TECHNOLOGY POLICY INSTITUTE
Studying the Global Information Economy

Understanding International Broadband Comparisons

2009 Update

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June 2009

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Introduction

Discussions about broadband policy in the United States today inevitably begin by citing OECD estimates. Many analysts interpret the low ranking of the U.S. in broadband penetration relative to other OECD countries as meaning that U.S. broadband policy has been a failure.

In May 2008 I provided a detailed analysis of cross-country broadband data (Wallsten 2008). This paper updates the previous analysis where new information is available, but does not reproduce the entire report.

Some highlights of the update:

- Household broadband adoption continues to increase quickly in all OECD countries. U.S. household broadband penetration increased from 47 percent in March 2007 to 63 percent in April 2009, meaning the U.S. ranks somewhere between 8th and 10th in household broadband penetration among OECD countries. If current trends continue, the U.S. and nearly all wealthy OECD countries will reach a saturation point within the next few years.
- Speeds continue to increase around the world. Four OECD countries—Korea, Japan, Sweden, and the Netherlands at 18, 15, 12, and 9.4 mbps—had average download speeds well above others in the first quarter of 2009. Another 12 countries had average download speeds between 6 and 8 mbps, including the U.S. with an average of 6.4 mbps.
- Consumers in the U.S. download far more movies and music per capita via the Internet than do consumers in the U.K, France, Germany, Italy, Canada, or Japan (the only countries considered in a recent Ofcom study).
- The U.S. appears to have among the least expensive low-end broadband plans among OECD countries, but among the more expensive high-end plans.
- The U.S. remains at or near the top of many other ICT indicators including the latest estimates of IT investment.

Broadband Penetration

The OECD estimated about 80 million wireline broadband connections in the U.S. in December 2008.[1] When normalized by population, the U.S. ranks behind 14 other countries in penetration per capita by the OECD's count.

Per capita estimates, however, are not meaningful. Any estimates based on numbers of wired connections per capita will be misleading because household sizes differ across countries. Because the U.S. has relatively large households it will rank low in per capita broadband rankings. Similarly, Korea and Japan, which also have relatively large households on average, will not fare well in per capita rankings. It is for this reason that Korea's per capita rank has fallen from first as late as 2005 to sixth today.

[1] The OECD defines broadband as a connection that supports at least 256 kbps in at least one direction.

Because average household sizes differ across countries, when every household in every country is connected to broadband the U.S. will rank 18th among OECD countries and much lower when compared to all countries in the world. Consider, for example, country rankings of the number of landline telephone subscribers per capita. In 2006 (before consumers started cutting their landlines in significant numbers), the U.S. ranked 45th in the world by this metric, despite 95 percent of all U.S. households having a telephone.[2]

Policymakers interested in measuring the effectiveness of policies intended to improve broadband in this country should take note: because the U.S. per capita rank will ultimately decrease over time, any policy will appear to fail if success is measured by per capita rank. Subscribers per household will allow a more accurate comparison, as discussed below.

Household Broadband Penetration: U.S. Ranks Between 8th and 10th

The right way to compare wired broadband connections across countries is to measure connections per household, not per capita. It is not possible to derive the per household measure simply by dividing the number of connections the OECD counts by the number of households because these counts combine business and residential lines in inconsistent ways across countries.

Well-constructed household surveys, however, can provide an accurate measure of residential broadband connections per household. Data on household broadband penetration in the U.S. come from the Pew Internet and American Life Project, which reported that household penetration had increased to 63 percent by April 2009 (Horrigan 2009). The European Commission also conducts household surveys of broadband adoption, surveying approximately 26,000 households annually. According to this survey, in December 2007 (the most recent data available) 36 percent of EU households had broadband connections. This average across EU countries is somewhat misleading in comparison with the U.S. since the EU includes a number of relatively poor countries.

Finding comparable data on household penetration is difficult, especially due to the frequency with which many publications err by combining business and residential connections or counting wireless connections in some places and not in others. Nevertheless, it is possible to aggregate several sources to fill in those missing countries. Figure 1 presents estimates of household penetration for most OECD countries.[3] The figure shows the U.S. to be somewhere between 8th and 10th place, depending on growth rates in each country.

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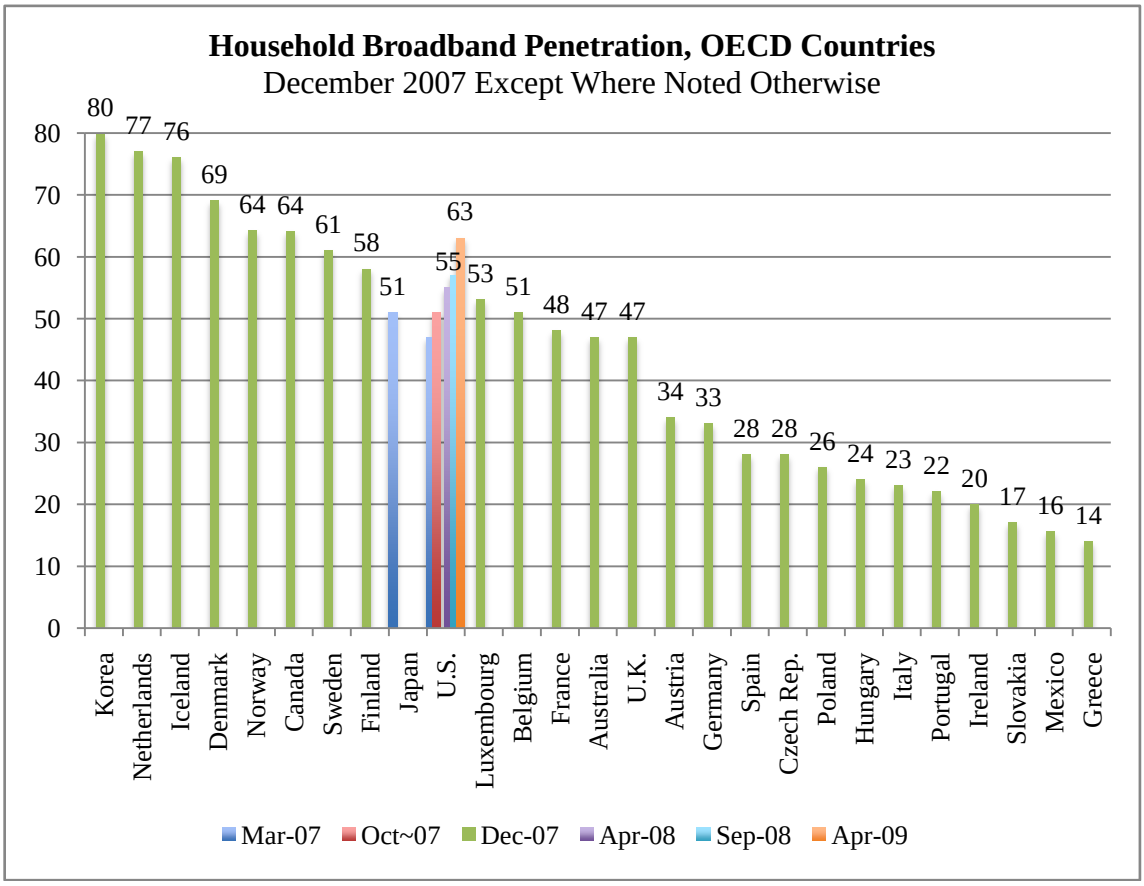
[2] Ranking data derived from ITU statistics available here: http://www.itu.int/ITU-D/ICTEYE/Indicators/Indicators.aspx#. Percentage of households with a telephone available from FCC (2007c) table 16.1.

[3] The OECD has started to report household penetration as part of its "Broadband Portal." The OECD is to be commended in its effort to expand its data collection efforts. Unfortunately, these particular household data show the importance of ensuring that the data are comparable across countries. The OECD presents numbers from a report on Europe's "i2010" program (European Commission 2008b). The numbers reported from this survey, which are available in Eurostat, generally show higher household penetration than does the E-Communications survey. The reason for the difference is that the Eurostat survey includes wireless as an option for household broadband while the E-Communications survey does not.

Moreover, broadband penetration is growing so quickly that by April 2009 the U.S. had the same penetration level that two of the leaders, Canada and Norway, had in December 2007. In other words, to the extent that the U.S. is behind the leaders in broadband penetration, it is behind only by months.

It is also important to remember that broadband penetration will eventually reach a saturation point that will be difficult to exceed. Korea, for example, has probably reached that point at about 80 percent of households connected. At current trends the U.S. will be in a similar position sometime in 2011.

Figure 1



Sources: See footnote 4.

Specifically, the Eurostat survey asks households how they connect to the Internet, and for broadband gives them the choice of DSL or "other." Other includes "Cable, UMTS, etc." UMTS is a 3G (broadband) wireless technology (European Commission 2007). As a result, the numbers reported in Eurostat are likely to include wireless as a broadband option while most other surveys do not, increasing measured household adoption. Unfortunately, Eurostat does not reveal which countries include wireless and which do not. To the extent that households in any country have multiple broadband-enabled wireless handsets these estimates may overstate household penetration.

[4] EU data from European Commission (2008a). U.S. data from Pew Internet and American Life Project (Horrigan 2007;Horrigan 2008;Horrigan 2009). Data on Iceland from http://www.statice.is/lisalib/getfile.aspx?ItemID=6407;

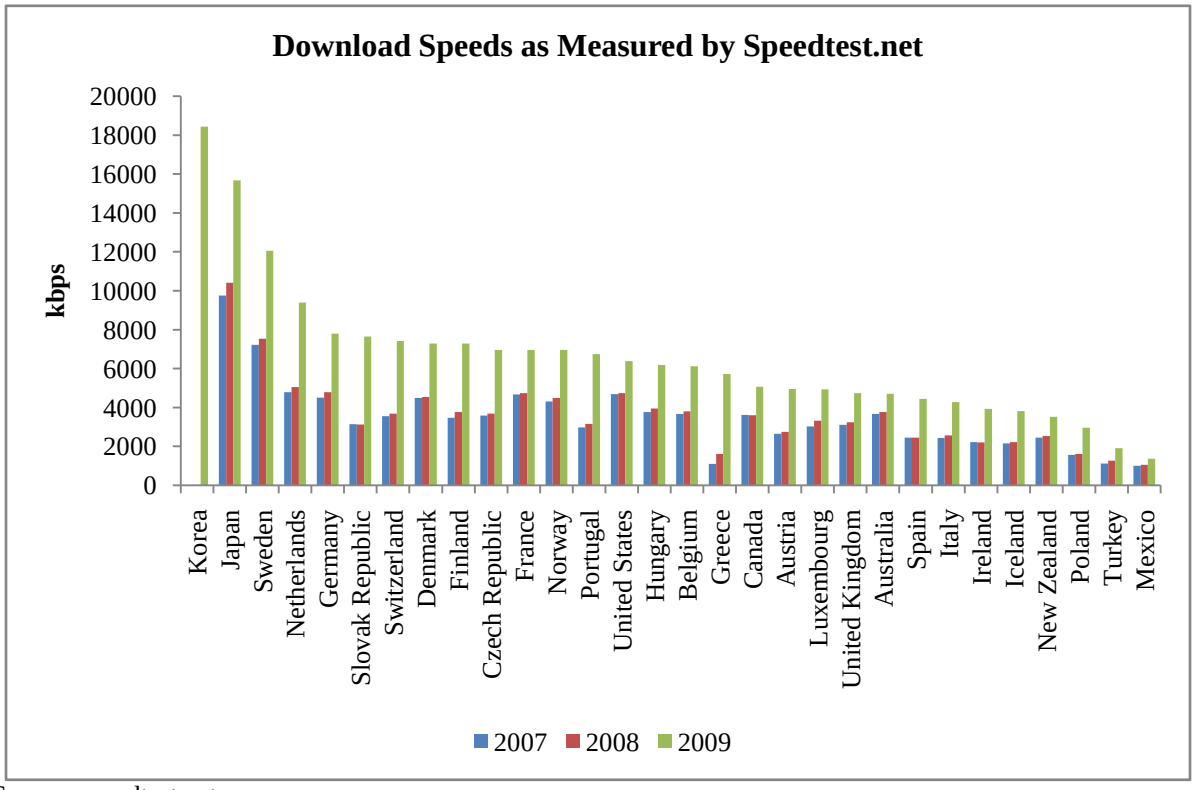
Broadband Speeds

This section reviews the evidence on what speeds consumers around the world actually receive.

Actual Speeds Around the World: Evidence from Akamai and Speedtest.net

Several on-line utilities help consumers test the speed of their connections. One, speedtest.net, collects data on speeds around the world. Measured speed will depend not just on the subscriber's speed tier, but also on the state of the network between the subscriber and the server running the test. To mitigate this problem speedtest.net has servers in nearly every country, and multiple servers in many countries.[5]

Figure 2



Source: speedtest.net.
Note: Averages are based on tests from nearly 56 million unique IP addresses.

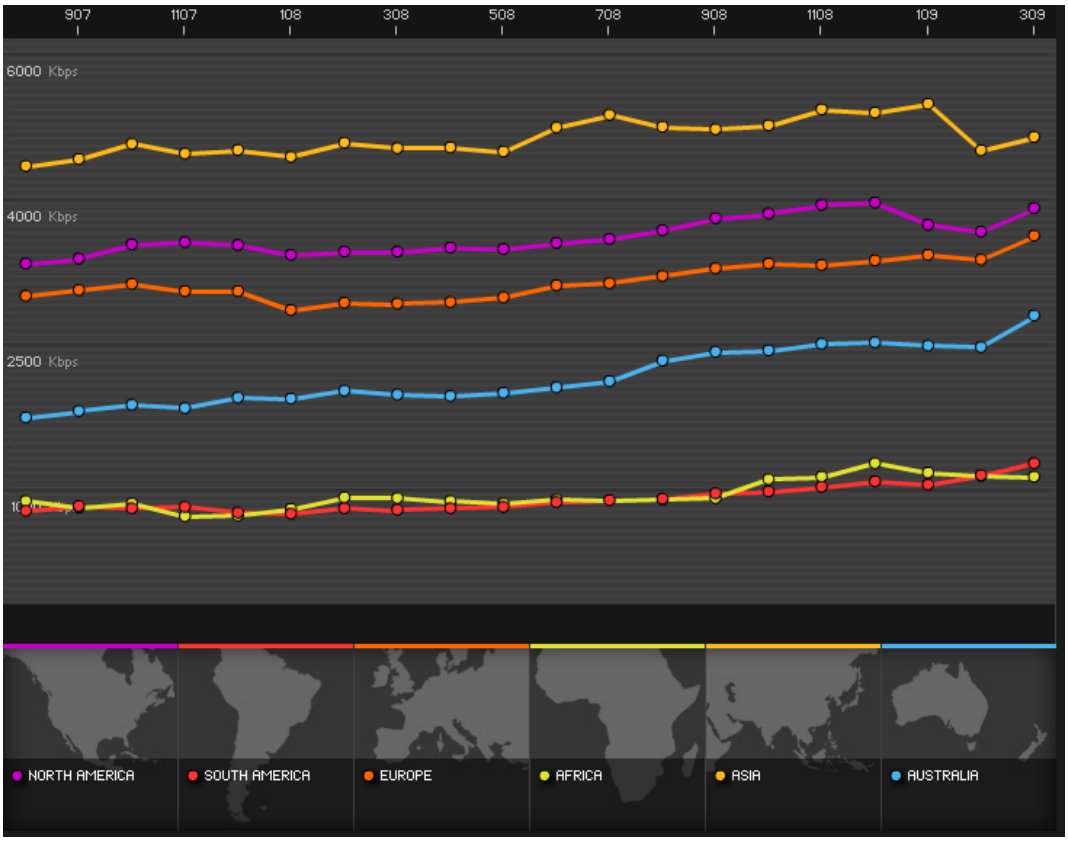
No month specified; Extrapolated from 89% (DSL) and 2% (other broadband) of 84% of households with internet access. Data on Norway from http://www.ssb.no/english/subjects/10/03/inet_en/arkiv/. Data on Canada from http://www.crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2008/cmr2008.htm#n226b. Data on Japan from http://www.apira.org/download/conference2007_slides/6%20APIRA%20pre2%20E%20JAPAN.pdf. Data on Australia from http://www.abs.gov.au/Ausstats/abs@.nsf/Latestproducts/8146.0Media%20Release12007-08?opendocument&tabname=Summary&prodno=8146.0&issue=2007-08&num=&view=. Data on Mexico from http://www.slideshare.net/Engelnator/e-marketer-mexico-online-2009-presentation.

[5] To calculate the country averages, speedtest.net calculates "the 95th percentile speed in each direction for every unique IP address that has tested at Speedtest.net. These numbers are then averaged together for each geographic level (both overall and per ISP)." http://speedtest.net/qna.php#q18

Figure 2 shows measured speeds from speedtest.net. The figure shows steadily increasing speeds by all countries and four clear leaders: Korea, Japan, Sweden, and the Netherlands. The United States falls towards the low end of a group of countries in which consumers receive between 6 and 8mbps, on average.

Akamai collects similar data based on information its servers gather as computers around the world query them for information. Figure 3 shows Akamai's data by continent. The figure shows Asia with the fastest speeds, followed by North America, Europe, Australia, and finally South America and Africa.

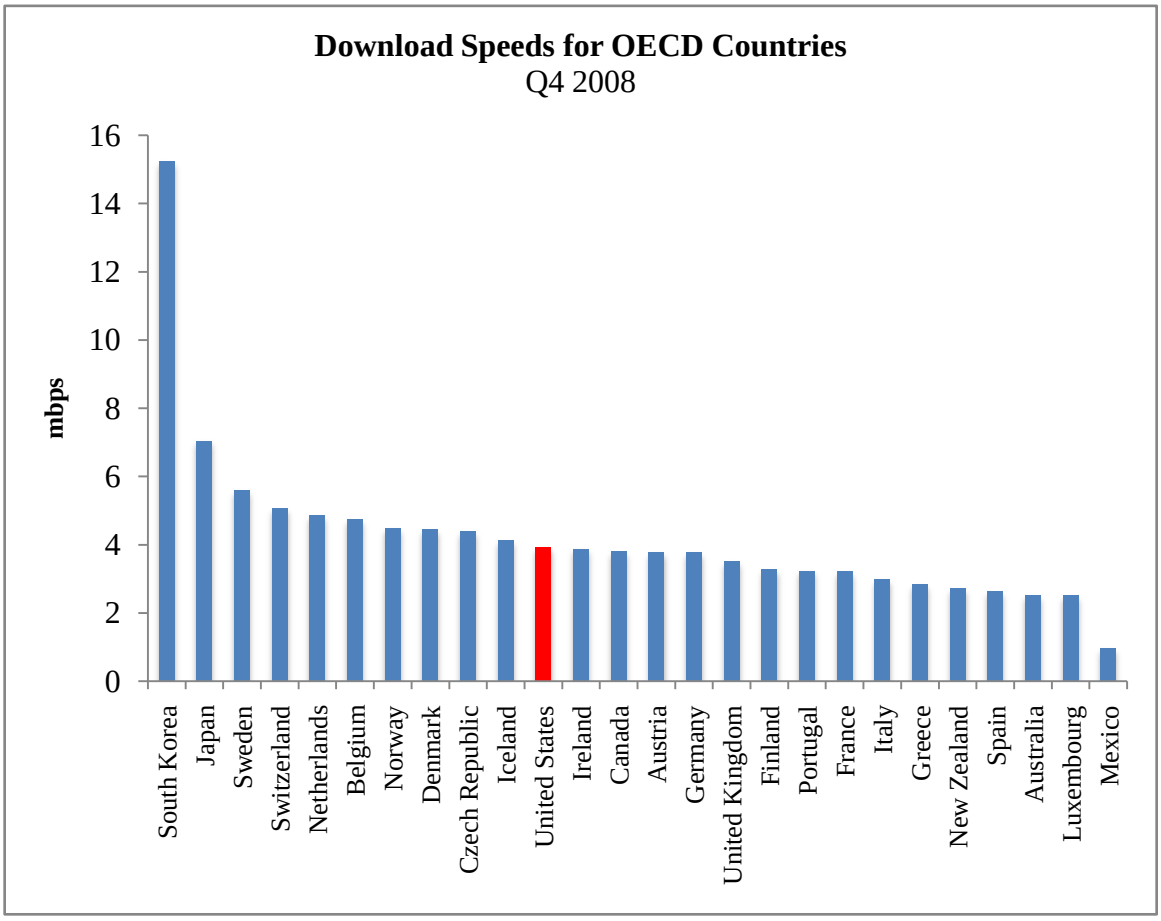
Figure 3
Regional Speeds Over Time as Observed by Akamai



Source: http://www.akamai.com/stateoftheinternet/ (as of June 2, 2009).

Akamai also disaggregates this information by country (Figure 4). It finds a similar relative position of countries, though seems to measure all countries as slower than does speedtest.net. One possible reason for this discrepancy is that speedtest.net tests speeds using servers close to the testers' locations, whereas Akamai's servers may be further from the user.

Figure 4



Source: Akamai (2008).

A Note on Speedmatters.org

The Communications Workers of America runs a website, speedmatters.org, and publishes a report showing broadband speeds across the country (Communications Workers of America 2008). CWA estimated the median download speed in the U.S. to be 2.3 mbps, far lower than either speedtest.net or Akamai. CWA's speed test is run by Ookla Net Metrics—the same company that owns and operates speedtest.net. It is unclear why speedmatters.org estimates such a lower download speed than does speedtest.net when, presumably, the tests use the same servers and the same technology. Speedtest.net shows results from nearly 21 million tests in the U.S., while speedmatters.org shows results from about 230,000 people between May 2007 and May 2008. It is possible that speedmatters may be inadvertently targeting people who are more likely to have slower connections, either through its advertising or if CWA's membership tends to have slower than average connections.

High-Bandwidth Uses

Improving broadband speeds is not an end in itself. Faster speeds are valuable when they make it possible to engage in a wider variety of online activities. Many believe that speeds in the U.S. are not sufficient for Americans to fully use Internet applications, such as video.[6] Such claims do not comport with reality. First, bandwidth is only one factor determining the quality of an Internet connection. Real time video may require well-managed networks but not very high bandwidth. Cisco's Telepresence system, for example, provides real-time, high-definition, life-sized teleconferencing that requires only symmetric 2-5 mbps per screen, but very low jitter and latency.[7]

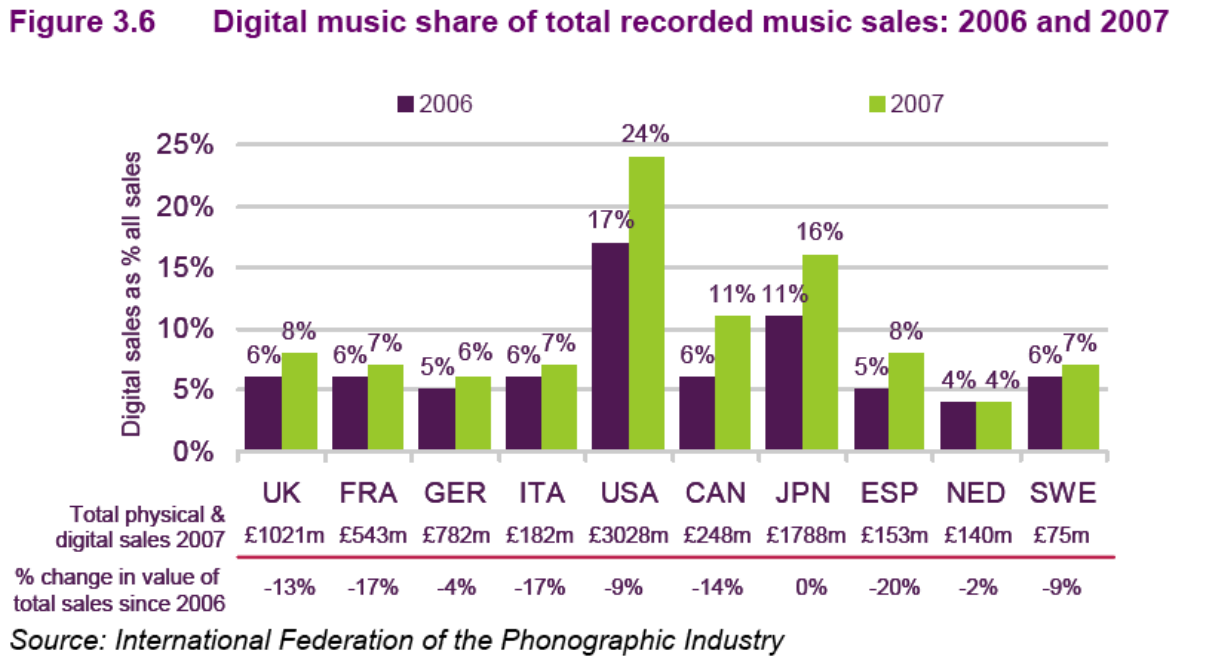
Second, according to Ofcom, Americans are the biggest consumers of online music and video (Ofcom 2008). Figure 5 shows that consumers in the United States download from the Internet a far larger share of their music purchases than do consumers in the UK, France, Germany, Italy, Canada, Japan, Spain, the Netherlands, or Sweden.

[6] See, for example, Walt Mossberg discussing this issue at the Finnish Embassy in Washington, DC in April 2008 (http://mossblog.allthingsd.com/20080403/ftc-should-stop-verizon-from-calling-dsl-broadband/):

"The biggest obstacle we have in the United States at least...is: we really suck at broadband. We have terrible, terrible broadband, and remember I'm taking about a consumer point of view. The typical consumer either has been lured into broadband by a DSL service that in Finland would not count as broadband...768 Kbps is not broadband by world standards; and our government has no broadband policy. The typical household is getting a cable modem service that might advertise itself as 6 or 8 Mbps which is the object of pity and pathos in Japan and Korea...and if they promise you 8 Mbps they're probably delivering 3.
"We are not going to be able to do this video revolution through IP, through the Internet. I don't care what the receiving vehicle is, whether it's a laptop or giant LCD TV—unless we get broadband in this country. It'd be like saying 'We have this thing called cable TV, but it only has enough bandwidth for one analogue channel."
"So, from the point of view of the consumer: I think they love video; I think the internet is a video medium for them; but I do think there are a number of obstacles before it can really reach its full potential." [Transcript derived from video.]

[7] http://www.cisco.com/en/US/netsol/ns669/networking_solutions_solution_segment_home.html

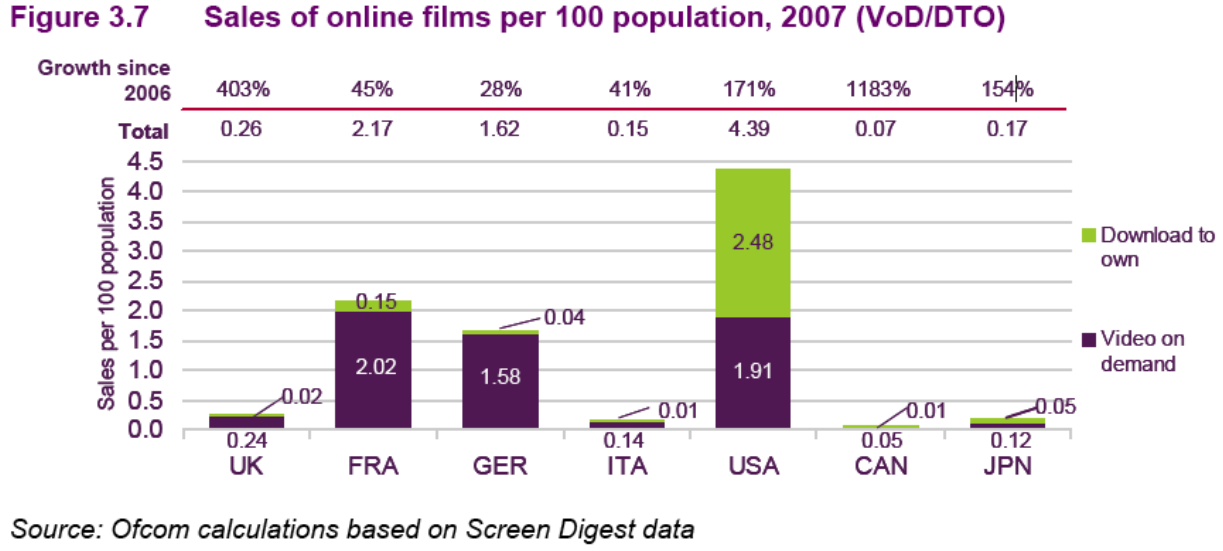
Figure 5



Source: Ofcom (2008), figure 3.6, page 100.

Similarly, Figure 6 shows that U.S. consumers download many multiples more movies from the Internet than do consumers in the UK, France, Germany, Italy, Canada, or Japan.

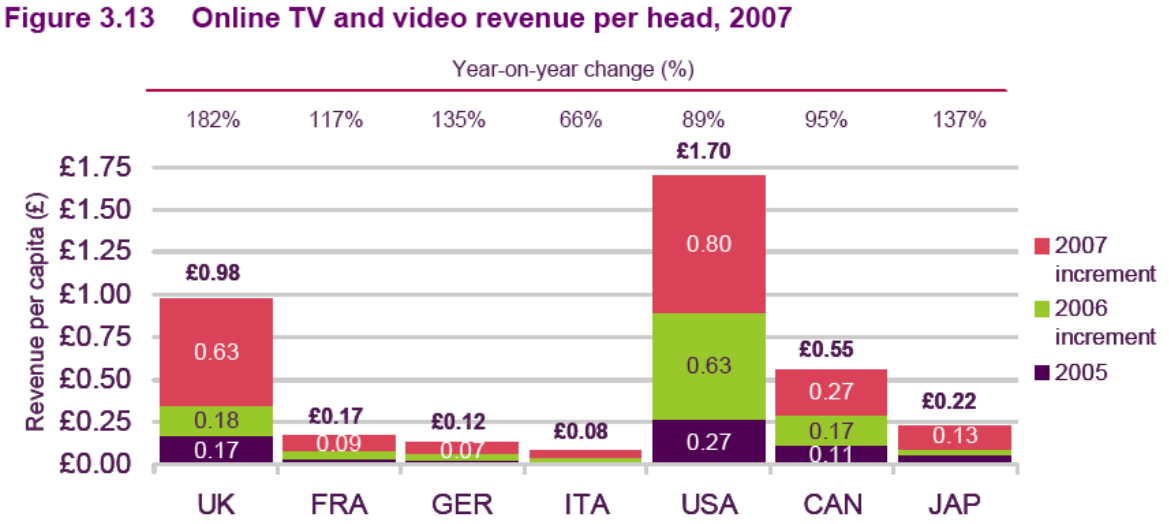
Figure 6



Source: Ofcom (2008), figure 3.7, page 101.

Perhaps not surprisingly, given this dominance in online video, online TV and video revenues per capita are much higher in the U.S. than elsewhere (Figure 7).

Figure 7



Source: © Informa UK Ltd 2008. All rights reserved. Taken from "Online TV & Video: The over-the-top challenge to traditional TV"

Source: Ofcom(2008), figure 3.13, page 107.

Several possibilities could explain this U.S. lead. First, as discussed above, bandwidth is not the only criterion in determining the quality of an Internet connection. With caching and compression technologies widely available, American bandwidth is sufficient for most one-way video applications. Second, popular U.S. video distribution sites like Hulu and iTunes make it difficult for consumers outside of the United States to view or purchase American videos.[8]

Nevertheless, if the speed situation in the U.S. were as dire as critics claim then the U.S. would be unlikely to lead the world so strongly in the use of online media.[9]

Prices

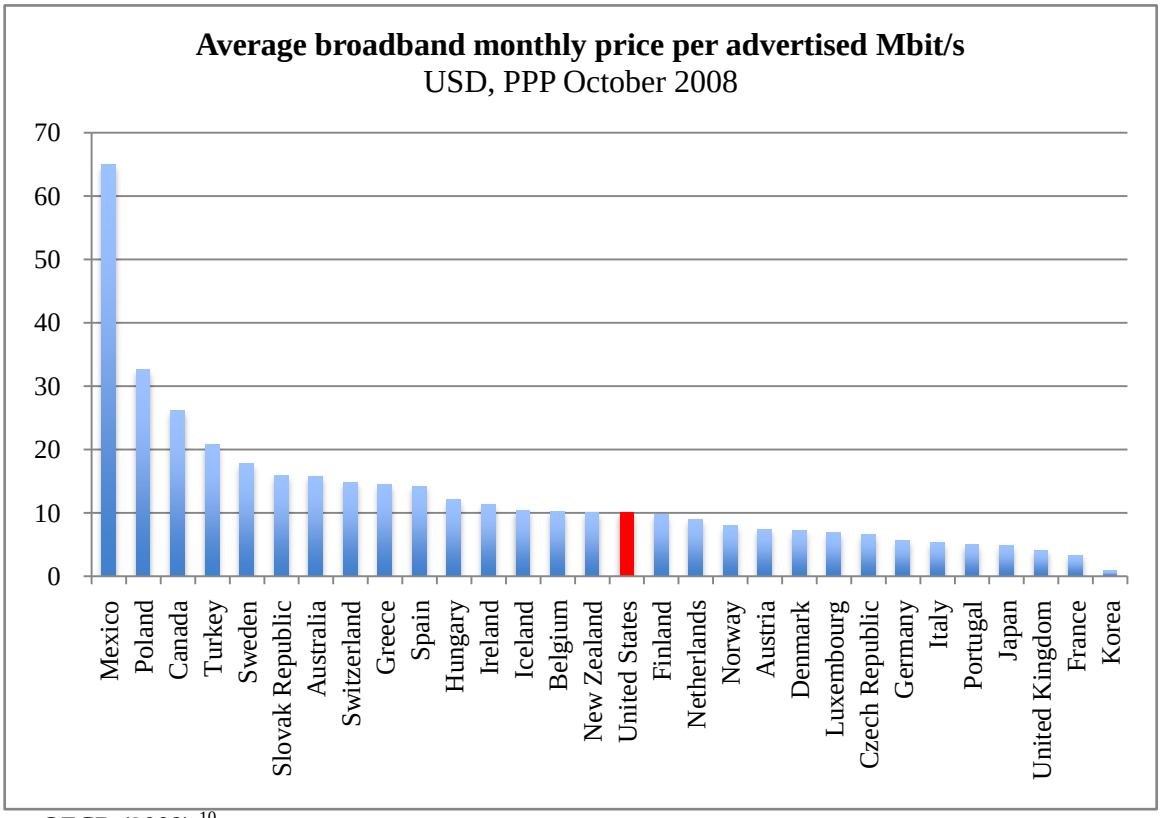
Prices are inherently difficult to compare due to the differing characteristics of the broadband products consumers buy and the tendency to purchase services in bundles. Bundles, in particular, make comparisons difficult since the prices most publications document are standalone prices, which may not reflect the prices that consumers actually pay. With that caveat in mind, this section explores the available evidence on prices. The OECD shows prices in several different ways on its Broadband Portal, and Ofcom also present useful information in its International Comparisons report (Ofcom 2008).

[8] Hulu streams shows only inside the United States: http://www.hulu.com/support/geofilter. iTunes makes cross-border sales difficult: http://discussions.apple.com/thread.jspa?messageID=9372678&#9372678.

[9] Note, of course, that Ofcom did not include all OECD countries in these figures, so it is not possible to say how the U.S. ranks relative to, say, Korea. In addition, if movies are downloaded to households then the proper normalization is households rather than population. The per capita normalization biases the U.S. downward relative to other countries, so the U.S. has an even bigger lead, though the difference is already so great that the normalization will not matter very much.

One approach is to normalize monthly prices by a measure of speed (Figure 8). That is a useful comparison for consumers who value speed heavily. It is less useful for consumers who place a lower value on speed and are more interested in the total price they must pay for a connection. It also has the disadvantage of making prices appear to go to zero as speeds increase.

Figure 8

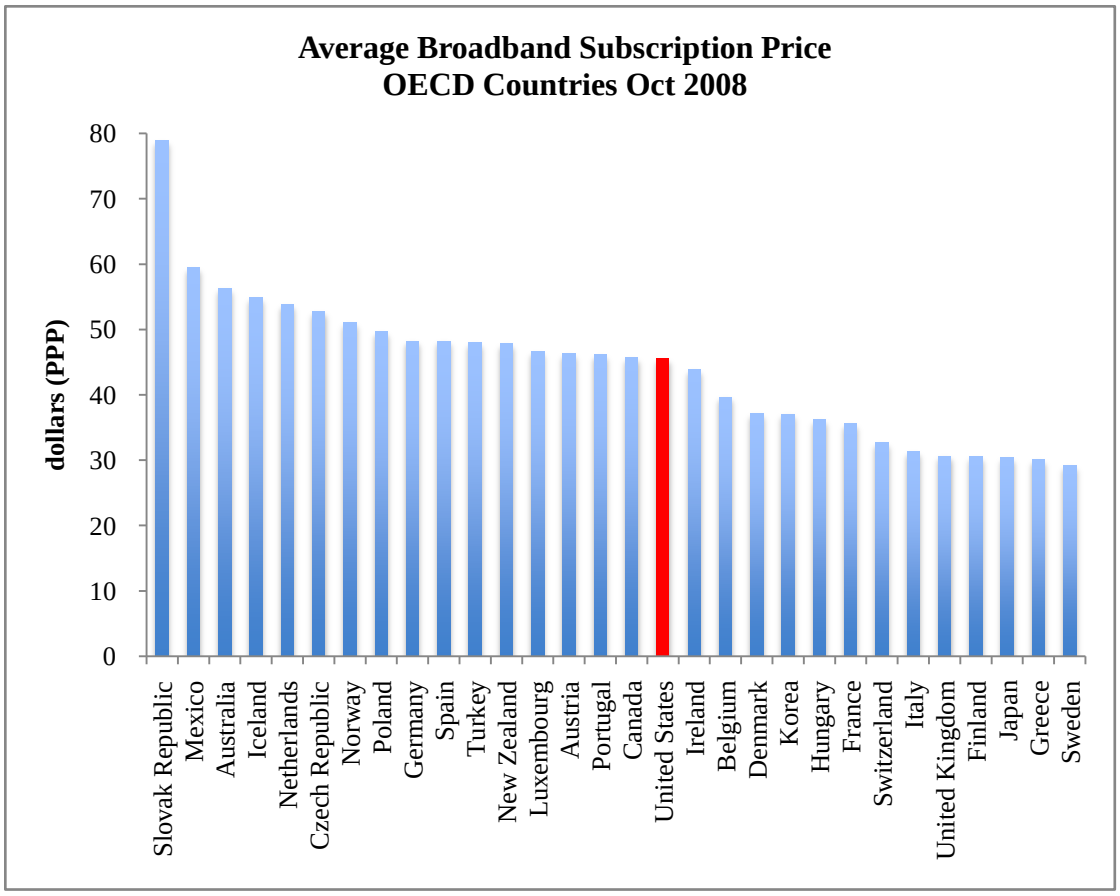


Source: OECD (2009).[10]

Another approach is to compare the average of available plans. Figure 9 shows the OECD's average of surveyed prices across countries. The United States appears to be relatively similar under either approach—neither the most expensive nor the least expensive. Generally the countries with the most expensive normalized prices also have the highest non-normalized average prices, though there are some exceptions. Sweden, for example, appears to have relatively expensive prices when normalized by speed, but the least expensive plans when simply averaging prices across plans.

[10] http://www.oecd.org/dataoecd/22/45/39575011.xls

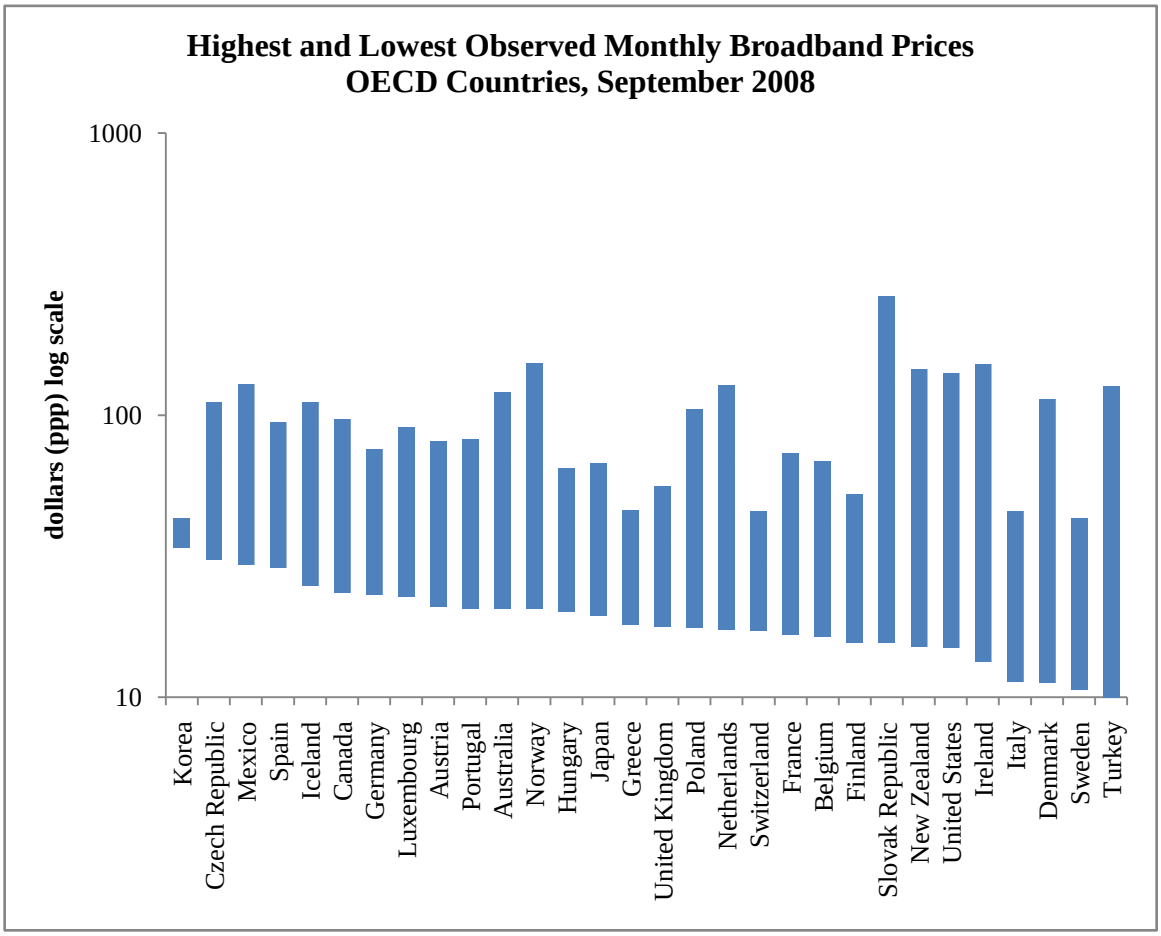
Figure 9



Source: OECD 2009.

One reason for such apparent anomalies is that the range of prices and plans within a country can be large. Figure 10 shows the range between the most expensive and least expensive plans within a country. The figure shows that consumers in the U.S. are able to purchase fairly inexpensive plans relative to other OECD countries. It also shows that the U.S. exhibits a large range of prices, and prices for top-tier plans are among the most expensive among OECD countries.

Figure 10

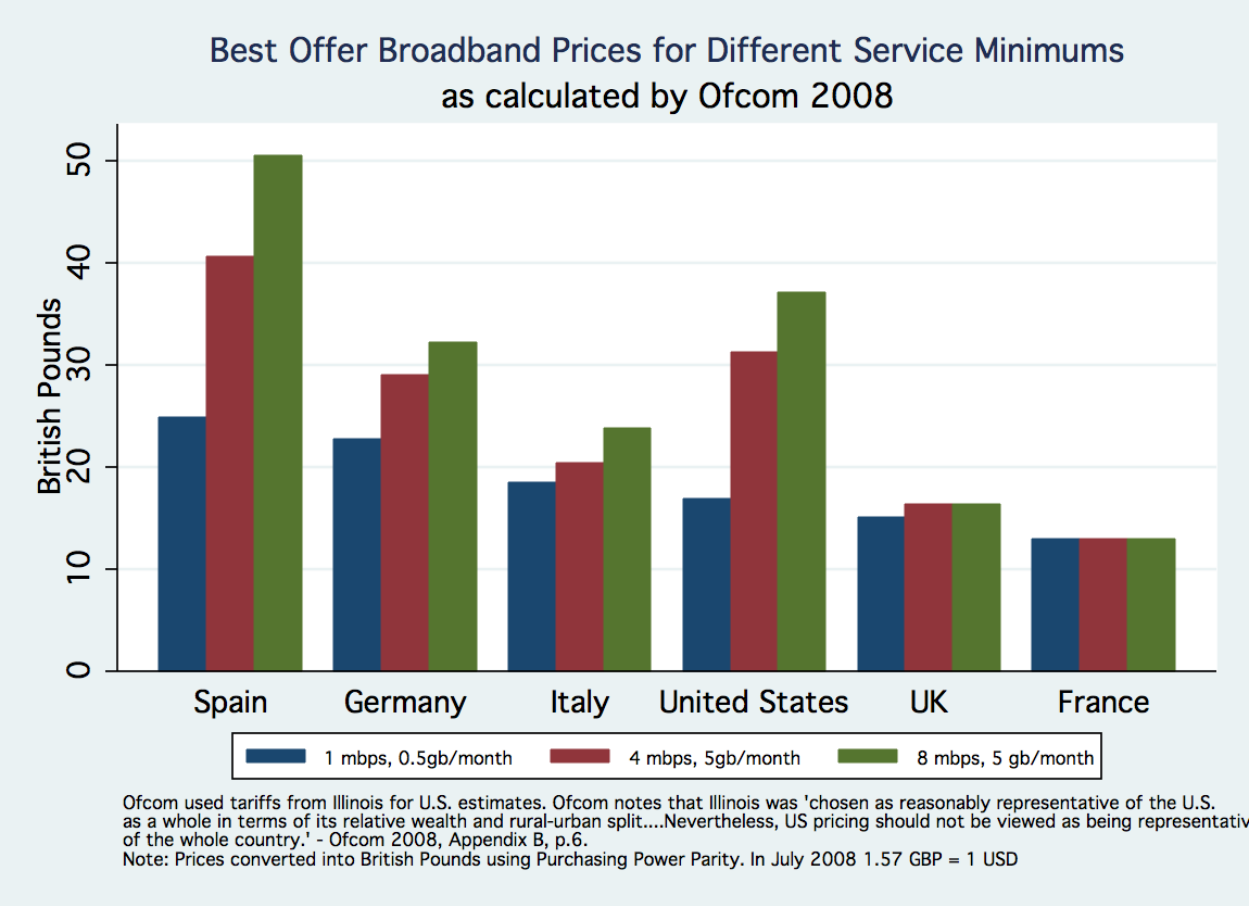


Source: OECD (2009)

Contrary to indices that normalize for speed, however, straight comparisons of prices assume that plans are identical, which they are not. Not only do low-end plans differ from high-end plans, but a low-end plan in one country can differ substantially from a low-end plan in another country.

To handle the issue of differing plans, Ofcom (2008) compares the prices of similar plans in the U.S., U.K., Italy, Germany, and France. Figure 11 shows how comparable plans are priced in these countries. The figure shows that the U.S. has relatively inexpensive low-end plans, but that the price increases more sharply for higher tiers than in the other countries except for Spain.

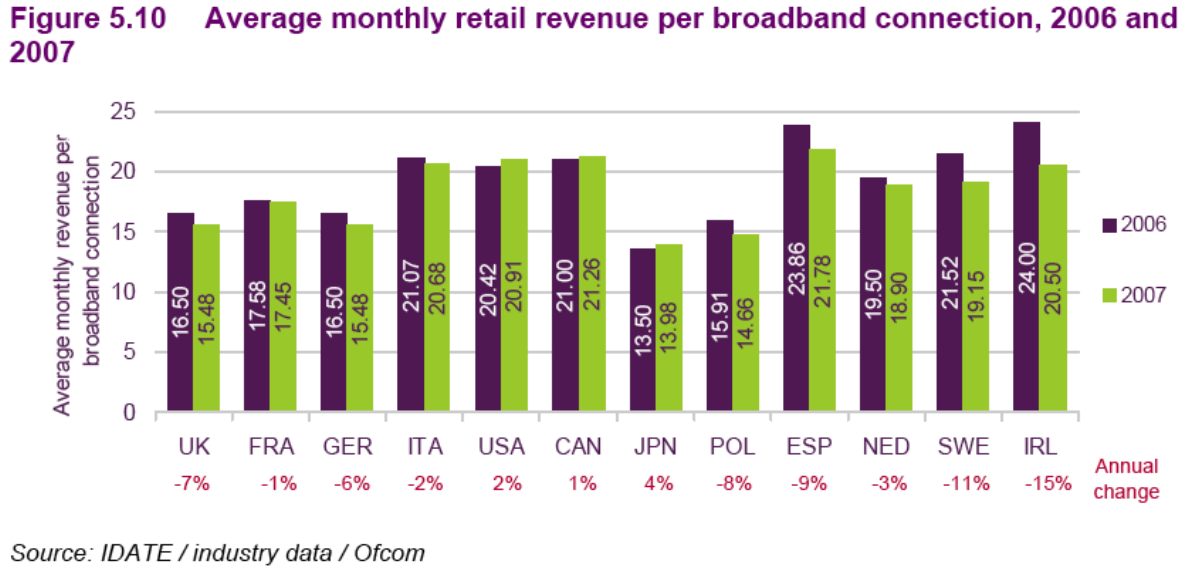
Figure 11



Source: Derived from Ofcom(2008), section 2. Ofcom notes that the "lowest prices are available in France, where it is also notable that the most basic packages from all three of the leading operators meet the requirements of the highest specification basket (8Mbit/s and 5GB per month)" (p.66).

It is also worth knowing how much consumers ultimately pay for their connections, as that reflects an intersection of supply and demand. Figure 12 shows one measure—revenues per broadband line—for several countries in 2006 and 2007, as compiled by Ofcom (2008). Some results are consistent with information presented above. Revenues per connection are lowest in Japan. Other results are more surprising. In particular, revenues per connection across these 12 countries are remarkably similar given the wide variation in pricing discussed earlier, ranging from £14 per month in Japan to £22 per month in Spain. Nevertheless, at about £21 per month, revenues per connection are higher in the U.S. than in all other sampled countries except for Canada and Spain.

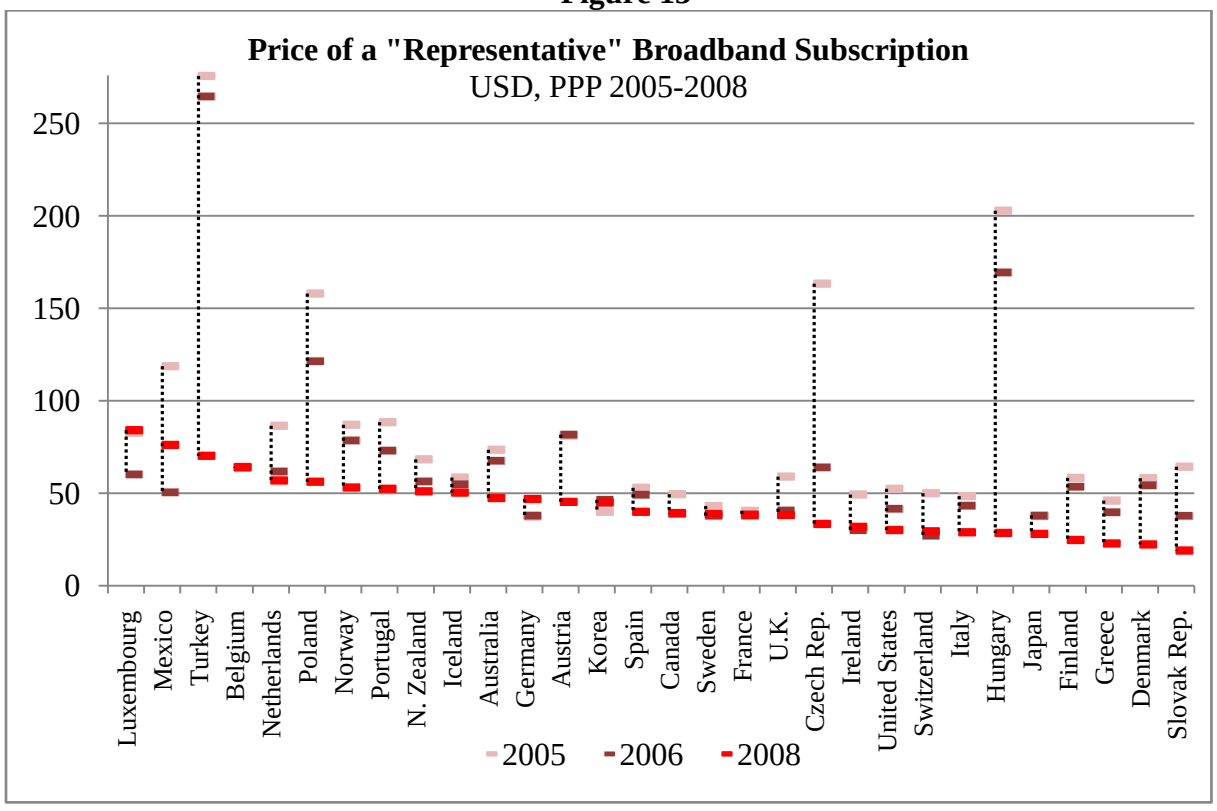
Figure 12



Source: Ofcom (2008), figure 5.10, p.196.

Finally, prices change over time and it may be instructive to see how they have changed in different countries. Figure 12 above showed that revenue per broadband connection appeared to change very little between 2006 and 2007. Figure 13 shows changes in prices, derived from OECD data, between 2005 and 2008. Nearly all countries show price decreases over that time period, with countries that had the highest prices in 2005 showing the biggest price decreases.

Figure 13

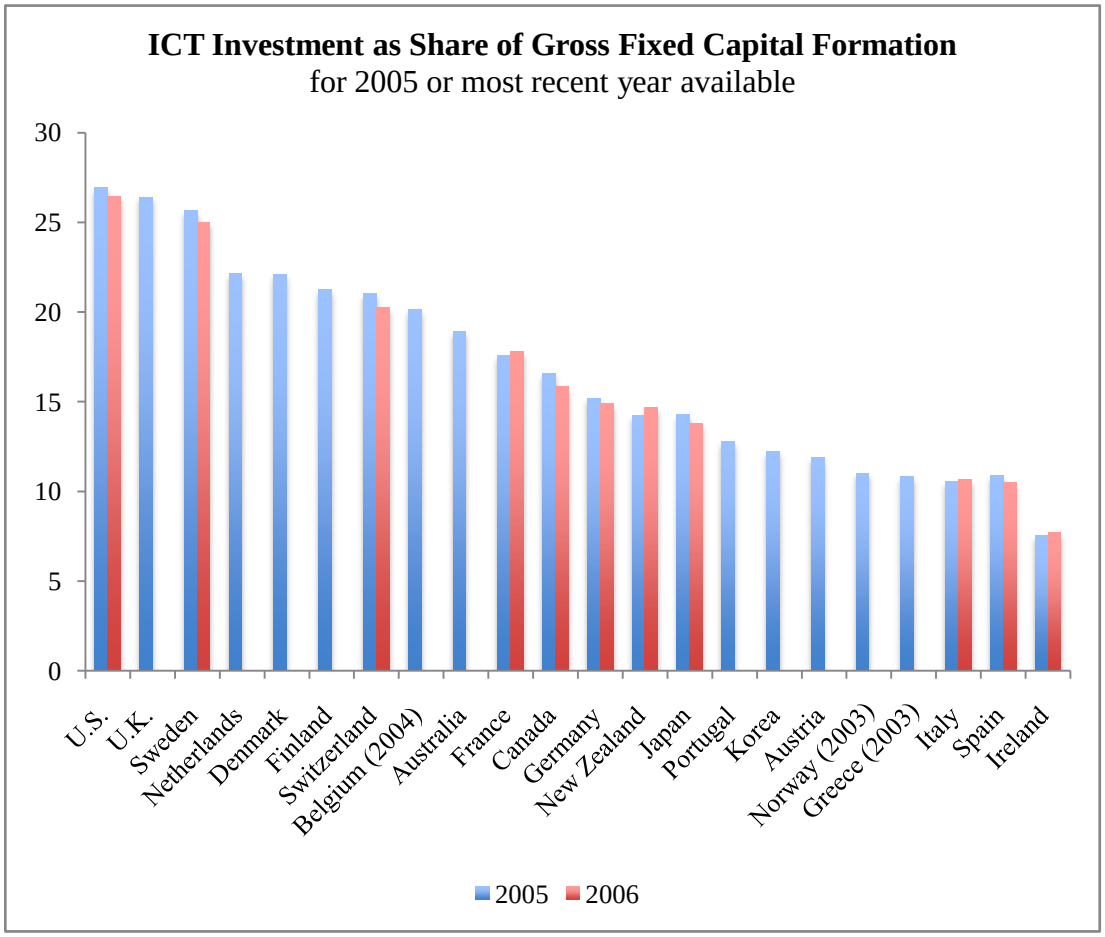


Other ICT Indicators

Broadband is but one component in the makeup of a country's information and communications technology (ICT) landscape. Rather than focus on a single variable (broadband, in this case), it is useful to examine a range of ICT indicators. These indicators tend to put the United States at or near the top.

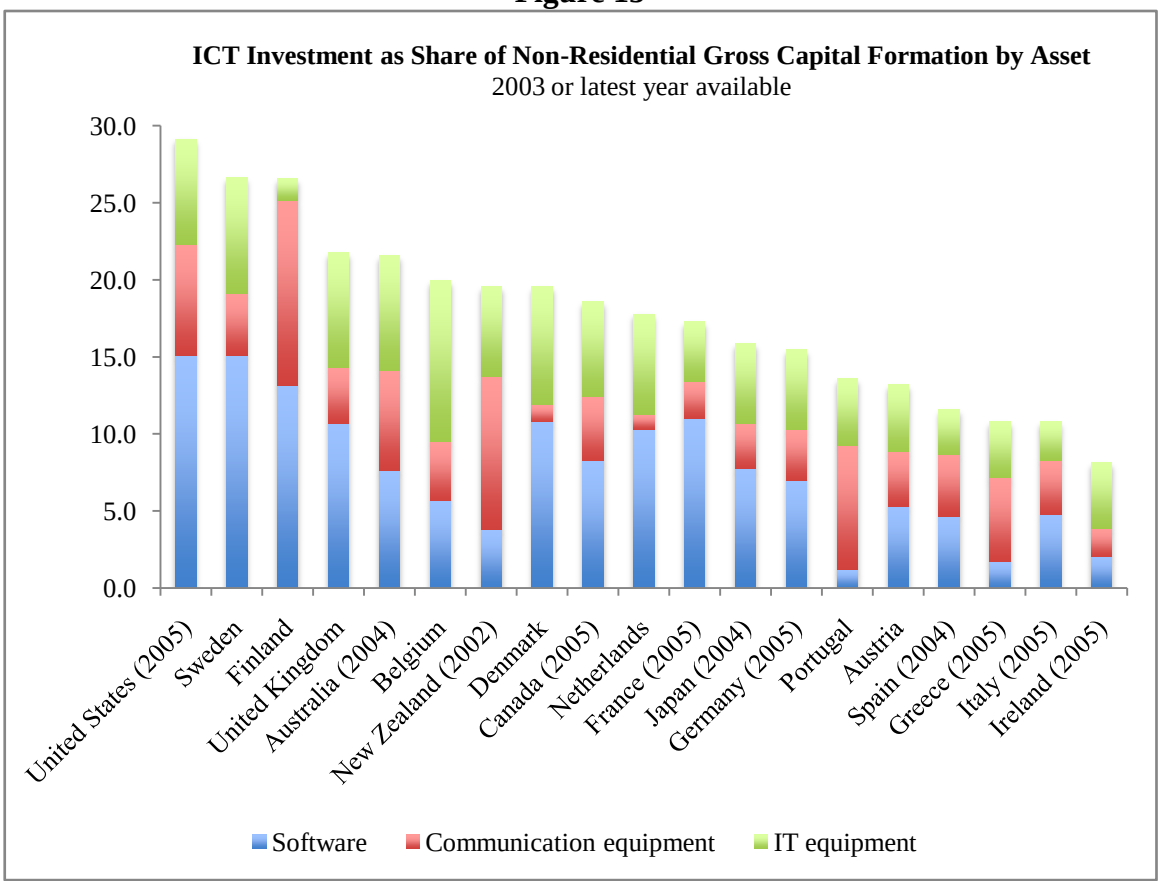
The OECD compiles data on investment in ICTs. Figure 14 presents the OECD's estimates of ICT investment as a share of gross fixed capital. The most recent data show the U.S. leading the OECD in this investment. Figure 15 breaks ICT investment into investment in software, communications, and IT equipment.

Figure 14



Note: ICT equipment is defined here as computer and office equipment and communication equipment; software includes both purchased and own account software. Software investment in Japan is likely to be underestimated, owing to methodological differences. Data are for 2005 and 2006 where available, or the latest year available.
Source: OECD database on capital services. www.oecd.org/statistics/productivity

Figure 15



Source: OECD database on capital services.
ICT equipment is defined here as computer and office equipment and communication equipment; software includes both purchased and own account software. Software investment in Japan is likely to be underestimated, owing to methodological differences.[11]

Some sources combined various measures to create indices to compare countries' connectivity ratings.

Table 1 shows the "e-Readiness Rankings" from the Economist Intelligence Unit (2008), the "Connectivity Score" calculated by Waverman and Dasgupta (2009), and the "Networked Readiness Index" compiled by the World Economic Forum (2009).

[11] http://caliban.sourceoecd.org/vl=848647/cl=18/nw=1/rpsv/sti2007/ge1-2.htm

Table 1

Economist e-Readiness 2008			Waverman Connectivity Score, 2009			WEF Networked Readiness Index 2008-09	
United States	**8.95**		**United States**	**7.87**		Denmark	5.85
Hong Kong	8.91		Sweden	7.04		Sweden	5.84
Sweden	8.85		Denmark	6.73		**United States**	**5.68**
Australia	8.83		Norway	6.6		Singapore	5.67
Denmark	8.83		Netherlands	6.51		Switzerland	5.58
Singapore	8.74		Canada	6.22		Finland	5.53
Netherlands	8.74		Finland	6.05		Iceland	5.5
United Kingdom	8.68		Singapore	5.93		Norway	5.49
Switzerland	8.67		United Kingdom	5.69		Netherlands	5.48
Austria	8.63		Australia	5.65		Canada	5.41
Norway	8.6		Japan	5.5		Korea, Rep.	5.37
Canada	8.49		Korea	5.49		Hong Kong SAR	5.3
Finland	8.42		Hong Kong SAR	5.47		Taiwain, China	5.3
Germany	8.39		France	5.39		Australia	5.29
South Korea	8.34		Ireland	5.09		United Kingdom	5.27
New Zealand	8.28		Germany	5.06		Austria	5.22
Bermuda	8.22		New Zealand	4.46		Japan	5.19
Japan	8.08		Belgium	4.43		Estonia	5.19
Taiwan	8.05		Italy	4.13		France	5.17
Belgium	8.04		Spain	3.7		Germany	5.17
Ireland	8.03		Portugal	3.56		Luxembourg	5.1
France	7.92		Czech Republic	3.5		New Zealand	5.04
Malta	7.78		Hungary	3.1		Ireland	5.03
Israel	7.61		Greece	2.85		Belgium	5.02
Italy	7.55		Poland	2.63		Israel	4.98
Spain	7.46					Malta	4.79
Portugal	7.38					U.A.E.	4.76

Indices are inherently problematic. First, they are comprised of underlying variables, all of which are measured with error.[12] This measurement error means that it is usually not possible to know whether index scores are statistically different from each other. Second, whoever creates the index must weight the underlying variables in order to combine them into an index. Many indices do not explicitly assign weights, but the failure to do so means that all variables are weighted equally, implying that they are all equally important. It is unlikely that all variables in an index truly are equally important. Waverman and Dasgupta (2009) at least partially avoid this pitfall by estimating the weights based on their measured contribution to economic growth.

No indicator or compilation of indicators is perfect. Yet, these broader measures of IT show that the U.S. scores quite well overall.

[12] These indices use the OECD broadband penetration estimates, presumably lowering the U.S. score.

Conclusion

International comparisons can be useful. They make it possible to compare the effects of different policy approaches and to examine different ways broadband can develop. They must, however, be done carefully. This report compares various aspects of broadband across countries, updating my report from a year ago (Wallsten 2008).

In general, the data show that broadband penetration is increasing rapidly in all OECD countries, including in the U.S. In terms of wired connections per household, the U.S. probably ranks somewhere between 8th and 10th. Moreover, at the current rates of broadband adoption the U.S. is behind the leaders only by a number of months, and all wealthy OECD countries will reach a saturation point within the next few years.

Download speeds in the U.S. seem to average about 6 Mbps, which puts the U.S. behind the leaders, but in a large group of countries that average about 6-8 Mbps. These speeds do not appear to be holding back use of broadband in the U.S., however. According to an Ofcom (2008) study, Americans download far more music and movies than do consumers in other countries.

Prices remain the most difficult aspect of broadband to compare due to the large number of plans in each country, questions regarding the right way to normalize the data, and the prevalence of bundling. Nevertheless, the data suggest that the U.S. has among the least expensive low-end broadband plans, but among the more expensive high-end plans.

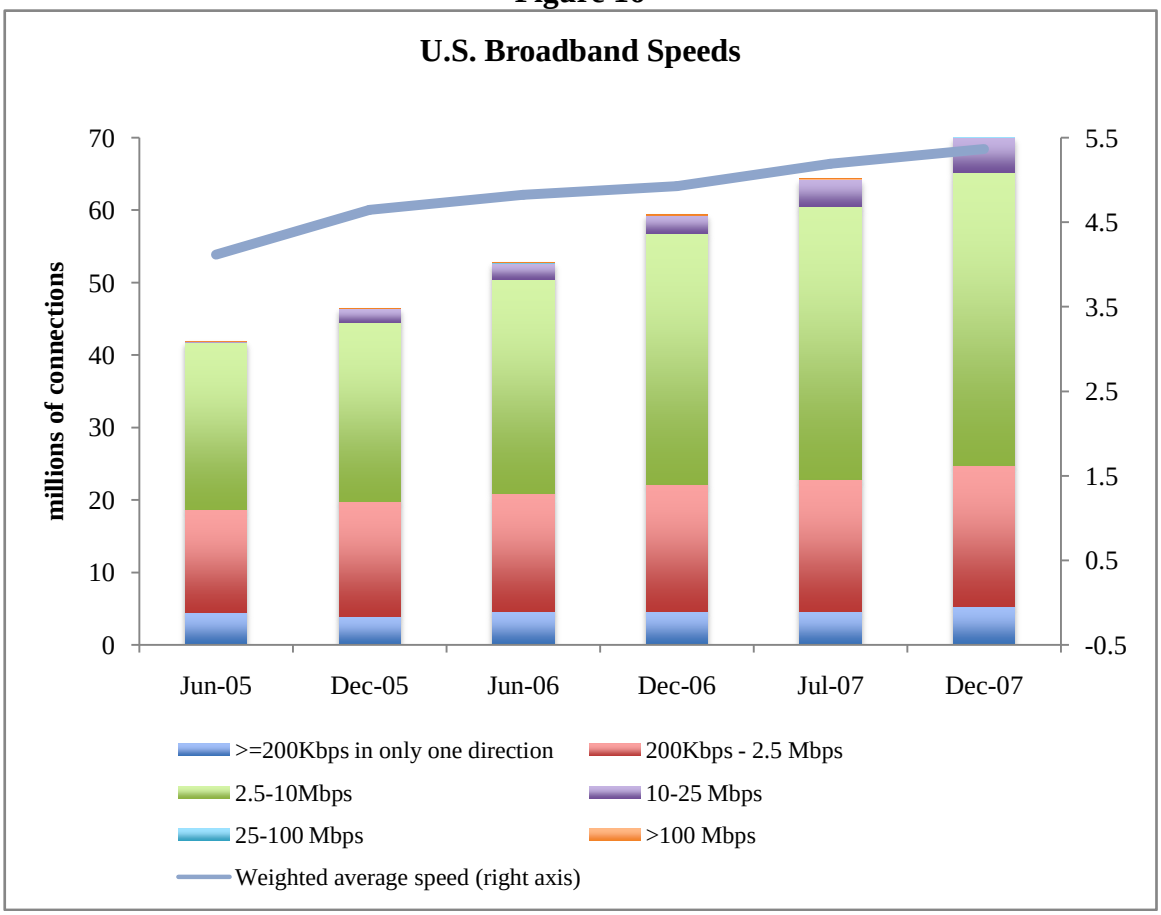
Several questions remain unanswered. In particular, how much are consumers in different countries willing to pay for faster speeds or lower latency? How should we take into account wireless broadband—that is, what is the elasticity of substitution between wireless and wired broadband and does it differ across countries?

Overall, this report shows that broadband in the U.S. is far better than many claim and is improving quickly, yet at the same time it also shows that the U.S. is not a world leader. Policymakers would be wise to consider any new policies carefully to ensure that they will have net benefits and new rules do not derail aspects of the broadband market that are working well.

Appendix: Broadband Speeds in the United States

The FCC collects data on broadband speeds (though recall that these are nearly all residential connections). Figure 16 shows speed categories to which consumers subscribe as reported by providers to the FCC. The figure shows that most of the growth has been in the 2.5 – 10 Mbps category, followed by the 10 – 25 Mbps category. The figure also shows steady growth in a weighted average speed.

Figure 16

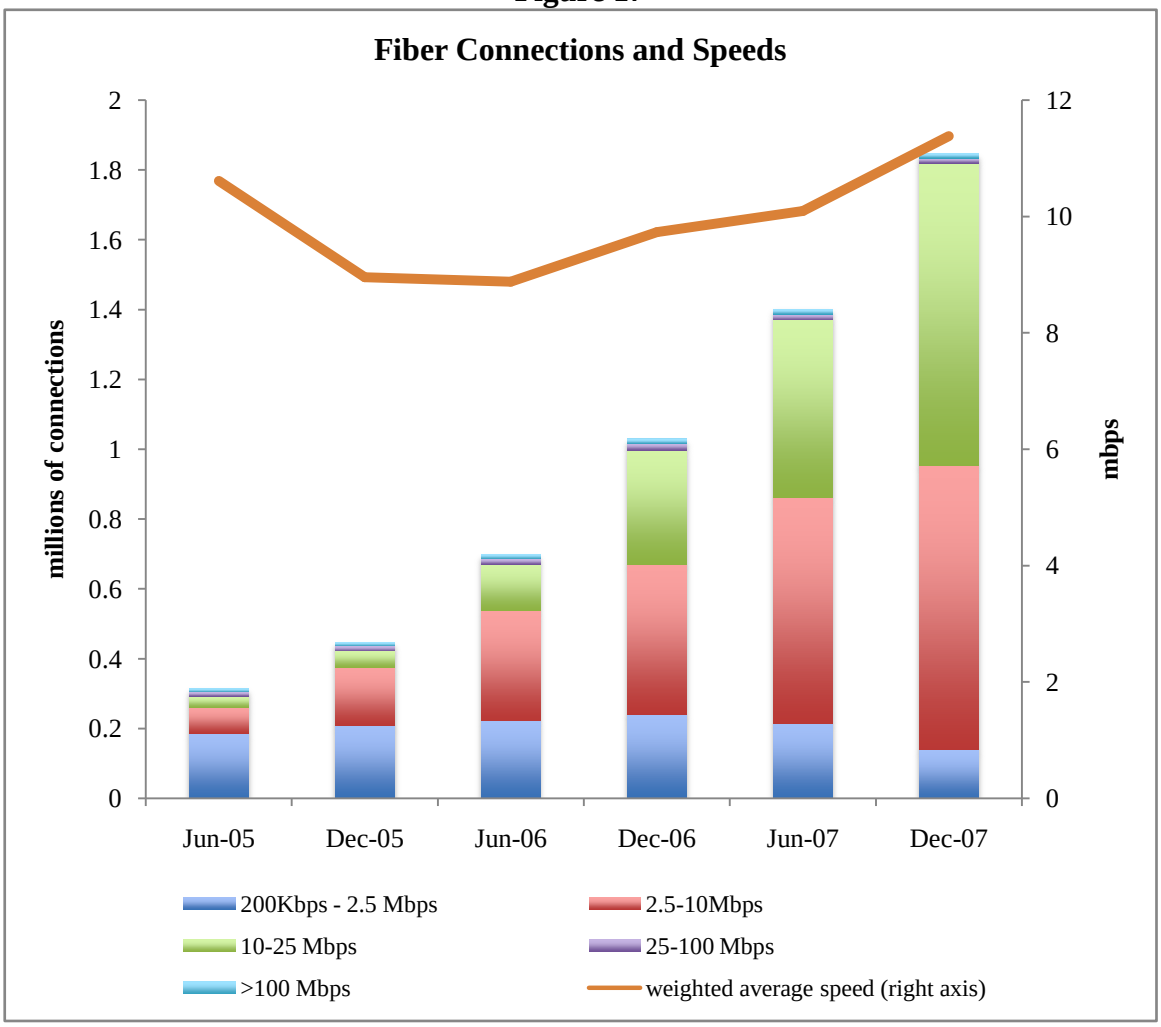


Source: Federal Communications Commission (2006a;2006b;2007a;2007b;2008b), Table 5, wireline connections only.
Note: Weighted average is author's derivation from FCC data. The weighted average is the sum of each category's midpoint multiplied by the share of connections in that category. I used 0.765 Mbps for the slowest category.

It is possible to derive some information about U.S. consumers' demand for speed from this information. It is not possible to know from the FCC data what speeds all the DSL and cable platforms offer. We do know, however, that fiber currently offers the fastest maximum speeds.

Figure 17 presents the number of fiber connections from June 2005 through June 2007 by speed tier. The figure shows that the majority of consumers choose speeds either in the 2.5 – 10 Mbps or the 10 – 25 Mbps category. Very few fiber customers choose speeds higher than 25 Mbps.

Figure 17



Source: See Figure 16.

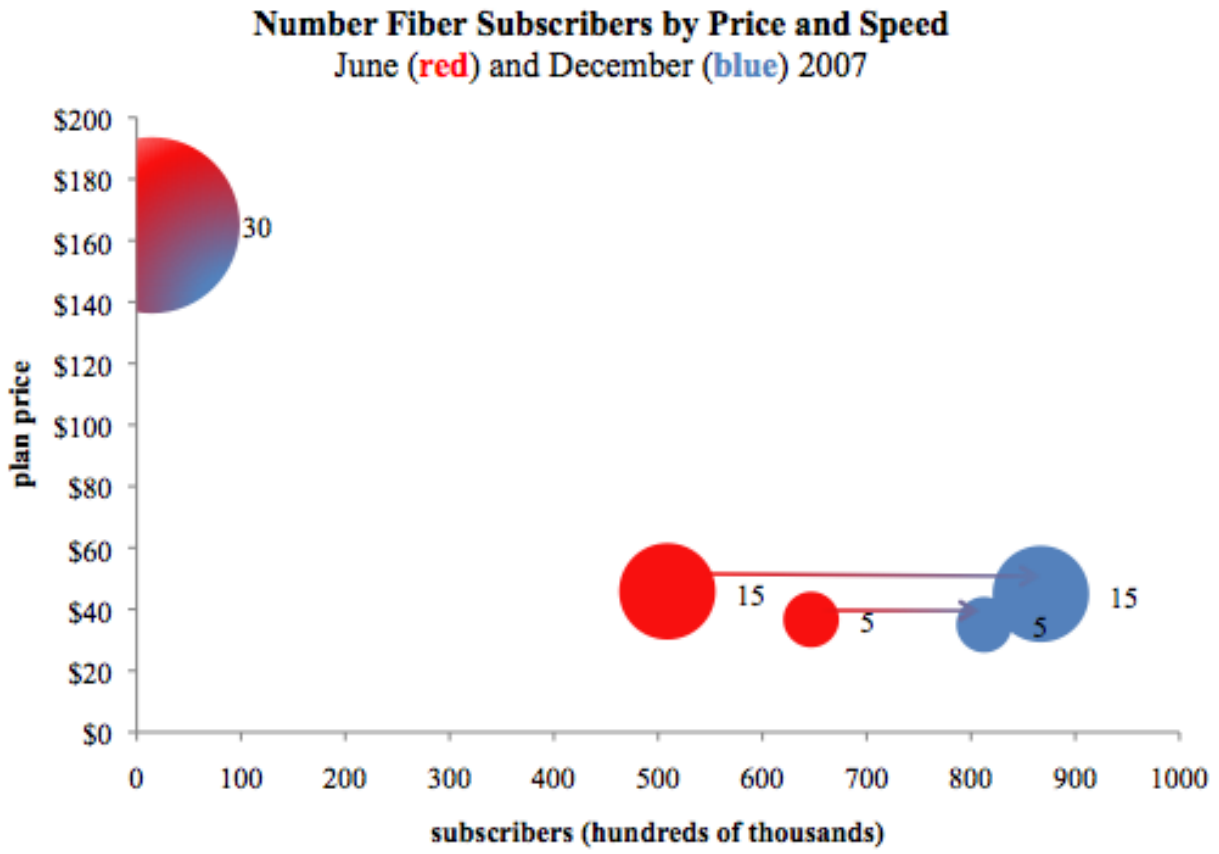
Because Verizon is the primary supplier of fiber connections to the home, we can (imperfectly) combine the FCC data with pricing information available from Verizon.[13] Figure 18 presents this information graphically for June 2007.[14] These data will allow us to glean some information about demand. In particular, we know approximate speed categories, the number of subscribers, and prices.

[13] Verizon reported about 1.5 million FiOS Internet customers by December 31, 2007 (http://policyblog.verizon.com/PolicyBlog/Blogs/policyblog/CZBlogger1/420/FiOS-Facts-Wrapping-Up-2007.aspx). The FCC counted about 1.4 million fiber customers in December 2007, implying that practically all counted fiber connections were from Verizon.

[14] Plan data are also available for June 2006, which in theory makes it possible to hold constant speed and see how price changes affect subscriptions. Unfortunately, prices appeared to be largely identical in June 2006 and June 2007 when accounting for the signup offer of a free month's service.
Speed and prices for June 2006: $34.95 for 5/2, $44.95 for 15/2, and $179.95 for 20/2 with one month free when signing a one-year contract.
http://web.archive.org/web/20061215183200/http://www22.verizon.com/content/consumerfios/packages+and+prices/packages+and+prices.htm (last accessed May 8, 2008).

The figure shows limited willingness to pay by consumers for the highest speeds. Indeed, the FCC reports that the number of subscribers to plans offering between 25 and 50 mbps decreased slightly from 16,292 to 14,448 between June and December 2007. Verizon's offering during this time period was 30 mbps down and 5 mbps up for a net $165.95 per month with a one or two-year contract.[15] The price (net of discounts) for both the 5 mbps and the 15 mbps decreased slightly (due to offering a $10 per month discount for the first 6 months of a one- or two-year contract). The number of subscribers to both plans increased with a much bigger increase in demand for the 15 mbps plan than the 5 mbps plan. Unfortunately, from these data we cannot determine why the 15 mbps plan became relatively more popular than the 5 mbps plan.

Figure 18



Sources: FCC (2008a;2008b)and archive.org.[16]
Note: Circle size indicates download bandwidth: 5, 15, and 30Mbps. The 30mbps circles overlap because of the similar number of subscribers to that plan in the two time periods.

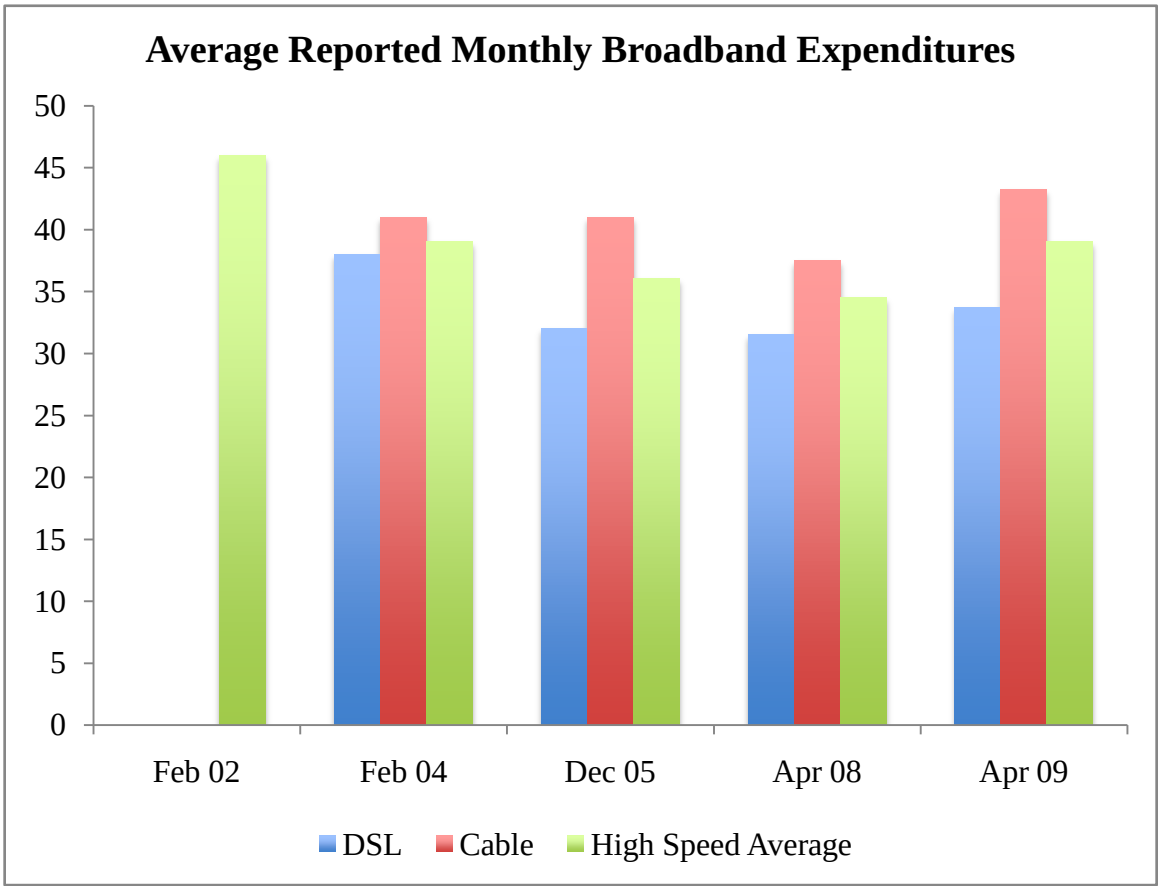
[15] List price $179.99 per month with one month free when signing up online and signing a one year contract. http://web.archive.org/web/20071022101736/http://www22.verizon.com/content/consumerfios/packages+and+prices/packages+and+prices.htm

[16] Verizon FiOS speed and price plans for June 2007: $39.95 for 5 Mbps down / 2 Mbps up, $49.99 for 15/2, and $179.99 for 30/2. These prices are for standalone Internet service and do not include bundles. http://web.archive.org/web/20070607004754/http://www22.verizon.com/content/consumerfios/packages+and+prices/packages+and+prices.htm (last accessed May 8, 2008).

Broadband Prices in the U.S.[17]

Prices are not easy to estimate due to the prevalence of different broadband plans and bundles of Internet, telephone, and television. They are also difficult to evaluate over time because of increasing speeds and the typically higher prices for higher speeds. Data from the Pew Internet and American Life Project show that consumers report that the prices they pay for broadband generally fell from 2002 through 2008 and then ticked up slightly in 2009 (Figure 19).

Figure 19



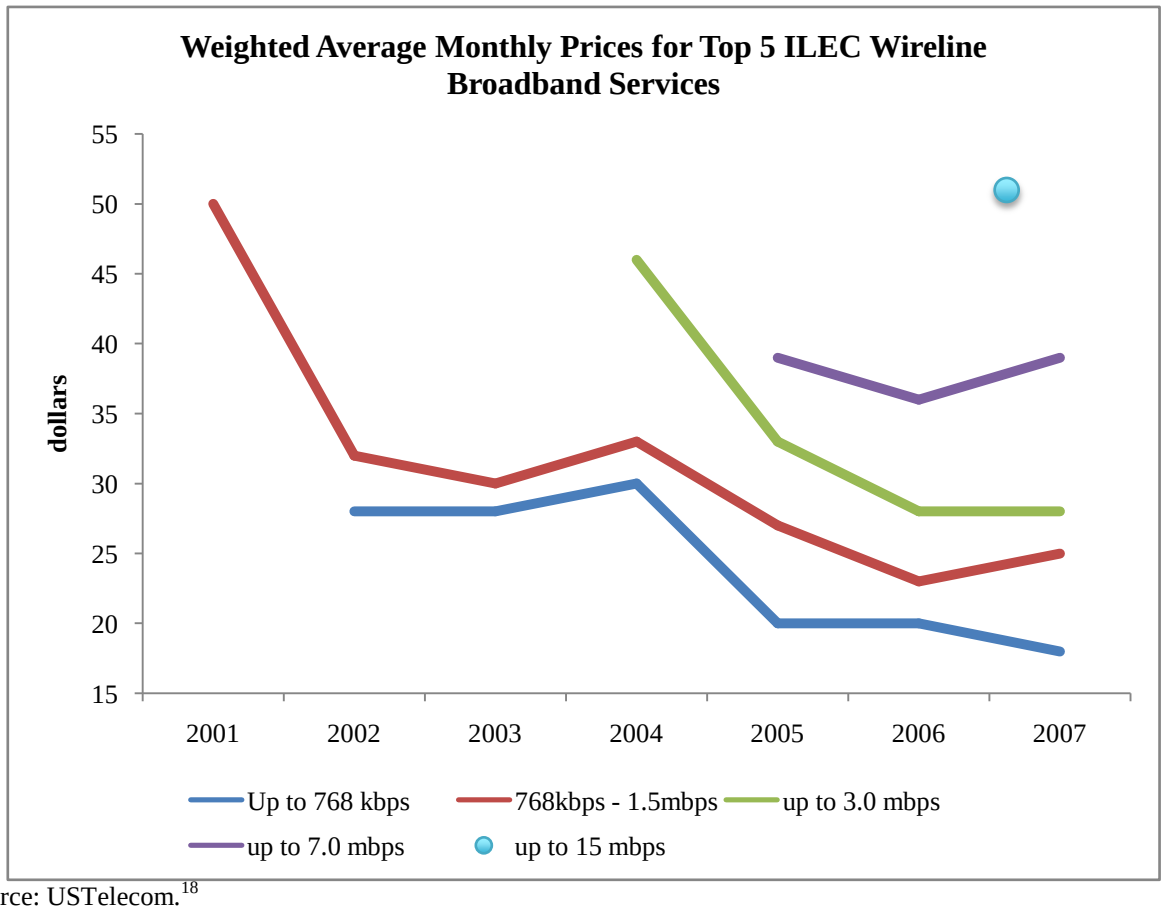
Source: Pew Internet and American Life Project (Horrigan 2006;Horrigan 2007;Horrigan 2008;Horrigan 2009)

Other information shows this information in a different light. Figure 20 shows the weighted average price, as calculated by USTelecom, for broadband connections of various speeds over time offered by the incumbent telecommunications companies. It is noteworthy that in 2007 consumers could purchase plans offering 7-15 mbps for the same amount they paid for 768kbps – 1.5 mbps in 2001. Their data shows generally declining prices for broadband plans that offer up to 3 mbps and that the monthly price for a connection that offers 7 – 15 mbps in 2007 was about the same as for a 768 kbps connection in 2001. The data also show that, as one would expect, prices for faster speeds are higher than prices for lower speeds. Moreover, those

[17] The text in this section comes from Hahn and Wallsten (2009).

prices seemed to increase somewhat between 2006 and 2007. The general move towards faster speeds—as discussed below—combined with this price increase could lead to higher consumer expenditures on broadband.

Figure 20



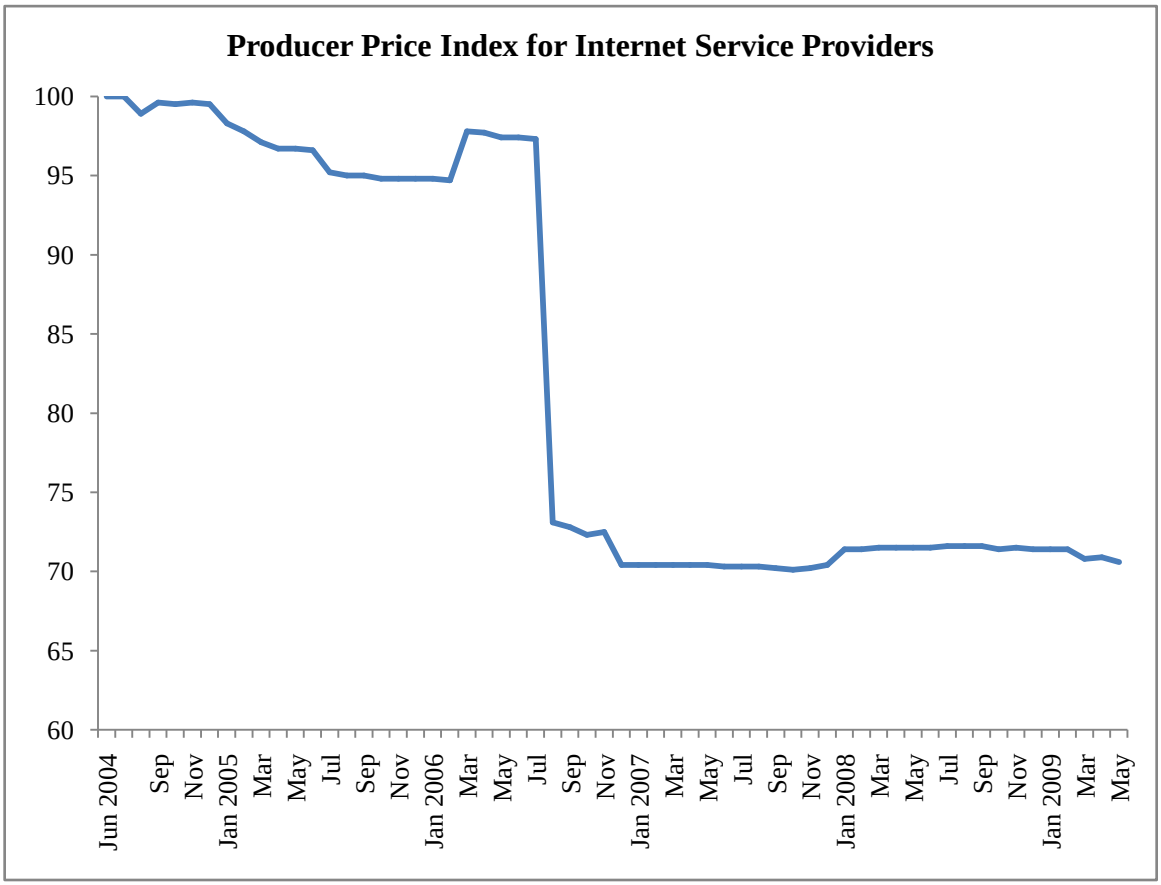
Source: USTelecom.[18]

Another indicator of prices comes from the Bureau of Economic Analysis, which has compiled an index of prices ISPs charge their customers.[19] This index includes primarily dialup and ADSL, but also incorporates prices businesses pay for leased lines and symmetric DSL service. Figure 21 shows a steep decline in the middle of 2006, but relatively stable prices since then. Greenstein and McDevitt (2009), who use this PPI index in their study of the economic effects of broadband, explain that the most likely explanation for the steep 2006 decline was AOL's decision to move to advertising-supported dialup service, thus reducing prices by 100 percent to 25 percent of the population that subscribed to Internet service in 2006.

[18] http://www.ustelecom.org/uploadedFiles/Learn/Broadband.Pricing.Document.pdf

[19] http://www.bls.gov/ppi/ppiisp.htm

Figure 21



Source: Bureau of Economic Analysis 2009.[20]April, May, and June 2009 are preliminary estimates.

[20] PPI derived for NAICS 518111.

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