The Law and Political Economy of Workplace Technological Change

Brishen Rogers*

Forthcoming, 55 HARV. CIV. RIGHTS-CIV. LIBERTIES L. REV ___ (2020)

DRAFT of Feb. 11, 2020 – Do not cite without author's permission

Abstract: This article explores how labor and employment laws shape workplace technological change. It focuses on emerging data-driven technologies such as machine learning, the branch of artificial intelligence that has sparked widespread concern about the future of work. The article argues that labor and employment laws shape employers' technological choices in two ways. First, those laws help to facilitate technological development by granting employers broad rights to gather workplace data, to develop new technologies using that data, and to implement those technologies into the workplace, typically regardless of workers' preferences. Second, those laws channel technological development in certain directions, in particular by encouraging companies to use technologies to exert power over workers and therefore cut labor costs. This analysis has policy implications. Among other things, it suggests that ensuring a decent future of work may require reforms to guarantee workers a voice in the development and deployment of workplace technologies.

* brishen.rogers@gmail.com; Associate Professor of Law (with tenure), Temple University; Fellow, Roosevelt Institute. Earlier versions of this paper, and the research on which it is based, were presented at workshops including the Yale Private Law Theory Colloquium; the Princeton/LAPA Conference on Law and Work; the Yale Convening on the Law and Political Economy of Technology; the Arizona State/NSF-DSG Technoscientific Constitutionalism Workshop; the St. Louis University Symposium on Law, Technology, and the Organization of Work; the University of Texas Colloquium on Human Rights and Global Inequality; at conferences including the Labor Law Research Network Conference (2019), the Society for the Advancement of Socio-Economics (2019); and at faculty workshops at Queens University Law School (as the Douglas Cunningham Memorial Lecture), Georgetown University Law Center, and the Cornell University School of Industrial and Labor Relations. I also presented it to staff of the Economic Policy Institute and the Washington Center for Equitable Growth. An earlier draft was published as a working paper by the Roosevelt Institute, entitled *Beyond Automation: The Law and Political Economy of Workplace Technological Change* in the Summer of 2019. For helpful comments on prior drafts, thanks to participants in the aforementioned workshops, and to Kate Andrias, Yochai Benkler, Julie Cohen, Ruth Dukes, Cynthia Estlund, Willy Forbath, Jason Jackson, Karen Levy, Rakeen Mabud, and Daniel Markovits. Errors remain mine alone.

TABLE OF CONTENTS

Introduction

This article explores how labor and employment laws shape workplace technological change. That relationship is a matter of public importance today, since employers are using data-driven technologies to restructure work. More and more jobs are now performed in the shadow of data-gathering devices such as mobile phones, handheld scanners, GPS and other location trackers, and of course computers, which often feed data straight into corporate intranets. As a result, companies have more usable data about workers' performance and about workplace processes than ever before. Companies also have new tools to interpret that data, including machine learning and other sorts of artificial intelligence ("AI"), which they are using both to automate certain tasks, and to monitor and manage workers in new ways.[1] These developments have already transformed the ride-hailing sector, where gig economy companies have grown rapidly in many major cities,[2] and are now altering other large low-wage sectors including fast food, retail, hotels and hospitality, and warehousing.[3] These developments have also sparked extensive debate about the future of work.[4]

Yet there is a gap in the literature regarding the relationship between labor and employment laws and workplace technological change.[5] One reason is that debates around technology and

---

[1] *See* discussion, *infra* Parts II and III.

[2] *See generally* ALEX ROSENBLAT, UBERLAND: HOW ALGORITHMS ARE REWRITING THE RULES OF WORK (2018); Alex Rosenblat & Luke Stark, *Algorithmic Labor and Information Asymmetries: A Case Study of Uber's Drivers*, 10 INT'L. J. COMM. 3758 (2016); Brishen Rogers, *The Social Costs of Uber*, 81 U. CHI. L. REV. DIALOGUE 85 (2015).

[3] *See* discussion, *infra* Part III.

[4] *See* Carl Benedikt Frey & Michael A. Osborne, *The Future of Employment: How Susceptible Are Jobs to Computerisation?*, 114 TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE 254 (2017) (prominent paper arguing that automation is a major threat to work today); Cynthia Estlund, *What Should We Do After Work? Automation and Employment Law*, 128 YALE L.J. 254 (2018) (arguing that policymakers should prepare for the possibility of a world with much less work, even if the scope of the automation threat isn't clear); GUY STANDING, BASIC INCOME: A GUIDE FOR THE OPEN-MINDED 104–107 (2017) (arguing that automation is not a major threat, but that technological developments are nevertheless eliminating stable and well-paid employment).

[5] Other labor and employment law scholars have begun to analyze these issues ways that overlap with my own. Several articles on point will be published in a symposium issue of the *Comparative Labor Law & Policy Journal* in 2020. *See*, *e.g.*, Valerio De Stefano, *"Negotiating the Algorithm": Automation, Artificial Intelligence and Labour Protection*, __ Comp. Lab. L. &. Pol'y. J. ___, ___ (2020) (in addition to automating some tasks, new technologies "also increase the possibility of management to increasingly monitor working activities in a way that is not desirable for the worker"); Jeremias Prassl, *What if Your Boss Was an Algorithm: Economic Incentives, Legal Challenges, and the Rise of Artificial Intelligence at Work*, __ Comp. Lab. L. &. Pol'y. J. ___, ___ (2020) ("Instead of taking away workers' jobs…advances in AI-driven decision-making will first and foremost change their managers' daily routines…we are witnessing the rise of the 'algorithmic boss'"); Matthew W. Finkin, *Technology and Jobs: Has What Was Old Become New?* __ Comp. Lab. L. &. Pol'y. J. ___ (2020) (arguing that incorporation of new information technologies into work processes is more likely to exacerbate economic inequality than to

work have focused on conflicts between new technologies and employment regulations. For example, gig economy representatives and some scholars have argued that modern worker protections may restrict companies' abilities to innovate, potentially thwarting technological progress.[6] Worker advocates and other scholars have responded that companies are using new technologies to avoid legal obligations toward workers.[7] Both arguments have merit; novel technologies often put pressure on existing legal categories.[8]

But as legal realists and their intellectual descendants have emphasized, law in modern societies does more than *regulate* economic behavior. Law also helps *constitute* economic and social relations in the first place.[9] Law does this by establishing parties' entitlements to particular resources, and by setting the background rules of economic cooperation. For example, labor and employment laws regulate work by forbidding employers to pay employees less than the minimum wage or to terminate them for seeking to unionize. But those laws also constitute employment as a legal relationship that carries certain rights and duties, and they grant

---

generate widespread technological unemployment).

[6] *See*, *e.g.*, John Myers, *Uber, Lyft, DoorDash Launch a $90-Million Fight Against California Law*, L.A. TIMES, Oct. 29, 2019. *See generally* Seth D. Harris and Alan B. Krueger, A Proposal for Modernizing Labor Laws for Twenty-First Century Work: The "Independent Worker", Hamilton Project (December 2015) (arguing that gig economy work relationships are in tension with existing laws around employment classification). Another line of work focuses on a different set of emerging conflicts between law and technology, arguing that existing worker protections will soon be rendered moot by an automation wave. *See*, e.g., ANDY STERN (WITH LEE KRAVITZ), RAISING THE FLOOR: HOW A UNIVERSAL BASIC INCOME CAN RENEW OUR ECONOMY AND REBUILD THE AMERICAN DREAM (2016); MARTIN FORD, RISE OF THE ROBOTS: TECHNOLOGY AND THE THREAT OF A JOBLESS FUTURE (2015). *See also* Estlund, *supra* note 4 at 254. ("Automation offers the ultimate exit from the costs and risks associated with human labor.")

[7] This has been alleged in several major lawsuits, *e.g.* Cotter v. Lyft, 60 F. Supp. 3d 1067 (N.D. Cal. 2015) (denying defendant's motion for summary judgment on employment status of Lyft drivers); *O'Connor v. Uber Techs*., 82 F.Supp.3d 1133 (N.D. Cal 2015). Scholarship on point includes some of my own work, *see* Brishen Rogers, *Employment Rights in the Platform Economy: Getting Back to Basics*, 10 HARV. LAW & POL'Y REV. 479 (2016).

[8] *See generally* Gary Marchant, *The Growing Gap Between Emerging Technologies and the Law*, 22-23 in Marchant et al, eds., THE GROWING GAP BETWEEN EMERGING TECHNOLOGIES AND LEGAL-ETHICAL OVERSIGHT: THE PACING PROBLEM (2011) (arguing that law lags behind technology both because legal regulations "are based on a static rather than a dynamic view of society and technology" and because legal institutions take significant time to revise. *See also* Simon Deakin and Christopher Markou, *The Law-Technology Cycle and the Future of Work*, Univ. of Cambridge Faculty of Law Research Paper No. 32/2018 (May 22, 2018) at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3183061

[9] *See*, *e.g.*, Robert Hale, *Coercion and Distribution in a Supposedly Non-Coercive State*, 38 POL. SCI. Q. 470 (1918) (classic legal realist article on how law helps to constitute economic relations); Simon Deakin et al, *Legal Institutionalism: Capitalism and the Constitutive Role of Law*, 45 J. COMP. ECON. 188 (2017) (contemporary discussion of how legal institutions help to constitute capitalist markets); JULIE E. COHEN, BETWEEN TRUTH AND POWER: THE LEGAL CONSTRUCTIONS OF INFORMATIONAL CAPITALISM (2019) (contemporary discussion of relationship among legal institutions, development of networked information technologies, and changes in the political economy). *See also* works cited, *infra* note 39.

employers most decision-making powers within employment relationships, including powers to develop and deploy productive technologies.[10] Some labor and employment doctrines therefore help facilitate the development of novel technologies like machine learning, even as others may slow down technological progress.[11] An accurate picture of the relationship among law, technology, and work must account for this constitutive role of law.

Debates around the future of work have also tended to view technological development as an apolitical process that is driven by advances in science and engineering.[12] Yet a wealth of historical and contemporary evidence suggests that social and political factors influence the course of technological development. Canonical works in science and technology studies, for example, have demonstrated that actors often choose technologies strategically to advance their own interests.[13] Labor sociologists and historians, meanwhile, have shown that employers have often favored technologies that limit workers' shop-floor power—sometimes even at the expense of efficiency or productivity.[14] Law and technology scholars, finally, have built on those insights and on the legacies of legal realism to illuminate the relationship among law, contemporary information technologies, and the distribution of power in society.[15]

Together, these bodies of scholarship suggest that employers' technological choices are embedded in workplace power relations, which are themselves structured at every level by labor and employment laws. Technology should therefore evolve in response to labor and employment laws, as employers develop or choose particular technologies subject to the privileges and constraints those laws establish.[16] Hence this article's title: It argues that the path of workplace technological change is shaped in profound ways by the law and political economy of work.[17]

---

[10] *See* discussion, *infra* Part I.B.

[11] *See* discussion, *infra* Part I.B.

[12] *See* discussion *infra* Part II.A. *See generally* Yochai Benkler, *A Political Economy of Oligarchy: Winner-take-all ideology, superstar norms, and the rise of the 1%* at 2-4 (unpublished, 2017), available at benkler.org (arguing that most public debate around technology and work is deterministic, assuming that technological progress drives economic and political developments).

[13] *See generally* Langdon Winner, *Do Artifacts Have Politics*, 109 DAEDALUS 121 (1980); LEWIS MUMFORD, TECHNICS & CIVILIZATION (1934).

[14] *See, e.g.*, HARRY BRAVERMAN, LABOR AND MONOPOLY CAPITAL (1974). *See* discussion, *infra* Part I.A.

[15] *See generally* COHEN, *supra* note 9; Yochai Benkler, *Power and Productivity: Institutions, Ideology, and Technology in Political Economy*, in POLITICAL ECONOMY AND JUSTICE (__, eds., forthcoming ___). *See* discussion, *infra* Part I.A.

[16] *See* Deakin and Markou, *supra* note 8 ("We should … expect law to lag behind technology at times of rapid innovation, but also understand that law does more than simply respond belatedly to technological change. Technology's evolution is shaped by its legal environment.")

[17] Benkler, *Oligarchy supra* note 12, at 4 (defining "political economy" as "the study of how power shapes production and distribution in society"). *See generally* David Singh Grewal, Amy Kapczynski & Jedediah Purdy, *Law and Political Economy: Toward a Manifesto*, LPEBLOG (Nov. 6, 2017), *available at* https://lpeblog.org/2017/11/06/law-and-political-economy-toward-a-manifesto/ (proposing new field of

To build out this argument, the article shows that employers are developing two new sorts of technological means today, which they are using for two distinct ends.[18] The new means are (1) automation, or the use of machines to perform tasks previously performed by line-level workers, and (2) "algorithmic management,"[19] or the use of data and algorithms to hire, direct, monitor, schedule, or discipline workers.[20] The ends are (1) to enhance labor productivity, by enabling workers to increase output while holding input constant, and (2) to augment employers' power vis-à-vis workers and therefore limit labor costs.[21] Productivity enhancement is generally desirable and should be encouraged, since it enables rising labor standards.[22] Power-exertion by employers is often undesirable, since it can erode labor standards.[23] Importantly, either means can be used for either end. Employers can automate work tasks that involve drudgery—or they can automate tasks that were performed by skilled workers with some labor market power. Employers can use algorithms to make job searches cheaper and easier—or they can use algorithms to surveil workers more closely and undermine their autonomy.

Our labor and employment laws shape this process in two distinct ways, both of which have been referenced above. Those laws facilitate the development of new technological means by establishing and enforcing employers' rights to gather, process, and control workplace data, and to implement workplace technologies, typically without regard to workers' preferences.[24] Those laws, and the broader political economy of work that they help sustain, also encourage employers

---

study, "law and political economy," which seeks to understand how law "gives shape to the relations between politics and the economy at every point.")

[18] New technologies are often developed or sold to companies by suppliers or vendors, of course. The article will nevertheless refer to "employers" as the parties developing technologies for ease of exposition.

[19] The term is not my own. It seems to have become popular due to a working paper by several Carnegie Mellon researchers. *See* Min Kyung Lee et al., *Working with Machines: The Impact of Algorithmic and Data-Driven Management on Human Workers* (working paper, 2015), *available at* https://dl.acm.org/citation.cfm?doid=2702123.2702548.

[20] *See* discussion, *infra* Part II (discussing automation) and Part III (discussing algorithmic management).

[21] The article's distinction between power-enhancing and productivity-augmenting technologies is indebted to similar distinctions in Benkler, *Power and Productivity*, *supra* note 15 and Samuel Bowles, *Social Institutions and Technical Change*, in TECHNOLOGICAL AND SOCIAL FACTORS IN LONG-TERM FLUCTUATIONS (De Matteo et al, eds., 1989).

[22] Though labor and employment laws, and other institutions, help determine whether productivity increases translate into wage increases. *See generally* Bruce E. Kaufman, *Economic Analysis of Labor Markets and Labor Law: An Institutional/ Industrial Relations Perspective*, *in* RESEARCH HANDBOOK ON THE ECONOMICS OF LABOR AND EMPLOYMENT LAW (Cynthia L. Estlund & Michael L. Wachter eds., 2012).

[23] The article adopts Weber's definition of "power" as one party or group's ability to "realize their own will in a communal action against the resistance of others." H. H. GERTH & C. WRIGHT MILLS, EDS., FROM MAX WEBER: ESSAYS IN SOCIOLOGY, 180 (1946) (translating MAX WEBER, WIRSTSCHAFT UND GESELLSCHAFT (ECONOMY AND SOCIETY), Part III, Chap. 3, pp. 631–40 (1922)).

[24] *See* discussion, *infra* Part I.B.

to use new technologies to exert power over workers.[25] Indeed, comparative evidence suggests that U.S. employers use technologies for power augmentation more often than their counterparts in nations with stronger worker protections.[26] Employers may exert power over workers to ensure that managers and investors capture a significant share of profits. Or employers may do so to maintain a competitive position in economic sectors dominated by low-wage, low-productivity production strategies.[27] Either way, the effect is typically to reduce wages and to erode the quality of work. Employers' technological choices, as shaped by labor and employment laws, therefore impact the distribution of both income and political-economic power over time.[28]

This analysis has several implications for today's debates around technology and the future of work. For example, it suggests that lawmakers have substantial room to ensure decent work today and in the future. Enhanced worker protections can still encourage higher wages and a better quality of work; such protections may also encourage employers to invest more in productivity-enhancing technologies. This analysis also suggests that ensuring a decent future of work may require giving workers rights to consult or bargain over workplace technologies.[29] Along the way, the article argues that automation is not now a world-historic threat, and likely will not be soon.[30]

Part I outlines the article's basic account of the law and political economy of workplace technology. Part I.A introduces the article's methodology, which draws from various fields that focus on the relationship among institutions (including law), labor politics, and economic outcomes, and discusses the history of workplace conflict around technology. Part I.B then summarizes key labor and employment law doctrines that enable companies to gather work-related information, quantify it as usable data, and use it to reshape production. The most important include background rules of the employment relationship, including employment-at-will, the default rule of individual contracting, the absence of extensive employee privacy rights, and narrow legal definitions of employment. Certain legal norms are also quite important, including commitments to freedom of contract and a deeply rooted assumption that employers "own" the workplace in a manner familiar from classical property law.

---

[25] As will become clear, employers almost always use new technologies for some combination of productivity enhancement and power augmentation. Law affects employers' choices regarding the balance between those uses of technology at the margin. *See* discussion, *infra* Part I.A.

[26] *See* discussion, *infra* Part IV.A.

[27] *See generally* discussion, *infra* Part IV. Those markets have co-evolved with our legal regimes that grant employers near-plenary power in the workplace, just as other nations' markets and characteristic uses of technology have co-evolved with their own institutions. *See* discussion *infra* Part IV.A (regarding comparative evidence on uses of technology in other nations).

[28] *See* discussion, *infra* Parts I.A. and IV.A.

[29] *See* discussion, *infra* Part IV.B.

[30] *See infra* Part II.

The next two Parts examine how employers are actually using new data-driven technologies. Part II discusses automation. Part II.A summarizes labor market data suggesting that automation is a real and important phenomenon but not a world-historic threat. It also sketches the current occupational structure, which is heavily weighted toward jobs that are difficult to automate using currently available technologies. Part II.B then surveys the promise and limits of machine learning, the subfield of artificial intelligence that has generated widespread concern about the future of work. Doing so helps illustrate the likely scope of automation in the near future, as well as how machine learning could enhance algorithmic management processes. Part II.C then discusses a few recent automation successes. Those suggest that companies do not typically automate entire jobs at once; rather, they automate particular tasks and may focus on tasks that give workers some labor market power. What's more, after automating such tasks, companies often alter production processes in ways that limit workers' discretion and autonomy. As a result, automation can enhance employer power as well as productivity.

Part III then discusses algorithmic management—which, like automation, can be used both to enhance productivity and to exert power over workers. Part III.A examines algorithmic hiring and scheduling. Those processes could benefit workers in some cases: they could enable easier job searches and could make employer decisions more legible to regulators. But they can also undermine labor standards and encourage illicit discrimination. Part III.B discusses algorithmic monitoring, which may reward especially diligent workers, but seems likely to put downward pressure on wages and working conditions in the aggregate. Part III.C discusses what the article calls "data-driven fissuring," or the use of new technologies to monitor work that has been shunted outside company boundaries through subcontracting, franchising, and related strategies.[31] Fissuring is not problematic *per se*, but it often erodes standards in the low-wage labor market.

Part IV then draws out some broader lessons. Part IV.A brings in historical and comparative evidence to suggest that a different allocation of rights in workplace technology could encourage a different balance between productivity-enhancing and power-augmenting strategies—and even a more equal distribution of income and wealth. Part IV.B then outlines policy responses that would democratize the governance of workplace technology by giving workers a voice in technological decisions. Those reforms would be most effective if bolstered by changes in industrial policy and other means of enhancing worker voice.

This article has several limitations that are worth noting at the outset. It focuses largely on the low-wage labor force. This is because the low-wage labor market is more homogenous in terms of job classifications than the mid-wage and high-wage markets, which makes it easier to trace general trends; there are also large numbers of low-wage workers today, which make their

[31] *See generally* DAVID WEIL, THE FISSURED WORKPLACE: WHY WORK BECAME SO BAD FOR SO MANY AND WHAT CAN BE DONE TO IMPROVE IT (2014).

concerns economically significant.[32] The article also largely focuses on economic terms of employment, including wages, hours, and collective bargaining rights, and says less about how new data practices interact with workplace civil rights, in part because scholars have already begun to address those issues in detail.[33] That being said, the low-wage labor markets the article discusses are disproportionately populated by women and other members of historically disenfranchised groups, including African Americans, Latinx individuals, and immigrants.[34] As a result, virtually *all* of the practices discussed below have a disproportionately negative impact on such groups, even before illicit discrimination comes into the picture. In that regard, this analysis may also contribute to our understanding of the intersection of race, class, and other power structures in today's political economy.

I. The Law and Political Economy of Workplace Technology: An Overview

This Part outlines the article's account of the relationship among law, political economy, and workplace technologies. Part I.A summarizes past scholarship demonstrating that both the labor contract and companies' choices of technologies are shaped by workplace and social power dynamics. Part I.B summarizes the key labor and employment law rules that shape the political economy of work, and therefore facilitate and channel workplace technological change.

I.A. The Political Economy of Workplace Technology

[32] According to the Bureau of Labor Statistics ("BLS"), there are around 12.9 million manufacturing workers in the U.S., with a unionization rate just over 10 percent, and median wages of around $22 an hour. There are far more low-wage service workers, many of whom work for major corporations. For example, there are now over 13 million nonsupervisory retail workers, 11 million food service workers, 4.2 million hand laborers, which includes warehouse workers, and 3.2 million home health aides and personal care aides. The median wage for each of those groups is under $15 an hour, with the exception of hotel workers, where the median is just over $15 an hour. All data from BLS, bls.gov (last checked Oct. 13, 2019).

[33] *See e.g.*, Ifeoma Ajunwa, *Age Discrimination by Platforms*, 40 BERKELEY J. EMP. & LAB. L. 1 (2019); Ifeoma Ajunwa, Kate Crawford & Jason Schultz, *Limitless Worker Surveillance*, 105 CALIF. L. REV. 735 (2017); Pauline Kim, *Data-Driven Discrimination at Work*, 58 WM. & MARY L. REV. 857 (2017); Solon Barocas & Andrew D. Selbst, *Big Data's Disparate Impact*, 104 CALIF. L. REV. 671 (2016). On the relationship between contemporary surveillance practices and process of racial formation more generally, *see* Simone Browne, *Race and Surveillance*, in ROUTLEDGE HANDBOOK OF SURVEILLANCE STUDIES (Ball, et al, eds. 2012).

[34] IRENE TUNG, YANNET LATHROP, & PAUL SONN, NATIONAL EMPLOYMENT LAW PROJECT, THE GROWING MOVEMENT FOR $15 at 1 (Nov. 2015) (summarizing data on demographic characteristics of low-wage workers).

Labor is a peculiar commodity, quite different from tangible commodities like soybeans.[35] Because labor is always performed by a human being, it cannot be separated from workers and stored for future use. Moreover, workers' interests and employers' interests both overlap and diverge. They share an interest in profitability, but companies have an incentive to reduce labor costs while increasing output, while workers have an incentive to increase their wages and benefits while not working too hard. Workers also develop normative understandings of fairness at work, and often take collective action to advance their interests within the workplace. Their ability to do so, however, is shaped at every level by the legal regimes constituting and governing employment.

Understanding the labor contract, and the role of technology within it, thus requires attention not just to supply and demand but also to the *law and political economy of work*: how power shapes economic behavior,[36] and how economic behavior co-evolves with the broader legal and institutional structure.[37] For present purposes, the most important laws are labor and employment laws, and the most important institutions are industrial relations systems and other mechanisms of workplace governance, which differ substantially across nations. This article therefore draws from various disciplines that shed light on the law and political economy of workplace technology and labor contracts.[38]

---

[35] The argument in this paragraph draws generally on ROBERT M. SOLOW, THE LABOR MARKET AS A SOCIAL INSTITUTION (1990); Kaufman, *supra* note 22; and Joseph E. Stiglitz, *Information and the Change in the Paradigm in Economics* (Nobel Prize Lecture), 92 AM. ECON. REV. 460 (2002); Claus Offe & Helmut Wiesenthal, *Two Logics of Collective Action: Theoretical Notes on Social Class and Organizational Form*, 1 POL. POWER & SOC. THEORY 67 (1980).

[36] *See* Benkler, *Oligarchy supra* note 12 at 4 (defining political economy in similar terms). *See also* Wolfgang Streeck, *Taking Capitalism Seriously: Toward an Institutionalist Approach to Contemporary Political Economy*, MPIfG Discussion Paper, No. 10/15 at 1 (2015) ("Political economy looks at the inter-relations between collective action in general and collective rule-making in particular, and the economy; it extends from economic and social policy-making to the way in which economic interests and constraints influence policy, politics and social life as a whole.")

[37] By "institutions and "institutional structures," I mean the complex of collective practices that typically co-evolve with the law in modern economies, but which are not reducible to law, and which structure economic behavior. That definition is close to Douglass North's definition of institutions as "humanly devised constraints that structure political, economic and social interaction." Douglass North, *Institutions*, 5 J. ECON. PERSP. 97 (1991). But while North and many social scientists treat law as one among many institutions, I treat it in a separate category, to focus on how law shapes other institutions and vice versa.

[38] The article operates within a modified rational choice framework. Specifically, it assumes boundedly rational firms and workers with capacities for both self-interested and solidaristic strategic behavior, who are often more interested in their relative than their absolute position in the distribution of income and social esteem, and who tend to satisfice rather than maximize. At scale, individual (boundedly) rational decisions can therefore lead to aggregate patterns of behavior and production that diverge from neoclassical predictions and instead exhibit substantial power-seeking or rent-seeking. For a parallel approach to such questions *see* Benkler, *Power and Productivity*, *supra* note 21. *See also* ADAM

For example, legal realists and their descendants in critical approaches to law have long argued that markets are constituted, in part, through law, and that the law both reflects extant power relations and provides subordinate groups with tools for resistance.[39] Heterodox economists and "old" institutional economists have also focused on the legal and social constitution of the labor market,[40] arguing for example that supply and demand should be understood as broad bands rather than discrete curves, within which political and social factors can influence wages and other working conditions.[41] Law and technology scholars, and scholars within social studies of technology, have shown that technology itself can be a means of social control, and that actors, including employers, may select and deploy technologies to advance their own particular interests.[42] These bodies of scholarship differ in various important ways, but they collectively show that technology, including workplace technology, is partially endogenous to social relationships, and that the ability to design and choose technology is an important source of social and economic power, with potentially significant distributive effects.

Indeed, in the literature on the politics of technology, some of the leading examples involve the workplace. In a canonical article, Langdon Winner highlighted the 19th-century industrialist Cyrus McCormick's adoption of pneumatic molding machines that were both more expensive and less precise than the state of the art. [43] Doing so was more costly in the short term, but it enabled him to prevent unionization of his plant.[44] Control over technology was also central to

---

PRZEWORSKI, CAPITALISM AND SOCIAL DEMOCRACY (1986) (earlier effort to bring insights of rational choice theory to the study of class power relationships and political economy).

[39] *See* Hale, *supra* note 9; Morris Cohen, *Property and Sovereignty*, 13 CORNELL L. REV. 8 (1927). Prominent critical approaches to labor law include Karl E. Klare, *Labor Law as Ideology: Toward a New Historiography of Collective Bargaining Law*, 4 INDUS. REL. L.J. 450 (1981) and Katherine Van Wezel Stone, *The Post-War Paradigm in American Labor Law*, 90 Yale L.J. (1981). Recent scholarship on the legal constitution of capitalist markets includes KATHARINA PISTOR, THE CODE OF CAPITAL: HOW LAW CREATES WEALTH AND INEQUALITY (2019) (discussing how the law creates modern financial instruments); COHEN, *supra* note 9 (discussing legal constitution of modern networked information technologies, and their effects on economic and social behavior).

[40] *See*, *e.g.*, Kaufman, *supra* note 22 at 78 (explaining "institutional economics/industrial relations" perspective on labor economics that emphasizes legal and social constitution of labor markets); SOLOW, *supra* note 40; Samuel Bowles & Herbert Gintis, *Contested Exchange: New Microfoundations for the Political Economy of Capitalism*, 18 POLITICS & SOCIETY 165 (1990) (prominent account of labor contract by heterodox economists).

[41] Kaufman, *supra* note 22 at 83.

[42] COHEN, *supra* note 9 at 3; Benkler, *Power and Productivity*, *supra* note 21; Lawrence Lessig, *Code is Law: On Liberty in Cyberspace*, HARVARD MAGAZINE (Jan. 1, 2000) (arguing that whoever controls the code on which the internet runs "sets the terms on which cyberspace is experienced," helping determine whether users can remain anonymous, for example, and whether and how governments can regulate online speech). *See generally* Winner, *supra* note 13; MUMFORD, *supra* note 13.

[43] Winner, *supra* note 13 *at* 125.

[44] Id.

the transition from craft to industrial production.[45] Through "Taylorism," or the system of "scientific management" developed by Fredrick Winslow Taylor,[46] companies captured craft workers' tacit knowledge and used it to break production "into discrete, rationalized, low-skill tasks" that could be performed by workers with little specialized training.[47] As discussed in Parts II and III, employers often use modern data-gathering and processing technologies in the same way.[48] Building on this record, heterodox economist Samuel Bowles has argued that modern employers use technologies for three distinct purposes: to enhance efficiency or productivity, to "homogenize" work by enabling less-skilled workers to perform it, and to monitor work more closely and therefore project a credible threat that underperforming workers will be identified and terminated.[49] This article classifies both of the latter uses of technology as power-augmenting.[50] Individual technologies can serve multiple purposes, of course: The Fordist

---

[45] This is a major theme in the "labor process" school of sociology. *See, e.g.*, BRAVERMAN, *SUPRA* NOTE 14; DAVID MONTGOMERY, WORKERS' CONTROL IN AMERICA: STUDIES IN THE HISTORY OF WORK, TECHNOLOGY, AND LABOR STRUGGLES (1979); MICHAEL BURAWOY, MANUFACTURING CONSENT: CHANGES IN THE LABOR PROCESS UNDER MONOPOLY CAPITALISM (1982); MICHAEL PIORE AND CHARLES SABEL, THE SECOND INDUSTRIAL DIVIDE: POSSIBILITIES FOR PROSPERITY (1986); Katherine V.W. Stone, *The Origins of Job Structures in the Steel Industry*, 6 REV. OF RADICAL POL. ECON. 113 (1974). *See also* Bowles, *supra* note 21 at 72-73.

[46] *See, e.g.,* FREDERICK WINSLOW TAYLOR, THE PRINCIPLES OF SCIENTIFIC MANAGEMENT 63 (1911) (scientific management is "directly antagonistic to the old idea that each workman can best regulate his own way of doing the work.")

[47] Karen Levy, *The Contexts of Control: Information, Power, and Truck-Driving Work*, 31 THE INFO. SOCIETY 160, 161 (2015). *See also* BRAVERMAN, *supra* note 45, at 76–83 (arguing that Taylor sought to reorganize machine tool production for the purpose of disempowering workers); Craig R. Littler, *Understanding Taylorism*, 29 BRITISH J. SOCIOLOGY 185 (1978).

[48] Employers efforts to replicate workers' tacit knowledge parallel efforts by tech companies to gather user data and use it to produce new forms of artificial intelligence and other technologies. Julie Cohen has argued that such efforts are often legitimated through analogy to the public domain in intellectual property law, such that users' data is "a repository of raw materials that are there for the taking." Employers, like tech giants, have successfully cast these efforts as natural and unobjectionable despite their distributive effects. Julie E. Cohen, *The Biopolitical Public Domain: The Legal Construction of the Surveillance Economy*, 31 PHIL. & TECH. 213, 213 (2018). *See also* Nick Couldry & Ulises A. Mejias, *Data Colonialism: Rethinking Big Data's Relation to the Contemporary Subject*, 20 TELEVISION & NEW MEDIA 336 (2019). The cost of granting exclusive rights in knowledge that was previously part of a public domain is a longstanding theme in intellectual property scholarship. *See*, *e.g.*, James Boyle, *The Second Enclosure Movement and the Construction of the Public Domain*, 66 LAW & CONTEMP. PROBS. 33 (2003).

[49] Bowles, *supra* note 21 at 78. *See also id.*, at 70 (arguing that employers may favor *inefficient* technologies where doing so helps them contain workers' power and capture a higher share of profits).

[50] In using the term "productivity" I do not endorse a particular method for measuring productivity. I use the term simply to mean generating *more output per unit of input*. Purchasing a die press that is stronger and faster than an existing die press will enhance productivity in that sense; requiring assembly line workers to use the old die press at a faster pace will not. On some of the challenges of measuring productivity today, *see* Zia Qureshi, *A More Productive Debate About Productivity*, Georgetown Journal of International Affairs, at https://www.georgetownjournalofinternationalaffairs.org/online-edition/a-more-productive-debate-about-productivity. For the most part, the discussion below also brackets the

assembly line did not just homogenize work and enhance efficiency through specialized machinery but also enabled foremen to easily discern which workers were falling behind pace.[51]

Employers' choices of technology at the micro (firm) level can also, over time, influence the distribution of power at the macro level. In particular, as employers adopt technologies that alter the occupational structure over time, workers' capacities for collective action may be bolstered or undermined,[52] as will their capacities to establish and enforce legal regimes that protect their interests.[53] This can lead to feedback effects, as employers' decisions to use technology in one manner or another—and workers' abilities to resist—are then shaped by the institutional context in which both operate.[54] For example, scholars in comparative political economy have argued that firms' technological choices are shaped by patterns of economic coordination. In some economies with more centralized collective bargaining and complementary training systems, leading employers to maintain profitability by pursuing high value-added production strategies requiring greater and more specialized capital investment.[55]

---

contribution of human capital to productivity, but that issue is discussed in brief in Parts II.C (discussing upskilling and down-skilling that accompanies automation) and IV.B (summarizing comparative evidence on employers' investments in upskilling).

[51] Bowles, *supra* note 21 at 80.

[52] For example, the shift from craft to industrial production reduced workers' skills but also created opportunities for them to organize en masse within factories. *See*, *e.g.*, Chiara Benassi et al, *Explaining Divergent Bargaining Outcomes for Agency Workers: The Role of Labor Divides and Labour Market Reforms*, 25 EUR. J. OF INDUS. RELNS. 163, 165 (2018) (discussing different sources of worker power within contemporary production relationships, including skills, capacities for collective action, and legal or institutional protections.)

[53] This analysis reflects, in part, Karl Polanyi's theory of the state (and therefore law), in which "the exercise of state power fundamentally shapes the relative strength of different social actors." *See* Fred Block, *Polanyi's Double Movement and the Reconstruction of Critical Theory*, 38 PAPERS IN POL. ECON. __ (2008). *See generally* KARL POLANYI, THE GREAT TRANSFORMATION (1944). It also reflects Marc Galanter's classic insight that the U.S. legal system systematically favors the "haves," who have the capacity to fight for rules as well as outcomes in litigation. Marc Galanter, *Why the Haves Come Out Ahead: Speculations on the Limits of Legal Change*, 9 LAW & SOC. REV. 96 (1974).

[54] Employers in low-wage services may have especially powerful incentives to limit workers' power through technological and legal strategies, since it is more difficult to achieve steady productivity gains through capital investment in services than in manufacturing. *See generally* William J. Baumol, *Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crises*, 57 AM. ECON. REV. 415 (1967) (arguing that relative cost of services will increase over time as productivity growth lowers the cost of manufactured goods); *See also* Torben Iversen and Anne Wren, *Equality, Employment and Budgetary Restraint: The Trilemma of the Service Economy*, 50 WORLD POLITICS 507 (1998) (outlining economic challenges faced by modern service economies). *See also* Aaron Benanav, *Automation and the Future of Work—2*, 120 NEW LEFT REVIEW 117, 126-128 (2019) (noting relevance of Baumol's analysis in contemporary economy). The growing size and power of the financial sector has also increased pressure on companies to limit labor costs today. *See generally* EILEEN APPELBAUM AND ROSEMARY BATT, PRIVATE EQUITY AT WORK: WHEN WALL STREET MANAGES MAIN STREET (2014).

[55] Peter A. Hall & David Soskice, *An Introduction to Varieties of Capitalism*, in VARIETIES OF CAPITALISM: THE INSTITUTIONAL FOUNDATIONS OF COMPARATIVE ADVANTAGE at 38-39 (Hall &

This understanding of workplace technology as a source of power in itself, and as embedded in a thick institutional context, is distinct from mainstream treatments of the issue. Neoclassical labor economics, for example, tends to disregard power differentials emerging from either technology or social factors, on the theory that competitive markets will eliminate them.[56] Theories of skill-biased technological change similarly assume that technological change is productivity enhancing[57]—disregarding power-augmenting uses of technology—and de-emphasize employer strategies at both the micro- and macro-level to reduce worker power, unionization rates, and the real value of the minimum wage.[58] To be clear, firms are not mere takers of technology in such accounts—rather, they (or their suppliers) develop technologies to solve challenges they encounter during production. But because labor and product markets allocate factors of production more-or-less efficiently, firms that do not maximize productivity will suffer or even fail.[59] In contrast, the various studies of law and political economy noted above, and the analysis that follows in this article, suggest that companies use power-augmenting technologies often enough, and at such a scale, to have significant political-economic effects.[60]

Soskice, eds., 2001). *See also* KATHLEEN THELEN, VARIETIES OF LIBERALIZATION AND THE NEW POLITICS OF SOCIAL SOLIDARITY (2014) (refining varieties of capitalism framework to understand different patterns of market liberalization in advanced economies). *But see* Streeck, *Taking Capitalism Seriously*, *supra* note 36 at 22-25 (implicitly criticizing varieties of capitalism framework for its inattention to conflicts within capitalist societies).

[56] Michael L. Wachter, *Neoclassical Labor Economics: Its Implications for Labor and Employment Law, in* RESEARCH HANDBOOK ON THE ECONOMICS OF LABOR AND EMPLOYMENT LAW 21-24 (Estlund & Wachter eds., 2012) (summarizing "textbook" example of competitive labor market in which no party has power).

[57] *See generally* David H. Autor & David Dorn, *The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market*, 103 AM. ECON. REV. 1553, 1553 (2013) ("Technology in the canonical model [of skill-biased technological change] is assumed to take a factor-augmenting form, meaning that it complements either high- or low-skill workers"); *id.*, at 1559 (revising canonical model to account for automation as "computers substitute[] for low-skill workers performing routine tasks—such as bookkeeping, clerical work, and repetitive production and monitoring activities.")

[58] The canonical Autor & Dorn analysis, for example, assumes that skill levels and wages correspond perfectly, Autor and Dorn, *id.*, charts at pp. 1554, 1557. This disregards cases where low wages are a result of formal or functional exclusion from labor and employment laws. For example, agricultural and domestic workers are among the lowest paid in the country, but both are excluded from the NLRA. 29 U.S.C. 152(3) (2018). Many other workers lack real protections due to the "fissuring" of employment, discussed in Part III.B. *See also* Daron Acemoglu, Technical Change, Inequality, and the Labor Market, 60 J. Econ. Lit. 7, 10 (2002) (institutional changes may contribute to inequality, but those changes themselves are driven by technological changes).

[59] *See* Benkler, *Oligarchy supra* note 12 (unpacking and criticizing foundational assumptions of skill-biased technological change ("SBTC") theories). *See also* Paul Krugman, *Liberals and Wages*, N.Y. TIMES, July 17, 2015, (arguing that "the case for 'skill-biased technological change' as the main driver of wage stagnation has largely fallen apart"); David Card and Join E. DiNardo, *Skill-Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles*, 20 J. LAB. ECON. 733 (2002) (arguing that labor market data does not support SBTC theories).

[60] Employers' abilities to choose technologies are of course not limitless. Laws, norms of fair treatment, workers' responses, and product markets present real constraints in that regard. That said,

I.B. Employment Laws, Employment Structures, and Technological Change

Employment and labor laws shape this process by establishing and enforcing employers' and workers' rights with regard to workplace technology.[61] While the overall doctrine here is complex, its basic thrust is clear: Employers can typically gather data on workers' performance and workplace processes and can use that data to develop new workplace technologies and reshape production processes—regardless of workers' desires. This sub-Part summarizes several key laws and complexes of laws, delineated by italicized subheadings, and their effects on employers and workers rights to choose workplace technologies.

Employment-at-will and the persistence of the common law: By far the most important U.S. labor and employment law doctrine is the employment-at-will rule. Under employment-at-will, either party to an employment contract can terminate it at any time, for any reason (even a malicious one), so long as doing so is not otherwise unlawful. While this doctrine is no longer as robust as it once was,[62] it still shapes basic workplace power relations. For example, while employment-at-will grants the employer and employee formally equal entitlements to end an employment contract, those rights benefit employers in the run of cases since they engage in many employment contracts while workers typically engage in only one.[63]

Employment-at-will also reflects a deeply rooted sense that the employer *owns* the enterprise and enjoys sovereignty over it, in a manner familiar from classical property law, and encourages courts to view the employment relationship as based on freedom of contract and consent.[64] For example, it serves as a sort of "business judgment rule" for employment decisions: Unless there is evidence of other wrongdoing such as fraud or a statutory violation, the employment-at-will rule deters courts from second-guessing companies' decisions to terminate workers.[65] And

---

product and labor market constraints may not be as acute as is often assumed. Innovation may require a degree of monopoly power, which may mitigate product market pressures. *See*, *e.g.*, John Roemer, *Endogenous Technological Change*, 98 J. POL. ECON. S71 (1990). There is also growing evidence that monopsony is prevalent in contemporary labor markets, which limits workers' ability to move among jobs. For a recent summary of the data and surrounding policy debate, *see* Ioana Marinescu and Eric Posner, *A Proposal to Enhance Antitrust Protection Against Labor Market Monopsony*, (December 21, 2018). Available at SSRN: https://ssrn.com/abstract=3317575.

[61] For ease of exposition, I will use the term "rights" to refer to the full spectrum of Hohfeldian entitlements, including "claims," "privileges," "powers," and "immunities." Wesley Newcomb Hohfeld, *Some Fundamental Legal Conceptions as Applied in Judicial Reasoning*, 23 YALE L.J. 16 (2013).

[62] For example, there are various exceptions to and limitations on employment-at-will that have been developed under contract and tort doctrine, and via statute. *See* Cynthia Estlund, *Book Review: Rethinking Autocracy at Work*, 131 HARV. L. REV. 795, 803–805 (2018).

[63] Bowles & Gintis deem this "short-side power." Bowles & Gintis, *supra* note 40, at 184.

[64] *See* Cohen, *Property and Sovereignty*, *supra* note 39. *See also* De Stefano, *supra* note 5, at ___ to ___ [Part IV in draft on file with author] (discussing importance of "managerial prerogatives" to assign tasks and organize production, and tracing the intentional legal constitution of those prerogatives over time by courts and legislatures in various nations).

[65] Wachter, *supra* note 56 at 43; *see also* Richard Michael Fischl, *'A domain into which the King's*

because it enables termination of employment contracts without notice, it often enables employers to revise those contracts without notice. Various courts have held that workers' decisions to continue working absent a duty to do so constitutes consideration for what would otherwise be an impermissible unilateral change to terms, the addition of a binding arbitration clause, or even a covenant not to compete to an employment contract.[66] Employment-at-will also means that workers who complain about employer actions that are not otherwise unlawful—including, for example, the implementation of new monitoring systems or other new technologies—can be disciplined or terminated without remedy.[67]

Closely related to employment-at-will is the default rule of individual contracting rather than collective bargaining. This means that terms and conditions of employment are set through individual negotiations between employer and employee unless, and until, workers unionize.[68] By contrast, in other countries, workers often enjoy some collective workplace representation regardless of whether they have unionized. German works councils, for example, are enterprise-level bodies with rights to veto some management suggestions, including required overtime, as well as rights to be consulted on other issues, including scheduling, reductions in work, and technological changes..[69] The European Union has also mandated works councils with consultative rights at large multinational enterprises, though they are empowered only to consult with management.[70] Such bodies can encourage employers to use technologies in different ways, as discussed in Part IV. But they are unlawful in nonunionized workplaces in the United States.[71]

Collective bargaining and workplace technology: Labor law, which governs workers' collective action, union organizing, and the collective bargaining process, modifies these background rules somewhat. For example, in a nonunion workplace, a collective protest against a

---

writ does not seek to Run': Workplace Justice in the Shadow of Employment-at-Will, in LABOUR LAW IN AN ERA OF GLOBALIZATION: TRANSFORMATIVE PRACTICES AND POSSIBILITIES 253 (Joanne Conaghan, Richard Michael Fischl & Karl Klare eds., 2004).

[66] *E.g.*, *Asmus v. Pacific Bell*, 999 P.2d 71 (Cal. 2000) (employees' decision to continue work after employer's unilateral change to employee policies was consideration for employer's revised promises, such that new policies were binding on employees); *Lucht's Concrete Pumping, Inc. v. Horner*, 255 P.3d 1058 (Colo. 2011) (continued employment can constitute consideration for covenant not to compete); *Soto-Fonalledas v. Ritz-Carlton San Juan Hotel Spa & Casino*, 640 F.3d 471 (1st Cir. 2011) (bilateral promises to arbitrate constitute adequate consideration for arbitration clause).

[67] If workers do so collectively, they are protected against retaliation under the NLRA, *see* discussion, *infra* notes 72 to 74.

[68] Benjamin I. Sachs, *Enabling Employee Choice: A Structural Approach to the Rules of Union Organizing*, 123 HARV. L. REV. 655, 660 (2010).

[69] *See* Matthew Dimick, *Productive Unionism*, 4 U.C. IRVINE L. REV. 679, 688, n.49 (2014). *See generally* Joel Rogers & Wolfgang Streeck, eds., WORKS COUNCILS: CONSULTATION, REPRESENTATION, AND COOPERATION IN INDUSTRIAL RELATIONS (1995).

[70] Directive 2009/38/EC of the European Parliament and of the Council (6 May 2009).

[71] U.S. 29 U.S.C. 158(a)(2) (2018); *Electromation, Inc*. 309 NLRB 990, 998 (1992) (employer violated NLRA by unilaterally establishing "action committees" of workers and management to address employee complaints).

new workplace technology such as new machinery or a monitoring device that would lead the employer to increase the pace of work may be protected against employer retaliation.[72] This is an exception to employment-at-will, but it applies only in cases where the workers act collectively around a matter that affects terms and conditions of employment. In practice, nonunionized worker protests around technological change appear to be rare, or at least those protests have only rarely led to National Labor Relations Board ("NLRB") cases.[73] That may be because the employer could lawfully terminate workers if their jobs have become redundant due to technological change, even if it were prohibited from retaliating against them for such protests.

Once employees have unionized, employers have a duty to bargain with them in good faith over wages, hours, benefits, disciplinary policies, and other terms and conditions of employment.[74] This does limit employers' power to use new technologies in various ways. For example, unionized employers cannot begin to use new monitoring devices that would alter disciplinary practices without first bargaining with their employees' union.[75] Nor can a unionized employer evade collective bargaining obligations by moving operations to a new and more technologically advanced plant.[76]

But employers are only obligated to bargain over decisions to adopt technological innovations that would displace workers (as opposed to altering disciplinary or supervisory practices) "if the benefit, for labor-management relations and the collective-bargaining process, outweighs the burden placed on the conduct of the business."[77] The Supreme Court developed that standard in a case considering whether an employer had to bargain over decisions to outsource work.[78] It is rather employer-friendly, since it doesn't even put workers' interests in the balance, which may explain why there is little caselaw addressing the duty to bargain over labor-displacing innovations.[79] Employers must nevertheless bargain over the *effects* of such technological changes, which can ensure that they pay severance or put displaced workers into

---

[72] *See generally Labor Board v. Washington Aluminum Co.*, 370 U.S. 9 (1962) (holding that Section 7 of NLRA, 29 U.S.C. 157, prohibits employer from disciplining workers who engaged in collective protest around working conditions, even if the workers had no intention of unionizing.)

[73] *But see Legacy Trad. Such*., 2018 NLRB LEXIS 338 (Aug. 16, 2018) (non-union teacher's complaints about higher workload resulting from employers' request that teachers utilize new technologies are protected).

[74] 29 U.S.C. 158(a)(5) (2018).

[75] *Colgate-Palmolive Co.*, 323 NLRB 515 (1997).

[76] *See Leach Corp. v. NLRB*, 54 F.3d 802 (D.C. Cir. 1995).

[77] *First Nat'l Maintenance Corp. v. NLRB*, 452 U.S. 666, 679 (1981). *See also id.,* at 686 n.22 (whether employers must bargain over decisions to automate work must be decided on a case-by-case basis).

[78] Id.

[79] GORMAN AND FINKIN, LABOR LAW ANALYSIS AND ADVOCACY, § 21.6 at 806 (2013) (noting that there are few published opinions dealing with whether an employer must bargain over automation decisions).

other facilities.[80] In practice, though, the duty to bargain mostly means that the employer must meet and confer with the workers' union in good faith. If the parties do not reach an agreement, the workers can strike; but in doing so, they risk permanent replacement, and the employer can typically implement its plans without legal consequence.[81]

The rules around technological bargaining reflect general trends in our labor law, which often protects employers' common law prerogatives, again reflecting a classical conception of the workplace as the employer's property.[82] For example, while the National Labor Relations Act ("NLRA") protects the right to strike, the NLRB and Supreme Court have outlawed some of the most effective sorts of strikes, including sit-downs and intermittent strikes, often on the grounds that they interfere with employers' rights to control the workplace.[83] In a case with direct relevance to the uses of technology discussed below, the NLRB held that workers had no right to slow down their pace of work in protest of employer efforts to alter work processes. Such a slowdown, the NLRB reasoned, "constituted a refusal on [the workers'] part to accept the terms of employment set by their employer," and instead involved an effort to "to work on their own terms," which was *per se* unlawful.[84] The opinion cited another case that reasoned that if workers were able to limit their own hours through collective action, "it would follow that a similar right existed by which they could prescribe all conditions and regulations affecting their employment."[85] In this legal context, limiting workers' rights vis-à-vis technological innovation seems only natural, since technology is the employer's physical or intellectual property.

These rules resulted from historical battles over the scope of workers' rights, including their rights to a voice in technology. For example, in the late 19th and early 20th centuries, U.S. employers building the modern factory system wrested control over the pace and technical content of production from skilled craft workers. As Charles Sabel has argued, the triumph of Fordist production techniques was not inevitable, and in fact that craft-dominated production remained sustainable in other jurisdictions, including parts of Italy, until the present.[86] Another key moment was the 1947 Taft-Hartley Act, in which Congress explicitly sought to limit labor unions' power by restricting their rights to strike, making union organizing more difficult, and

---

[80] *First Nat'l Maintenance*, 452 U.S. at 681.

[81] *NLRB v. Mackay Radio*, 304 U.S. 333 (1938) (not an unfair labor practice to permanently replace economic strikers); *NLRB v. Katz*, 369 U.S. 736 (1962) (unfair labor practice for employer to make unilateral change before bargaining to impasse).

[82] *See generally* Klare, *supra* note 39; Karl Klare, *Judicial Deradicalization of the Wagner Act and the Origins of Modern Legal Consciousness*, 62 MINN. L. REV. 265 (1978).

[83] *NLRB v. Fansteel Metalurgical Corp.*, 306 U.S. 240 (1939) (outlawing sit-down strikes); *UAW Local 232 v. Wisconsin Employment Relations Board (Briggs & Stratton)*, 336 U.S. 245 (1949) (intermittent strikes).

[84] *Elk Lumber Co.*, 81 NLRB 333, 337 (1950).

[85] *Id.*, citing *C. G. Conn, Ltd. v. NLRB*, 108 F. 2d 390 (7th Cir. 1939).

[86] CHARLES SABEL, WORK AND POLITICS (1982).

narrowing the scope of employment.[87] Political scientists have argued that the Act shaped the postwar political economy by making new organizing difficult, which in turn encouraged unions to focus on improving conditions in individual workplaces and firms rather than achieving a voice in business decisions, and discouraged sector-wide mobilization and social democratic politics.[88]

The scope of employment: Another foundational rule is the legal definition of employment. That definition is essential to modern regulations, which typically levy duties only upon entities legally defined as employers, and typically allocate rights only to individuals legally defined as employees. Most statutes borrow the legal definition of employment from the common law of agency, which was developed to determine whether a worker or the company they worked for is responsible when a tort by the worker injured a third party; if the company enjoys the right to control the worker's performance, then the company is liable.[89] Indeed, the common law employment relationship was central to Ronald Coase's theory of the firm as a means of minimizing the transaction costs associated with market contracting.[90] As Coase put it, "it is the fact of direction which is the essence of the legal concept of 'employer and employee,' just as it was in the economic concept" of the firm.[91] A classic independent contracting relationship arises when the principal hires an independent business that brings specialized skills to the table, and is therefore best positioned to take precautions against harms to third parties.

The definition of employment under most statutes limits workers' power in two ways. First, though agency law's control test was a sensible means of allocating responsibility for harms to third parties, that test does not reflect the statutory purposes of employment regulations, which are to protect workers against social harms, such as low wages, unsafe working conditions, and discrimination.[92] Thus, it is arguably too narrow *per se*. Second, the scope of employment is

---

[87] *See generally* Klare, *Judicial Deradicalization*, *supra* note 82; Andrias and Rogers, *supra* note 227.

[88] Sean Farhang and Ira Katznelson, *The Southern Imposition: Congress and Labor in the New Deal and Fair Deal*, 19 STUDIES IN AM. POL. DEV. 1 (2005). Over time, the Taft-Hartley Act's limitations on workers' power encouraged unions to focus on winning a share of productivity gains rather than a voice in production strategies themselves. That balance of authority was formalized in the so-called "Treaty of Detroit," the landmark 150 UAW-GM contract in which GM "regained control over one of the crucial management functions in any line of manufacturing—long-range scheduling of production, model changes, and tool and plant investment," in exchange for a guaranteed share in productivity, and generous private benefits. *See* Daniel Bell, *The Treaty of Detroit*, at 53 FORTUNE (July 1950), cited in NELSON LICHTENSTEIN, THE MOST DANGEROUS MAN IN DETROIT at 280-81 (1995)

[89] RESTATEMENT (SECOND) AGENCY § 220 (1958) (listing factors that should be used to determine whether a relationship constitutes employment). For an historical account of the evolution of the difference between employment and independent contracting within employment and labor law, *see* V. B. Dubal, *Wage Slave or Entrepreneur? Contesting the Dualism of Legal Worker Identities*, 105 CALIF. L. REV. 101 (2017).

[90] Ronald Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937).

[91] Coase, *supra* note 90, at 404.

[92] *See, e.g.,* Noah Zatz, *Beyond Misclassification: Tackling the Independent Contractor Problem without Redefining Employment*, 26 ABA J. LAB. & EMPL. L. 279, 282–83 (2011); *see also Sec. of Labor*

often too narrow in operation. In part, this is because many work relationships do not fall neatly into either category (employee or independent contractor) and the doctrine is malleable. For example, the NLRB uses a multifactor test derived largely from agency law to determine employment status,[93] but the precise factors that the Board and the courts emphasize have varied over time and from case to case.[94] This leads to uncertainty and raises the costs of proving a violation, inviting a degree of arbitrage.

Those enforcement challenges, and the scope of employment itself, influence employers' technological decisions. Subcontracted workers and other nonemployees have few if any rights to protest new uses of technology, since they have few collective bargaining rights against the firms that utilize their labor. Yet, as discussed in Part III.C., new data-driven monitoring techniques can enable employers to keep a close watch on workers' performance even if they are far away from its physical plant and irrespective of their employment status.[95] This creates incentives for companies to formalize and standardize production processes and inputs in order to enable easier outsourcing and monitoring.

Workplace privacy laws: In theory, workplace privacy laws could serve as an important site for negotiations around control of workplace data and workplace technology. After all, many of today's workplace innovations involve monitoring workers more closely, which may violate norms of privacy. But workplace privacy laws give workers few rights to prevent their employer from gathering information about their conduct in the workplace, and even fewer rights to prevent their employers from monitoring their work. Notably, while employers' right to monitor the performance of work is now well-established under law and generally accepted as a norm, workers in the past often resisted such monitoring, sometimes even refusing to work if supervisors were present.[96]

Those privacy laws that do apply to workers are a patchwork. There is no general statutory right to workplace privacy in the United States, and workplace privacy is not understood to be a fundamental right as it is in Europe.[97] The common law privacy tort of intrusion upon seclusion is probably the most important generally applicable protection,[98] but it typically does not extend

---

v. Lauritzen, 835 F.2d 1529, 1544 (7th Cir. 1987) (Easterbrook, J., concurring) ("the reasons for blocking vicarious liability have nothing to do with the purposes of the FLSA.")

[93] *St Joseph News-Press*, 345 NLRB 474 , 477–78 (2005) (enumerating factors that include the skills required, the ownership of tools, the method of payment, the ability to hire staff without managerial approval, the parties' perception of the relationship, and the risk of loss or opportunity for profit.)

[94] *Compare Pennsylvania Academy of Fine Arts*, 343 NLRB 846 (2004) with *Lancaster Symphony Orchestra*, 357 NLRB No. 152 (2011).

[95] *See* discussion, *infra* Part III.C.

[96] MONTGOMERY, *supra* note 45 at __.

[97] *See, e.g.*, European Court of Human Rights, *Q&A: Grand Chamber Judgment in the Case of Barbulescu v. Romania* (no. 61496/08) (Sept. 5, 2017).

[98] RESTATEMENT (SECOND) TORTS § 652B (1977).

to employers' monitoring of work-related conduct, which is presumptively nonprivate.[99] And, to obtain damages for intrusion, as through an unduly invasive search, an employee must show that the employer's action was "highly offensive to a reasonable person."[100] Lawyers will generally not find it worthwhile to pursue such claims on behalf of workers without substantial resources given this high bar to recovery. Some states have stepped into the breach. Most notably, California adopted a general privacy statute in 2018, which requires businesses to inform consumers that they have a right to delete any personal information gathered by the business, including "employment-related information,"[101] but its impact on employees is not yet clear.[102]

Most privacy statutes are aimed at particular harms and practices. For example, the Federal Stored Communications Act protects workers' privacy in their personal email accounts,[103] but not in employer-provided email accounts.[104] Various states require employees' notice and consent before monitoring of telephone or electronic communications, though consent can often be easily obtained from at-will employees.[105] Health information is also protected under provisions of the Health Insurance Portability and Accountability Act and the Americans with Disabilities Act.[106] Finally, the NLRA protects employees' privacy in some circumstances, prohibiting employers

---

[99] *See*, *e.g.*, *Elgin v. St. Louis Coca-Cola Bottling Co.*, 2005 WL 3050633 (E.D. Mo. Nov. 14, 2005) (employer's installation of GPS tracker on company-owned van driven by plaintiff cannot support intrusion upon seclusion claim); *O'Bryan v. KTIV Television*, 868 F. Supp. 1146 (N.D. Iowa 1994) (employer can search employee's desk area for work-related documents without violating employee's reasonable expectations of privacy); *Terrell v. Rowsey*, 647 N.E.2d 662 (Ind. Ct. App. 1995) (employer search of employee's personal vehicle was reasonable where done to investigate drinking on employer's property). *See generally* Pauline T. Kim, *Data Mining and the Challenges of Protecting Employee Privacy under U.S. Law*, 40 COMP. LAB. L. & POL'Y J. 405 (2019).

[100] *E.g.*, *K-Mart Corp. Store No. 7441 v. Trotti*, 677 S.W.2d 632, __ (Ct. App. Tex. 1984).

[101] California Senate Bill 1121 (2018).

[102] Legislation was proposed in 2019 would eliminate the coverage of employees. California Assembly Bill 25 (2019). That did not pass, but advocates expect it may be introduced again in the next legislative session.

[103] 18 U.S.C. §§ 2701 *et seq* (2018)

[104] 18 U.S.C. § 2701(c)(1) (2018).

[105] *See* MATTHEW W. FINKIN, PRIVACY IN EMPLOYMENT LAW 1076-89 (5th ed. 2018). Various states also require forbid employers from gathering biometric data on employees, *e.g.*, 740 Ill. Comp. Stat. 14/1 (2018); Tex. Bus. & Com. Code Ann. § 503.001 (West 2017); Wash. Rev. Code §§19.375.010 - .900 (2018). Others forbid employers to request employees' social media passwords. LITTLER MENDELSON, P.C., THE BIG MOVE TOWARD BIG DATA IN EMPLOYMENT 14 (2015) (showing that 21 states had passed such laws by 2015).

[106] HIPAA Privacy Rule, 45 CFR Part 160 (2018); EQUAL EMPLOYMENT OPPORTUNITY COMMISSION, ENFORCEMENT GUIDANCE ON DISABILITY-RELATED INQUIRIES AND MEDICAL EXAMINATIONS OF EMPLOYEES UNDER THE AMERICANS WITH DISABILITIES ACT (ADA), (July 27, 2000), *available at* https://www.eeoc.gov/policy/docs/guidance-inquiries.html. The Fair Credit Reporting Act also limits employers' rights to gather data about employees and potential employees. 15 U.S.C. §§ 1681 et seq (2018). *But see EEOC v. Freeman*, 778 F.3d 643 (4th Cir. 2015) (upholding summary judgment for defendant in disparate impact claim based on background checks that gathered financial data in part because EEOC's expert testimony on matter deemed unreliable).

from surveilling or monitoring workers for the purpose of preventing unionization or other lawful concerted action.[107] Again, however, these are exceptions to the general rule, and none of them touch everyday monitoring of work.

Intellectual property rights: While a full treatment of their influence is beyond the scope of this article, intellectual property doctrines also affect the course of workplace technological development. For example, Walmart recently patented a device that would monitor conversations near check-out counters to help supervise cashiers and to determine whether customers are becoming frustrated.[108] It is not clear from the patent application, but machine learning that enables natural language processing may be essential to that device's performance, for reasons discussed in Part II.B. Uber, meanwhile, has patented aspects of its business processes that match riders with drivers,[109] as well as aspects of its autonomous vehicle technology, both of which draw on data generated by drivers.[110] Other aspects of production processes may be protected as trade secrets, whether or not they are patentable. Those include algorithms used to optimize internal processes, including machine learning programs and the databases of information on workers' performance that they utilize,[111] and algorithms used in hiring efforts.[112] As Orly Lobel has demonstrated, companies today are using intellectual property and related doctrines, including covenants not to compete and non-solicitation clauses, to claim property rights in what was previously workers' own "cognitive property."[113] While Lobel focused on highly skilled workers, a similar process seems underway for less-skilled workers, as discussed in Parts II and III, as companies extract and formalize workers' tacit knowledge and then utilize it in production.[114]

In sum, this complex of rules illustrates the continuing influence of classical property rights and notions of freedom of contract on employment relationships. The "bundle of rights" includes employer rights to monitor nearly all work-related activities, to glean data from that monitoring, to develop new technologies and implement them into the workplace, and to discipline or terminate workers who object. Workers retain important rights too, but the overall tilt of the

---

[107] *See*, *e.g.*, *Local Joint Exec. Bd. v. NLRB*, 515 F.3d 942, 945–47 (9th Cir. 2008) (summarizing test for unlawful surveillance under NLRA).

[108] *Listening to the Front End*, U.S. Patent No. 10,020,004 (Jul. 10, 2018).

[109] E.g., *Real-time Resource Management for On-Demand Services*, U.S. Patent 10460411 (Oct. 29, 2019).

[110] *Neural Network System for Autonomous Vehicle Control*, U.S. Patent 10452068 (Oct. 22, 2019).

[111] Jeanne C. Fromer, *Machines as the New Oompa-Loompas: Trade Secrecy, The Cloud, Machine Learning, and Automation*, 94 N.Y.U. L. REV. 706, 721-24 (2019) (arguing that machine learning algorithms and the datasets they utilize are often protectable as trade secrets).

[112] Jamillah Bowman Williams, *Diversity as a Trade Secret*, 107 GEO. L.J. 1685, 1702, 1707 (2019).

[113] Orly Lobel, *The New Cognitive Property: Human Capital Law and the Reach of Intellectual Property*, 93 TEX. L. REV. 798 (2015).

[114] *See* discussion, *infra* Parts II and III. Non-competes are often unenforceable against low-wage workers, but they may still deter workers from taking jobs with competitors.

doctrine is clear: It grants employers significant authority to determine the course of technological development.

II. Automation and Digital Taylorism

Public debates around the impact of technology on work have focused on automation, or the use of technology to perform tasks previously undertaken by human beings, and the possibility of a wave of technological unemployment. This Part develops a more nuanced account of automation today—one that reflects the limits of existing technologies and acknowledges that workplace power dynamics influence companies' automation decisions. Part II.A summarizes a prominent framework developed by a labor economist to understand automation potential based on the mixture of tasks performed in a given job, and summarizes economic data indicating that automation is not a world-historical threat today. Part II.B then explores the promise and limits of machine learning, the branch of AI that has sparked extensive debate around automation. While this requires a brief detour from the article's major argument, it should help dispel worries about a looming automation wave, and also sets up Part III's argument that AI is altering management practices. Part II.C then unpacks how the law and political economy of work affect companies' decisions around which tasks to automate, as well as how to reorganize production after automation.

II.A. Automation: Tasks versus Jobs

Companies do not typically automate entire jobs at once. Rather, most jobs are made up of many distinct tasks, and companies automate some of those tasks while leaving others untouched. The labor economist David Autor and coauthors have developed a fairly intuitive division of such tasks into three categories, based on those tasks' susceptibility to automation. The categories are "routine," "abstract," or "manual."[115] "Routine" tasks "follow an exhaustive set of rules and hence are readily amenable" to automation. Those can be physical tasks, such as putting a bolt into an automobile chassis or moving a shelf in a warehouse, or cognitive tasks, such as spell-checking, multiplication, or data entry. Jobs primarily made up of such tasks, particularly in clerical fields, administrative support, and industrial production, have already been hit hard by automation.[116] Indeed, industrial automation is a major reason for the steady

[115] *See generally* David Autor, *Polanyi's Paradox and the Shape of Employment Growth*, *in* Federal Reserve Bank of St. Louis: Economic Policy Proceedings, Reevaluating Labor Market Dynamics (2015). *See also* David H. Autor, *Why Are There Still So Many Jobs? The History and Future of Workplace Automation*, 29 J. ECON. PERSP. 3 (2015) ("even expert commentators tend to overstate the extent of machine substitution for human labor and ignore the strong complementarities between automation and labor that increase productivity, raise earnings, and augment demand for labor.")

[116] Autor, *Polanyi's Paradox*, *supra* note 115 at 135.

decline in manufacturing jobs in the United States since 1979, a decline that has left the bulk of less-skilled and mid-skilled workers in service positions.[117]

The other two categories of tasks—"abstract" tasks and "manual" tasks—have proven stubbornly resistant to automation. Abstract tasks "require problem-solving capabilities, intuition, creativity and persuasion."[118] Many high-wage professional, managerial, and technical jobs are made up primarily of abstract tasks. Such jobs often consist of making high-level situational judgments—*Does this patient have lung cancer? Is this lawsuit meritorious? Should we invest in this new line of business?*—that others eventually implement. Those judgments require some knowledge of human behavior, norms, or other social factors that existing technologies cannot replicate, for reasons discussed below. Those difficulties have led three University of Toronto Business School professors to argue that, for the foreseeable future, new forms of artificial intelligence will often enhance professionals' judgment capabilities by generating predictions about the likely effects of particular decisions, but they will not replace professionals *en masse*.[119]

"Manual" tasks, finally, involve "situational adaptability, visual and language recognition, and in-person interactions." This category includes "food preparation and serving jobs, cleaning and janitorial work, grounds cleaning and maintenance, in-person health assistance by home health aides, and numerous jobs in security and protective services."[120] It also includes many jobs in retail, where shelf stocking, assisting customers, and checking customers out all require similar skills. And it likely includes work for "platform economy" firms such as Uber and Lyft, and delivery services such as Deliveroo and Instacart. A world-historic wave of automation would require robotics to replace huge numbers of workers whose jobs consist largely of such "manual" tasks. To replicate the manual dexterity, situational judgments, and language skills required to work as a barista, waiter, cook, delivery driver, or home care worker would require both that artificial intelligence approach, or reach, human levels of intelligence *and* that artificially intelligent systems could be integrated into highly advanced robotics. Neither seems likely soon, for reasons discussed in Part II.B.

Before doing so, it is worth noting that labor market data largely supports Autor et al.'s analysis. For example, while it is challenging to determine changes in the rate of automation in historical perspective, in part because automation can take many different forms, recent productivity statistics suggest it is not occurring at a high rate today. If companies were installing robotics in historically high numbers, we would likely see significant increases in productivity

---

[117] Autor, *Polanyi's Paradox*, *supra* note 115 at 140.

[118] Autor, *Polanyi's Paradox*, *supra* note 115 at 138.

[119] *See generally* AJAY AGRAWAL ET AL., PREDICTION MACHINES: THE SIMPLE ECONOMICS OF ARTIFICIAL INTELLIGENCE (2018).

[120] Autor, *Polanyi's Paradox*, *supra* note 115 at 138. *See also* David Deming, *The Growing Importance of Social Skills in the Labor Market*, 132 Q. J. ECON. 1593 (2017).

growth, as firms were able to substantially increase output with fewer workers. Instead, labor productivity growth has recently been as slow as at any time since World War II.[121] Productivity growth in the manufacturing sector—where automation has historically been easiest—has been especially tepid lately, at 0.7 percent over the last decade.[122] Levels of "occupational churn," or the net creation of jobs in growing occupations and loss of jobs in declining occupations, are also low today.[123]

Nor does it appear likely that companies are generally gearing up to install new technologies. If they expected artificial intelligence and highly advanced robotics to be a major source of productivity growth in the near future, they would presumably be investing heavily in information technology. They are not. Computers and software constituted 13.5 percent of the value of companies' investments from 2000 to 2007, as the internet was coming into wide use. Over the last decade that rate declined to 4.8 percent.[124] Meanwhile, unemployment has not jumped in the United States, despite higher minimum wage laws in many states,[125] and various European countries are facing labor shortages, rather than labor surpluses, even in manufacturing, despite having higher labor costs.[126] While it is possible that those data reflect a lag between the development of new technologies and their implementation, it seems more likely to reflect the limits of the technologies themselves, for reasons discussed immediately below.

---

[121] Productivity growth averaged 2.8 percent annually from 1945 to 1970, and 2.2 percent annually during the 1990s dot-com boom, but has hovered around 1.2 percent annually for the last decade. US Bureau of Labor Statistics, *Labor Productivity and Costs*, *at* https://www.bls.gov/lpc/prodybar.htm (last modified May 3, 2018). *See also* JASON FURMAN ET AL, ARTIFICIAL INTELLIGENCE, AUTOMATION, AND THE ECONOMY, EXECUTIVE OFFICE OF THE PRESIDENT at 9-10 (December 2016) (noting slowdown in both labor productivity growth generally, and in total factor productivity growth, which is taken as a measure for the portion of productivity growth attributable to technological change). The slowdown is not limited to the U.S.; productivity growth slowed in 30 of 31 advanced economies from 2005-2015. *Id.*, at 10. *See also* Aaron Benanav, *Automation and the Future of Work—1*, 119 NEW LEFT REVIEW 5 (2019), Aaron Benanav, *Automation and the Future of Work—2*, 120 NEW LEFT REVIEW 117 (2019) (attributing slowdown in economic growth to global industrial overcapacity).

[122] US Bureau of Labor Statistics, *Labor Productivity and Costs*, *available at* https://www.bls.gov/lpc/prodybar.htm (last modified May 3, 2018).

[123] Robert D. Atkinson & John Wu, *False Alarmism: Technological Disruption and the U.S. Labor Market, 1850–2015*, Information Technology & Innovation Foundation, at 20 (May 2017).

[124] US Bureau of Labor Statistics, *News Release, Multifactor Productivity Trends – 2017* (Mar. 21, 2018), *available at* https://www.bls.gov/news.release/archives/prod3_03212018.htm.

[125] *See U.S. Bureau of Labor Statistics, Labor Force Statistics from the Current Population*, *available at* https://data.bls.gov/timeseries/LNS14000000 (last visited Jan. 19, 2019) (showing unemployment falling under 4 percent starting in April of 2018).

[126] Liz Alderman, *Danish Companies Seek to Hire, but Everyone's Already Working*, N.Y. TIMES (Feb. 28, 2017). Autor's model also matches what the BLS has tracked over the last decade. U.S. Bureau of Labor Statistics, *Projections of Occupational Employment, 2016–26* (Oct. 2017), *available at* https://www.bls.gov/careeroutlook/2017/article/occupational-projections-charts.htm (last visited Jan. 19, 2019) (showing contraction in manufacturing and some clerical tasks but expansion in health care and social assistance and leisure and hospitality, as well as wholesale trade, and utilities).

II.B. The Limits of Contemporary Automation

Contemporary automation fears have largely pivoted off developments in the subfield of AI known as machine learning. While machine learning is not new, several papers in the early 2010s demonstrated how the technique could be used for purposes of image recognition.[127] That sparked extensive investment in it by tech companies.[128] It will, therefore, be helpful to have a basic understanding of the promise and limits of machine-learning technology.

II.B.i. The Promise and Limits of Machine Learning

Machine learning is "essentially a statistical technique for classifying patterns, based on sample data."[129] For example, a relatively simple system can determine whether a particular picture is of a dog or a cat.[130] Programmers would "train" it by uploading thousands of pictures of dogs and cats (the training data), appropriately labeled, into the machine. The machine would then develop statistical correlations between the pixels in images labeled "dog" or "cat" and the outcomes "dog" and "cat," and programmers would adjust its analyses until it was able to recognize them accurately. Where the datasets are large enough and standardized, the results can be remarkably precise. Distinguishing cats from dogs is trivial, but machine learning may be able to help determine whether particular moles are cancerous and to help interpret radiological scans.[131] Google uses a deep neural network known as RankBrain to help in search responses,[132] another to play games such as Go,[133] and yet another to develop fairly precise language recognition and translation.[134]

Starting in the mid-2010s, various commentators extrapolated from these developments to predict a historic automation wave.[135] The logic is as follows. The inputs to machine learning and

---

[127] *E.g.*, Alex Krizhevsky et al., *ImageNet Classification with Deep Convolutional Neural Networks*, 60 COMMS. OF THE ACM 84 (June 2017); Dan Ciresan et al., *Multi-column Deep Neural Networks for Image Classification*, IDSIA Technical Report No. IDSIA-04-12 (Feb. 2012), *available at* https://arxiv.org/abs/1202.2745.

[128] *See generally* Gary Marcus, *Deep Learning: A Critical Appraisal*, at 3 (Jan 2, 2018), *available at* https://arxiv.org/abs/1801.00631.

[129] Marcus, *supra* note 128 at 3.

[130] *E.g.*, Sandipan Dey, *Dogs vs. Cats: Image Classification with Deep Learning using TensorFlow in Python*, Data Science Central (Aug. 14, 2017) *at* https://www.datasciencecentral.com/profiles/blogs/dogs-vs-cats-image-classification-with-deep-learning-using.

[131] Stanford ML Group, *MURA: Bone X-Ray Deep Learning Competition*, *available at* https://stanfordmlgroup.github.io/competitions/mura/ (last visited Jan. 19, 2019).

[132] Cade Metz, *AI Is Transforming Google Search. The Rest of the Web Is Next*, Wired (Feb. 4, 2016).

[133] Google, *AlphaGo*, *available at* https://deepmind.com/research/alphago/ (last visited Jan. 19, 2019).

[134] Quoc V. Le & Mike Schuster, *A Neural Network for Machine Translation, at Production Scale*, Google AI Blog (Sept. 27, 2016), *available at* https://ai.googleblog.com/2016/09/a-neural-network-for-machine.html.

[135] My argument in this paragraph draws on discussions of "exponentialism" popularized by RAY KURZWEIL, THE AGE OF SPIRITUAL MACHINES: WHEN COMPUTERS EXCEED HUMAN INTELLIGENCE (2000) (arguing that technological capacities are today growing at an exponential rate). ERIK

some other forms of AI—good data on social processes and processing power—are both becoming cheaper over time.[136] Regarding data, many contemporary technologies are not just *using* datasets but also *generating* them, which suggests that machine learning devices may, over time, replicate more and more tasks currently performed by humans. In a clear echo of Taylorism, two economists wrote in a report for the Census Bureau that "the act of collecting data serves to codify information, which makes it more explicit and less tacit," thus enabling automation and other changes to production processes.[137]

While ongoing task substitution is sure to continue, prominent arguments for a looming automation go much further. They often insist that algorithms are now becoming exponentially more powerful—just as data sources and processing power expand exponentially[138]—and that we will soon pass a threshold into "artificial general intelligence" that can replicate all cognitive tasks that a human can perform, and which would itself then continue to improve exponentially.[139] To be clear, this argument seems speculative. Yet, it is common in public-facing writing on the future of work. What's more, very powerful artificial intelligence would likely be *required* to replicate the emotional intelligence and other skills that predominate in today's low-wage labor market.[140]

For better or for worse, there is no evidence that we are experiencing exponential progress toward artificial general intelligence, or even in task displacement.[141] Meanwhile, it appears

---

BRYNJOLFFSON AND ANDREW MCAFEE, THE SECOND MACHINE AGE, Chapter 3 (2016) (discussing possibility of accelerating technological change due to exponential progress in underlying technologies); KLAUS SCHWAB, THE FOURTH INDUSTRIAL REVOLUTION at 11 (2016) (citing favorably BRYNJOLFFSON AND MCAFEE), *id*. at Chapter 3 (discussing expected exponential progress); ANDY STERN (WITH LEE KRAVITZ), RAISING THE FLOOR: HOW A UNIVERSAL BASIC INCOME CAN RENEW OUR ECONOMY AND REBUILD THE AMERICAN DREAM 57–60 (2016) (same); PEDRO DOMINGOS, THE MASTER ALGORITHM: HOW THE QUEST FOR THE ULTIMATE LEARNING MACHINE WILL REMAKE OUR WORLD at 43–45 (2015) (by computer scientist); MARTIN FORD, RISE OF THE ROBOTS: TECHNOLOGY AND THE THREAT OF A JOBLESS FUTURE at 229–48 (2015).

[136] Progress in processing power is due to "Moore's law," or the pattern that processing speed tends to double roughly every 18 months. *Moore's law*, Wikipedia, *available at* https://en.wikipedia.org/wiki/Moore%27s_law (last visited Jan. 19, 2019). *But see* Tom Simonite, *Moore's Law Is Dead. Now What?*, MIT TECH. REV. (May 13, 2016) (arguing that progress in chip speed has reached hard physical limits).

[137] *See* BRYNJOLFSSON AND MCELHERRAN, DATA IN ACTION: DATA-DRIVEN DECISION MAKING IN U.S. MANUFACTURING, U.S. CENSUS BUREAU, CENTER FOR ECONOMIC STUDIES, Report 10-06 at 5 (Jan 2016).

[138] *See* sources cited *supra* note 135 (discussing exponentialism).

[139] NICK BOSTROM, SUPERINTELLIGENCE: PATHS, DANGERS, STRATEGIES 26-62 (2014) (discussing paths to "superintelligence").

[140] *E.g.*, FORD, *supra* note 135, at 83–128 (discussing displacement of white collar jobs).

[141] The following argument regarding the limits of machine learning is heavily indebted to Rodney Brooks' and Gary Marcus' work. *See generally* Rodney Brooks, *The Origins of Artificial Intelligence*, Rodney Brooks (Apr. 27, 2018), *available at* https://rodneybrooks.com/forai-the-origins-of-artificial-intelligence/ (noting that recent academic publications in the field are modest and theoretical); GARY

likely that machine learning is not a path to artificial general intelligence.[142] The underlying problem, as one journalist put it, is that machine learning systems are "greedy, brittle, opaque, and shallow."[143] They are "greedy" in that they require enormous processing power and human oversight to develop, which limits their scalability.[144] They are "brittle" in that they are robust with regard to their training data—but only that data; it remains difficult to transfer a machine learning algorithm's findings into another domain. They are "opaque" in the sense that their operations are often inscrutable to programmers, which makes it difficult to reverse-engineer them and replicate their success. Most importantly, they are "shallow" because they "possess no common sense about the world or human psychology."[145] As a result, minor changes in the input layer can lead systems to fail. For example, a recent study found that such programs had difficulty recognizing the same animal in different frames of a video, identifying a polar bear "as a baboon, mongoose, or weasel depending on minor shifts in the background."[146]

II.B.ii. The Challenges of Contemporary Automation

The machine learning efforts discussed immediately above all took place in experiments in controlled environments, and typically in online spaces, and yet were buggy. The challenges of using machine learning to replace humans quickly compound once algorithm-powered machines such as autonomous vehicles encounter the physical world. Most such vehicles "employ a 'sense-plan-act' design," in which a suite of sensors gathers information about the environment such as lane markings, obstacles, and other vehicles, and then algorithms interpret that information and respond.[147] That strategy has enabled engineers to automate *many* of the subtasks involved in performing an operation. For example, it now seems technologically

---

MARCUS AND ERNEST DAVIS, REBOOTING AI: BUILDING ARTIFICIAL INTELLIGENCE WE CAN TRUST (2019) (elaborating argument that machine learning is not a path to artificial general intelligence). *But see id.*, at 203-206 (predicting that once artificial general intelligence is developed, using tools other than machine learning which are not yet available, it will have displace a substantial number of workers).

[142] Steve LeVine, *Artificial Intelligence Pioneer Says We Need to Start Over*, AXIOS (Sep. 15, 2017) (programmer who developed "back-propagation" method that is at the heart of machine learning now believes it is a dead end).

[143] Jason Pontin, *Greedy, Brittle, Opaque, and Shallow: The Downsides to Deep Learning*, WIRED (Feb. 2, 2018).

[144] *See* Rodney Brooks, *Machine Learning Explained*, Rodney Brooks (Aug. 28, 2017), *available at* https://rodneybrooks.com/forai-machine-learning-explained/. The need to hand-code data has limited IBM's progress in using machine learning for medical diagnostics. Casey Ross & Ike Swetlitz, *IBM Pitched its Watson Supercomputer as a Revolution in Cancer Care. It's Nowhere Close*, Stat (Sept. 5, 2017), *at* https://www.statnews.com/2017/09/05/watson-ibm-cancer/.

[145] Pontin, *supra* note 143.

[146] Aharon Azulay & Yair Weiss, *Why Do Deep Convolutional Networks Generalize So Poorly to Small Image Transformations?*, arXiv (May 30, 2018), *available at* https://arxiv.org/abs/1805.12177. *See also* Marcus, *supra* note 94 (describing machine learning program trained on even numbers that was baffled by odd numbers).

[147] RAND CORPORATION: AUTONOMOUS VEHICLE TECHNOLOGY: A GUIDE FOR POLICYMAKERS 61–63 (2016).

feasible to automate the tasks of plotting a course, accelerating, steering, braking, and sensing other vehicles under many circumstances.

But companies cannot yet take a human with situational judgment out of the picture entirely, because unexpected things happen on roads all the time, including extreme weather, intoxicated people running into the road, items flying off of other cars, police redirecting traffic to go the wrong way in a lane, etc. In such cases, it is insufficient to make a statistical inference from a dataset of past occurrences, since the situation being confronted does not appear in the training data.[148] A glitch of this sort helped cause one of Uber's self-driving cars to hit and kill a pedestrian in 2018, as the image-recognition devices misidentified the pedestrian and therefore did not respond in time.[149] While human judgments are also flawed, a human driver in that situation would likely have had little difficulty recognizing the cyclist or at least would have slowed while deciding what to do. Due to these and related limitations, companies in the autonomous vehicle sector have sought to lower investors' expectations over the past year.[150]

There are also major technical challenges to the full displacement of manual workers rooted in the limits of contemporary robotics.[151] Some of these involve limits of machine learning, while others involve technical limitations in the design and strength of robotic devices.[152] Promotional videos by the robotics company Boston Dynamics show humanoid and dog-like

---

[148] MARCUS AND DAVIS *supra* note 141 at ___.

[149] Filip Piekniewski, *AI Winter Is Well on Its Way*, Piekniewski's Blog (May 28, 2018), *available at* https://blog.piekniewski.info/2018/05/28/ai-winter-is-well-on-its-way/. *See also* Amir Efrati, *Waymo's Big Ambitions Slowed by Tech Trouble*, THE INFORMATION (Aug. 28, 2018) (autonomous vehicles being tested in Phoenix were often unable to turn left, or stopped suddenly, irritating other drivers).

[150] Cory Weinberg, *At CES, New Questions Emerge as Self-Driving Ambitions Narrow*, THE INFORMATION (Jan. 11, 2019). Neal E. Boudette, *Despite High Hopes, Self-Driving Cars Are 'Way in the Future'*, N.Y. TIMES (July 17, 2019).

[151] There is remarkably little hard data on the impact of automation on work, particularly given the prominence of automation fears in public debates. One recent study by Daron Acemoglu and Pascual Restrepo found that the introduction of robots had led to net employment losses and declines in wages in local labor markets between 1990 and 2007. Daron Acemoglu and Pascual Restrepo, *Robots and Jobs: Evidence from U.S. Labor Markets*, NBER Working Paper No. 23285 (March 2017), at https://www.nber.org/papers/w23285. The net findings were nevertheless relatively modest: in manufacturing, each robot per thousand workers eliminated around six jobs within the local labor market, and reduced wages by between 0.25 and 0.5 percent. Acemoglu and Restrepo, *Robots and Jobs*, at __. A review of the data by the Economic Policy Institute pointed out that the paper found that forms of automation other than industrial robotics had neutral or even positive effects on employment; argued that the paper had not adequately accounted for job creation within other labor markets during the same period; and argued liberalized trade led to four times as many net job losses as industrial robotics during that time period. LAWRENCE MISHEL AND JOSH BIVENS, THE ZOMBIE ROBOT APOCALYPSE ARGUMENT LURCHES ON, ECONOMIC POLICY INSTITUTE (May 24, 2017).

[152] *See*, *e.g.*, James Vincent, *Pioneering creator of collaborative 'cobots' Rethink Robotics shuts down*, THE VERGE, (Oct. 4, 2018) (reporting that a leading co-bot company had shut down due to low sales, and challenges that arose trying to balance a tension between two goals: keeping the co-bots safe to work alongside, and engineering them to be strong and accurate enough to perform the tasks required.)

robots walking through forests unattended, opening doors so they can escape buildings, and even performing backflips. But the robots are not actually autonomous: The company has admitted that they are either programmed in exquisite detail in how to perform particular tasks or are remotely controlled by humans.[153] Until robots can move autonomously, and have substantial manual dexterity,[154] they cannot replace human workers in jobs that require navigating highly irregular and unpredictable physical and social environments, such as package delivery, landscaping, housekeeping, and home care.[155] Even industrial automation isn't nearly as simple in contemporary factories as it was for some tasks in heavy industrial production. For example, the Taiwanese electronics giant Foxconn, which assembles Apple products, has slowed a planned automation of its factories because it has found it difficult to reprogram robots quickly enough to manufacture goods on the short timeframes required in modern consumer product markets.[156]

II.C. The Political Economy of Automation

These technical limits have implications for the political economy of work. A fully automated factory or fleet of vehicles would avoid labor politics entirely—no strikes, no protests, and no need to cater to community norms. But when employers cannot automate entire jobs, they must determine which tasks to automate and how to reorganize production processes afterward. That involves reassigning groups of workers and reshaping their jobs, which can bring labor politics back into the picture.

Amazon's incorporation of robotics into its warehouses is illustrative. Due to the limits of robotic hands and of humanoid robots generally, it isn't possible for robots to roam a warehouse's shelves to grab items.[157] Amazon has instead developed an army of robots to carry shelves from a storage area to human "pickers" who then find the appropriate goods, grab them, and put them into plastic bins.[158] The effects of these automation efforts on workers are complex. Some of the job growth in Amazon's warehouses has been among higher-skilled workers that the

---

[153] Cade Metz, *These Robots Run, Dance and Flip. But Are They a Business?*, N.Y. TIMES (Sept. 22, 2018).

[154] That requires progress in robotic hands, which has been slow due to the simple physical complexity of human hands. Sean Captain, *Why It's So Hard For Robots To Get A Grip*, FAST COMPANY (Jan 12, 2017).

[155] Matt Beane, *In Automation, the 'Last Motion' Will Come Before the Last Mile*, WIRED, (Apr. 23, 2019).

[156] He Huifeng, *Foxconn hits bumps in road to full automation*, SOUTH CHINA MORNING POST (Jul. 29, 2016).

[157] Nick Statt, *Amazon Says Fully Automated Shipping Warehouses Are At Least a Decade Away*, THE VERGE, May 1, 2019. *See also* conversation notes of discussions with warehouse managers, taken by Frank Levy, shared with author and on file, dated May 13, 2009.

[158] Will Knight, *Inside Amazon's Warehouse, Human-Robot Symbiosis*, MIT TECH. REV. (Jul. 7, 2015); Nick Wingfield, *As Amazon Pushes Forward with Robotics, Workers Find New Roles*, N.Y. TIMES (Sept 10, 2017).

company trained to manage robots.[159] But many of the remaining jobs have become more repetitive. As a recent *New York Times* piece put it, "Unlike pickers in manual warehouses," who walk among shelves to find goods, "the pickers [at a semiautomated warehouse] have almost no relief from plucking goods off shelves, other than their breaks."[160] In some warehouses, the particular bin on a shelf where goods can be found lights up.[161] This means that the job of a picker requires little training and little firm-specific or warehouse-specific knowledge. That should put downward pressure on wages by enabling almost anyone to do the job.[162]

Another example comes from Uber's operations, though it does not involve physical automation. Uber has long sought to develop fully autonomous vehicles, in part so that it could dispense with drivers, who are the company's dominant expense.[163] Uber slowed that program down following the fatal crash noted above,[164] but some of the technologies involved are also fueling its existing app. For example, it has integrated GPS-powered navigation into the drivers' side of its app and may be able to continuously improve it using data from past rides.[165] But this is also a form of deskilling, or job "homogenization" in Bowles' terms,[166] since taxi drivers' specialized knowledge of how to navigate a crowded city was historically a source of labor market power.[167] In essence, Uber has captured or replicated some of taxi drivers' tacit knowledge and craft skills, which it now leases to drivers.[168] As with the Amazon case, this means that almost anyone can do the job, putting downward pressure on wages.

These examples suggest that companies today have incentives to selectively automate tasks that give workers some labor market power, just as they have in the past.[169] They also highlight

---

[159] Wingfield, *supra* note 158. Ben Casselman and Adam Satariano, *Amazon's Latest Experiment: Retraining Its Work Force*, N.Y. TIMES (Jul. 11, 2019).

[160] Noam Scheiber, *Inside an Amazon Warehouse, Robots' Ways Rub Off on Humans*, N.Y. TIMES, (Jul. 3, 2019)

[161] Id.

[162] *See also* Noam Scheiber, *Amazon and Union at Odds Over Firing of Staten Island Warehouse Worker*, N.Y. TIMES (March 20, 2019) (discussing allegations that company retaliated against workers for seeking to unionize).

[163] *See* Aarian Marshall, A *Bet on Uber is a Bet on Self-Driving*, WIRED, May 10, 2019.

[164] *See* Michael Laris, *Nine Months After Deadly Crash, Uber is Testing Self-Driving Cars Again in Pittsburgh*, WASH. POST, Dec. 20, 2018 (noting that the company ceased tests for nine months following the accident).

[165] *See generally* ALEX ROSENBLAT, UBERLAND: HOW ALGORITHMS ARE REWRITING THE RULES OF WORK (2018).

[166] Bowles, *supra* note 21.

[167] In London, cab drivers even needed to pass a test showing that they knew the names and locations of all streets in the area, so that they could get to anywhere from anywhere without a map. Transport For London, The 'Knowledge of London' Examination System, (2014), http://content.tfl.gov.uk/knowledge-examinations-system.pdf

[168] *Compare* Cohen, *Biopolitical Public Domain*, *supra* note 48 (discussing similar extraction of data from consumers).

[169] *See generally* BRAVERMAN, *supra* note 45; Bowles, *supra* note 21.

that employers often couple task automation with other process changes, such as algorithmic management, and that the basic rules governing employment facilitate this process.

III. Algorithmic Management (Including Fissuring)

When automation of physical tasks is not possible, firms can also use machine learning and other data-driven technologies in other ways that enhance productivity or reduce labor costs. Researchers at Carnegie Mellon have used the term "algorithmic management" to describe contemporary companies' use of data-driven algorithms to "manag[e] distributed human workers at a large scale."[170] This article borrows that term to refer to the full set of ways in which major companies use data, fed into powerful algorithms, to manage workers today. While Uber, Lyft, and other on-demand companies are the most prominent examples of this phenomenon, they are far from alone. As this Part illustrates, major retailers, fast food companies, and delivery companies are already using forms of algorithmic management, often at scale.

The underlying technologies here vary greatly.[171] They include sensors that determine where drivers are and whether they are speeding, as well as bar code scanners and inventory control devices of all sorts. They also include natural-language processing, which companies can use to monitor employees' speech and emails or to scan resumés. They include other sorts of machine learning and data analytics, which analyze the data from those devices to make inferences about how workers are performing. And they include classic information technologies, such as mainframe computers and intranets, which can be used to communicate information between worksites and centralized servers. What unites the activities treated here are (a) gathering of data to quantify aspects of work processes; (b) processing that data through machine learning or other algorithmic technologies; and (c) making managerial decisions on the basis of those algorithms' analyses.

Algorithmic management efforts are less attention-grabbing than full-job automation, since they often involve iterative changes to management processes and to workers' jobs. To be clear, in many instances they *do* involve task automation, though the tasks being automated—screening of resumes, inventory tracking and ordering, scheduling, workflow organization, oversight, payroll processing, etc.—were formerly carried out by managers rather than line-level workers and are largely cognitive rather than physical. But algorithmic management may prove more consequential than automation in the near term—and perhaps even in the long term. Few or no

[170] Lee et al., *supra* note 19.

[171] This paragraph draws on Ajunwa, Crawford & Schultz, *supra* note 33; Matthew T. Bodie, Miriam Cherry, Marcia L. McCormick, and Jintong Tang, *The Law and Policy of People Analytics*, 88 U. COLO. L. REV. 961 (2017); Elizabeth Tippett, Charlotte Alexander & Zev Eigen, *When Timekeeping Undermines Compliance*, 19 YALE J. L. & TECH. 1 (2017) (examining various timekeeping and scheduling platforms in current use).

changes to physical workplaces are required, which makes such technologies cheaper to deploy than robotics. Ongoing progress in machine learning, especially when combined with employers' ready access to data on workplace processes, should also make algorithmic management more powerful over time.

The overall effects of algorithmic management techniques on workers under current law are complex but often negative. Algorithmic management techniques that reduce transaction costs or that enable workers to find jobs that better match their skills and preferences will often enhance productivity, as will tasking programs that reduce waste in complex operations; such changes can benefit workers as long as wages track productivity increases. Talented line-level workers may also benefit from greater quantification of management processes as well, since that may render their performance more visible to management. But such techniques can also enable managers to centralize control of operations and to homogenize work.[172] Line-level workers as a class may then end up with less workplace autonomy, lower wages, a faster pace of work, and irregular or unpredictable schedules.

Below, Part III.A discusses the use of algorithms to hire and schedule workers, and Part III.B discusses algorithmic monitoring and discipline strategies. Part III.C discusses how such techniques can be used to monitor work across firm boundaries, encouraging what the article calls "data-driven fissuring."

III.A. Algorithmic Hiring and Scheduling

Algorithms are already being used at scale to assist in hiring processes and to schedule workers for shifts. This Part treats these uses of algorithms together because their net effects on workers are likely ambiguous: They may enable significant productivity gains or otherwise benefit workers in many cases, though in other cases they may lead to a faster pace of work or to other declines in job quality.

Algorithmic hiring: The theory behind algorithmic hiring is that advanced data analyses may identify aspects of applicants' experience or aptitudes that correlate with success in particular positions. This is superficially plausible, especially since candidates often submit resumés and other data to recruitment websites, and companies often perform background checks that generate some data on skills and work experiences.[173] Past efforts by companies to quantify or formalize aspects of their hiring processes have apparently improved retention and productivity, at least where the jobs at issue required certain aptitudes.[174]

---

[172] Laura Tyson & Michael Spence, *Exploring the Effects of Technology on Inequality*, in AFTER PIKETTY 182–83 (Heather Boushey et al. eds., 2017).

[173] *See* Matt Ritchel, *How Big Data is Playing Recruiter for Specialized Workers*, N.Y. TIMES (Apr. 28, 2013).

[174] *See, e.g.* David Autor and David Scarborough, *Does Job Testing Harm Minority Workers? Evidence From Retail Establishments*, 123 Q. J. ECON., 219 (2008) (finding that formalized job testing for

Algorithmic hiring has already evolved rapidly. Various efforts to automate recruitment using machine learning basically failed, but subsequent efforts to bring machine learning and data analytics into the process in a more limited fashion seem at least moderately successful.[175] For example, Ideal, a Toronto-based startup, has helped various large retailers with hiring by screening resumés, gathering information from applicants regarding their shift availability and skills via chatbot, and recommending qualified candidates.[176] Many McDonald's franchisees use a centralized candidate screening system that the company hired a contractor to develop, which makes at least some algorithmic assessments of workers before their applications are ever reviewed by a manager.[177] Such efforts can benefit workers in some cases. Job searches are costly for both parties,[178] and if algorithms enable easier and better matching of potential workers with jobs, both employers and workers may be better off.

In the low-wage labor market, however, algorithmic hiring may undermine labor standards. One economic theory of wage-setting holds that when employers bear the costs of hiring new workers, they may pay above-market wages to reduce turnover and limit recruitment costs.[179] If technology can reduce recruitment costs, labor markets may behave more like classic commodity markets, likely driving down wages. And if companies utilize task automation to reshape production processes in ways that require fewer skilled workers but more workers without specialized skills, there may be lower returns to finding the best candidates. The more pressing need in such cases simply may be to get a sufficient number of candidates in the door to staff existing processes. This may be the case at numerous large low-wage employers today, including McDonald's, Uber, and Amazon, which have (and tolerate) high levels of employee turnover. Where an employer can hire replacement workers at low cost, it will have greater latitude to terminate or discipline workers who demand higher pay.

Moreover, automated searches are only as good as their underlying data and programming and can reproduce various forms of bias within labor markets, as past scholars have documented.[180] A machine learning program that captures health or disability-related data may

---

a large national retail firm "yielded more productive hires" and "raising mean and median tenure by 10 percent or more.")

[175] Michelle V. Rafter, *Why Robots Won't Take Over HR Recruiting Any Time Soon*, PC Magazine (Apr. 20, 2016), (quoting CEO of hiring startup Ideal: "A lot of people think recruiting can be totally automated and it's not possible. . . . We tried to develop the system thinking we could and we can't.")

[176] Ideal, *Chatbot and Candidate Messaging Software*, *available at* https://ideal.com/product/recruiting-chatbot/ (last visited Jan. 19, 2019). *See also*

[177] Charging Parties' Post-Hearing Brief in Opposition to Proposed Settlement Agreements, *McDonald's USA LLC, a Joint Employer and Fast Food Workers Committee and SEIU*, National Labor Relations Board Cases 02-CA-093893 et al., and 04-CA-125567 et al. (Apr. 27, 2018).

[178] Richard Rogerson et al., *Search-Theoretic Models of the Labor Market: A Survey*, NBER Working Paper 10655 (July 2004), *available at* http://www.nber.org/papers/w10655.

[179] Joseph E. Stiglitz, *Alternative Theories of Wage Determination and Unemployment in L.D.C.'s: The Labor Turnover Model*, 88 Q. J. ECON 194 (1974).

[180] *See generally* Ajunwa, *supra* note 33, Barocas and Selbst, *supra* note 33, Kim, *supra note* 33.

be per se discriminatory. An algorithm that finds that workers tend to stay in jobs longer if they live near the worksite may exclude African American workers at a disproportionate rate depending on patterns of housing segregation.[181] Indeed, Amazon actually shut down a machine-learning-powered hiring tool after realizing that it tended to correlate success in more technical positions with being male.[182]

Algorithmic timekeeping and scheduling: Many major companies use timekeeping software that tracks when workers sign in and out of work, determines their net hours during each pay period, and interfaces with payroll-processing companies.[183] Many also use algorithms to schedule workers for their shifts. Those algorithms predict consumer demand based on past sales as well as factors such as weather reports, and schedule workers accordingly in an effort to ensure that worksites are neither over- nor understaffed.[184] This involves partial automation, though the tasks being automated are managerial. As with hiring, algorithmic scheduling can benefit workers. When workers can specify times that they would ideally like to work, and an algorithm can figure out how to optimize the schedule for a manager, this can reduce a company's costs and also help ensure worker satisfaction.[185] And while fixed schedules are highly desirable in most instances, many workers would like some flexibility, and workers may well prefer to be able to request a different shift via an app rather than in person with a manager. Automated scheduling may also help ensure compliance with wage/hour laws,[186] or could help workers prove that they suffered discrimination if, for example, women or African American workers are frequently assigned less-desirable shifts.

That said, automated scheduling is again only as good as its underlying data. An algorithm may assign African-American workers to less-desirable shifts if they have received those shifts in the past due to discrimination. Likewise, if a company does not accurately predict consumer

---

[181] *See generally* Pauline Kim, *Data-Driven Discrimination at Work*, 58 WM. & MARY L. REV. 857, 863, 873 (2017) (noting that algorithmic hiring processes may encourage racial discrimination if, for example, they correlate likelihood of job success with residence in a particular neighborhood, given patterns of housing segregation).

[182] Jeffrey Dastin, *Amazon scraps secret AI recruiting tool that showed bias against women*, REUTERS (Oct 9 2018). *But see* Bo Cowgill and Catherine Tucker, *Algorithmic Bias: A Counterfactual Perspective*, Working Paper: NSF Trustworthy Algorithms, (December 2017), at http://www.columbia.edu/~bc2656/papers/NSF-Workshop-Cowgill.pdf. Hiring algorithms may also discriminate against the unemployed. *See generally* Gregor Jarosch & Laura Pilossoph, *Statistical Discrimination and Duration Dependence in the Job Finding Rate*, 86 REV. ECON. STUD. 1631 (2019).

[183] *See generally* Elizabeth Tippett, Charlotte Alexander & Zev Eigen, *When Timekeeping Undermines Compliance*, 19 YALE J. L. & TECH. 1 (2017) (examining various timekeeping and scheduling platforms in current use); Jodi Kantor, *Working Anything but 9 to 5*, N.Y. TIMES, (Aug. 13, 2014) (describing use of scheduling software by "virtually every major retail and restaurant chain.")

[184] Kantor, *supra* note 183.

[185] Kronos, *Hannaford* [Supermarkets] *Uses Kronos Optimized Scheduling and Navigator to Streamline Workforce Management*, *available at* https://www.kronos.com/customers/hannaford-supermarkets (last visited Jan. 19, 2019).

demand, then it may end up scheduling too leanly, leading to a frantic pace of work. Employers may also program algorithms in ways that disregard workers' needs, especially for workers with multiple jobs or caregiving responsibilities. The issue came to public attention with Starbucks' practice of "clopenings," where workers were required to close the store one night and then open it the next day, making it nearly impossible for them to sleep.[187] In the wake of media attention, the company promised more regular and predictable schedules in the future.[188] Notably, Starbucks' decision was not required under federal wage and hour laws, which do not guarantee steady hours, or minimum or maximum hours.[189] There is also evidence that timekeeping software can affirmatively undermine compliance. Three legal scholars reviewed common timekeeping software programs and found that their default settings would often undercount hours, and that the programs enabled employers to edit down hours worked.[190]

Part of what is at stake here is who pays for unused labor power. The norm that firms hired employees and required them to stay onsite for eight hours at a time provided firms with an incentive to give employees sufficient work for that period, but also meant that companies bore the risk of workers not being busy during the entire time. Today those norms have eroded due to various political-economic factors, including the decline of collective bargaining and the shift to a service economy, which have increased pressure on firms to limit costs. As a result, workers typically have no formal voice in scheduling policies. This is another illustration of how uses of technologies are embedded in political-economic context: with a different set of background entitlements, norms and practices, employers might use algorithmic scheduling programs in ways that serve workers' needs to a greater degree.

III.B. Algorithmic Monitoring and Tasking

Algorithmic monitoring and tasking may prove to be the most consequential new use of data-driven technologies. They may enable substantial efficiency or productivity gains, but may also substantially impact the pace of work, wages, and workers' autonomy. The latter effects may arise because employers' difficulties in monitoring work have often affected wage-setting in the past.[191] From the employer's perspective, workers who have been asked to perform a set of tasks may do so more or less diligently, but the employer may not be able to detect which workers are over- or underperforming. Such monitoring costs are at the heart of some variants of "efficiency

---

[186] *Id.*

[187] Kantor, *supra* note 183.

[188] Jodi Kantor, *Starbucks to Revise Policies to End Irregular Schedules for Its 130,000 Baristas*, N.Y. TIMES (Aug. 14, 2014).

[189] *See* 29 U.S.C. § 207 (2018) (maximum hours provision of FLSA, requiring overtime for work over 40 hours in a week, but not requiring regular or reasonable hours).

[190] Tippett *et al*, *supra* note 183 at 3.

[191] The argument in this paragraph draws on Stiglitz, *Paradigm in Economics*, *supra* 35; Robert Gibbons, *Piece-Rate Incentive Schemes*, 5 J. LABOR ECON. 413, 416 (1987); Carl Shapiro & Joseph Stiglitz, *Equilibrium Unemployment as a Worker Discipline Device*, 74 AM. ECON. REV. 433, 433 (1984).

wage" theory, which arose to explain a phenomenon that puzzled neoclassical economists: Why do labor markets rarely "clear," with wages dropping to the point that unemployment approaches zero?[192] Per such theories, employers who cannot monitor workers' performance easily may pay above-market wages to increase the costs of unemployment to workers or to induce worker loyalty.[193] Importantly, however, this theory assumes that employers were unable to cheaply observe workers' effort or output levels.[194] Conversely, if firms are able to monitor work at low cost, they will have less incentive to pay above-market wages.[195]

Data-driven technologies may dramatically enhance employers' monitoring capacities. For example, employers have long monitored telephone communications and email and have utilized keystroke-monitoring programs to estimate workers' productivity.[196] Advanced technologies have increased their powers to do so. The company Crossover offers a tool called WorkSmart to monitor remote workers, which takes a photo of workers every ten minutes through their computer's webcam, which it combines with "other data—including app use and keystrokes—to come up with a 'focus score' and an 'intensity score' that can be used to assess the value of freelancers."[197] Though peer-reviewed research on how such efforts affect wages is rare, one study found that when the platform Freelancer put into practice a monitoring system that tracked keystrokes and the like, clients' preferences "for bidders with a high effort-related reputation in time-based projects" fell; new users on the platform were able to find clients more easily, but the equilibrium price for time-based projects dropped by almost 7 percent.[198]

---

[192] Stiglitz, *Paradigm in Economics*, *supra* note 35, at 473.

[193] Shapiro & Stiglitz, *supra* note 191 at 433. *See also* Janet Yellen, *Efficiency Wage Models of Unemployment*, 74 AM. ECON. REV. 200, 203 (1984) (examining efficiency wages as a means of selecting for high-performing workers); George A. Akerlof, *Labor Contracts as Partial Gift Exchange*, 97 Q. J. ECON 543 (1982) (arguing that efficiency wages arise due to norms of fair treatment within the firm or workplace).

[194] Jeremy I. Bulow & Lawrence H. Summers, *A Theory of Dual Labor Markets with Application to Industrial Policy, Discrimination, and Keynesian Unemployment*, at 2, NBER Working Paper No. 1666 (July 1985), *available at* https://core.ac.uk/download/pdf/6690394.pdf. *See also* Yellen, *supra* note 193, at 200, 201 (arguing that efficiency wages may also be less important "in the secondary sector, where the wage-productivity relationship is weak or nonexistent").

[195] Efficiency wage theories do *not* predict that wage increases amount to a free lunch of sorts, on the grounds that higher wages will lead to increased productivity. Rather, they arose to explain persistent unemployment. Alex Tabarrok, *The False Prophets of Efficiency Wages*, Marginal Revolution (Apr. 28, 2015), *available at* https://marginalrevolution.com/marginalrevolution/2015/04/the-false-prophets-of-efficiency-wages.html.

[196] As long ago as 2007, 45 percent of employers tracked what workers did at computer workstations. American Management Association, *The Latest on Workplace Monitoring and Surveillance* (2007), *available at* https://www.amanet.org/training/articles/the-latest-on-workplace-monitoring-and-surveillance.aspx (last visited Jul. 19, 2019). *See also* Kirstie Ball, *Workplace Surveillance: An Overview*, 51 LABOR HISTORY 87 (2010) (summarizing literature and date on workplace surveillance).

[197] Olivia Solon, *Big Brother isn't just watching: workplace surveillance can track your every move*, THE GUARDIAN, (Nov. 6, 2017).

[198] Chen Liang et al., *Effects of IT-Enabled Monitoring on Labor Contracting in Online Platforms:*

Companies also have numerous new tools to monitor workers' conversations. Employers often monitor phone calls,[199] and their power to do so may be augmented by natural-language processing. A phone conversation can be translated instantaneously into text, and then it can be scanned with machine learning for particular words or phrases, or simply analyzed to determine whether an employee accurately judged what a caller needed. Labor unions that represent call center workers report that nascent forms of such technology are now being used to oversee their members. One report from the Communications Workers of America describes an AI-powered system known as CallMiner, which recorded all telephone conversations and sought (often in a buggy fashion) to determine whether workers were appropriately handling customer complaints.[200] Since the technology affected disciplinary policies, the employer had a duty to bargain over its use,[201] and unionized call center workers were able to establish rules around when the monitors could be turned on and off and when workers could be disciplined based on data gathered.[202] Nonunion workers have no rights to bargain over such matters.

Another example comes from Amazon. The company has used data gathered while goods move through its warehouses to determine how quickly workers are performing tasks, and to push them to work faster.[203] Documents disclosed as part of a labor dispute between Amazon and a worker who alleged that he had been fired in retaliation for organizing efforts showed that various aspects of that oversight had been automated. "Amazon's system tracks the rates of each individual associate's productivity," according to some of the materials turned over, "and automatically generates any warnings or terminations regarding quality or productivity without input from supervisors."[204] Around 10 percent of the workers in that warehouse had been terminated via that process, for productivity reasons alone, during the preceding year.[205]

Evidence from a Natural Experiment, NET Institute Working Paper No. 16-01 (2016), *available at* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2844920. Such monitoring programs also raise general concerns about worker privacy and autonomy.

[199] *See generally* Kirstie Ball, *Workplace Surveillance: An Overview*, 51 LAB. HIST. 87, 88 (2010) (summarizing data on extent of employer monitoring of telephone and other communications).

[200] *See* NELP and AFL-CIO, *Wheeling and Dealing Misfortune: How Santander's High-Pressure Sales Tactics Hurt Workers and Auto Loan Customers* at 6-8 (July 21, 2017) (describing monitoring system known as "call-miner."

[201] *See* discussion, *supra* notes 74-77 (summarizing rules governing collective bargaining around technological change).

[202] CWA Issue Brief: Protections Against Abusive Monitoring, (on file with author) (describing contract language around such matters). Walmart may soon begin using similar monitoring technology at cashier stations. *See* Sam Levin, *Walmart Patents Tech That Would Allow it to Eavesdrop on Cashiers*, THE GUARDIAN (July 12, 2018).

[203] Colin Lecther, *How Amazon automatically tracks and fired warehouse workers for 'productivity*,' THE VERGE, (Apr 25, 2019).

[204] Quoted in id.

[205] *Id.* Uber has also used algorithmic monitoring and tasking extensively, often generating and exploiting informational asymmetries vis-à-vis drivers. *See generally* ROSENBLAT, *supra* note 165; Alex Rosenblat & Luke Stark, *Algorithmic Labor and Information Asymmetries: A Case Study of Uber's*

As employers gain more information about workers' performance, they may have reduced incentives to pay efficiency wages. As with scheduling programs, there is nothing natural or necessary about this result. Under a different set of background rules, employers' monitoring powers could be used to ensure compliance with basic labor standards. They could also be subjected to collective bargaining, so that workers could trade off some monitoring for higher wages or share in the productivity gains that result. Part IV discusses that possibility.

III.C. Data-Driven Fissuring

Contemporary information technologies also make it easier for companies to purchase labor through intermediaries, thereby avoiding duties under labor and employment laws. This has come to be known as the "fissuring" of employment, since it creates a legal gap between workers and the companies that utilize their work.[206] While fissuring is often legitimate and beneficial for all involved, it can also undermine labor standards, as discussed below.[207] There are three key fissuring strategies today. The first is misclassification: legally classifying workers as independent contractors but still exerting enough control over them that they should rightly be classified as employees.[208] This is arguably common in the gig economy, among delivery firms such as FedEx, and elsewhere in the logistics sector.[209] A second fissuring strategy is subcontracting, in which user firms hire labor through agencies or third-party contractors. Unlike independent contractors, subcontracted workers clearly have an employer—the contractor—but the user firm may have more power to set working conditions than that employer. Subcontracting is especially common in building services, agriculture, logistics, hotels and warehouses (where workers are often hired through temporary agencies).[210] The third strategy is franchising, where core firms, especially in fast food and retail, license their trademarks and product line to independent businesses, who in turn employ line-level workers.[211]

Drivers, 10 INT'L. J. COMM. 3758 (2016). *See also* Levy, *supra* note 47 (discussing monitoring of truck drivers through data-driven "telematics" systems).

EIL, *supra* note 31 at 7 (drawing this metaphor).

[207] *See* discussion *infra* notes 214-226.

[208] *See generally* CATHERINE RUCKELSHAUS ET AL, WHO'S THE BOSS: RESTORING ACCOUNTABILITY FOR LABOR STANDARDS IN OUTSOURCED WORK, NATIONAL EMPLOYMENT LAW PROJECT (May 2014).

[209] *Id. See also*, *Alexander v. FedEx Ground Package System, Inc*., 765 F.3d 981 (9th Cir. 2014) (finding that FedEx misclassified drivers under California laws regarding wages, hours, and work-related expenses); Cotter v. Lyft, 60 F. Supp. 3d 1067 (N.D. Cal. 2015) (denying defendant's motion for summary judgment on employment status of Lyft drivers); *O'Connor v. Uber Techs*., 82 F.Supp.3d 1133 (N.D. Cal 2015) (denying defendant Uber's motion for summary judgment in similar case under California law); *Dynamex Operations West., Inc. v. Superior Ct. of Los Angeles*, 4 Cal. 5th 903 (Cal. 2018) (adopting new test for employment status for purposes of California wage orders, due to widespread concerns about misclassification of gig economy and other workers under extant test).

[210] *See generally* RUCKELSHAUS, *supra* note 208.

[211] *See generally* WEIL, *supra* note 31 at 122–58 (discussing franchising and its effects).

Fissuring today often depends on the low costs "of gathering information and undertaking monitoring in light of developments in the digital world."[212] According to the basic Coase/Williamson theory of the firm, companies have greater incentives to produce goods in-house, and to control production tightly, when it is difficult to specify outputs with precision or to monitor outside parties' performance.[213] However, bringing workers in-house as employees makes the firm responsible for substantial employment-related costs. If new technologies enable a firm to ensure high-quality production through suppliers and outside contractors, that firm will have incentives to fissure away the work to reduce labor costs.[214]

The rest of this section summarizes several prominent examples of data-driven fissuring in today's economy.[215] Some of these do not require particularly advanced information technologies. Nevertheless, machine learning may render fissuring cheaper and easier by enabling closer oversight of fissured workers, and by concentrating that oversight capacity within large firms. Moreover, assuming that data on work processes is becoming more plentiful and more accurate due to some of the monitoring techniques discussed above, and that the costs of transmitting and processing that data continue to fall, such efforts should become cheaper and more widespread over time.

Logistics: FedEx has long used sophisticated suites of devices known as "telematics" systems to monitor drivers' delivery times, driving speed, and seatbelt usage, while classifying them as independent contractors.[216] Similar uses of technology are clear in the on-demand economy of Uber, Lyft, and the like. As noted in Part II.B., Uber uses algorithms to manage an enormous and constantly changing workforce with almost no direct human supervision. Meanwhile, Uber has

---

[212] WEIL, *supra* note 31 at 61. *See* also *id.*, at 64–72 (discussing companies' monitoring strategies in retail and fast food). *Accord* Tyson & Spence, *supra* note 172 at 187; NATIONAL ACADEMY OF SCIENCES, INFORMATION TECHNOLOGY AND THE U.S. WORKFORCE: WHERE ARE WE AND WHERE DO WE GO FROM HERE?, at 66 (2017).

[213] Oliver Williamson, *The Economics of Organization: The Transaction Cost Approach*, 87 AM. J. SOC. 548 (1981); *see also* Coase, *supra* note 60.

[214] It is clear that fissuring has this effect. *See*, *e.g.*, Samuel Berlinski, *Wages and Contracting Out: Does the Law of One Price Hold?* 46 BRIT. J. INDUS. RELNS. 59 (2008) (subcontracted janitors and security guards make less than 15 percent of what in-house workers doing same jobs make); WEIL, *supra* note 31 at 88, discussing TRUMAN BEWLEY, WHY WAGES DON'T FALL DURING A RECESSION (1999) (showing different pay for employees and contractors performing the same job on the same worksite); Rosemary Batt and Hiro Nohara, *How institutions and business strategies affect wages: A cross national study of call centers*, 62 INDUS. & LAB. RELN'S. REV. 533 (2009) (showing lower wages in outsourced call centers).

[215] *See also* MARY L. GRAY AND SIDDHARTH SURI, GHOST WORK: HOW TO STOP SILICON VALLEY FROM BUILDING A NEW GLOBAL UNDERCLASS (2019) (surveying use of off-site workers for many purposes by Silicon Valley firms in their development of artificial intelligence and other products).

[216] *See Alexander v. FedEx Ground Package Services*, 765 F.3d 981 (2014) (overturning district court judgment that FedEx drivers were independent contractors as a matter of law, because FedEx exerted extensive control over their work). *See also* WEIL, *supra* note 31 at 63 (noting FedEx' monitoring capabilities).

disclaimed any duties toward its drivers under labor and employment laws by claiming that they are independent contractors rather than employees.[217] What is striking about Uber is not that it uses an independent contractor model—taxi companies have long done the same—but that it does so while using modern technologies to supervise workers closely, which has almost certainly contributed to its ability to keep labor costs low.[218]

Hotels: Today, most major hotel brands use contractors to ensure "clean rooms, cheery front desk staff, or prompt curbside service."[219] They also use a franchise business model, where the brand leases operating rights and provides some services to independent businesses who own particular properties. Indeed, by 2011, Marriott "owned and managed only 1 of the 356 properties operating under one of its brands."[220] At the same time, Marriott has integrated systems for reservations and supply chain management to serve its global network of hotels. Some of its practices are centralized and others are decentralized, but it uses a single integrated platform for both sourcing and accounts payable. As a recent article put it, that platform "ensures data that can be analyzed and be transparent, enabling Marriott to better determine where commodities are needed, in real-time."[221]

Fast food: McDonald's is not a single legal enterprise but an amalgamation of tens of thousands of enterprises. At the center is McDonald's corporate; at the edges are the many McDonald's franchises that are independently owned and operated as separate corporations.[222] But unions have argued that point-of-sale and payroll management systems are integrated between franchisees and McDonald's corporate, which gives corporate a good sense of which

---

[217] *See Razak v. Uber Techs*, 2018 U.S. Dist. LEXIS 61230 (E.D. Pa., Apr. 18, 2018) (granting defendant's motion for summary judgment on issue of employment status in FLSA case); *but see O'Connor v. Uber Techs*., *supra* note 209. *But see* Brishen Rogers, *Employment Rights in the Platform Economy: Getting Back to Basics*, 10 HARV. LAW & POL'Y REV. 479 (2016) (arguing that existing statutory tests for employment are broad enough, if interpreted purposively, for courts to find that Uber and Lyft employ drivers).

[218] Uber drivers' average pay is not publicly known, but one study estimated that drivers earn around $9.21/hour after accounting for expenses and taxes. Lawrence Mishel, Economic Policy Institute, *Uber and the Labor Market* (May 15, 2018), *available at* https://www.epi.org/files/pdf/145552.pdf. The company itself has contested those figures. Erin Winick, *Maybe Uber and Lyft Drivers *Can* Make a Living*, MIT TECH. REV., Mar. 6, 2018.

[219] WEIL, *supra* note 31 at 146-47.

[220] WEIL, *supra* note 31 at 146.

[221] Nell Walker, *How Marriott has achieved the mammoth task of streamlining its worldwide supply chain*, SUPPLY CHAIN DIGITAL (Oct 11, 2017), at https://www.supplychaindigital.com/company/how-marriott-has-achieved-mammoth-task-streamlining-its-worldwide-supply-chain#

[222] On the franchising business model, *see generally* WEIL, *supra* note 31 at 123–32. On how antitrust laws have encouraged franchising, *see* Brian Callaci, V*ertical Power and the Creation of a Fissured Workplace: The Case of Franchising*, U. Mass. Amherst, Dept. of Econ. Working Paper (Sept. 5, 2018); Sanjukta Paul, *Fissuring and the Firm Exemption*, 82 LAW & CONTEMP. PROBS. 65 (2019).

franchisees and workers are over- or underperforming.[223] McDonald's also standardizes how work is performed across franchisees by training managers and other staff,[224] and it sets specifications for the performance of specific tasks, sometimes down to the second.[225] According to unions, it also coordinated franchisees' responses to recent worker organizing.[226]

Summary: Fissuring presents the tightest connection between law, political economy, and technological choice. Under different background rules companies would have less incentive to fissure away work—and perhaps less ability to do so. For example, if definitions of employment were broader, it would be harder to avoid labor costs through subcontracting or independent contracting. Similarly, if unions had the ability to take wages out of competition across industrial sectors, companies would less often seek to reduce labor costs through fissuring.[227] But under existing rules companies have incentives to use such strategies to reduce their labor costs. One result is that each of the sectors discussed above involves centralized authority over work but diffuse responsibility toward workers.

IV. Toward a New Politics of Workplace Technology

This final Part draws out some broader lessons of the argument above—that our labor and employment laws both facilitate technological change and channel employers toward power-augmenting uses of technology. Part IV.A draws on comparative evidence to further illustrate the impact of legal and political-economic institutions on companies' technological choices. Part IV.B then considers reforms that may encourage a different politics around workplace technology.

IV.A. Historical and Comparative Perspective

The technical and legal factors discussed above have encouraged U.S. companies to utilize large amounts of low-wage, low-skill labor. At the micro-level, investors and managers within

---

[223] *See* discussion of McDonald's immediately below. *See also People of the State of N.Y. v. Domino's Pizza*, Memorandum of Law in Support of Verified Petition at 3, [case number not available] (Nov. 4, 2016) (alleging that Domino's pizza "possesses contemporaneous time records for all franchisee employees…[including] detailed records showing each employee's minute-by-minute actions each day," and arguing that fact should lead to Domino's being classified as those workers' joint employer).

[224] Charging Parties' Post-Hearing Brief, *supra* note 177 at 17–18.

[225] *See* Charging Parties' Post-Hearing Brief, *supra* note 177 at 20 (citing McDonald's regulations providing that "[g]uests should wait no more than 90 seconds from your greeting to the completion of their order," and that their "total experience time should not exceed 3 minutes, 30 seconds.")

[226] Charging Parties' Post-Hearing Brief, *supra* note 177. *But see* Jones Day, Letter Brief to NLRB Associate General Counsel (May 22, 2014), (denying that McDonald's responses to organizing drive were evidence of joint employment, and denying that company uses technology to exert control over franchisees or their employees).

[227] *See* KATE ANDRIAS & BRISHEN ROGERS, *REBUILDING WORKER VOICE IN TODAY'S ECONOMY*, ROOSEVELT INSTITUTE, at 16-20 (Aug. 2018).

firms have sought to disempower labor through technological and other means. At the meso- and macro-level, such practices often take root within sectors, making it difficult for individual firms to raise wages without losing market share.[228] Other advanced economies at the technological frontier have followed different paths, in part due to their distinct labor market institutions.[229] For example, German industrial workers have worker voice through three institutions: unions that bargain at the sectoral level; works councils, which are nonunion bodies that provide collective worker voice at the firm or worksite level; and seats on companies' supervisory boards.[230] German manufacturers have responded by focusing on high-wage, high-skill, high-productivity strategies, which enable profitability despite high labor costs.[231] While the German model is no longer as robust as it once was,[232] it continues to influence firms' practices.

In some cases, the institutional context affects the choice of technologies themselves. For example, German and U.S. call centers tend to have different labor relations, even as they provide services to the same companies. U.S. centers use "a narrow division of labour, tight discipline and individual incentives" along with managerial efforts to homogenize jobs, while German centers utilize "high-involvement employment systems with broad skills and worker discretion," in part because works councils have limited employer monitoring and encouraged upskilling.[233] Similarly, a recent working paper found that German companies subject to a stricter form of codetermination had higher capital intensity than companies subject to forms of

---

[228] *See* Kathleen Thelen, *Presidential Address: The American Precariat: U.S. Capitalism in Comparative Perspective*, 17 PERSPECTIVES ON POLITICS 5 (2019) (noting high incidence of low-wage work and precarious work in the U.S. compared to other countries); *see generally* Hall & Soskice, *supra* note 55. For a complementary account of skill differences among nations that centers power relations between workers/unions and employers/employer associations, *see* Wolfgang Streeck, *Skills and Politics: General and Specific*, MPIfG Discussion Paper 11/1 (March 10, 2011). To be clear, there are basic economic limits to the low-wage, low-skill strategy. If wages fall below a certain level, companies cannot recruit workers with even minimal skills, leading to declines in quality. Whether the U.S. economy is at that point is not clear, though we are now experiencing a labor shortage in various sectors. *See* David Yaffe-Bellany, *Hiring is Very Hard for Restaurants These Days. Now They May Have to Fire*, N.Y. TIMES, Aug. 23, 2019.

[229] *See generally* Hall and Soskice, *supra* note 55.

[230] *See generally* Tobias Schultze-Cleven, *German Labor Relations in International Perspective: A Model Reconsidered*, 35 GERMAN POL. & SOC. 46 (2017).

[231] *See generally* WOLFGANG STREECK, RE-FORMING CAPITALISM: INSTITUTIONAL CHANGE IN THE GERMAN POLITICAL ECONOMY (Oxford, 2009); Hall and Soskice, *supra* note 55; Joel Rogers, *Divide and Conquer: Further 'Reflections on the Distinctive Character of American Labor Laws'*, 1990 WIS. L. REV. 1 (1990).

[232] THELEN, VARIEITES OF LIBERALIZATION, *supra* note 55 at 30-31 (2014) (discussing emergence of "dualism" in Germany, where precarious work is common outside of industrial core).

[233] Virginia Doellgast, *Collective Voice under Decentralized Bargaining: A Comparative Study of Work Reorganization in US and German Call Centres*, 48 BRIT. J. INDUS. RELNS. 375, 375, 376 (2010). *See also* Simon Jager et al, *Labor in the Boardroom* (working paper, July 2019), available at http://economics.mit.edu/files/17273 (finding that German companies subject to a stricter form of codetermination had higher capital-intensity, on average).

codetermination that give workers less power, suggesting that worker voice can encourage companies to pursue higher-productivity strategies.[234]

In other cases, political-economic factors influence how particular technologies are used, rather than the choice of technologies themselves. One set of comparative data points there comes from nations' differing responses to Uber's arrival. While the company used essentially the same set of technological tools in different nations, its entry into their markets triggered different responses rooted in those nations' distinctive political-economic alignments. As Kathleen Thelen has shown, most cities and states in the United States partnered with Uber to facilitate the company's operations, reflecting workers' structural weakness. In Germany, incumbent taxi companies, which were well-organized into associations, united to block Uber's entry into local markets. In Sweden, regulators enabled the company's operation while ensuring that it paid all applicable taxes.[235] The employment status of Uber drivers mattered less in the Swedish context due to its universal and tax-funded welfare benefits, and since unions who represented taxi drivers at the sectoral level and enjoyed access to lawmakers had already set a high wage floor in the sector.[236] Institutions in all three countries—American liberalism, German corporatism, and Swedish social democracy—influenced how the new technology was received in each case.[237]

Uses of technology have also differed meaningfully in the retail sector. The emergence of bar code scanners, integrated point-of-sale systems, and supply chain management technologies enabled mega-retailers to drive many smaller players out during the 1980s and 1990s, yet the specific transitions differed between nations. In the United States, Walmart (relatively unchecked by unions or powerful associations of incumbent retailers) implemented a "lean retailing" model that used "dominating relationships with suppliers and workers to strip costs and retailer control over logistics to improve efficiency."[238] In contrast to the American model, in Denmark and

---

[234] Simon Jager et al, *Labor in the Boardroom* (working paper, July 2019), available at http://economics.mit.edu/files/17273.

[235] Kathleen Thelen, *Regulating Uber: The Politics of the Platform Economy in Europe and the United States*, 16 PERSP. ON POLITICS 938, 939 (2018). *See also* Kathleen Thelen, *Transitions to the Knowledge Economy in Germany, Sweden, and the Netherlands*, 51 COMP. POLITICS 2 (2019) (tracing how different coalitional alignments in those nations led to distinct innovation patterns.).

[236] Thelen, *Regulating Uber*, *supra* note 235.

[237] *See generally* GOSTA ESPING-ANDERSEN, THE THREE WORLDS OF WELFARE CAPITALISM (1990) (dividing welfare states into three models: "liberal" states such as the U.S. and U.K. that provide meager benefits, "Conservative" or "Christian Democratic" states such as Germany which provide generous benefits to workers in the industrial core, and "Social Democratic" states in Scandinavia that provide relatively universal benefits).

[238] BARTHOLOMEW WATSON, NATIONS OF RETAILERS: THE COMPARATIVE POLITICAL ECONOMY OF RETAIL TRADE, UC BERKELEY POLITICAL SCIENCE DISSERTATION (2011) available at https://escholarship.org/uc/item/18z1138t. *See also* ZEYNEP TON, THE GOOD JOBS STRATEGY (2014) (arguing that this model can become counter-productive, as overworked employees take shortcuts such as mis-scanning items or not actually helping customers). Walmart has also taken steps toward a "good

Germany, a "relational contracting" model emerged in which retailers "work with workers and suppliers, finding ways to share and reduce long-term costs through worker training, improved productivity, and reduced costs from confrontation."[239] These differences reflected different interest group politics and industrial relations structures within those nations.

Taking a further step back, this account supports some political economists' suggestions that the United States and other liberal market economies have a comparative advantage in "radical innovation," or innovation that "entails substantial shifts in product lines, the development of entirely new goods, or major changes to the production process."[240] Amazon's partial automation of its warehouses, Uber's development of a new means of taxi facilitation, and Walmart's previous revolutions in supply chain management are all excellent examples. But those efforts also reflect an American political economy that encourages extensive use of low-wage, low-productivity labor, in part by granting extensive legal rights and powers to employers.

These comparative examples also suggest that institutions that give workers more power within the workplace and the broader political economy can encourage a different politics around technology. If required to negotiate with workers over such matters, employers may choose a different mix of productivity-enhancing and power-augmenting technologies. The potential causal mechanism is clear: If power exertion is foreclosed or made more difficult due to labor's countervailing power, profit-seeking employers will invest comparatively more in productivity enhancements. Labor laws are, of course, not the only important institution here; they interact in important ways with corporate governance laws, financial regulations, and trade policy, to name a few.[241] Employee privacy is also likely to be increasingly important, and the different privacy regimes between the United States and European Union, especially after the European General Data Protection Regulation (GDPR),[242] may over time lead employers in the two jurisdictions to make divergent technological choices, though the magnitude of that effect will depend in part on whether transnational firms apply GDPR throughout their operations.[243] Nevertheless, worker

---

jobs" model recently, perhaps in response to higher labor costs driven by minimum wage increases and the affordable care act. *See* Katie Bach, Sarah Kalloch, and Zeynep Ton, *The Financial Case for Good Retail Jobs*, HARVARD BUSINESS REVIEW (June 26, 2019) (connecting Walmart's recent investment in robotics to its efforts to improve working conditions in its stores).

[239] Watson, *supra* note 238. *But see* Maarten Hermans & Miet Lamberts, *Digitalization in the Belgian Retail Sector: Tensions, Discourses, and Trade Union Strategy* (presentation of April 25, 2019, on file with author) (demonstrating changes in Belgian retail sector that parallel US changes, despite substantially different industrial relations systems).

[240] Hall and Soskice, *supra* note 55 at 38-39. I say "suggestion" because Hall & Soskice presented their theory as a framework for subsequent research rather than a fully fleshed-out account of institutional differences).

[241] Hall and Soskice, *supra* note 55.

[242] Regulation (EU) of the European Parliament and of the Council, 2016/679, (April 27, 2016).

[243] *See* Anupam Chander, Margot Kaminsky and William McGeveran, Catalyzing Privacy Law, 26-27 (working paper, August 2019), available at

voice and power at the point of production is necessary to alter the micro-level politics of workplace technology.

IV.B. Democratizing Workplace Technology

Workers and their organizations in the United States have already been pushing for a greater voice in technological change. Part III mentioned call center workers' efforts to set standards around machine-learning-powered supervision. Technology has also been an issue in several recent major strikes. For example, one of the major issues behind the 2018 West Virginia teachers' strike was the state's effort to establish a new health care plan that would give teachers premium rebates if they wore Fitbit-type devices that tracked health metrics.[244] Similarly, when Marriott hotel cleaners went on strike later in 2018, they demanded a voice in how technology was used to manage them. Cleaners had complained about the company's development of a new app that assigned them to clean rooms, often in a random order that made their days more hectic and difficult, and desk staff had concerns about the company's development of check-in and related apps.[245] The eventual contract gave their union the right to be consulted early about the development and adoption of new technologies.[246] The Fight for $15, a major effort to raise minimum wages and to unionize fast food workers, has been arguing for some time that McDonald's corporate is the party with real power over franchisee working conditions and therefore the legal employer of line-level workers, as evidenced, in part, by its use of advanced technologies to manage those relationships.[247] Finally, tens of thousands of Google employees walked off the job in 2018. While the immediate spark for the protests was the revelation that the company had paid a high severance to an executive who had sexually assaulted a subordinate, many workers were also frustrated at their lack of a voice in the company's decisions to develop new technologies for the military, or which would enable censorship in China.[248]

In each case—teachers, hotel workers, fast food workers, and tech workers—workers were demanding that their companies' uses of technology be subject to democratic norms and checks. This final Part considers what such a democratic agenda might entail.

---

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3433922 (noting that some but not all multinationals have applied GDPR across their operations).

[244] Jane McAlevey, *The West Virginia Teachers Strike Shows That Winning Big Requires Creating a Crisis*, THE NATION, (March 12, 2018).

[245] Sarah Holder, *Why Marriott Workers Are Striking*, CITYLAB (Oct. 19, 2018); Juliana Feliciano Reyes, *Hotel housekeeping on demand: Marriott cleaners say this app makes their job harder*, PHILADELPHIA INQUIRER, (July 2, 2018).

[246] Samantha Winslow, *Marriott Hotel Strikers Set a New Industry Standard*, LABOR NOTES (Dec. 20, 2018).

[247] *See* discussion, *supra* Part III.B. and III.C.

[248] *See*, *e.g.*, Farhad Manjoo, *Why the Google Walkout was a Watershed Moment in Tech*, N.Y. TIMES (Nov. 8, 2018). Brishen Rogers, *Solidarity in Silicon Valley*, BOSTON REVIEW, May 4, 2019.

Raising minimum standards and expanding the scope of employment: A first set of reforms here would be straightforward: Workers' statutory entitlements around wages and hours could be strengthened. This would respond to companies' use of advanced information technology to keep wages low, or to ensure a faster pace of work. States and/or the federal government could mandate higher minimum wages and could require employers to give workers reasonable notice of schedules and guarantees of steady hours.[249]

There is nothing technologically advanced about such mandates, but technology could assist in enforcing them. As discussed above, fissuring is an impediment to enforcement of wage and hour mandates today, and many companies that fissure away workers also use new technologies to monitor the underlying work. Legislatures could respond by expanding definitions of employment under major labor and employment law statutes to capture the relationship between Uber and its drivers, for example, or between McDonald's and its franchisees' workers.[250] Legislatures could also define work relationships in certain sectors as legal employment for purposes of particular statutes, mandating, for example, that major franchisors are jointly liable for wage/hour violations by their franchisees. Or legislatures and regulators could begin to take technological monitoring and management strategies into account when determining whether a firm employs particular workers. In the case of Uber or McDonald's, for example, evidence that the companies monitor how work is performed, or help to hire or schedule workers, could be presumptive evidence of employment status.[251]

The theory behind such reforms is not that they would prohibit companies from organizing work relationships as they like, nor that they would limit the deployment of new technologies to manage work. Rather, it is that companies should, regardless of the organizational strategy used, have duties toward workers over whom they enjoy substantial economic or operational power. At the same time, reforms that directly raise wages and ensure more predictable scheduling may have beneficial knock-on effects on subsequent technological development. If companies cannot drive wages below, say, $15 an hour, and cannot escape duties to pay workers overtime, they

---

[249] *See* Sara Eber Fowler & Lynn Kappelman, *As Predicted . . . On July 1, Oregon Will Become the First State with a Predictive Scheduling Law*, Seyfarth Shaw Employment Law Lookout (June 28, 2018), *available at* https://www.laborandemploymentlawcounsel.com/2018/06/as-predicted-on-july-1-oregon-will-become-the-first-state-with-a-predictable-scheduling-law/ (discussing newly enacted Oregon law as well as similar laws passed by municipalities).

[250] As the California Supreme Court did in a landmark 2018 decision, *Dynamex Operations West., Inc. v. Superior Ct. of Los Angeles*, 4 Cal. 5th 903 (Cal. 2018) (establishing "ABC" test for employment).

[251] For ideas along these lines, *see* Zatz, *supra* note 92; ANDRIAS & ROGERS, *supra* note 227 at 16–20 (Aug. 2018) (discussing problems of fissured work in labor law/collective bargaining context, suggesting various solutions); Rogers, *Employment Rights in the Platform Economy*, *supra* note 217 (discussing misclassification suits against Uber and Lyft, and possible solutions); Brishen Rogers, *Toward Third-Party Liability for Wage Theft*, 31 BERKELEY J. EMP. & LAB. L. 1 (2010) (discussing relationship between supply chain management and employment status).

may have greater incentives to use new technologies to enhance productivity, to share productivity gains with workers, and to train workers accordingly.[252]

Data-sharing to encourage enforcement and organizing: Efforts to enhance wage and hour enforcement, and to extend duties across corporate boundaries, would both benefit from an additional reform: ensuring that workers and regulators have reasonable access to companies' data about workers' performance. Once data on workplace performance is gathered and analyzed by companies, it is essentially costless to transfer it to regulators or workers. Regulators could use their own algorithms on that data, for example, to spot potential noncompliance with wage and hour or antidiscrimination laws. Workers could potentially use it for the same purposes in private suits, to demonstrate, for example, that a particular hiring practice has a disparate impact on women or people of color, or that an employer has not been paying workers for all hours worked.[253]

Access to such data could also enhance workers' organizing efforts. Gig economy workers, for example, have at times turned off their apps en masse to protest companies' policies.[254] Those protests could be more effective and potent if the workers and organizers had access to data on where other workers are geographically located, for example, so that they could more easily contact them. Similarly, gig economy workers and organizers would benefit from being able to communicate directly with gig economy customers about their concerns via apps, much as picketing workers have rights to speak directly to potential customers of struck companies even when doing so causes some infringement of the company's property rights.[255]

Encouraging organizing and bargaining around technological choices: Another set of reforms would encourage collective bargaining around technology. Such an approach would

---

[252] As noted above, *supra* note 238, this may already be happening with Walmart.

[253] Disclosing such data to regulators and/or private parties may of course raise privacy concerns. If the data includes identifying information about particular workers, and the recipient agency is required to share it with other agencies, then workers may fear that their workplace data could be used against them for tax enforcement, or to track down criminal suspects or irregular immigrants. Data breaches are also a risk, of course. These issues are beyond the scope of this paper, but would need to be taken into account at the stage of institutional design. I am grateful to a participant in the Yale Law School Private Law Theory Colloquium for this observation.

[254] *E.g.* April Glaser, *Instacart Workers are Striking Because of the App's User Interface*, SLATE, Nov. 5 2019; Kate Conger et al, *Uber Drivers' Day of Strikes Circles the Globe Before the Company's IPO*, N.Y. TIMES, May 8, 2019.

[255] The Supreme Court has found such consumer communications important enough to protect them under the First Amendment even in circumstances where they may have been prohibited by the NLRA, as amended. *Labor Board v. Fruit Packers*, 377 U.S. 58 (1964). Another parallel set of cases raised the question whether workers can use employer-provided email for organizing efforts. *Compare Purple Communications*, 361 NLRB 1050 (2014) (employees have a right to use their employer-provided email system for Section 7 protected communications around wages, hours, and other terms and conditions of employment) *with Caesars Entertainment d/b/a/ Rio All-Suites Hotel and Casino*, 368 NLRB No. 143 (Dec. 17, 2019) (overruling *Purple Communications*).

stand in contrast to two alternative regulatory strategies around workplace technology. One is our existing system, as discussed above, which gives employers near-plenary entitlements to choose technologies. The second involves centralized rule-setting intended to shape the course of workplace technological development directly. For example, policymakers could prevent employers from deploying new monitoring devices, or from using the data such devices generate to develop new algorithmic management systems or even new forms of automation. Or policymakers could tax robotics or machine-learning-powered systems in order to deter their development.

A risk of centralized rule-setting approaches is that they may thwart beneficial innovations, even from workers' perspectives. In the past, when regulators have restricted the development of specific branches of scientific or technical knowledge—for instance, through restrictions on human cloning—there have been unusually strong moral or ethical considerations, or even an imminent danger to the public.[256] Some of the workplace privacy rules surveyed in Part I.B, such as protections for individuals' health data and social media passwords, have been motivated by these sorts of considerations, and rightly so. At the moment, however, the most prominent worries about automation relate not to safety but rather to fears that the pace of automation will spiral out of control. As Part II argued, those fears appear overblown. As a result, policies that seek to deter automation by taxing it, or restricting employers' access to work-related data, may do more harm than good. For many workers, the best-case scenario is for task automation to displace fairly rote or boring tasks, and for employers to invest in upskilling and technologies that complement labor. Moreover, to the extent that automation enables production of goods at lower net energy cost, it will assist in the transition to a green economy.

A democratization strategy, in contrast, would empower workers to consult on or bargain over employers' technological decisions. Such a strategy may be most productive where workers themselves are well-placed to understand both the costs and benefits of new technologies and may be able to respond to them in a more nuanced fashion than regulators. Workers' optimal bargaining approach when an employer seeks to implement a new technology would vary based on the circumstances. Sometimes their best move would be to block uses of technology that seem likely to drive down wages or undermine their autonomy, as often occurs with data-driven fissuring. In other cases, workers might trade off more intense supervision for other goods.

[256] Conversely, once certain technologies are developed and deployed, it may be too late to mitigate or even shape their social impact. As Langdon Winner argued, the nuclear bomb is a clear example: it needs to be managed by a "rigidly hierarchical chain of command" to avoid accidents and misjudgments. Winner, *supra* note 13 at 131. While the bomb is perhaps a singular case, facial recognition technology, human cloning, and even global social media may have similar characteristics: once in use at scale, they may have negative social and political consequences that cannot be unwound. This suggests that some technological decisions cannot be left to the sort of co-determination process outlined in this final Part, and that there remains a role for general precautionary regulations. I am grateful to Paul Ohm for this observation.

Warehouse workers might permit new monitoring devices and a somewhat faster pace of work as long as they enjoyed higher wages in exchange. In still other cases workers would welcome new technologies and help their employers determine how best to use them; ride-sharing drivers might welcome GPS guidance so long as they are free to deviate from a proposed route or have means of communicating that the guidance is somehow flawed. Such collaboration, however, requires a degree of trust that is very hard to achieve in nonunion, low-wage enterprises today.

Lawmakers could nevertheless encourage this sort of bargaining through reforms to our labor and employment laws.[257] For example, they could make it far easier for workers to unionize in the first place and alter rules around appropriate subjects of bargaining so that companies would need to bargain over most or all technological changes and associated workplace reorganizations.[258] Nearly every aspect of workplace technology discussed above, including firms' abilities to monitor work, reorganize work, and terminate workers at will, could be opened to democratic debate by such reforms.[259] They could also guarantee all workers some rights to engage with their employers over technological changes, regardless of their unionization status. As noted in Part IV.A., German works councils have such rights. While works councils cannot strike over technological changes, their ability to veto certain other employer requests—such as for mandatory overtime—can help them to resist certain technological changes.[260]

There are downsides to establishing such rights: They will enable workers to block employers from developing or implementing productive technologies in some cases, placing unionized firms at a competitive disadvantage. What's worse, it often will not be clear *ex ante* whether a particular technology is more likely to enhance or undermine labor standards.

But those challenges do not necessarily undermine the case for reform. In many cases, the optimal use of technology will need to be worked out in practice, and worker voice can help ensure that power-augmenting uses are foreclosed or minimized. Any comparative disadvantage suffered by unionized firms could also be mitigated if collective representation were the norm rather than the exception. For related reasons, a growing number of scholars and activists in the

---

[257] For a kindred proposal from the 1970s, *see* James C. Oldham, *Organized Labor, The Environment, and the Taft-Hartley Act*, 71 MICH. L. REV. 936 (1973) (proposing legal reforms to enable unions to bargain over the environmental effects of their employers' production processes).

[258] For a summary of recent proposals to ease the organizing process, see ANDRIAS & ROGERS, *supra* note 226. For further details on the distinction between mandatory and permissive bargaining subjects, and potential reforms to enable more bargaining on permissive subjects, *see* James R. Rasband, *Major Operational Decisions and Free Collective Bargaining: Eliminating the Mandatory/Permissive Distinction*, 102 HARV. L. REV. 1971 (1989); Donna Sockell, *The Scope of Mandatory Bargaining: A Critique and a Proposal*, 40 INDUS. LAB. REL'NS. REV. 19 (1986).

[259] Such reforms could also encourage worker to form new sorts of unions, and to organize through new communications tools such as social media. *See* Brishen Rogers, *Social Media and Worker Organizing under U.S. Law*, 35 INT'L J. COMP. LAB. L. & INDUSTRIAL RELNS 127 (2019).

[260] *See* Dimick, *supra* note 69, at 688, n.49. Author conversation with works council representatives at major German company, September 2018.

United States are now proposing that our labor laws be reformed to encourage sectoral bargaining.[261] That may be especially important for workers in sectors such as fast food, hospitality, retail, and logistics, where low wages and fissuring are today the norm, but where current industrial structures make worksite- or firm-based collective bargaining difficult to obtain and not very effective.[262] Debates around sectoral bargaining have largely focused on its effectiveness at setting a wage floor. But doing so, and thereby moving distributive conflict outside the firm, could also pave the way for workers to collaborate with firms more readily around technology.

Many details would need to be worked out: how to define industrial sectors, how to appropriately balance workers' rights to exercise voice over technological change with employers' need for some flexibility, and the appropriate balance between local and sector-level negotiations. The core idea, however, is clear: Granting workers some rights to help shape the course of workplace (and perhaps firm- or even sector-level) technological change may have substantial positive effects on wage equality and broader patterns of social equality, and may also encourage, over time, more high-wage, high-productivity production strategies.

To be clear, such reforms cannot ensure a fulsome worker voice in technological change on their own, nor can they ensure economic equality more generally. They would need to be coupled with other reforms to the fundamental terms of the employment relationship, perhaps including guarantees of cause prior to dismissal or broader privacy rights in employment that could be waived or mitigated in collective bargaining.[263] Ensuring decent work in today's economy may also require industrial policy that encourages the creation of large numbers of mid-skill and high-skill jobs in leading sectors as well and training efforts that prepare workers for such jobs.[264] Such efforts may be especially important to ensure that a significant segment of workers are in

---

[261] *E.g.*, ANDRIAS & ROGERS, *supra* note 227; Dylan Matthews, *The Emerging Plan to Save the American Labor Movement*, Vox (Sept. 3, 2018), *available at* https://www.vox.com/policy-and-politics/2018/4/9/17205064/union-labor-movement-collective-wage-boards-bargaining.

[262] *E.g.*, ANDRIAS & ROGERS, *supra* note 227.

[263] Such a provision would parallel unionized workers' ability to waive certain statutory rights under the Fair Labor Standards Act pursuant to a collective bargaining agreement. *See*, *e.g.*, 29 U.S.C. 207(b) (providing for certain exceptions to overtime pay requirements where work hours are set via collective bargaining agreement).

[264] *See* Dani Rodrik and Charles Sabel, *An Industrial Policy for Good Jobs*, SOCIAL EUROPE, June 12, 2019; Dani Rodrik and Charles Sabel, Building a Good Jobs Economy, Working Paper (Draft of April 2019), at https://drodrik.scholar.harvard.edu/files/dani-rodrik/files/building_a_good_jobs_economy_april_2019_rev.pdf. *See also* MARIANA MAZZUCATO, THE ENTREPRENEURIAL STATE: DEBUNKING PUBLIC VS. PRIVATE SECTOR MYTHS (2013) (outlining history of public investment in innovation and proposing expansive public investment in green technology and other forms of industrial policy); *see generally* TODD TUCKER, INDUSTRIAL POLICY AND PLANNING: WHAT IT IS AND HOW TO DO IT BETTER, ROOSEVELT INSTITUTE (July 2019).

sectors where significant and ongoing productivity gains are possible.[265] Complementary reforms to antitrust law and policy may also be warranted to alter the balance of power in the political economy, including by limiting the size and scope of the tech giants.[266]

Before closing, it is worth comparing this strategy to another high-profile proposal to deal with technological change and even wage stagnation: an unconditional basic income, or UBI. Many in public-facing debates have encouraged policymakers to consider a UBI due to fears of looming technological unemployment.[267] As should be clear from the argument above, while there may be sound reasons to embrace a UBI, imminent technological unemployment is not among them. More generally, a UBI may have little effect on labor politics, since employers' powers over workers are legally overdetermined;[268] thus a strategy of democratization may be a better solution to those power disparities. Such an effort should also be coupled with more universal benefits, including health care, and with greater investment in public goods such as education, housing, and transportation, so that even low-wage workers have access to the resources and services they need to thrive. While a UBI or cognate policies may be necessary in the long term to ensure a decent standard of living for workers in sectors where substantial productivity increases are more difficult to generate, and/or for those unable to work,[269] rebuilding state regulatory capacity and institutions of countervailing power are higher priorities in the meantime.

Conclusion

Firms are using advanced information technologies to change work—but not in the ways that many believe. The pace of automation has not increased in recent years, and it seems unlikely

---

[265] *See* Rodrik and Sabel, *supra* note 296 (proposing reforms along these lines). *See also* TON, GOOD JOBS STRATEGY, *supra* note 238 (arguing that productivity can be significantly increased in the retail sector through worker training and changes to business strategy).

[266] *See generally* Lina M. Khan, *Amazon's Antitrust Paradox*, 126 YALE L. J. 564 (2017) (arguing that consumer welfare standard in antitrust is a poor fit for contemporary markets); Lina Khan and Sandeep Vaheesan, *Market Power and Inequality: The Antitrust Counterrevolution and its Discontents*, 11 HARV. L & POL'Y REV. 235 (2017) (arguing that market concentration may encourage greater economic inequality).

[267] *See generally* STERN, *supra* note 135, and FORD, *supra* note 135.

[268] *See* discussion, *infra* Part I.B. *See also* Brishen Rogers, *Basic Income in a Just Society*, BOSTON REV. FORUM (Spring 2018), *available at* http://bostonreview.net/forum/brishen-rogers-basic-income-just-society; Brishen Rogers, *Basic Income and the Resilience of Social Democracy*, 40 COMP. LAB. L. & POL'Y. J. 199 (2019). *See also* De Stefano, *supra* note 5, at ___ (arguing that UBI is limited in its capacity to increase workers' bargaining power within the firm due to laws protecting managerial prerogatives).

[269] I am grateful to Neel Sukhatme for pressing me on this point. There are overlapping arguments for welfare policy reforms based in critiques of the historically gendered division of care work and the enormous quantity of unpaid work, typically performed by women, that labor market regulations typically ignore. *See*, *e.g.*, Noah Zatz, *Supporting Workers by Accounting for Care*, 5 HARV. L & POL'Y. REV. 45 (2011); Noah Zatz, *Care Work In & Beyond the Labor Market*, LPEBLOG.ORG, (Dec. 6, 2019).

that it will soon displace tens of millions of workers. However, companies can use (and are using) new technologies to disempower workers in other ways, including through algorithmic management and the fissuring of employment. Firms' ability both to develop such technologies, and to use them to disempower workers is, in large part, a function of our labor and employment laws—including the fundamental rules governing the employment relationship, workplace privacy rules, and workers' rights (or lack of real rights) to unionize and bargain collectively. Policy reforms to give workers a greater voice in workplace technology could right the balance, encouraging employers to use data-driven technologies to enhance productivity rather than to disempower workers.