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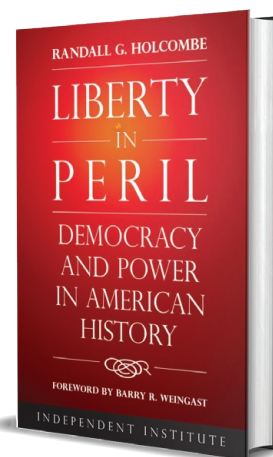
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# Countering the Modern Luddite Impulse

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TOM LEHMAN

Fear of job loss attributed to increased technology in the workplace has recently reached a high point perhaps not seen since the Luddite uprisings and property destruction in British textile factories more than two hundred years ago. There is little evidence of direct property destruction connected with modern Luddite philosophy,<sup>1</sup> but if we take our cues from contemporary media hyperbole over the rapid advance of technology and its connection to worker displacement,<sup>2</sup> it cannot be long before the “destroyers of machines” are at the gates, pitchforks at the ready.

Since the shift to an information economy and the dawn of the “Internet Age,” pundits and scholars of all stripes have popularized the notion that advances in information technology embodied in robotics and automated production machinery will mean the “end of work” (the title of Jeremy Rifkin’s polemic published in 1995) and perhaps the end of civilization as we know it. Even some economists, a group who should be naturally skeptical of Luddite fallacies, are instead lending credibility to them. The esteemed Lawrence Summers recently lamented that because of advances in technology and software-driven automation, there are “more sectors losing jobs than creating jobs. And the general-purpose aspect of software technology means that

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1. A glaring exception is the “Unabomber.” From 1978 to 1995, Theodore “Ted” Kaczynski conducted a national bombing campaign targeting people and property involved in or related to the production of modern technology in the United States. Kaczynski planted or sent by mail numerous homemade bombs that resulted in the deaths of three people and injuries to many others, all in the hope of restraining or defeating advances in technology that Kaczynski found threatening to human civilization (see Douglas and Olshaker 1996; Kaczynski and Skrbina 2010).

2. See Needleman and Loten 2013; Avent 2014; Galston 2014; Aepfel 2015; Ford 2015; and Mangu-Ward 2015.

even the industries and jobs that it creates are not forever. . . . If current trends continue, it could well be that a generation from now a quarter of middle-aged men will be out of work at any given moment” (2014).

The modern Luddite impulse appears not to be overtly antitechnology or antimachine per se, even though that tendency may be latent among some. Critics expressing fears about modern technology are generally careful not to reject the technology itself for fear of losing their audience altogether. They know at some level the tremendous improvements in the quality of life that information technologies have brought to the average person. Consider William Galston’s skeptical nod to technology but with vague reservations: “No doubt the latest technological wave has brought gains to average Americans as consumers. But the losses it has inflicted on average Americans as producers is far more consequential” (2014).

Instead of being strictly antimachine, the modern Luddite impulse typically reflects an anti-inequality ideology (Ford 2014; Hanson 2015). Noted MIT economist David Autor openly confessed this point of view when quoted in the *Wall Street Journal*: “The real problem I see with automation is that it’s contributed to growing inequality” (qtd. in Aepfel 2015). Recent technological advances in the workplace have disparate effects on the productivity of different types of labor, usually augmenting the productivity and wages of skilled and educated workers while having a neutral or depressing effect on the productivity and wages of less-skilled and less-educated workers (Brynjolfsson and McAfee 2014). Economists label this effect “skill-biased technological change” and have long identified it as a primary source of rising income inequality since the early 1980s.<sup>3</sup> Earlier generations of technological change may not have been quite so skill biased, but there is some evidence that new technologies often favored skilled workers even in the past (Chin, Juhn, and Thompson 2006; Katz and Margo 2014).

Technological advances embodied in automated machinery in the workplace are characteristically complementary to high-skilled labor while serving simultaneously as a substitute for low-skilled labor, leading to rising income inequality between low- and high-skilled wage earners. Computerized and automated manufacturing processes have generally increased the demand for and wages of elite technicians and software engineers. But these changes have also shown a tendency to temporarily displace low- or semiskilled workers, rendering their skills obsolete and increasing the wage gap. It is this rising inequality that has become the real locus of the modern Luddite’s resistance to recent technological advances. If continuous advances in technology keep the demand for skilled labor increasing faster than the supply of skilled labor, rising income inequality is the result. The modern Luddite’s fear is that technological advances and automation will push the skill requirements of a small (and diminishing) class of jobs far above the average worker’s intelligence capabilities. In their view, these advances

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3. See Murphy and Welch 1992, 1993; Juhn, Murphy, and Pierce 1993; Krueger 1993; Leamer 1996; Levy and Murnane 1996; Autor, Katz, and Krueger 1998; Goldin and Katz 1998.

would leave only a few high-skilled workers capable of earning premium wages, while others experience stagnant real incomes (Brynjolfsson and McAfee 2014). Too much wealth at the top, goes this line of reasoning, yields too much political power and influence in the hands of too few wealthy elites, leading to corruption in the rule of law, cronyism, as well as distortions and misrepresentations in the democratic process. Economists as diverse as Tyler Cowen (2011, 2013) and Thomas Piketty (2014) have expressed concerns about the role of modern technology in exacerbating wage inequality or lowering the returns to certain types of labor, potentially leading to the feared political and cultural problems highlighted earlier.

Although it is hard to deny the logic of supply and demand for skilled labor or the evidence for skill-biased technological change as a source of income inequality, I would nonetheless like to make the strong case in this essay that the advance of technology and automation is an unmitigated good and is broadly beneficial in a market economy where strong property rights, the rule of law, and small and limited government prevail. In a free economy, labor-saving technology, whatever its impact on income inequality, is a key source of prosperity, economic growth, and higher living standards. It makes possible an increased level of output with the same or fewer inputs, thus freeing up scarce resources (including labor) for alternative and more productive uses over time, permitting a greater level of consumption as a result.<sup>4</sup> And under conditions of limited state power, where property rights and voluntary market exchange are protected by the rule of law, the increase in income inequality that may result from skill-biased technological change is actually a beneficial guide to scarce resource allocation. With the proper institutions in place, the impact that income inequality might have on political influence and power relationships is attenuated by the state's neutered and constrained position. The modern Luddites' fears are thus just as overblown today as they were more than two centuries ago.

## **An Unconditional Economic Defense of Technological Advance**

The Luddites' great culminating fear throughout history has been centered in the notions that technologically advanced machines, left unchecked, will come to dominate production and replace workers, that eventually and inevitably no human being (or an extreme few of us) will be employed doing work, and that this lack of employment will result in economic decline and dystopia. These fears, however, are a version of what economists call the "lump of labor" fallacy (Black 1997; Aeppel 2015): that there is a finite amount of work to go around; that the more work is accomplished by machines, the less work is to be done by humans; and that this process will eventually culminate in a massive wave of unemployment and poverty.

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4. For an interesting and contemporary example of these benefits, see Bensinger 2014.

In fact, however, if we could have machines perform all functions, jobs, occupations, and duties throughout the economy, we should welcome and celebrate such an outcome. Individuals or households might simply employ their machines (robots) to produce for them, which would allow these individuals or households to experience much greater leisure time and enjoy pursuits beyond direct labor. Our income would be based on the productivity level of the machines we employed, the creativity and ingenuity with which we choose to apply them in various occupations, the revenue streams they can generate for us in service to and trade with others, and the ongoing capital investments and improvements we have made in our machines. In the extreme, the income now generated through labor would be replaced and supplanted by income generated through capital (robot) ownership, and Adam Smith's "division of labor" would evolve into a "division of capital" as structural shifts in factors of production make contemporary definitions of labor generally obsolete.

Some critics may be quick to object that the typical worker-capitalist could not possibly afford modern automated robots and that machine automation would become concentrated in the hands of a wealthy few. High-quality robots or other technological advances may be too costly for the average person to obtain, blocking the path to capital ownership for a plurality or majority of people even as capital ownership potentially becomes the sole means of earning income. However, the trends in the electronics and microprocessor industries in the past thirty years suggest just the opposite, as witnessed by the falling prices of desktop and laptop computers, smartphones, tablet and GPS devices, and, potentially, 3-D printing (Doherty 2015). Indeed, these devices *are* the "robots" of the present capitalist age. Rather than remaining expensive and out of reach for the normal person, they have become increasingly less expensive and more attainable at least since the 1990s (Berndt and Rappaport 2001; Whelan 2002). In fact, it may be the very attainability of such revolutionary technology and machine automation that creates fear among some modern Luddites (Ford 2014; Hanson 2015). This is especially obvious if we think of the potential implications for the manufacturing sector as 3-D printing capabilities evolve and a plausible assumption if 3-D printing hardware, software, and computer-aided product designs become less costly. In any case, direct ownership of capital in the form of personal robots need not be the only hypothetical option. Shared ownership of robotic capital among millions of investors in financial markets earning returns on robot-intensive industries seems equally plausible and would open the further possibility of more widespread and democratized access to the potential returns on the roboticization of production.

In addition, robots, as a form of capital, will increase the productivity and thus the wages of those workers whose skills are complementary with them. So even those who may not directly own robots would likely benefit from higher incomes simply by working alongside them, provided they invest in the requisite compatible skills. And there is no reason to believe that the ownership of capital (robots) would necessarily become significantly more unequal than it is at present.

Thus, the more work that machines can do, the more the average wage earner is turned into a capitalist who earns his income not from the direct sale of his labor services but instead from the returns on his investment in capital—that is, his (or others’) personal robots. Individuals and households will still consume goods and services but without so severely enduring the “disutility of labor” itself. We might even envision a hypothetical future when direct labor activities end for the majority of the population and where we live lives of relative ease and leisure except for the time spent maintaining, improving, upgrading, and redirecting our machines (or programming them to maintain, improve, upgrade, and redirect themselves). This process can already be faintly seen in the present-day introduction of ever more intelligent software, personal computers, and smart-device applications over the past thirty years. We have become relatively more productive and enjoy marginally more leisure time (see Aguiar and Hurst 2006) because we can employ our machines to shoulder much more of the burden of our work.<sup>5</sup> And these machines (personal-computing “smart” devices) in some measure already maintain and update themselves automatically over the Internet or the airwaves.

Skeptics of this “utopian” narrative might argue that work and the direct labor it entails actually give meaning to people’s lives, that much modern work is truly enjoyable for the workers themselves, and that there is little “disutility” attached to it. Some may gain satisfaction from the mission of the work itself or the employing institution, the gratification in serving and helping people or in committing oneself to a cause. Others may simply gain enjoyment from various aspects inherent in performing the work, the complexities in problem solving, the challenges, and the learning-by-doing process. Whatever the case, the displacement of this type of work by mechanized, computerized automation might potentially constitute a nontrivial loss to a number of people who receive great nonwage benefits from their labor.

Although this is certainly the case in much of the modern workforce, at least two responses to this argument should be considered. First, work itself is not performed solely for the benefit of the laborer or employee. If it were, the worker would presumably require no compensation to induce her to complete it. She would perform these tasks or engage in these activities as a volunteer. Such “work” would

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5. According to the U.S. Bureau of Labor Statistics Time-Use Surveys, average leisure and non-work time per day for the U.S. employed civilian population increased from 18.15 hours in 2004 to 18.27 hours in 2013, an increase of about two-thirds of a percent over just this nine-year period for which data exist (U.S. Bureau of Labor Statistics n.d.b, table 8). For ease of comparison, these values refer to “employed adults living in households with no household children under age 18,” suggesting that the increase in leisure and non-work time over this period is found even among fully employed people in the prime of their working careers, people whose greater consumption of leisure would be most related to advances in technology and automation of routine job duties. This increase in leisure consumption is thus not due to declining labor-force participation rates or rising unemployment rates during this period. An alternative explanation is that greater part-time work during this period, due to business-cycle conditions during the Great Recession, may explain part of the increase. It might also be that workers in their peak earning years are treating leisure time as a normal good, happily consuming marginally more leisure as their incomes rise (i.e., a backward-bending supply curve of labor at higher levels of income). If so, it is plausible to think that automation and technological advance play a role in this process.



then actually be a form of leisure consumption. Hypothetically, were we to witness people continuing to perform these types of jobs even if their earnings were suspended, it would be the equivalent of workers offering labor services at a market wage of zero simply to receive the benefits of the activity itself. In such an instance, technological displacement or obsolescence of the work would be extremely unlikely. There would be little conceivable economic incentive or rationale to invest scarce resources and costly technology for the delivery of equal-quality services that could be obtained freely from worker-volunteers. However, it is not likely that workers, even in the most attractive and interesting occupations, would continue to perform those jobs without monetary pay at some level. To earn that pay, the worker must look beyond her own personal fulfillment and turn attention to the demands of others.

In a market economy, labor-market work is first and foremost a form of trade in which the supplier of labor services serves the demander (consumer-buyer) in exchange for agreed-upon and market-determined compensation. The trade of goods and services in this manner is assumed to be mutually beneficial to both parties, not just to the worker-seller. If scarce resources, including not only automated technology but also other rival workers, can be rearranged to consummate the trade at a lower opportunity cost to the consumer-buyer, market forces (and the law of demand in particular) will naturally lead to just this outcome. It would be highly inefficient to keep people employed doing work that has value or meaning only to the worker, and there would be no reason to believe that consumer-demanders would pay a premium on services purely to provide workers with a sense of meaning or personal fulfillment.

This leads to the second and tightly related response. Meaningful work, or work that carries nonmonetary benefits to the worker, exhibits what economists call a “compensating nonwage differential.” In this case, the compensating differential is simply the nonwage benefit received by the laborer in certain attractive or enjoyable types of occupations or classes of work (Black 1997). Examples include jobs that are gratifying or appealing to the worker, such as the enjoyment a professor receives from teaching students and conducting interesting research or the benefit of lower stress levels that may be experienced by medical doctors working in a family practice rather than in an emergency room. Such compensating differentials are typically reflected in somewhat lower monetary earnings to those workers employed in more-attractive occupations relative to wage premiums typically earned by workers in less-attractive jobs, all else being equal (Kostiuk 1990). The lower monetary reward is the market’s method of internalizing the positive externality to the worker engaged in work that is considered more appealing or fulfilling. As the foregoing discussion argues, the greater the compensating differential inherent in the job (be it gratification or some other beneficial trait), the more competitive (and less costly) the worker becomes relative to rival substitutes, such as machine automation, and thus the lower the likelihood that this worker will be displaced by technology.

If workers who receive nonwage benefits from performing their jobs willingly lower their reservation wages in order to prevent being displaced by machines, they

might potentially retain their fulfilling and gratifying jobs and avoid obsolescence.<sup>6</sup> The positive externality they receive from being employed in this type of “meaningful work” will be internalized by the lower money-wages they now accept. However, if such workers are unwilling to lower their reservation wage, it signals that the money-wage benefits of the job (balanced against whatever disutility the job may carry) trump the nonmonetary benefits of the labor activity itself, and the worker will be pushed or drawn into some other line of employment, either as a worker or as a machine-owning capitalist. Either way, jobs that are meaningful to the worker, that are gratifying, interesting, or intellectually rewarding, or that carry with them any other significant compensating nonwage differentials would tend to be the least likely to be replaced by automation. Because workers who perform more gratifying jobs are generally willing to accept less in money and benefits to perform them, the pressure to replace such occupations with machine automation is weakened. At any rate, it seems plausible to conclude that, on balance, these types of jobs would be the last to be uprooted by technological advances. If and when they are made obsolete, the meaningfulness inherent in the job would be a thin reed on which to rest an objection against automation. By that logic, we would have forcefully halted the advance of the internal combustion engine one hundred years ago with the goal of keeping blacksmiths and wagon makers employed in what, to many of them, was surely a “meaningful” occupation.

In any case, aside from the skeptics’ objections, the more extreme depiction of automation and direct labor obsolescence described in the earlier narrative is not likely to be fully realized any time soon and maybe not ever. It seems the moment we automate some given process with labor-saving devices, we identify some new problem, unresolved issue, or unmet need, and the scarce labor resources that had been employed in the now automated line of work are eventually shifted over to the new problem to address the continued and ongoing struggle against scarcity—all coordinated by price and wage signals emerging from supply and demand in the marketplace. In a world of scarcity, we are not likely to reach an end point where there is no further human work to undertake, no unmet demands, no utopia where all problems are solved or where all problems might be left to automation alone. Even in a world ubiquitous with tablet computers, “smart” devices, smartphone apps, GPS navigators, self-driving automobiles, automated production facilities, drone delivery mechanisms, and other robots, we seem to have a never-ending parade of more complex problems to solve. These problems continue to require the complementary employment of both machines and humans (Isaacson 2014; Frick 2015)

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6. It should be noted that even if workers accept lower nominal wages to prevent obsolescence from machine-automated technologies, they are not necessarily made worse off. First, they are able to retain a job that has positive compensating nonwage differentials. And, second, technological advances in other areas of the economy may reduce the prices of consumer goods by at least as much as (or more than) the decline in their nominal wages, leaving real wages unchanged and improving the workers’ economic positions as consumers.



in ever more sophisticated analysis, thought, and engineering to meet consumers' ever-emerging and never-ending new demands. This continual evolution makes education, knowledge, skill, and human capital investment more important than ever (Brynjolfsson and McAfee 2014). As more soluble challenges are overcome and more complex problems emerge, continued investment in knowledge generation, skill development, and entrepreneurship are critical to maximizing the gains from new technologies.

A recent survey of employers by Michigan State University's College Employment Research Institute (Gardner 2014) illustrates the continued demand for skilled and educated workers in spite of the growing use of technology and automation. This survey of more than five thousand firms—from large corporations to small businesses—reveals that employers expected to increase their hiring of workers with a bachelor's degree by double-digit percentages in 2015, with small firms (less than one hundred employees) expecting to increase hiring of these workers by an average of 12 percent and large firms (more than ten thousand employees) expecting an average increase of 20 percent. The increase in the hiring of workers with master's or professional degrees is in many cases expected to be even greater. Part of this increase is surely a result of continued recovery in the economy from the Great Recession, precipitating a growth-driven increase in demand for skilled labor. But it also highlights the need to match skilled workers with advances in technology, suggesting that technology does not so much replace or eliminate labor as it transforms that labor in type.

This has been an ongoing process in market economies since at least the Industrial Revolution, generally with the mistaken Luddite fear lurking in the background that somehow the new machines are going to take over and that we will all end up unemployed or, worse, working for (or enslaved by) the machines themselves (Kaczynski and Skrbina 2010; Bailey 2014; Marcus 2014). Popular culture and media love to play on this fear because it makes for exciting and entertaining theatrical drama. The modern incarnation has been around since at least the 1970s when the classic rock band Styx came out with the hit song "Mr. Roboto." The entire *Terminator* movie series (1984, 1991, 2003, 2009, 2015) is based on it, as is the *Matrix* movie trilogy (1999, 2003, 2003). The dystopian movie *Elysium* (2013) is an even more contemporary example of these fears. Although most technophobic propaganda in pop culture is wildly entertaining, it is not economically well informed. It is a great irony that modern worker-consumers have such relatively large amounts of leisure time to devote to frightening themselves about the implications of technology. As suggested earlier, that same technology has generally been responsible for the gains in productivity that reward these worker-consumers with marginally more leisure time in the first place (Aguilar and Hurst 2006).

Further reflection will reveal that if we take the modern Luddite position to its logical conclusion and thus restrain or suppress evolving technological advances in the name of "saving jobs," then this must imply that any type of labor-saving innovation

from the near or distant past also poses a threat and must be destroyed or suppressed in the name of keeping people employed. Everything from electric power to steam power and even animal power is a form of labor-saving technology. By the Luddite logic, we must not permit these advances for fear that they will displace labor (which is certainly the case in some occupations). Internal-combustion engines, electric cars, wagon-pulling oxen, and even the horse and carriage must be abandoned. Then we can strap up and employ more humans to pull the plows and wagons. Indeed, wagons themselves are a form of labor-saving machinery, so they, too, must be banned. Think of all the people we could employ carrying boxes and cartons of items were it not for the job-destroying characteristics of wagons, animal power, or the internal combustion engine. In fact, boxes and cartons are a form of technological advance that also save labor, so even they must be prohibited. If we make it simple for one person to carry too many items in boxes and cartons, then we may be taking a job and the related wages from someone, somewhere, at some time, in the economy.

This *reductio ad absurdum* points to all the glaring flaws in the Luddite fears and the “lump of labor” fallacy. Were the Luddite argument true, the tremendous gains in productivity from the technological advances of the past two hundred years would have long since meant the end of all wage employment. Clearly, this did not happen. Instead, the more advanced we become in applying labor-saving technology and machines to known problems, the wealthier we become as we free up scarce labor resources for as yet unsolved riddles and challenges. With technology and labor-saving devices, we can free up labor and other inputs to address more complex problems waiting for market entrepreneurs to discover and solve. As a result of this market process, we produce more valuable goods and services that could not be produced before the labor-saving devices were introduced. Moreover, many personal services that (as yet) cannot be replaced by automation are normal goods. As a result, rising incomes due to the compatibility of skilled labor with improved technology in some economic sectors may actually increase the demand for (and prices of) services in economic sectors where machines are more difficult to employ—those provided with the company of another human being (Sachs, Benzell, and LaGarda 2015).

For example, according to the U.S. Bureau of Labor Statistics and the Census Bureau, average annual hours worked in manufacturing have fallen from 164.8 hours per capita in 1979 to 75.9 hours per capita in 2013, a decline of 54 percent over this period. In contrast, average annual hours worked per capita in the service sectors of the economy—including information, financial, professional and business, education, health care, leisure and hospitality, and other—has increased by 60 percent from 220.4 hours per capita in 1979 to 352.7 hours per capita in 2013.<sup>7</sup> This shift seems a clear indicator that as we modernize and automate much of the production processes in manufacturing, we free up labor resources for greater employment in the

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7. Author's calculations from data provided in U.S. Bureau of Labor Statistics n.d.a and U.S. Census Bureau n.d.b.

often higher-paying service industries of the economy, increasing the overall value of output in both sectors.

An important insight in this debate is to remember that employment per se is not the end goal of an economy. Human labor employment in and of itself is not what creates wealth.<sup>8</sup> Wealth is created when that employment is directed toward solving some unknown or undiscovered problem, producing value for oneself and for others through voluntary market exchange. If employment alone were an end in itself, then we could destroy all the machines and have a dictator split the population into ditch diggers and ditch fillers, with the first half of the population employed in digging ditches and the second half employed in refilling the ditches—all without shovels, mind you, because shovels are labor-saving devices. We would have 100 percent employment coupled with 100 percent poverty. When Milton Friedman was once told by government officials that it was better to dig ditches with shovels than bulldozers because more jobs were created that way, he rhetorically asked, “Why not use spoons?” (Hayward 2012). Friedman’s reply reminds us that there are serious flaws in the “employment equals wealth” argument, and the modern Luddite impulse is one of the more extreme examples of this logical entrapment.

### **An Important Caveat: Market Prices and Wages**

This defense of technological innovation depends critically on the market process of voluntarily determined wage-and-price signals being fully operative and dominant in the social allocation of scarce labor and other resources. That is, it depends on wage-and-income *differences* being freely determined by the underlying supply-and-demand conditions in the labor and capital markets of a free economy. Reliance upon these wage differences is necessary to signal to workers and owners of capital where their efforts are most valuably employed and where their efforts are less suitably applied in serving their fellow man. Two examples are worth mentioning in this context. If technological advances raise the productivity of and the demand for skilled workers, as the skill-bias thesis suggests, then we need some way of signaling that increase in demand to the labor market so that the requisite supply of skilled labor can emerge to match demand. The market has a ready answer: high and rising wages to workers whose skills are most compatible with the new technology, which provide workers with an incentive to prepare themselves with the human capital required of a changing labor market. Conversely and by the same logic, if there is an ample supply of low and unskilled labor seeking employment in the marketplace, the relatively lower wage costs for this class of

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8. *Wealth* means many things to many people and, at least in the discipline of economics, goes well beyond money or monetary income. In the context in which the term is used here, *wealth* simply means whatever people value and are willing to sacrifice to obtain or the many and varied ends that people purposefully seek to improve their well-being in a world of scarcity. The argument here is that voluntary market trade creates wealth and that technological advances in the form of machine automation make it easier for people to leverage the wealth-creation process in trade with each other.

worker could signal to entrepreneurs and capital markets to begin developing unskilled-labor-biased technologies that are compatible with less-skilled workers. This development, in turn, may potentially increase their productivity and wages as this type of capital proliferates. However, the key is that price-and-wage signals be free and undistorted to reflect the underlying conditions of supply, demand, and labor specialization. To the extent that income inequality appears in such a system of specialization, as it inevitably will, it is a positive force for moving people from less to more valued lines of work and production. As Ludwig von Mises forcefully argued,

The inequality of individuals with regard to wealth and income is an essential feature of the market economy. . . . What pressure is needed to impel an individual to contribute his share to the cooperative effort of production is exercised by the price structure of the market. This pressure is indirect. It puts on each individual's contribution a premium graduated according to the value which the consumers attach to his contribution. . . . If this responsibility is not brought about by the price structure of the market and the inequality of wealth and income it begets, it must be enforced by the methods of direct compulsion as practiced by the police. (1966, 286–89)

In response to price-and-wage signals across all markets, workers and capitalists are motivated toward using labor services, capital investment, and technology to their most productive ends as determined by consumers. As people work, invent, invest, and improve with the hope of moving from lower- to higher-paying employments (i.e., in response to income inequality), the result is a tremendous gain in living standards, as observed by the experience of the past two hundred years in the most advanced economies.

The question remains, however, why the high and rising wages in skilled occupations over the past thirty years have not been enough to draw more skilled workers into these occupations from out of the labor pool. That is, what is preventing wage signals (the growing wage gap between low- and high-skilled jobs) from increasing the number of workers suitable for the types of jobs complementary with modern technologies? Why does the rise in skilled-labor supply so stubbornly lag the rise in demand? To put the issue another way, why is the skilled-labor supply curve so price inelastic, and what makes it so slow to shift? One obvious answer is that skill development has a relatively high cost in terms of time, effort, and money. Education and training that equip someone for the modern workforce are not inexpensive. But another possible answer to these questions may be the increasing presence of social policy in the economy over this same period, and its unintended impact on labor markets and human capital investment. The use of wealth and income redistribution, to the extent that they attenuate wage signals and dampen the incentives for the shifting of labor and other resources from old and obsolete lines of employment into new and emerging lines, must necessarily stunt and distort the process of technological advancement described in the preceding argument.

The modern Luddite impulse, usually sympathetic to wealth- and income-redistribution policies, is driven by fears that the accelerating pace of technological change will increase the demand for high-skilled labor at a clip that will forevermore exceed its supply, leaving only a handful of genius-entrepreneurs, software developers, and biomedical engineers to reap the benefits of the Information Age while the rest of us live on the scraps of stagnant real wages. In this narrative, the result is high and persistent income inequality—an economically benign result in a free economy but one that egalitarian critics cannot abide. Skeptics of technological progress, seeing wage and income compression as the Holy Grail, then make a two-pronged case: (1) that the demand for high-skilled labor must somehow be restrained, perhaps by purposefully preventing or retarding the development and implementation of new technologies that drive it; and (2) that workers displaced as a result of technological advances be compensated through the expropriation of income and wealth taken from high-income earners whose skills may be more compatible with the new technology (Avent 2014; Galston 2014; Ford 2015; Sachs, Benzell, and LaGarda 2015).<sup>9</sup>

Yet what these critics largely overlook is the possibility that the supply of high-skilled labor compatible with these new technologies is being artificially restrained by the very policies of redistribution they typically favor. Any government regulation that reduces labor-market flexibility or alters incentives away from market-determined verdicts will make it that much more difficult for labor markets to efficiently adapt to new and changing technologies. Government transfer payments and progressive income taxation intended to temper inequality and cushion the effects of “creative destruction” may well discourage many (especially younger) people from making longer-term investments in the very type of human capital necessary for them to adapt and thrive in an age of technological innovation and advanced robotics (Keane 2011; Mulligan 2012; Murray 2012). In this case, it is not the rapid acceleration in the demand for skills that is the source of the inequality “problem.” It may instead be the sluggish increase in the supply of skills (Goldin and Katz 2009; Gordon 2013).

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9. In their working paper on this topic, Jeffrey Sachs, Seth Benzell, and Guillermo LaGarda (2015) develop at least one possible theoretical model in which capital investments in the form of robots permit production without labor, which, they argue, has the potential to “immiserize workers who cannot compete” in the form of lower wages, resulting in falling overall economy-wide output through reverse multiplier effects. Without addressing the complexities involved and by assuming away any and all incentive effects on labor or capital investment, these authors vaguely and somewhat naively recommend intergenerational redistribution from the elderly (retired) beneficiaries of robotic innovations to young workers who are or might potentially be displaced by robots. However, the proposed models illustrating worker immiseration fail to account for the dynamic shifting between labor and capital that would plausibly occur as a result of lower wages to labor and higher returns on robot-intensive capital investments. That is, the authors’ models assume that workers displaced by robots exhibit perfectly inelastic long-run labor supply curves and do not alter their behavior in response to lower wages by, say, investing in human capital complementary to robotic capital or by preparing themselves for employment in sectors where workers produce output not substitutable with robots. Moreover, the authors further ignore the possibility that their prescribed policy of intergenerational transfers to the young might attenuate or dampen younger workers’ incentives to shift out of lines of work perfectly substitutable by robots. In other words, their models and policy prescriptions appear to ignore incentives altogether; questionable assumptions may have led these authors to hasty policy recommendations.

The concern should be that the cause of this sluggish increase in skilled labor supply may be in part the disruption of wage–price signals in the marketplace brought about by the very policies intended to reduce inequality. In short, it is not implausible to suggest that the rise in wage inequality and the dearth of “good jobs” so feared by the modern Luddite are themselves a partial consequence of policies many in their camp have long championed.<sup>10</sup> By providing incentives to avoid often distasteful human-capital investments and the hard work of education necessary to cope with advances in technology, the welfare state may significantly restrain the supply of high-skilled labor so that the income returns to technological advances in the twenty-first century are, indeed, confined to a relative handful of intrepid entrepreneurs and technical geniuses. In other words, the modern welfare state, by lowering the opportunity costs of low human capital investment, may restrict investment in human capital and restrain the natural progression of labor from low-skilled into high-skilled and technologically complementary occupations (i.e., people climbing the income ladder by continually broadening their skill sets). In this case, it is not the *present* supply of skilled labor that is affected by social transfer payments but rather the *future* or *potential* supply of skilled labor that fails to emerge over successive generations due to the masking of wage signals by income-maintenance programs. It would be a sad but not necessarily shocking irony if the growing modern Luddite resistance to technology, stemming as it does from fears about rising inequality, were the unintended and largely unrecognized consequence of income-leveling policies implemented several generations in the past.

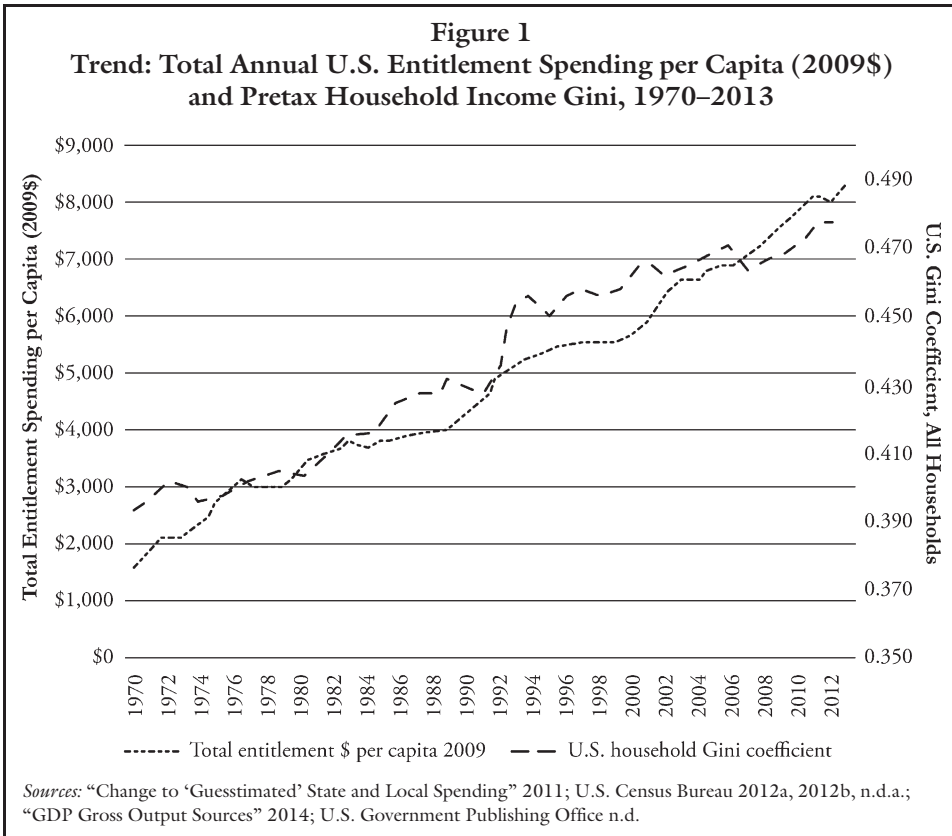
The data on this relationship are suggestive and instructive, if not confirmatory. Figures 1 and 2 indicate the similar trends and close correlation between inflation-adjusted total annual government (federal plus state and local) per capita entitlement spending and the pretax household Gini measure of income inequality in the United States from 1970 to 2013.<sup>11</sup>

The data reveal an interesting association: rising per capita entitlement spending is strongly positively correlated with rising income inequality, lending some support

10. See especially Avent 2014, Galston 2014, and Ford 2015 for a list of favorite policy recommendations.

11. All Gini values used here are computed by the Census Bureau using pretax and pretransfer measures of household income reported in the Current Population Survey for each year of the period under investigation (1970–2013). It should also be noted that the large increase in the Gini coefficient occurring from 1992 to 1993 (see figure 1) is an aberration in the data caused by a change in the Current Population Survey income-reporting methodology. According to the Census Bureau, “In 1993, the Census Bureau began using a new method of collecting income data, allowing respondents to report greater income values in the Current Population Survey. . . . This had a profound effect on the upper end of the income distribution by recording income levels that had been previously underreported. . . . The Census Bureau introduced computer assisted personal interviewing (CAPI) in January 1994 to the Current Population Survey. The March 1994 supplement permitted households to report up to \$1 million in earnings, up from \$300,000, and we made parallel increases in the reporting limits for selected other income sources. Both of these changes affected the data. One analysis of the 1993 inequality statistics suggests that the increase in the maximum amounts that could be reported accounts for about 1.8 percentage points, or about one-third, of the 1992–1993 increase of 5.2 percent. The contribution of the change to CAPI to the increase in measured inequality cannot be determined, but may well bring the share of survey methods-related changes in inequality to over one-half of the 5.2 percentage point apparent increase” (Jones and Weinberg, 1).





to the theory that the relative increase in transfer payments might have dulled incentives for human capital investment and restrained skilled-labor supply, leading to greater income dispersion.

Of course, correlation is not causation, so further research on this association is needed and would include additional control measures on the rate of increase or decrease in educational attainment over this period (Goldin and Katz 2009; Gordon 2013).<sup>12</sup> For example, one question might be whether and to what degree government subsidization of secondary and higher education over the same time period could have potentially offset the disincentive effects on human-capital investment hypothetically resulting from social programs and transfer payments—or, more specifically, why government subsidization of education has apparently failed to overcome the welfare state’s constraint on skilled-labor supply. Further questions about this association also remain. For example, to what extent does U.S. immigration policy restrict the supply of skilled workers? And do other modern welfare-state economies

12. Robert Gordon (2013) argues that there has been a contemporary decline or “stagnation” in educational achievement since around 1990 and that this slowdown is directly linked to rising income inequality, although he does not connect this slowdown to entitlement spending.

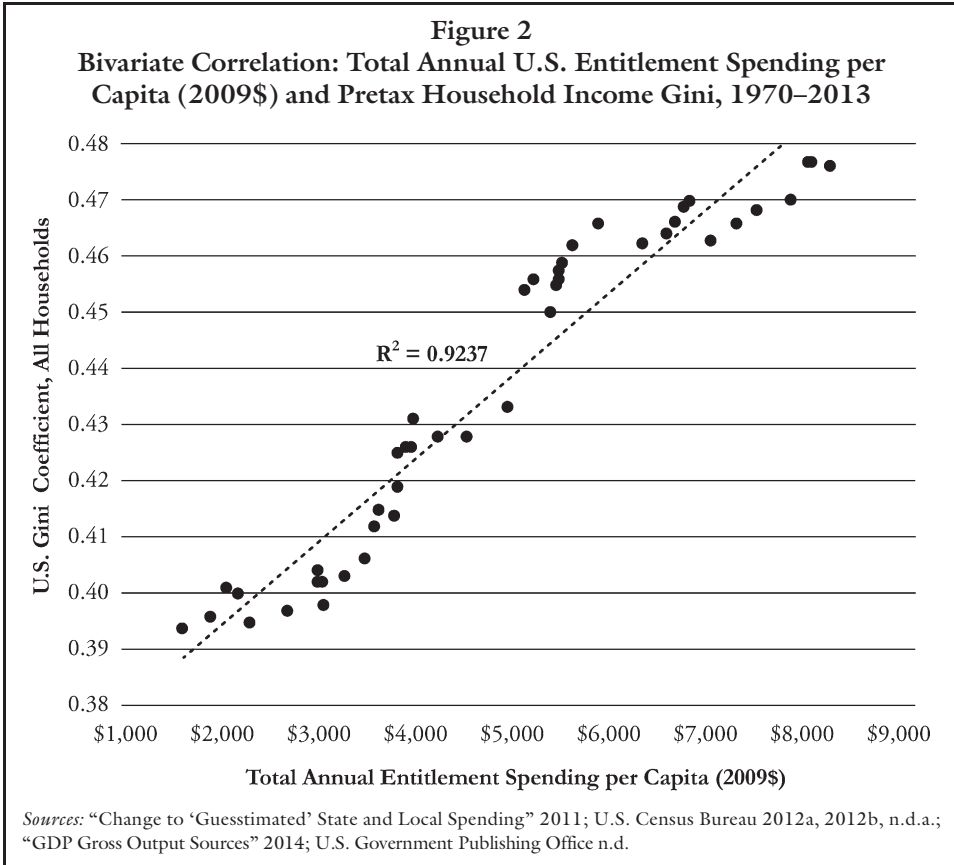


exhibit a similar positive correlation between per capita entitlement spending and income inequality? If not, why not, and what policies or institutions are present in these economies that prevent the correlation? If the pattern is observable elsewhere, then does it make the association and argument more generalizable, or is it simply idiosyncratic and spurious? And, finally, the weaknesses in income-inequality measures are well known (Gastwirth 1972; Ryscavage 1999; Reynolds 2007), so alternative non-Gini measures of income inequality would also need to be explored and compared (see Jones and Weinberg 2000). Yet, notwithstanding these caveats, the preliminary association observed here is instructive and suggests that transfer-payment suppression of skilled-labor supply as a possible contributor to modern income inequality is not an utterly implausible hypothesis. It deserves further investigation.

## Conclusion

It is not the advancement of technology or the rise in the demand for skilled workers or the attendant and natural rise in income inequality that we should fear. In a free economy, these elements combine with the wage–price system to direct

scarce-resource use into ever more productive employments, which raises the general standard of living. When subjected to economic logic, the Luddite fallacies are no more compelling today than they were at any time in the past, whether driven by direct animosity toward labor-saving machinery or instead linked to distaste for technology-based income inequality. Each time a new form of technology unleashes an automation wave of creative destruction in the labor market, technophiles caution that the shifts are merely temporary, to which the Luddite technophobes respond that “this time is different.” Yet there is no historical evidence to support the notion that technology and automation have ever led to a long-term secular decline in employment, so the “this time is different” argument has little credibility. Ongoing automation is not likely to reduce the total number of jobs but instead will change the types of jobs that people do or shift people from the role of wage-earning laborers to the role of rent-earning capitalist (robot) owners.

What we should fear instead are social or political restraints on the advances in technology driven by egalitarians who suppose that the material living standards of the vast majority should be made subordinate to the egalitarians’ own personal vision of a more equal society. Ironically, it may be that past policies of wealth and income redistribution have so distorted the incentives in labor-supply decisions that the supply of skilled labor complementary with new technology perpetually lags the growth in demand, resulting in both less productivity and output than what might have been, but with no observable reductions in inequality.

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