

Entrepreneurial Finance in the Platform Economy Era:
What Consequences for Labor?

Martin Kenney
(mfkenney@ucdavis.edu)

John Zysman
(zysman@berkeley.edu)

© authors

October 26, 2017

This conference, “The Many Futures of Work,” explores the changing character of work and employment in the coming years. Our position, presented in section 1, consistent with the conference, is that the choices we make in firms and our communities about the development and deployment of technology will shape the outcomes.¹ Section 2 acknowledges the difficulty of deciding how to frame the context of the changes that are occurring and suggests that entrepreneurial finance has an independent influence on the emerging outcomes for work and labor markets. Section 3 extends our previous work on the emerging platform economy and the impacts of computation-intensive automation by examining the impact of entrepreneurial finance on the development and deployment of digital tools.² In section 4, we consider some of the implications of these changes for labor and labor markets.

1. Technology and the Future of Work

The era of intelligent tools and computation-intensive automation of manufacturing and services is upon us. Or, more prosaically, human society is entering an era in which platforms, intelligent tools, and computation-intensive automation of manufacturing and services are becoming ubiquitous. The rapid development and adoption of robotics and intelligent systems with self-learning algorithms will not only automate job tasks associated with blue-collar work but also automate less-routine job tasks that have been considered knowledge work.³ This digitization process seems to be inexorably diffusing into more sectors of economic and social life. Much of this work will be organized on digital platforms.

Digital technologies are evolving very rapidly, as enormous capital investments are being made in computation-intensive automation. Despite this seemingly inexorable march of technology, the future is not predetermined but, rather, will be shaped by social, political, and economic actions taken. In this sense, the future is ours to create. A dystopian future in which jobs are simply lost and workers are only displaced is not inevitable. These tools can be deployed in ways that generate new employment, organize work to augment skills, and support a more just and equal society.

The necessary first task is understanding what the real challenge is. Some recent studies, and much of the resulting press coverage, have suggested an impending dystopia. Other studies undertaken to analyze the current status and likely future impact of intelligent systems and advanced robotics arrive at different conclusions. The conclusions and implications of these studies are so diverse that it is vital to examine carefully the

underlying assumptions each study makes about the future, including those about technology, data sources, and analysis.⁴ If large swathes of jobs are swept away in the next decade, a crisis might erupt; a steady transformation over several decades, however, produces a more ordinary process of industrial growth and change. Frey and Osborne⁵ imply that 47% of employment will be eliminated. However, rather than entire jobs being eliminated by computation-intensive automation, it seems far more likely, then, that activities and particular tasks that are a portion of particular jobs will be automated. In other words, work processes will become increasingly defined by software, as many of the tasks will be discharged by algorithms, while other, less-automatable ones are performed by humans. Perhaps, the proper analogy is that of manufacturing workers on the assembly line embedded in machinery that, in part, determines many of their movements and activities.⁶ For example, on YouTube, video-screening pattern-recognition algorithms identify possible pornography or other violations and then those that are less easy to evaluate are routed to human beings for final determination. In this case, much of the “watching” has been automated and replaced, but final judgments are largely made by people. Technical advances constantly shift the boundary between activities that require humans and those that can be performed by machines (algorithmic).

What choices are there to influence the directions and consequences of intelligent technologies? The issues and debates are becoming clear.

1. *Intelligent Machines as Tools*. Stated simply, the first inescapable fact in the contemporary evolution of machinery (both physical and virtual) is that the tools are increasingly capable of sensing, storing, and processing data. How can people be most effectively engaged and fulfilled in a work world where they are in

constant interaction with these intelligent tools? How are and will intelligent systems and machines be used as tools to complement human labor and substitute for and amplify/augment human intelligence even as work is reorganized and reconceived? Is it possible to develop trajectories that not only accelerate productivity and innovation but also reveal new approaches for developing and sustaining human capabilities—skills, training, and education—and for achieving inclusive prosperity?

2. *Policies for Technology, Work, and Labor.* What should policies and policy processes, technology development, and work organization practices look like if we are to shape a future in which intelligent machines do not simply replace human labor but, instead, are used to augment human intelligence?

- Critical among these are how we develop our education and training systems. Education and training systems dedicated to lifelong learning will likely need to be created to accommodate what may become a continuous reorganization of work and employment as digital technologies transform value-creating activity repeatedly. The character of work, and consequently the skills required, are likely to evolve ever more rapidly, as the frontier between human and machine work continually changes. In the earlier phases of industrial development, extending the number of years of education—first to primary, then to high school, and on to higher education—was sufficient. We must now reconsider what we do with the years of education: what needs to be learned, how, and when.

- The debates extend well beyond education, to market rules, regulations, competition, and social policy. Consider the debates around Uber.

Competition and antitrust policies, which may, at first glance, appear to be distant from the workplace, will inevitably affect labor. For example, if transportation network firms, such as Uber, are allowed to use regulatory arbitrage to offer lower prices for transportation than taxis that have a public-service function (which, of course, is a cost), then this competition decision affects the labor and compensation structure faced by taxi drivers. In some sense, human intelligence will be augmented, but the question, by definition, is who will be replaced and what will be created.

3. *Rethinking Business Strategies*: The difficulty with trying to affect technological trajectories is that socially beneficial evolutionary paths must also be able to survive market competition. Socially beneficial directions that are not economically viable are unlikely to survive in competitive markets. This requires the promotion and development of human-centric business strategies that succeed in the market through the effective mobilization of the workforce as an indispensable resource not just as a cost to be reduced or rationalized. Business strategies that promote skill development and the effective and innovative use of the new intelligent tools will be needed. Structures and incentives must be created that shift the calculus such that firms will find their workforce to be resources to be promoted and developed, not just as headcount to be cut or rationalized. This will necessitate creating strategies that promote skill development and the effective and

innovative use of the new intelligent tools. Rethinking business strategies, of course, raises the issues of how firms and their profitability are valued, how they are financed, and the strategies supported by their financing.

All this, particularly the issues relating to business strategies, can be presented more formally and draw directly from the classical literature. Adam Smith and Charles Babbage, and even more so Karl Marx, understood that work, in particular the future of work, is intimately related to the development of science and technology. As the debate over the ability of technology to shape the factory and work processes continues, most scholars agree that technology opens a range of possible directions or trajectories⁷, but the actual evolution is the outcome of interplay among actors with varying degrees of power to shape such trajectories. Certain technological advances, this line of reasoning argues, can provide firms and entrepreneurs with a “lever” that is almost always combined with or makes possible new business models that shift the grounds of competition. Over the past six decades, the advances in computation and communication technologies have repeatedly created new digital tools that provide entrepreneurs with openings to reorganize or, to put it in the current vernacular, “disrupt” existing businesses⁸ and create entirely new businesses.

Although this conference largely focuses on labor, the deployment of capital is of vital importance because it funds investment in the tools used to create value. Indeed, capitalism is a system within which differing recipes of capital and heterogeneous labor are combined to create value for consumers and profit for investors. If the availability of capital is unequally distributed or if investors perceive investment opportunities

differentially, then the firms that have a greater ability to raise capital will have unique competitive advantages.

Entrepreneurial finance differs from traditional bank lending, as its practice is based on acquiring equity in a young firm in the hope of securing future capital gains. Such investments are high risk by nature, and most often the firms receiving the financing initially lose money. The fastest-growing firms may operate at a deficit for long periods prior to becoming profitable and, in the greatest successes, fabulously profitable. During the initial period, the goal is growth, not profit. The ultimate goal, of course, is to surpass any incumbents (usually from the previous technology regime) and establish a dominant position, if not a monopoly or near-monopoly position (e.g., Intel in microprocessors, Microsoft in operating system and productivity software, Cisco in routers and switches, Google in search, maps, etc., Amazon in online shopping, Facebook in social media, and, of course, Standard Oil in an earlier era). The drive to disrupt and the need to establish a powerful market position affect both the industrial structure and the labor market.

2. The Rise of the Platform Economy

Digital platforms in reorganizing many sectors of the global economy.⁹ Platforms are the fundamental organizing principle for a wide variety of digital businesses that are transforming the current political economy across a broad range of businesses, including search, mobile (Android), advertising (Google), retail sales, and, more recently, distribution (Amazon, Etsy), social media (Facebook), transportation (Lyft, Uber, Blablacar), lodging (Airbnb), and gig work sites, such as Amazon Mechanical Turk, TaskRabbit, Topcoder, and Upwork. Digital platforms are composed of algorithms and software that run in the

cloud and operate on data. Business ecosystems form upon these platforms. The concept of a platform economy refers to the thesis that digital platforms are gradually organizing an increasing share of economic activity.¹⁰

Labeling the current growth in cloud computing–organized economic activity correctly is important. Initially, many observers termed the new organizational principle a “sharing economy,” which referred to their interpretation of the organization of the business models and strategy as a form of sharing. Other more critical observers claimed that these developments were the rise or, more properly, an extension of a “gig economy,” largely because they concentrated upon the labor market and organization of work. Finally, yet others termed the new organization an “on-demand” economy. Each of these formulations captures certain features of the evolving reorganization of significant parts of the economy. However, we submit that each of these labels is limiting and ultimately does not capture the profound shift that is occurring as digital platforms are organizing ever greater sections of the economy.

The conceptual basis of the “sharing economy” concept was best captured by Yochai Benkler in his *Wealth of Networks*.¹¹ He observed that internet-enabled networks facilitated the open-source software movement and community-created websites such as Wikipedia that operated on a sharing movement. However, the label was rapidly appropriated by entrepreneurs and venture capitalists who began to fund firms that allowed individuals to offer their labor services (TaskRabbit) or labor services with a capital asset (Uber/Lyft and Airbnb) on a firm’s platform. In these cases, money is exchanged in return for a good or service. For example, Uber, to the extent that it involves sharing, is really about converting a private asset, a personal consumption good, into a capital asset for a commercial

transaction. Indeed, Uber often involves individuals who offer a service without the regulations normally faced by a taxi driver. As J.B. Schor and W. Attwood-Charles show in their article on the sharing economy, Lyft, Uber, TaskRabbit, and others are not “sharing” in the usual sense of the word.¹² Further, the extension of the word “sharing” to the activities of Google, Facebook, and Snapchat stretches it even further, as these are unapologetically capitalist enterprises that offer services in exchange for information about the user or the ability to place content—all of which is sold to advertisers. Sharing, as Wikipedia and open-source software has shown, was a possible evolutionary path that many of these digital platforms could have taken. However, it is clear that the venture capitalists would never have funded growth in that direction, as they could not have secured capital gains from that growth.

The “gig economy” moniker that many use to refer to the current nature of increasing portions of the labor market is a useful metaphor for certain parts of the labor market, but misses the fact that a gig economy can exist without digitization and platforms as the organizing principle. In fact, in developing countries, portions of the labor force already participate in a gig economy with no digitalization. Thus, the notion of gigs does not capture the emerging organization of work, whose organizing principle is, in fact, platforms.

What is certain is that a radical reorganization of segments of the economy, including retail, is underway. Amazon’s acquisition of the bricks-and-mortar retailer Whole Foods is an example and further extends its challenge to conventional retailing. The notion of an Internet of Things and Industrie 4.0 presage the reorganization of production itself, including the organization of supply chains.

3. Finance, the Trajectory of Tech Firms, and Consequences for Work

The future of work is being created as decisions about business models and production shape how work will be organized and the character of work and jobs. The focus of discussion has been heavily on policy and largely about how to limit new business models or to moderate their consequences. For example, enormous attention has been paid to whether Uber, a “tech” company or a “transportation” company, is obliged to follow taxi rules or limousine rules. Because Uber is a platform that controls much of the drivers’ work process, much discussion and litigation have taken place as to whether they are employees or independent contractors. Such conundrums abound as platforms organize larger groups of workers.

But what influences those decisions and shapes those choices? What shapes the business models in the first place? Even within similar applications, variations in business models and strategies have deep consequences for the demand for labor and its deployment? In this conference, with its labor focus, we note that elsewhere we have argued that one essential element is whether labor is viewed as an asset that can be augmented to contribute to the success of the firm or is simply a cost that must be contained, minimized, in a price-based competition.

We believe that discussion of the dynamics of these digital platform firms could be enriched by considering the role of finance in both supporting start-ups and existing firms, such as finance, and thus contributing to shaping the ways in which technology is deployed and used. Finance, not surprisingly, has a significant impact on the digital transformation on work and employment. Considering the role of finance in the growth of digital platforms

is not meant to engage the larger question of the role of finance in the US economy or to enter into the more general debate over the financialization of the US economy.¹³ It is simply to consider how the increasing financial resources of venture capitalists (and other private equity pools of funds) underwrite the funding of firms intent upon restructuring business sectors.

Investment euphoria is not unique to the current era. As Carlota Perez, in her *Technological Revolutions and Financial Capital*¹⁴, and William Janeway, in his *Doing Capitalism in the Innovation Economy*¹⁵, have argued, after such investment euphoria, the political economy is permanently altered. Our discussion draws upon the studies of investment euphoria and current studies of financialization and the separate discussions about how differences in national financial systems influence the relations between business and state structure.¹⁶

“Disruption” has become a code word for an era of platform-based experiments in the creation and delivery of services. Oversimplified, start-up finance, in its abundance and its logic, facilitates the disruptors; the disruptors in turn are attempting to disrupt businesses and sectors.

An important part of this is that the cost of building digital “tools,” including platforms, has dropped dramatically, with cloud computing providing low-cost infrastructure for “users”.¹⁷ One consequence is widespread experimentation within businesses and in the form of new start-ups. The winner-take-all features of the platform economy firms, driven by the economics of digital networks, pushes them to focus on a strategy of scale and dominant market presence prior to establishing profitability. The very nature of the start-up process is predicated upon a firm’s initially being cash-flow negative,

that is, “bleeding” money. The wager that investors make is that the losses are necessary to capture the market. However, with success, the firm is expected to establish a powerful market position—dare we call it proto-monopoly. These firms are not expected to win via early, sustained operating profit but absorb operating losses financed by venture investment of some sort with the aim of driving incumbents and other new entrants out of the market. Investors may be willing to absorb the exceptional losses with the goal of achieving to proto-monopolistic profits. Current antitrust/competition policy is completely unprepared to address business strategies, such as those of small entrepreneurial firms.

What is the real economic value of these disruptions? Disruption has tended to suggest that the modern is displacing the bypassed and old-fashioned. The automobile disrupted the horse-and-carriage business; digital search engines and digitization of content displaced or altered library operations. In this narrative, disruption is a positive; it forces the rest to adapt or vanish. If consumers gain, and the disruptors make money, who should complain? Certainly, Uber makes finding a ride in London easier for a visitor from San Francisco. Google changes our attitude and approach to information. Facebook and LinkedIn transformed how personal and professional connections are maintained.

Consider the music business, which is experiencing fundamental change. The music business has been and continues to be in turmoil as downloads have given way to streaming, and the direct compensation to the studios and artists is changing dramatically.¹⁸ Even as Spotify and Pandora compete with app store downloads, YouTube is entering the competitive space and threatening all these services by offering even lower costs. Not surprisingly, these changes have driven not only the transformation in industrial structure

but also compensation schemes and the labor process for musicians. In this case, the music industry has repeatedly had to respond to threats from outside the industry.

The role of Amazon in the book business has been equally profound. Initially, the focus was entirely upon whether the Amazon online bookstore would grow and drive local bookstores out of business—and many of them did succumb. However, the bookstore chains such as Barnes & Noble, Borders, and others were deeply affected as well—and, by extension, so were their labor forces. However, Amazon’s effect was not confined to bookstores. Trade book publishers are also affected, as approximately 25% of book sales are now through Amazon’s self-publishing function. Yet again, another link in the entire value chain is threatened by an extension of the Amazon platform. The impact on authors and their ability to earn income is as yet uncertain. The Amazon platform allows authors to circumvent the intermediary, the publisher, and have a far more direct relationship with readers. Yet if Amazon self-publishing captures greater portions of the market, authors will increasingly be at its mercy.

Of course, the ultimate question is: why should we care? This logic that progressive “disruption” advances society certainly comes with negative consequences. Let us note at least a few. As the newspaper business struggles, investigative and international journalism declines, and, some argue, with it comes a decline in our democracy. Perhaps we subsidize journalism, which risks making it dependent on government, rather than private interests. Uber drivers lack protections, so perhaps we rejigger employment law. All this, though, assumes that the disruptors in their profit-making pursuits are generating social gain in the form of new services and products that we value or greater efficiency in the provision of existing ones.

But there is another story. Because many of the firms sustain operating losses over long periods, it is possible to question the economic, as much as the social, benefit. Are the disruptions, if they are driven by extended losses, really justified? As we said, many are not, at the moment, structured to eventually attain sustained operating profit. Rather, they pursue growth at all costs, with the aim of achieving market domination—something that can be achieved only by accepting operating losses financed by venture investment of some sort. The envisioned capital gains would come with domination or establishing the distinct value of particular elements of intellectual property. Apart from the notion that monopoly is thought to be contrary to the longer-term social interest that drives to domination has its own social consequences. Operating losses with the goal of market dominance may also encourage business strategies of transgressing established rules. But financing losses as a way of overcoming existing systems via social disruption and long-term operating losses forms a treacherous environment for profit-making incumbents.

Let us consider some of the elements and cases we have mentioned. The point is not to dismiss the enormous value that digital technologies and platform-based business have created. Rather, it is to interrogate the enormous enthusiasm for generating entrepreneurial start-ups, losses or not, and for seeking to turbocharge their growth to the point that they become so-called unicorns (see below). Two conditions need to be noted and understood: the decline in the cost of experimentation and the abundance in several forms of funding.

Decline in the Cost of Technological and Business Experimentation

Over the past twenty years, the cost of establishing a start-up or experimenting internally has decreased dramatically. As important as the cost decline, incidentally, is how

the abundance of software tools and cloud-based operations speeds the time from initiation to implementation.¹⁹ The reasons for this cost decline are numerous, of which a technical one is the secular decline in the cost of computation—a long-standing tendency encapsulated in the shorthand of Moore’s law but far deeper than just the dynamics of semiconductors. The economics of information technology (IT) start-ups, it is evident, have fundamentally changed. Previously, a start-up had to purchase and build an entire IT infrastructure, which was a capital cost. However, the emergence of merchant cloud-computing offerings allows a new firm to rent server capacity from a vendor, such as Amazon Web Services. What previously was a capital investment is now a variable cost, and capacity can be scaled up or down without any capital investment.²⁰ Cost and time to market were further reduced by the availability of downloadable open-source software modules from sources such as GitHub. This open-source software eliminates the need to write code from scratch, thereby reducing cost, providing opportunities to customize, and avoiding vendor lock-in.²¹ The availability of low-cost infrastructure and open-source software dramatically decreases the cost of establishing a new digital business. Thus the technical changes permit the entry of far more new firms than ever before and encourage internal experimentation in existing firms. Of course, being able to easily enter does not guarantee success – there can be many more experiments, with only a few survivors.

Abundant Capital and the Toleration of Operating Losses

The easy availability of finance and the belief that many industries are poised for disruption because of developments in information and communications technology (ICT), such as big data, machine learning, and the Internet of Things (which, with smartphones,

are new classes of computers), and the development of new business models have convinced investors that start-ups offer the opportunity for great potential capital gains. This has resulted in an enormous flow of money into private equity, of which venture capital is one genre.

Not only is the scale of capital available remarkable, but there has also been a proliferation of funding mechanisms for start-ups (Arrington 2010).²² Let us begin with conventional venture capital firms. Before the internet bubble that began in the mid-1990s, traditional venture capital (VC) firms were the predominant funders of successful technology firms.²³ However, as the elite VC firms became more successful, many of the largest VC-raised and managed mega-funds held \$1 billion or more in assets. These firms could no longer invest in early-stage firms, where an appropriate investment is \$1 million or less simply because of the management time needed to ensure their investments were wise or in the vernacular of the venture capitalists, the need to put more money to work in each deal.

The market gap created by the emergence of gargantuan funds evoked four institutional responses. First, a group of angels or “super-angels” that could easily invest up to a few million dollars in a firm’s early stages emerged, particularly in Silicon Valley.²⁴ Second, accelerators, which vet and then accept aspiring entrepreneurs, and then provide small amounts of capital and coaching in return for a small tranche of equity, emerged. Their goal was to assist in the growth of the entrepreneurs’ idea to the point that they could “graduate” and form a proto-firm, able to raise money from super-angels or venture capitalists.²⁵ Third, a wide variety of digital platforms for crowdfunding emerged, ranging from Indiegogo and Kickstarter—where funds are contributed to a project, but the funders

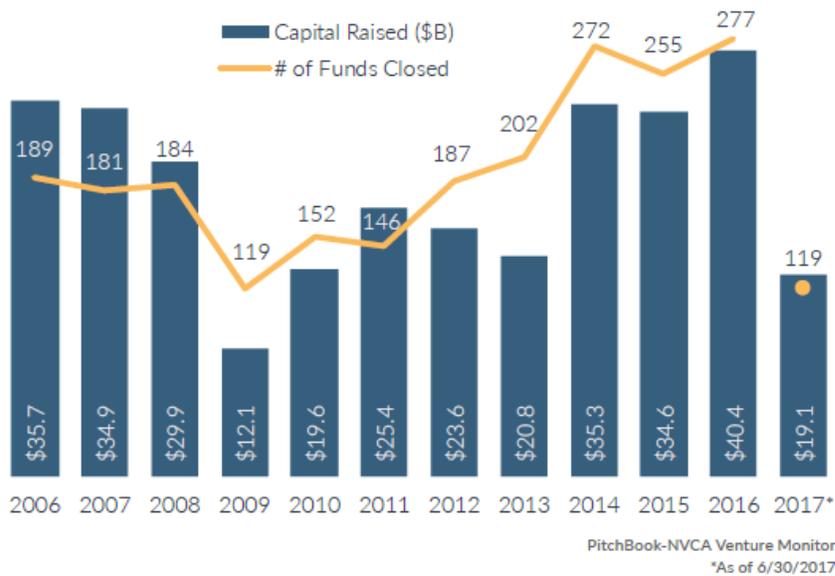
receive no equity—to other platforms, such as Angelslist—where only certified investors can invest, and they do receive equity.²⁶ Fourth is the emergence and proliferation of smaller, seed-stage VC firms, a functional segmentation of the VC market. In this sense, an ecosystem of organizations and networks has emerged that provide funding for entrepreneurial experiments made possible by the technological changes that reduce the cost of starting an ICT firm.

Because of this reduction in the cost of starting a business, more firms than ever can enter any potentially attractive segment. Thus there are likely to be many new entrants competing for the same market segment. Finance now becomes particularly important because, as we note, many of these digital markets have winner-take-all (most) characteristics due to network effects. This makes it imperative to grow as quickly as possible to occupy the space before other start-up competitors or before an established firm can introduce a competitive product.²⁷ During this phase, profitability is not as important as growth. Initial success often demands even more capital as the start-up grows. In the course of this growth, angels and incubators can no longer provide the capital necessary for such growth, and thus the expanding start-up must secure capital from the big VC firms, and investments must be far larger. The entrepreneurial environment is particularly munificent today as venture capitalists have been raising huge sums for investment. As Figure 1 shows, fundraising in 2014, 2015, and 2016 was the largest since 2006, with a total of \$40 billion raised by 277 funds.

This means that there is an enormous amount of capital searching for investment opportunities.

Figure 1. Venture Capital Fund-Raising by Year, 2006-2017

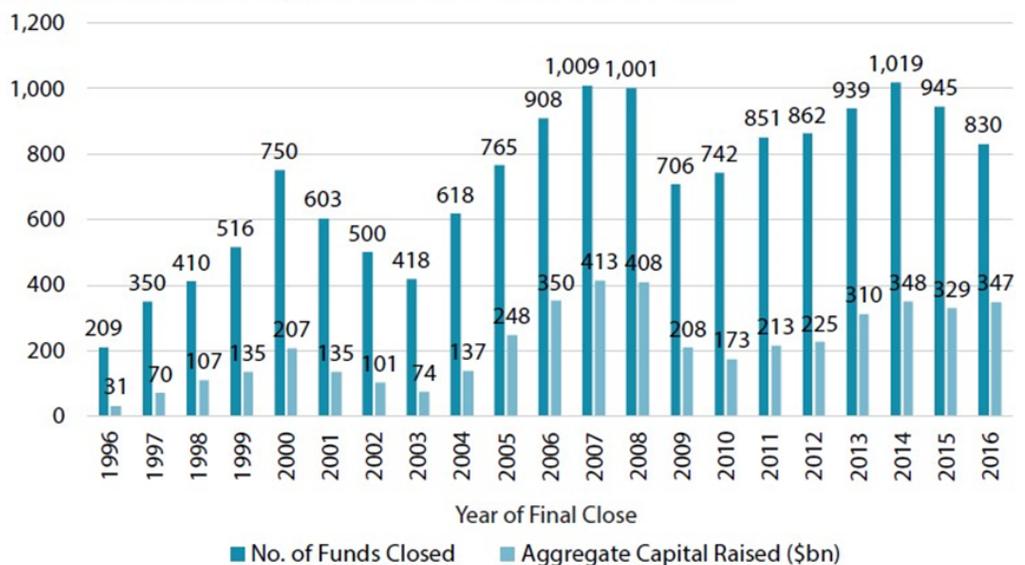
2017 off to somewhat unexpectedly strong start
US VC fundraising activity



Although VC is important for early or midterm growth of the firm, as firms remain private for longer periods, they need to raise even more capital. The enormous growth in the private equity industry in terms of available capital provides a source of funds for private firms to tap in their growth phase. As Figure 2, Private Equity Under Management, indicates, the capital under management by private equity firms has increased to over \$2 trillion. This considerable inflow into private equity and VC funds creates a need for fund managers to find opportunities with the promise of significant returns. The returns to investors in earlier platform firms tells investors that they can expect to earn similar returns going forward precisely because platforms have network effects and can result in winner-take-all markets, with their concomitant monopoly dynamics. In the next section, we explore the proliferation of privately held start-ups whose value is over \$1 billion—the so-called unicorns.

Figure 2. Private Equity Raised per Year, 1996-2016

Fig. 4.1: Annual Global Private Equity Fundraising, 1996 - 2016



Source: Preqin Private Equity Online

4. Financial Weapons in Digital Markets: Implications for Labor

We try to wend our way through this complexity by focusing on investment and business strategies that rest on enduring operating losses. The ability to access enormous sums of capital and an elevated stock valuation provides the focal firm with a powerful tool for outcompeting its rivals, as it can lower prices or even purchase its competitors, as Facebook has done with Instagram and WhatsApp. The structure of competition is important not only for investors but also for labor. *How* firms compete can determine how much of what kind of labor is needed, who will deploy that labor, and where.

Establishing and contributing to the growth of start-ups and internal firm experimentation by investors willing to incur long-term operating losses pose many questions. Rapid growth strategies by platform economy firms have, by implication, raised questions for government regulators in a wide variety of sectors, in practice an aggressive assault on regulatory boundaries, even as the

labor platforms place significant and often effective wage pressure on parts of the workforce. Current strategies seem to suggest less attention on developing the talents and ability of workforces to form structures that support workers. Certainly Uber, Google Maps, and smartphones, for example, transform ordinary drivers with limited knowledge of a locale into “contracted” transportation providers. At the same time, the new Uber drivers put downward pressure on prices for all. There is no single story here; rather, the implications are contingent and continue to evolve. The consequences for labor will vary dramatically depending upon applications, and that varies across applications and market segments, and, indeed, among firms.

By way of conclusion, rather than offering a sweeping discussion of the impact on work generally of intelligent tools, a category that encompasses platforms, robots, AI, and big data, we highlight two issues: first, a wide variety of work arrangements is being generated by digital platforms; second, matters that seem distant from labor markets may determine the possibilities for labor.

5. Policy and Work in the Platform Economy

Potential policy implications for labor and labor markets are as complex and diverse as the platforms and are perhaps even less evident than the restructuring of work. Debate, political choices, and legal decisions about what precisely constitutes platform firms will become critical. Uber claims to be a tech company when, in fact, it is firmly in the business of organizing and orchestrating transportation. In this case, the question is whether rules about issues such as public conveyance should apply. Meanwhile, the winner-take-all attributes of most digital platforms that underpin the willingness of investors to accept large operating losses for fairly long periods open a

debate over competition/antitrust policies as important responses not only to investors and consumers but to workers.²⁸

The concentration of power into a few digital platform giants, combined with the increased use of computation in almost every sphere of work and value creation, will continue to change the nature and process of work. One particularly important facilitator and accelerator of these changes is the enormous amount of capital available to firms experiencing with deep losses in the near and midterm that have the goal of developing a monopoly or monopoly-like position in the longer term when their target industries or markets are transformed. Those interested in the future of work ignore at their peril the role of capital in that transformation.

ENDNOTES

¹ A working group at Berkeley is exploring many of the same concerns as those that motivate this conference. The concerns in our research group, as in this conference, are the transformation of work, the economy, and the character of the society that results. Let us start by acknowledging those issues. Much of the language in this statement is drawn from the jointly authored statement of purpose for our research and discussion group, “Working, Earning, Learning in the Age of Intelligent Tools.” Those at Berkeley involved in organizing the work include, in addition to ourselves: Annette Bernhardt, Brad DeLong, Ken Goldberg, Jennifer Granholm, Kenji Kushida, Mark Nitzberg, Shankar Sastry, Costas Spanos, and Laura Tyson.

² Kenney, M., and Zysman, J. (2016). The rise of the platform economy. *Issues in Science and Technology*, 32(3), 61; Zysman, J., and Kenney, M. (2018). The next phase in the digital revolution: Platforms, automation, growth, and employment. *Communications of the Association of Computing Machinery* Forthcoming.

³ Brynjolfsson, E., and McAfee, A. (2012). *Race against the Machine: How the Digital Revolution Is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*. Lexington, MA: Digital Frontier Press; Brynjolfsson, E., and McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. W.W. Norton; Ford, M. (2015). *Rise of the Robots: Technology and the Threat of a Jobless Future*. Basic Books.

⁴ Manyika, J., Chui, M., Miremadi, M., Bughin, J., George, K., Willmott, P., and Dewhurst, M. (2017). *A future that works: Automation, employment, and productivity*. McKinsey Global Institute, New York.

⁵ Frey, C. B., and Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, 114, 254-280.

-
- ⁶ We hasten to add that, even in such environments, human beings have the ability to decide the proper functioning of the machines, etc. See, for example, Pfeiffer, S. (2016). Robots, Industry 4.0 and humans, or why assembly work is more than routine work. *Societies*, 6(2), 1-26.
- ⁷ Dosi, G. (1982). Technological paradigms and technological trajectories: a suggested interpretation of the determinants and directions of technical change. *Research Policy*, 11(3), 147-162.
- ⁸ Christensen, C. M. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston: Harvard Business Review Press.
- ⁹ Kenney, M., and Zysman, J. (2016). The rise of the platform economy. *Issues in Science and Technology*, 32(3), 61.
- ¹⁰ Kenney, M., and Zysman, J. (2016). The rise of the platform economy. *Issues in Science and Technology*, 32(3), 61; Lobel, O. (2016). The law of the platform. *Minnesota Law Review*, 101, 87-166.
- ¹¹ Benkler, Y. (2006). *The Wealth of Networks: How Social Production Transforms Markets and Freedom*. New Haven: Yale University Press.
- ¹² Schor, J.B., and Attwood-Charles, W. (2017). The “sharing” economy: labor, inequality, and social connection on for-profit platforms. *Sociology Compass* 11(8).
- ¹³ Davis, G. F., and Kim, S. (2015). Financialization of the economy. *Annual Review of Sociology*, 41, 203-221; Lazonick, W. (2010). Innovative business models and varieties of capitalism: Financialization of the US corporation. *Business History Review*, 84(4), 675-702.
- ¹⁴ Perez, C. (2003). *Technological Revolutions and Financial Capital*. Edward Elgar.
- ¹⁵ Janeway, W. H. (2012). *Doing Capitalism in the Innovation Economy: Markets, Speculation and the State*. Cambridge University Press.
- ¹⁶ Soskice, D. W., and Hall, P. A. (2001). *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*. Oxford: Oxford University Press; Zysman, J. (1983). *Governments,*

Markets, and Growth: Financial Systems and the Politics of Industrial Change. Ithaca: Cornell University Press.

¹⁷ Murray, J., and Zysman, J. (2011). Cloud computing: Policy challenges for a globally integrated innovation, production and market platform. Berkeley Roundtable on the International Economy, University of California, Berkeley.

¹⁸ Sellin, D., and Seppälä, T. (2017). Digital music industry: Background synthesis. ETLA Working Paper No. 48, <https://www.etla.fi/julkaisut/digital-music-industry-background-synthesis/>.

¹⁹ Murray, J. 2014. Cloud computing PowerPoint presentation. BRIE-ETLA Conference, Helsinki, Finland, 29 August.

²⁰ Murray, J., and Zysman, J. (2011). Cloud computing: Policy challenges for a globally integrated innovation, production and market platform. Berkeley Roundtable on the International Economy, University of California, Berkeley.

²¹ Northbridge and Blackduck. (2016). The future of open source. <https://www.slideshare.net/blackducksoftware/2016-future-of-open-source-survey-results/>.

²² Arrington, M. (2010). VCs and super angels: The war for the entrepreneur. TechCrunch. <https://techcrunch.com/2010/08/15/venture-capital-super-angel-war-entrepreneur/>.

²³ Kenney, M. (2011). How venture capital became a component of the US National System of Innovation. *Industrial and Corporate Change*, 20(6), 1677-1723.

²⁴ Manjoo, F. (2011). How “super angel” investors are reinventing the startup economy. *Fast Company* (February), <https://www.fastcompany.com/1715105/how-super-angel-investors-are-reinventing-startup-economy/>.

²⁵ Radojevich-Kelley, N., and Hoffman, D. L. (2012). Analysis of accelerator companies: An exploratory case study of their programs, processes, and early results. *Small Business Institute Journal*, 8(2), 54-70.

²⁶ Belleflamme, P., Lambert, T., and Schwienbacher, A. (2014). Crowdfunding: Tapping the right crowd. *Journal of Business Venturing*, 29(5), 585-609.

²⁷ It is interesting to consider the implications of the fact that each of the new entrants is likely to have a different business model meant to disrupt the incumbent. Thus the challenge the incumbent faces is not one entrant with one model, but multiple entrants with different models. If any of these models shows promise of success, then the venture capitalists will provide further funding for its growth. It is these multiple experiments/challenges that contribute to making the environment so treacherous for incumbents.

²⁸ Coyle, D. 2017 Digital platforms force a rethink in competition theory. *Financial Times* (August 18); Khan, L. (2017). Amazon's antitrust paradox. *Yale Law Journal*, 126, 710-805.