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An Age of Technological Unemployment and Radical Inequality

At the turn of the 20th century, Thorstein Veblen described a social hierarchy in which those at the top – the leisurely class – pursue honor, mostly through symbolic actions and conspicuous leisure, while those below work and toil productively. This hierarchy is, for the most part, determined by job or career status and, to a lesser degree, income[1]. A businessman's suit, a judge's robes, and a professor's chair are all designed to convey status and one's removal from the drudgery of forced, menial work. This social hierarchy can exist as long as the human norm to work does. However, technological gains – especially those that do not produce as many jobs as they destroy and, more significantly, destroy not only 'blue collar' jobs but also 'white collar' jobs and those belonging to the leisure class – may upend this social stratification system and, inevitably, replace it with another system. In this paper, I will first discuss technological unemployment, its history and its future, and the criteria by which we can measure and predict it. I will then assume a society in which the most extreme predictions of technological unemployment have come to fruition, a post-scarcity and post-employment society, and attempt to establish the standards and counter-standards by which society may stratify itself to recover its Veblen glory days. My argument is that regardless of whether one accepts that technological unemployment has been a major factor in inequality in the past, it will be in the future, and education and entrepreneurship are not enough to prevent it.

Technological upheaval and economic reinvention is not a new concept. Rather, it is the basis for economic growth as companies find new, better ways to make products and compete

[1] Even though a plumber may earn more than a young college professor, no one would regard the plumber as of a 'higher status' than the professor.

with others. Neither is the worry about technological unemployment new. English textile artisans, apocryphally inspired by a youth named Ned Ludd, protested against and destroyed power looms and other related technologies in the early 1800s. They worried that the new industrial machines would replace their jobs, as low-skilled workers with little artisanal training could produce cloth much faster than they could. Since then, technology has dramatically increased the standard of living and has created many more jobs than it has destroyed, and anyone who attacks technology has been derogatively deemed a Luddite.

This history lays the battleground for thinking about technological unemployment today. Technology displaces workers, and it creates new jobs. The difficult question – and essential criterion – is whether the jobs it creates are equal to (or greater than) in quantity as well as in quality (wage, skill level) the jobs that it makes obsolete. There are two second-order criteria under the assumption that technological gains do not change the distribution of demand for labor skill level. The first is whether there will be true competition or oligopolies to dominate new industries and the IT-ification of old ones. The second is whether individuals can be trained quickly enough to transfer from an old industry to a new one, or whether they are relegated to permanent unemployment or reduced wages as a younger (more recently trained) generation works with the 'cutting-edge' technology. The second-order questions, and especially the one pertaining to the re-education of displaced workers, have been more relevant up to now and still dominate the public conversation (when technological unemployment is discussed at all); the assumption that technology will create as many skilled jobs as it displaces has largely held in the past[2]. However, there is a new debate regarding the recent past and long-term future of "skill-

[2] The service, manufacturing, and computing industries all provide jobs not available before their respective technological advancements. Harvard economist Lawrence Katz argues that "we never have run out of jobs. There is no long-term trend of eliminating work for people. Over the long term, employment rates are fairly stable. People have always been able to create new jobs" (Pethokoukis, 2014)

biased technological change" (SBTC) (Shierholz, Mishel, & Schmitt, 2013), as the assumption may no longer hold.

In *Race against the Machine,* MIT professors Erik Brynjolfsson and Andrew McAfee summarize the recent research on SBTC. They describe two aspects: "technologies like robotics, numerically controlled machines, computerized inventory control, and automatic transcription have been substituting for routine tasks, displacing those workers. Meanwhile other technologies like data visualization, analytics, high-speed communications, and rapid prototyping have augmented the contributions of more abstract and data-driven reasoning, increasing the value of those jobs" (Brynjolfsson & McAfee, 2011). The result, they claim, is a U-curve in skill demand – an increase in the demand of very low-skill workers to operate machines and high-skill workers to make them and analyze their results, but a decrease in the demand for medium-skill and middle-class workers (such as bank tellers) who used to do the now automated jobs. They claim that the data support the theory that technological unemployment is a component of the increase in inequality since the mid-20th century and the tepid hiring post-crisis in 2008. They see this trend in the past and increasing in the future to lead to further income inequality.

In "Don't Blame the Robots," Heidi Shierholz, Lawrence Mishel, and John Schmitt argue that a SBTC-based view of historical (post 1950s) trends in inequality and employment does not fit the data. Most fundamentally, they cite "the relatively smooth, long-standing nature of job polarization, which appears poorly suited to explaining the abrupt rise in inequality at the end of the 1970s [and] … the failure of the most conventional measure of job polarization to show any signs of occupational employment polarization in the 2000s, even as wage inequality continued to grow; and, the consistent lack of correspondence across the 1980s, 1990s, and 2000s between changes in occupational employment, occupational wages, and the overall wage distribution"

(Shierholz, Mishel, & Schmitt, 2013). If Shierholz, Mishel, and Schmitt are correct regarding the data[3], then the specific models Brynjolfsson and McAfee use are no longer valid. It is thus an unsettled debate whether, in the last fifty years, technological forces, rather than other factors, contributed the most to income inequality. At least one prestigious economist[4] argues that political decisions, rather than technology based skill biasing, have led to increasing inequality (Galbraith, 1998). Under this view, public policies, "including further increases in the minimum wage, renewed investment in urban and public amenities, jobs programs, and universal health care" can reverse the inequality trend (Galbraith, 1998). At least for now, that view may hold, and I'm not terribly interested in litigating exact past causes of unemployment and inequality.

In a reversal of the classic statement that 'hindsight is 20/20,' I think that while it may be unclear which of the factors have been most important leading to inequality and technological unemployment in the past, it is clear that the future will be one in which technology is the key factor contributing to inequality or, at the least, unemployment. The authors of both *Race against the Machine* and "Don't Blame the Robots" agree that education is a key factor in keeping up with technological change; they just disagree on whether education has done the job in the last fifty years. For the most part, technological unemployment has flown underneath the radar (and tackling it has been considered less important than tackling other problems) because technology has been seen by the public as a net job creator, and workers can usually be retrained for new technologies; technology has been seen (whether correctly or not is a difficult question) to favorably pass both criteria detailed above.

However, the rate of technological change is reaching a level at which no amount of education, minimum wage policies, or job programs can keep up. The authors of *Race against*

[3] I'm not qualified to analyze and compare competing claims on what economic data says, and I won't pretend to do so here.
[4] And, might I say, a professor with much honor

the Machine do an effective job of enumerating the technologies already being developed that have been overhauling major industries long seen immune to computerization. Google and car manufacturers are developing autonomous vehicles which will inevitably (assuming laws and effective regulations follow the technology) upend the trucking, delivery, and general driving industries. Pattern recognition software is replacing the grunt work performed by aspiring and young lawyers, and IBM's Watson is being used for more accurate medical diagnoses (Henschen, 2013). These technologies, while replacing industries, do not create new industries. Once such technologies mature and become commonplace, they may eliminate a wide swath of jobs, or at the least heavily reduce demand for them.

The assumption of the first criteria that technology creates as many jobs as it destroys, an assumption that has long been used to denigrate Luddites, may finally be dead. It is important to note, however, that the unimaginative have always been predictably bad at predicting future technologies. In a popular story[5], the commissioner of the US Patent Office in 1899 uttered, "everything that can be invented has been invented" (Crouch, 2011). New, unimagined industries that can only be done by humans may yet emerge. However, the only realm of the human mind that seems even possibly out of the scope of computers is Consciousness itself[6], and so, in the (ultimate) long-term, the emergence of such industries seems impossible.

Even if new industries do develop due to the ever increasing power of computers, the second criteria to judge technological unemployment – that there be true competition between old firms and new in the new industries and technologies, and that the newly unemployed are able to be quickly retrained and integrated into new businesses – will almost certainly not both

[5] that is probably not true, but gets the point across anyway

[6] The debate regarding the possibility of a truly Conscious computer, or a Strong AI, is out of the scope of this paper. While most CS professors maintain that a strong AI is in the scope of computing, several theorists (led by Roger Penrose) maintain that the brain carries out some non-computable function.

be met. The rate of technological development in the coming century will be too great, according to Ray Kurzweil, who is cited in *Race against the Machine*. He champions a law of exponential progress of technology that reaches back to the birth of humanity. Moore's Law for transistors[7] is simply a new phase in this progress, one that will eventually reach its physical limits and be replaced (and progress in software has already begun the task). For Kurzweil[8], the law of accelerating returns means that while only 25 years of progress was made in the 20th century[9], 20,000 years of progress will be made in the 21st century (Kurzweil, 2001). Such technological progress is almost impossible to imagine, but it is one that will (and has already began to) shape the business environment and workforce.

Regarding the business environment, there are two opposite tendencies in tension with one another. Advancing technological capabilities beget opportunities for new businesses to overtake an existing leader. Such businesses can identify inefficiencies in the current market leader's processes and solve them using newly available tools. With the era of IT, data analytics, and cloud computing, these opportunities span virtually every industry. From this strain, new companies may develop and quickly offer competition. On the other hand, a large, research oriented firm can quickly dominate several industries with its unique set of resources. Google, for example, has made inroads in such diverse fields as shopping (with Google shopping), payment systems (with Google wallet), driving (with its Google Maps and eventual Google car), and telecommunications (by buying phone hardware manufacturers). *Race against the Machine* describes this possibility as a tension between "Superstars vs. Everyone Else," in which several superstars have a global reach and crowd out potential competition (Brynjolfsson & McAfee,

[7] That the number of transistors per area doubles roughly every two years
[8] Admittingly, it is easy for a technological optimist like myself to fall into the cult of Kurzweil, as I did back in high school. However, it is more easy (and widespread) for economists and the public at large to completely ignore that the world 30 years from now will be completely different than our world today.
[9] standardized to the year 2001

2011). A company such as Google, with the Android Operating System for example, fears competition only from the very few companies who have the resources to develop such an OS. Many app makers, on the other hand, fear competition from a bored college kid with a lot of free time. The implications of a large, research oriented firm winning ground in numerous fields are the same as the dangers of other monopolies in the past: wealth becomes more concentrated, competition goes down, and the distribution of wealth is more determined by capital (ownership of the few monopolies, especially as ownership passes through generations) than it is through skill or labor (who otherwise may launch competing companies).

Regardless of which business model – the one with a continuous process of numerous, small, new companies or the one with a giant technological firm with both horizontal oligopolies and vertical integration – wins out[10], the rate of exponential progress does spell the death of the power of retraining. Such a trend has emerged in the computer science and IT industries (leaving aside even the question of people whose jobs were automated and who cannot code), even as the number of jobs in the field has exploded. Silicon Valley experiences a marked ageism as the older generation is seen to not possess the right skills and CS/algorithmic education to develop apps or even work (as new hires) in such large corporations as Google (Eadicicco, 2014). Every few years brings new programming languages, tools, and frameworks. A young programmer or college student has the time to master these new developments, while an older programmer with a family may not be able to afford the time to continuously train and keep up with the technology. Unlike in the past, experience is valued far less than knowledge of cutting edge technology. Unless the older employee moves up into management and planning, where experience matters much more, he or she is often pushed out in favor of younger (and cheaper) programmers. Other fields will see an initial sudden change (when automation and IT first enter

[10] And they can, of course, coexist depending on the market.

the field and out-compete traditional competition, much as Amazon has done or Walmart did to traditional mom-and-pop stores) and then will follow a pattern similar to the one in the software industry. It is important to note that even as I tend to believe that skill differentials are contributing to the inequality of wages and employment, I do not blame the workers, as I believe that the problem is one of demand (of labor) and of an impossible task on the part of workers to keep up. This problem worsens over time as we move toward the steeper portion of the exponential curve.

Eventually, research and development will reach such a pace – aided by robotics and automation – that humans simply cannot keep up. Ray Kurzweil deems this point, when information technologies pass the capabilities of humans, the Singularity. At this point, Kurzweil begins his argument for transhumanism, with human-computer integration and eventual brain uploads. Such a topic is out of the scope of this paper[11], and I will restrict my arguments to the short term in which something could, in theory, be done to slow down inequality due to technological unemployment and SBTC.

Though the authors flesh the argument out differently, *Race against the Machine* sees similar technological factors influencing the future of employment and skill demand as I do. However, I think that the solutions they outline are wrongly placed in the short term and laughably inadequate in the long term[12]. Their first two categories for solutions are education and entrepreneurship, both important in their own right (Brynjolfsson & McAfee, 2011). However, by stressing these solutions, they reduce the problem to the individual, rather than the societal.

[11] The argument and predictions are similar in nature to the ones made at the end of *Race against the Machine* regarding human-computer teams outperforming either humans or computers alone, but involves physical integration within a single human rather than within a team.

[12] Of course, they make recommendations that would be, on balance, net benefits, such as reducing the length of patents reducing (implicit) subsidies to financial services, and separating health and other benefits from the workplace (Brynjolfsson & McAfee, 2011). However, they do not tackle the primary problem head on.

The implicit message of stressing education as the solution – even if one correctly asserts that society has failed to provide equal access to education – is that ultimately, the onus is on the individual to develop skills that are marketable, even if that task is impossible and even if the demand will simply be too low even for the most skilled workers. You make a similar point regarding education and SBTC advocates as a whole in your article on *Created Unequal: The Crisis in American Pay,* and the point can be extended to entrepreneurship (Galbraith, 1998). The authors of *Race against the Machine* emphasize the need to reduce government barriers and otherwise encourage entrepreneurs, but they miss the scenarios in which only established, large, research oriented firms (such as Google) can even hope to compete. Even though they explain the increasing market bias toward superstars with a global reach, they fail to see the market structure as the problem in reducing competition from entrepreneurs. For the problem of income and wealth inequality due to technological biasing in the future, education and entrepreneurship cannot be the only answer.

Some conclusions can be drawn from the above discussion of technological unemployment and inequality. Though it is up for debate whether technology based skill biasing has had a large impact in the past on increasing inequality, it is clear that it will have a profound effect in the future. The first criterion to judge technological unemployment is whether it creates more jobs than it destroys, and there is little evidence that new industries which cannot be overtaken by robots will develop to replace the industries that are on the cusp of an automation revolution. The 1st second-order criterion is whether only a few firms will dominate any potential new industries or whether there will be true competition, and this question is still up for debate. Similarly (in the sense of equality), the 2nd second-order criterion is whether, if technology somehow does not destroy more jobs than it creates, displaced employees can be retrained

quickly enough in new industries or technologies. Recent history regarding this criterion does not bode well for the average worker, and the problem will only worsen. In the face of such a changing employment landscape, wealth inequality is only set to increase. Though, within this landscape, technological gains will produce unimagined quantities of wealth, the average citizen will see virtually none of it through the market, as he or she will be unemployed. No amounts of education or cutting of government regulation can reverse the trend toward automation, and not even the proposed solutions of human-computer teams increasing productivity can sustain a large workforce. Public policy must become involved again to more equitably share the gains due to accelerating returns of technological development. This is not a paper on the social safety net and how to change it, but transfer payments or government assistance of some sort must be the answer to technological unemployment.

In a grand rhetorical twist, I will now assume[13] that the problems in inequality discussed above have been solved, and that the resulting society is a relatively equitable, post-scarcity and post-employment[14] society[15]. Veblen asserted that our current society is marked with a group on the top that pursues honor through the use of status symbols and, most fundamentally, through conspicuous leisure (Veblen, 1899). Conspicuous leisure is the luxury to be unproductive. It is important, and a source of status and honor, precisely because not everyone can have it without society failing. However, in a post-scarcity, post-employment society, leisure is no longer a luxury, as it becomes the default, as only the superstars identified in *Race against the Machine* will remain employed. The question becomes, in such a society, on what is the social hierarchy

[13] Avoiding the truly difficult and political questions of how to solve the problems, or whether such a society is even probable.
[14] Or rather, post mass-employment.
[15] Again, I will not imagine a society in which Kurzweil's transhumans/computer-integrated humans have become the norm. I assume humans will remain humans.

based? As important is the question of the counter-culture: if certain standards develop by which to judge humans, what will be the standards of the counter-culture that resists that culture?

I think that an initial, cheap, solution is that those who do productive, scientific work alongside the machines, along with those who lead the businesses, will be at the top of the hierarchy – Erik Brynjolfsson's and Andrew McAfee's superstars. While most of the population may be in a state of forced leisure, these people will be seen as the sustainers and breadwinners of humanity, alongside the robots. However, such an answer is not a general solution, a standard for honor and hierarchy amongst the majority of the population.

The next[16] possibility for a standard in a post-scarcity society is the popularity of one's art and creativity. Humans, in addition to our superior (for now) pattern recognition capabilities, also have the power to create art, and, most importantly, to power our creativity with human emotions and past experiences. We share these emotions with other humans, and only a truly Conscious machine[17] can even hope to mimic our emotions. As such, the ability to create art and connect with others could become a sort of status symbol. We would be able to share artwork across networks, and have numerous new media, enabled by technology, through which to express ourselves. Sites such as Youtube have already contributed to the rise of the amateur artist, with new forms of artwork unimagined twenty years ago. Such a standard would also have the benefit of subsuming both the culture and the counter-culture. Both the culture's and the counter-culture's status standard could be artistic, just with different forms of art. Other standards similar to artistry and creativity, such as beauty and athletics, can also emerge. These last standards of beauty and athletics also suggest an obvious counter-culture – a culture in which technological gains are eschewed, and so one could judge athletes or people who have not been

[16] I would say the optimist's ideal
[17] And even then, such a machine would have the emotions of a separate species, not of a human

improved by advances in medicine. We already have a similar standard for professional athletes who are banned from using steroids or certain supplements such as HGH[18].

This counter-culture can be brought to a more fundamental level: the development of a culture in which the luxury afforded by technological gains is rejected, and people live according to the technological level of some arbitrary period in the past. Such counter-cultures exist today[19], though they tend to be heavily marginalized. Popular culture has already imagine a future society in which technology plays a much more significant role in one's daily life than it does even today, and such a counter-culture always emerges. Whether such a counter-culture attempts to overthrow (somehow) the technological norm is a question only time can answer. Whether our society ever reaches such a post-scarcity, post-employment, wealth-equality stage is also a question that only time can answer.

The issue of technological unemployment is especially salient today, as the United States is still recovering from a financial crisis and high unemployment, and battles wage regarding the minimum wage, healthcare, and social security. Even if one does not believe that technological unemployment has played a large role historically, one should not overlearn the lessons of the past. The exponentially increasing level of technological development and accelerating rates mean that the coming technological unemployment and resulting inequality will be deeper and more widespread than can be imagined. Only by actively preparing for it and shifting the terms of the debate back to a societal level (away from individual responsibility for societal ills) can we minimize the harms.

[18] The official reason is because these substances are harmful, but there exist non-harmful substances that are also banned because they may provide too much help to an athlete over his or her peers.
[19] Consider the hipster who brags about not owning a TV, while drinking Starbucks and living in an air-conditioned house and driving around in a decently new car.

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