U.S. broadband networks rise to the challenge of surging traffic during the pandemic

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Since the Covid-19 shelter-in-place and lockdowns began, internet traffic has surged and networks in various parts of the world have responded at different levels. Data from Ookla show that the U.S. broadband networks have performed very well, particularly when compared to those of the European Union (EU) and the OECD. Three factors that may account for that are the high level of investment in telecommunications by U.S. carriers, the prevalence of high-speed fixed-broadband networks in the U.S., and a light-touch regulatory environment.

Global internet traffic has exploded

It is not unusual, of course, for internet traffic to grow. Cisco VNI predicted that global internet traffic would grow at an annual compounded growth rate of 30% between 2017 and 2022.[1] What is unusual in the Covid-19 environment is the suddenness of the traffic growth. Rather than growing 30% in a year, traffic grew about that much in a month. Sandvine reports a "staggering increase in volume for network operators to cope with and absorb."[2] During March, according to Sandvine, global traffic grew 28.69% with an additional 9.28% during April, for a total of 38% over the two months. Upstream traffic growth was even more stunning, up 123.18% in March before leveling off.

Methodology

Ookla gathers data from millions of internet users every day about the speeds at which their networks operate and then aggregates that data.[3] It has provided a weekly report on global internet network performance during the pandemic by country.[4] Ookla's report dated June 8th for the period ending June 7th provides, for each week, both the mean and median performance for many countries' fixed-broadband and mobile-broadband networks.[5]

Our goal is to compare the performance of the U.S. networks to those of some of its peers, i.e. entities that have relatively similar scale and population density. Specifically, we analyzed data for the U.S., for the OECD[6] countries excluding the U.S, for the EU, and for the combined-total of the four largest countries in the EU (Germany, France, Italy, and Spain).

The U.S. houses roughly 328 million people in about 3.7 million square miles, for a population density of 93 people per square mile. Within the U.S., there is tremendous variety, with population density ranging from Alaska's 1.2 people per square mile to the District of Columbia's 9,857 people per square mile.[7] The EU houses roughly 446 million people in 1.54 million square miles, for a population density of 289 people per square mile, but again with great variations among its member states.[8] The OECD includes many of

the EU countries, but adds some countries like Canada and Australia that, like the U.S., include very large areas with low population density.

The period covered was determined by Ookla, which treated the week of March 2d to March 8th as the base week, i.e. the week before the pandemic effect began. Unless otherwise stated, our analysis covers the fourteen weeks that begin with Ookla's base week, from March 2d through June 7th.

We analyzed Ookla's data for both fixed and mobile networks to determine the average[9] performance for each of these entities during the pandemic. In each case, we took the mean of the weekly rates provided by Ookla for each country for the given period. For the U.S. and the global average[10] that is the rate we report. For the EU, EU-4, and OECD we weighted the mean by the percentage of that entity's broadband-subscriptions that each country contributes to the total, based on the most recent subscription numbers provided by the OECD.

U.S. networks generally outperformed their peers

As can be seen from Figure 1, the U.S.' fixed-broadband download speeds far exceeded those of its EU and OECD peers. Of course, that reflects the performance of the networks during normal times as well as during the pandemic. Figure 1 shows the range of weekly speeds during the pandemic (as do Figures 2-4). It is worth noting that on average, the U.S. mean download speed during the pandemic period was 138 megabits per second (mbps) while the weighted mean download speeds of the EU, EU-4, and OECD were 102 mbps, 106 mbps, and 89 mbps, respectively. The global mean download speed was 75 mbps. In other words, the U.S. fixed-broadband download speed exceeded the global speed by 83%, and those of the EU, EU-4, and OECD by 35%, 30%, and 55% respectively.

While Figure 1 is based on the mean download rates for each entity, Figure 2 is based on the median. Again, the U.S. greatly outperformed its peers. It outperformed the global average by 150%, the EU by 83%, and both the EU-4 and the OECD by 95%.

Figures 1 and 2 also shows that the U.S. networks' fixed-broadband speed bottomed out within three weeks, as did the global index, while the speeds of the EU, EU-4, and OECD continued to decline for another three weeks.

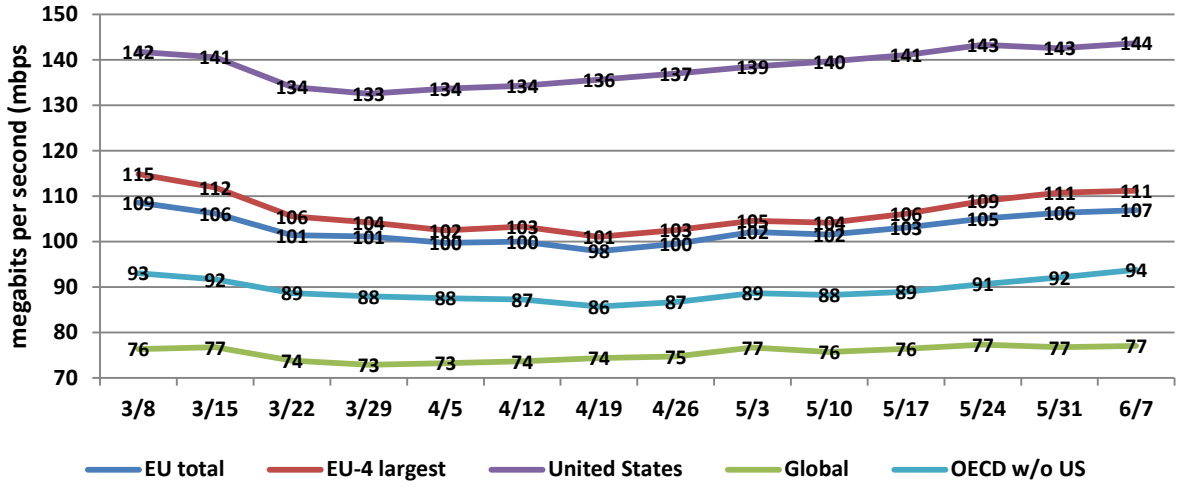
As Figures 3 and 4 show, the U.S. mobile-broadband download speed also exceeded that of its peers, though not nearly as dramatically. The U.S. mobile average (mean) download speed was 37% higher than the global rate, and 9%, 15%, and 16% higher than those of the EU, EU-4, and OECD. When median rates are considered, the U.S. outperformed the global average by 70%. It also outperformed the EU, EU-4, and OECD by 6%, 18%, and 11% respectively.

Figures 3 and 4 show that the mobile networks of all the entities reached bottom during the third week, recovered at somewhat different rates, but all have reached or exceeded their pre-Covid levels as of June 7th.

Figure 1

Fixed Broadband: Weighted Average Download Speed

during the pandemic: 3/2/20-6/7/20

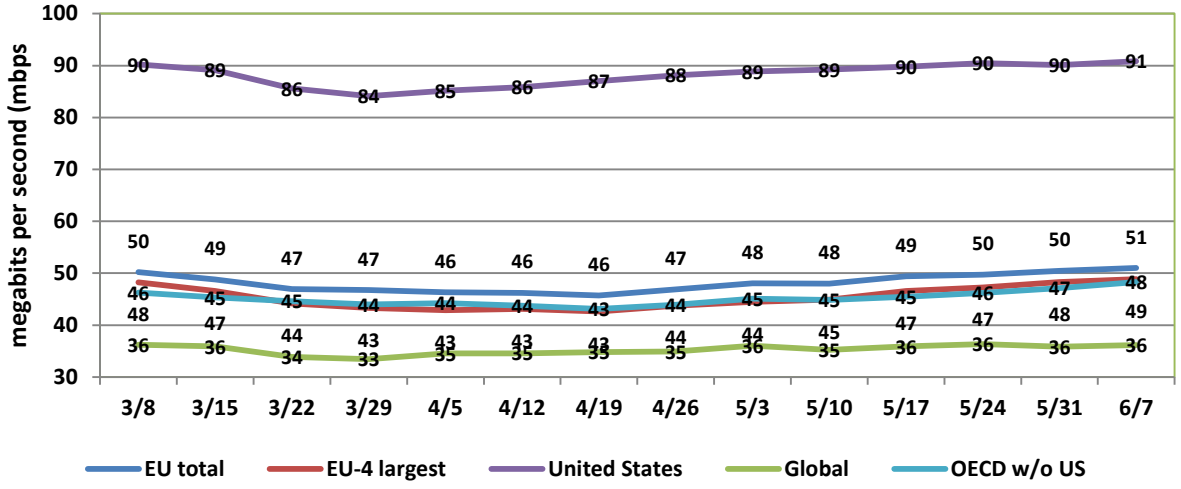


Source: Ookla Speedtest (speed), OECD (weighting)

Figure 2

Fixed Broadband: Weighted Median Download Speed

during the pandemic: 3/2/20-6/7/20

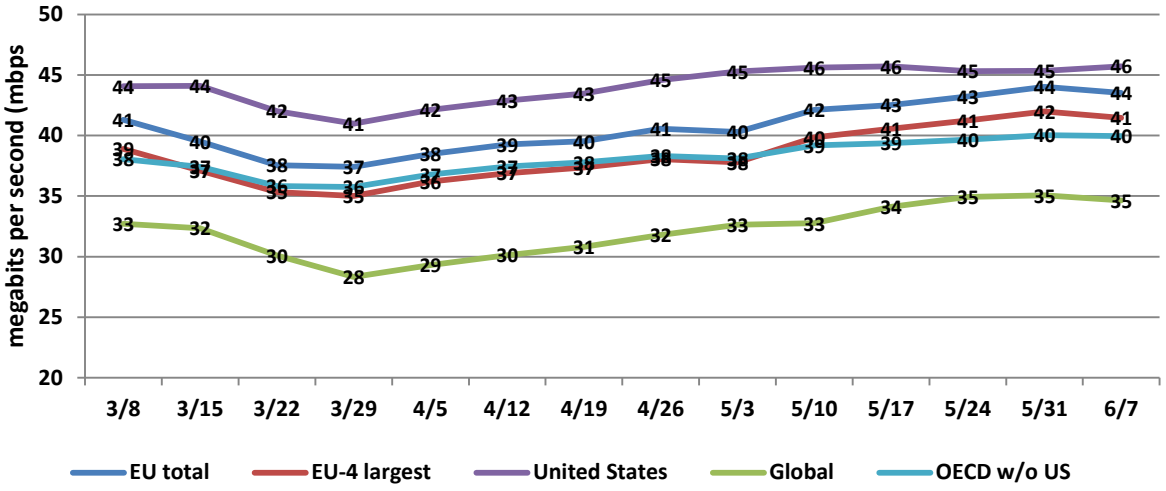


Source: Ookla Speedtest (speed), OECD (weighting)

Figure 3

Mobile Broadband: Weighted Average Download Speed

during the pandemic: 3/2/20-6/7/20

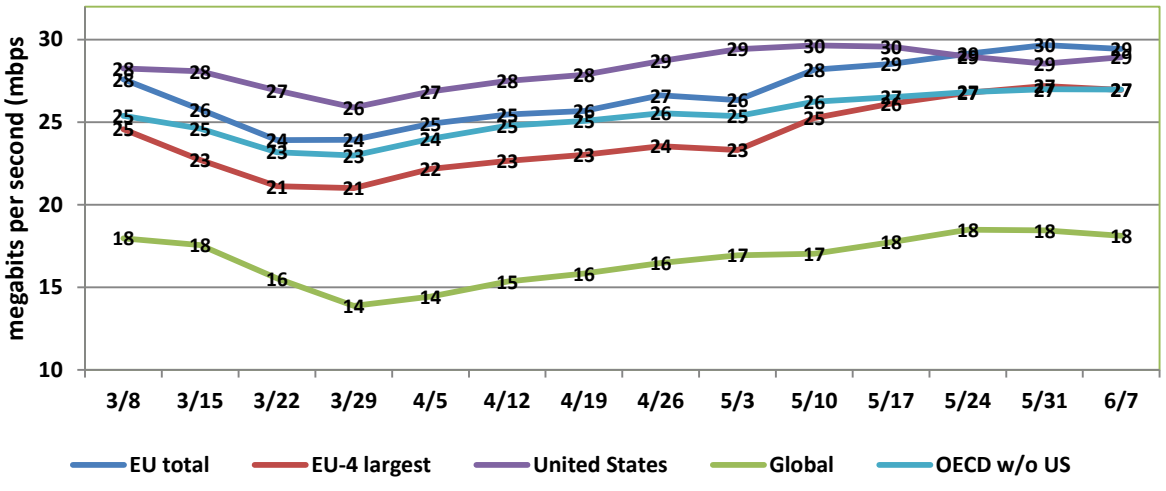


Source: Ookla Speedtest (speed), OECD (weighting)

Figure 4

Mobile Broadband: Weighted Median Download Speed

during the pandemic: 3/2/20-6/7/20



Source: Ookla Speedtest (speed), OECD (weighting)

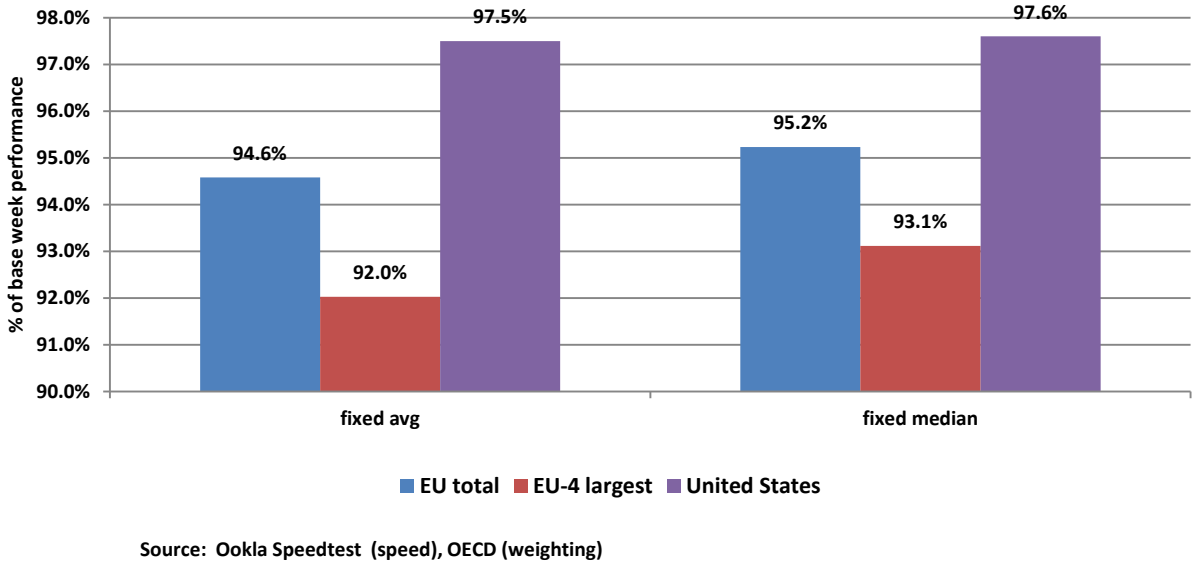
Investment and technology-mix affect performance

According to Sandvine, the two biggest contributors to internet traffic are YouTube and Netflix. Together, they comprise a total of 27% of global traffic and 24% of U.S. traffic.[11] EU Commissioner Thierry Breton was concerned that European networks would not be able to handle the rapid traffic increases during the pandemic. Via Twitter, on March 18th, he asked European consumers to shift their video streaming from high-definition (HD) to standard-definition (SD). He also asked the video-streaming companies directly.[12] Netflix responded by reducing its streaming speeds in Europe by 25%,[13] while YouTube shifted to SD globally.

Commissioner Breton's concern is understandable if one examines the data for the individual EU countries during the week he made his request. The performance of the EU's networks deteriorated significantly, with the EU's fixed-broadband networks operating an average of 7% below their base-week level and their mobile-broadband networks operating roughly 10% below. Ten EU countries had fixed-broadband performance deteriorate by more than 10%. For perspective, the performance of U.S. fixed-broadband and mobile-broadband networks remained within 5% of the base-week level.

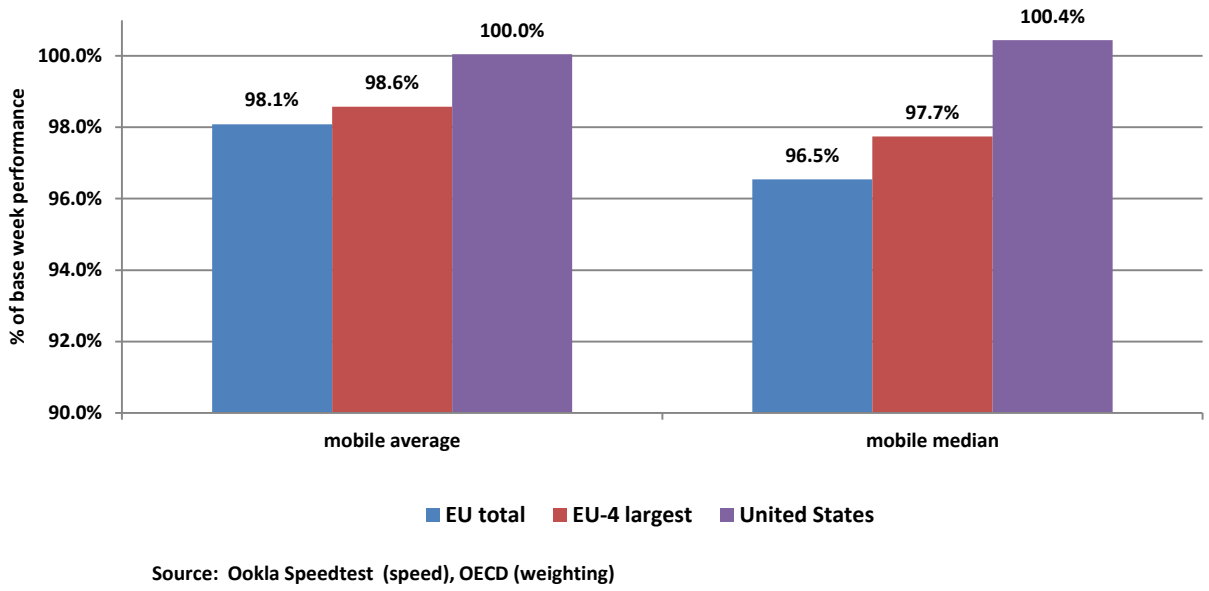
The longer-term effect of the deeper descent and more gradual recovery of the EU and EU-4 networks can be seen in Figures 5 and 6, which compare the weighted-average and weighted-median performance of the fixed-broadband and mobile-broadband networks of the EU, EU-4, and the U.S. from March 2d through May 7th.[14]

Figure 5



Source: Ookla Speedtest (speed), OECD (weighting)

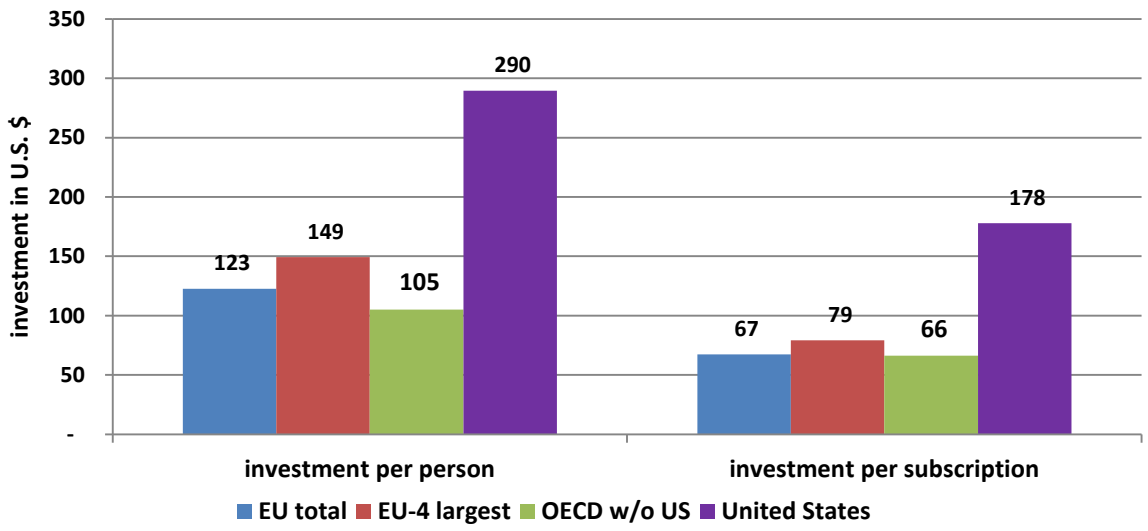
Figure 6



Source: Ookla Speedtest (speed), OECD (weighting)

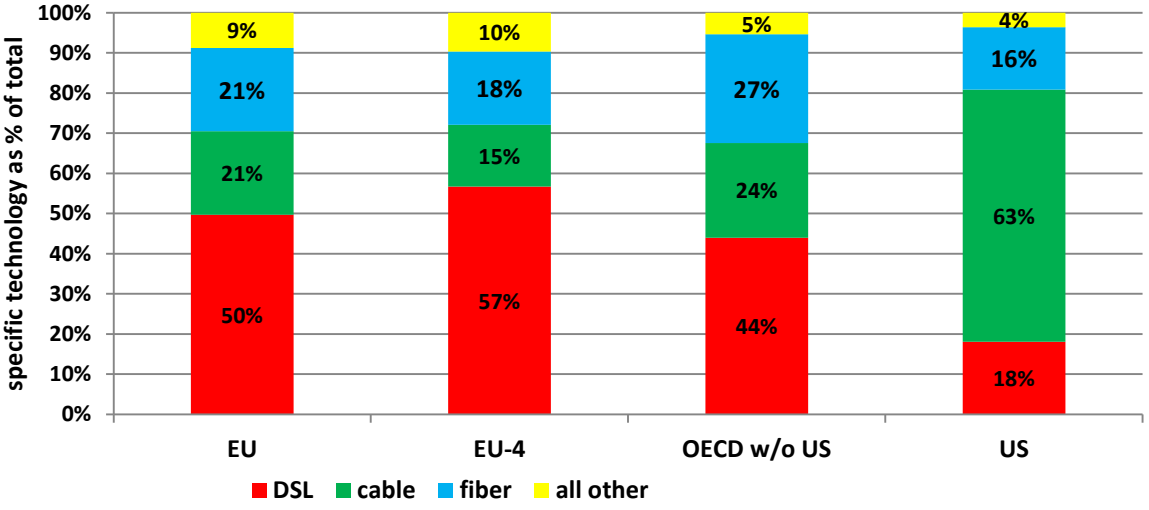
One obvious question is why the EU needed such help from the video-streaming companies and the U.S did not. Three factors may help explain the difference in performance between the U.S. and its peers. First is the far higher level of investment in telecommunications by the U.S. than by the EU and, for that matter, the OECD. Figure 7 shows that U.S. carriers invest in telecommunications 136% more per person than do those of the EU, 94% more than those of the EU-4, and 176% more than those of the OECD.[15] On a per-subscription basis, including both fixed-broadband and mobile-broadband subscriptions,[16] the U.S. carriers spend 163%, 125%, and 169% more than their counterparts in the EU, EU-4, and OECD respectively. An article by Roger Entner shows that this is not a recent phenomenon. Rather, the U.S. telecom carriers have out-invested their peers for decades.[17]

Figure 7



Source: OECD

Figure 8



Source: OECD

Second, the U.S. also employs a different mix of technologies than do its peers. In particular, the U.S. is much less DSL-reliant than the EU, instead relying more heavily on cable and fiber networks, both of which provide high-speed fixed-broadband. Figure 8 shows the fixed-broadband technologies used by the U.S., EU, EU-4, and OECD. It is striking how little the U.S. relies on DSL compared to its peers. DSL constitutes only 18% of U.S. fixed-broadband subscriptions v. 50% for the EU, 57% for the EU-4, and 44% for the OECD. On the other hand, the U.S. employs cable—which is now capable of gigabit speed--much more heavily. Of U.S. subscribers, 79% use either cable or fiber, v. 42% in the EU, 33% in the EU-4, and 51% in the OECD. As the Ookla results show, the U.S. mix of technologies results in performance that is far superior to that of its peers.

Third, relative to a more heavy-handed regulatory approach in Europe, the U.S. has enjoyed a broadband policy environment dating back to the turn of the century that has encouraged private sector investment in networks. While among the complex of countries that constitute the EU or OECD there is a range of regulatory policies, on the whole it is fair to say that the U.S. has enjoyed a lighter-touch regulatory environment.[18] While this lighter-touch regulatory approach cannot be said to always be superior to alternative governance mechanisms, the lighter-touch approach toward the broadband industry has proven to be consistent with a "Results-Based" regulatory approach that looks at tangible economic metrics to guide policy. Price, output, investment and network innovation have proven themselves to be responsive to the policy environment in the U.S. [19] The result is that U.S. networks are better positioned to perform at higher levels and could respond more rapidly to the Covid-driven demand surge than those in Europe.

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[1] *Cisco Visual Networking Index: Forecast and Trends, 2017-2022*, Figure 5.

2 Sandvine, *Global Internet Phenomena Report Covid-19 Spotlight*, May 2020, p. 5.

3 Ookla explains its methodology in: *Ookla SPEEDTEST Methodology, the definitive source for network performance metrics, 2006-2020*. On page 3 of this document, Ookla explains why its tests often show higher speeds than those that use other methodologies.

4 We used data from Ookla Speedtest Covid-19 spreadsheet updated for the week ending June 7, 2020.

5 It is worth noting that Ookla tends to show speeds higher than those shown by other testing methodologies, but it is consistent within itself, as Ookla explains in its document about its methodology. In other words, a comparison of U.S. speeds shown by Ookla v. speeds shown by Cisco VNI could (and does) vary significantly, so that a comparison of a U.S. speed measured by Ookla v. another country's speed measured by Cisco would not be valid. However, a comparison of a U.S. speed measure by Ookla v. that of another country's speed measured by Ookla is valid because the methodology is consistent.

[6] Unless otherwise specified, in this paper OECD refers to the OECD excluding the U.S.

[7] U.S Census 2010.

[8] Website of the European Union, Living in the EU.

9 OECD iLibrary, National Accounts of OECD Countries, Volume 2019, Detailed Tables, OECD Publishing, Paris 2019. OECD website tables: 1.1, 1.2, 2.1, 9a, 9b. For the OECD, for the EU, and for the combined four largest EU countries (EU-4, Germany, France, Italy, Spain) we weighted the averages by the fixed and mobile subscriber numbers provided by the OECD for 2018, the most recent year available. Our totals for the OECD do not include Korea and Iceland, because Ookla did not provide data for those. Our totals for the EU do not include Bulgaria, Croatia, Cyprus, and Romania, because the OECD did not provide data for those.

[10] Ookla presents the data for the U.S. and the global index as single entities so we did not have the necessary data to weight the components.

11 Sandvine, *Global Internet Phenomena Report Covid-19 Spotlight*, May 2020, p. 7.

[12] Twitter stream by Thierry Breton, on March 18th stating that he had an "Important phone conversation with @Reed Hastings, CEO of Netflix" and requesting "To secure Internet access for all let's #SwitchToStandard definition when HD is not necessary." Follow up on March 19th: "I welcome the very proper action that #Netflix has taken to preserve the smooth functioning of the Internet during the #COVID19 crisis while maintaining a good experience for users" and on March 20th: "I warmly the initiative that @Google takes to preserve the smooth functioning of the Internet during the #COVID19 crisis by having #YouTube switch all traffic to SD by default."

[13] Netflix blog, March 21, 2020.

[14] Ookla provides data on the relative performance of each country's fixed and mobile broadband as measured against the base week. For each week, it provides the percentage by which the performance is higher or lower than that of the base week, and it does so for both the average and median. Figures 5 and 6 show the weighted average of that performance for the period of 3/2-20-6/7/20.

15 Figure 7 also looks at investment per broadband subscription, using OECD data, with the telecommunications investment divided by the total fixed broadband plus mobile broadband subscriptions.

[16] There are more subscriptions than people because some people subscribe to both fixed and mobile broadband while some subscribe to only one or to neither. The OECD data on subscriptions includes subscriptions that can serve voice as well as data, as does the data on telecommunications investment.

[17] Roger Entner, Industry Voices – Entner: A tale of two continents and the internet during COVID-19, in *FierceTelecom*, April 29, 2020.

[18] Anna-Maria Kovacs, The Effect of Title II Classification on Wireless Investment, July 2017, posted by the Georgetown Center for Business and Public Policy.

[19] John W. Mayo, "Results-Based Regulation: 20th Century Lessons and 21st Century Opportunities," Economic Policy Vignette, Georgetown Center for Business and Public Policy, September 2015.