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Stop focusing on irrelevant broadband metrics.

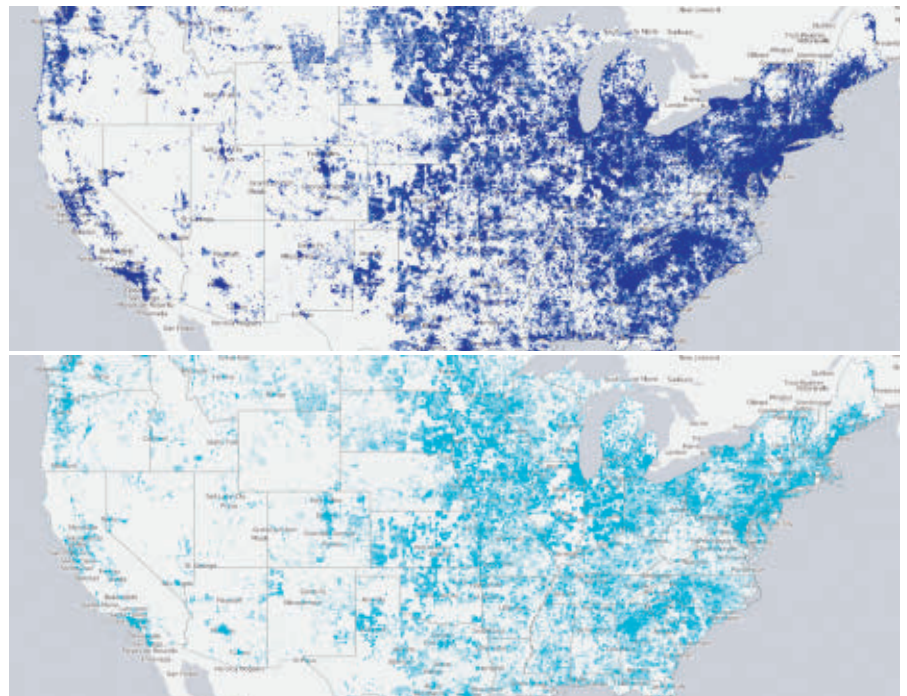
U.S. BROADBAND IS “terrible” has become a familiar meme. An article in *Scientific American* last year fretted, “our creaky Internet makes it harder for U.S. entrepreneurs to compete in world markets.”⁴ Given the growing importance of broadband Internet connections to our work, civil society, and entertainment, a poor broadband infrastructure would indeed be cause for concern.

As it turns out, however, much of this concern is misplaced. It arises from a combination of the focusing on the wrong metrics, a misguided interpretation of consumer preferences, and a popular obsession with rankings. These misperceptions translate into misdirected, if well-intentioned, public policies that waste scarce resources.

Even worse, we do face real problems and issues with respect to broadband—a significant income-based digital divide, for example, and inefficient use of spectrum—but our singular focus on almost meaningless metrics and rankings distracts from more important issues.

Adoption and Speed

The most commonly compared broadband metrics are adoption and speed. Conventional wisdom holds that both are too low in the U.S. While it is impossible to know what the right levels



Maximum advertised speed available (top) compared with type of technology available (bottom).

are, more careful analysis suggests that neither is a problem.

Adoption. Twice a year the Organization for Economic Cooperation and Development (OECD) reports that the U.S. ranks right around the middle of all OECD countries in the number of wired broadband connections per capita. That ranking, however, is increasingly meaningless in rich countries for the simple reason that multiple people in a household share

each wired connection and average household sizes differ across countries. Countries with relatively large households, like the U.S. and Japan, are doomed to low per capita rankings. Consider that if every household in every OECD country had a wired broadband connection the U.S. would rank 17th or 18th on a per capita basis due to household size alone.

Moreover, broadband is available in the U.S. almost everywhere. Accord-

ing to the National Broadband Map, approximately 98% of U.S. households have Internet access with speeds at least 768kbps downstream and at least 200kbps upstream, and 96% have access to broadband of at least 3mbps downstream and 768kbps upstream. Nearly everyone without terrestrial access can purchase service from two satellite providers that are both in the process of significantly upgrading their service.

While availability is not a significant problem, a large income-based digital divide remains: poor people adopt broadband at substantially lower rates than wealthier people. Yet, U.S. policy does not focus on changing adoption. It focuses on building out to underserved areas, a less effective way to increase adoption.² For example, the \$7.1 billion in broadband stimulus grants focused almost exclusively on building infrastructure, and the enabling legislation even barred the program from granting subsidies to individuals rather than firms. Current efforts to reform universal service suggest this focus is unlikely to change much.

Speed. Average advertised download speeds in many OECD countries are generally faster than they are in the U.S. As the accompanying figure indicates, however, the means of advertised plans do not reflect the speeds consumers actually purchase or receive. As it turns out, measured speeds are remarkably similar across rich countries.

Conventional wisdom holds that faster broadband speeds are always better, but is faster more useful? Most consumers do not value very high speeds and do not purchase those speeds even when they are available. It is true that speeds considered acceptable in the early days of DSL are too slow for many of today's common applications. But even today, speeds faster than approximately 10mbps deliver little incremental value for the simple reason that even the most bandwidth-intensive uses, like streaming high-definition video, require much less. Netflix and Amazon, for example, stream high-definition video at under 5mbps. A broadband connection cannot pull in the video faster than it is being pushed out.

Speed seems to be of so little concern to most U.S. broadband users

Conventional wisdom holds that faster broadband speeds are always better, but is faster more useful?

that 80% of them do not even bother to remember or check their own speed. A recent FCC survey found that 80% of U.S. broadband users did not know the speeds of their home broadband connections, yet 50% of users reported being "very satisfied" and 41% reporting being "somewhat satisfied" with their speed. In a detailed study of residential broadband demand in the U.S., Rosston, Savage, and Waldman¹ found that consumers were willing to pay about \$80 per month for a reliable, "fast" connection, but were willing to pay only an additional \$3 per month for a "very fast" connection.

To be sure, demand for speed will continue to change over time, as it has

since the Bell 103 modem first communicated at a blazing 300bps, and someday we might consider today's speeds similarly absurdly slow, but no evidence suggests speeds are holding back innovation today. The typical purchased and available speeds in nearly every OECD country already exceed the bandwidth required for commonly used applications.

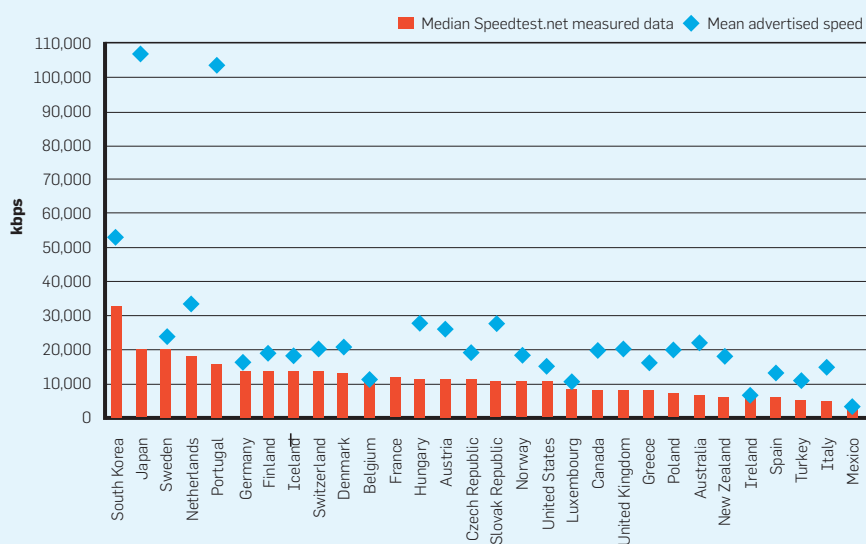
What Should We Measure?

Comparing performance across countries can be valuable, but we should focus on the right things.

Wireless Inputs and Outputs. A few years ago broadband implicitly meant wired connections. Within wired broadband, even as late as 2009 many industry observers thought the future of broadband exclusively meant fiber. Cable's DOCSIS 3.0 technology improved the capacity of cable broadband to such an extent that some analysts believe hybrid-fiber coaxial connections will allow the cable industry to dominate the wired market in much of the U.S.

Perhaps even that prediction is changing. The iPhone, iPad, Android operating system, and related app stores have made wireless an increasingly important part of the broadband ecosystem. Soaring wireless broad-

Measured and advertised download speeds (in kbps).



Source: Speedtest.net, OECD

Note: Speedtest.net: median "country daily speed" in Q2 2010 as calculated by the author from Net Index Source data.



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Perhaps lack of speed is not a barrier to viable new applications while other aspects of quality are.

band use has implications for the direction of broadband innovation, competition, and adoption.

If the trend toward wireless use and mobility continues—and there is no guarantee it will, given the rapid succession of changes in what we think is important—then issues like spectrum policy should move to the forefront of all broadband policy issues. But we have little detailed cross-country information spectrum policy.

Business Use. Popular broadband metrics contain another misleading feature: they focus on residential broadband. Yet, residential broadband connections are unlikely to have large effects on net economic activity (see Wallsten³). Residential connections are used primarily for personal communication, shopping, and consuming news and entertainment. Much of business-to-consumer e-commerce, for example, reflects a shift in economic activity from “brick and mortar” to online retail rather than new economic activity. These activities largely represent transfers of economic activity rather than net new economic activity.

How digital communications technologies change business production processes, however, is more likely to determine whether these new technologies will have transformative economic effects. The direct economic effects of business use dwarf residential use. According to the U.S. Census, while business-to-consumer revenues reached almost \$300 billion in 2009, they were an order of magnitude less than business-to-business revenues of about \$3.1 trillion.

To be sure, productivity benefits may ultimately flow from residential

broadband. Telecommuting, for example, could reduce resources society consumes, such as those used for physically commuting. That is only beginning to happen.

In short, how business incorporates digital communications technologies will have a much bigger effect on our standard of living over the next 20 years than will whether we reach 70% household broadband penetration in six months or a year.

Quality of Service Beyond Speed. Speed is but one element of broadband quality. Other factors like jitter, latency, and lack of fluctuations in quality also matter, but we know almost nothing about how consumers value other attributes of quality. Perhaps lack of speed is not a barrier to viable new applications while other aspects of quality are.

Conclusion

Focusing on the wrong metrics will do more harm than good. If we care about broadband adoption then we should stop focusing on availability. It is a much smaller problem. If we are worried about broadband quality, then we should focus on the aspects of quality businesses and consumers truly value, not merely speed. If we are worried about how broadband affects entrepreneurship and economic growth, then we should focus on barriers businesses face in integrating connectivity into their production processes. If we believe wireless connectivity is increasingly important, then we should focus on developing metrics for wireless and spectrum. ■

References

1. Rosston, G.L., Savage, S., and Waldman, D. Household demand for broadband Internet service. *The B.E. Journal of Economic Analysis and Policy* 10, 1 (Sept. 9, 2010); <http://www.bepress.com/bejeap/vol10/iss1/art79/>.
2. Rosston, G.L. and Wallsten, S. The path to universal broadband: Why we should grant low-income subsidies and use experiments and auctions to determine the specifics. *The Economists' Voice* 8, 1 (Apr. 2011).
3. Wallsten, S. The future of digital communications and research. *Federal Communications Law Journal* 63, 1 (Dec. 2010), 33–42.
4. Why broadband service in the U.S. is so awful and one step that could change it. *Scientific American* (Oct. 2010).

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