Valuation of Digital Goods During the Coronavirus Outbreak in the United States

By MARK A. JAMISON AND PETER WANG *

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We examine how the coronavirus pandemic affected consumer valuation of digital services. Governments responded to the pandemic with various forms of lockdowns and social distancing, leading to increased dependence on digital services for work, social engagement, and leisure activities. We identify consumer valuations through surveys where respondents express their reservation prices for digital services such as email, search, and social media. We compare our results to surveys done in 2016 and 2017 and find an about six-fold increase in valuations.

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* M. Jamison: Public Utility Research Center and Digital Markets Initiative, Warrington College of Business, University of Florida, 205 Matherly, Gainesville, Florida 32611 (mark.jamison@warrington.ufl.edu). P. Wang, Digital Markets Initiative, Warrington College of Business, University of Florida, Gainesville, Florida 32611 (peter.wang@warrington.ufl.edu) (corresponding author). The authors thank the Digital Markets Initiative, via gifts from the Charles Koch Foundation and AT&T, for financial support. The authors are responsible for all errors and omissions. An earlier version of this paper was titled "How the Wuhan Coronavirus Outbreak Affects Consumers' Valuations of Digital Goods."

The outbreak of the Coronavirus (COVID-19) has provided significant disruptions to the economy and people's everyday lives. The virus emerged in China in late 2019 and China first let the rest of the world know about the virus in early January 2020. Within four months one-third of the world's population was in lockdown, including roughly 80% of Americans. (Kaplan, Frias and McFall-Johnsen 2020; Page, Fan, and Khan 2020; Secon, Woodward, and Mosher 2020)

These lockdowns restrict people's abilities to work, spend, and conduct business, which slows economies: In March the United Nations Conference on Trade and Development estimated the slowdown would cost $1 trillion to $2 trillion worldwide. (UNCTAD 2020) At about the same time Goldman Sachs estimated that US gross domestic product could drop 34% in the second quarter of 2020, followed by a rapid recovery if the restrictions are removed quickly. (Cox 2020)

People in lockdowns look for substitutes for physically congregating and for moving from place to place. For many people, this means increased reliance on the internet and related services. In the United States, NCTA (2020) reported that on a nationwide basis, downstream internet use (data flowing into people's homes) increased 20.1% in March and upstream internet use (data flowing from people's homes) increased 27.7%. In New York, the state most severely affected as of April 1, 2020, the increases were at or slightly above the national average: 20.1% downstream and 34% upstream.

People outside the US responded in similar fashion. Facebook (2020) reported at one point that messaging was up about 50% in countries hardest hit by the virus. Network usage was also up in Europe, so much so that networks struggle to keep up, prompting the European Commission to ask video content providers to decrease the amount of bandwidth their services require. (Alexander 2020)

Government-imposed lockdown and voluntary social distancing – a term adopted to describe how people keep their physical distance from each other to decrease the chances of the virus moving from one person to another – affect also how people

use mobile communications. On April 2, 2020, Verizon reported decreases in mobile handoffs, the instances where a person's communications session moves from one cell site to another as the person moves around: These were "significantly down in the New York Metro area (-53%) and Upstate New York (-49%) vs. a typical day. Other metro regions like the Mid-Atlantic/greater Washington, D.C. metro area and New England follow with declines of -39% and -37%, respectively, with Southern California declining -35% and Northern California down -27%. Nationally, mobile handoffs have dropped -29% versus a typical day." (Verizon 2020) People were moving around significantly less.

Verizon also witnessed a ten-fold increase in its customers' use of collaboration tools, applications that enable customers to see and speak with colleagues, friends and family. Use of other services also increased: At one point, gaming more than doubled, use of virtual private networks was up 40%, video was up 33%, and web use was up 24% relative to normal times. (Verizon 2020)

These increases in usage imply that such services became more valuable to people during the pandemic. How much people increased their valuation is an important question for at least two reasons. One is that it indicates how central to people's lives and work these services are during the pandemic. This informs policymakers as it helps put dollar values to developing information infrastructure and to light-handed regulatory policies that allow companies to quickly adapt to changed circumstances. A second reason is that valuation enables more accurate estimates of the economic impacts of the pandemic. As Brynjolfsson, Collis, and Eggers (2019) (hereafter, BCE) explain, the value of many digital services is missing from estimates of national income. So this increased value of digital services is missing from calculations of the magnitude of the economic downturn.

We estimate the increased value of digital services with surveys comparable to those done in 2016 and 2017 by BCE. We find that people's valuations were about six-fold higher on average in March 2020 than three years earlier. More

specifically, we find that the median U.S. consumer consuming all nominally free digital services we study was unwilling to part ways with them even if compensated $14,524 to do so. We also find that the valuations rose during our survey period, providing support for the notion that the pandemic was responsible for much of the increased value.

In addition to adding to the literature on valuing services that have zero monetary prices, our study adds to the literature on the digital divide. Pew Research reports that 58% of eighth-grade students in the United States use the internet for doing homework, but 17% teens ages 13 to 17 are often or sometimes unable to complete homework assignments because of a lack of reliable access to a computer or internet. This is particularly acute in low-income and racially black households. (Auxier and Anderson 2020) Gonzales (2015) adds that internet services used by the poor in the US is unstable and characterized by frequent periods of disconnection. The US Census Bureau found that 18% of US households lacked internet access in 2016 and Friemel (2014) observes that lack of internet access hinders households' economic activity because many public and private services are designed for online access. Little has been done by way of cost-benefit analysis of closing the digital divide, and what has been done has not benefited from a quantification of the value of internet services during times of emergency.

We also add to the literature on light-handed regulation. Chelius and Smith (1987) find that smaller firms are more adversely impacted by mandated workers compensation insurance than are larger firms. Thomas (1990) finds that regulations by the US Federal Drug Administration lowered research productivity for small firms, but benefitted large firms. Coffey, McLaughlin, and Perettoc (2020) find that federal regulatory restrictions in the United States dampened economic growth by approximately 0.8% per annum since 1980. Chambers, McLaughlin and Richards (2018) show that more federal regulation in the United States is positively correlated with the preponderance and survivability of large firms, and negatively

correlated with entrepreneurship. Gong and Yannelis (2020) find that increased regulation is associated with less productivity. While we do not measure the impacts of regulation on how companies offering digital services have responded during the pandemic, we note that service providers in the United States have responded voluntarily and to market incentives. We also note that markets in countries with more stringent controls than the United States have not been as responsive. (Layton 2020)

The remainder of this paper proceeds as follows. Section I describes our approach. Section II provides our results and Section III is our discussion. Section IV is the conclusion.

I. Methods

We use a stated preference approach, which is a method often used in environmental economics to uncover how much people value goods and services, called their reserve prices[1]. The values represent people's willingness to accept (WTA) a payment in exchange for giving up a service. Hanemann (1991) shows that WTA gives similar results as willingness to pay (WTP) except when there are no close substitutes for the services in question. We find price elasticities of demand expressed as WTA are quite inelastic for the services we study, indicating that there are few substitutes at least in the short run. Therefore our WTA estimates should be fairly different from what would be found in WTP studies.

We conducted our surveys using Google Surveys by asking people how much they would need to be compensated to forgo various digital goods for one month. A person's answer implies that the good in question is at least worth this much to the consumer, all other things being equal. To improve validity, we used multiple

[1] This refers to individual reserve prices, rather than the "price" at which no individual elects to keep the good in question.

online surveys in which various price points were presented to randomly selected consumers in simple take-it-or-leave-it offers.

We began our surveys on March 20, 2020, and ended on March 29. Google Surveys allowed us to choose our audience and ask up to ten questions at a time in a variety of formats. Google provides incentives for people to participate and protects the respondents' privacy. To be timely and to provide results that could be compared to those of BCE, we chose to survey persons in the United States. Each person was asked a single question: "Would you give up y for one month with a compensation of $x?" where "y" is the service (e.g., email) and "$x" is a price randomly chosen within ranges that we chose. At each price point, 250 samples were chosen.[2] We obtained 14 to 20 price points per category, equating to a sample size of 3,500 to 5,000 per category of digital goods.[3]

We analyze our data using two functional forms for the relationship between WTA and the percent of respondents. Equation (1) assumes that the price elasticity of demand ε_i is constant and equation (2) assumes it is linear in price, i.e., $\varepsilon_i = b_{1,i} - b_{2,i} \cdot p_i$. Due to limitations in our data, we do not control for income or other factors that might affect demand.

$$\ln p_i = \varepsilon_i \cdot \ln q_i + e_i \tag{1}$$

$$\ln q_i = a_i + b_{1,i} \cdot \ln p_i + b_{2,i} \cdot p_i + u_i \tag{2}$$

where p_i is the WTA of good i, q_i is the quantity expressed in terms of percent of respondents, e_i and u_i are error terms, and a_i, $b_{1,i}$, and $b_{2,i}$ are coefficients.

[2] Due to Google's weighting methodology to obtain a nationally representative model, the actual number of respondents per price point is around 200.

[3] Inevitably, these types of surveys suffer a hypothetical bias, because people do not face real choices in the survey. It would be inappropriate to run these surveys as real experiments during a pandemic. However, if we were to believe that people's hypothetical bias remained relatively constant during this time period from 2017 to today, we can reasonably conclude that digital goods and services provided significantly greater value during the pandemic.

II. Results

Table 1 shows our results and compares them with BCE's findings. Column (1) lists the categories of digital goods as ranked by the 2017 valuations. Search was the most valuable and instant messaging was the least. The column (2) shows the 2017 median value found by BCE. The column (3) shows the median values from our surveys and column (4) shows the change in value from 2017 to March 2020. The column (5) shows the percentage change of the value during the pandemic from the 2017 value. The last two columns show the ranks of the goods categories for 2017 and for March 2020.

Following BCE, Table 1's reserve prices represent the estimated median WTA payment to forgo these digital goods and services for one month, i.e. the reservation prices for which exactly 50% the population will accept the amount and forgo the service and 50% will refuse. We calculate the March 2020 reserve prices using equation (2) – assuming elasticity is linear in price – and using 50% as the quantity.

Our results are consistent with those of BCE, except that the valuations we find are several orders of magnitude higher, presumably reflecting the increased importance of digital goods during the pandemic. Each digital good's rank in importance is the same in 2020 as in 2017, with two exceptions: Maps rose from fifth to third and instant messaging rose from eighth to sixth.

The first thing to notice in Table 1 is the magnitudes of individual value changes. Only two goods – search and email – have percentage changes less than 500%. That their percentage changes are the lowest makes sense as they are the highest valued products in both years, which biases their percentage changes downward even though they have the highest dollar changes: $8,623.60 for search and $1,435.70 for email. These large value changes also make sense because people working from home are more reliant on search to find work-related information that might normally be obtained by informally asking a colleague, and more reliant on email

to asynchronously engage with co-workers, customers, and vendors. This is also true for home-bound students and teachers.

People in lockdown also value search to find vital information on healthcare, government actions, and changes to essential services. Edelman (2020) describes in its special report on trust and the coronavirus that Americans place low trust in the media and politicians for accurate coronavirus information. So rather than accept the word of traditional media and government officials, Americans search the internet for what health professionals are saying.

Table 1. Comparisons of consumers' median valuations of digital goods, 2017 versus March 2020

(1)	Reserve Price for One Month of Service			(5)	(6)	(7)
Digital Goods Categories	(2) 2017	(3) March 2020	(4) Change	Percent change	Rank 2017	Rank 2020
Search	$1,460.80	$10,084.40	$8,623.60	590%	1	1
Email	$701.10	$2,136.80	$1,435.70	205%	2	2
Maps	$304.00	$1,017.82	$713.82	235%	3	3
Video	$97.75	$639.30	$541.55	554%	4	5
E-Commerce	$70.16	$758.44	$688.28	981%	5	4
Social Media	$26.80	$172.24	$145.44	543%	6	7
Music	$14.00	$99.73	$85.73	612%	7	8
Instant Messaging	$12.90	$473.83	$460.93	3573%	8	6

Sources: Authors' calculations and BCE (2019). "Video" means streaming video, such as YouTube and Netflix.

Video streaming also rose in value for both work and personal reasons. People working from home and engaging in education from home can use video streaming, such as YouTube, as an information source. Video streaming for entertainment,

such as Netflix, has also increased in value since entertainment is less available from sporting events, movies, eating out, etc.

Social media's value increased 543%, but it had the second lowest dollar increase. This might reflect social media's relative unimportance for working remotely and for online education. And while it has its usefulness for staying in touch with others on a social basis, social media conversations are perhaps too public to make up for in-person conversations. It also appears that consumers view social media's information on healthcare and the like is less reliable than what is found with traditional search. (Edelman 2020)

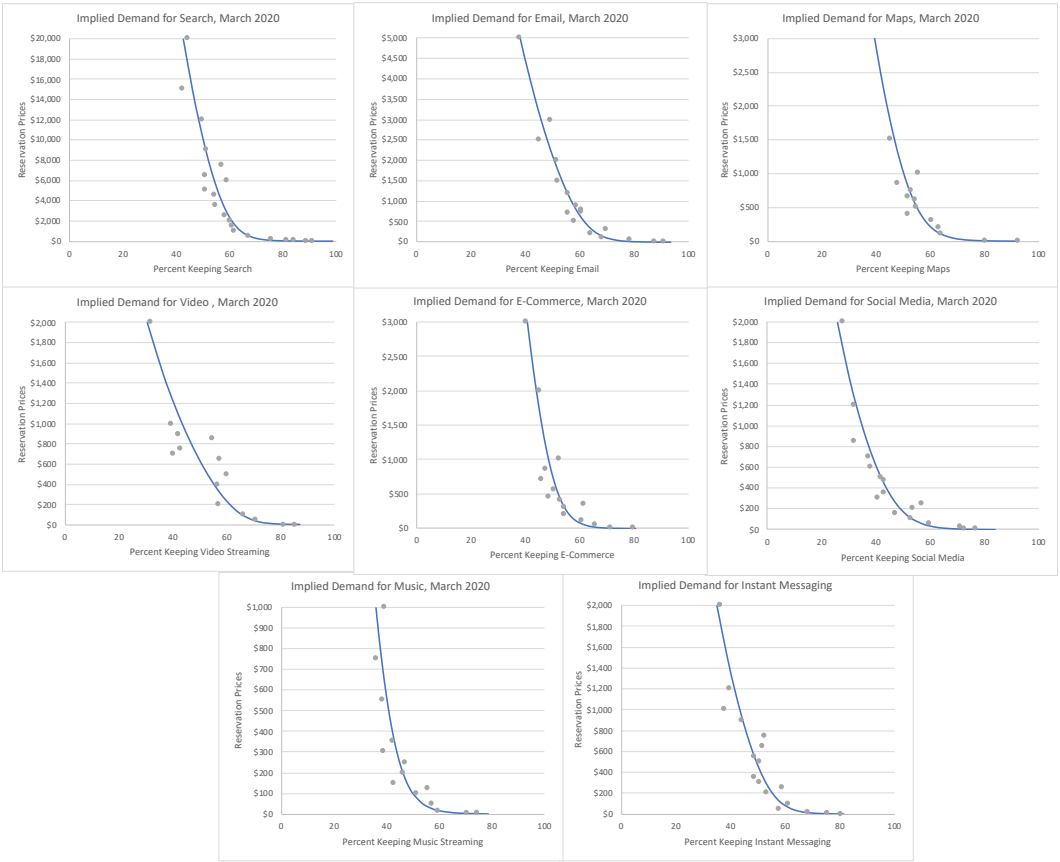
Regarding the changes in rankings, the rise in the importance of maps could be because the lockdowns increased the number of people providing delivery services and individuals driving to unfamiliar locations in search of products that they perceived as being in short supply during the time of the surveys, such as certain paper products and hand sanitizer. And digital maps often provide information on store hours, which can be particularly useful when store availability is uncertain.

Instant messaging's rise in the ranking is also understandable. Messaging apps, such as WhatsApp, are popular outside the United States and so are convenient, low-cost ways for persons in the United States to stay in touch with relatives in other countries and include multiple family members in private conversations. Instant messaging also allows people working from home to utilize a silent communication channel while on video or audio conferences and webinars. Instant messaging had the highest percentage increase, 3,573%, but that is largely because of its low 2017 value. It had the third lowest increase in dollar value, $460.93.

Our results also show how price insensitive customers are for these digital products. While conducting this research, we noticed that expressing reservation prices in $50 or even $100 dollar increments barely affected the number of consumers rejecting the offers. Graph 1 illustrates.

Graph 1 shows the relationships between reserve prices and the percent of respondents choosing to keep their digital goods. The solid lines are based on equation (2). Relative to consumer valuations in 2017, the coronavirus outbreak appears to have caused consumer valuation of these digital goods to shift upward and become more inelastic. For each category, 10% to 25% of the population is readily willing to give up these services for even $1. But the remaining consumers are largely insensitive to price, to the point that for any category, there is always some portion – generally 20% to 40% -- that appears unwilling to give up the service even at high prices.

Graph 1. Valuations and Percent Keeps by Digital Product



Sources: Authors' calculations.

Graph 1 implies that users of these digital services are largely insensitive to price above a small level. For example, at a reservation price of $50 versus $200 (a 300% increase), only 14% fewer consumers were willing to forgo social media for the next month. This implies a price elasticity of demand[4] of 0.14 in absolute value.[5] This level of inelastic demand implies that at least half the population of the United States these digital goods and services are viewed as necessities in times of pandemic, possibly because users would not find alternatives in the compressed amount of time.

Although not examined by BCE, we examine video conferencing because of its importance to people working from home and to distance education. We find all video conferencing had a median monthly estimated value of $318.02,[6] which is between the e-commerce and social media values. This is surprising given its use for work and distance education. It might be that our sample is dominated by people that are not working from home or have students at home. They might also view video conferencing as something they could give up personally because it is provided by their employer or school. Table 2 provides results.

Graph 2 shows the WTA demand curves for video conferencing and Zoom. It shows that the demand for Zoom is greater than the demand for video conferencing in general. This could reflect the surge in Zoom use in schools and businesses when the lockdowns began, perhaps leading people to also prefer it for personal use.

[4] Our data represent valuations of digital goods from the perspective of Hicksian or compensated demand, i.e., consumers are given additional income to make up for the value they lose in giving up the products. As a result, it cannot be said that consumers would pay these amounts for these services since that would mean lowering the amount of income they would have available for other purchases. (Hanemann 1991)

[5] Although not directly comparable because our data represent compensated demand, Franz et al. (2008) estimated the price elasticity of demand for cigarettes is about 0.37, or about two times larger.

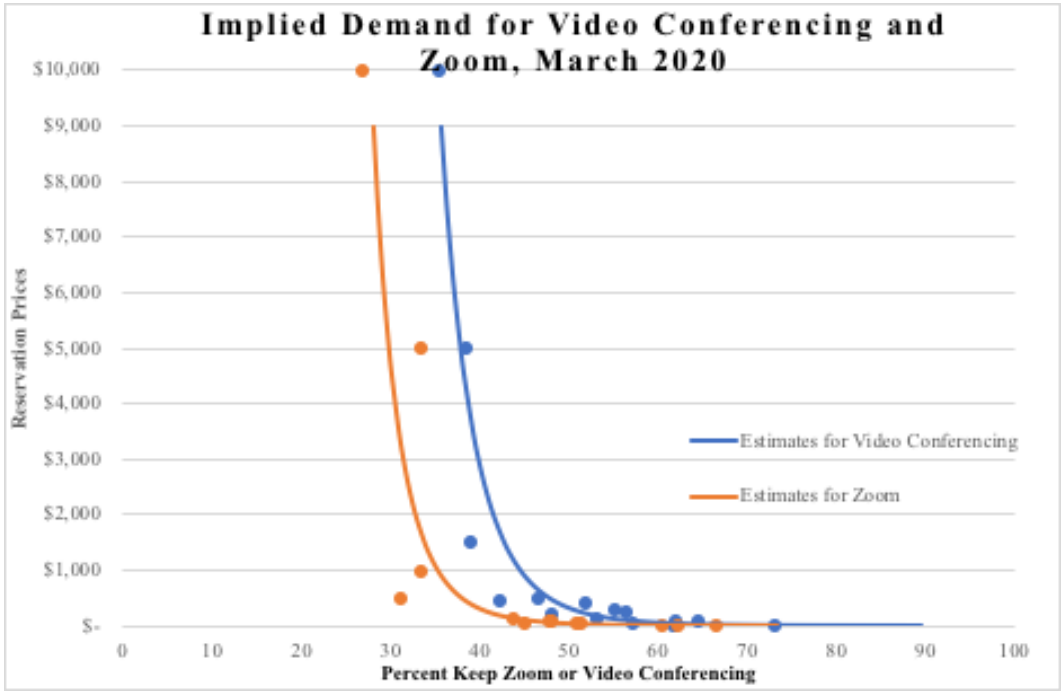
[6] We used equation (2) for this estimate.

Table 2: Demand and Elasticity Estimates for Video Conferencing

VARIABLES	(1) Video Conferencing	(2) Video Conferencing	(3) Zoom	(4) Zoom
ln *p*	-0.100***	-0.0979***	-0.105***	-0.106***
	(0.00990)	(0.0163)	(0.0111)	(0.0173)
p		-1.97e-06		6.94e-07
		(1.16e-05)		(1.50e-05)
Constant	4.492***	4.483***	4.293***	4.295***
	(0.0572)	(0.0794)	(0.0587)	(0.0737)
Elasticity at median price	*-*	-0.1	*-*	-0.11
R-squared	0.903	0.903	0.891	0.891

Columns (1) and (3) are constant elasticity of demand estimates for Video Conferencing category and Zoom, respectively, and columns (2) and (4) are for linear elasticity of demand estimates. Standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Graph 2: Linear Demand Estimates for Video Conferencing and Zoom



Solid lines derived from equation (2).

III. Discussion

The digital goods we study come mostly to users at zero monetary prices, asking only that users have internet service, provide their time and attention, and allow service providers to gather data. The exceptions in our categories are e-commerce, video conferencing, and music. If willingness to accept payment to forgo is indeed a good measure of flow of benefits to the consumers from the zero-price services, in total, the median consumer using all of the nominally free services enjoys a monthly benefit of $14,524.39, compared to a 2017 benefit of $2,603.35.[7]

We develop a conservative estimate of the aggregate value of the nominally free services in March 2020 of $3.49 trillion, or $41.82 trillion on an annualized basis. This is an over 460% increase over the 2017 value. Table 3 shows these results. Column (1) lists the services for which there was zero nominal charge for users. The column (5) shows the number of users that we assume for our calculations. They are conservative in that they underestimate the number of actual users. For search, we used number of Google search users for the United States for 2019. This omits people that used only non-Google search. Google's share of general search in the United States was 62.5%. (Statista 2020) For email, we used the total number of US adults using email in 2019. For maps, we used the number of Google Maps users for 2018, omitting the users of Waze, Mapquest, and the like. For streaming video, we used the number of YouTube users in the US for 2019. This includes users that pay for YouTube, but omits users of other free streaming services, such as some AMC Networks and HBO offerings made free during the lockdowns, Crackle, Hoopla, and IMDb. For social media we only count Facebook users for the United States for 2019. For instant messaging, we count only users of Facebook instant messaging in 2018. Columns (2) and (3) show the annual value in 2017 and

[7] The sum of the 2017 reservation prices in Table 1 for search, email, maps, video streaming, social media, and instant messaging is $2,603.35, and for 2020 is $14,524.39.

2020 respectively, which we derive by multiplying the number of users by the respective monthly values in Table 1 and annualize the products. Column (4) is the change.

Table 2. Total Value Estimate

(1)	Annual Value in Trillions			(5)
Digital Goods Categories	**(2) 2017**	**(3) March 2020**	**(4) Change**	**Users in Millions**
Search	$4.54	$31.34	$26.80	259.0
Email	$2.12	$6.46	$4.34	251.8
Maps	$0.56	$1.89	$1.32	154.4
Video	$0.15	$0.97	$0.82	126.0
Social Media	$0.07	$0.46	$0.39	221.0
Instant Messaging	$0.02	$0.72	$0.70	126.0
Total	$7.46	$41.82	$34.36	

Sources: Authors' calculations and BCE (2019); Statista (2019a, 2019b, 2019c, 2020); 99 Firms (2020); and Review 42 (2020).

While the high valuations of these digital products certainly represent a change in demand, they also reflect how well the service providers responded to market demand by adding capacity for established services and adapting services. Amazon hired thousands more workers and prioritized household staples and medical deliveries. (Amazon 2020a; Amazon 2020b) Internet service providers adapted their networks to education and work-at-home needs. AT&T provided free service to healthcare workers on FirstNet. (AT&T 2020) Zoom expanded to accommodate a 378% increase in video-conferencing. When uninvited guests began "Zoombombing," Zoom adapted with new security measures. (Bary 2020; Hodge 2020)

Light-handed regulatory constraints are critical for this kind of adaptability. Some network responses, such as zero rating, would likely have violated the FCC's former net neutrality restrictions. Europe kept such regulatory holds and now faces network congestion problems. (Layton 2020) While it cannot be proven that these problems result from regulation, the evidence in the economics literature is that such controls discourage network investment. (Jamison 2019)

Unwarranted threats of antitrust and other regulatory action are also problematic as they incentivize digital companies to be risk averse in their efforts to help during the pandemic. Such threats come primarily from supporters of expansive antitrust action. For example, Morton (2020) tweeted that Zoom's growth during the pandemic is good reason for greater scrutiny should another company seek to merge with Zoom. Senator Josh Hawley of Missouri wrote to the CEOs of Apple and Google letting them know that he thought each should be held personally liable if there were a security breach in their collaborative effort to trace the spread of COVID-19. (Hawley 2020) Sussman (2020) argues that Amazon's prioritization of home staples and medical supplies during the pandemic should be investigated post-crisis to ensure that the company did not benefit.

Morton's opinion expresses a belief that market share and/or company size equate to market power. This is a view shared by many, including the European Union, which considers a 40% market share to be conclusive evidence of market dominance. (Jamison 2020) The growth of digital services during the pandemic shows the falseness of such beliefs. Customer choices have driven the size of Google, Zoom, Apple, and the like. Certainly the companies played active roles in achieving their success by developing products that customers prefer and taking those products to market, but as Jamison (2020) explains, size and market share are more likely indicators of providers serving customers well than of having control over customers.

It would appear that those putting digital companies on notice that their actions will be scrutinized post-pandemic intend to alter the companies' behaviors. Suppose the critics are successful? The result would be services that are less responsive to customer changes and thus less valuable, as well as a decline public services, such as the voluntary work some do to track the virus, provide expanded and free service to healthcare workers, and small business support.

Our valuations also provide input to a hole in public policy in the United States, namely a meaningful cost-benefit analysis of government efforts to expand broadband access. Several government agencies have subsidized broadband development for many years. There is little evidence that these subsidy programs have had positive effects. Valuing impacts has been hard because we have lacked knowledge of the economic value created by subsidized broadband. Our valuations of digital services provide a useful datapoint that can be used to assess the economic loss of not having broadband available in some areas during the pandemic.

IV. Conclusion

We examine how the coronavirus crisis in the US affected people's valuations of digital services. How quickly these digital products adapted to the changed circumstances and how quantities consumed responded so quickly to changed demand tells us something about the importance of responding to market forces. Some regulators have wisely stayed out of the way of consumer choice. The Federal Communications Commission's deregulatory policies encouraged internet service providers to build networks that are handling the traffic surge.

These are extraordinary times. In these times when people are experiencing the tightening of their budget and forgoing of some luxuries, our research shows that their WTA payment to forgo digital goods and services spiked. The significance of the value from digital goods during the coronavirus outbreak can be illustrated by

imagining how the society would have operated without. Without these digital goods, it is likely that more jobs would have been lost, productivity would have declined more, and people might have been less inclined to follow stay-at-home guidelines.

More research is needed. We have not focused on minority and rural populations. Doing so would inform us about distributional effects. We have also omitted analyses of impacts by type of employment, geographic area, lockdown provisions, and the like. Nor have we focused on the implications for entrepreneurs and small businesses.

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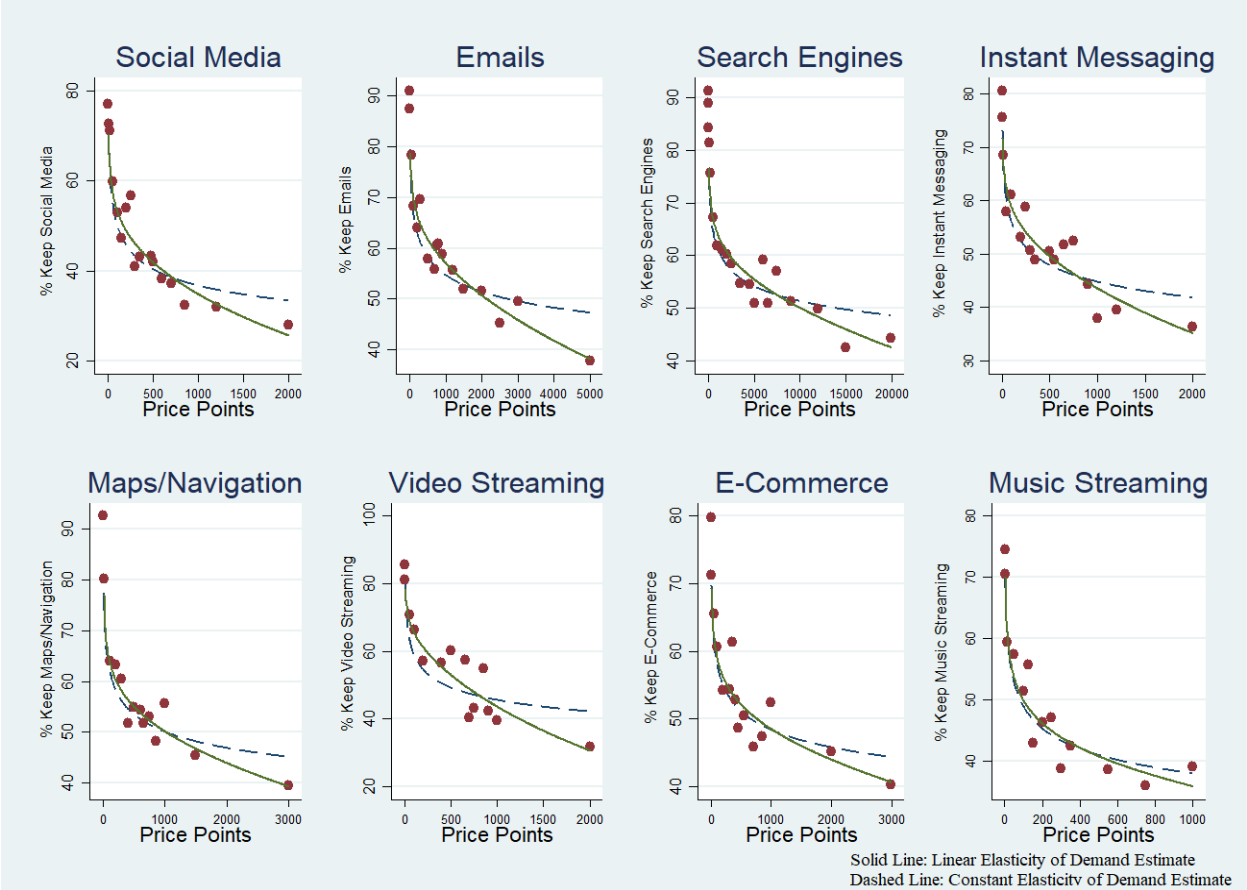
Appendix 1

Graph A1: Constant Elasticity of Demand vs. Linear Elasticity of Demand Estimation



Linear elasticity estimates obtained from regression of equation (1) and constant elasticity estimates are obtained from regression of equation (2).

Table A1: Constant Elasticity of Demand Estimates

VARIABLES	Social Media	Email	Search Engines	Instant Messaging
ln p	-0.137***	-0.0909***	-0.0778***	-0.0980***
	(0.0159)	(0.0102)	(0.00654)	(0.0110)
Constant	4.548***	4.631***	4.655***	4.479***
	(0.0876)	(0.0645)	(0.0491)	(0.0618)
R-squared	0.831	0.840	0.887	0.841
VARIABLES	Maps	Video Streaming	E-Commerce	Music Streaming
ln p	-0.0948***	-0.112***	-0.0795***	-0.110***
	(0.00868)	(0.0202)	(0.00851)	(0.0113)
Constant	4.569***	4.595***	4.428***	4.397***
	(0.0517)	(0.117)	(0.0494)	(0.0565)
R-squared	0.909	0.719	0.870	0.888

Dependent variables are natural logs of each category of digital goods and services, with 14-20 observations per regression, depending where median price lies, and with 250 weighted respondents per observation. Standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A2: Linear Elasticity of Demand Estimates

VARIABLES	Social Media	Email	Search Engines	Instant Messaging
ln p	-0.0927***	-0.0604***	-0.0606***	-0.0664***
	(0.0162)	(0.00832)	(0.00712)	(0.0123)
p	-0.000240***	-7.61e-05***	-1.21e-05***	-0.000168***
	(6.24e-05)	(1.42e-05)	(3.46e-06)	(4.83e-05)
Constant	4.431***	4.538***	4.593***	4.401***
	(0.0702)	(0.0420)	(0.0425)	(0.0521)
R-squared	0.918	0.948	0.935	0.915
VARIABLES	**Maps**	**Video Streaming**	**E-Commerce**	**Music Streaming**
ln p	-0.0765***	-0.0550**	-0.0662***	-0.0961***
	(0.00838)	(0.0210)	(0.0104)	(0.0168)
p	-7.94e-05***	-0.000314***	-5.22e-05*	-0.000122
	(2.36e-05)	(8.52e-05)	(2.72e-05)	(0.000111)
Constant	4.523***	4.469***	4.391***	4.366***
	(0.0403)	(0.0886)	(0.0490)	(0.0626)
R-squared	0.955	0.875	0.901	0.899

Dependent variables are natural logs of each category of digital goods and services, with 14-20 observations per regression, depending where median price lies, and with 250 weighted respondents per observation. Standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A3. Elasticity of Demand Estimation

	Constant Elasticity	Linear Elasticity
Search	-0.08	-0.18
Email	-0.09	-0.22
Maps	-0.09	-0.16
E-Commerce	-0.08	-0.11
Video	-0.11	-0.26
Instant Messaging	-0.1	-0.15
Social Media	-0.14	-0.13
Music	-0.11	-0.11

Linear Elasticity of Demand estimated at the median reservation price using equation (2) in the main text.