

August 2020

The Pandemic Accelerant: Digital Age Business Strategies



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- The digitization of the economy is gaining steam, with working from home, Edtech, e-commerce, e-fitness, and telehealth activities all being accelerated by the pandemic. Once the crisis subsides some telepresence activities will snap back, like a rubber band, to their pre-COVID levels. However, much of the digital acceleration will prove permanent. Hybrid models will be the most resilient and successful.
- From a macro perspective, digital platforms feature low marginal costs and increasing returns to scale. This creates winner-takes-all markets which favor global champions. Further, the asset-light business model—in which technology is increasingly being substituted for capital and labor—points to improved free cash flow margins and higher ROE. This will allow many companies to increase dividends and buybacks, keeping overall payout ratios well above historical norms.
- Additionally, digitization, like automation and globalization, is profoundly disinflationary, which implies “lower for even longer” interest rates. This is especially beneficial for long duration equities like tech.
- With an increasing proportion of activities moving from “bricks and mortar” to the virtual world, we expect digital platforms to represent the vast majority of equity market capitalization by the end of the decade, with tech, health care, and communications the most promising sectors.

The last six months have been profoundly transformational, with the COVID shock acting as an accelerant for the digitization of the economy. This radical transition is especially advantageous for asset-light business models in the tech, health care, and communications sectors, but is also likely to turbo-charge a range of industries, including Edtech, telehealth, e-commerce and e-fitness. All companies will be acutely affected, although the biggest winners are platforms, with their economies of scale and low marginal costs.¹

“What is your business strategy in the digital age?” has become one of our favorite questions to ask management teams. If a company cannot provide a convincing response, we believe it will likely flounder and ultimately disappear. As the

1. Our January 2018 paper, “When ‘Bits’ Meet ‘Atoms’” explains the rise of digital platforms and Superstar economics, as well as why asset-lite business models dramatically improve ROE and corporate profitability.

success of the big tech firms has demonstrated, “Data is the new oil,” with comparative advantage increasingly defined by the ability to aggregate content and consumers. With “bits” rapidly replacing “atoms,” we expect digital platforms to represent the vast majority of equity market capitalization by the end of the decade.

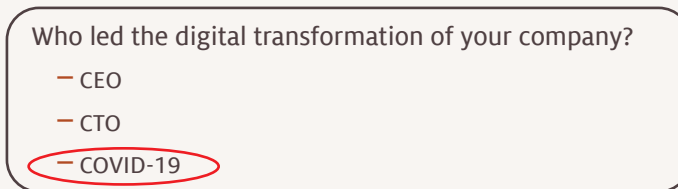
“As Covid-19 impacts every aspect of our work and life, we’ve seen two years’ worth of digital transformation in two months.”
— Satya Nadella, Microsoft CEO

For investors, the COVID shock is best viewed as a forced experiment, compelling much of the economy online, into the digital sphere, and offering an opportunity to assess what works and what doesn’t. The pandemic massively accelerated the adoption of remote activities such as working, studying, shopping, consulting a physician and exercising from home. Once the pandemic subsides some telepresence activities will snap back, like a rubber band, to their pre-COVID levels. However, we believe much of the digital acceleration will be permanent. For most activities, hybrid models will prove most resilient and successful. Consequently, in coming years, technology—always the great disruptor—is likely to play an even more central role in shaping the modern economy and driving equity market returns.

In terms of macro impact, the digitization and virtualization of the services sector is similar, in many respects, to the automation and globalization of manufacturing that occurred in recent decades. For a start, it will be profoundly disinflationary and lead to even more vexing difficulties in accurately measuring GDP.² Moreover, tech disruption in services will be magnitudes larger than what occurred in the manufacturing sector, which itself was

FIGURE 1: It’s only funny because it’s true!

A COMMON SOCIAL MEDIA MEME DURING THE PANDEMIC:



Source: Melissa Swift, global head of Digital Transformation Advisory at Korn Ferry

severe with long-lasting consequences for America’s political economy. The manufacturing experience also suggests wage growth will lag productivity gains, lowering unit labor costs and pushing up profit shares.

The COVID Shock: Boosting Tech’s Wallet Share

With the COVID-shock, the digital versus physical divergence has widened profoundly. While companies that rely exclusively on a physical footprint have struggled this year, digital businesses are thriving and gaining market share. Today, the digital economy represents about 38% of U.S. GDP and has been growing at an impressive multiple relative to overall output (Figure 2). Impressive, yet the COVID shock is likely

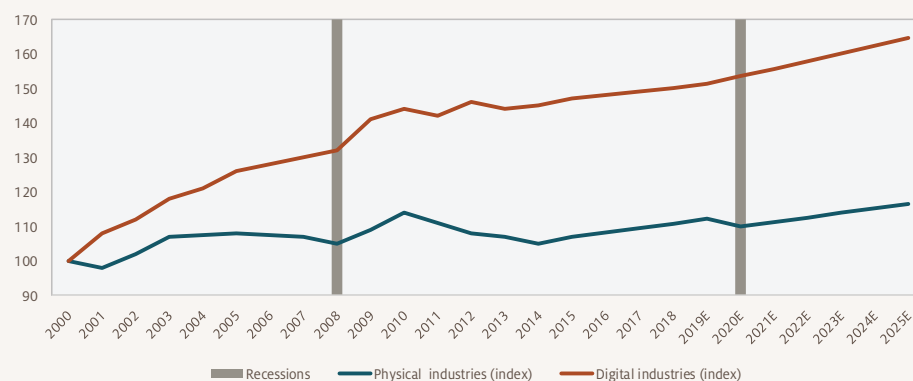
to accelerate the transition from the world of “atoms” to the world of “bits” even further.

“If you’re a shareowner in Amazon, you may want to take a seat, because we’re not thinking small.”
— Jeff Bezos, Amazon CEO

Even before the pandemic the digital economy was growing more than four times as quickly as the rest of the economy (Figure 3). With the lockdown-induced boost, this growth differential is likely to increase even further. While “lower for even longer” interest rates help buy time for the rising proportion of “zombie” companies³ they can’t escape the gale-force headwinds posed by the accelerating substitution of technology for labor

Digital industries have increased their productivity by four times as much as physical industries.

FIGURE 2: Productivity of digital and physical industries in the U.S. (index 2000 = 100)

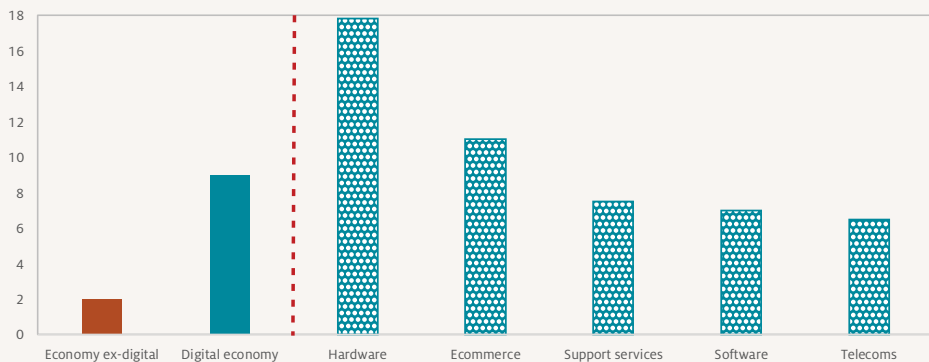


Source: The Coming Productivity Boom, NBER, BEA, Bloomberg, Epoch Investment Partners

2. National accounts were designed to measure the output of a manufacturing-based economy in which production could be dropped on your toe. Today’s virtual economy requires a fundamental rethink about how to best measure value-added activities.

3. The NY Fed estimates that 25% of U.S. public firms possess an interest coverage ratio below one. Without the dramatic decline in interest rates this percentage would be much higher.

FIGURE 3: components of the digital economy: real value-added annual growth, 1998-2018 (%)



Source: Bureau of Economic Analysis

and physical assets (bricks and mortar). As companies seek to improve their profitability in a slow growth world, this means capital-light models will prevail in all industries.

While the digitization of the modern economy has been turbo-charged by the pandemic, that is not the only catalyst. Other critical factors include massive improvements in tech hardware, cloud computing⁴ the ongoing rollout of 5G, and exponential gains in AI efficiency. According to a study published by OpenAI in May, the cost to train AI is declining several orders of magnitude faster than the pace of Moore's Law.⁵

While the gains in AI efficacy are truly spectacular, computing power keeps improving as recent innovations in semiconductor design suggest Moore's-law naysayers have been outmaneuvered yet again.⁶ This is important as one of the biggest beneficiaries of the pandemic is the semiconductor industry, given these devices are the key enabler of the connected world. Consequently, we believe the digitization of the economy, featuring the substitution of "bits" for "atoms," is still in the early innings and, if anything, is gaining steam.

Tech guru Benedict Evans stresses that tech was very small until recently, with the number of global computer users having quadrupled since 2004 (representing a 10% CAGR), with no signs yet of slowing down. Moreover, in a world in which "data is the new oil," global internet traffic continues to grow at a 20%+ pace (Figure 4). To illustrate the myriad ways in which the pandemic has acted as an accelerant for the digitization and virtualization the economy, the next five sections discuss working from home, Edtech, e-commerce, e-fitness, and telehealth.

Lockdown Tech: The Percentage of Employees Working from Home is Expected to Triple

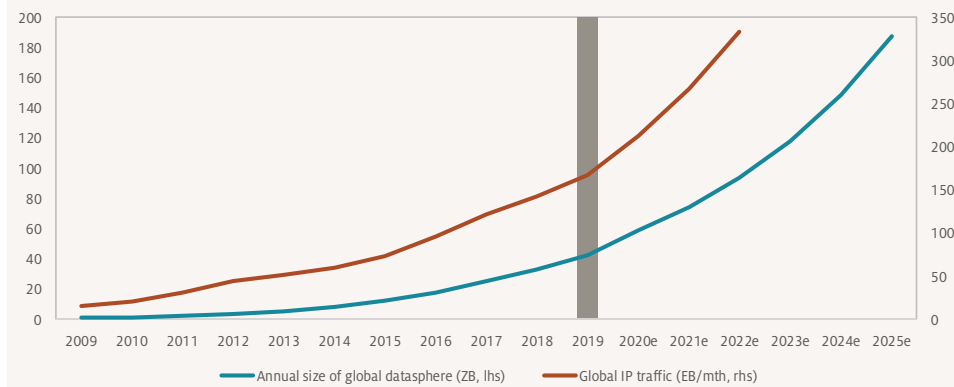
"We find that 37% of jobs in the U.S. can be performed entirely at home."

— Jonathan Dingel et al, University of Chicago

Between 1960 and 2000 the share of employees working full-time from home never topped 3.5%. In the two decades since 2000, the share has risen slowly but steadily to 5.5%. This year it has soared, although it is still too early to know with any precision what the share has risen to during the lockdown. Eventually it could be as high as the 37% figure quoted above, although another study estimated that 56% of U.S. jobs could be performed at least partially from home.

Regarding the structure of work post-pandemic, recent survey results suggest the anticipated share of working days at home is set to triple—rising to 16.6%. Other surveys have found that 75% of respondents would like to continue working remotely at least occasionally, while more than half want it to be their primary way of working after the crisis ends. A hybrid arrangement appears

FIGURE 4: Still early innings -- global data traffic continues to grow at a 20%+ pace



Source: Cisco, IDC

4. Global spending on cloud services was up 30% yoy in 2Q20 and, according to Flexera's "2020 State of the Cloud" report, 59% of large companies expect to increase their planned cloud spend in response to COVID-19.

5. Compared to 2012, it now takes 44 times less computation to train a neural network. By contrast, Moore's Law would have yielded an 11x cost improvement. That is, progress with AI tasks is occurring even more quickly than tech hardware such as semiconductors.

6. There is an old joke in the semiconductor business that the number of people predicting the death of Moore's law doubles every two years.

most likely to prevail, a trend that will permanently change the labor market edifice and, among other things, boost the demand for a slew of tech products and services.

This year's rapid shift to WFH was enabled by two preconditions. First, tech hardware, residential broadband, cloud services, collaborative software, and videoconferencing capabilities have improved tremendously over recent years.⁷ Second, our economy now revolves around services, rather than manufacturing. This has allowed a majority of U.S. companies to engage in what amounts to a national experiment in remote-work capabilities.

Economists are frantically collecting data to make sense of this year's experiment and, so far, the evidence on productivity appears mixed. Regardless, it is clear that the nature of work has changed profoundly. For a start, many employees have swapped fixed 9-to-5 hours for fragmented "Swiss Cheese" schedules, with working hours becoming more flexible, night-time email traffic soaring, the weekday-weekend divide all but disappearing, and business travel plummeting.

One company's newly remote workforce was the subject of a July study in the Harvard Business Review, which found that meetings were getting shorter, but there were more of them, so that overall meeting time actually increased by 10% overall. (The analysis suggested more connections were scheduled to compensate for the lack of informal discussions in hallways or by the coffee machine.) Employees worked an average of four more hours a week, as a "night shift" emerged and work on weekends increased. Finally, supervisors are bearing the brunt of the shift to remote work, with senior managers collaborating an additional eight-plus hours per week.

These results were echoed by a July study from Harvard Business School. It covered a large set of firms and found that, compared to pre-pandemic levels, the number of meetings per person rose by 13%, while the average length of meetings declined by 20%. It also found that the length of the average workday increased by 8% (50 minutes).

"Travel will never, ever go back to the way it was pre-COVID; it just won't."

— *Brian Chesky, Airbnb CEO*

Regarding business travel, a July survey by the Atlanta Fed found that firms anticipate slashing their annual travel expenditures by 30% when concerns over the virus subside. Such a large, broad-based reduction in travel spending not only suggests a sluggish and potentially drawn-out recovery for the travel, accommodation, and transportation industries, but also indicates that firms are counting on a shift from face-to-face meetings to lower-cost virtual meetings. Survey respondents held 16% of their external meetings by video conference pre-COVID but expect this to rise over three-fold, to 50% post-COVID. The Atlanta Fed summarizes their results pithily, "Move over, jet lag—here comes 'Zoom' fatigue."

Edtech: The Imperative of Making Online Learning More Effective

"If one were to invent a crisis uniquely and diabolically designed to undermine the foundations of traditional colleges and universities, it might look very much like the current global pandemic."

— *Brian Rosenberg, former president of Macalester College*

While WFH has had far-reaching consequences for the economy and society more broadly, probably the most important telepresence shift has resulted

from the closure of schools and colleges. In mid-April, at the peak of the global pandemic, 192 countries had closed all their educational institutions (partial closures were implemented by six other countries, including the U.S.). According to UNESCO, this affected a staggering 1.6 bn students worldwide (90% of total enrollment), with researchers projecting that U.S. students are likely to return in fall 2020 with 63%-68% of the learning gains in reading relative to a typical school year and with 37%-50% of the learning gains in math. While many countries are starting to reopen schools, it is unlikely that in-school learning will snap back to pre-COVID levels anytime soon. The myriad adverse consequences of school disruptions on this generation of students will be felt for decades to come with, regrettably, the lowest income groups suffering the most.

The physically close-knit nature of the classroom puts them not far behind cruise ships and assisted-living facilities as ideal theaters of contagion. While a calamity in many ways, the pandemic has been a boon for online learning. It had exhibited painfully slow growth over the previous two decades, largely because of institutional barriers, technological hurdles, and opposition from teachers and professors. As NYU's Scott Galloway points out, "higher education is perhaps the only industry in the U.S. that hasn't faced pressure to cut costs." However, with COVID-19, even the most elite institutions with enormous endowments and coveted brand names, won't be able to resist change.

"COVID provides an opportunity for universities to remake themselves into institutions where real learning is delivered in classrooms, good teaching is valued, and the focus returns to educating students."

— *Aswath Damodaran, NYU*

COVID-19 has exposed the underbelly of the university model and may have

7. For example, five years ago my home PC used to crash incessantly when I was downloading data from Bloomberg with a couple apps open, but now that only happens a couple times a week. Still frustrating, but a dramatic improvement with more certain to come.

accomplished what hundreds of years of griping and grumbling have not. NYU’s Aswath Damodaran (“Professor free cash flow”) emphasizes two lessons: First, as classes moved online, many students hardly noticed the difference, as classes taught without energy, enthusiasm and engagement in a physical classroom sound the same online, and are easier to mute. Second, of the many things that students miss after teaching moved online, the classes themselves were way low down the list, well below friends, college sports and parties. This has drawn attention to budget-busting tuition rates and how little of it is directly connected to student education. And it is forcing students and parents to question their pre-conception that the only way to get an education is to spend four years at a bricks and mortar university.

The changing nature of higher education was examined in the cover story for the August 8 edition of *The Economist*, “The absent student: How COVID-19 will change college.” The magazine emphasized that zoom lectures are accelerating a long-running trend that was started by online-education providers. It also noted that a growing number of universities offer degrees online, often in partnership with “online-program managers” that run the digital portals. The Economist estimates that one-third of graduate students were learning fully online last year, a number that now looks certain to rise.

“CFA exams will shift from paper-based to computer-based testing starting in 2021. This change allows us to provide smaller group sizes, better social distancing, and easier scheduling with more locations.”
— CFA Institute

As *The Economist* suggests, we are witnessing an unprecedented wave of Edtech innovation, as millions of educators and entrepreneurs focus their

collective attention on one of the most important questions of the COVID era: how can we make online learning more effective for all ages of students? As 13D Research has stressed, even before COVID-19, the adoption of education technology was already experiencing high growth with global Edtech investments hitting \$18.7 bn in 2019, up from \$16.8 bn in 2018. To give this some context, investments in 2018 and 2019 combined far surpass the total sum of investments made to Edtech companies during the previous twenty-year period.

The good news is that education is rapidly moving beyond “chalk and talk,” with Edtech companies not only offering self-paced eLearning, but increasingly emphasizing AI-based learning, mixed-reality tools (using AR and VR), game-based learning, and educational bots (programs that can interact with users). Metaari, a specialist research firm, believes such advanced learning technologies are in the midst of profound innovation, with global revenues forecast to increase at a CAGR of 25% over the next five years. Growth is expected to be especially strong in tertiary and higher education, as well as from corporations (including health care) and federal government agencies (e.g., training military personnel).

“Crises lead to accelerations, and this is best chance ever for online learning.”

— Sebastian Thrun, co-founder of Udacity

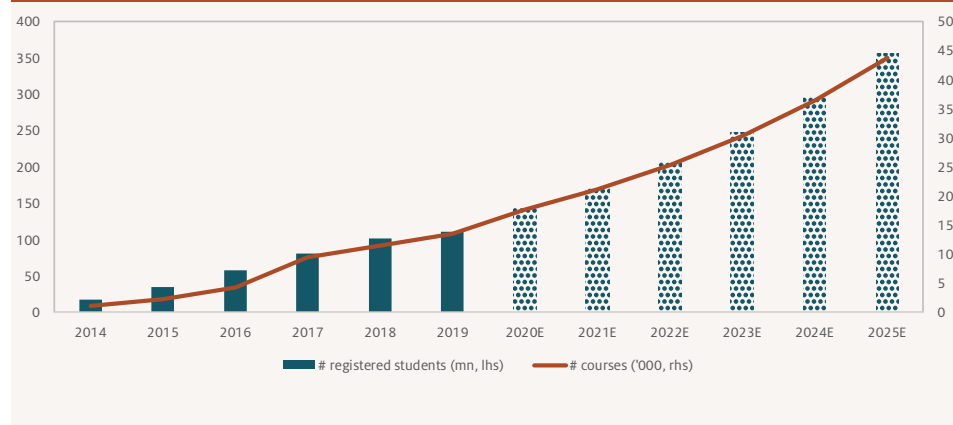
A high-profile example of Edtech is the MOOC (massive open online courses) movement, which has gained considerable momentum over the last decade and is forecast to exhibit a CAGR of 20% over the next five years (Figure 5). The first MOOC courses were offered by Stanford in 2011 but since then over 900 universities globally have begun offering online courses and degree programs. The most popular courses include “Machine Learning” (offered by Stanford, taught by Professor Andrew Ng, with 3.3 mn students enrolled) and “Programming for Everybody” (Michigan, 1.5 mn enrolled). We are particularly intrigued by “Financial Markets,” which is taught by the always thought-provoking Robert Shiller.

“Why shouldn’t students around the world have access to the best lecturers and materials?”

—Kenneth Rogoff, Harvard

[Kevin] On a personal note, over the last six months my 13-year son has

FIGURE 5: Number of registered students in moocs



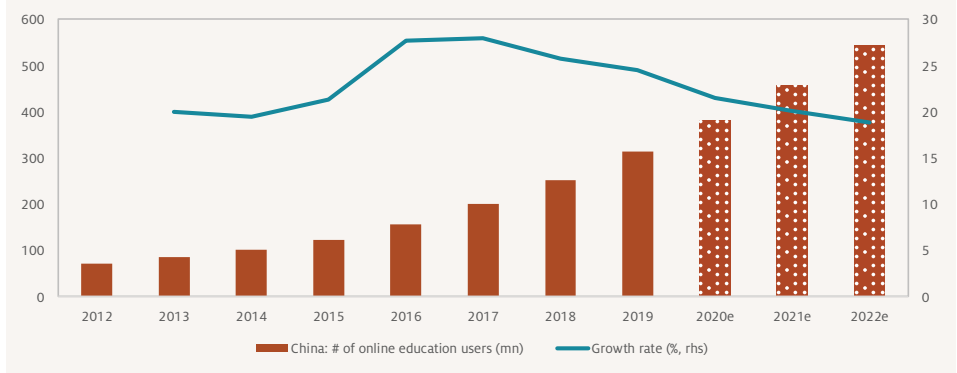
Source: ClassCentral.com

taken two online courses, Algebra and Biology through Johns Hopkins. Although he greatly misses interacting with his friends, there is no doubt that the online courses, pedagogically, are vastly superior to what he was taking in school. The multi-media courses offer frequent, concise quizzes with plenty of feedback and a tutor that responds promptly and constructively to questions and concerns. The algebra instructor was particularly outstanding, a distinguished mathematician and award-winning teacher who frequently breaks into hilarious takes on popular songs to help explain the more challenging concepts and keep students engaged. It is puzzling that such terrific courses haven't yet been made widely and affordably available to hundreds of millions of children worldwide.

One country that has experienced faster growth in Edtech is China (Figure 6). Resistance by teachers and administrators has been less effective there, largely because the overall education field is expanding so rapidly and has been deemed such a high priority by the central government.⁸

The long-term outlook for Edtech has undoubtedly been accelerated by COVID-19, with the overall market forecast to expand at a 15% CAGR over the next five years. This is especially impressive relative to an economy that is struggling to exhibit sub-4% nominal growth. Still, as the pandemic subsides, we do not envisage an outright shift to online learning. Rather, we expect a hybrid “blended learning” model, in which traditional in-person classes are increasingly integrated with online activities. This will inevitably change the requirements for courseware, with an inevitable shift toward the digitization of education. With that, we now turn to our third example of the virtualization of the economy, e-commerce.

FIGURE 6: Number of online education users (mn) in China



Source: iResearchChina.com

E-Commerce and Creative Destruction: Still in Early Innings

“The retail world that would have existed in the year 2030 has been pulled into 2020. Brick and mortar retailers that were thinking of moving online have done so at an incredible clip over the last 8-10 weeks.”

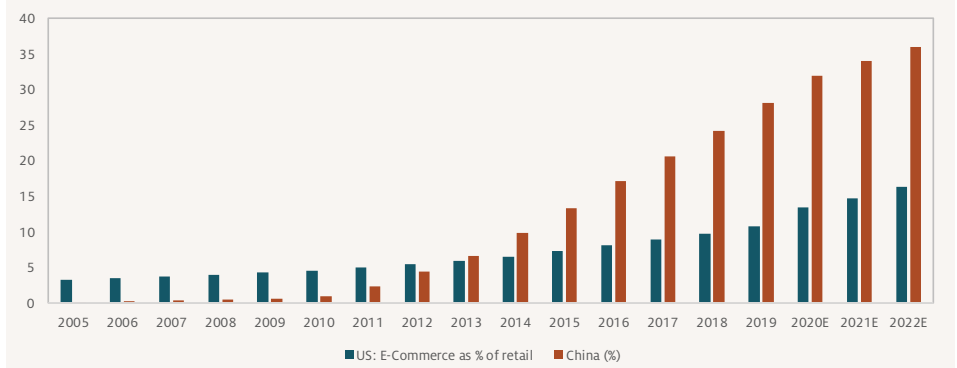
— *Harley Finkelstein, Shopify COO*

It was just over 25 years ago that the leading e-commerce company sold its first book and started a retail revolution. While e-commerce has grown tremendously since then, the average global penetration rate is not yet even 15%, suggesting we're still in early innings. The much higher share in China, also implies plenty of runway remains (Figure 7). While no one denies that the pandemic bolstered

virtual shopping, there is much debate as to whether we've leaped ahead by two, three or five years. There is also some controversy regarding how much of this ramp-up will remain in place once the pandemic recedes. We believe much of the new activity will stick, with a recent survey by McKinsey indicating that during the crisis 75% of consumers tried a new shopping behavior, such as a different website or delivery app, with over 73% intending to continue using it post-crisis.

“The crisis has profoundly accelerated the digital transformation of the beauty sector. In e-commerce, we achieved in eight weeks what it would have otherwise taken us three years to do ... We are setting ourselves up for a world where half

FIGURE 7: e-commerce sales (as % of retail) in China and the U.S.



Source: Bank of America, Bernstein, Epoch Investment Partners

8. China leads in a number of other tech sectors as well, including e-commerce, digital payments, and surveillance systems. The reasons are detailed in a provocative book by Kai-Fu Lee, *AI Super-Powers: China, Silicon Valley and the New World Order*.

of the business is e-commerce and 80% of consumer interactions will happen online.”

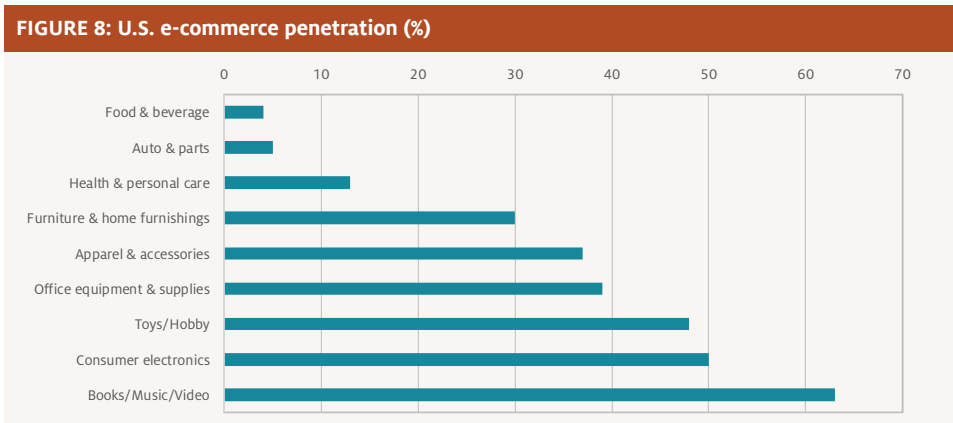
— Lubomira Rochet, L'Oréal's Chief Digital Officer

The digital economics favoring e-commerce platforms are extremely powerful and becoming even more so. As a result, we believe its share will rise for all categories, from food and beverage, with its 4% penetration rate in the U.S., to books and music which currently has a chunky 63% (Figure 8). While health and personal care had only a 13% e-commerce share pre-COVID, this proportion is set to rise dramatically. For example, online sales have risen from 3% of of one company's total in 2014 to 20% this year, up an impressive 65% in the first half of 2020. Further, 70% of its advertising and marketing spend is now online, up from 50% in 2019.

Bolstered by the impact of COVID-19, global e-commerce sales are expected to expand at an impressive 17% in 2020, and by a 10% CAGR over the next five years. And this is not the first time that an outbreak has provided a tailwind for online activity. The SARS outbreak in Hong Kong/China, which was especially dangerous from 11/2002 to 7/2003, proved to be a vital watershed moment for Chinese e-commerce. Duncan Clark, the author of *Alibaba: The House That Jack Ma Built*, asserts that SARS represented the turning point when the internet emerged as a truly mass medium in China: “Crucially for Alibaba, SARS convinced millions of people, afraid to go outside, to try shopping on-line instead.” It was not by coincidence that Alibaba’s tremendously successful e-commerce website, Taobao, was launched in May 2003.

“It’s as if e-commerce jumped ahead five years...”

— Vince Martinelli, RightHand Robotics (builds platforms for e-commerce order fulfillment)



Source: eMarketer

The process of creative destruction necessarily has its downside and, in this case, it is the ongoing retail apocalypse. UBS predicts that 100,000 brick-and-mortar U.S. retail stores will close by 2025, continuing a trend that started before the pandemic and has accelerated amid COVID-related shutdowns. A record 25,000 stores are predicted to close in 2020 — up from the pre-pandemic estimate of 8,000. This is a multiple of the previous record, 9,800 stores closed in 2019, and partially reflects the overbuilt state of America’s retail sector (Figure 9).

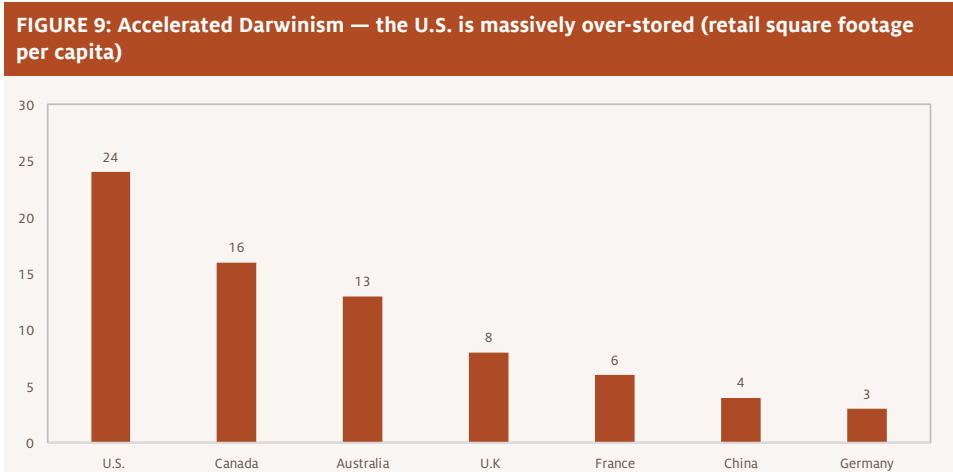
Even so, post-COVID we expect brick and mortar stores to hold a large, albeit declining share. Similar to WFH and Edtech, we project a hybrid model to

remain in place for the next decade or so. With that, we now turn to our fourth example of the virtualization of the economy, e-fitness.

E-Fitness: Not a Passing Fad

Before the pandemic, sweating profusely next to other fitness fanatics in a dark room with loud music was worth \$30 a class. Now, getting that same workout from the comfort of your well-ventilated home seems much more appealing to most people. Virtual cycling or running with a \$2,000-plus internet-connected stationary bike or a \$4,000-plus treadmill (monthly subscription sold separately) was once regarded as an almost obscene extravagance. However, in the “new normal”

The U.S. has by far the highest per capita retail footprint



Source: International Council of Shopping Centers, Bernstein

such luxuries are viewed by fitness aficionados as necessities, with the real coup being that they might ultimately save both time and money if used regularly. This helps to explain why, following a wobbly IPO debut in 2019, a fitness company's sales surged 66% last quarter.

Will working out from home prove to be a passing fad? Probably not. A recent survey of 2,000 Americans who exercise at least twice a week found that 24% will never be returning to gyms even once the pandemic is over. Additionally, 30% responded that they will likely continue to exercise at their gym or fitness studio, but less than before, with 40% anticipating returning at the same rate as previously. With 42% responding that they now have a home gym set-up that they prefer over their membership gym, it seems clear that fitness in the coronavirus age will end up in the same place as work, education, shopping, and health care: hybridized, but with an increasing proportion of activities moving from “bricks and mortar” to the virtual world.

Andrew Kortina, emphasizes two different types of virtualization. E-fitness in many cases is a “microphone technology,” that is a platform for broadcasting from one-to-many. As such it can be characterized by low marginal costs, significant economies of scale, and superstar effects. This means virtualization will enable some extremely talented local yoga or cycling instructors to massively expand their audience (“aggregating demand”), resulting in winner-takes-all dynamics and superstar earnings. While many people will crave the social element of the studio, it could be more than offset by a lower price point, no commute time, and a broader variety of class types. While microphone technology creates a lot of value, for both talented instructors and their students, it could exacerbate inequality by reducing the overall number of instructors as fewer

students seek out local studios near their homes or offices.

On the other hand, some classes are likely to adopt “stethoscope technology,” that is listening and interacting one-on-one. While this model of virtualization lacks economies of scale, it does have several other benefits. Commuting time is eliminated and your instructor no longer needs to live in an expensive urban area. If private 1:1 instruction becomes far cheaper to deliver, demand could expand dramatically, implying this is one area where virtualization has the potential to create more jobs than it destroys. In addition to personal trainers, this platform could be applicable to music lessons, telemedicine, nutritional counselling, math tutoring, executive coaching, and other interactions that require focused human attention. We now turn to our final example of the virtualization of the economy, telemedicine.

COVID-19 has Accelerated Telemedicine “By a Decade”

“In February, just 0.1% of primary care visits covered by traditional Medicare were done via telehealth. By April, it was 43.5% — more than a 400-fold increase.”

— Alex Azar, U.S. Secretary of Health and Human Services

This spring, from March to April, the number of patients using telehealth services in traditional Medicare increased from roughly 13,000 a week to over 1.5 million a week. Given the experience over the last six months we can all understand why this occurred, but the question remains: Why didn't it happen earlier? Habit and technological hurdles certainly represent part of the answer, but Secretary Azar argues that “regulations explain much of why telehealth hadn't taken off before the pandemic.” Fortunately, a host of government regulations were relaxed in the early stages of the crisis, and we

are confident that many will be made permanent post-pandemic.

Health care providers in the U.S. have been inching toward making more services available via telehealth for years (especially for mental health issues). However, health care leaders across the ideological spectrum agree that COVID-19 has pushed the inevitable telemedicine revolution forward by a decade. Further, health care is being redesigned so that telehealth could represent around 25% of patient visits by 2025. Consistent with this view, Frost & Sullivan expects an impressive 38% CAGR to 2025, which is roughly ten times projected nominal GDP growth during that period.

“[Telemedicine] made a big contribution in saving lives because it didn't require our Medicare beneficiaries to leave their home.”

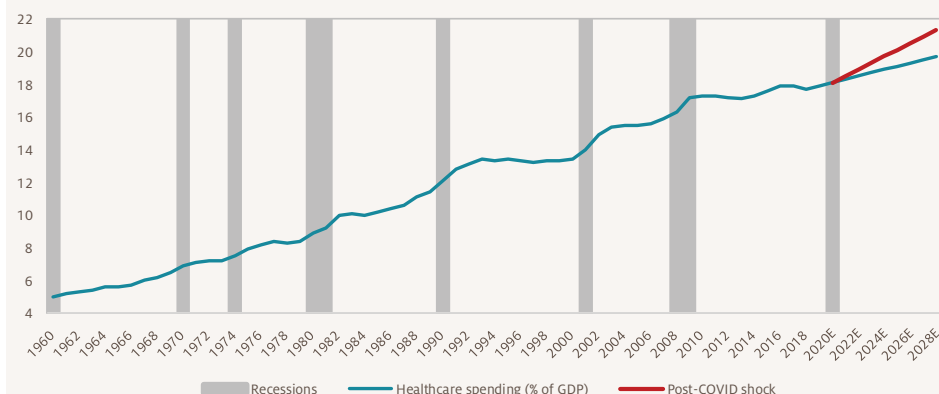
— Seema Verma, head of Centers for Medicare and Medicaid Services

Some analysts expect telehealth use to flag in late-2020 if the coronavirus loses steam. However, McKinsey researchers think current dynamics will persist for the next 12 to 18 months at least, until a vaccine is widely available, giving teleconsulting and telemonitoring ample time to become normalized in the health care delivery system. Post-COVID, McKinsey estimates that 24% of office visits and outpatient volume could be done virtually, with even 20% of emergency room visits avoided via virtual urgent care. Projections are even higher for mental health issues and home health services (such as physical, occupational and speech therapy).

“The right number is probably about 25%. The old model of bringing patients in for every medical reason is over. And now that there's been that exposure to telehealth, a lot of specialties will be redesigning care.”

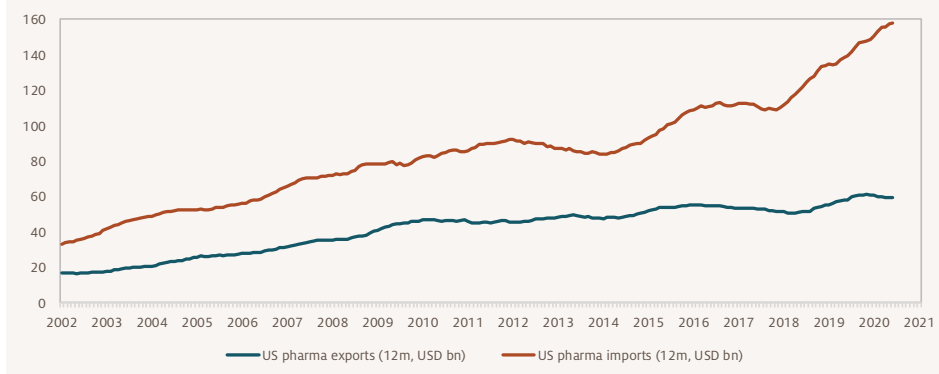
— Chad Ellimoottil, U Michigan

FIGURE 10: U.S. health care spending (% of GDP)



Source: National Health Statistics; BEA, NBER, Epoch Investment Partners

FIGURE 11: U.S. pharmaceutical imports have soared since China entered the WTO



Source: U.S. Census Bureau, Bloomberg, Epoch Investment Partners

While telehealth certainly won't replace in-person care, it can give patients and providers the flexibility to decide on the right mix of the two. With this, virtual interactions have an opening to become part of the "standard of care." Companies well-positioned for this transition include a telemedicine firm which, in 1H2020, experienced revenue growth of 63%, with visits up 144% yoy. While the acceleration in telemedicine has been a terrific and welcome development, America's overall response to COVID-19 has been flawed in a number of respects, partially reflecting national unpreparedness. To some extent this is puzzling, as total public and private health care spending already amounts to 17.7% of GDP (Figure 10), which is

the world's highest rate. Regardless, 13D Research makes a convincing case that, despite the country's top-notch private medical system, it has fallen short on public-health infrastructure to handle infectious disease outbreaks and maintain the overall health of its population. As a result, 13D believes public health may become one of the biggest investment opportunities of the decade.

A second public policy issue that has moved to the front burner during the pandemic is America's increasing dependence on pharmaceutical imports (Figure 11). The COVID-19 crisis caused a host of disruptions to global supply chains, laying bare America's reliance on China for critical medicines. For example, over 80% of the world's supply of

antibiotics comes from China, according to the Council on Foreign Relations. Overall, China makes nearly half of the planet's API (active pharmaceutical ingredients), the chemicals that give drugs their medicinal properties. Christopher Priest, an official at the defense department, stressed that "The national security risks of increased Chinese dominance of the global API market cannot be overstated." Similarly, USTR Robert Lighthizer (America's chief trade negotiator) emphasized that one lesson of the pandemic was that "over-dependence on other countries as a source of cheap medical products and supplies has created a strategic vulnerability." In early August President Trump issued an executive order to encourage drug manufacturing to return to America, but it will take several years to know whether or not it has been a success.

"Health care is the most information-intensive industry in the economy, and it uses information technology among the least of any industry. The fax machine seems to exist, at the moment, only for health care."

— Professor David Cutler, Harvard

Another reason to be optimistic about the health care sector includes scientific advances, particularly in molecular genetics and biotechnology, that are poised to transform modern medicine. This revolution has been decades in the making, but progress is now accelerating as it becomes cheaper and faster to sequence DNA. Moreover, one-third of the world's data resides in the health care industry, which makes it ripe for disruption given advances in computing power, the cloud, 5G and AI. This suggests a lot of upside, according to Accenture. When ranked based on their digital skills and capabilities, health care sits squarely in the bottom half of sectors.

"If you zoom out into the future, and you look back, and you ask the question: 'What was Apple's greatest contribution to mankind?' it will be

about health. We're democratizing it. We're taking what has been with the institutions and empowering the individual to manage their health."

— Tim Cook, Apple CEO (citing products like the Apple Watch's ECG app)

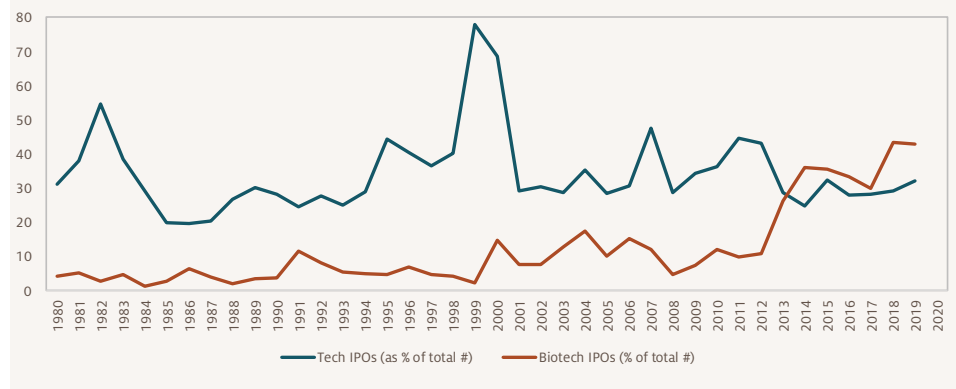
The above points explain why all the big tech firms have serious initiatives in health care and, for each of the last six years, biotech has been the leading sector for IPOs (**Figure 12**). The strength continued into 2020, with 26 biotech IPOs in the first half of the year. Further, according to Silicon Valley Bank, VC fundraising for biotech has also witnessed a flurry of activity, with \$10.4 bn raised in the first half of 2020, coming in just a smidge below 2019's full-year record of \$10.7 bn.

Health care is one of the three most promising sectors in our view, and that is even before taking into account that more than 100 teams of scientists around the world are working to develop a COVID-19 vaccine as quickly as possible (6 candidates are in phase 3, 18 in phase 2, 26 in phase 1, and 139 pre-clinical evaluation). Government support includes the White House's Operation Warp Speed which is reducing regulatory hurdles and also financially backing efforts to start manufacturing doses while clinical trials are still ongoing. That means when a vaccine does get approved, there may already be hundreds of millions of doses ready to be distributed nationally, possibly by early 2021. This is likely to prove one of the two most important market events over the next twelve months.

Accelerated Automation: Robots Neither Catch Nor Spread Viruses

Having discussed the five most important examples of the digitization and virtualization of the economy, we now turn to an important side-effect of the pandemic. In a recent survey by Ernst & Young, 41% of executives said they expect to accelerate automation because

FIGURE 12: Biotech and tech IPOs (as a % of total)



Source: Ritter, Epoch Investment Partners

of the pandemic. Due to concerns over vulnerable supply chains and the potential for infection of human workers, COVID-19 has incentivized companies to implement labor-saving technologies where they can. And once automated, those jobs will not be coming back.

Given that there are ten times as many service sector jobs as there are in manufacturing, there is every reason to believe that tech disruption in services will be magnitudes larger than what has occurred in the manufacturing sector over recent decades. That experience strongly suggests wage growth will lag productivity gains, lowering unit labor costs and pushing up profit shares. It also implies further stress and polarization is in store for America's political economy.

This view is supported by a study published last month by the Bank of Canada, "COVID-19 and Implications for Automation." It emphasized that the pandemic is likely to accelerate the automation of jobs, as employers invest in technology to safeguard against current and potential future pandemics. Their analysis demonstrated that among the occupations with a high joint risk of viral transmission and automation potential are: medical assistants, dental hygienists, correctional officers, pharmacy technicians, and retail salespeople. Unsurprisingly, the occupations with

the highest viral transmission risk tend to be in the services sector.

In addition to COVID-19, there are four reasons why the installed base of industrial robots is expected to double from 2019 to 2025 (**Figure 13**). First, they are becoming more flexible and autonomous by virtue of improvements in AI. Robots are also becoming cheaper, with the Boston Consulting Group projecting prices to decline by 6% annually (in quality-adjusted terms), which is clearly disinflationary and will act to hold down wages for a number of occupations. Next, the robotics industry is looking to copy the successful SaaS model. A major challenge to the spread of industrial robots, especially for small and medium enterprises, has been their high initial cost. With a RaaS model, customers essentially subscribe to industrial robots as they might a cloud service like AWS. Finally, e-commerce has received a huge boost from COVID-19 and is leading in the deployment of mobile robotics, although most of these systems require external infrastructure like barcodes and magnetic tape to move around.

"I'm happy to see the U.S. Open using Hawk-Eye Live. Is the system perfect?"

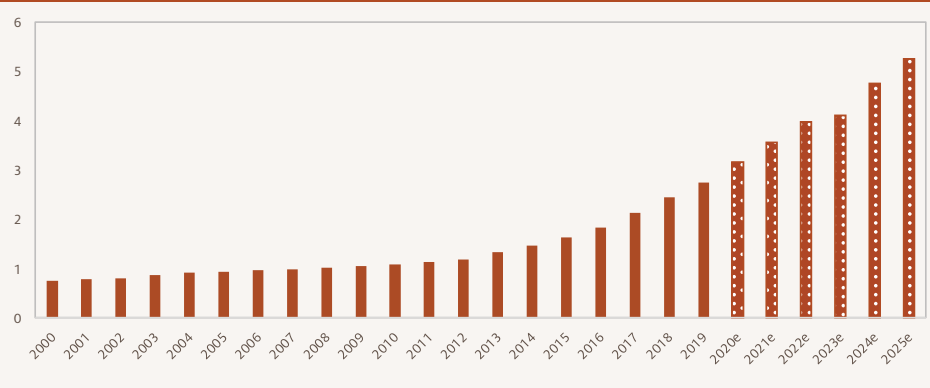
Probably not. Is it close to perfect? Yes. Is it more perfect than humans?

100 percent yes."

— Carlos Silva, CEO World Team Tennis

The pandemic is accelerating the use of robots

FIGURE 13: Industrial robot installed base (mn) to double from 2019 to 2025



Source: International Foundation of Robotics

The remainder of this section provides three examples to illustrate how concerns about COVID-19 is accelerating automation. First, the biggest annual sporting event in NY is the U.S. Open. Earlier this month the tournament director announced that, due to the pandemic, “Every functional area of the tournament has been asked to limit the number of people who physically need to be on-site.” One area that will definitely be noticed by players and fans concerns line calls, which will be made by Hawk-Eye Live on 15 of the 17 courts (that is, on all but the Arthur Ashe and Louis Armstrong Stadiums). Electronic line calling has been used at the U.S. Open since 2006, but only as part of the challenge system. Hawk-Eye now goes from serving as quality control to being the first and final word (although there will still be a chair umpire on court). This action will drastically reduce the number of line judges on site: from approximately 350 to well under 100.

“At some point in the not-too-distant future, you can walk up and use your face to buy pizza.”

— Christian Lau, CTO Los Angeles Football Club

When will fans be able to return to sports and music stadiums? Likely

not for a while, but in the meantime, stadiums have instigated an overhaul of the fan experience, focused on “how to reduce touch points” that is not unlike efforts being made to reduce risks at offices, schools, restaurants and airports. Turnstiles where attendants scan ticket bar codes have been identified as one touch point that poses risk for spreading the virus. Consequently, some stadiums are planning to roll out facial-recognition technology, which has proven to be sufficiently reliable and is now routinely used at many big airports. As face scans replace tickets the number of attendant jobs at stadiums is set to plummet.

“Automation is something we think is going to be revolutionary for our business. We are on the cusp of a significant rollout.”

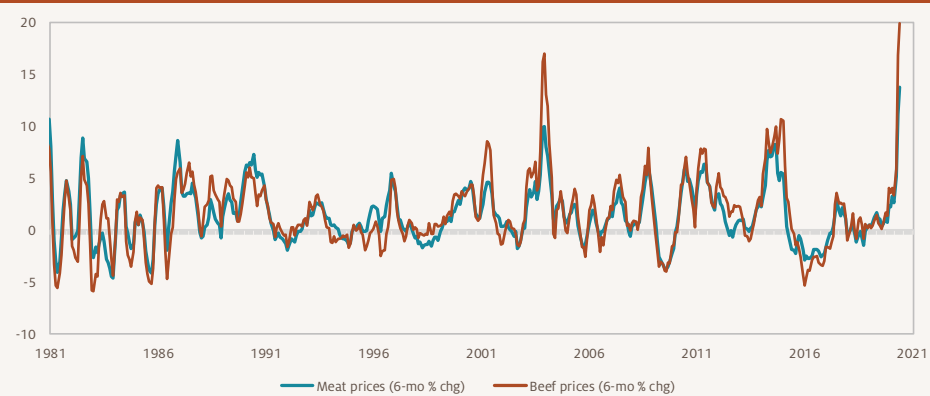
— Doug Foreman, Director of manufacturing technology, Tyson Foods

While relatively few people are employed as tennis line judges or stadium attendants, our third example concerns U.S. meatpacking plants, which employ roughly 585,000 people, making them among the top employers in several states. Last month the WSJ ran an article, “Meatpackers Slammed by Virus Turn to Robot Butchers.” While the headline is rather abrupt and jarring, it does summarize the issue quite well.

The pandemic has been a debacle for the industry which, due to its cramped and icy working conditions, became an early epicenter for infections with about 10% of employees being diagnosed with COVID-19.

A few months ago, for the first time in memory for many Americans, there wasn’t enough meat to go around. Plant shutdowns reduced U.S. beef and pork production by more than one-third in late April, forcing some grocery stores to limit how much fresh meat shoppers could buy and resulting in soaring beef prices (Figure 14). The perception was so bad that President Trump signed an executive order on April 28 under

FIGURE 14: With meatpackers hit hard by the virus, prices surged by the most in over 40 years



Source: Bloomberg, Epoch Investment Partners

the Defense Production Act to compel meatpacking plants to stay open.

In response, meatpackers spent hundreds of millions of dollars on safety equipment such as personal protective gear, thermal scanners, and workplace partitions. The industry is also searching for longer-term solutions, particularly accelerating the installation of robotics. In this transition, U.S. plants are well behind their European counterparts, where technology means a single person often does the work of eight or nine workers in American plants. While automation is not a new phenomenon, its steady march has certainly been sped up by the pandemic.

Atomic Habits: On Average it Takes 66 Days to Form a New Habit

“Pandemics are not like hurricanes. You don’t hunker down, weather the storm, and then everything goes back to normal.”

—Neil Ferguson, epidemiologist, Imperial College London

The pandemic has not only changed our economy and the way we work, travel, and learn—it has also changed us. According to a 2010 study, on average it takes about 66 days to form a new habit, so the behavior becomes automatic.⁹ It’s now been over five months since we last worked in the office, so we are well past the average date. New habits have definitely been formed, suggesting many of the transitions to virtual activities will prove enduring.

Some socio-economic-political outcomes are governed by what Professor Richard Baldwin refers to as “rubber-band dynamics,” others by “paper-clip dynamics.” When you pull on a rubber band, the shape deforms and stretches, but returns to its original shape when you let go. Such temporary shocks have temporary effects. Most economic phenomena are like this, which is one

reason why mean reversion is such a popular concept on trading floors. On the other hand, when you pull on a paper clip, it deforms but the shape doesn’t return when you stop pulling. In this case, temporary shocks have permanent effects.

“Crises usually accelerate real trends in society and technology; they don’t create or refute them.”

— Gary Kasparov

What proportion of virtualizations over the last six months will prove temporary like the rubber band versus permanent like the paper clip? It is clearly too early to say with any degree of confidence, but a couple points seem evident. First, the biggest short-term effect will mostly be an acceleration of pre-pandemic trends toward virtualization. More things will go in the cloud; more things will happen at the edge; more buying, selling, and entertaining will happen online: and so on. These trends will simply speed up. But what about other changes that people chatter about, like the death of commuting, the end of vacations abroad, the collapse of professional sports and music concerts, and the like? These were not pre-existing trends and strike us as much less likely to become enduring habits.

While much of the digital acceleration will be permanent, hybrid models will prove most resilient and successful. While a third of jobs can already be done fully online, we are some way off from this being the case for a majority of workers. The same points apply to Edtech, especially regarding younger children and those studying subjects that require extensive lab work or hands-on clinical experience. Similarly, for e-commerce, telehealth, e-fitness, and so on: hybridized, but with an increasing proportion of activities moving from “bricks and mortar” to the virtual world. If this perspective is correct,

what does it suggest regarding inflation, profit margins, and the wage share?

“When people say things are different, 20% of the time they are right”

— John Templeton

Virtualization of the Economy: Macro Effects

For a start, virtualization, like automation and globalization, is profoundly disinflationary. Think of the impact e-commerce has already had on retail prices or the downward price pressures currently being unleashed on America’s colleges. The same effects, leading to lower prices are likely to accompany the inevitable growth of e-fitness, telehealth, and so on.

Next, most virtual businesses, like tech platforms, are characterized by economies-of-scale and “superstar” effects. The winner-takes-all phenomenon implies a further increase in sector concentration as the virtualization of services favors ever larger companies. As we have emphasized in previous notes and webinars, this process also comprises a huge tailwind for margins and ROE, as digital businesses need less capital and fewer workers. This is an enormous positive for equity markets over the medium- to longer-term.

Unfortunately, though, and echoing the experience with manufacturing automation and globalization, the virtualization of the services sector suggests wage growth will continue to lag productivity gains. In addition to lowering unit labor costs and pushing up profit shares, this is likely to further exacerbate wage inequality. Worryingly, this effect could be even more traumatic than what we have witnessed since the 1980s, given there are ten times as many jobs in the services sector.

Some commentators have also argued that virtualization is like globalization, but on steroids. For example, why does

9. The range is quite wide, from 18 to 254 days, depending on the behavior, the person, and the circumstances.

my son's online guitar teacher need to live in expensive New York? There is every reason to believe that some service sector jobs in Edtech, e-fitness, telehealth, and so on will move to geographies where quality-adjusted labor is cheaper. The gains from such offshoring will be shared by three parties (firms, overseas workers, and consumers), but not the domestic labor force. This suggests existing tensions provoked by income inequality could get even worse over the next decade.

How Expensive is Tech After the Pandemic's Supercharged Returns?

“We overestimate the impact of technology in the short-term and underestimate the effect in the long run.”

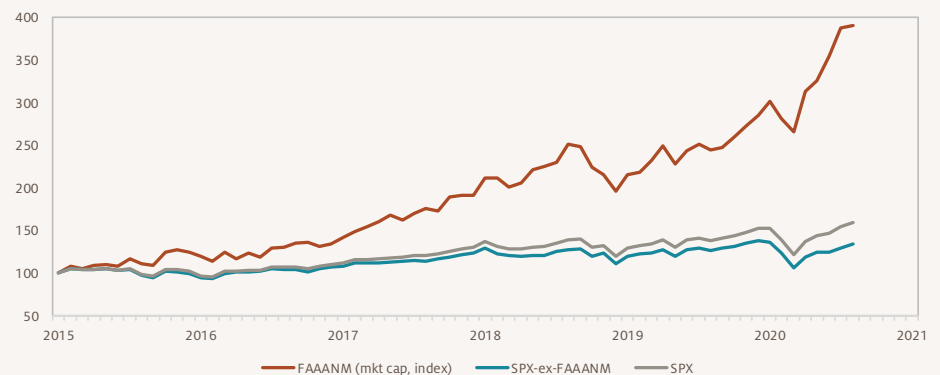
— Roy Amara, Stanford

As demonstrated in the above discussion, the COVID shock has acted as an accelerant for the digitization of the economy, with asset-light platforms in the tech, health care, and communications sectors being among the primary beneficiaries. To illustrate, six of the highest profile digital platforms now represent 24% of the S&P's market value (up from 18% at the beginning of the year and 10% in 2015) and have accounted for 50% of the S&P's rise over the last 5 years (**Figure 15**).

The vertiginous ascent experienced by the digital platforms has led many investors and commentators to assert that the tech sector is dangerously expensive, no longer driven by fundamentals, and overdue for a sharp correction. Although the sector is trading on its lowest free cash flow yield since 2008, it is only 0.6 standard deviations below its historical average (**Figure 16**). Moreover, taking into account the decline in bond yields, we find the sector to be fairly valued.

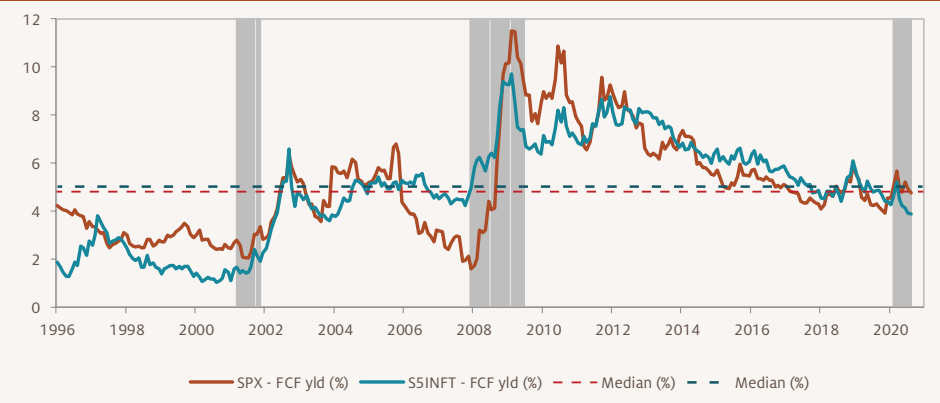
Most of the tech sector's gains over the last year reflect strong revenue growth

FIGURE 15: Six digital platforms* account for 50% of the S&P 500's rise since 2015



Source: Bloomberg, Epoch Investment Partners, Minack
* FAAANM: FB, AAPL, Alphabet, AMZN, NFLX, MSFT

FIGURE 16: The tech sector looks moderately expensive on a FCF yield basis, but appears fairly valued when lower rates are taken into account



Source: Bloomberg, Epoch Investment Partners, NBER

and lower bond yields, which is a vastly different backdrop than experienced in late-1990s. Regardless, while we remain constructive on tech over the medium-term, valuations imbed aggressive earnings growth expectations, and lower for longer interest rates, leaving little room for error.

Big Tech: Bubble Watch

Stock market bubbles that end in crashes are a lot like recessions, they're often anticipated but occur only infrequently. Regardless, there are a few reasons to be cautious. First, the big tech stocks are up over 60% during the past two years and continue to exhibit strong momentum. Second, valuations are

stretched, as discussed above. However, as Empirical Research emphasizes, it's extremely hard to call a turning point in momentous moves like tech's, particularly given the leadership's exceptional fundamentals. Big tech's revenues have been bolstered by growth in Cloud sourcing and it has produced 24% free cash flow margins in the last four quarters, a truly impressive feat.

As interest rates have sunk, the valuation gap between big tech plays on the digital economy and the rest of the SPX has widened. Given that backdrop, Empirical warns of a risk scenario in which the arrival of a credible vaccine could result in a marked upgrade to economic growth projections, sending interest

rates dramatically higher. This conceivably could drive a momentum shift from long-duration tech into beaten-down value stocks. Although not our base-case, it is a risk scenario that we need to be mindful of and monitor for carefully.

While the possibility of a pullback in the short-term is undeniable, we are confident the digitization of the economy is still in early innings. This suggests the best days likely remain ahead for the tech, health care, and communications sectors. By the end of the decade we expect the vast majority of the S&P's market value will consist of digital platforms, although they could well be a different group than has led the market over the last decade.

“There are decades when nothing happens and weeks when decades happen.”

— Vladimir Lenin

(Although, as near as anyone can tell, he never said this or anything like it)

Investment Conclusions: COVID-19 as an Accelerant for the Virtual Economy

The last six months have been profoundly transformational, with the COVID shock acting as an accelerant for the digitization and virtualization of the economy. Affected activities include WFH, Edtech, e-commerce, e-fitness, and telehealth. Once the pandemic subsides some telepresence activities will

snap back, like a rubber band, to their pre-COVID levels. However, much of the digital acceleration will be permanent. For most activities, hybrid models will prove most resilient and successful.

The digitization of the economy, featuring the substitution of “bits” for “atoms,” is still in the early innings and, if anything, is gaining steam. Given this, we believe asset-light business models in the tech, health care, and communications sectors are most likely to be the future investment winners. With an increasing proportion of activities moving from “bricks and mortar” to the virtual world, we expect digital platforms to represent the vast majority of equity market capitalization by the end of the decade.

From a macro perspective, this implies an asset-light economy in which technology is being substituted for capital and labor. This points to improved free cash flow margins and higher ROE—in fact, all three components of ROE should rise. Additionally, platforms feature low marginal costs and increasing returns to scale. This creates winner-takes-all markets which favor global champions. Further, digitization, like automation and globalization, is profoundly disinflationary, which implies “lower for even longer” interest rates. This is especially beneficial for long-duration equities such as tech.

Understanding how companies will adapt their business models is central

to assessing their ability to produce free cash flow on a sustainable basis. In light of this, “What is your business strategy in the digital age?” has become one of our favorite questions to ask management teams. If a company cannot provide a convincing response, we believe it will likely flounder and ultimately disappear.

Capital allocation processes will also be influenced, as capital-light business models, combined with solid revenue growth and higher free cash flow margins, allow many companies to increase dividends and buybacks, keeping overall payout ratios well above historical norms.

Epoch has always favored companies that possess superior managements with effective capital allocation policies, believing they are the most probable winners. These attributes are likely to be even more important going forward, as management is tasked with creating value by marshalling talent and technologies during a period of unprecedented innovation and disruption.

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