



Technology, Unemployment & Policy Options: Navigating the Transition to a Better World

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Journal of Evolution and Technology - Vol. 24 Issue 1 – February 2014 - pgs 26-44

Abstract

There is growing concern that emerging technologies such as computers, robotics and artificial intelligence are displacing human jobs, creating an epidemic of “technological unemployment.” While this projection has yet to be confirmed, if true it will have major economic and social repercussions for our future. It is therefore appropriate to begin identifying policy options to address this potential problem. This article offers an economic and social framework for addressing this problem, and then provides an inventory of possible policy options organized into the following six categories: (a) slowing innovation and change; (b) sharing work; (c) making new work; (d) redistribution; (e) education; and (f) fostering a new social contract.

Introduction

The Luddite fear and prediction that technology will displace many workers and lead to widespread unemployment may, after many false alarms, finally be coming true. At the same time, the utopian vision of humans being liberated from a life filled mostly with the drudgery of manual or mindless labor to enjoy a productive, happier and more meaningful level of existence through art, music, literature, and rich social relationships, such as that suggested by behavioral psychologist B.F. Skinner (1948) in *Walden Two*, may also be closer to realization.

Navigating the tension between these negative and positive perspectives on the growing displacement of human labor by technology requires a calculated and delicate effort to manage this critical period of transformation. If handled poorly, the widespread displacement of workers by technology could result in rapidly expanding economic divergence between rich and poor, economic poverty and social unrest for growing numbers of dislocated workers, backlashes against technology and social institutions, and economic and social decline. If properly managed, the use of technology to replace mundane, lackluster, repetitive, dangerous or strenuous labor, could free us to live more enjoyable, meaningful and leisurely lives.

Over the years, technology has consistently been a net enhancer of employment. Past innovations in industries such as the automobile, agricultural, chemical, energy, computer, and telecommunications sectors have sparked rapid growth in quality, gainful jobs. In fact, a 1968 paper that perhaps recognized for the first time the impact of the computer for communications by two leading computer scientists predicted that as a result of the growing role of computers, “[u]nemployment would disappear from the face of the earth forever” (Licklider and Taylor 1968, 40). While the computer has indeed had an enormous impact on communications, those early experts were overly optimistic about the long-term impact on employment. But there is no doubt that the general effect of technology on employment over the years has been positive. As the National Academy of Sciences (NAS) concluded in a 1998 report, “[h]istorically, technological change and productivity growth have been associated with expanding rather than contracting total employment and rising earnings” (National Academy of Sciences 1998, 5).

The same report had a positive prediction for the future of technology and employment:

The future will see little change in this pattern.... Rather than producing mass unemployment, technological change will make its maximum contribution to higher living standards, wages, and employment levels *if* appropriate public and private policies are adopted to support the adjustment to new technologies. (National Academy of Sciences 1998, 3-5) (emphasis added).

The “if” here is an important caveat and the objective of this paper is to address “the appropriate public and private policies” that should be pursued to guide the transition into an era where machines do more and more of the jobs that humans have traditionally undertaken.

Policy intervention appears necessary. While the evidence is only suggestive and not conclusive to date, the argument has been made that in this “jobless recovery,” machines are now resulting in net job loss, perhaps at an accelerating rate (Rotman 2013; Deane 2013). Brynjolfsson and McAfee (2011) call this the “great uncoupling” where economic growth has become detached from employment growth for the first time in the modern era. Other experts vociferously disagree with this prognosis, contending it is just the latest of a long history of false alarms about the impact of technology on jobs going all the way back to Ned Ludd and his Luddite followers in the 19th century (Miller and Atkinson 2013; Bessen 2013). Just as the major loss of agricultural jobs led to increases in manufacturing jobs, and the loss of manufacturing jobs led to increased jobs in digital industries, technological optimists point to new industries and jobs that are already developing even as machines replace many existing jobs – examples include app development and additive manufacturing (Wadhwa 2012).

While it may be too soon to definitely conclude whether technology replaces jobs, we can see anecdotal evidence all around us in our daily lives, as human beings are replaced by automated technology to perform the functions once done by gas station attendants, bank tellers, travel agents, tax preparers, farmers, secretaries, call service centers, and grocery store cashiers. Artificial intelligence is empowering robots and computers to replace more complex job functions such as assembly line worker, surgeon,

barista, and legal practitioner (Markoff 2012). In the legal field, for instance, in order to predict the likely outcome of a case, computer scientists and engineers are developing software programs that have the ability to execute some of the work done by attorneys, thereby establishing a niche called “quantitative legal prediction” (Lu 2012).

The appeal to employers of replacing workers with machines is considerable given that machines require no wages or benefits, take no sick days or vacations, provide a consistent, highly reliable quality of work for up to twenty-four hours a day, seven days a week if needed, and incur no injuries. They also require no workers’ compensation, do not complain or disclose proprietary information, and do not quit, retire, strike or take coffee breaks. It is said that,

...[a] robot can be operated 160 hours a week. Even assuming competition from nimble-fingered humans putting in 12-hour shifts, a single robot might replace two workers, and possibly as many as four (Larson 2012).

This most recent quote is supported by Andrew McAfee, when he emphasizes the, “massive increases in productivity brought on by digital technology” (Regalado 2012).

Rapid advances expected in robotics and artificial intelligence will be the primary drivers of technology-driven unemployment. However, other technologies will also contribute. For example, 3D printers, nano manufacturing, and autonomous vehicles will all displace thousands, if not millions, of workers.

Erik Brynjolfsson and Andrew McAfee argue in their provocative book *Race Against the Machine* that,

Computers are now doing many things that used to be the domain of people only. The pace and scale of this encroachment into human skills is relatively recent and has profound economic implications. Perhaps the most important of these is that while digital progress grows the overall economic pie, it can do so while leaving some people, or even a lot of them, worse off (Brynjolfsson and McAfee 2011, 9).

A recent study from the James Martin 21st Century School at Oxford University estimated that approximately 47 percent of U.S. employment was at high risk of being replaced by computerization over the next couple decades (Frey and Osborne 2013). This concern is not new. Back in 1930, economist John Maynard Keynes (1930) predicted this problem in his essay entitled *Economic Possibilities for our Grandchildren* where he posited that a new malady called “technological unemployment” is on the horizon to replace and outrun human labor with more efficient, fast-paced innovations. Like Skinner, Keynes maintained that an age of leisure would be part of our future - a future he foresaw as being replete with social and other repercussions.

If these projections of increasing job loss to technology are accurate, and the predictions of widespread technological unemployment are finally coming true, the consequences could be dire. Accordingly, the time is overdue to seriously consider what potential policy interventions are available to address this emerging problem. Our objective in this article is to inventory and briefly evaluate the policy options that might be considered in an attempt to mitigate or help society adapt to the growing dislocation of jobs by technology. We start with a more theoretical framing of the problem in Part II, and then describe potential policies in Part III, grouped into six categories of potential policy options.

Framing the Problem and the Response

If we assume for the purpose of this analysis that technology is indeed in the process of widespread displacement or elimination of human jobs, there are two aspects of the consequent problem – an economic and a social dimension (from both an individual and collective perspective) (Deane 2013).

First, from the economic side, growing prevalence and permanence of unemployment and underemployment presents the challenge of how affected individuals will support their existence and that of their families. As Martin Ford in *The Lights in the Tunnel* has warned,

Jobs are the primary mechanism through which income – and hence purchasing power – is distributed to the people who consume everything the economy produces. If at some point, machines are likely to permanently take over a great deal of the work now performed by human beings, then that will be a threat to the very foundation of our economic system (Ford 2009, 5).

The economic problems from unemployment do not just affect those who are unemployed and their families. If a significant (and growing) proportion of the working-age population is unable to find adequate work to sustain themselves with a reasonable lifestyle, this problem would not only represent an individual tragedy for those persons, but would also represent a major burden on the overall economy if the unemployed cannot actively participate as consumers of products and purchasers of services. This second-order effect limiting economic activity will have a spiraling negative effect on the economy, leading to additional loss of jobs and generating further impediments to economic growth.

Over and above what machines are currently and ultimately able to provide, there is much productive and useful work that can be done by human workers – restoring infrastructure and inner cities, cleaning up the environment, taking better care of the sick and elderly, or helping people in developing countries, among many other priorities. The problem is finding an economic structure to compensate for, or acknowledge, such work. Our current political-economic system seems unwilling or unable to reward or remunerate people to undertake these worthy functions.

Second, for most people, a job ensures not only a livelihood, but is also linked to identity, self-worth and focus (Deane 2013). Even if we could find ways for people to pay for the basic necessities of life, if jobs and careers disappear, it may cause or contribute to major psychological and social stresses due to stigmatization or an inability to cope with the reality of long-term unemployment, including depression, anxiety, poor self-esteem, divorce, substance abuse, increased chronic diseases, suicide and mortality (Baker and Hassett 2012; American Psychological Association 2013). For the purpose of this essay, we posit that people must do some kind of work. Being productive is essential to human well-being (Vardi 2012). This is reiterated by Leon Kass in *The Other War on Poverty* where he states that,

Unemployment, even if compensated is demoralizing, degrading and dehumanizing...We need to consider work, as Dorothy Sayers put it, as ‘not, primarily, a thing one does to live, but the thing one lives to do’ (Kass 2012, 6).

Widespread unemployment may also cause *collective* disruptions. The strains presented by the “Occupy Wall Street” movement in 2011 and the “99 vs. 1 percent” protest theme are but a minor and relatively mild early indicator of the type of social disruptions that are likely to occur if successful people continue to thrive and prosper, while a growing percentage of the population is left behind in permanent poverty and despair.

An important aspect of the technology unemployment problem is determining whose jobs will be eliminated by technology. A recurring theme among researchers, economists, political and social scientists such as Charles Murray, Tyler Cowen, Erik Brynjolfsson, Andrew McAfee, David Autor and Lawrence Katz (see Rotman 2013) is that the middle-skilled class, based on nowadays' requirements, has all but disappeared and what is left is a polarization between the highly-skilled (wealthy) and the low-skilled (poor). This "hollowing out" of the economy by removing middle-class jobs and pushing workers into either low-paying manual labor that cannot be done by machines (e.g., restaurant and construction workers) or higher-end jobs involving higher skills and pay would tend to polarize the population into two disparate classes (Autor and Dorn 2013). However, more recent analyses suggest that the impact of technological unemployment might concentrate primarily on low income workers (Frey and Osborne 2013). Under either economic model, there will be a new urgency to improve the education and training of workers to be able to perform skilled, high paying jobs, which at least at this time are sometimes going unfilled.

When considering the near future and its economic and social repercussions, we must also consider the generations affected by the inevitable displacement. If mostly elderly workers are affected, the economic dimension may be the most important. Individuals who have worked for many years have already established their social status and have mostly performed their duty to society to be productive. For those who wish to continue to work, re-education and re-training will be critical. For others, who may be unable or uninterested in continuing to work, the focus will be on how they can retire with dignity and a good quality of life. This primarily depends on the establishment of economic safeguards, derived from personal savings or from other sources of external support. If, on the other hand, technology's destruction of jobs primarily affects young people, the problem may now be both acutely economic and social. The lack of any employment opportunity for young people, who are likely to have recently completed the most updated educational training, is likely to cause tremendous disenchantment and frustration, which could lead to social disruption.

It is worthwhile noting that gender may also play a role with regard to predictions relating to unemployment or displacement. In a paper prepared for the National Science Foundation, David H. Autor and Lawrence F. Katz boldly state that technological advances breed "winners and losers." The authors explain that, "in the long run, technological progress affects the *composition* of jobs not the *number* of jobs" (Autor and Katz 2010, 1). According to Autor and Katz, women in most industrialized countries have greatly exceeded men in the attainment of higher education and are, thus, better positioned to obtain higher paying occupations.

Not surprisingly, the recurring theme derived from various lines of research is that the impacts of technological unemployment will not be spread evenly. While machines will eliminate many jobs, resulting in unemployment or displacement, most of the people who will fall victim to this phenomenon will be the less educated, whose current job functions are more susceptible to replacement by machines. Perhaps, the issue initially is how to unequally but not unfairly sustain the lower and middle skilled class while incentivizing them to voluntarily become more educated or contribute to society in other compensable and meaningful ways.

As the capabilities of artificial intelligence, robotics, and other technologies continue to advance, more and more job functions will become automated, leaving fewer and fewer jobs where humans are essential, and thus raising broader, longer-term questions about what type of future society and lives we want. The efficiency and wealth created by technologies, even as they may reduce employment, create a window of opportunity to enact policies that can use that wealth to help all citizens achieve enough material support to enjoy a good life with greater leisure and satisfaction (Newman 2010). Policy interventions must

address both shorter- and longer-term goals, and ensure that short-term actions are aligned with longer-term objectives.

Potential Policy Responses

Policymakers in the U.S. and other industrialized nations have struggled for many decades to develop effective policies to address cyclical unemployment, generally by trying to stimulate innovation and economic activity, and hence boost job retention and creation. Today's situation is different – increased innovation and economic activity may not lead to more jobs. It in fact could accelerate replacement of human jobs by machines. New and different policy interventions are therefore needed to address this new era of technological unemployment (Perry 2013). Below we identify six potential categories of policy interventions, and begin the task of populating those categories with specific proposals. The six categories are: (a) slowing innovation and change; (b) sharing work; (c) making new work; (d) redistribution; (e) education; and (f) fostering a new social contract.

Not all six categories of interventions are likely to be equally desirable and effective, and we do not shy away from offering our own preferences and recommendations. We recognize though that views on the merits of different options may vary, and thus try to identify as many policy options within each category as possible, whether we personally think they are good, bad or indifferent. There may also be differences in effectiveness, appeal and feasibility between policy options within a given category, varying along dimensions such as the relative roles they give to governments versus individuals, or whether they are static or dynamic.

None of the categories of policy approaches are mutually exclusive, as optimal public policy is likely to involve mixtures of policies drawn from several or perhaps most or even all of the categories. The optimal mix of categories is also likely to shift over time, with some types of policies more effective and feasible in the short term, while others more salient and necessary in the longer term. Experimentation with different mixes of these policy options will also be valuable to better evaluate the individual options and their interactions.

A. Protecting Employment

These policy options seek to use legal interventions to protect jobs that might otherwise be lost due to technology innovation and development.

A.1. Place Limits on Technological Development: If technology is the problem that is displacing many jobs, then one solution might be to try to slow or block new technological developments. This was the Luddite strategy, and was most recently resurrected by Bill Joy's famous essay in 2000 on a "policy of relinquishment" for technologies such as genomics, nanotechnology and robotics (Joy 2000). Such policies, often encapsulated by stronger versions of the "precautionary principle," are doomed to fail for several reasons. First, restrictions on technology innovation would make a nation anticompetitive in the increasing global marketplace, as other countries would step in to displace the laggards and achieve technological, economic, and military predominance. Second, emerging technologies are being developed and commercialized so rapidly in large part because of demand for and benefits of those technologies. Therefore, foregoing such technologies would likely be counter-productive to overall social welfare. Finally, "stopping progress" has never been a successful or politically feasible strategy, and runs counter to human nature and aspirations.

A.2. Mandating Human Workers: Throughout history, legislators, regulators, and trade unionists have attempted to protect jobs by prohibiting displacement of human jobs with technology. Perhaps the iconic

example of trying to preserve jobs by legal mandates is New Jersey's (and Oregon's) current law prohibiting consumers from pumping their own gasoline, thus protecting the employment of gas station attendants to pump gasoline. This anachronistic policy simply increases costs, deprives consumers of convenience, and artificially prolongs jobs that are low-paying and of declining relevance (Yglesias 2013).

Trade unions have responded to automation with things like work preservation clauses or Bills of Rights which are intended to protect employees' jobs when technology is integrated into the work environment. This approach has the same objective as New Jersey's gas pumping law in that specific duties that could be performed by a machine are required to be executed by a human being (Moon 2004). Although such clauses may have temporarily preserved some jobs, they also promoted inefficiency and stalled innovation, to the long-term detriment of both the companies and workers in those sectors. Japan is a good demonstration of this, where companies facing changing markets and technologies are competitively harmed by outdated laws preventing them from laying off workers, assigning such workers to "chasing-out rooms" where the company tries to force the employee to voluntarily quit by creating boring job conditions (Tabuchi 2013). These types of antiquated policies simply delay the inevitable by mandating inefficiency (Dau-Schmidt 2001).

A.3. Regulatory Restraint: Regulation has become a controversial political subject in the United States with respect to its impact on employment, with conservatives making regulatory retrenchment a key part of their jobs strategy, while liberals argue that regulation does not harm and may even benefit employment. For example, Arizona, a state with a conservative government, has enacted by Executive Order a moratorium on new regulations (with certain enumerated exceptions) in order to "promote job creation and retention in the state" (Brewer 2013). The empirical record on this issue is equivocal and disputed, with most (but not all) studies finding that any net impact of regulations on employment to be relatively minor (Lee 2013). Not all regulations may have the same effect, and therefore reducing regulations that have less important benefits or that particularly burden small businesses may have a beneficial impact on employment.

A.4. Employment Impact Statement for Regulations and Legislation: While wholesale reductions in government regulation may not be effective or politically feasible for increasing employment, selective study of the impact of regulations may help minimize regulatory burdens on job-creating businesses and activities. Impact statements have become a useful tool for anticipatory governance, and are frequently mandated for governmental actions that may affect the environment, privacy, or other important social priorities. This approach could also be extended to employment impacts. While differing in scope and manner of execution, several state legislatures currently require employment (or economic) impact statements with regard to proposed bills (Rappa 2011). Employment impact statements consider factors such as the nature of the impact, affected numbers and categories, adverse impact regions and mitigation. Additional considerations may apply based on the rules, regulations and laws of each state (NYS Department of State 2013). The objective of the analysis is to determine whether a proposed action will have an adverse impact on jobs and job opportunities, and to consider the relative employment impacts of policy alternatives. Such a requirement could be expanded to include federal legislation and federal and state regulations. Although impact statements are criticized as being just "paper exercises" where the evaluating body simply goes through the motions to comply with the procedural requirement without affecting the pre-determined choice to proceed with the chosen policy, they do have the beneficial effect of forcing legislatures and agencies to incorporate in-house expertise on employment impacts, which can have subtle beneficial influences. Impact assessments also inform the public and media of such impacts, which can have an indirect influence on policymaking, all of which helps to elevate the priority given to considering and ameliorating to the extent feasible, adverse employment impacts.

B. Sharing Work

These policy options seek to minimize the frequency of unemployment by sharing the paid work that is available across more workers. Although these policies are mostly short-term, they may help delay or lessen the impact of technological unemployment.

B.1. Mandatory Retirement Age: One straightforward way to share the diminishing supply of work among more people is to impose a mandatory retirement age. Some employers (e.g., airlines) already impose such a limit, but it could be applied more broadly across the economy. The main advantage of such a policy is that it would free up more jobs to the benefit of young people, who are increasingly being blocked out of the workforce by the lack of open jobs. However, such a policy would have significant detrimental impacts on individuals and society. As people live longer, many want to continue working past the typical retirement age for both economic and psychological reasons. Also, it does not appear to be in society's best interest to compel the retirement of skilled and experienced workers who have many healthy, productive years of potential work remaining.

B.2. Shorter Work Week: A shorter work week could help spread work among more workers and possibly lead to a better quality of life for workers who would have more time for leisure, retraining, and other activities. Some Silicon Valley employers are now using a reduced work week as a perk of employment to attract the best and brightest young talent (Tracy 2013). According to one European expert,

[a] 25-hour work week will allow younger people to spend more time with their children, take better care of their health (which will help raise average life expectancy), and improve their over-all quality of life, while for the older population--many of whom have more time on their hands than they know what to do with--work can serve as both a psychological and physical outlet (Ebdrup 2013, quoting James W. Vaupel).

This proposal for reduced hours could take a couple of forms. Many states take part, and have established programs, in what is commonly referred to as shared work, work sharing or short-time compensation. In an effort not to cut jobs, some companies (often taking part in state-run programs) have reduced employees' hours and have assisted them with obtaining prorated benefits for lost time. This differs from the traditional view of job-sharing in that it does not increase employed numbers but it helps keep people employed when companies have to trim labor costs. Other positive aspects of such a strategy include: (a) when businesses recover, they may once again increase employees' hours without having to retrain them – a costly and time-consuming enterprise; (b) it helps avoid long-term unemployment which often has a negative effect on re-employment; (c) it provides security for older workers who may not be as likely to find work if laid off instead of having their hours reduced; and (d) the employee may appreciate the employer's efforts to avoid layoffs and reward the employer with greater loyalty, commitment and performance. In addition to the above, the traditional work-share model where two or more employees share the same job by limiting the hours each employee may work is another form of work sharing. This may allow an employer to cut back on certain benefits, and results in more workers being employed. It may have some negative repercussions, however, if it is perceived by employees as an attempt to reduce benefit payments rather than to minimize unemployment. There are also inefficiencies and extra burdens in having more employees do the same amount of overall work, including the extra training, monitoring and evaluation costs and the loss of consistency and continuity of work between two workers sharing the same job function. Moreover, as machines take over more and more jobs, it is unlikely that there will be enough available human work hours to even justify a shorter work week, and so such a strategy may help in the short-term, but just delay the inevitable in the long term (Vardi 2012).

B.3. More Vacation Time: Another way of achieving the same objective of hiring more workers to do the same amount of overall work is to provide more vacation time. For example, U.S. workers currently enjoy much less vacation time than their contemporaries in Europe. If the U.S. was to mandate a minimum of four weeks of vacation, this could create the need for hiring additional workers, especially in larger facilities where work is more fungible. Of course, such a requirement would impose a burden on employers who would be required to pay for the additional vacation time, thus increasing payroll costs and creating some inefficiency. It would have the benefit of providing a more enjoyable life for most employees, in addition to the impact in increasing employment. Such a policy could be implemented now or later as technological employment becomes more severe. Another variant would be to give employees a paid sabbatical, which would not only create the need for more hiring to fill the gaps, but would also give employees an opportunity to engage in retraining or other beneficial pursuits in their time off (Ford 2009).

C. Making New Work

These policy options seek to use governmental and other non-market interventions to create additional employment that would not otherwise be available under existing market conditions.

C.1. Government Work Programs – Government-created work programs were successful to help lift the nation out of the great depression in the 1930s, and may be needed to help get us out of the current great recession. For example, Kevin A. Hassett recently made the following proposal in Congressional testimony:

The stigma of long term unemployment may be ameliorated by a short run jobs program that recruits the long term unemployed to assist with the normal functions of government. This may allow individuals to look for a new job while employed, a change that may have a large impact on placement (Hassett 2013, 10).

Interestingly, when it comes to government training programs, Hassett claims they, “are a national embarrassment, and the unemployed would be better off if the monies were available to individuals who themselves chose the skills they wish to acquire” (Hassett 2013, 11).

A government-assisted program might include a, a) relocation service and subsidy to serve geographic areas or sectors that are experiencing a shortage, b) lump-sum payment to an unemployed worker who secures employment; c) low-interest loan to start a promising business; d) visa or other permit to retain highly-educated and skilled foreign students or workers; and e) reduction of red tape and tax implications involved in establishing and maintaining new businesses (Strain, 2013).

C.2. National Service: Two kinds of national service exist, namely mandatory or voluntary. Whether one is preferable to the other is a matter of opinion, however, it has been pointed out that,

A republic, to survive, needed not only the consent of the governed but also their active participation. It was not a machine that would go of itself; free societies do not stay free without the involvement of their citizens (Stengel 2007).

In an article published by *Time* magazine, Richard Stengel, well-known journalist, editor and author, noting the importance of national service, nonetheless recommends that such a system should be voluntary. Stengel cites the American mindset as the main reason mandatory service would not be successful because Americans do not enjoy being told what to do. In terms of the components of an incentive-based voluntary plan, these could include: (a) establishment of a “national service baby bond”

whereby the federal government would invest a fixed amount of money in the name of each U.S.-born child in a fund. At and between a certain age range, the child would be entitled to the money in the fund provided he or she commits one or two years to national service. In addition, the funds could only be used for specific, worthy expenditures (e.g. education, down payment on a home, etc.); (b) expansion and increased awareness of existing national service programs (e.g. AmeriCorps) that would benefit from additional membership derived from an incentive-based voluntary program; and (c) creation of additional entities that would serve as options for national service such as corps directed toward education, student summer service, health, environment and emergency response. (Stengel 2007). Conceivably, the list is virtually endless limited only by the creativity of the planners and framers of a national service system. Providing incentives in exchange for the execution of respectable and valuable work, which in turn also results in skills and other professional enhancements, certainly appears to create a win-win situation.

In terms of mandatory national service, Ilya Somin, Professor of Law at George Mason University School of Law, has said that,

Mandatory national service, which would require young people to do government-mandated work...is pretty clearly involuntary servitude under any reasonable definition of the word.

In response to whether a national service requirement may violate the 13th Amendment's restriction on "involuntary servitude," Somin replied,

I think that the answer is pretty clearly 'yes,' especially if you take the text of the Constitution seriously...Note that the Amendment forbids not only 'slavery' but also 'involuntary servitude,' a provision deliberately inserted to prevent state governments from, in effect, reenslaving blacks by imposing 'temporary' forced labor systems (Somin 2009).

The article in *The New American* that references Somin's comments, provides that,

National service is just another costly and wasteful big-government program. Like most federal government programs, it will be top-heavy, slow-reacting, expensive, ineffective, and administered from D.C. To get a good idea of what these new "corps" will be doing, one only has to review what AmeriCorps has been up to since its inception (Krey 2009).

With regard to the implied failings of the AmeriCorps program, Krey maintains that the effects of AmeriCorps activity have been inconsequential, citing "comical volunteerism" and mismanagement with no tangible results. He further addresses the repercussions of a forced system which according to Krey are destruction of private charity, government indoctrination and tax increases and inflation (Krey 2009).

C.3. Guaranteed Employment: The purpose of a job guarantee program (JGP) is to lift the burden off the private sector's shoulders during periods of slow economic growth and provide all the unemployed with a job. Pay would be based on the federal minimum wage and legislated benefits would also be provided. The system would work like a pendulum: in a boom economy workers would move from a JGP to the private sector and back to a JGP during times of economic bust.

The benefits of a JGP include, the elimination of unemployment benefits and the need for other costly social safety nets, job security, ongoing skills training and development, poverty reduction, less economic pressure on the healthcare system, economic and social stability and increased production of goods and services coupled with a solid consumer base. In essence, a JGP may be viewed as a,

... genuine bottom-up approach to economic recovery. It is a program that trickles up and stabilizes the rest of economic activity. Strong and stable demand means strong and stable profit expectations. A program that stabilizes employment and purchasing power is a program that stabilizes cash flow and earnings. Stable incomes through employment also mean stable repayments of debts and greater overall balance sheet stability (Tcherneva 2011).

On the negative side, it may be argued that implementing and running a program like the JGP would be extremely costly. However, if the government can thereby eliminate many of the costs currently associated with paying people who are not working, it may not be a bad proposal. Unemployment may be viewed as a policy tool to regulate inflation because when cost pressures rise during a slow, unemployment-ridden economy, interest rates are tightened and wage demands are reduced which together ensure inflation is kept in check. On the other hand, it has been argued that the back and forth between private and public sector employment and a fixed JGP wage are enough to control inflation. This is the view of William F. Mitchell, Professor of Economics at Newcastle University and Charles Darwin University, Australia, who has published extensively in the areas of wage and price inflation and unemployment (Mitchell 1998).

C.4. Tax Credits – A long-standing proposal to increase employment is to use the tax system to give companies incentives to hire more workers (Spence and Hlatshwayo 2011). For example, Alan Blinder, former vice-chairman of the Federal Reserve, has proposed giving companies a tax credit equal to ten percent of the increase in their wage payments over the previous year (Blinder 2013). Other experts have proposed using tax policy to benefit young people who may be disproportionately affected by technological unemployment (Sachs and Kotlikoff 2012).

C.5. Greater Priority for Traditional Job-Creating Factors: Over time, we have learned that certain societal factors and forces create new jobs, such as technology innovation, entrepreneurship, and stable social environments. Although these forces may not be capable of completely compensating for technological unemployment, they may help stall and mitigate the severity of such unemployment. Policies such as supporting research and development, providing additional financing and reducing regulatory burdens on small business entrepreneurs, increasing international trade, and promoting stable family environments should therefore be given higher priority in this time of potentially runaway unemployment (Baker and Hassett 2012; Spence and Hlatshwayo 2011). Universities are centers of innovation and entrepreneurial start-up companies, all of which generate high quality jobs, and therefore should also be a priority for funding (Florida 2013).

D. Redistribution

These policy options seek to redistribute wealth in order to blunt the human and social costs of widespread technological unemployment.

D.1. Minimum Guaranteed Income (MGI): One common policy proposal to the problem of technological unemployment is for the government to guarantee a minimum income to each citizen. While this proposal seeks to address some of the humanitarian problems associated with chronic unemployment, it is also the case that government-conferred benefits without demanding work from those who are able undermines the work ethic, attenuates social bonds, creates an alienated underclass and breeds resentment among those who have to pay (assuming the employed are being taxed to assist with subsidization). This is the lesson learned from previous welfare programs. Of course, these impacts would be mitigated somewhat by the government not having to pay for some existing drains on the public purse such as unemployment benefits, food stamps and social security that could be replaced by a MGI.

Nonetheless, a MGI would likely have a corrosive effect on the social fabric, would not address the need for people to have a meaningful purpose to their lives, and would likely be politically infeasible in this era of government cut-backs and retrenchment. Switzerland's upcoming national referendum on a proposal for a guaranteed national income will be an interesting test case for the political feasibility of the MGI – if it is not approved in that nation, it is unlikely to be adopted in countries like the USA that historically and culturally have a smaller role for government involvement.

D.2. “Smart” Social Programs - The human impacts of long-term unemployment are real and tragic, and from a humanitarian perspective cannot be ignored if we are entering an era of growing technological unemployment. Painful lessons from the past half-century of social programs have taught us that simply providing disadvantaged individuals with a monthly check does not usually help those people to get back on their feet and become self-supporting. Rather, such handouts tend to create cycles of dependency, lethargy, and lack of self and external respect. While the ethical case for some type of support to ensure a minimal standard of life is strong, such support should be structured to include incentives and training provisions. Martin Ford for example, has suggested a system based on government-provided income that is fed by taxation on businesses (who will not have to pay wages, benefits, vacation pay and so forth) and consumer goods and services (Ford 2009). The model involves “incentives” that, if fulfilled, would have a positive effect on one's income: the greater the response to the incentives, the greater the income the individual will receive. Such incentives might include participation in environmental stewardship, continuing education, child-care, art, music, volunteer work and other laudable activities. Ford's proposal arguably eliminates the often negative effects of having “idle hands,” low self-esteem associated with job loss, social stigma and unproductivity. Under this incentive model, the individual incomes received while unequal would not be unfair.

E. Education

These policy options seek to revise our educational system to make workers more adept in succeeding in an increasingly technology-focused and changing world.

E.1. Lifelong Education Policies: The traditional model of education in which young people spend the first quarter or so of their life getting educated and then are done with education is quickly becoming obsolete. In such a rapidly changing world, there is a need for continuous, life-long education rather than the current “once and done” approach to education today. Education will need to become more dispersed and delivered in a multitude of ways throughout a person's life. Governments, educational establishments and employers will all need to work together to create a new ethos of lifelong learning. This shift could be encouraged by a mix of tax credits, employee incentives, and new online educational technologies to create consumer demand for lifelong learning. Michael Spence, for example, has argued that the education system should be given greater value and to provide access for as many people as possible in order for the U.S. workforce to remain competitive (Spence 2011, 39). He argues that this focus should go hand in hand with tax reform and government investment in infrastructure and technology

Similarly, the NAS reported in 1987 that, “a key factor in sustaining American living standards and employment thus is continued private and public investment in new knowledge” (National Academy of Sciences 1987, 3). The NAS also underscored the importance of establishing training-focused adjustment policies for effective worker transitions in the wake of technological displacement. The source of funding for this revised educational policy was deemed to be beyond the NAS panel's charge. One barrier to ongoing training through the workplace is that shorter job durations that many employees now experience provides less incentive for employers to pay for ongoing training, since that employer will not get the benefit of that training once the employee has moved on to another job (Dau-Schmidt 2001).

E.2. Updated Education Curriculum: In addition to becoming life-long, the content of education must also change to align with a rapidly changing world. At a time of unprecedented global change, teaching static views of the world focused on facts and information (all of which is now readily available online) is obsolete. In a world dominated by technology, greater emphasis must be given to science, technology, engineering and mathematics (STEM) education, as has been well-recognized recently but slow to be implemented. More importantly, the type of adaptive and forecasting skills that will be essential in a time of rapid change must be taught, including study of the possibilities and probabilities of human change, awareness of fluctuations and alternatives, a menu of skills for emerging jobs and coping skills, flexibility, and adaptability to change.

As Abdul Raheem Yusuf has suggested, the era of rapid technological change necessitates that humans of the future be educated thinkers who are problem solvers, leaving the mundane tasks to technology (Yusuf, 2007). Similarly, Frank Levy and Richard Murnane predict that,

The major consequence of computerization will not be mass unemployment but a continued decline in the demand for moderately-skilled and less-skilled labor. Job opportunities will grow, but job growth will be greatest in higher-skilled occupations in which computers complement expert thinking and complex communication to produce new products and services (Levy and Murnane 2004, 79).

Levy and Murnane further maintain that while better education is not a perfect tool it is the best one we have to prepare workers for the unpredictable and ever-changing employment market. The authors conclude that many of the jobs already lost will not return and that our “dynamic environment requires new policies, and the first step in creating those policies is to recognize the new realities” (Levy and Murnane 2004, 82).

In a subsequent report prepared for the Organization for Economic Co-operation and Development (OECD), Levy distinguishes among inductive/deductive rule-based skills, expert thinking and complex communication – only the first of which can be performed by a computer. Jobs requiring expert thinking and complex communication, on the other hand, require a robust educational foundation and are, thus, not easily replaced with automation. To remain successful in the future job market, Levy recommends that workers must stay abreast of job market trends and hone skills that complement technology rather than skills that may be eliminated by same (Levy 2010).

E.3. Greater Educational Experimentation: Given the many stresses and changes affecting education, this is an opportune time for more experimentation in education to try to find what strategies and approaches work best in the era of evolving technologies and jobs. One track to try might be greater emphasis on the type of trade school model used more in the United Kingdom and some other European nations, where some students may opt for a more practical and skills-oriented training rather than attending traditional college. While studies consistently show that young people with a university degree do much better than those without in terms of finding quality jobs (Berger and Fisher 2013; Pielke 2012), a growing number of university graduates are not finding worthy jobs, despite having gone deeply into debt to pay for their college education, and may have fared better with a more focused skills-based or trade school education (Silva 2013). For example, a recent poll conducted by Accenture found that forty-one percent of recent college graduates say they are underemployed and sixty-three percent say they will need more training in order to get their desired job (Accenture 2103).

The advent of online education and massive open online courses (MOOCs) is another opportunity for experimentation. Even more radical are promising existing programs to develop robotics for teaching, such as “RUBI” at the University of California, San Diego, “Simon” at the Georgia Institute of

Technology, and “Cosmobot” developed by AnthroTronix. Different models of funding education, including private enterprise training and block grants to states, can also be tried. In all these various experiments in educational innovation, careful metrics should be kept to evaluate the success and strengths and weaknesses of the various approaches.

E.4. Mental Upgrading: Brynjolfsson and McAfee (2011) consider ways to directly upgrade the human brain using brain-computer interfaces thereby allowing us to better keep pace with technological change. Unemployment here is viewed as the result of people not being able to keep pace with technology. An enhanced existence may therefore help to eliminate unemployment as our altered state of mind would be better prepared for anything the future throws our way. Relatedly, our superior cognitive capabilities might induce us to either reject a market economy or, alternatively, spark new industries to keep employment vibrant.

F. Fostering a New Social Contract

These policy options seek to alter the existing social model in which an individual’s economic livelihood, social status, and personal self-worth are based on their employment.

F.1. Health Care Not Tied to Job: In the new culture of the future, flexibility will be paramount to allow individual workers to adapt to new technologies, industries and opportunities. Moreover, the concept of having a single job is increasingly outmoded for many people, who by choice or necessity cobble together their own portfolio of contractual tasks, part-time jobs, short-term jobs, freelance jobs, commissioned projects, entrepreneurial initiatives, and other income-earning opportunities to make their livelihood. This pattern will become more and more common going forward. The regulatory and social benefit approaches to employment must adjust to this changing model (Dau-Schmidt 2001). Most people now have their health care tied to a specific employer, which constrains the employment flexibility and adaptation that will be needed for the future. As Ford writes, “[o]ne thing that is abundantly clear is that, in a world where traditional jobs are disappearing, access to healthcare insurance cannot be coupled to employment” (Ford 2009). New models of health care will be needed for the future whereby health insurance is not tied to a single employer. Health care exchanges, such as those that are being established under the Affordable Care Act in the United States, health care coops, or universal health care are models that will better fit the changing workplace of the future.

F.2. Alternative Valuation System: For hundreds of years, our society has been structured on an economic model in which people earn their income through employment, and then use that income to pay for their living costs. This model may be facing collapse if technological unemployment results in a significant proportion, perhaps even a majority, of the population eventually unable to support themselves because of the shrinking employment opportunities. A new social order will be needed to both provide basic essentials for such people to live a good life, as well as to live of life of dignity, respect and accomplishment. As discussed above, simply giving handouts to affected persons undercuts their respect to both themselves and the members of their community. Healthy, happy living requires the sense that one is making a contribution to something meaningful. Traditionally, but not always, that source of meaning and achievement has often been associated with one’s job. But that has never been the case for everyone, as some find meaning and respect outside of the employment context, whether it is as a caregiver for children or elder relatives, a volunteer for a charitable organization, an advocate for a cause, or as a serious hobbyist.

The problem of technological unemployment means that more people will need to find their meaning or value in life outside of the employment relationship, *and* there will be a need to incentivize and reward such activities when they are socially valuable in a way that can allow those people to obtain the

amenities (shelter, food, clothing, health care, etc) necessary to live a full and satisfactory life. In the long term this may mean moving beyond the existing economic model where dollars earned are used to recognize and reward effort, to a broader and more flexible metric to recognize and reward social value. Perhaps some type of online social contribution index will eventually need to be created, whereby individuals score points for traditional work, volunteer efforts, caregiving activities, creative inventions, good deeds, and other socially valuable contributions. Compensation and entitlements would be based on each individual's social contribution score. The era of Big Data and the massive amount of information collected daily on each person would be used to generate the rankings needed to administer such a system. While such a post-economic scheme may seem far-fetched and infeasible at this time, such social engineering to restructure our social expectations and reward systems may be needed over the long-term to address both the economic and social dimensions of the technology unemployment problem. Although such systems go beyond our current market system, the fact is that the market system is dependent on customers, and if large numbers of consumers (perhaps even a majority) are without any means to purchase goods and services, the market economy cannot succeed.

Conclusion

Change always brings with it risk and opportunity. The rapid emergence of a growing number of technologies that can replace human "work" presents both risks and opportunities. The real possibility of widespread and chronic technological unemployment could result in unacceptable individual and societal instability and adversity. But those same technologies also have the potential to enrich our lives and to free us from the drudgery and danger of manual, boring labor and to enjoy a higher quality of life. To make this happen, our laws, policies, assumptions and social contract must evolve as quickly as our technologies will. There is thus an urgent need to identify, evaluate and implement policies that can help manage and smooth our transition into the new technological era (Perry 2013). Shorter-term policies need to focus on preserving and creating as many jobs as possible to counter and delay as much as possible the trend towards technological unemployment, and then to use redistribution and government support to ensure that individuals who are replaced from their (existing or future) jobs by technology have the material means to live a decent life and the incentive to improve themselves and live with dignity and respect. Over the longer term, more radical social engineering policies will be needed, moving eventually to a new social contract that recognizes and rewards people for their contributions to society within and outside the employment context.

We hope to contribute to the effort to ensure an appropriate policy response by inventorying an initial list of potential policy initiatives to address the emerging technological unemployment problem. We plan to post this list online and update it on a regular basis, and welcome suggestions from readers for additional ideas of policy interventions that we can add (with appropriate attribution) to our evolving list. There will be no single "silver bullet" that will solve this problem, but rather what is needed is experimentation with a constantly shifting portfolio of policies such as some of the ones provide here. The more ideas and proposals are available for policymakers to choose from, the more successful and effective their policy experimentation is likely to be.

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