified sample was drawn using 2011 data. We do not redraw the sample for 2012 and 2013; rather, we keep data for the cities that match those selected in 2011.

We added cities in Brazil and India to our comparison analysis in the 2012 and 2013 data. To add them, we generated the proportions of cities for the stratified sample from the Ookla data rather than the population because of the discrepancy between the availability of Ookla data (primarily large cities) and population distribution. Population was used to identify the strata city size indicators for Brazil and India. The stratified sample cities for Brazil and India remained unchanged in the 2013 update. Other than the modifications noted, we followed the stratified sampling methodology outlined in the Third IBDR.[10] Appendix F Tables 3a and 3b, respectively, present the population proportions for each stratum of non-U.S. and U.S. cities.

[10] The report can be downloaded from http://www.fcc.gov/reports/international-broadband-data-report-third. See Appendix F, Section 5 for explanation of the stratified sampling methodology.

Figure 3a shows the country speed ranks based on the cities in the sample. In 2012, the results from the sample are consistent with the results using all data, presented in Figure 1a, with the United States ranking 26th of 40 countries.[11] This is a decrease from 2011, when the United States was ranked 18th of 38 countries. This indicates that while speeds may have increased in absolute value (moving from 12.53 Mbps in 2011 to 14.70 Mbps in 2012), the U.S. cities in the sample increased more slowly than other cities in the sample. In contrast, the United States enhanced both its absolute speed, as well as its ranking compared to other IBDR countries in 2013. Average download speed in the United States increased to 19.55 Mbps and the U.S. rank changed to 25th of 39 countries. Greece did not have data for 2013; however, it ranked below the United States in previous years and therefore was not the cause of the U.S. improvement in ranking. Of the 39 countries that reported data, 35 increased their average download speed, and of these, Luxembourg posted the largest growth at 22.89 Mbps. Data for all states and countries can be found in Appendix F Table 3d.

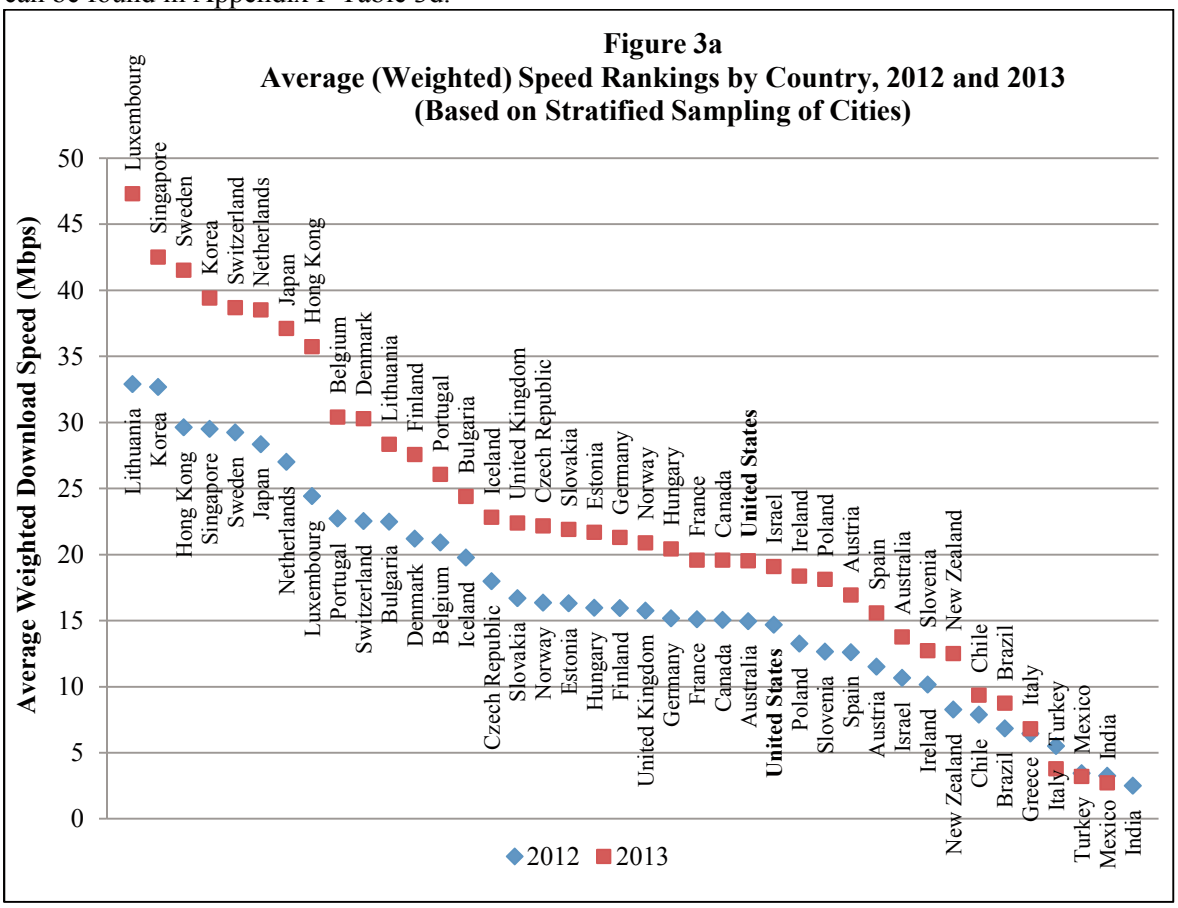


Figure 3a
Average (Weighted) Speed Rankings by Country, 2012 and 2013
(Based on Stratified Sampling of Cities)

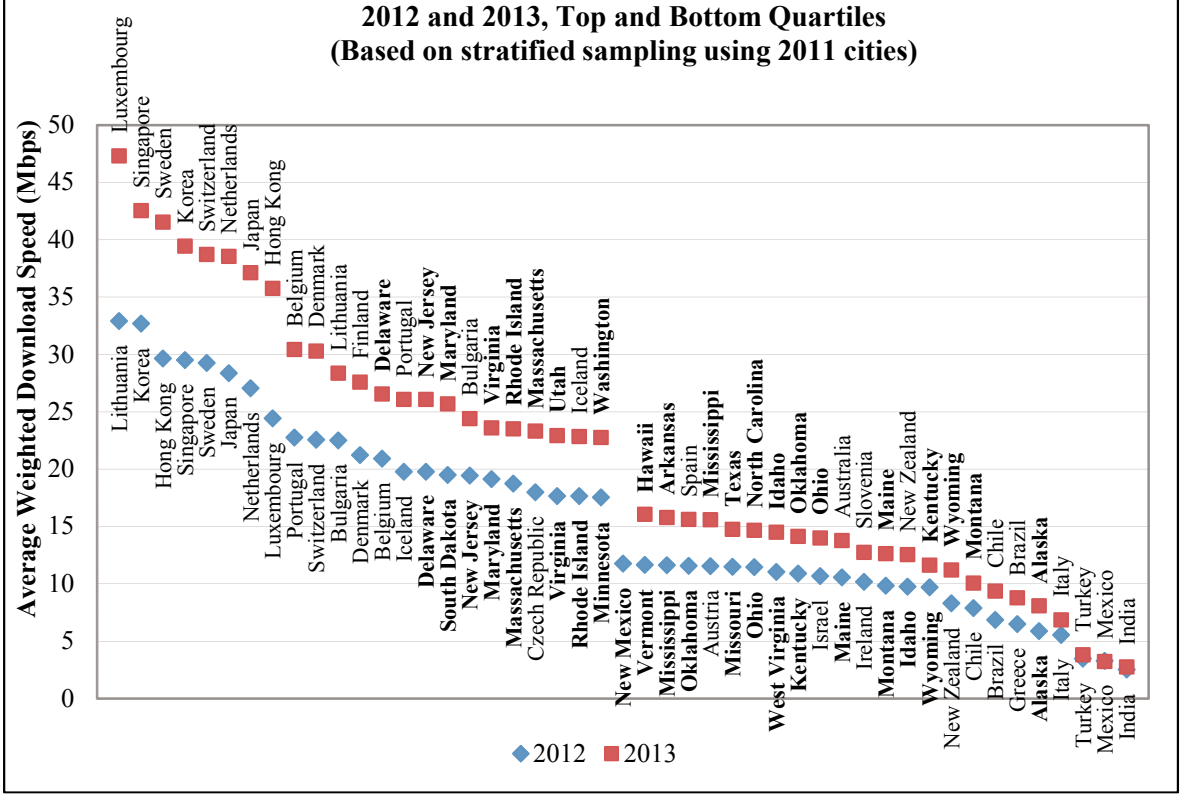
Source: Actual Download Speeds from Net Index by Ookla, weighted by sample size (Data drawn on Dec. 6, 2012). Cities use to construct the sample are identical to those used in the Third IBDR, based on 2011 data, with the addition of Brazil and India.

Figure 3b compares the United States at the state level with the other IBDR countries in 2012 and 2013. The top and bottom quartiles show that considerable variation in download speed exists within the United States. Eight U.S. states appeared in the top quartile in 2012, a decrease of one from 2011. New York and North Dakota are no longer in the top quartile, but the average

[11] *See* Appendix F Table 3c for the Average (Weighted) Download Speeds by Country (2012) (based on stratified sampling).

(weighted) download speed in New Jersey increased from 12.62 Mbps to 19.44 Mbps, moving it into the top quartile. There were 14 states in the bottom quartile in 2012, up from 11 in 2011. There were again eight states in the top quartile in 2013. The number of states in the bottom quartile remained at 13, though there were many states new to it. Kansas improved its average download speed by 7.43 Mbps (from 13.38 Mbps in 2012 to 20.81 Mbps in 2013), which helped the state jump from 57th to 36th place. A number of states displayed nominal growth, and among these Montana improved its average download speed by just 0.25 Mbps. Data for all states and countries can be found in Appendix F Table 3d.

Figure 3b
Average (Weighted) Speed Rankings by US States and International Countries, 2012 and 2013, Top and Bottom Quartiles
(Based on stratified sampling using 2011 cities)



Source: Actual Download Speeds from Net Index by Ookla, weighted by sample size (Data drawn on Dec. 6, 2012). Cities use to construct the sample are identical to those used in the Third IBDR, based on 2011 data, with the addition of Brazil and India.

In addition to analyzing the overall speed ranks based on the sampling approach, we also show how each country ranks within each stratum. Appendix F Tables 4a-4d present these results.

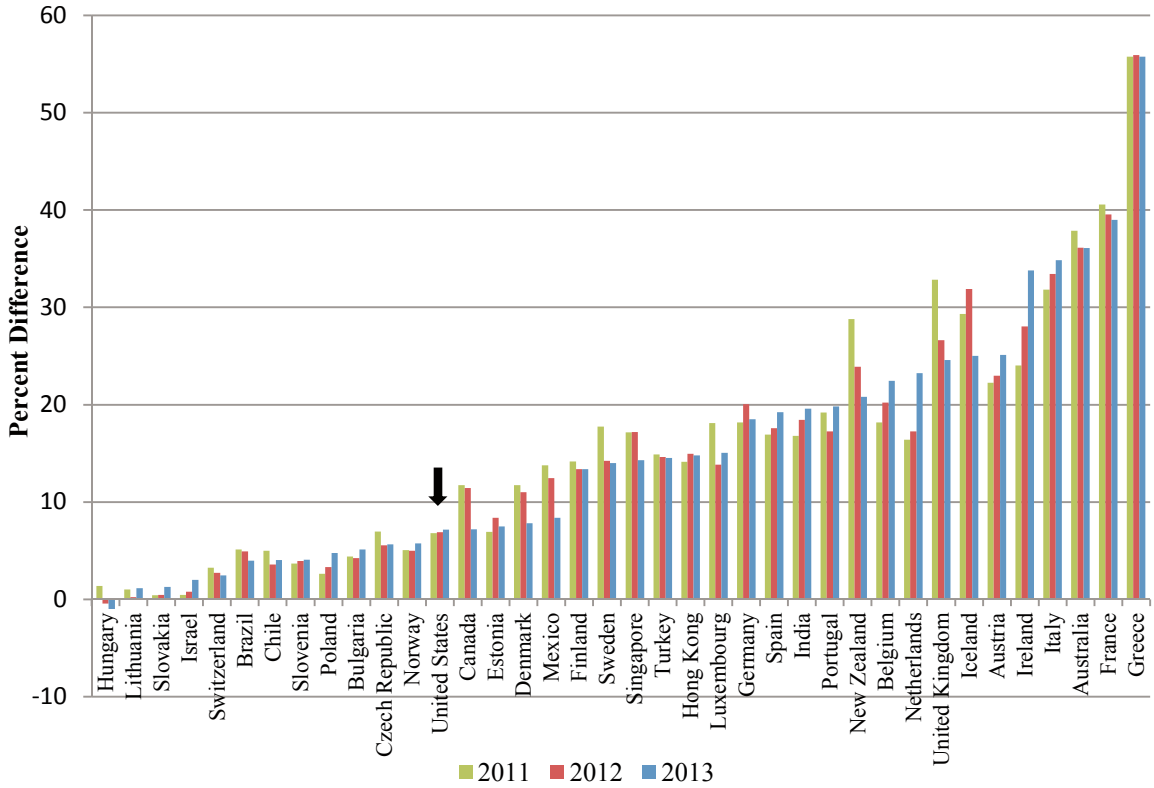
4. Advertised versus Actual Speed

Figure 4 presents the shortfall index – *i.e.*, the percent difference between advertised and actual speeds[12] – for 2011, 2012, and2013. Of the 38 countries that reported data, half saw a

[12] Ookla also refers to this as the Promise Index -- an index that ranks the value of the median ratio of actual download speed to the download speed subscribed to (the "promised speed"). *See* http://www.netindex.com/promise/. The promise index is the median ratio of actual download speed to the advertised download speed subscribed to by the consumer. The shortfall index is: 1 – (Actual Speed/Advertised Speed).

decrease in their shortfall index from 2011 to 2012 (that is, half the countries improved on delivering advertised speeds).[13] Luxembourg, New Zealand, Sweden, and the United Kingdom saw the largest decreases; however, Iceland, Italy, and Ireland all saw increases in their shortfall index. Hungary has a shortfall index of -0.44, which indicates the actual speeds exceed advertised speeds. The shortfall index for the United States increased slightly from 6.8 percent in 2011 to 6.9 percent in 2012. Slightly more than half of the countries experienced a decrease in their shortfall index from 2012 to 2013. Iceland saw the greatest reduction in shortfall at 6.8 percentage points, while Ireland and the Netherlands both experienced growth in excess of five percentage points. The shortfall index for the United States increased to 7.2 in 2013.[14]

Figure 4
Shortfall Index in 2011-2013
(% Difference Between Advertised and Actual Speed)



Source: Promise Index from Net Index by Ookla. Data drawn on Dec. 6, 2012 and Dec. 16, 2013.

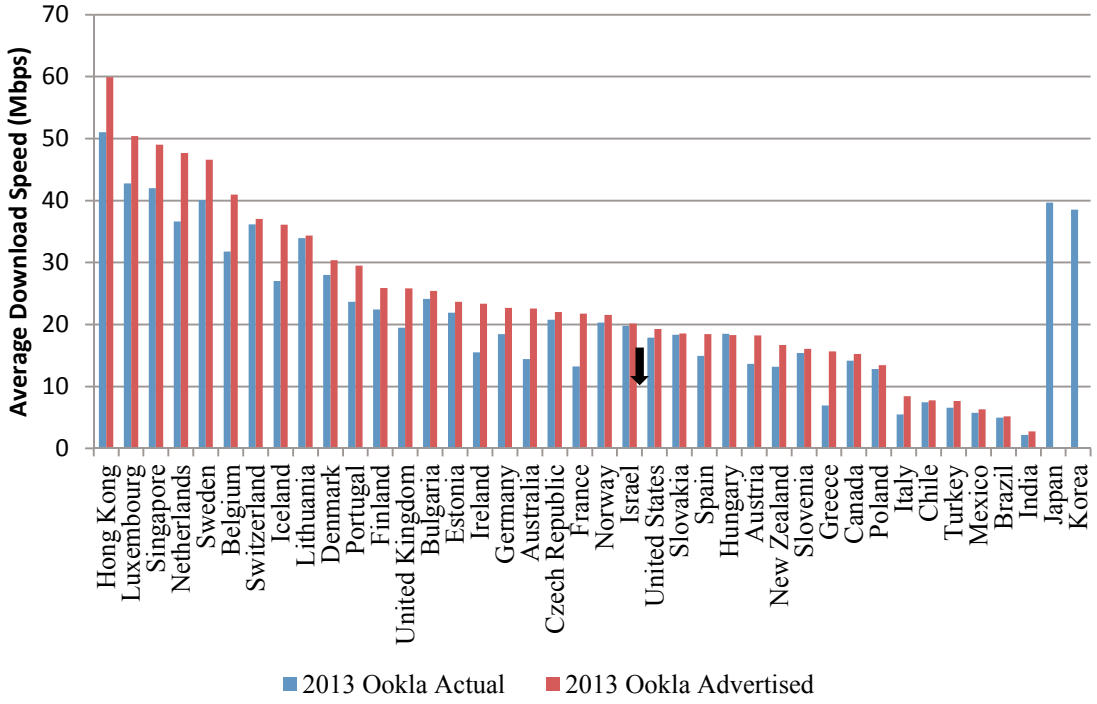
The shortfall index may not be entirely representative of a nation's broadband carriers' ability to deliver advertised speeds. In order to generate the Promise Index Ookla requires consumers that submit test results to fill out a survey that asks for the advertised speed to which they are subscribed. This means that the Promise Index is created from a smaller subset of test results than the Net Index and assumes that the test subjects know the promised speed of the plan to which they have subscribed. Also, the potential exists that consumers unhappy with their speed are more likely to run tests for the Promise Index, thereby creating a bias in the data.

[13] Japan and Korea did not report shortfall data for 2011-2013.

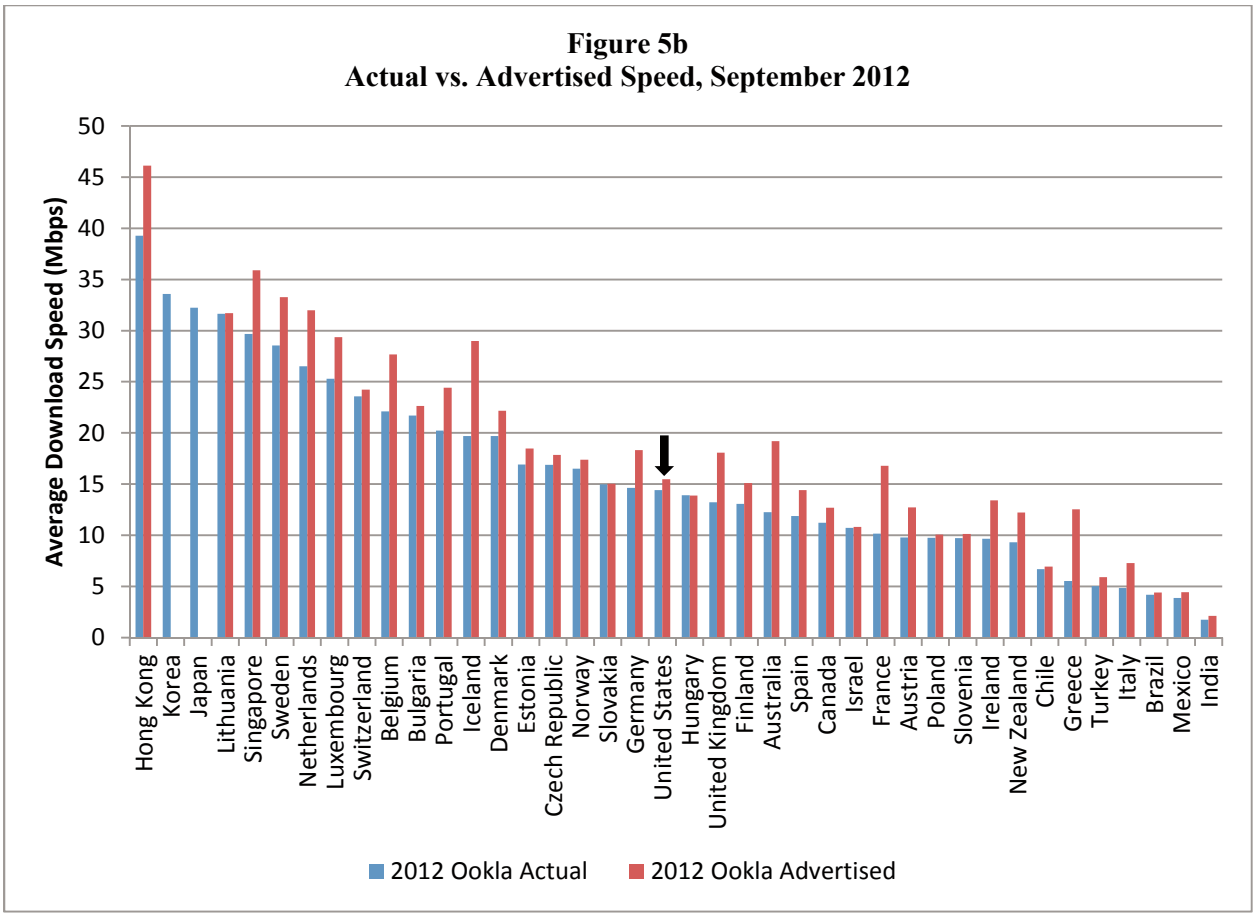
[14] *See* Appendix F Table 5.

The Ookla Promise Index, though imperfect, does provide a means for comparing many countries on their broadband carriers' ability to deliver advertised speeds. In addition to constructing a shortfall index, we present the average and advertised download speeds from the Ookla data. Figures 5a and 5b show the download speeds from September 2013 and September 2012, respectively. The United States was ranked 21st of 38 countries for its advertised speed of 12.8 Mbps in 2011. Both actual and advertised speeds increased for the United States between 2011 and 2012, although the increase in the average advertised speed was larger than the increase in average actual speed. The United States ranked 20th of 40 countries for September 2012 according to the Ookla actual average download speed data.[15] For advertised speed, the United States improved its ranking by one and is currently 20th of 38 countries with an advertised speed of 15.5 Mbps. In 2013, the U.S. ranked 24th of 40 countries in terms of actual download speed and 23rd of 38 countries with an advertised download speed of 19.3 Mbps. Data for both 2012 and 2013 are presented in Appendix F Table 6.

Figure 5a
Actual vs. Advertised Speed, September 2013



[15] Japan and South Korea do not have actual download speeds reported in this dataset.



We believe that the Commission's Measuring Broadband America (MBA) program, an ongoing, rigorous, nationwide study of residential broadband performance in the United States, provides a more accurate picture of U.S. broadband providers' ability to deliver advertised speeds. The most recent MBA study (released on June 18, 2014), like those conducted before, involves actual performance tests for thousands of subscribers of ISPs serving well over 80 percent of the residential market.[16] Both the 2013 and 2014 reports found that five ISPs routinely delivered nearly 100 percent or greater of the download speed advertised to the consumer, even during time periods when bandwidth demand was at its peak, while in 2012 the U.S. ISPs on average delivered 97 percent of advertised download speed during peak usage periods.[17]

The Measuring Broadband America program relies on measurements by hardware and software deployed in the homes of thousands of volunteer consumers by Commission contractor SamKnows. The SamKnows "Whitebox" devices and their software conduct automated, direct

[16] *See* 2014 Measuring Broadband America: Fixed Broadband Report - A Report on Consumer Wireline Broadband Performance in the U.S., FCC's Office of Engineering and Technology and Consumer and Governmental Affairs Bureau, http://data.fcc.gov/download/measuring-broadband-america/2014/2014-Fixed-Measuring-Broadband-America-Report.pdf

[17] *Id.* at p. 14; 2013 Measuring Broadband America: February Report - A Report on Consumer Wireline Broadband Performance in the U.S., FCC's Office of Engineering and Technology and Consumer and Governmental Affairs Bureau, p. 4, http://transition.fcc.gov/cgb/measuringbroadbandreport/2013/Measuring-Broadband-America-feb-2013.pdf.

measurements of broadband performance throughout the year, though for reporting purposes, the Commission focuses on test results during a specific time period (September 2013 in the case of the June 2014 report).[18] The study examines service offerings from 14 of the largest broadband providers (focusing on four ISP delivery technologies—DSL, cable, fiber, and satellite), which collectively account for well over 80 percent of all U.S. residential broadband connections. Hardware approaches involve placing a device inside the user's home, and it is physically connected to the consumer's Internet connection, and periodically running tests to remote targets on the Internet.

Several countries have undertaken detailed broadband studies similar to our own,[19] the largest being a EC-organized study of actual broadband speeds in 30 countries across Europe, also using SamKnows.[20] A comparison of the latest MBA and EC reports is warranted due to similarities in methodologies and the time of data collection. The United States does much better

[18] 2014 Measuring Broadband America Fixed Broadband Report: A Report on Consumer Fixed Broadband Performance in the U.S., FCC's Office of Engineering and Technology and Consumer and Governmental Affairs Bureau, rel. June 19, 2014, available at http://www.fcc.gov/reports/measuring-broadband-america-2014. (*2014 MBA Report*.)

[19] The United Kingdom is a notable example. Ofcom, the United Kingdom's telecommunications regulator, has also partnered with SamKnows to conduct regular broadband speed tests. *See* U.K. fixed-line broadband performance, Ofcom, November 2012, available at http://stakeholders.ofcom.org.uk/binaries/research/broadband-research/nov2012/Fixed_bb_speeds_Nov_2012.pdf, and the U.K.'s most recent report (April 2014) at http://consumers.ofcom.org.uk/internet/broadband-speeds/broadband-speeds-april-14/. Singapore's Infocomm Development Authority has also partnered with SamKnows to provide broadband speed test results for Singapore's consumers. *See* http://www.ida.gov.sg/applications/rbs/chart.html. In 2012, new rules took effect in Brazil that require ISPs to provide at least 20 percent of the speed that they advertise. Anatel, the Brazilian regulator, has provided meter devices to volunteers to measure broadband speeds and ensure that ISPs comply with the speed regulation. *See* New Rules for Brazil Broadband Providers, The Rio Times, Nov. 6, 2012, available at http://riotimesonline.com/brazil-news/rio-business/new-rules-for-brazil-broadband-providers/#). Anatel released its findings in 2013; *see* http://www.samknows.com/broadband/news/brazil-latest-report-from-anatel-11140.html and http://www.anatel.gov.br/Portal/exibirPortalNoticias.do?acao=carregaNoticia&codigo=30427. Germany's telecommunications regulator, Bundesnetzagentur (BNetza), released the results of its 2012 and 2013 studies of actual broadband speeds experienced by German broadband subscribers (*see*http://www.bundesnetzagentur.de/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Breitband/Dienstequalitaet/qualitaetsstudie/qualitaetsstudie-node.html). BNetza's method of testing is similar to Ookla's, in that the test was software-based and conducted via a consumer's web browser (*see* http://www.initiative-netzqualitaet.de/startseite/). Those taking the test were required to fill out a survey identifying, among other factors, the name of their broadband provider and the speed tier (maximum "up to" speed) to which they subscribe. Germany's test results reveal that 15.7 percent of fixed broadband customers and 21 percent using mobile broadband devices achieved the advertised maximum speeds. *See* "Internet Speeds Fail to Meet Promises in Germany, Study Shows," *New York Times*, April 11, 2013, available at http://www.nytimes.com/2013/04/12/technology/internet-speeds-fail-to-meet-promises-in-germany-study-shows.html.

[20] "Quality of Broadband Services in the EU, October 2013," Final Report prepared for the European Commission, rel. March 25, 2014, available at http://ec.europa.eu/digital-agenda/en/news/quality-broadband-services-eu-samknows-study-internet-speeds-second-report. For this study, the EC recruited 10,000 consumers across these 30 countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom (*i.e.*, the 28 EU member countries plus Iceland and Norway). The study examined speeds on xDSL, cable, and fiber networks of more than 200 ISPs.

than Europe when comparing the proportion of advertised speeds to actual speeds.[21] The European study is based on data SamKnows gathered from Whiteboxes in October 2013 and the latest MBA study is based on Whitebox data gathered in September 2013. The chart below shows the peak (7:00 pm-11:00 pm) average advertised and actual broadband speed for both the United States and Europe for DSL, cable, fiber, and (for the United States) satellite ISPs. The speeds below are averages for all observations of a given technology. For the United States, the reported figure is the average for all consumer observations using the indicated technology. For Europe, the reported figure is the average for all observations in the 30 country survey. These high-level averages do not account for variations in actual/advertised speeds at various speed tiers.[22]

Technology	**United States advertised speed (Mbps)**	**Europe adverstised speed (Mbps)**	**United States actual speed[23] (Mbps)**	**Europe actual speed[24] (Mbps)**	**United States actual/ Advertised (%)**	**Europe actual/ Advertised (%)**
xDSL	9.88	13.95	9.64	8.13	97.6	63.8
Cable	27.71	60.54	28.92	52.21	104.4	89.5
fiber	40.76	59.48	45.17	47.74	110.8	82.7
Satellite	12	NA	17.81	NA	148.4	NA

This chart suggests that although advertised and actual speeds are often higher in Europe than in the United States, U.S. broadband providers are more effective than European providers in delivering promised speeds to consumers. U.S. providers' (that is, those providers in the MBA sample) actual speeds exceed advertised speeds for all platforms except DSL, whereas European providers (again, only those providers that participate in the study) do not exceed advertised speeds for any technology. Further, for DSL, although European providers advertised faster speeds than U.S. providers, the U.S. providers, on average, delivered actual speeds that were faster than actual speeds of the European providers.[25]

5. Other Quality Measures for Fixed Broadband Connections

The focus of our discussion so far has centered on the speed of broadband connection, which measures the average rate at which information packets travel from a source to a

[21] This should be considered when looking at pricing data (section III.C. *infra*) which is collected with only advertised speeds. Based on the data above, it appears that U.S. broadband consumers get more of what they pay for, compared to European consumers.

[22]. The U.S.-based MBA testing data does not include all speed tiers for the tested 12-15 providers for all regions. Thus, we cannot say that all consumers in the United States for a specific technology experience a specific speed on average. For the 6,000-7,000 Whiteboxes tested at some speed tiers for the largest 12-15 providers in some regions of the United States, the average speeds were what we show in the table above. The averages provide a useful tool for comparing huge volumes of data, but they reflect only the experiences of those consumers participating in the SamKnows studies (both in Europe and the United States), and do not necessarily represent a true "average" American or "average" European experience.

[23] These are peak period actual speeds, averaged for all carriers using the technology described.

[24] These are peak period actual speeds, averaged for all carriers using the technology described.

[25] The U.S. data is publicly available at "Validated Data - Measuring Broadband America 2014," http://www.fcc.gov/measuring-broadband-america/2014/validated-data-fixed-2014.

destination. There are, however, other metrics of network quality that may provide insight about comparative broadband performance across countries. Three common measures of connection quality are latency, jitter, that is the variance in latency, and packet loss. Ookla collects data on these broadband quality measures through user-based tests at pingtest.net.[26]

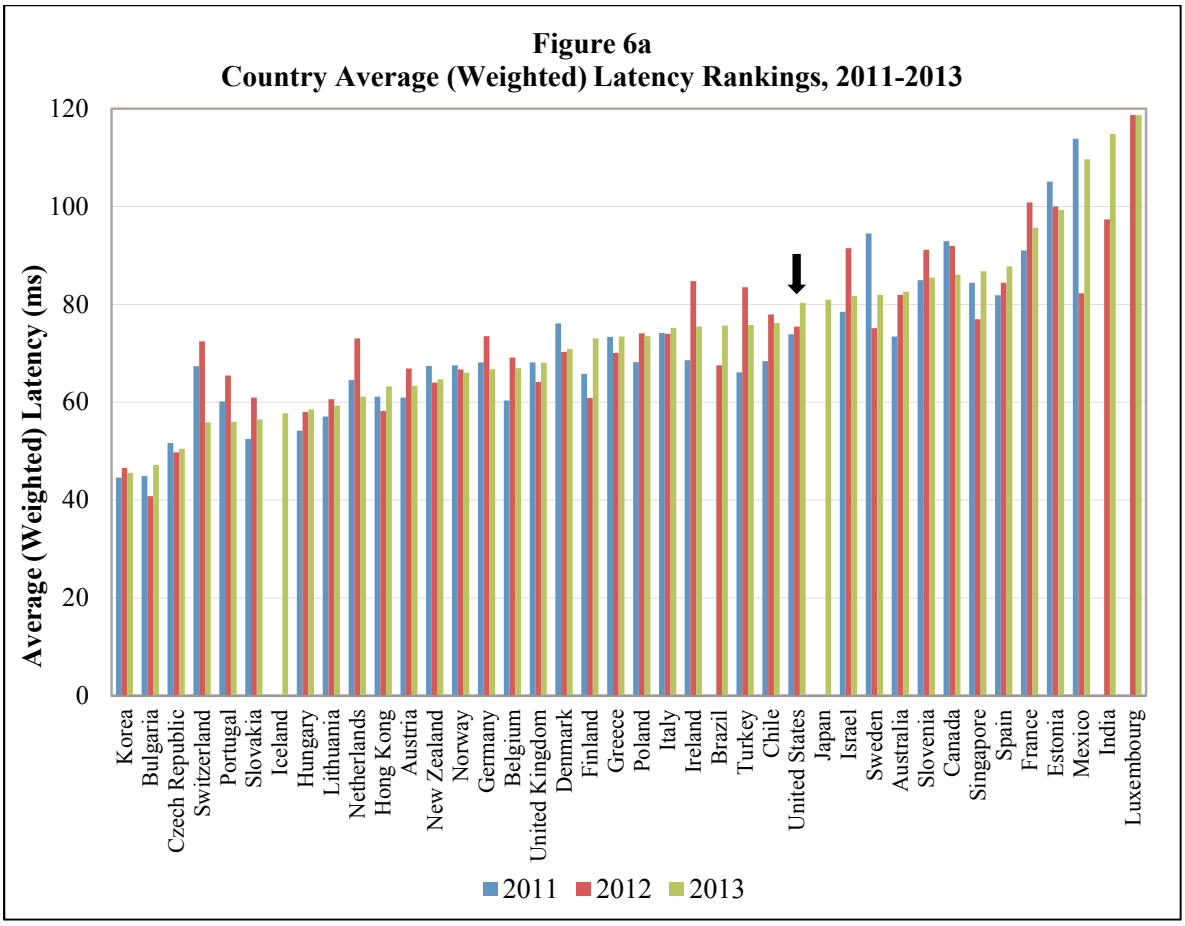
a. Latency

Latency (also known as ping) refers to several types of delays typically incurred during network data processing, and is typically measured in milliseconds (ms). One common measure is round-trip latency, which measures the amount of time it takes a data packet to travel from a source to a destination and back. More precisely, it is measured as the sum of time from the start of packet transmission by a source to the start of packet reception by a destination plus the time that it takes for the packet to travel back from the receiving destination to the source. Latency is often affected by factors such as the properties of the physical medium through which the network packets are transmitted or processing delays which may occur when the packets need to pass through proxy servers.

Figure 6a shows the weighted latency rankings for the 40 IBDR sample countries for 2011-2013. From 2011 to 2012, latency in the United States decreased from 73.87 ms to 73.73 ms and ranking improved from 24th (of 38 countries) to 21st (of 40 countries). Several countries experienced increases in latency in 2012, with the largest growth seen in Belgium, Ireland, Israel, and Turkey. Latency in Mexico and Sweden decreased in 2012. In the United States, latency increased from 73.73 ms to 80.33 ms from 2012 to 2013, causing its rank to fall to 27th (of 40 countries).[27] A number of countries experienced increases in latency in 2013, of which Finland, India, and Mexico experienced the greatest growth. Latency decreased in Israel and Switzerland in 2013. Data is shown in Appendix F Table 7a.

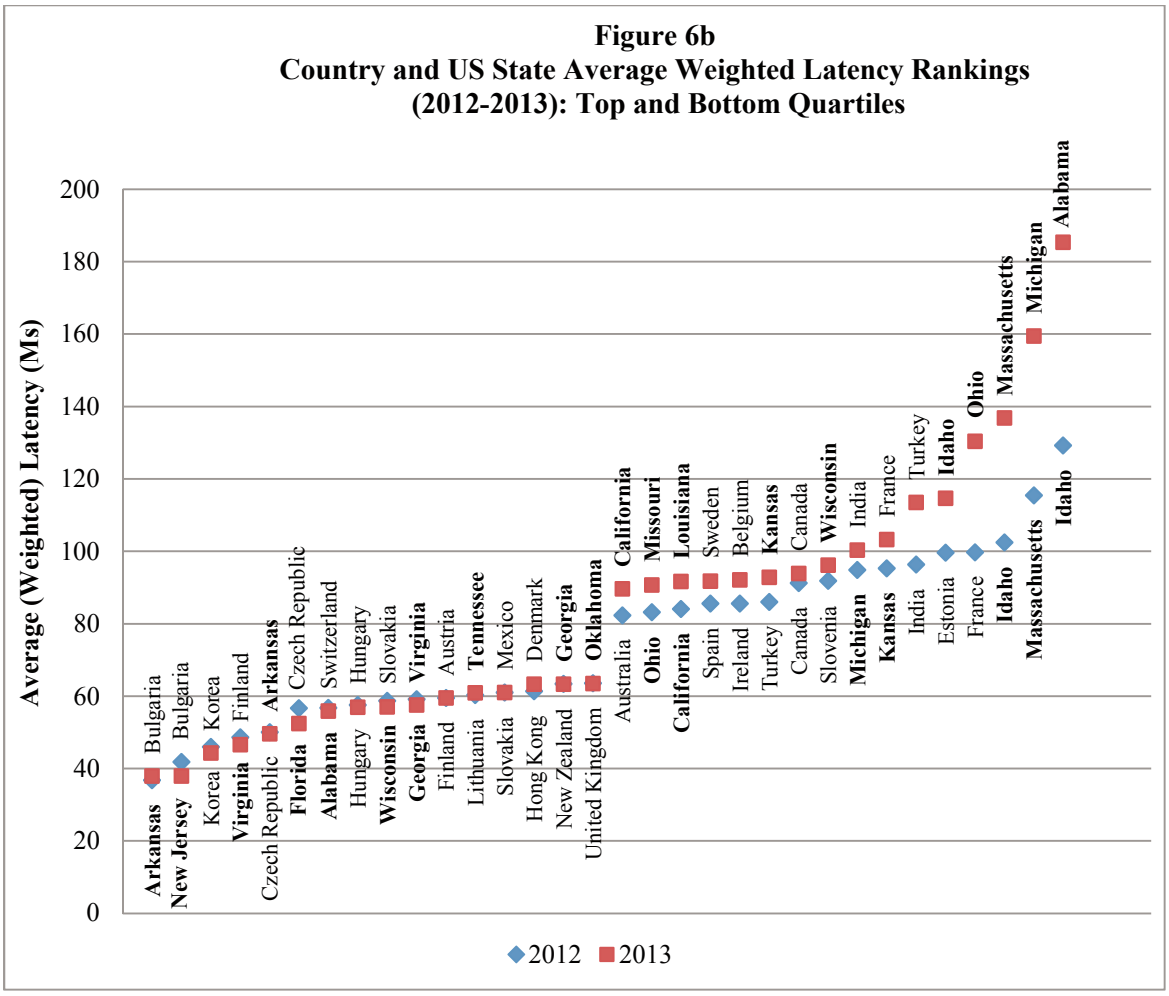
[26] These data are included with the full NetIndex download.

[27] *But see 2014 MBA Report*, finding that across all terrestrial technologies during peak periods, latency (round trip_ averaged 34. 9 ms for those ISPs surveyed. *2014 MBA Report* at p. 16.



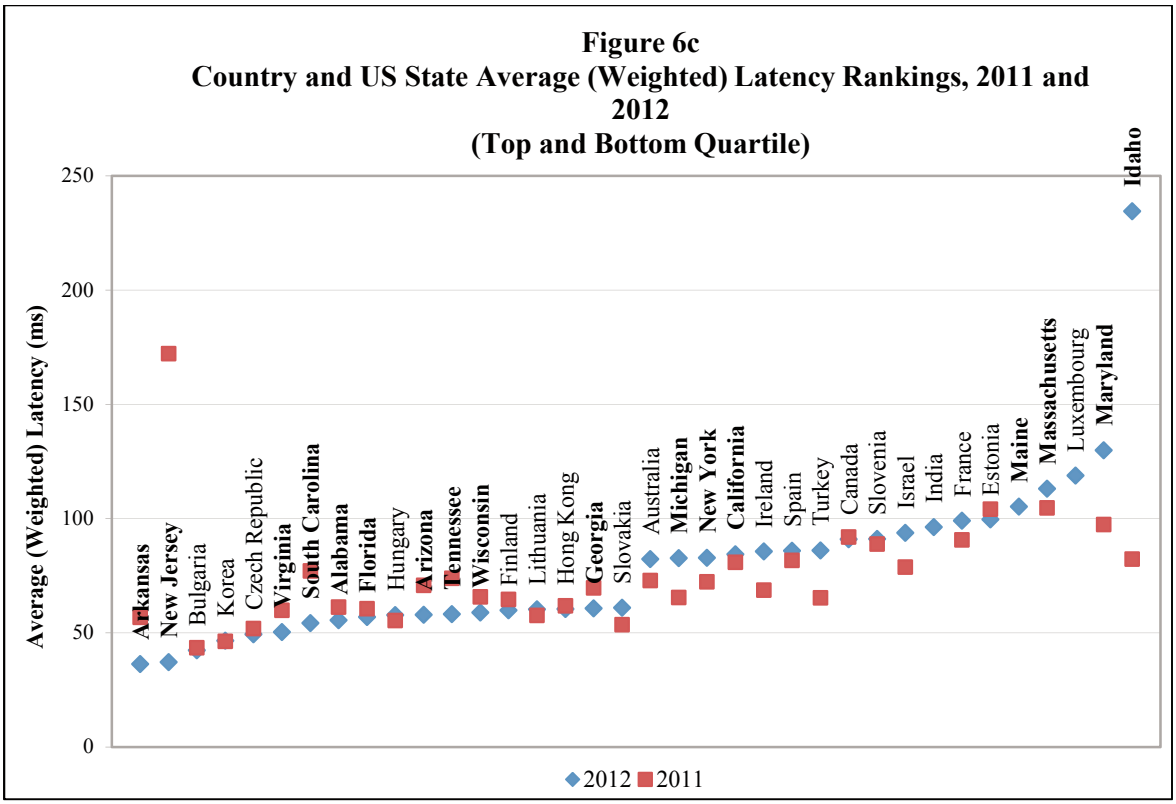
Note: 2011 quality data is not available for Luxembourg. Iceland and Japan do not have data prior to 2013. Brazil and India were not comparison countries in the Third International Broadband Data Report. Data drawn on Dec. 6, 2012 and Dec. 16, 2013.

In Figure 6b, we plot the top and bottom quartiles of average (weighted) percent packet loss for the IBDR countries and most U.S. states (including District of Columbia) for 2012 and 2013. In 2012, the number of U.S. states in the top quartile decreased by four, for a total of six, and the number of states in the bottom quartile decreased from 10 to seven. In 2013, the number of states in the top quartile fell to six, and the number states in the bottom quartile returned to 10. New Jersey significantly reduced its latency from 172.11 ms in 2011 to 78.83 ms in 2012. Idaho saw the largest increase in latency over this period, moving from 82.29 ms to 234.46 ms. In 2013, however, Maryland experienced the largest decrease in latency, when it dropped from 129.21 ms to 76.62 ms. Alabama saw the largest increase in 2013, moving to 185.32 ms from 56.78 ms the previous year. Data for IBDR countries and all states which reported data are presented in Appendix F Table 7b.



Note: 2011 quality data is not available for Luxembourg. Brazil and India were not comparison countries in the *Third IBDR*. Data drawn on Dec. 6, 2012 and Dec. 16, 2013.

In Figure 6c, we compare U.S. states to the IBDR countries, with the top and bottom quartiles from 2012 being displayed. For comparison, their average latency from 2011 is also shown. 2012 data can be seen in Appendix F Table 7b. The United States increased the number of states in the top quartile by one, for a total of ten, and decreased the number of states in the bottom quartile from ten to seven. New Jersey significantly reduced its latency from 172.11 ms in 2011 to 37.19 ms in 2012. Idaho saw the largest increase in latency, moving to 234.46 ms, from 82.29 ms in 2011.



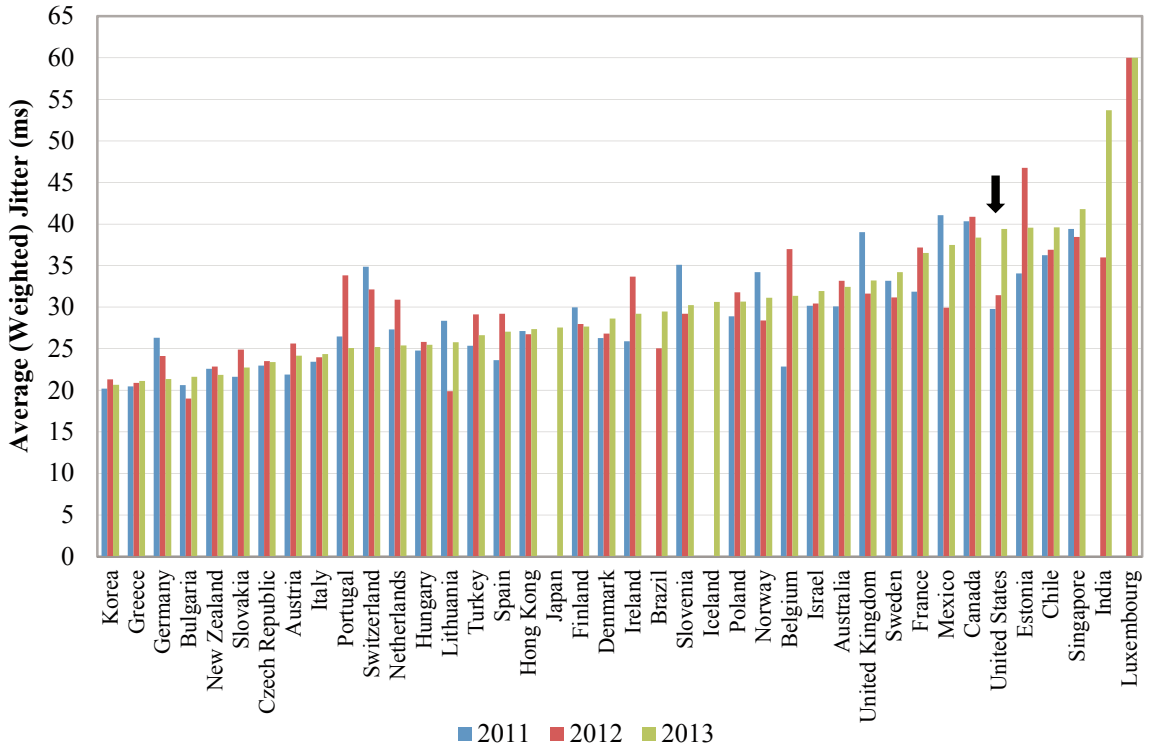
Note: 2011 quality data is not available for Luxembourg. Brazil and India were not comparison countries in the *Third IBDR*.

b. Jitter

Jitter (also known as packet delay variation) refers to the variance of latency over time, and is measured by the average deviation from the mean latency of the network. More generally, jitter measures the consistency of the broadband connection.

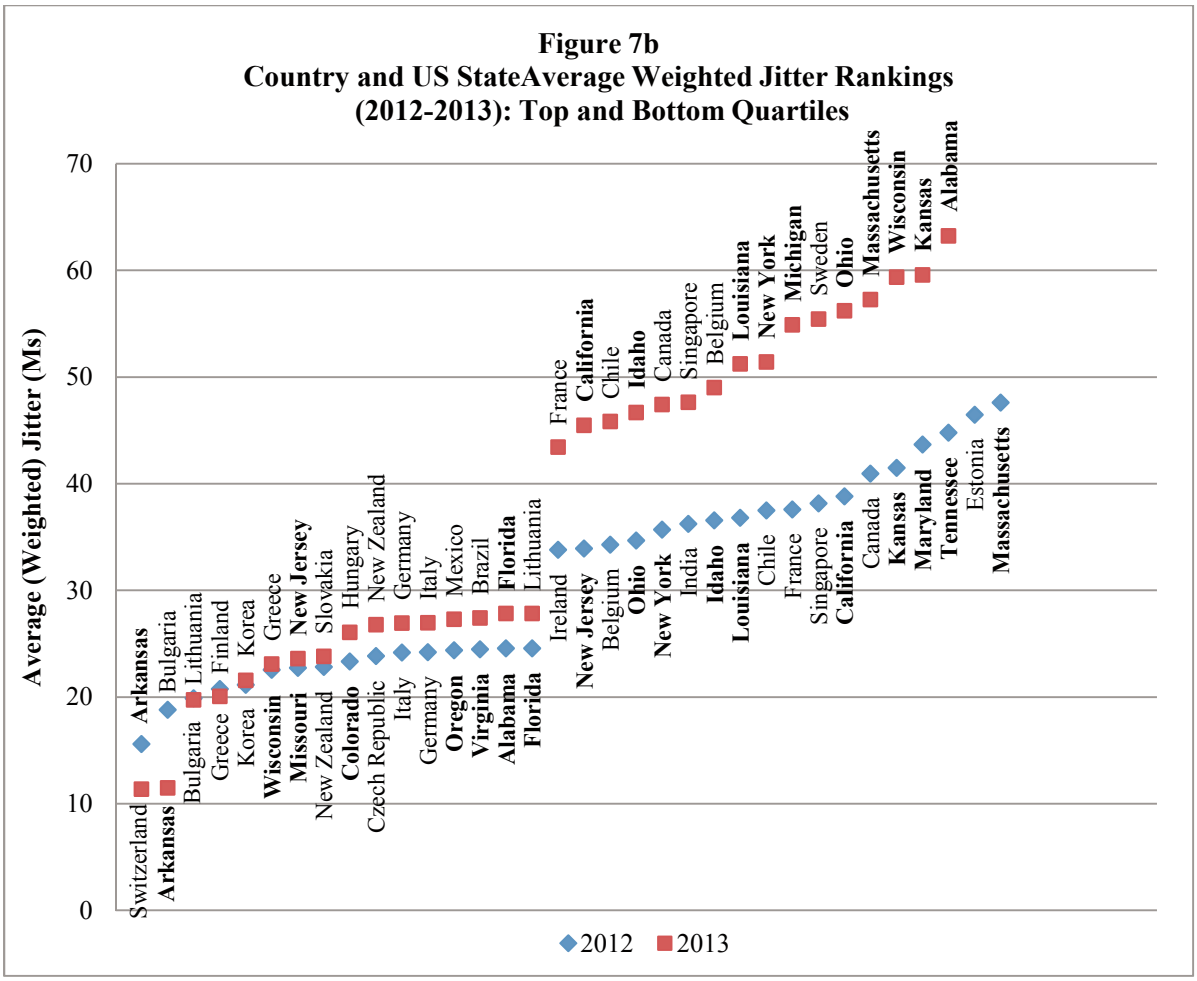
Figure 7a shows the average jitter rankings for the 40 IBDR countries. Many countries saw increases in jitter between 2011 and 2013, including the United States. The United States ranked 35th (of 40 countries) in 2013, compared to 27th (of 38 countries) in 2012 and 22nd (of 35 countries) in 2011. In addition to rank, jitter increased over this period as well, increasing from 29.77 ms in 2011 to 31.44 ms in 2012, and to 39.41 ms in 2013. Estonia and Belgium experienced the largest increases in jitter in 2012, while Mexico and Lithuania both improved their rankings. In 2013, the United States showed the second greatest increase in jitter (7.97 ms) behind India (17.71 ms), while Portugal displayed the greatest decrease at -8.71 ms. Complete data can be found in Appendix F Table 8a.

Figure 7a
Average (Weighted) Jitter Rankings, 2011-2013



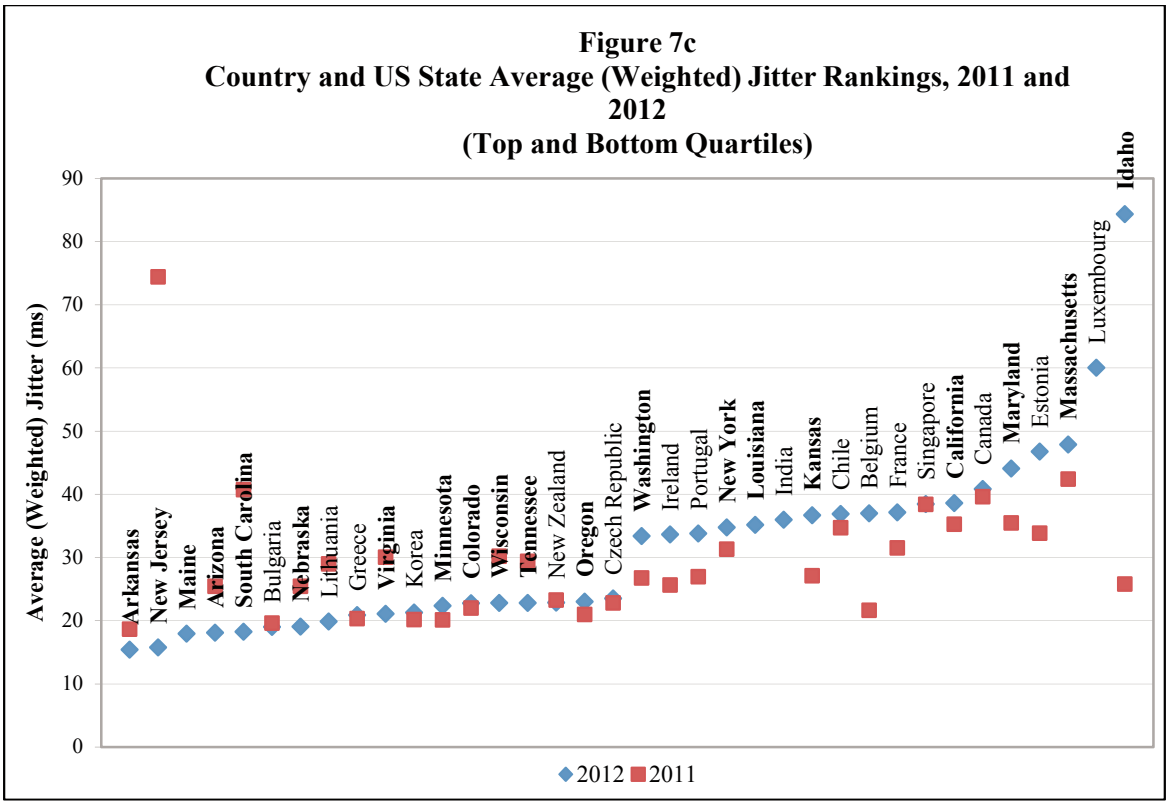
Note: 2011 quality data is not available for Luxembourg. Brazil and India were not comparison countries in the Third *IBDR*. Iceland and Japan were new additions in 2013. Data drawn on Dec. 6, 2012 and Dec. 16, 2013.

Figure 7b compares U.S. states with the IBDR countries; the top and bottom quartiles from 2012 and 2013 are displayed. In 2012, eight states appeared in the top quartile, compared to 10 states in 2011. There were three states in the top quartile in 2013. The number of states in the bottom quartile increased from eight to 10 in 2012, and many of these states were new to the bottom quartile. There were again 10 states in the bottom quartile in 2013. New Jersey saw a large change in 2012, decreasing from 74.40 ms to 33.93 ms. In 2013, Wisconsin and Alabama saw large changes, with Wisconsin increasing from 22.54 ms to 59.37 ms and Alabama increasing from 24.56 ms to 63.24 ms. Data for IBDR countries and all states for which Ookla collected data are presented in Appendix F Table 8b.



Note: 2013 data not available for Maine, Arizona, South Carolina, Nebraska, Portugal, and Luxembourg; 2012 data not available for Connecticut or District of Columbia. Brazil and India were not comparison countries in the *Third IBDR*. Data drawn on Dec. 6, 2012 and Dec. 16, 2013.

Figure 7c compares U.S. states with the IBDR countries and displays the top and bottom quartiles from 2011 and 2012. Twelve states appear in the top quartile compared to 10 states in the previous year. The number of states in the bottom quartile remains at 8, although many of the states in this quartile have changed. Similar to the latency data, New Jersey and Idaho have substantial changes from 2011 to 2012, with Idaho increasing from 25.82 ms to 84.32 ms and New Jersey decreasing from 74.40 ms to 15.77 ms. Data for all U.S. states and IBDR countries is available in Appendix F Table 8b.

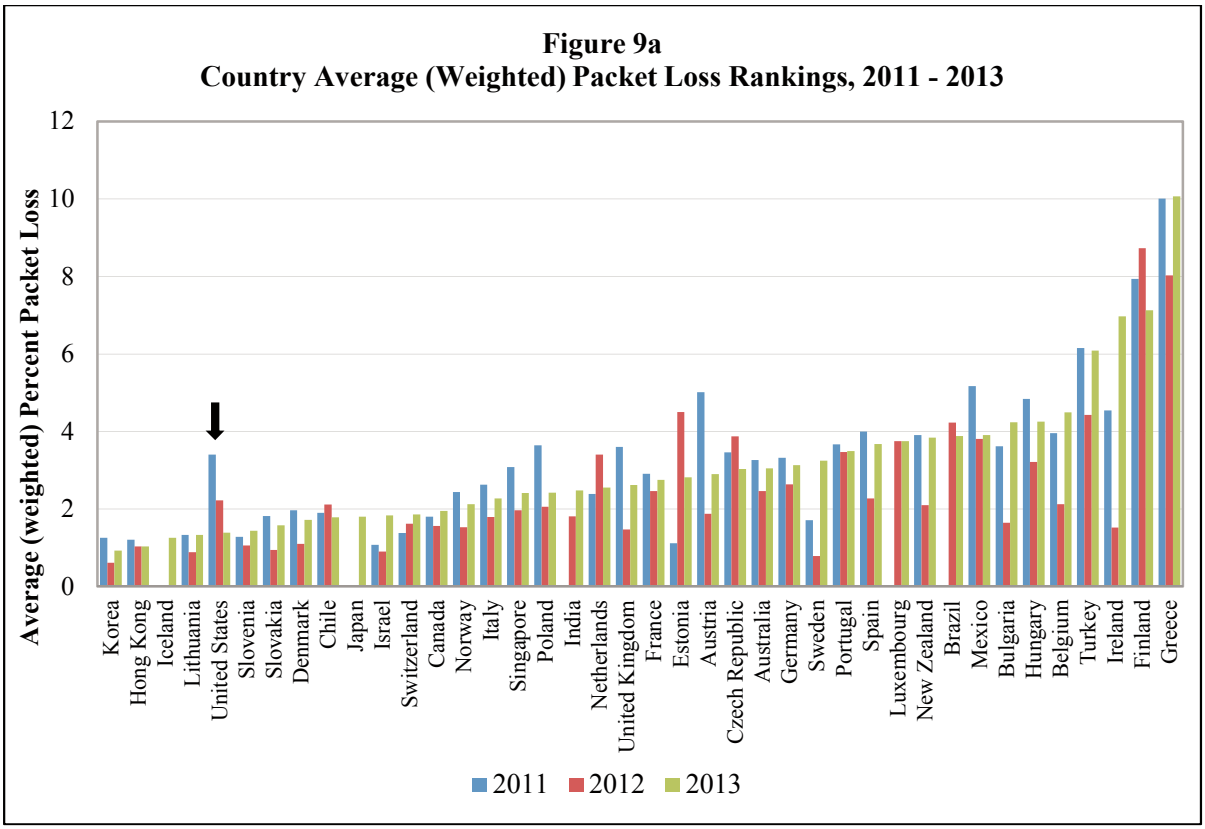


Note: 2011 quality data is not available for Luxembourg. Brazil and India were not comparison countries in the Third IBDR.

c. Packet Loss

When packets of data traveling across the network fail to reach their destination, the phenomenon is termed packet loss. Packet loss can occur because of network congestion, signal degradation, faulty network drivers or networking hardware, and the distance between the origin of the transmitted data and the destination. When packet loss occurs due to these reasons, it can be used as a quality loss metric. In some cases, however, packet loss may be intentional, and intended to slow down specific services. Therefore, packet loss statistics, while still useful in measuring connection reliability, are imperfect.

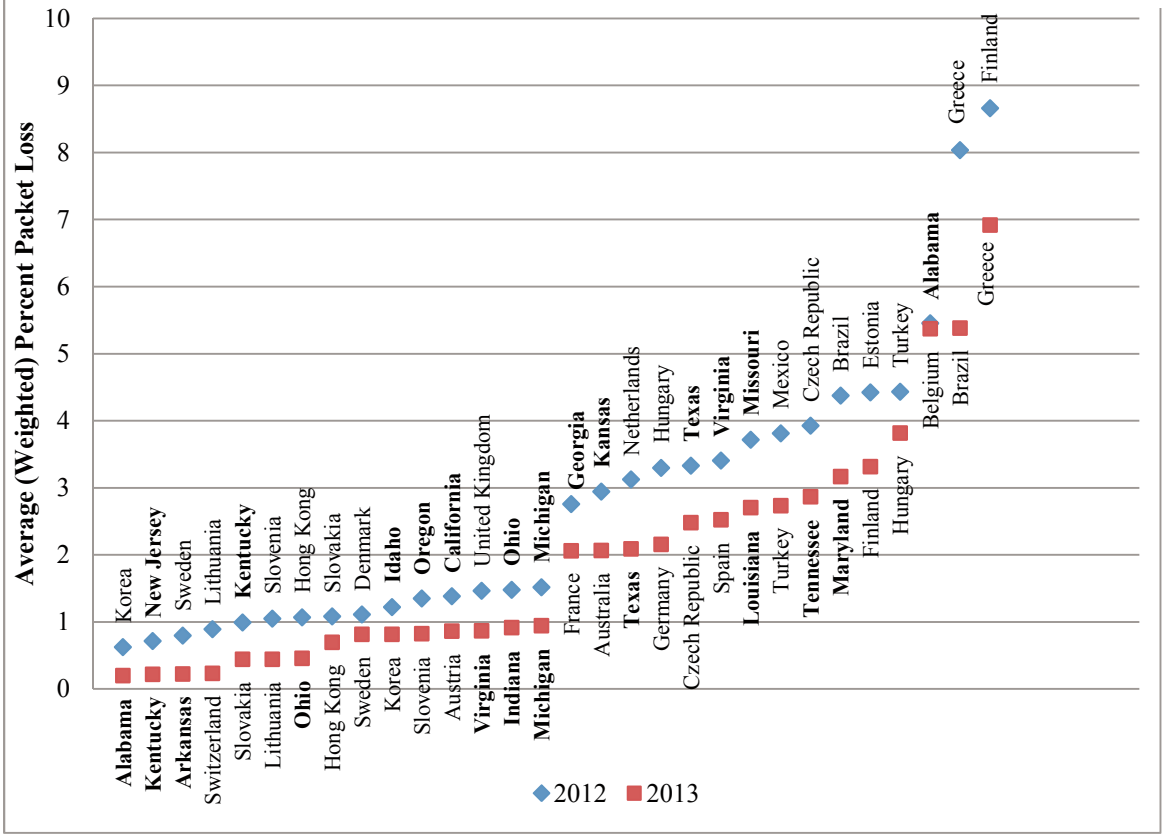
Figure 8a shows the average weighted percent packet loss from 2011-2013 for the 40 IBDR countries. Packet loss decreased for most countries in 2012, including the United States. In 2012, packet loss in the United States was 2.22 percent, down from 3.40 percent in 2011. The countries with the greatest improvement (fewer packets lost) in 2012 were Austria and Ireland, while Brazil saw the largest increase in percent packet loss. Packet loss decreased again for the United States in 2013. The United States saw its ranking improve from 22nd (of 38 countries) to fifth (of 40 countries), reflecting a 0.83 percentage point decrease in percent packet loss (to 1.39 percent). The countries with the greatest improvement in 2013 were Estonia and Finland, while Ireland experienced the largest increase in percent packet loss. Complete data can be found in Appendix F Table 9a.



Note: 2011 quality data is not available for Luxembourg. Brazil and India were not comparison countries in the *Third IBDR*. Iceland and Japan were new additions in 2013. Data drawn on Dec. 6, 2012 and Dec. 16, 2013.

In Figure 8b, U.S. states are compared to the IBDR countries. In Figure 8b, we plot the top and bottom quartiles of average (weighted) percent packet loss for countries and U.S. states for 2012 and 2013. Idaho saw substantial improvement in 2012 with fewer packet losses and joined six other states in the top quartile, one more than the previous year. The number of U.S. states in the bottom quartile increased as well, rising from five to six in 2012. The number of states in the top quartile remained[at seven in 2013, while the number of states in the bottom quartile returned to five. Of the U.S. States, Alabama made the greatest improvement in 2013, moving from 5.45 percent packet loss to 0.20 percent packet loss. Data for IBDR countries and all states which reported data are presented in Appendix F Table 9b.

Figure 8b
Country and US State Average Weighted Packet Loss Rankings (2012-2013): Top and Bottom Quartiles



Note: 2013 Quality data was not available for Arizona, Iowa, Israel, Luxembourg, Main, Nebraska, Portugal, and South Carolina. Brazil and India were not comparison countries in the *Third IBDR*. Data drawn on Dec. 6, 2012 and Dec. 16, 2013.

SPEED DATA TABLES

Appendix F Table 1a

Average (Weighted) Actual Download Speeds (2012-2013): All Available Data

2012 Data			2013 Data		
Country	**Average Download Speed (Mbps)**	**Rank**	**Country**	**Average Download Speed (Mbps)**	**Rank**
Lithuania	35.42	1	Luxembourg	42.97	1
Korea	33.63	2	Singapore	42.52	2
Hong Kong	29.73	3	Lithuania	41.72	3
Singapore	29.51	4	Sweden	39.85	4
Luxembourg	27.59	5	Korea	39.28	5
Sweden	27.58	6	Japan	37.42	6
Netherlands	27.31	7	Netherlands	37.02	7
Bulgaria	25.64	8	Switzerland	36.01	8
Japan	24.27	9	Hong Kong	35.85	9
Iceland	23.86	10	Iceland	33.97	10
Portugal	22.42	11	Finland	30.56	11
Switzerland	21.79	12	Denmark	30.45	12
Denmark	20.54	13	Bulgaria	27.78	13
Belgium	19.4	14	Belgium	26.04	14
Norway	18.84	15	Portugal	25.86	15
Czech Republic	18.82	16	Norway	24.08	16
Finland	18.38	17	France	23.66	17
Slovakia	17.87	18	Estonia	23.40	18
Estonia	17.59	19	UK	23.29	19
Germany	17.5	20	Czech Republic	23.18	20
Hungary	17.41	21	Slovakia	23.05	21
United Kingdom	16.87	22	Hungary	22.32	22
France	15.71	23	Austria	22.19	23
Austria	15.22	24	Germany	21.73	24
United States	14.5	25	Ireland	19.28	25
Canada	13.88	26	United States	18.67	26
Spain	13	27	Canada	18.06	27
Ireland	11.93	28	Spain	17.43	28
Poland	11.81	29	Israel	17.19	29
Slovenia	11.57	30	Poland	15.35	30
Australia	11.39	31	Slovenia	15.00	31
Israel	10.16	32	New Zealand	14.53	32
New Zealand	10.07	33	Australia	13.51	33
Chile	8.61	34	Mexico	10.16	34
Brazil	6.8	35	Chile	10.13	35
Turkey	6.38	36	Brazil	8.35	36
Greece	6.07	37	Turkey	8.34	37
Mexico	5.98	38	Greece	7.53	38

Italy	5.6	39	Italy	6.87	39
India	2.27	40	India	3.33	40

Appendix F Table 1b

Median (Weighted) Download Speed (2012): All Available Data Above 4 Mbps

Country	2013 Median Download Speed (Mbps)	2013 Rank	Country	2012 Median Download Speed (Mbps)	2012 Rank
Singapore	41.06	1	Singapore	29.7	4
Switzerland	38.63	2	Switzerland	20.71	12
Japan	37.57	3	Japan	21.8	11
Netherlands	36.93	4	Netherlands	26.33	6
Lithuania	36.34	5	Lithuania	35.48	2
Finland	35.56	6	Finland	18.13	19
Sweden	35.46	7	Sweden	25.44	8
Korea	35.30	8	Korea	34.51	3
Iceland	34.77	9	Iceland	22.96	10
Luxembourg	34.77	10	Luxembourg	27.05	5
Denmark	29.89	11	Denmark	20.07	13
Bulgaria	29.61	12	Bulgaria	25.18	9
Hong Kong	28.52	13	Hong Kong	43.44	1
Portugal	28.04	14	Portugal	25.78	7
Belgium	25.92	15	Belgium	19.56	15
Austria	25.53	16	Austria	18.07	20
Slovakia	24.74	17	Slovakia	19.68	14
Norway	23.98	18	Norway	19.25	17
Hungary	22.45	19	Hungary	18.18	18
United Kingdom	22.35	20	United Kingdom	17.86	21
Ireland	22.24	21	Ireland	14.23	26
Germany	21.85	22	Germany	16.86	23
Czech Republic	21.61	23	Czech Republic	19.33	16
France	20.69	24	France	16.99	22
Estonia	19.56	25	Estonia	14.81	24
United States	18.43	26	United States	14.35	25
Canada	18.34	27	Canada	13.87	27
Poland	16.51	28	Poland	13.15	29
Spain	16.06	29	Spain	13.53	28
Israel	15.76	30	Israel	9.76	33
Slovenia	14.02	31	Slovenia	12.47	30
New Zealand	12.97	32	New Zealand	9.94	32
Mexico	11.79	33	Mexico	7.62	36
Australia	11.19	34	Australia	11.13	31
Chile	10.09	35	Chile	8.73	34
Turkey	9.28	36	Turkey	7.13	37
Brazil	8.50	37	Brazil	7.81	35
Greece	7.49	38	Greece	6.15	38

Italy	6.17	39	Italy	5.61	39
India	2.90	40	India	4.23	40

Appendix F Table 1c
Percent Change in Average (Weighted) Download Speed, 2012-2013

Country	Upper Bound	Lower Bound	Percent Change
Hong Kong	89.5	76.1	82.8
Mexico	74.1	70.1	72.1
Israel	74.1	65.0	69.5
Switzerland	65.1	59.1	62.1
Japan	66.7	53.5	60.1
Ireland	65.4	53.2	59.3
Finland	61.5	55.5	58.5
France	51.8	48.7	50.3
Luxembourg	56.8	40.0	48.4
Denmark	51.3	45.2	48.2
India	48.8	43.4	46.1
Austria	48.3	43.5	45.9
Iceland	59.4	32.3	45.9
New Zealand	53.0	37.2	45.1
Sweden	45.1	39.3	42.2
Singapore	60.9	19.9	40.4
Belgium	41.1	38.2	39.6
United Kingdom	37.6	35.3	36.5
Netherlands	36.3	34.4	35.4
Spain	34.9	30.5	32.7
Turkey	33.2	28.7	31.0
Canada	32.1	29.3	30.7
Slovenia	33.7	26.5	30.1
Slovakia	32.9	25.8	29.4
Estonia	34.5	24.1	29.3
United States	28.8	27.9	28.3
Norway	29.7	25.7	27.7
Hungary	28.5	23.9	26.2
Czech Republic	27.5	22.4	24.9
Poland	26.6	22.9	24.7
Greece	25.2	21.5	23.4
Germany	24.2	22.2	23.2
Brazil	24.2	22.0	23.1
Italy	21.7	20.5	21.1
Lithuania	22.3	13.2	17.7
Chile	22.3	12.5	17.4
Australia	19.0	14.7	16.9

Portugal	16.6	12.3	14.5
Korea	14.5	9.4	11.9
Bulgaria	10.7	7.0	8.8

Appendix F Table 2
Average (Weighted) Download Speeds (2012-2013):
Non-US Capital Cities & US State Capitals and Washington, D.C.

Country	City	2013 Average Download Speed (Mbps)	2013 Rank	2012 Average Download Speed (Mbps)	2012 Rank
Lithuania	Vilnius	50.73	1	39.80	1
France	Paris	44.86	2	29.82	4
Singapore	Singapore	42.52	3	29.66	5
Luxembourg	Luxemburg	39.48	4	22.00	15
Korea	Seoul	39.44	5	33.24	2
Switzerland	Bern	37.39	6	22.07	14
Japan	Tokyo	37.09	7	20.49	21
Iceland	Reykjavík	34.75	8	24.64	9
Finland	Helsinki	34.71	9	24.45	11
Netherlands	Amsterdam	33.51	10	25.08	8
Bulgaria	Sofia	32.80	11	31.75	3
Hong Kong	Hong Kong	32.56	12	26.81	6
Sweden	Stockholm	31.93	13	24.63	10
Portugal	Lisbon	31.21	14	25.35	7
Denmark	Copenhagen	31.11	15	20.80	19
United States	**Dover**	31.08	16	22.83	12
United States	**Trenton**	30.85	17	21.95	16
Norway	Oslo	28.56	18	20.67	20
United States	**Annapolis**	28.12	19	20.89	18
United States	**Bismarck**	27.83	20	21.90	17
Austria	Vienna	27.83	21	18.14	30
Slovakia	Bratislava	26.46	22	19.51	23
United States	**Olympia**	26.45	23	19.07	25
Hungary	Budapest	24.29	24	18.72	26
Czech Republic	Prague	24.27	25	19.12	24
United States	**Harrisburg**	23.81	26	18.15	29
United States	**Richmond**	23.80	27	18.59	28
Estonia	Tallinn	23.00	28	17.31	31
United States	**Salem**	22.78	29	15.72	39
Spain	Madrid	22.62	30	14.41	44
Ireland	Dublin	22.43	31	13.43	49
United States	**Carson City**	22.17	32	22.35	13
Germany	Berlin	22.12	33	19.53	22
United Kingdom	London	21.69	34	16.61	34
United States	**Phoenix**	21.45	35	14.76	42
Canada	Ottawa	21.34	36	14.04	47
United States	**Providence**	21.32	37	15.85	37
United States	**Concord**	21.31	38	16.64	33
United States	**Tallahassee**	20.67	39	17.18	32

Country	City	2013 Average Download Speed (Mbps)	2013 Rank	2012 Average Download Speed (Mbps)	2012 Rank
United States	**Saint Paul**	20.35	40	16.10	36
United States	**Nashville**	19.89	41	15.25	41
United States	**Madison**	19.76	42	15.67	40
United States	**Santa Fe**	19.72	43	10.20	76
United States	**Baton Rouge**	19.24	44	14.46	43
United States	**Atlanta**	19.04	45	13.21	50
United States	**Montgomery**	18.82	46	16.60	35
United States	**Salt Lake City**	18.31	47	14.15	46
United States	**Denver**	18.22	48	12.54	57
United States	**Pierre**	17.85	49	18.63	27
United States	**DC**	17.76	50	11.50	68
United States	**Washington, D.C.**	17.76	51	11.48	69
New Zealand	Wellington	17.63	52	12.62	56
United States	**Jefferson City**	17.17	53	15.82	38
United States	**Springfield**	16.99	54	12.83	52
United States	**Hartford**	16.97	55	11.38	70
Poland	Warsaw	16.73	56	12.06	59
United States	**Boston**	16.35	57	10.46	75
United States	**Lansing**	16.00	58	12.07	58
United States	**Albany**	15.91	59	14.38	45
United States	**Jackson**	15.83	60	11.70	65
United States	**Austin**	15.45	61	13.49	48
Belgium	Brussels	15.38	62	11.88	62
United States	**Indianapolis**	15.33	63	11.51	67
United States	**Sacramento**	15.29	64	10.85	73
United States	**Little Rock**	15.16	65	10.91	72
United States	**Oklahoma City**	15.02	66	12.70	54
United States	**Des Moines**	14.69	67	11.73	64
United States	**Honolulu**	14.46	68	12.01	60
United States	**Raleigh**	14.35	69	12.72	53
Slovenia	Ljubljana	14.34	70	12.68	55
United States	**Columbus**	14.10	71	11.59	66
United States	**Topeka**	14.04	72	11.27	71
United States	**Boise**	13.91	73	10.57	74
Australia	Canberra	13.88	74	7.26	85
United States	**Columbia**	13.75	75	11.76	63
Israel	Jerusalem	13.64	76	8.63	80
United States	**Augusta**	13.60	77	13.02	51
Mexico	Mexico	13.20	78	7.65	83
United States	**Charleston**	12.41	79	8.31	81
United States	**Cheyenne**	11.90	80	11.91	61
United States	**Helena**	10.99	81	8.67	79
United States	**Lincoln**	10.96	82	9.72	77
Chile	Santiago	10.61	83	8.68	78

Country	City	2013 Average Download Speed (Mbps)	2013 Rank	2012 Average Download Speed (Mbps)	2012 Rank
Brazil	Brasília	10.15	84	8.26	82
United States	**Montpelier**	10.15	85	7.10	86
Turkey	Ankara	9.49	86	6.72	87
United States	**Frankfort**	8.60	87	7.41	84
Greece	Athens	7.59	88	6.23	88
Italy	Rome	7.30	89	6.03	89
India	New Delhi	3.02	90	2.46	90

Appendix F Table 3a
Population Strata for Non-US Cities (2011-2013)
(Based on City Population and Ookla Data)

Strata	No. of Cities in Stratum	Proportion (%)
Very Small Cities Less than 25,000 inhabitants	9,700	57.3%
Small Cities Greater than or equal to 25,000, but less than 50,000 inhabitants	2,704	16.0%
Medium Cities Greater than or equal to 50,000, but less than 100,000 inhabitants	3,441	20.3%
Large Cities Greater than 100,000 inhabitants	1,085	6.4%
Total	16,930	

Appendix F Table 3b
Population Strata for Non-US Cities (2011-2013)
(Based on City Population and Ookla Data)

Strata	No. of Cities in Stratum	Proportion (%)
Very Small Cities Less than 25,000 inhabitants	911	34.9%
Small Cities Greater than or equal to 25,000, but less than 50,000 inhabitants	916	35.1%
Medium Cities Greater than or equal to 50,000, but less than 100,000 inhabitants	500	19.2%
Large Cities Greater than 100,000 inhabitants	283	10.8%
Total	2,610	

Appendix F Table 3c
Average (Weighted) Download Speeds by Country (2012)
(Based on stratified sampling)

Country	2013 Average (Weighted) Download Speed (Mbps)	2013 Rank	2012 Average (Weighted) Download Speed (Mbps)	2012 Rank
Luxembourg	47.32	1	24.43	8
Singapore	42.52	2	29.51	4
Sweden	41.53	3	29.26	5
Korea	39.43	4	32.68	2
Switzerland	38.70	5	22.54	10
Netherlands	38.54	6	27.03	7
Japan	37.13	7	28.37	6
Hong Kong	35.75	8	29.64	3
Belgium	30.42	9	20.91	13
Denmark	30.29	10	21.21	12
Lithuania	28.35	11	32.90	1
Finland	27.57	12	15.95	20
Portugal	26.08	13	22.74	9
Bulgaria	24.40	14	22.50	11
Iceland	22.83	15	19.78	14
United Kingdom	22.39	16	15.77	21
Czech Republic	22.18	17	17.99	15
Slovakia	21.91	18	16.70	16
Estonia	21.70	19	16.32	18
Germany	21.30	20	15.17	22
Norway	20.89	21	16.38	17
Hungary	20.44	22	15.98	19
France	19.60	23	15.11	23
Canada	19.58	24	15.06	24
United States	19.55	25	14.70	26
Israel	19.11	26	10.67	31
Ireland	18.37	27	10.17	32
Poland	18.14	28	13.27	27
Austria	16.95	29	11.53	30
Spain	15.59	30	12.62	29
Australia	13.77	31	14.97	25
Slovenia	12.74	32	12.67	28
New Zealand	12.53	33	8.29	33
Chile	9.36	34	7.89	34
Brazil	8.76	35	6.85	35
Italy	6.83	36	5.53	37
Turkey	3.80	37	3.47	38
Mexico	3.22	38	3.27	39
India	2.74	39	2.52	40
Greece		N/A	6.48	36

Appendix F Table 3d
Average (Weighted) Download Speed by US States and International Countries: 2012-2013, Based on stratified sampling using 2011 cities

Country	2013 Average Weighted Download Speed (Mbps)	2013 Rank	2012 Average Weighted Download Speed (Mbps)	2012 Rank
Luxembourg	47.32	1	24.43	8
Singapore	42.52	2	29.51	4
Sweden	41.53	3	29.26	5
Korea	39.43	4	32.68	2
Switzerland	38.70	5	22.54	10
Netherlands	38.54	6	27.03	7
Japan	37.13	7	28.37	6
Hong Kong	35.75	8	29.64	3
Belgium	30.42	9	20.91	13
Denmark	30.29	10	21.21	12
Lithuania	28.35	11	32.90	1
Finland	27.57	12	15.95	35
Delaware	26.54	13	19.77	15
Portugal	26.08	14	22.74	9
New Jersey	26.06	15	19.44	17
Maryland	25.68	16	19.12	18
Bulgaria	24.40	17	22.50	11
Virginia	23.60	18	17.64	21
Rhode Island	23.50	19	17.64	22
Massachusetts	23.31	20	18.73	19
Utah	22.91	21	15.97	34
Iceland	22.83	22	19.78	14
Washington	22.75	23	16.06	30
United Kingdom	22.39	24	15.77	37
Czech Republic	22.18	25	17.99	20
Arizona	22.16	26	14.95	46
Slovakia	21.91	27	16.70	24
Florida	21.88	28	16.51	26
Estonia	21.70	29	16.32	28
Nevada	21.54	30	15.98	33
New York	21.41	31	15.86	36
Germany	21.30	32	15.17	41
Minnesota	21.25	33	17.52	23
New Hampshire	21.12	34	16.08	29
Norway	20.89	35	16.38	27
Kansas	20.81	36	13.38	57
Oregon	20.73	37	15.71	38
South Dakota	20.61	38	19.49	16
Hungary	20.44	39	15.98	32
Connecticut	20.37	40	16.01	31
Pennsylvania	20.04	41	14.70	47

Country	2013 Average Weighted Download Speed (Mbps)	2013 Rank	2012 Average Weighted Download Speed (Mbps)	2012 Rank
Colorado	19.77	42	14.06	52
France	19.60	43	15.11	43
Canada	19.58	44	15.06	44
Michigan	19.52	45	14.42	50
North Dakota	19.20	46	16.61	25
Israel	19.11	47	10.67	75
Tennessee	19.08	48	15.39	40
Illinois	18.73	49	13.87	53
Ireland	18.37	50	10.17	77
Indiana	18.16	51	13.56	55
Poland	18.14	52	13.27	58
Nebraska	18.07	53	12.89	61
California	18.03	54	14.44	48
Vermont	17.70	55	11.65	67
Georgia	17.46	56	14.42	49
New Mexico	17.37	57	11.77	66
Louisiana	17.24	58	13.40	56
Wisconsin	16.96	59	15.13	42
Austria	16.95	60	11.53	70
South Carolina	16.81	61	14.25	51
West Virginia	16.74	62	11.02	73
Alabama	16.70	63	15.45	39
Missouri	16.67	64	11.49	71
Iowa	16.63	65	12.75	62
Hawaii	16.04	66	13.66	54
Arkansas	15.78	67	13.09	59
Spain	15.59	68	12.62	64
Mississippi	15.59	69	11.60	68
Texas	14.74	70	12.11	65
North Carolina	14.65	71	13.06	60
Idaho	14.50	72	9.74	79
Oklahoma	14.12	73	11.56	69
Ohio	14.00	74	11.46	72
Australia	13.77	75	14.97	45
Slovenia	12.74	76	12.67	63
Maine	12.62	77	10.55	76
New Zealand	12.53	78	8.29	81
Kentucky	11.63	79	10.90	74
Wyoming	11.21	80	9.69	80
Montana	10.07	81	9.82	78
Chile	9.36	82	7.89	82
Brazil	8.76	83	6.85	83
Alaska	8.07	84	5.87	84
Italy	6.83	85	5.53	85
Turkey	3.80	86	3.47	86

Country	2013 Average Weighted Download Speed (Mbps)	2013 Rank	2012 Average Weighted Download Speed (Mbps)	2012 Rank
Mexico	3.22	87	3.27	87
India	2.74	88	2.52	88

Appendix F Table 4a
Average Download Speed (2012-2013) in Very Small Cities for a Country/State
(Based on stratified sampling using 2011 cities)

Country	2013 Download Speed (Mbps)	2012 Download Speed (Mbps)	Country	2013 Download Speed (Mbps)	2012 Download Speed (Mbps)
Luxembourg	47.3	24.4	Israel	19.1	10.7
Sweden	39.8	27.7	**Alabama**	18.8	18.3
Japan	37.7	25.5	Slovakia	18.7	16.2
Switzerland	37.1	23.9	**South Carolina**	18.3	17.9
Netherlands	37.0	25.9	**Georgia**	18.3	14.2
Hong Kong	34.0	28.6	**Indiana**	17.9	13.6
Korea	33.7	30.9	**Missouri**	17.8	12.6
Lithuania	31.6	27.9	**California**	17.7	15.6
Denmark	30.3	21.8	**South Dakota**	17.5	16.0
Delaware	30.1	22.0	**Idaho**	17.4	6.7
Belgium	29.5	20.5	**Michigan**	17.2	12.4
Maryland	28.9	21.0	**Kansas**	17.2	14.1
New Jersey	27.9	20.1	Hungary	17.1	11.7
Portugal	26.0	23.2	Austria	16.9	11.5
Massachusetts	25.8	20.4	**Hawaii**	16.9	14.7
Bulgaria	25.7	23.8	**Vermont**	16.8	12.5
Virginia	25.0	18.8	**Wisconsin**	16.6	16.4
Finland	24.6	15.5	Spain	15.4	12.5
Arizona	24.1	16.2	**Oklahoma**	15.3	13.2
Florida	22.8	16.8	**Mississippi**	15.3	11.2
Pennsylvania	22.4	17.6	**Colorado**	15.1	12.7
Czech Republic	22.0	17.5	**North Carolina**	15.1	14.6
Utah	21.9	16.9	**Texas**	14.8	12.5
Estonia	21.7	16.3	Slovenia	14.3	12.7
Oregon	21.5	17.7	**West Virginia**	14.1	9.8
Nebraska	21.4	16.6	**Maine**	14.0	12.2
Nevada	21.3	16.2	Australia	13.7	14.9
Germany	21.0	14.3	**Ohio**	13.4	11.7
Washington	21.0	15.7	**Kentucky**	12.8	11.1
Iceland	20.9	17.3	**Iowa**	12.4	10.7
Rhode Island	20.6	15.9	**North Dakota**	11.5	10.3
New Hampshire	20.3	17.4	**Arkansas**	11.0	10.0
Minnesota	20.2	17.5	Ireland	10.9	6.5
Norway	20.2	15.9	**Montana**	10.3	10.3
France	20.2	13.4	Chile	9.9	8.4
Poland	20.2	12.0	**Wyoming**	8.9	7.1
Canada	20.0	15.4	Brazil	8.8	6.8
Illinois	19.7	14.8	**Alaska**	5.9	4.6

Connecticut	19.7	15.3	Mexico	3.2	3.2
Louisiana	19.4	15.2	Turkey	3.0	3.1
New York	19.3	15.2	India	2.8	2.5
Tennessee	19.2	16.2			

Appendix F Table 4b
Average Download Speed (2012-2013) in Small Cities for a Country/State
(Based on stratified sampling using 2011 cities)

Country	2013 Download Speed (Mbps)	2012 Download Speed (Mbps)	Country	2013 Download Speed (Mbps)	2012 Download Speed (Mbps)
Lithuania	44.5	33.7	**Pennsylvania**	18.8	14.2
Switzerland	42.3	27.3	**West Virginia**	18.8	14.2
Netherlands	40.8	28.8	**Indiana**	18.3	13.7
Sweden	38.9	30.6	**Illinois**	18.3	13.9
Belgium	38.8	25.7	**California**	18.2	14.5
Delaware	29.0	21.1	**Iowa**	18.0	14.5
Denmark	27.5	18.0	**Georgia**	17.4	13.9
Portugal	27.3	22.1	**Vermont**	16.9	11.0
Ireland	27.2	15.9	**Mississippi**	16.7	12.6
New Jersey	26.7	19.8	**Kansas**	16.7	12.8
Rhode Island	26.3	19.9	**South Carolina**	16.3	14.5
South Dakota	26.0	24.0	**Louisiana**	16.1	13.8
Iceland	25.5	23.2	**Missouri**	15.8	13.3
Massachusetts	24.9	19.1	**Arkansas**	15.7	13.2
Maryland	24.3	17.6	Poland	15.6	13.9
Virginia	23.7	17.5	**Hawaii**	15.2	12.1
North Dakota	23.6	21.0	Spain	15.0	11.9
Connecticut	23.5	18.7	**North Carolina**	14.6	12.6
Washington	23.4	17.5	**Alabama**	14.6	11.8
Slovakia	22.9	17.5	**Texas**	14.4	11.3
Utah	22.5	15.7	**Ohio**	13.6	11.3
Hungary	22.4	18.5	**Idaho**	13.0	9.5
New York	22.3	18.9	**Kentucky**	13.0	10.8
Finland	21.9	13.1	**New Mexico**	12.6	9.1
New Hampshire	21.5	14.4	**Oklahoma**	12.3	9.4
Czech Republic	21.3	17.3	**Nebraska**	12.1	11.3
Oregon	21.1	15.6	**Wyoming**	11.8	10.1
Bulgaria	20.5	20.7	**Maine**	11.2	8.6
Germany	20.5	15.3	**Montana**	9.5	9.0
Minnesota	20.2	17.9	France	8.3	6.4
Michigan	20.2	15.9	Australia	6.3	17.0
Arizona	20.2	13.8	**Alaska**	5.6	4.3
Tennessee	20.0	16.3	**Nevada**	4.3	3.5
Florida	19.7	15.7	Turkey	3.8	4.4
Colorado	18.9	14.5	Chile	2.2	2.4
Wisconsin	18.8	15.7			

Appendix F Table 4c
Average Download Speed (2012-2013) in Medium Cities for a Country/State
(Based on stratified sampling using 2011 cities)

Country	2013 Download Speed (Mbps)	2012 Download Speed (Mbps)	Country	2013 Download Speed (Mbps)	2012 Download Speed (Mbps)
Hong Kong	59.1	38.0	**Tennessee**	19.0	15.5
Sweden	48.5	34.4	**Pennsylvania**	18.5	13.6
Netherlands	43.1	31.7	**Indiana**	18.5	14.8
Switzerland	36.2	25.3	**Arkansas**	18.1	14.9
Germany	34.4	18.3	**Illinois**	18.0	12.9
Portugal	29.8	24.2	Spain	17.5	16.8
Hungary	27.4	20.9	**Michigan**	17.2	14.5
Slovakia	27.1	16.4	**Georgia**	17.2	15.4
North Dakota	26.5	23.2	**Kansas**	17.2	15.3
Maryland	26.4	19.9	**California**	17.1	13.1
New Jersey	25.4	19.5	**Louisiana**	16.7	11.0
Bulgaria	25.1	22.8	**New Mexico**	16.6	12.0
Massachusetts	24.8	18.8	**Missouri**	16.5	13.3
Finland	24.6	14.6	**Iowa**	16.3	12.7
Delaware	23.7	18.4	**Nevada**	15.9	15.6
New Hampshire	23.2	17.9	**Idaho**	15.4	10.1
United Kingdom	23.1	15.8	**Texas**	15.1	12.0
Utah	23.1	17.0	**North Carolina**	15.0	13.4
Japan	23.1	25.2	**South Carolina**	14.7	11.0
Rhode Island	22.9	17.8	**Wisconsin**	14.6	14.6
Arizona	22.7	14.3	**Ohio**	14.5	12.5
New York	22.3	19.2	**Mississippi**	14.3	10.7
Colorado	22.3	16.3	Poland	14.0	10.4
Washington	22.2	16.6	**Oklahoma**	13.9	11.1
Florida	22.1	17.6	**Maine**	12.8	11.9
Minnesota	21.3	17.1	New Zealand	12.5	8.3
Oregon	20.8	15.5	**Montana**	11.0	9.2
South Dakota	20.6	20.2	**Wyoming**	10.9	10.4
Connecticut	20.5	15.7	**Kentucky**	8.1	9.4
Czech Republic	20.1	15.7	France	7.3	6.8
Alabama	19.6	16.9	Italy	6.8	5.5
Virginia	19.4	13.4	Turkey	4.2	3.5

***Vermont Not Included**

Appendix F Table 4d
Average Download Speed (2012-2013) in Large Cities for a Country/State
(Based on stratified sampling using 2011 cities)

Country	2013 Download Speed (Mbps)	2012 Download Speed (Mbps)	Country	2013 Download Speed (Mbps)	2012 Download Speed (Mbps)
Hong Kong	47.8	34.8	**Connecticut**	19.5	14.3
Sweden	42.3	31.4	**California**	18.9	15.6
Korea	39.6	33.1	**Tennessee**	18.7	14.5
Japan	38.8	32.1	**Oregon**	18.7	13.5
Finland	36.1	17.5	**New Mexico**	18.7	12.3
Lithuania	34.6	35.4	**Georgia**	18.1	14.2
France	34.0	19.5	**Illinois**	17.8	13.6
Switzerland	32.2	15.0	**Alabama**	16.8	14.6
Denmark	30.6	19.8	**Missouri**	16.3	10.7
Maryland	28.6	21.6	**Louisiana**	16.2	12.0
Utah	26.2	13.7	Canada	15.8	12.2
Hungary	26.0	23.2	**North Dakota**	15.7	12.6
Czech Republic	26.0	22.4	**South Carolina**	15.3	12.4
Bulgaria	25.3	22.0	**New Hampshire**	15.1	11.8
Virginia	24.5	18.2	**Iowa**	15.1	12.0
Florida	24.1	16.0	**Indiana**	14.6	11.1
Norway	23.8	18.3	**Oklahoma**	14.5	12.3
New Jersey	23.8	17.9	Spain	14.4	11.7
Portugal	23.2	20.7	**North Carolina**	13.9	12.3
Washington	22.9	15.3	**Texas**	13.6	11.5
Kansas	22.8	13.0	**Ohio**	13.5	11.0
Arizona	22.5	15.3	**Wisconsin**	12.7	11.0
Nebraska	22.2	13.4	**Vermont**	12.5	10.4
Nevada	22.1	16.3	**West Virginia**	11.9	8.1
South Dakota	21.7	20.3	**Rhode Island**	11.2	6.1
Massachusetts	21.0	15.5	**Montana**	9.2	11.1
Poland	21.0	16.7	**Kentucky**	9.2	7.8
Germany	20.7	19.2	**Alaska**	8.7	6.3
Michigan	20.1	14.3	Chile	8.2	6.7
Colorado	20.1	13.8	**Arkansas**	3.7	3.4
New York	19.9	14.5	India	1.8	1.6
Pennsylvania	19.6	14.1			

Appendix F Table 5
Shortfall Index (%), 2011-2013

Country	Median Shortfall 2011	Median Shortfall 2012	Median Shortfall 2013
Hungary	1.36	-0.45	-0.99
Lithuania	1.02	0.23	1.15
Slovakia	0.41	0.44	1.28
Israel	0.45	0.77	2.00
Switzerland	3.24	2.72	2.46
Brazil	5.13	4.92	3.98
Chile	4.99	3.56	4.05
Slovenia	3.66	3.93	4.05
Poland	2.62	3.29	4.75
Bulgaria	4.41	4.22	5.12
Czech Republic	6.97	5.55	5.64
Norway	5.06	4.99	5.74
United States	6.80	6.89	7.15
Canada	11.72	11.43	7.20
Estonia	6.93	8.39	7.50
Denmark	11.73	11.02	7.82
Mexico	13.77	12.44	8.38
Finland	14.17	13.39	13.37
Sweden	17.75	14.22	13.99
Singapore	17.15	17.20	14.28
Turkey	14.87	14.62	14.52
Hong Kong	14.14	14.96	14.77
Luxembourg	18.10	13.83	15.06
Germany	18.19	20.06	18.51
Spain	16.93	17.57	19.22
India	16.79	18.43	19.60
Portugal	19.20	17.25	19.83
New Zealand	28.79	23.91	20.79
Belgium	18.17	20.23	22.47
Netherlands	16.41	17.25	23.23
United Kingdom	32.83	26.62	24.59
Iceland	29.34	31.88	25.02
Austria	22.26	22.98	25.12
Ireland	24.03	28.03	33.79
Italy	31.81	33.42	34.85
Australia	37.87	36.14	36.11
France	40.57	39.54	38.99
Greece	55.77	55.93	55.75

Appendix F Table 6
Ookla Actual and Advertised Average Download Speeds, 2011-2013

	2013		2012		2011	
Country	**Actual**	**Advertised**	**Actual**	**Advertised**	**Actual**	**Advertised**
Hong Kong	51.0	59.9	39.3	46.1	35.1	41.0
Luxembourg	42.8	50.4	25.3	29.4	11.3	14.3
Singapore	42.0	49.0	29.7	35.9	17.3	21.0
Sweden	40.1	46.6	28.5	33.3	27.9	33.4
Japan	39.7		32.2		22.5	
Korea	38.5		33.6		30.7	
Netherlands	36.6	47.7	26.5	32.0	23.6	28.0
Switzerland	36.1	37.1	23.6	24.2	21.0	21.7
Lithuania	33.9	34.3	31.7	31.7	29.2	29.5
Belgium	31.8	41.0	22.1	27.7	19.1	23.0
Denmark	28.0	30.4	19.7	22.2	18.8	21.2
Iceland	27.0	36.1	19.7	29.0	15.9	22.2
Bulgaria	24.1	25.4	21.7	22.6	19.2	20.1
Portugal	23.7	29.5	20.2	24.4	13.7	16.8
Finland	22.4	25.9	13.1	15.1	10.7	12.4
Estonia	21.9	23.7	16.9	18.5	14.8	15.9
Czech Republic	20.8	22.0	16.9	17.9	14.9	16.1
Norway	20.3	21.5	16.5	17.4	12.2	12.8
Israel	19.8	20.2	10.7	10.8	7.0	7.0
United Kingdom	19.5	25.8	13.2	18.1	8.8	12.5
Hungary	18.5	18.3	13.9	13.9	11.6	11.6
Germany	18.5	22.7	14.6	18.3	13.3	16.4
Slovakia	18.3	18.6	15.0	15.0	13.7	13.7
United States	17.9	19.3	14.4	15.5	11.9	12.8
Ireland	15.5	23.4	9.7	13.4	6.4	8.4
Slovenia	15.4	16.1	9.7	10.1	8.0	8.3
Spain	14.9	18.5	11.9	14.4	10.9	13.2
Australia	14.4	22.6	12.2	19.2	9.9	16.0
Canada	14.1	15.2	11.2	12.7	10.1	11.5
Austria	13.7	18.2	9.8	12.7	8.1	10.8
France	13.3	21.7	10.1	16.8	9.7	16.1
New Zealand	13.2	16.7	9.3	12.2	7.8	10.7
Poland	12.8	13.4	9.7	10.1	7.4	7.6
Chile	7.5	7.8	6.7	6.9	5.2	5.4
Greece	6.9	15.7	5.5	12.5	5.3	12.0
Turkey	6.6	7.7	5.0	5.9	4.7	5.5
Mexico	5.8	6.3	3.9	4.4	2.9	3.4
Italy	5.5	8.4	4.8	7.3	4.5	6.6
Brazil	5.0	5.2	4.2	4.4		
India	2.2	2.7	1.7	2.1		

Appendix F Table 7a
Average (Weighted) Latency by Country (2012-2013)

Country	2013 Latency (Ms)	2013 Rank	2012 Latency (Ms)	2012 Rank
Korea	45.54	1	46.53	2
Bulgaria	47.22	2	40.77	1
Czech Republic	50.45	3	49.74	3
Switzerland	55.92	4	72.43	18
Portugal	55.96	5	65.44	11
Slovakia	56.50	6	60.93	8
Iceland	57.75	7		N/A
Hungary	58.55	8	57.97	4
Lithuania	59.31	9	60.59	6
Netherlands	61.12	10	73.04	19
Hong Kong	63.24	11	58.18	5
Austria	63.36	12	66.88	13
New Zealand	64.65	13	64.01	9
Norway	66.01	14	66.71	12
Germany	66.75	15	73.51	20
Belgium	66.97	16	69.12	15
United Kingdom	68.05	17	64.15	10
Denmark	70.91	18	70.27	17
Finland	73.07	19	60.90	7
Greece	73.45	20	70.10	16
Poland	73.53	21	74.06	22
Italy	75.21	22	73.94	21
Ireland	75.49	23	84.75	31
Brazil	75.68	24	67.52	14
Turkey	75.82	25	83.52	29
Chile	76.15	26	77.97	26
United States	80.33	27	75.49	24
Japan	80.96	28		N/A
Israel	81.76	29	91.48	33
Sweden	81.93	30	75.15	23
Australia	82.60	31	81.93	27
Slovenia	85.48	32	91.17	32
Canada	86.03	33	91.94	34
Singapore	86.75	34	76.94	25
Spain	87.79	35	84.40	30
France	95.65	36	100.88	37
Estonia	99.31	37	99.99	36
Mexico	109.70	38	82.28	28
India	114.83	39	97.39	35
Luxembourg	118.71	40	118.71	38

Appendix F Table 7b
Average (Weighted) Latency by US States and International Countries (2012-2013)

Country	2013 Latency (Ms)	2013 Rank	Country	2012 Latency (Ms)	2012 Rank
Bulgaria	37.94	1	**Arkansas**	36.79	1
New Jersey	37.96	2	Bulgaria	41.80	2
Korea	44.26	3	Korea	46.02	3
Finland	46.64	4	**Virginia**	48.60	4
Arkansas	49.57	5	Czech Republic	50.02	5
Czech Republic	52.48	6	**Florida**	56.66	6
Switzerland	55.86	7	**Alabama**	56.78	7
Hungary	56.92	8	Hungary	57.56	8
Slovakia	57.00	9	**Wisconsin**	58.68	9
Virginia	57.54	10	**Georgia**	59.12	10
Austria	59.49	11	Finland	59.50	11
Tennessee	60.94	12	Lithuania	60.26	12
Mexico	60.97	13	Slovakia	61.02	13
Denmark	63.29	14	Hong Kong	61.37	14
Georgia	63.31	15	New Zealand	63.37	15
Oklahoma	63.46	16	United Kingdom	63.54	16
Florida	64.65	17	Missouri	64.22	17
Indiana	64.92	18	Oklahoma	64.40	18
Nevada	65.57	19	Indiana	64.55	19
New Zealand	65.78	20	Colorado	65.81	20
Ireland	69.06	21	Norway	66.15	21
Hong Kong	69.57	22	Nevada	66.72	22
Lithuania	69.82	23	Austria	67.31	23
Greece	70.04	24	Texas	68.28	24
Illinois	70.58	25	Brazil	68.42	25
United Kingdom	70.72	26	Oregon	69.13	26
Texas	72.50	27	Illinois	69.57	27
Italy	73.37	28	Belgium	69.79	28
Brazil	75.13	29	Denmark	70.34	29
Poland	75.59	30	Greece	71.04	30
North Carolina	75.78	31	Switzerland	72.72	31
Pennsylvania	75.89	32	Louisiana	73.30	32
Norway	76.47	33	Netherlands	73.43	33
Maryland	76.62	34	Kentucky	73.63	34
Singapore	78.73	35	Italy	74.15	35
Oregon	79.16	36	Germany	74.26	36
Estonia	79.54	37	North Carolina	74.58	37
Kentucky	79.90	38	Poland	74.84	38
Slovenia	81.80	39	Washington	75.23	39
Minnesota	82.04	40	Sweden	75.38	40
Netherlands	83.41	41	Chile	75.40	41
Colorado	84.00	42	Singapore	76.93	42

Country	2013 Latency (Ms)	2013 Rank	Country	2012 Latency (Ms)	2012 Rank
Washington	84.57	43	Minnesota	77.54	43
Chile	84.79	44	Pennsylvania	78.37	44
Germany	84.90	45	**New Jersey**	78.83	45
New York	85.46	46	**New York**	79.02	46
Spain	87.22	47	**Tennessee**	79.32	47
Australia	89.17	48	Mexico	80.67	48
California	89.62	49	Australia	82.27	49
Missouri	90.75	50	Ohio	83.15	50
Louisiana	91.66	51	**California**	84.10	51
Sweden	91.72	52	Spain	85.57	52
Belgium	92.10	53	Ireland	85.58	53
Kansas	92.85	54	Turkey	86.00	54
Canada	93.91	55	Canada	91.19	55
Wisconsin	96.17	56	Slovenia	91.83	56
India	100.37	57	**Michigan**	94.87	57
France	103.27	58	**Kansas**	95.27	58
Turkey	113.52	59	India	96.33	59
Idaho	114.64	60	Estonia	99.63	60
Ohio	130.43	61	France	99.71	61
Massachusetts	136.87	62	**Idaho**	102.48	62
Michigan	159.45	63	**Massachusetts**	115.41	63
Alabama	185.32	64	**Maryland**	129.21	64

Appendix F Table 8a
Average (Weighted) Jitter by Country (2012-2013)

Country	2013 Jitter (Ms)	2013 Rank	2012 Jitter (Ms)	2012 Rank
Korea	20.67	1	21.86	4
Greece	21.12	2	20.75	3
Germany	21.35	3	23.83	7
Bulgaria	21.64	4	18.40	1
New Zealand	21.84	5	23.00	5
Slovakia	22.72	6	24.98	10
Czech Republic	23.39	7	23.57	6
Austria	24.17	8	25.19	11
Italy	24.34	9	24.14	8
Portugal	25.10	10	33.32	29
Switzerland	25.22	11	32.15	26
Netherlands	25.39	12	31.92	25
Hungary	25.48	13	25.60	13
Lithuania	25.76	14	19.80	2
Turkey	26.62	15	28.24	15
Spain	27.05	16	28.97	17
Hong Kong	27.34	17	25.47	12
Japan	27.53	18		N/A
Finland	27.67	19	29.24	18
Denmark	28.61	20	26.54	14
Ireland	29.21	21	33.46	31
Brazil	29.46	22	24.77	9
Slovenia	30.24	23	29.84	19
Iceland	30.62	24		N/A
Poland	30.68	25	31.61	23
Norway	31.13	26	28.66	16
Belgium	31.37	27	31.80	24
Israel	31.93	28	31.18	22
Australia	32.45	29	33.20	28
United Kingdom	33.22	30	33.33	30
Sweden	34.21	31	31.10	21
France	36.50	32	38.86	34
Mexico	37.48	33	30.11	20
Canada	38.37	34	41.25	36
United States	39.41	35	32.55	27
Estonia	39.55	36	47.10	37
Chile	39.58	37	39.18	35
Singapore	41.78	38	38.01	33
India	53.67	39	36.67	32
Luxembourg	60.01	40	60.01	38

Appendix F Table 8b
Average (Weighted) Jitter by US States and International Countries (2012-2013)

Country	2013 Jitter (Ms)	2013 Rank	Country	2012 Jitter (Ms)	2012 Rank
Switzerland	11.38	1	**Arkansas**	15.59	1
Arkansas	11.48	2	Bulgaria	18.80	2
Bulgaria	19.74	3	Lithuania	19.90	3
Finland	20.07	4	Greece	20.74	4
Korea	21.57	5	Korea	21.15	5
Greece	23.10	6	**Wisconsin**	22.54	6
New Jersey	23.61	7	Missouri	22.73	7
Slovakia	23.80	8	New Zealand	22.82	8
Hungary	26.07	9	**Colorado**	23.33	9
New Zealand	26.78	10	Czech Republic	23.83	10
Germany	26.93	11	Italy	24.17	11
Italy	26.95	12	Germany	24.22	12
Mexico	27.28	13	**Oregon**	24.38	13
Brazil	27.40	14	**Virginia**	24.46	14
Florida	27.84	15	Alabama	24.56	15
Lithuania	27.85	16	Florida	24.57	16
Hong Kong	28.36	17	**Oklahoma**	25.02	17
Virginia	28.44	18	Slovakia	25.09	18
Czech Republic	29.58	19	Brazil	25.24	19
Ireland	29.68	20	Kentucky	25.47	20
Spain	30.47	21	Austria	25.52	21
Estonia	30.67	22	Hungary	25.62	22
North Carolina	31.33	23	Indiana	25.67	23
Minnesota	31.35	24	**Minnesota**	26.16	24
Nevada	31.51	25	Nevada	26.35	25
Slovenia	31.72	26	Denmark	26.76	26
Missouri	31.83	27	Hong Kong	26.95	27
Poland	32.39	28	Finland	27.74	28
Austria	32.90	29	Norway	28.35	29
Georgia	33.08	30	Georgia	28.58	30
Tennessee	33.41	31	Texas	28.85	31
United Kingdom	33.50	32	Turkey	29.11	32
Turkey	33.87	33	Spain	29.15	33
Oregon	34.02	34	Slovenia	29.18	34
Texas	34.52	35	Mexico	29.94	35
Colorado	34.92	36	Pennsylvania	30.82	36
Netherlands	35.72	37	North Carolina	31.12	37
Norway	35.79	38	Sweden	31.24	38
Denmark	36.43	39	United Kingdom	31.48	39
Australia	38.27	40	Poland	31.72	40
Maryland	38.37	41	Netherlands	32.06	41
Oklahoma	38.46	42	Switzerland	32.13	42

Country	2013 Jitter (Ms)	2013 Rank	Country	2012 Jitter (Ms)	2012 Rank
Pennsylvania	38.48	43	**Washington**	32.69	43
Kentucky	38.66	44	Michigan	32.94	44
Washington	39.60	45	Australia	33.12	45
Indiana	40.44	46	Illinois	33.15	46
India	42.05	47	Ireland	33.80	47
Illinois	42.80	48	**New Jersey**	33.93	48
France	43.42	49	Belgium	34.28	49
California	45.47	50	Ohio	34.66	50
Chile	45.83	51	**New York**	35.69	51
Idaho	46.68	52	India	36.23	52
Canada	47.43	53	**Idaho**	36.55	53
Singapore	47.63	54	**Louisiana**	36.79	54
Belgium	49.00	55	Chile	37.50	55
Louisiana	51.24	56	France	37.59	56
New York	51.42	57	Singapore	38.15	57
Michigan	54.89	58	**California**	38.81	58
Sweden	55.44	59	Canada	40.95	59
Ohio	56.20	60	**Kansas**	41.49	60
Massachusetts	57.26	61	**Maryland**	43.68	61
Wisconsin	59.37	62	**Tennessee**	44.79	62
Kansas	59.57	63	Estonia	46.47	63
Alabama	63.24	64	**Massachusetts**	47.60	64

Appendix F Table 9a
Average (Weighted) Percent Packet Loss by Country (2012-2013)

Country	2013 Percent Packet Loss	2013 Ranking	2012 Percent Packet Loss	2012 Ranking
Korea	0.93	1	0.62	1
Hong Kong	1.04	2	1.03	6
Iceland	1.26	3		N/A
Lithuania	1.33	4	0.89	3
United States	1.39	5	2.22	23
Slovenia	1.44	6	1.06	7
Slovakia	1.58	7	0.94	5
Denmark	1.72	8	1.10	8
Chile	1.79	9	2.12	21
Japan	1.80	10		N/A
Israel	1.83	11	0.90	4
Switzerland	1.86	12	1.62	13
Canada	1.95	13	1.56	12
Norway	2.12	14	1.53	11
Italy	2.27	15	1.80	15
Singapore	2.42	16	1.97	18
Poland	2.42	17	2.06	19
India	2.48	18	1.81	16
Netherlands	2.55	19	3.40	29
United Kingdom	2.62	20	1.47	9
France	2.76	21	2.46	25
Estonia	2.82	22	4.50	36
Austria	2.90	23	1.88	17
Czech Republic	3.03	24	3.87	33
Australia	3.05	25	2.46	26
Germany	3.14	26	2.64	27
Sweden	3.25	27	0.79	2
Portugal	3.49	28	3.47	30
Spain	3.68	29	2.27	24
Luxembourg	3.75	30	3.75	31
New Zealand	3.84	31	2.10	20
Brazil	3.88	32	4.23	34
Mexico	3.91	33	3.81	32
Bulgaria	4.24	34	1.64	14
Hungary	4.25	35	3.21	28
Belgium	4.49	36	2.12	22
Turkey	6.08	37	4.43	35
Ireland	6.97	38	1.52	10
Finland	7.13	39	8.73	38
Greece	10.07	40	8.03	37

Appendix F Table 9b
Average (Weighted) Percent Packet Loss by US States and International Countries (2012-2013)

Country	2013 Percent Packet Loss	2013 Rank	Country	2012 Percent Packet Loss	2012 Rank
Alabama	0.20	1	Korea	0.62	1
Kentucky	0.22	2	**New Jersey**	0.73	2
Arkansas	0.22	3	Sweden	0.79	3
Switzerland	0.23	4	Lithuania	0.89	4
Slovakia	0.44	5	Slovakia	0.94	5
Lithuania	0.44	6	Hong Kong	1.03	6
Ohio	0.46	7	Slovenia	1.06	7
Hong Kong	0.69	8	Denmark	1.10	8
Sweden	0.81	9	**Idaho**	1.24	9
Korea	0.82	10	**Oregon**	1.45	10
Slovenia	0.82	11	**Kentucky**	1.45	11
Austria	0.86	12	**California**	1.45	12
Virginia	0.87	13	United Kingdom	1.47	13
Indiana	0.92	14	Ireland	1.52	14
Michigan	0.94	15	Norway	1.53	15
Georgia	0.95	16	**Maryland**	1.55	16
Massachusetts	0.99	17	Canada	1.56	17
Minnesota	1.02	18	Illinois	1.58	18
Pennsylvania	1.05	19	Switzerland	1.62	19
Washington	1.05	20	Bulgaria	1.64	20
California	1.10	21	Washington	1.65	21
Estonia	1.12	22	Ohio	1.66	22
Colorado	1.13	23	Pennsylvania	1.66	23
Bulgaria	1.13	24	Michigan	1.68	24
United Kingdom	1.20	25	Arkansas	1.68	25
Denmark	1.20	26	Minnesota	1.79	26
Italy	1.20	27	Italy	1.80	27
Wisconsin	1.22	28	India	1.81	28
Norway	1.23	29	Austria	1.88	29
New Jersey	1.25	30	Massachusetts	1.90	30
Oregon	1.25	31	Oklahoma	1.96	31
Idaho	1.25	32	Singapore	1.97	32
Missouri	1.28	33	Wisconsin	2.01	33
Illinois	1.29	34	Poland	2.06	34
Poland	1.33	35	New Zealand	2.10	35
Nevada	1.36	36	Chile	2.12	36
New Zealand	1.48	37	Belgium	2.12	37
Netherlands	1.54	38	Nevada	2.14	38
India	1.58	39	Virginia	2.19	39
New York	1.64	40	Colorado	2.24	40
Kansas	1.66	41	Spain	2.27	41

Country	2013 Percent Packet Loss	2013 Rank	Country	2012 Percent Packet Loss	2012 Rank
Oklahoma	1.75	42	France	2.46	42
Ireland	1.81	43	Australia	2.46	43
Florida	1.82	44	Tennessee	2.52	44
North Carolina	1.86	45	Louisiana	2.52	45
Singapore	1.89	46	Florida	2.63	46
Mexico	1.96	47	Germany	2.64	47
Canada	2.01	48	North Carolina	2.67	48
Chile	2.04	49	**Indiana**	2.70	49
France	2.06	50	**Missouri**	2.87	50
Australia	2.06	51	**Georgia**	3.07	51
Texas	2.09	52	Hungary	3.21	52
Germany	2.16	53	**New York**	3.38	53
Czech Republic	2.48	54	Netherlands	3.40	54
Spain	2.52	55	**Texas**	3.54	55
Louisiana	2.70	56	**Kansas**	3.68	56
Turkey	2.73	57	Mexico	3.81	57
Tennessee	2.87	58	Czech Republic	3.87	58
Maryland	3.17	59	Brazil	4.23	59
Finland	3.32	60	Turkey	4.43	60
Hungary	3.82	61	Estonia	4.50	61
Belgium	5.37	62	**Alabama**	5.35	62
Brazil	5.38	63	Greece	8.03	63
Greece	6.92	64	Finland	8.73	64

Appendix G
Broadband Deployment (European Union (EU) countries)

In both the United States and the EU, governments are tracking broadband deployment, especially in rural areas.[1] Generally, rural areas lag slightly in the deployment of basic broadband; however, that gap widens for high-speed broadband.[2] In this Report, we compare broadband deployment in the United States and Europe and find that high-speed broadband, as defined below, is more widely deployed in the United States. According to data from both 2011 and 2012, the broadband coverage gap between rural and non-rural areas remains larger across Europe than it is in the United States. In the European study, high-speed broadband was available to 54 percent of all households at the end of 2012, but only 12 percent of rural households – with a gap of 42 percentage points.[3] In contrast, high-speed broadband coverage in the United States in 2012 was higher overall than in the European study countries, and there was a smaller gap between rural coverage and total coverage. High-speed broadband was deployed to 80 percent of all US households, and 45 percent of rural households – for a gap of 35 percentage points.[4] The differences in coverage in rural and non-rural areas are even larger. Between December 2011 and December 2012, the high-speed broadband coverage gap in the United States between rural and non-rural households dropped from 46 to 42 percentage points. In Europe, the gap over the same time period rose from 47 to 49 percentage points as coverage in non-rural areas increased by more than it did in rural areas.

EC Broadband Study. Like the United States, the EU is tracking its progress in extending broadband coverage to all of its citizens.[5] The EU's Digital Agenda includes two objectives: provide all EU citizens with basic broadband coverage (at least 144 kbps download speed)[6] by the end of 2013 and "Next Generation Access," meaning broadband speeds of at least 30 Mbps by 2020 (referred to herein as high-speed broadband).[7]

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[1] The OECD has not updated its deployment (or coverage) data in several years. See http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm (*e.g.*, DSL and fiber coverage data are current as of 2009).

[2] For purposes of this discussion, basic broadband in the United States is service with download speeds of at least 200 kbps, and in Europe it is service with download speeds of at least 144 kbps.

[3] The EC study defines high-speed as 30 Mbps and above. In this Report, we use 25 Mbps and above as high-speed for the United States, the closest tier to EC's high-speed definition for which we have mapping data.

[4] A recent University of Pennsylvania study made similar findings, Christopher S. Yoo, "U.S. vs. European Broadband Deployment: What Do the Data Say?" U. of Penn, Inst. For Law & Econ, Research Paper No. 14-35. Prof. Yoo submitted this study as part of his comments on the 10th Broadband Progress NOI. *See* Prof. Yoo comments.

[5] *See 2015 Broadband Progress Report* at para. 6, Section I ("broadband is not being deployed in a reasonable and timely fashion because it is not yet available to the majority of rural and Tribal Americans and not becoming available quickly enough.").

[6] The EU Digital Agenda does not define "basic broadband" per se but relies on country-specific availability and averages. VDSL, the dominant delivery method across the EU, generally delivers faster speeds, but the generally accepted lowest speed for the Digital Agenda is 2 Mbps down/256 kbps up. This speed is now considered the floor for very "basic broadband." An EU study of the state of EU broadband in 2011 (cited in note 8 below) defines basic broadband as at least 144 kbps down.

[7] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A Digital Agenda for Europe, 2010, available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0245:FIN:EN:PDF.

In 2012, the EC issued a report entitled, "Broadband Coverage in Europe in 2011: Mapping Progress Towards the Coverage Objectives of the Digital Agenda."[8] The 2011 European study provides a measure of progress towards Europe's broadband coverage objectives in the study countries. Of particular value, the 2011 European study includes data at a sub-national level – corresponding to counties, departments, or provinces.[9] These sub-national data are helpful to determine broadband capability in international communities comparable to U.S. communities with respect to population size, population density, topography, and demographic profile.[10] In 2013, the EU released an update of its broadband coverage study with 2012 data and redid the study of the 2011 data, including an additional country and a new definition of rural.[11] The European studies show that, by the end of 2011, basic broadband reached 96 percent of European study country households, and high-speed broadband reached just over 50 percent of those homes. By the end of 2012, basic broadband covered more than 99 percent of study country homes, and NGA/High-Speed broadband reached 54 percent.

Not surprisingly, broadband coverage lags for inhabitants of rural areas.[12] At the end of 2011, in Europe's study country rural areas, basic broadband (144 kbps for the purposes of the study) coverage reached 80 percent of households, while high-speed broadband (30 Mbps) was reached only 9 percent of the households.[13] By the end of 2012, those numbers had increased to 83 percent and 12 percent, respectively. To reach the EU's 2020 goal, the EU study concludes that considerable investment in rural areas will still be necessary.[14]

Comparison to the United States. In the United States, different statistics are collected, but general comparisons can still be made.[15] The European study, discussed above, focuses on

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[8] Broadband Coverage in Europe in 2011: Mapping Progress Towards the Coverage Objectives of the Digital Agenda, Research Report prepared for the European Commission DG Communications Networks, Content & Technology, European Union, 2012, available at http://ec.europa.eu/information_society/newsroom/cf/document.cfm?doc_id=1102 ("2011 European study"). As of the writing of this IBDR, the EU has not yet reported 2013 data.

[9] The population of these sub-national areas (called NUTS-3 level units) range from 150,000 to 800,000.

[10] 47 U.S.C. § 1303(b)(2).

[11] Broadband Coverage in Europe in 2012: Mapping Progress Towards the Coverage Objectives of the Digital Agenda, A Study prepared for the European Commission DG Communications Networks, Content & Technology, European Union, 2013, available at http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=3647.

[12] In the EU's 27 countries, 24% of the population lives in NUTS-3 regions classified as "predominantly rural," according to Europa statistics. According to U.S. census block data, the U.S. rural share of the population is similar: 19.3% of the U.S. population lives in rural areas.

[13] Statistics for 2011 are from the 2013 report. A redefinition of "rural" in the 2013 report caused a revision of the statistics for 2011.

[14] *See* map of European coverage on page 18 of the European study.

[15] Because the European data in its study was from December 2011 and 2012, we also use U.S. data from December 2011 and 2012 for comparison. The U.S. data for December 2011 and December 2012 discussed here is the same broadband mapping deployment data the Commission relied on in the *2015 Broadband Progress Report* to present December 2011-2012 fixed deployment trends. *2015 Broadband Progress Report* at para. 79, Section IV.C.1. However, the Commission presented estimates for different speed tiers (3 Mbps/768 kbps, 10 Mbps/768 kbps, and 25 Mbps/3 Mbps).

the NUTS-3 geographical category with the population ranging from 150,000 to 800,000.[16] NUTS-3 is a political/bureaucratic jurisdiction that is a subdivision of NUTS-2. NUTS-2 is similar to U.S. states. In our comparative analysis below, we used counties as the U.S. counterpart of NUTS-3 areas. There are 3,234 counties in the United States.[17] The basic unit of analysis in the U.S. data is the census block. In our maps, we aggregate census block data to the county level, which more closely match the level of aggregation for the European study. Because the European study used households as the unit for measuring coverage, we do the same in our comparison.[18]

The 2013 European study uses a new rural database for both 2011 and 2012, in which areas with populations of less than 100 per square kilometer were considered rural.[19] Of the study country households, 15 percent were rural. A previous study of 2011 data used a different definition of rural. In this Report, we use the data from the 2013 European study to do our comparison.

For the U.S. data, we use the Census Bureau's determination of rural, which identifies each Census block as rural or non-rural.[20] We use this definition in our online National Broadband Map, and also our Connect America Fund work.[21] Each county is made up of multiple census blocks. We can therefore determine, for each county, the rural population with and without broadband deployment.

For purposes of the comparison, we consider any service above 200 kbps in the United States as basic broadband, because that is the speed tier in SBI data[22] which most closely matches

[16] There are 1303 NUTS-3 regions in Europe, and 3,221 counties in the United States. Only 351 U.S. counties fall within the NUTS-3 population range of 150,000 to 800,000. Most of the U.S. population lives in the 69 counties that exceed the NUTS-3 range. The remaining approximately 2,800 U.S. counties have populations of less than 150,000. The four least populous U.S. states (plus DC) fall within the NUTS-3 population range.

[17] The variation in population of counties varies widely outside the domain of the NUTS-3 general guidelines for counties (minimum population is 4, maximum population is nearly 10 million, and average population is about 100,000 with a standard deviation of over 300,000).

[18] Our broadband mapping data, available to the public online, has information at both household and population levels. *See* http://broadbandmap.gov/.

[19] In 2011, the EC released a study using December 2011 data. That study did not have complete data on rural coverage for all of the study countries, so the study authors estimated rural coverage in some cases. The study also used various definitions for "rural." This problem was remedied in the European study of 2012 data, which re-calculated the results of the 2011 data using the new definition of rural.

[20] Rural areas are those that are *not* within a densely developed territory which has at least 2,500 people. *See*: http://www.census.gov/geo/reference/gtc/gtc_urbanrural.html.

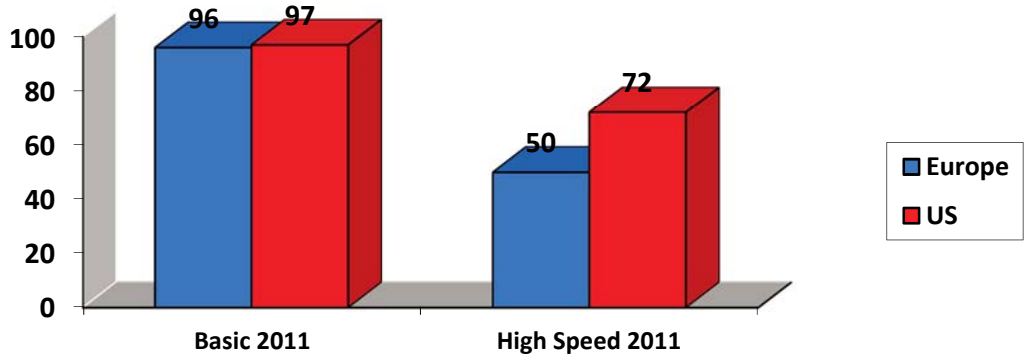
[21] *See* www.broadbandmap.gov and also www.fcc.gov/encyclopedia/connecting-america.

[22] Since July 2009, the National Telecommunications & Information Administration (NTIA), in coordination with the Commission, has been collecting data concerning where broadband is deployed across the nation as part of the State Broadband Initiative (SBI) Grant Program. *See* Department of Commerce, NTIA, State Broadband Data and Development Grant Program, Docket No. 0660-ZA29, Notice of Funds Availability, 74 Fed. Reg. 32545 (July 8, 2009) (*NTIA State Mapping NOFA*), http://www.ntia.doc.gov/files/ntia/publications/fr_broadbandmappingnofa_090708.pdf. For purposes of this Report, we call this data "SBI Data."

the 144 kbps threshold in the European study.[23] For high-speed broadband, we use the SBI speed data for 25 Mbps, which most closely matches the 30 Mbps threshold in the European study.[24] Despite this difference, we think the comparison remains apt. Nearly all the households captured at this tier of service in our mapping data have access to DOCSIS 3.0 or fiber, both of which are able to provide speeds well in excess of 25 Mbps.[25]

Total and Rural Household Broadband Coverage. In the United States, at the end of 2011, 97 percent of all households were covered by basic broadband of 200 kbps or greater. In contrast, 89 percent of rural households were covered by basic broadband. By the end of 2012, basic broadband was available to 97 percent of households overall, and 89 percent of rural households in the United States. Comparisons to the European data are captured in the table below.

2011 Broadband Coverage, All Households



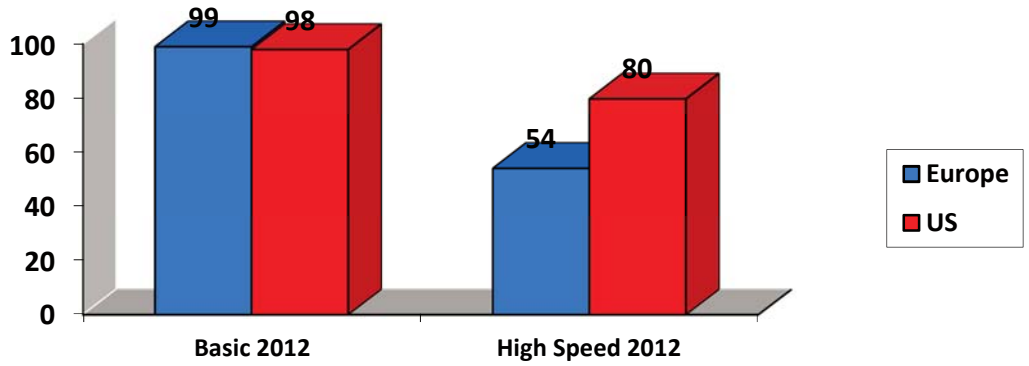
As of December 2011, 72 percent of U.S. households nationwide, compared to 50 percent of households in the European study countries had high-speed broadband coverage (25 Mbps in the United States and 30 Mbps in the European study countries).

[23] We note that in the *2015 Broadband Progress Report* for purposes of its section 1302(b) obligation, the Commission considered "advanced telecommunications capability" as 25 Mbps download and 3 Mbps upload. *2015 Broadband Progress Report* at para. 3, Section I; 47 U.S.C. § 1302(b). We use the term "basic broadband" here when referring to access speeds above 200 kbps merely for convenience. The European study identifies 144 kbps as the basic broadband threshold, and 200 kbps is the closest tier for which we have data to compare. *See* Department of Commerce, NTIA, State Broadband Data and Development Grant Program, Docket No. 0660-ZA29, Notice of Funds Availability, 74 Fed. Reg. 32545, 32559 (July 8, 2009), http://www.ntia.doc.gov/files/ntia/publications/fr_broadbandmappingnofa_090708.pdf.

[24] Moreover, Chairman Wheeler has said that a "25 Mbps connection is fast becoming 'table stakes' in 21st century communications" and that today "about 80 percent of American homes have access to a broadband connection that delivers 25 Mbps or better," Prepared Remarks of FCC Chairman Tom Wheeler, "The Facts and Future of Broadband Competition", 1776 Headquarters, Washington, D.C., September 4, 2014, available at https://apps.fcc.gov/edocs_public/attachmatch/DOC-329161A1.pdf .

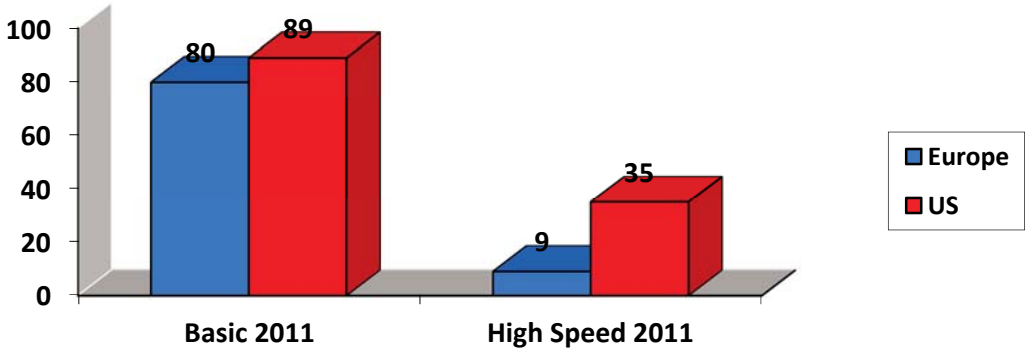
[25] *See* http://www.intel.com/content/dam/www/public/us/en/documents/case-studies/mission-possible-evolutionary-approach-to-docsis-whitepaper.pdf (accessed June 5, 2013).

2012 Broadband Coverage, All Households



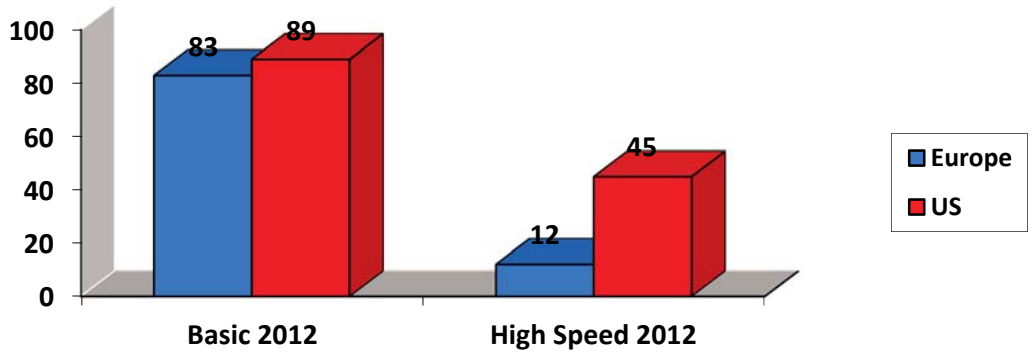
In 2012, high-speed broadband coverage expanded to 80 percent of U.S. households and 54 percent in the European study countries.

2011 Broadband Coverage, Rural Households



The chart above shows that the United States and European study countries have similar challenges: rural coverage of high-speed broadband lags national and regional coverage. At the end of 2011, 80 percent of rural European study country households and 89 percent of U.S. rural households had basic broadband. At the end of 2011, 9 percent of European study country rural households, but 35 percent of rural households in the United States had high-speed broadband coverage.

2012 Broadband Coverage, Rural Households



In 2012, we observe an increase in coverage, but rural coverage is still low in both regions. In the European study countries, 83 percent of rural households had basic broadband coverage and 12 percent of these households had high-speed coverage. In the United States, 89 percent of rural households had basic broadband coverage, while 45 percent of rural households had high-speed broadband coverage.

While both the European study countries and the United States have rural high-speed broadband coverage gaps, by the end of 2011, the United States had a much higher level of high-speed broadband coverage in rural areas – four times the European level. In 2012, high-speed broadband coverage in the United States remained nearly four times the European level (45 percent in the United States and 12 percent in Europe).

Rural and Non Rural Household Broadband Coverage. The charts above report the data set by the European study in comparing rural household coverage to total household coverage, which includes all households, including those in rural areas. But this comparison understates the gap in broadband coverage in rural areas. If we compare household coverage in rural areas to non-rural areas, we observe wider gaps between these areas. In Europe in December 2011, basic broadband was deployed to virtually all non-rural households, but only 80 percent of rural households, resulting in a gap of nearly 20 percentage points. In the United States, basic broadband was deployed to over 99 percent of all non-rural households, but only 89 percent of rural households, resulting in a gap of nearly 11 percentage points.[26] Thus, as of the end of 2011, the United States had a gap in serving rural and non-rural households with basic broadband that was just over half the size of Europe's.

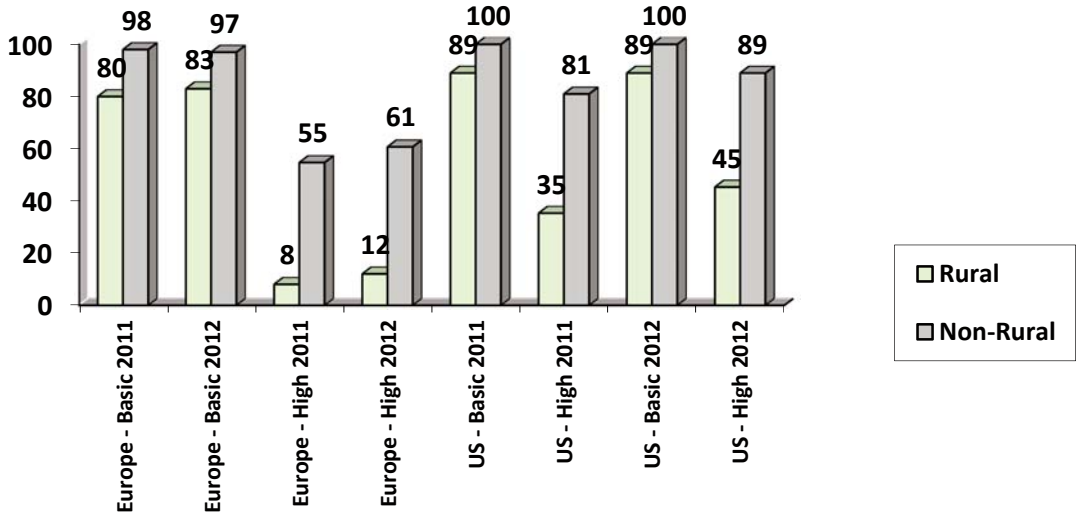
A similar pattern emerged in 2012. In Europe, by December 2012, the study countries had closed the gap between rural and non-rural areas for basic broadband to 17 percentage points, as coverage in rural areas had risen to 83 percent. In the United States, the gap for basic broadband the gap narrowed slightly, with coverage rising from 88.7 to 89 percent of rural households, and rising to nearly 100 percent for non-rural households, for a gap of just over 10 percentage points.

[26] We derived non-rural household coverage for the United States and Europe from the reported percentage of households that are rural and the percentages of broadband coverage for rural households and total households.

Between December 2011 and December 2012, Europe's high-speed broadband coverage grew from 55 to 61 percent for non-rural households and from 8 to 12 percent for rural households. The gap between non-rural and rural thus increased from 47 percentage points in 2011 to 49 percentage points in 2012.

Between December 2011 and December 2012, high-speed broadband coverage in the United States increased from 81 to 89 percent for non-rural households and from 35 to 45 percent for rural households. The gap between non-rural and rural fell slightly from 46 percentage points to 44 percentage points. Although the gap between rural and non-rural high-speed coverage is only a bit smaller in the United States than it is in Europe, the absolute level of coverage of high-speed broadband is much higher in the United States in both rural and non-rural areas, and the United States is making slightly increased progress in closing the urban-rural gap for NGA/High-Speed broadband.

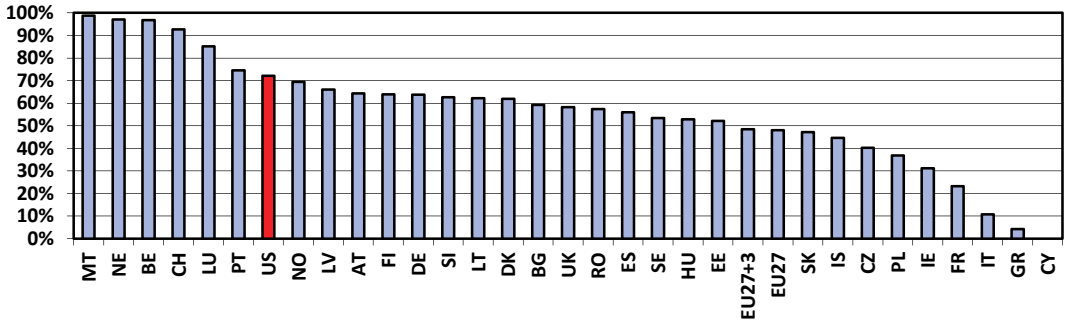
Broadband Coverage: Rural vs Non-Rural



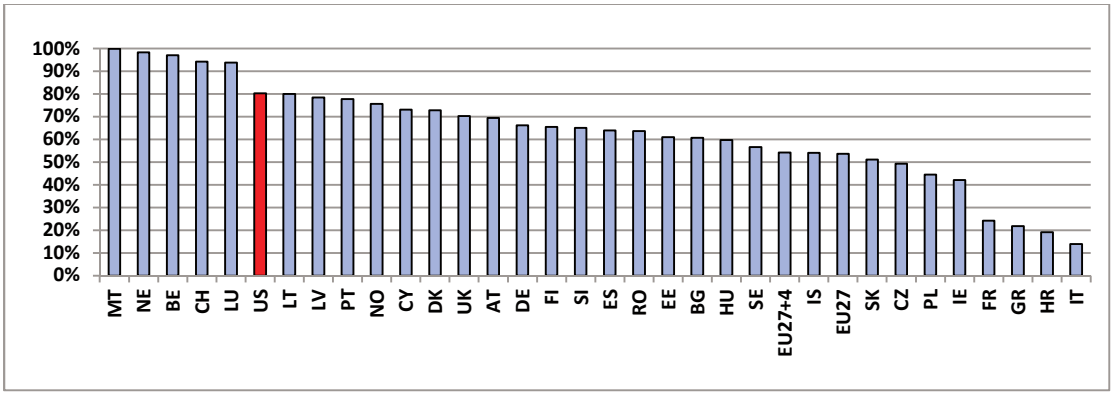
Total High-Speed Broadband Coverage by Country. The bar graphs 1 and 2 below illustrate the status of total high-speed broadband coverage in the European study countries and the United States in the years 2011 and 2012.[27] In 2011, with an overall 72 percent high-speed broadband coverage, the United States ranks higher than 24 of the European study countries. In 2012, with an overall 80 percent high-speed broadband coverage, the United States ranks higher than 25 of the European study countries.

[27] The European study countries included the then current 27 countries of the European Union (EU27): Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany(DE), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), Malta (MT), Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE) and the United Kingdom (UK). For both 2011 and 2012, the European data includes three additional countries: Iceland (IS), Norway (NO) and Switzerland (CH). For 2012, Croatia (HR), which joined the EU on July 1, 2013, was also included.

Graph 1: Total high-speed broadband coverage by country, December 2011

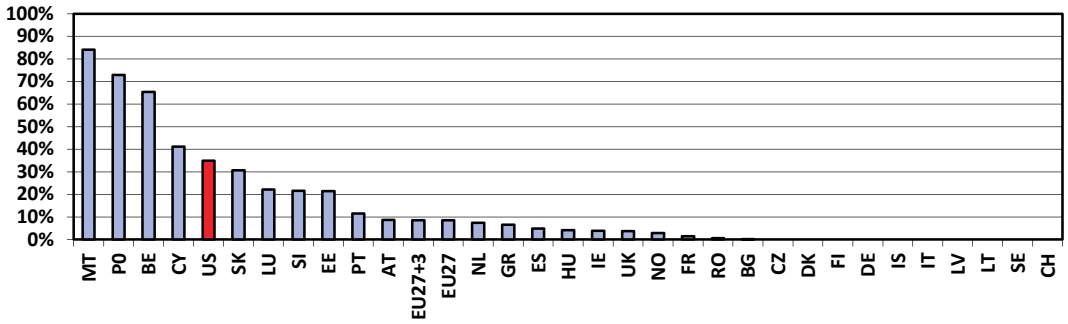


Graph 2: Total high-speed broadband coverage by country, December 2012

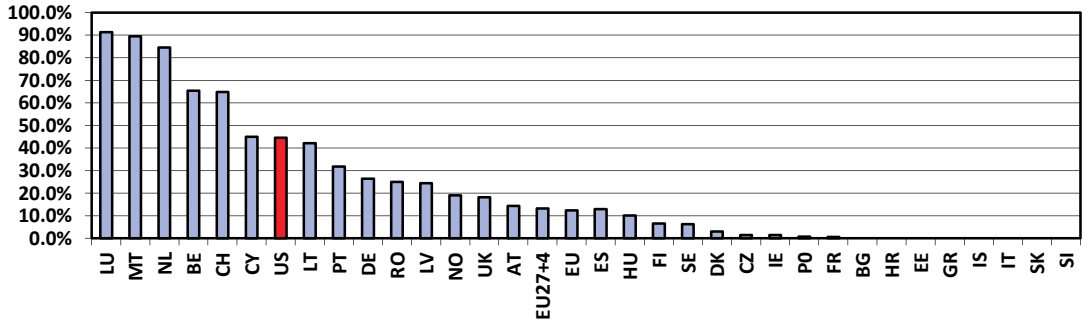


Rural High-Speed Broadband Coverage by Country. Similarly, the European study includes data for 2011 and 2012 on the status of rural high-speed broadband coverage by country. The bar graphs 3 and 4 below illustrate the status of rural high-speed broadband coverage across the European study countries and the Unites States. Only four European countries (Malta, Poland, Belgium and Cyprus) had higher rural high-speed broadband coverage than the United States in 2011, and six European countries had higher rural high-speed broadband coverage than the United States (Luxembourg, Malta, Netherlands, Belgium, Switzerland and Cyprus) in 2012.

Graph 3. Rural high speed coverage by country, December 2011



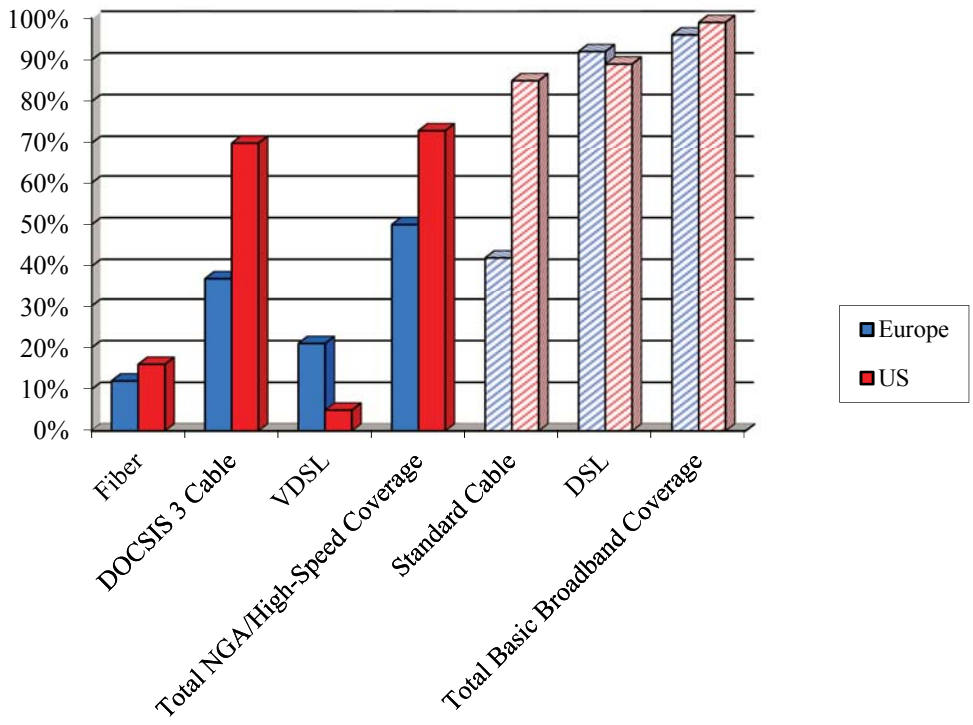
Graph 4. Rural high speed coverage by country, December 2012



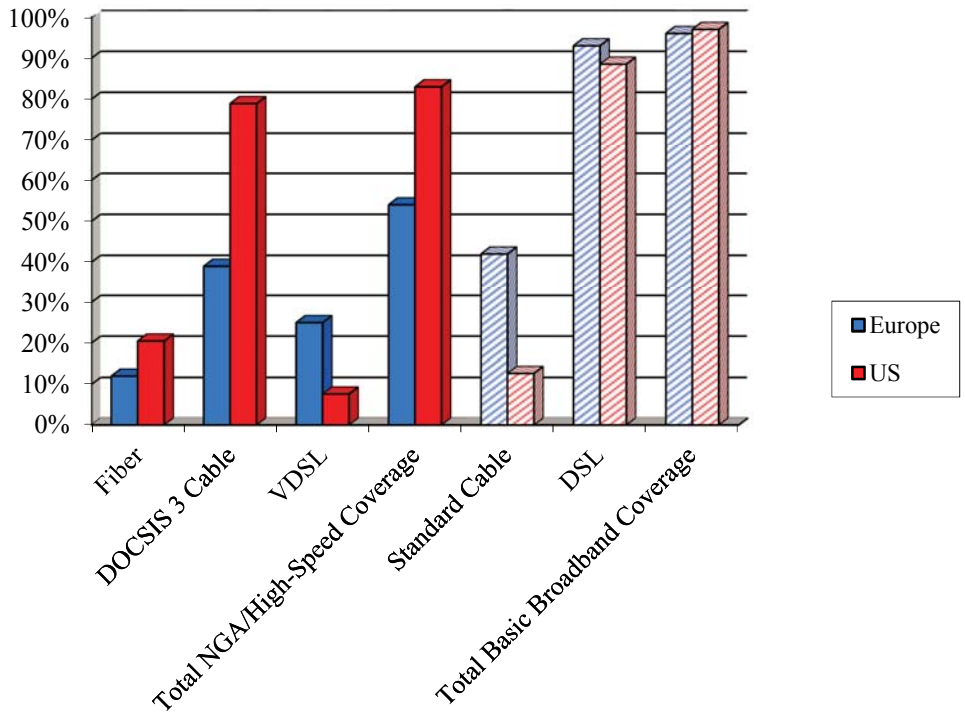
6. Broadband Coverage by Technology

The European study breaks down broadband into several categories: DSL, VDSL, FTTP, WiMAX, Standard Cable, DOCSIS 3 Cable, HSPA, LTE and satellite. We have U.S. data on similar categories. For basic broadband, Europe relies more heavily on DSL, while most U.S. homes have both DSL and cable technologies available to them. For high-speed broadband, cable is deployed to more U.S. households than any other technology.

Graph 5: Coverage by Technology, 2011



Graph 6: High Speed and Standard Coverage by Technology, 2012

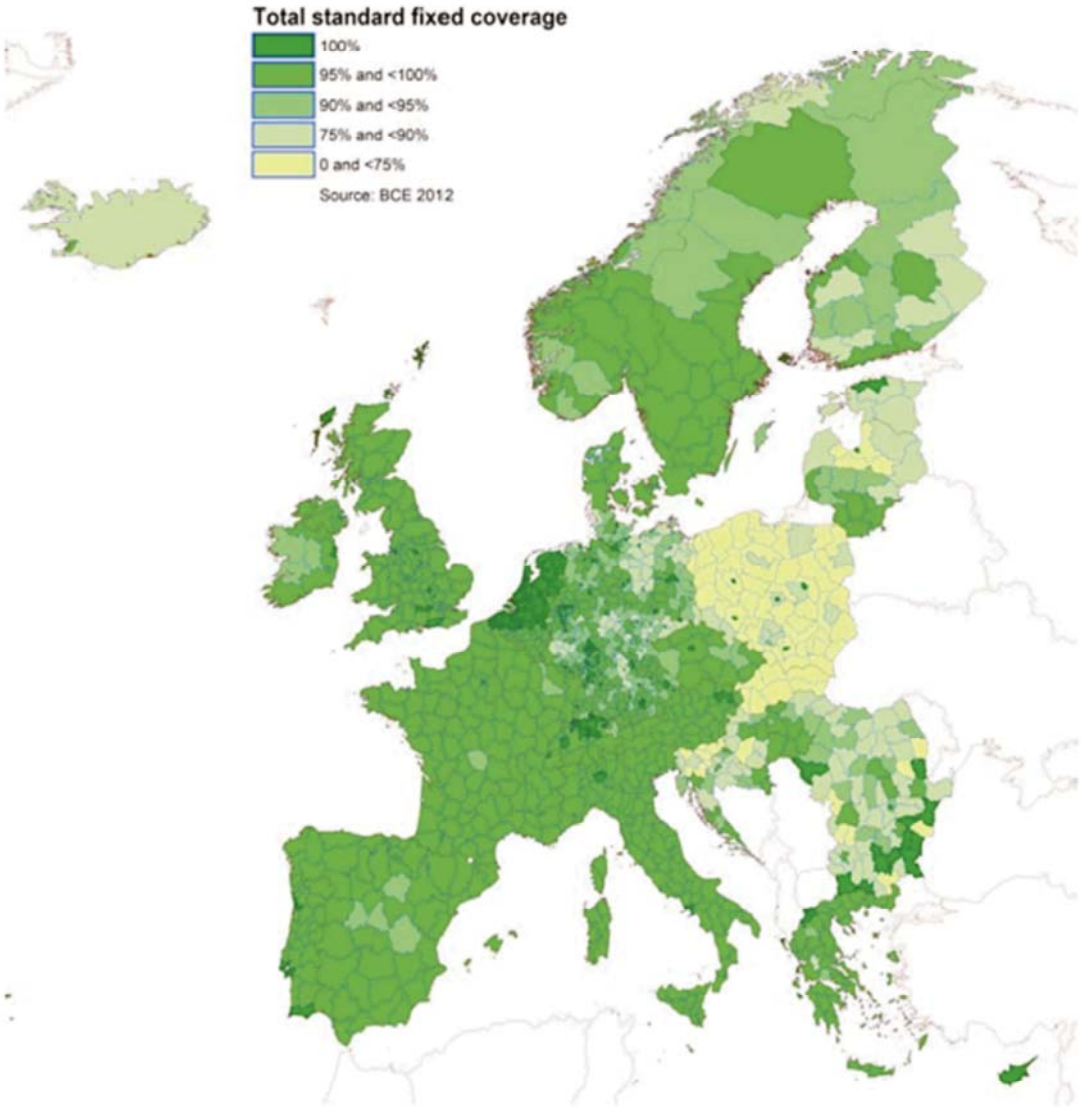


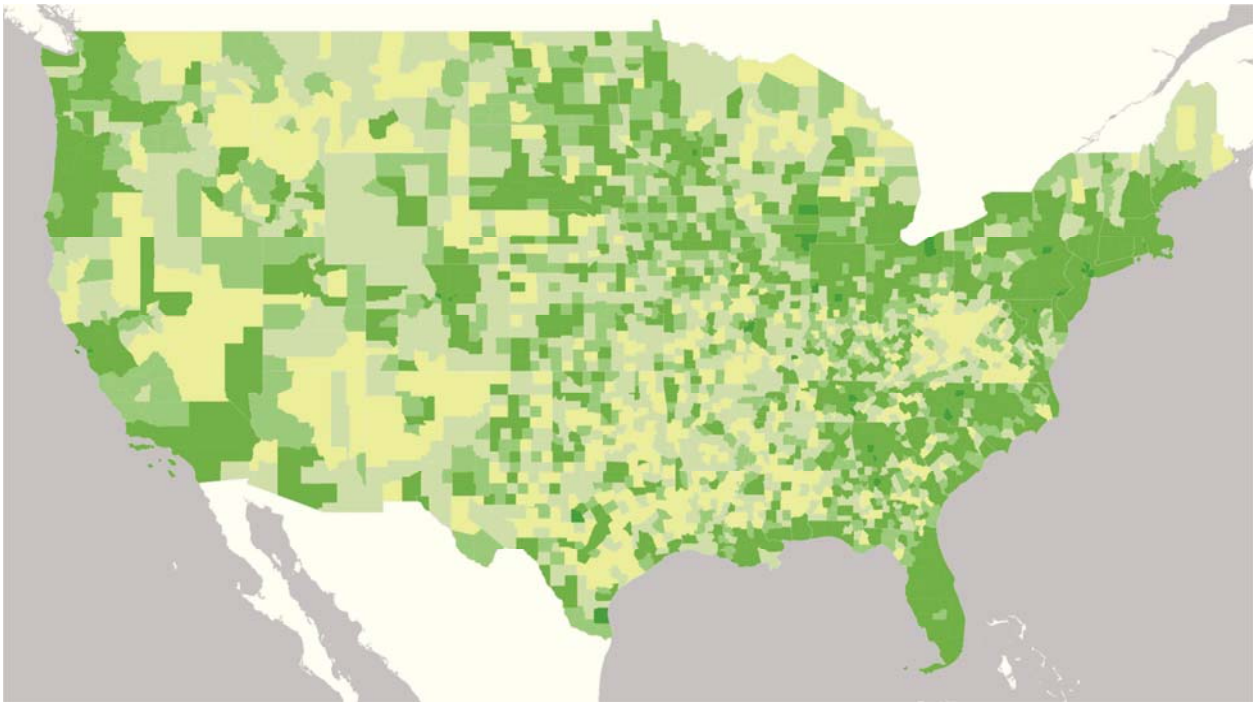
7. Broadband Coverage Maps

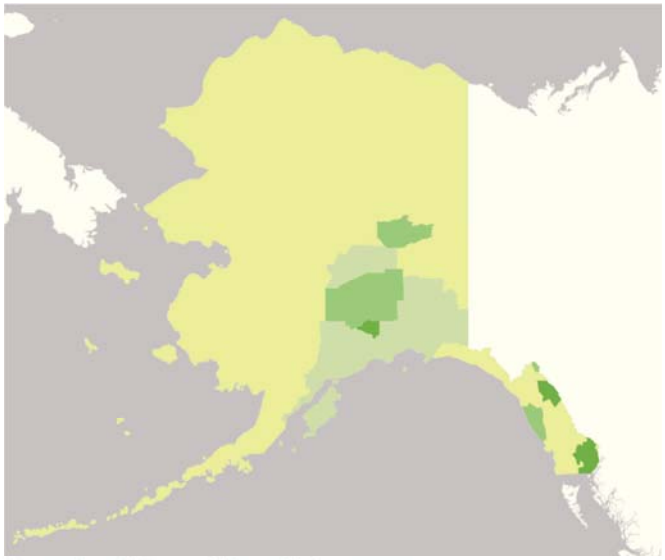
The European study includes maps showing the status of basic and high-speed broadband coverage across the study countries as of December 2012.[28] The EU maps below are similar to the U.S. maps and can be used to visualize the distribution of basic broadband and high-speed broadband coverage around the United States, compared to Europe. These maps reflect data as of the end of 2012. Current U.S. maps can be found at the FCC's broadband map website: broadbandmap.gov.

[28] *See* page 21 of European study.

Standard Fixed Broadband Coverage Maps – December 2012



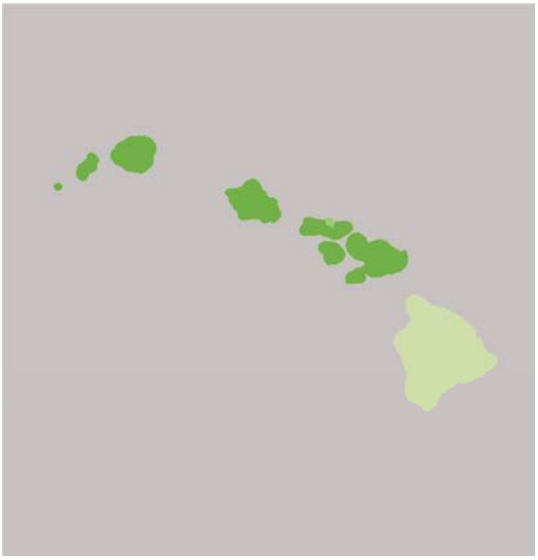




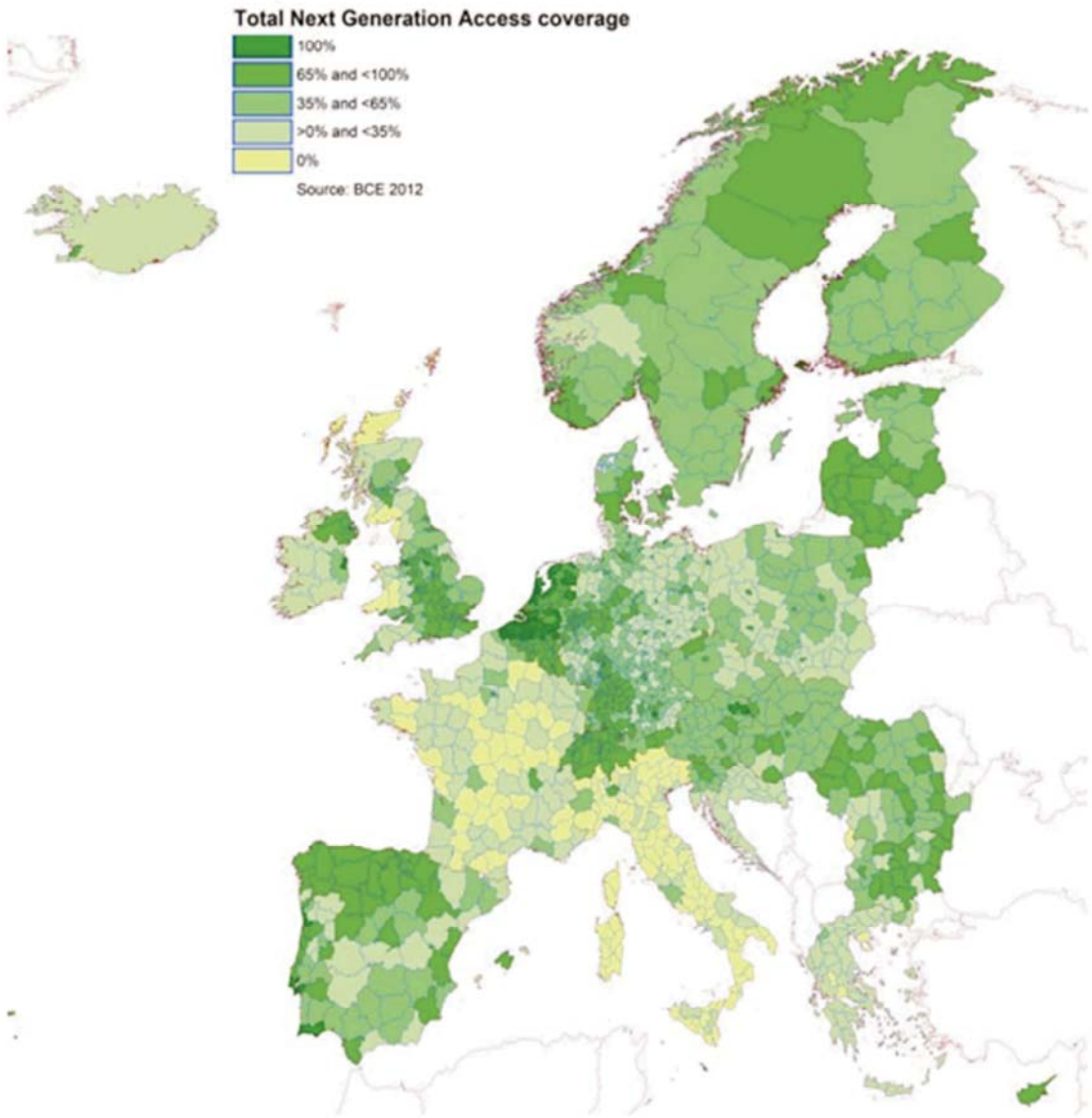
Standard Broadband Coverage

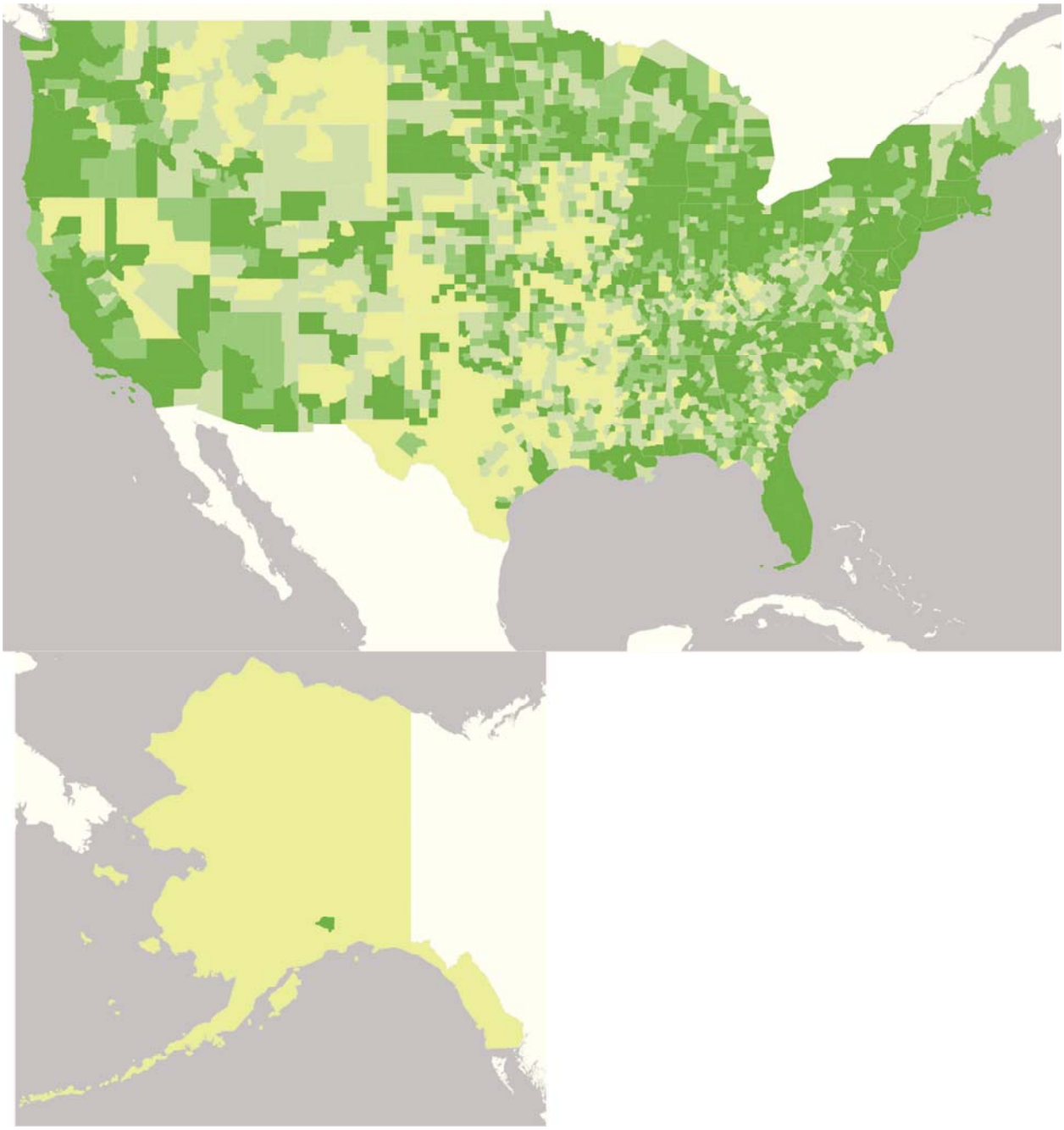
0% to < 75%	75% to < 90%	90% to < 95%	95% to < 100%	100%

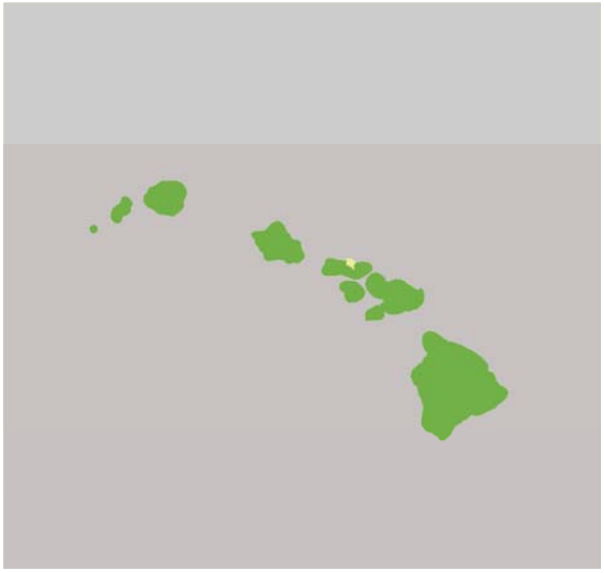
Source: National Broadband Map December 2012



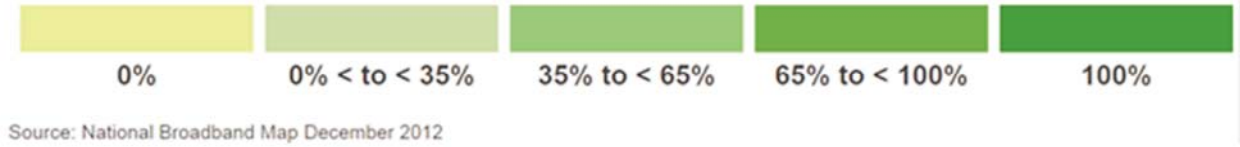
High-Speed Broadband Coverage Maps – 2012 Data







High-Speed Broadband Coverage



Source: National Broadband Map December 2012