

Online Outsourcing and The Future of Work

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Abstract

The push towards global connectivity and the worldwide expansion of the Internet, combined with the ongoing decline in the cost of technology, will change global labor markets and the nature of employment. Future technology will coordinate the assignment, distribution, and measurement of tasks to a billion-person network across multiple countries and dozens of skill vectors. The fixed-salary, full-time employee will be replaced with a network of online contractors who receive and deliver their work through computer-mediated auctions, assignments, and other economic mechanisms. I document these trends, explain the underlying economics, investigate the current labor laws and benefits for independent contractors, and suggest policy proposals to prepare for the transformation.

Introduction

The text you are now reading began as an audio file recorded in Texas: it was sent to the IBM Watson artificial intelligence engine that converted the audio into text, edited by a worker in South Africa who competed in an online auction against a pool of workers around the world, reviewed by a graduate research assistant in Washington D.C., printed and marked up by the author in Texas, and edited once more by another worker in the Philippines. All of these steps occurred entirely through the Internet, and they represent the modern-day equivalent of the assembly line. The Internet has expanded its reach around the world through strategic investments by technology giants like Facebook and Google. These mostly poor populations coming online for the first time will serve as producers, rather than consumers, bringing their own labor to the global marketplace. The Internet will serve as a massive clearinghouse for matching buyers and sellers of work, and this will have deep ramifications for the global distribution of wages, skills, and productivity.

This transformation, currently in its early innings, is not inevitable. The recent push toward nationalism and retreat from global economic integration can threaten this new global market. It is incumbent on entrepreneurs, financiers, intellectuals, and members of civil society to commit to free trade in services, especially that which will take place over the Internet. In what follows, I assemble preliminary evidence on this economic transformation, anchor the analysis in economic principles, speculate on long-term economic impacts, and recommend possible strategies to encourage online labor markets through actions of the public and private sector.

Evolution of Outsourcing

The first wave of outsourcing was offshoring, in which manufacturing jobs in the 1960s-1970s moved abroad because of free trade (Mankiw and Swagel 2006; Gereffi 2005). The second wave of outsourcing took place during the first Internet bubble of the late 1990s and early 2000s. During this time, companies set up operations abroad to outsource services handled by their back office, such as call centers in India. The third wave will be online outsourcing. Technology platforms will allow buyers and sellers to contract for work through dynamic and continuous auctions. Corporations will no longer only hire full-time employees who conduct all the tasks themselves, but rather these employees will interface with a global network of workers available on demand. This third wave of outsourcing will open up whole new worlds of productivity, expand economic opportunity across the globe, and change the nature of work. Forbes showed that in 2014, nearly 25% of the United States' workforce were freelance or contingent workers. It is projected that 40% of the workforce, or 60 million U.S. workers, will be freelancers by 2020 (Pofeldt 2015).

Outsourcing's initial wave brought with it passionate claims that foreign workers would steal American jobs. We now know much of the rhetoric was overstated. Global wages reflect productivity, and American factories' productivity is also high, given high levels of capital investment. Many of the benefits from offshoring failed to materialize because capital-enabled

factories in the U.S. could not compete with the much lower capital-to-labor ratios of factories abroad. This same logic falls apart in the online world. The spread of information technology has made IT more uniform across the world. For the purposes of services, a desktop computer in New York versus a laptop in the Philippines are roughly equivalent; therefore, it is likely that outsourcing will shift more jobs outside of the firm than offshoring did in the past.

The notion of distributed computing (which forms the basis of cloud computing) has inspired the development of distributed work. In the future, occupations as varied as architecture, financial services, software development, writing, customer service, and marketing will occur partly over an international network of contractors through a continuously adaptive mix of auctions and assignment algorithms.

To fix ideas, let me distinguish between online outsourcing and the “gig” economy. Companies like Uber, TaskRabbit, Thumbtack, and Airbnb all match buyers and sellers together over Internet-based technology platforms which result in a local transaction. Though Uber is a global company operating in cities around the world, every transaction takes place by matching a buyer (passenger) and a seller (driver) together in a local trade because transportation is a physical transaction. Alternatively, websites like Upwork and Amazon Mechanical Turk (AMT) match buyers and sellers of labor in global transactions. Upwork serves as a directory for companies and individuals to hire a wide variety of freelancers to perform computer programming, typing, copyediting, virtual assistance, and other Internet-based tasks. In fact, due to global disparity in skills and wages, these transactions are almost exclusively *non-local*, often with buyers residing in high-wage countries and procuring services from workers in low-wage countries.

Online outsourcing refers to the latter kind of trade, whose development is still in its infancy. Nonetheless, this kind of outsourcing technically falls under the gig economy because workers are acting as independent contractors, rather than full-time employees, which has consequences for benefits discussed later.

As aforementioned, the two major gig economy platforms are AMT and Upwork (Ipeirotis 2012). Upwork registers eight million freelancers on its two main sites: Elance and oDesk. The company claims that 53 million Americans are freelancing at any point, contributing \$700 billion to the economy (Upwork n.d.). This indicates that Americans participate in online labor markets both as workers and as employers. Elance posted over one million jobs in the first quarter of 2011, and almost 3.5 million by the end of 2013. Freelancers earned \$285 million in total earnings by the end of 2013 (Elance 2013).

Scope of the Transformation

The scope of this shift is significant. Consider this simple fact: the growth of online marketplaces as a business model has ballooned in recent years, which has enabled buyers and sellers to contract through technology platforms. Indeed, the world’s top five firms in the last five years with regards to market value have come from the top five United States technology companies alone; Facebook, Google, Amazon, Apple, and Microsoft all run immense

marketplaces. For example, Amazon has created well-defined procedures for sellers to list their goods online, advertise to buyers, close a sale, evaluate transactions, and establish long-term reputation mechanisms to bring in future business. What has already occurred in the goods marketplace will expand to the services markets.

This argument relies on the **extensive**, rather than the **intensive**, margin of labor supply. The intensive margin refers to increasing the hours of work from those already in the labor force, whereas the extensive margin refers to bringing new populations to the labor market altogether. The intensive margin will count workers who leave full-time, face-to-face jobs in favor of online work, whereas the extensive margin will count all of the population who will come online in the future to use the Internet as a means of work. My thesis is that the extensive margin will dominate the intensive margin, thus growing more rapidly in the future than today. Of the world's population of 7.36 billion people, 4.20 billion people do not have any kind of Internet access that would allow for the performance of work online. If one-eighth of these people are brought online and enter the workforce through online opportunities, then the total global labor market would increase by 15%.

These calculations are admittedly speculative, but so too were the early calculations on the growth of the Internet. For example, as Jeff Bezos has stated in public speeches, the key statistic that led him to leave his comfortable, high-paying job at the hedge fund D.E. Shaw in favor of starting Amazon.com was the Internet's 2300% annual rate of growth in 1994. With technology giants like Facebook disclosing spending of \$860 million per year on Internet infrastructure, the droves of people coming online are virtually inevitable.

While this transformation will be significant, it is unlikely to completely change all of current work practices. For example, work requiring tight coordination, creative input, and face-to-face feedback from multiple employees will always provide a need for full-time, in-person employment. As the trend towards agglomeration grows, the countervailing force will be the increased efficiency of urban centers, which will still make it efficient for some work to occur inside the corporation face-to-face. Thus, traditional corporations will not vanish, but rather adapt to this new reality in which online workers are a non-trivial component. Full-time employees will interface with the network of on-demand workers, thereby shifting some work out of the firm.

The Underlying Economics

The academic literature on the economics of organization can provide some guidance on the boundaries firm's and, most importantly, the kind of work taking place within the firm versus the market. Nobel Laureates like Oliver Williamson and Ronald Coase established their careers by developing theories of transaction costs that help determine the location of work and the structure of the firm (Coase 1937). Broadly speaking, when transaction costs are high, organizations like corporations are efficient at conducting work because the control structure of a hierarchy is an effective way to produce output. In contrast, when transaction costs are low,

individuals can contract with each other at low cost and can do so through price-mediated markets.

The key economic feature of the Internet has been the massive amount of disintermediation, which has led to a marked decrease in transaction costs. Before, a buyer and seller contracting with one another usually required a face-to-face meeting, possibly a long history of a business relationship, or even the use of a lawyer. However, the Internet has replaced many of these requirements as buyers and sellers no longer need to be in the same physical space, nor do they require local services like banking or legal contracts. Instead, reputation mechanisms online can serve the same function to enforce behavior. As such, the secular decrease in transaction costs brought on by the Internet has led to a shift in the boundaries of the firm, as more and more work will move from within corporations into the marketplace through networks of contracts.

There exists a vast number of examples of this widespread **disintermediation** in transactions. Previously, an entrepreneur in the U.S. would hire a graphics company to design its website. This company served the role of providing office space, recruiting talent, and securing payment. Those designers can now register as independent freelancers over the Internet, and entrepreneurs can contract directly with them. The Internet can serve many of the same roles that were once performed by the company: online search can substitute for business development, Paypal can provide a vehicle for payments, and the platform itself can provide performance evaluation and monitoring. Disintermediation cuts across a wide swath of industries, ranging from architecture to financial services, and the Internet has enabled the removal of the middleman to provide more direct contact between buyers and sellers. Chicago economist Ronald Coase proved transaction costs were the only barriers to efficiency between two bargaining parties. As transaction costs fall, negotiated outcomes move closer to efficient solutions. The growth of digital technology and its concomitant performance measurement, search, and payment functions all help eliminate intermediaries and reduce transaction costs to facilitate greater trade between buyers and sellers.

The second major trend is the rise of global Internet connectivity. Facebook and Google have made large investments in expanding the reach of the Internet, especially to poor, rural, underserved areas. As of 2015, only 3.2 billion (43% of the total world population) individuals have access to the Internet (Kende 2015; Broadband Commission 2014, 2015). The specific technology used to deploy the Internet will vary depending on the area, ranging from airborne drones, balloons, low-level satellites, towers, etc. While it is in the economic interest of these companies to bring new users to its platform, the positive externalities on society will be large. With the Google Chromebook available for a mere \$150, cheap laptops will spread across the developing world. These newcomers are unlikely to be large consumers given their low incomes and, therefore, are not the usual audience Facebook and Google target for advertisement. Instead, they will bring their labor to a global market, and new companies will form to harness this human capital. Bringing this human capital online will undoubtedly be the largest economic transformation the world has seen.

The third economic trend is the shift from input-based pay to output-based pay. Input-based pay describes most forms of compensation in place today with physical, face-to-face employment.

Workers are paid a salary, possibly with some discretionary bonuses. Output-based pay refers to paying based on the performance of the worker. This can take the form of stock options for the CEO or a piece rate for every unit produced by a worker on the assembly line. The remote and distributed environment of the Internet makes it a natural candidate for output-based pay, which will lead to significant efficiencies.

The academic support for output-based pay is long and deep. Output-based pay, also referred to as performance pay, has three primary benefits for productivity. First, it aligns incentives between the employer and the worker; second, it attracts better workers to the firm; third, it retains these talented workers over time. These three factors are called the incentive, selection, and retention effects of performance pay.

Notable labor economists like Edward Lazear have shown performance pay can lead to a 44% increase in productivity over fixed salaries and other input-based pay (Lazear 2000). This increase splits evenly between incentive effects and selection effects. The economic benefits of performance pay explain the widespread use of equity compensation among executives and directors of major corporations around the world. It also explains the use of performance pay throughout financial services and entrepreneurship, where founders of new companies receive large equity grants as incentives to grow the firm. These benefits will transfer to online workers.

The measurement of human output is only increasing over time, since sensor technology is becoming ever more portable and cheap. The self-quantification movement, which first established itself in fitness culture and health tracking, will eventually permeate most jobs. The spread of cheap sensor technology will improve the monitoring and measurement of human output, leading to Big Data opportunities for better, more refined, and more dynamic compensation schemes.

Performance compensation schemes are called “mechanisms” in academic literature. They are complex systems of payment to workers based on a vector of environmental variables, prior productivity measures, and other economic covariates. Surge pricing by Uber is one example of a mechanism that dynamically adjusts prices to match supply and demand for drivers and passengers. Other similar mechanisms will improve the productivity of online workers.

Human vs. Artificial Intelligence

A residual question lurking in the background is the interaction between human and artificial intelligence (AI). This is one of the deep philosophical debates of our time and will only become more acute as both technologies develop. The current narrative circulating in the popular press is that robots will rule the Earth and that the sliver of engineers who control them will capture all of the economic surplus. However, technology has historically served as a complement rather than a substitute for human output. As such, AI can help improve the quality of marketplaces coordinating labor in this new online world.

Even if humans are the ones performing actual work, AI technology can assist in coordinating, contracting, assigning, distributing, and evaluating work. This evolution is not inevitable but requires conscious choice by several simultaneous actors. As a society, we must choose to build a future that seeks to expand human opportunity, not shrink it.

At its highest level, the core problem with online outsourcing is: who does the job, and at what price? The academic economics and computer science literatures split the problem into two broad categories: auctions and assignment. Auctions allow platforms to develop prices under highly uncertain environments through a variety of bidding rules, some of which are invisible to users. For example, Google runs the largest ad auction in the world with eBay as its primary bidder. These auctions are designed by humans but implemented through machines. They set prices to reflect changes in demand, supply, and other environmental variables.

Assignment algorithms are an alternate, and more direct, approach to determining who performs the job. In general, auctions work better when there is large uncertainty on price and skill. Auctions reveal this information, but auctions suffer because of their complexity. Assignment algorithms are quicker and simpler than auctions but require more environmental knowledge about the optimal price and the set of workers best qualified for the job. There is variation now in the market, as websites like Thumbtack use auctions to solicit bids from service professionals, whereas others, like TaskRabbit, use direct assignment to allocate tasks. It is impossible to know exactly which method will dominate or what the appropriate mix between the two is. Ultimately, both academic and industrial research will experiment with all kinds of mixtures, and different mechanisms will likely perform better under different circumstances.

New technologies take time to cause changes in behavior. When Marconi first invented the radio in 1895, the prior form of communication was primarily newspapers. Early media companies bought radios, and their radio shows simply involved reading newsprint over the airwaves. Eventually, companies realized that radio opened up new opportunities that were unavailable before, marking the birth of radio talk shows. When television reached a mass audience in the late 1950s, early television shows were videotapes of prior radio shows (Blanchard 1998).¹ Eventually, media companies again realized television that provided new opportunities unavailable to radio and made full use of the broad spectrum of formats now occupying modern TV (like the Kardashians).

This same shift is occurring through online outsourcing. The early entrant into the online marketplace was oDesk, a website that connected buyers and suppliers of labor through an online directory. The initial technology for oDesk was designed to mimic face-to-face employment. The website monitored the workers through screenshots, and payment was based on hourly wages (The Workforce in the Cloud 2013). oDesk had the greatest revenue share of online labor markets. In 2012 alone, the company reported more than 500,000 hours of work time per week, and the company's annual earnings are projected to grow from \$1 billion in 2012 to \$10 billion

¹ Blanchard, Margaret. *History of the Mass Media in the United States: An Encyclopedia*. New York City, NY: Routledge, 1998.

by 2020. If this trend continues to permeate the entire online labor market industry, the scope of the growth will be enormous (Kokkodis and Ipeirotis 2016). At the same time, Elance used fixed-price contracts, which are a form of output-based pay. These two companies proceeded simultaneously until they merged together to form a single company, Upwork, in 2015 (Pofeldt 2015).²

The existing online labor markets are still in their early innings. Even AMT and Upwork, which offer fixed-price payments, require high touch interaction from the requester/employer. In particular, the employer needs to specify the terms of the agreement of work to be performed, a timeline, and a price. A better longer-term option is to automate all of these choices; software will set the price and eventually negotiate contracts on a somewhat individualized basis with workers. Existing markets also do not make use of worker performance data in a granular or dynamic way. Upwork allows employers to take screenshots of their workers for monitoring, but this information is not explicitly embedded in compensation. However, as the Informativeness Principle of Holmstrom (1979) shows, all relevant performance information should be part of compensation. Otherwise, the employer is effectively leaving money on the table.

As transaction costs fall over time, this information will be incorporated into compensation and boost productivity. My own research shows these productivity gains can be large and help with all manners of decisions, such as when and whether to terminate a worker. When the information from a performance system is coarse or incomplete, low-performing workers stay employed for too long, draining output. On the other hand, when this information is used for compensation and evaluation, it allows the employer to terminate low performers and raise output. In particular, the ones who stay work harder than the ones before (Ray 2007).

Case Study: The Philippines

The Philippines, a country of 92.34 million people and widespread English education, has historically served a primary role in business process outsourcing (BPO). Call centers have spread like wildfire across the Philippines in the last decade. In some sense, the first wave of outsourcing focused on call centers in India; now, those centers have shifted to the Philippines. The increase in the connectivity of the Internet will bring online labor markets to even more remote regions of the islands, and I have direct evidence of this.

In 2012, I was seeking cheap dictation transcription services for my notes taken during academic conferences. I located Cheryl Lamorin on oDesk, a nurse living in Cebu, 355 miles from the capital city of Manila. She chose her town because her mother was sick, and she spent half of her time caring for her at home. She needed to cut back on her hours at the hospital in order to do so, but, of course, stay-at-home care does not require full-time attention. Thus, she turned to oDesk to fill her time and earn extra income. I employed Cheryl for two full years until she formed her own medical transcription company with her friends, many of whom were stay-at-home moms.

² Elance and oDesk merged in 2013, and Upwork launched in May of 2015.

Critics of online outsourcing have called it the digital sweatshop, effectively holding the workers to low wages and confining them to a life of poverty. However, these arguments fail for the same reasons the basic sweatshop arguments fail: all trade is voluntary, especially in online markets with large amounts of transparency and low costs of switching employers. Moreover, people like Cheryl have a low opportunity cost because they need to stay home for personal reasons. It was impossible for her to take a job outside of her home, and therefore, she was open only to online work. She often thanked me for enabling her to support herself while her mother was sick.

Over time, people like Cheryl will have multiple job opportunities. Their opportunity cost will rise because their options within the online market itself will increase. Over the long term, this will raise the level of wages, which, in general, should follow the long-term rise in productivity once the market develops more fully. The overall macro effect is that the low transaction costs of the Internet will allow the market to spread to remote areas of the world where formal businesses are hard to establish, especially when the population is rural and scattered. This is how these online labor markets will increase the global supply of labor.

The Evidence

Measuring both traditional and online outsourcing poses a challenge because the data is incomplete and highly aggregated. Traditional outsourcing refers to the permanent shifting of jobs to an external provider. Online outsourcing refers to interfacing through a website to contract directly with individuals, some of whom are likely located abroad. Publicly available data is much higher on the former than the latter, primarily due to aggregate government statistics.

At the highest level, some preliminary evidence from the International Monetary Fund (IMF) and the Bureau of Labor Statistics (BLS) shows that traditional outsourcing is increasing. For example, outsourcing in the finance category refers to functions traditionally performed in the finance department of a U.S. manufacturing company. Now, they either contract with a firm abroad or establish a separate division in an overseas office, all within the same company. Aside from financial functions, most of the other services in the chart are steadily increasing over time. This tends to confirm public perception that outsourcing and global integration are increasing.

Precisely measuring the economic magnitudes of this shift is another matter altogether. The two major sources of data on traditional outsourcing are the Mass Layoff Statistics of the BLS and the data from the Bureau of Economic Analysis of the Department of Commerce (Mankiw and Swagel 2006).³ Levine (2012) conducted a comprehensive study on the BLS data, which tracks firms that lay off more than 50 workers who are out of work for more than 30 days. The BLS survey shows that most of these job losses did not involve any relocation of work. However, there are limitations because the study does not capture work moved outside of layoffs, nor does it measure changes in future hiring as a result of outsourcing. Nonetheless, the survey illustrates that most job losses do not result in relocation of work.

³ There is some controversy regarding the completeness of this data (Levine 2012).

What are the responses of companies to these macroeconomic trends? Again, the data is mixed. Some studies find U.S. parent companies use *more* labor as outsourcing increases. This is consistent with the logic that outsourcing reduces the cost for the firm, freeing up resources for investment elsewhere. These investments can lead the firm to hire more labor in new areas. Outsourcing increases job losses for domestic workers without a high school degree, but there is little evidence significantly related to job loss for workers with college degrees (Kemeny et al. 2013). This supports the intuitive notion that education is an antidote to outsourcing-related job loss.

The only data available for AMT comes from disclosures from Amazon itself. As of 2011, AMT claimed that over 500,000 workers were registered on their website from over 190 countries (Aws 2011). Online forums, like Turk Nation, have speculated that it is difficult for workers to earn a full-time wage on AMT given the low prices of the jobs (Guarino 2015). An NYU Professor calculated the average compensation per hour for an AMT worker in 2009 as \$2.30, well below the U.S. minimum wage, though still above the income for much of the developing world (Guarino 2015).

Some preliminary data published through white papers on their website shows that, at least for Elance, the total amount of outsourcing has increased over time, ranging from one million tasks outsourced in 2011 to 3.5 million tasks in 2013 (Elance 2013). These facts are undoubtedly part of the company's marketing apparatus because they show their success as a platform in matching buyers and sellers. However, it also shows that online outsourcing is on the rise.

In my view, these numbers are just the tip of the iceberg. The existing evidence on online outsourcing is more prospective than retrospective. It shows that online outsourcing passes a basic "proof of concept" test and can ultimately lead to massive growth. This is especially apparent when placed in the context of the large resources Facebook and Google are deploying to bring people online, as discussed earlier. The current level of outsourcing is just a sliver of what is possible, since connectivity in the world still reaches only half the globe.⁴ Once this connectivity expands, it is entirely possible that outsourcing will explode in both quantity and quality, especially because these new people brought online will primarily contribute their labor to the global economy rather than consumer purchases.

Much of the growth in IT outsourcing has occurred through services and businesses located on the coasts of America, which makes sense given the high concentration of service businesses in California and along the eastern seaboard. BPO refers to all tasks traditionally relegated to the business back office, such as customer service, accounting, tech support, performance evaluation, and legal services. Gartner finds that global spending for IT services was approximately \$932 billion in 2013 and is expected to grow to \$967 billion in 2014, a 3.8%

⁴ As of 2015, nearly 94% of the world's population receives a mobile phone signal, 48% are covered by mobile internet, and nearly 28% have subscribed to a data package (Kende 2015). As of 2014, there were nearly 711 million broadband connections worldwide (The State Broadband 2014).

growth from 2013. The market for BPO itself was predicted to grow by 6.2% in 2013. This suggests a global increase in BPO as a whole—and given the increasing levels of outsourcing, the relative growth of outsourcing in Asian countries captures a disproportionate share of the growth. Finally, an Ernst & Young research publication found the five-year compound growth rate for worldwide BPO would be 5.3% through 2016.

Trade in Services

Several policy questions arise in this new world of online outsourcing. Should the government subsidize or discourage online outsourcing? How should the government handle assistance to those hurt by outsourcing, if at all? Can the government invest in education for Americans to compete in, or help develop, these online labor markets themselves?

At its highest level, online outsourcing is another form of international trade. A company or individual can turn to a website and locate a worker who performs a service for a fee. Because the transaction is voluntary, both parties are better off. The buyer is better off because the value of his/her time is higher than the price paid for the work, while the seller is better off because his/her income from work exceeds the opportunity cost. This elemental transaction between a buyer and seller lies at the heart of all economics.

Economists such as Adam Smith and David Ricardo have recognized the benefits of trade at the international level for over two centuries. Ricardo referred to this as comparative advantage; in a world with two countries and two industries, even when one country is more productive than the other in both industries, both nations are better off if they trade. Each nation specializes in their highest comparative advantage.

Online outsourcing is the modern manifestation of international trade and should receive the same broad support from economists as free trade does.

Civil society will need to acknowledge the benefits of free trade in services. The current wave of nationalism spreading throughout the world has led many governments to retreat from the principles of free trade. Although such policies may seem to benefit a nation, generations of economists know they actually hurt the nation's long-term economics. Ultimately, free trade benefits both the producer and consumer surplus. Computations of welfare that defend protectionist trade policies usually count producer welfare but not consumer welfare. NAFTA may indeed have cost some manufacturing jobs in the U.S., but American consumers are better off as a whole, due to the subsequent lower prices on commodity products imported from low cost countries.

Just as faith in markets versus governments waxes and wanes over time, so too will this debate on nationalism versus globalism. When the benefits of nationalism fail to materialize, the world will return to free trade. The next major debate will center on trade in services, rather than trade in goods. Outsourcing will take center stage once again and will change the very nature of multiple policy debates, such as immigration. A Filipino must wait years before being allowed to

live in the U.S. but can now register online to work in the U.S. through online labor markets in seconds. As the debate on immigration shifts to productivity of human capital, the location of that capital becomes irrelevant once most work shifts online.

Government policy should, at minimum, not interfere with the development and growth of online labor markets and, at best, encourage their development. Examples of policies that could harm online labor markets are net neutrality rules that prevent pricing the Internet and restrictions on the buying or selling of work online through a form of labor tariff. Currently, such tariffs do not exist, but it is entirely conceivable that a protectionist nation state could impose wage tariffs on all online work sourced from different nations.

To further push the analogy with free trade, we know trade creates winners and losers, even though it makes the economy better off as a whole. The traditional response to those hurt by trade has been Trade Adjustment Assistance (TAA), a federal program in place since 1962 that provides benefits to both workers and firms (Hornbeck 2013). Workers displaced through trade receive retraining, relocation allowances, and extended unemployment benefits - while firms hiring displaced workers receive loans, loan guarantees, technical assistance, and tax benefits. In the name of fairness, TAA seeks to compensate the losers by redistributing wealth from the winners (the population of taxpayers). The budget for TAA as of 2015 was \$710.6 million,⁵ still a small sliver of the total \$3.68 trillion federal budget in 2015.⁶

In large measure, the TAA program is fairly uncontroversial. Most of the debate centers on the size and scope of the programs, and it does not follow traditional party lines. One problem with TAA is its exclusive focus on trade-related economic shocks. For example, the TAA website tells the story of Mr. Bustamante, a machine operator who lost his job because his company shut down his factory and moved it overseas. The TAA program paid for his retraining as a bus driver, and he soon earned a full-time job as an HVAC mechanic (United States Department of Labor, Employment, and Training Administration 2016).

In regards to this, two immediate concerns come to mind. First, had the company kept the plant in place and simply replaced Mr. Bustamante with a robot who could operate the machine, Mr. Bustamante would not have been eligible for TAA benefits. Thus, it seems somewhat arbitrary that the government is compensating individuals from one kind of economic shock (trade) but not another (technology). Second, robots may eventually replace all mechanics, thus eventually displacing Mr. Bustamante from his new job as an HVAC mechanic. Obviously, it is not the government's role to pick and choose between industries, as it is no better at forecasting future technological change than others. However, that is exactly what it is doing through the TAA program when it pays for retraining into jobs that may eventually become obsolete anyway. This begs the question of whether this is the best use of taxpayer funds.

⁵ United States of America. Department of Labor. *Congressional Budget Justification: Employment and Training Administration*. 11.

⁶ United States of America. Congressional Budget Office. *Monthly Budget Review: Summary for Fiscal Year 2015*.

Political economy justification for trade assistance programs exists namely as support for trade agreements. Trade assistance is a way to compensate the losers from free trade so they will support (or at least not oppose) trade agreements. However, a natural analog to trade agreements with respect to technology does not exist. When Amazon replaces factory workers with a fleet of robots, this does not impinge on any specific national economic policy because technological change is a secular productivity shock. Thus, it is not clear that the government needs to have any kind of formal TAA for technology. There are no similar ways for workers to politically oppose technological change through government policy. Therefore, political economy arguments do not work for making a persuasive argument to compensate losers from technological change. Rather, the most the government can do is prepare workers through broad-based approaches.

Skill Development and Education

A better approach is for the government to acknowledge online labor markets as inevitable and prepare workers for them. However, rather than structuring an ex-post corrective policy like TAA, a more sensible approach is to consider ex-ante investments in human capital that prepare people to participate in online labor markets. Primarily, this can occur through broad-based education and skill development. It is risky to build government policy around technological innovations because those innovations change much quicker than Washington can move, so a natural alternative is to leave the details to the states; they can compete amongst themselves in offering training programs for those seeking to work online. The federal government can play an effective role as a disseminator of information, making these online labor markets fully transparent through uniform disclosure laws and light forms of market-based certification.

Online labor markets already have a wide spectrum of skills necessary for their participation: ranging from data entry at the low end to advanced software development at the high end. A nationwide emphasis on STEM education would help with both the development of the market itself as well as American participation in the market once it is developed. Yet, existing proposals for STEM education are vague at the moment. Both the federal and state governments are scrambling to make investments in STEM education to respond to the secular shortage of computer science majors. It may require a more targeted approach, with careful understanding of the needs of online labor markets. This targeted form of educational investment can be optimal because it avoids picking specific winners and losers and provides enough flexibility for individuals to tailor their own educational needs. However, getting the balance right between broad-based and targeted education will be a challenge.

As a concrete example, the government could solve collective action problems of disparate private actors by suggesting investments that promote skill development in addition to the usual investments in public education that states routinely make. Simply identifying areas of need and requiring public disclosure about online labor markets could induce the private sector to make the requisite investments in such areas. For example, if learning to code in Python becomes the dominant technical skill of the future, the government could use some of its National Science Foundation research funds to support Python education and research. It could also encourage

national dialogue about developing companies that provide broad-based Python training to a wide class of workers.

Nonetheless, there may be a limit to upskilling. The government needs to watch the development of the online labor market to ensure any transfers to the skill development and education sector do not distort the behavior of market participants' ex-ante. For example, careful monitoring of online labor markets may show that American workers suffer from poor English grammar relative to their Filipino counterparts. This signal can inspire greater federal and state investments in English language training. Again, the key is the government leaning on signals from the market; in this case, from the emerging online labor market.

The main investment needs to come from the private sector. First, the labor markets themselves have room to grow, and the existing platforms like AMT and Upwork need much broader participation and engagement. Corporate America need not be ashamed to add online workers to their staff of full-time equivalent (FTE) employees. Finally, financiers like venture capitalists play outsized roles in the future evolution of industry, and they would be wise to take part in the future profit-making opportunities of online markets.

Online labor markets will require expertise in building technology platforms closely calibrated to market conditions, such as finding the best way to measure human performance and integrate said data into the economic mechanisms that run the platform. Participation in the online labor market will require skills that emerge from the demand side of the market itself. As the market grows, the platform will reflect the needs of employers and entrepreneurs around the world, thereby providing a window to the different skills necessary to power the global economy. For example, ten years ago, onsite network management was a key function of most businesses because of the growing pool of desktop computers connected on company networks. However, as technology shifts and more of these resources move to the cloud, the key skill in high demand will be the ability to manage multiple Amazon Web Services (AWS) systems distributed remotely. It is imperative for the online labor market to reflect timely, and even prospective, signals on labor demand.

Worker Benefits

A beginning question is how to classify workers. In the U.S., traditional full-time employees are classified and protected by the Fair Labor Standards Act (FLSA), which guarantees minimum wage, overtime pay, and explicit rules for calculating hours. If a worker is not covered by FLSA, then they are classified as an independent contractor. Therefore, there is an ongoing debate on how to classify gig economy workers and whether they should have the same benefits as full-time employees.

A key concern for regulators is the workplace safety net. Ever since the Occupational Safety and Health Act (OSHA) of 1970, a raft of employment protections come with full-time jobs. Indeed, OSHA first attached workplace disability insurance to jobs, while worker's compensation has been attached to jobs since 1911 at a state level and 1906 at a federal level (Guyton 1999). These

benefits are deeply entrenched in both law and American culture, and the race is on to think of how to represent these benefits in an online world. While campaigning in the 2016 presidential election, Hillary Clinton stated that the “on demand, or so called ‘gig’, economy is creating exciting economies and unleashing innovation. However, it is also raising hard questions about workplace protections and what a good job will look like in the future” (NASSCOM 2014).

This captures a particular concern Democrats have with the online economy, namely the erosion of workplace benefits. In the current regime (determined through labor law), employers are required to provide extensive benefits regardless of the skills or responsibilities of the worker (Department of Labor 2016). This effectively makes the worker a fixed cost to the firm, and therefore difficult for the firm to scale up or down as business needs change.

From a distributional perspective, those who are hired receive both benefits and a wage, whereas those who are not hired receive nothing. In this sense, the current regime of attaching benefits to the job increases inequality between workers for the same reason minimum wage does. Benefit exchanges would certainly be an improvement over this current regime because they allow more choice and flexibility for both the worker and the employer. The worker can choose the level of benefits they seek, and the employer can dial up or down the quality of benefits they need to pay. Every employer will face the same economic tradeoff: dollars spent toward wages can substitute for dollars spent toward benefits. However, the firm cannot unilaterally increase both without cost. The benefits attached to jobs are not “free”; they are a clear cost to the firm. On the margin, firms forced to pay large benefits through mandated labor laws will, in turn, offer lower wages. This emerges from the simple fact that the firm is subject to a budget constraint.

A more fundamental question is whether benefits should be attached to jobs at all. In a free market, workers can simply purchase whatever benefits they need; these benefits do not need to run through their employer. Unless a clear case for economies of scale can be made, workers would be better off simply receiving higher wages and buying what they need a-la-carte in a marketplace. Of course, this would require a more developed market for benefits. If legislators successfully rolled back some of the current onerous labor laws, it is entirely conceivable this market for benefits would emerge. Indeed, no theoretical or conceptual reason explains why benefits should run through employers and be such large fixed costs as they are today.

The chief argument for employers purchasing benefits themselves is the reality of economies of scale. If the firm acts as a single buyer on behalf of its workers, it may negotiate better prices and better terms than workers purchasing benefits themselves (Employee Benefit Research Institute 2002). In this sense, the firm can pass these bargaining profits down to workers, making workers better off. The benefits provider is able to lock in a large pool of customers at once, which may be advantageous against contracting individually with workers. Even before employee-sponsored insurance became widespread, there is some evidence that private groups still provided health insurance. For example, Beito (2000) documents that fraternal organizations provided healthcare for its members before World War II.

Some solutions that are market-oriented have circulated in the policy space to address the problem of providing benefits to flexible online workers. For example, in *National Affairs*, Eli

Lehrer discusses worker-controlled benefit exchanges that would substitute for the traditional package of benefits offered to full-time employees through employers. Workers can shop around from different vendors and assemble a package of benefits that provides a “replacement income stream,” which effectively serves the role of disability insurance, worker’s compensation, and sick leave. The key with these exchanges is their flexibility: workers can mix and match across different vendors, and employers do not need to commit to using the same exchange. This flexibility will lower costs for workers because vendors will compete with each other to offer the best benefit at the lowest price. Employers would pay into the exchanges, just as they pay into the benefit vendors under current law. This notion of market-based exchanges is promising because it injects a level of flexibility and creativity in the benefits space that does not exist today, as workers would have choices among vendors.

The genesis for these exchanges emerges from the local “gig” economy. For example, the Independent Drivers Guild represents Uber drivers in New York and is one of many associations taking the lead in both advocating and providing new platforms for benefits. However, in regards to online outsourcing, remember that American workers who choose to participate in Upwork or AMT will be competing with foreign workers who are able to offer their services at rock bottom wages. Adding a comprehensive benefits package on top of the wage compensation paid to an American online worker makes the total cost of compensation even less competitive in the global market.

Benefit exchanges will lead to significant government action because it will require updating the current benefits paradigm and portions of the FLSA. The example from the Independent Driver’s Guild above suggests that markets can develop some of these exchanges on their own. Nonetheless, the government may have a role in coordinating among multiple approaches to create a single standard that works for all kinds of markets. When the government picks a standard, it is important that they implement a healthy dose of competition to ensure that the best standard emerges on its own. This is why an early stage of “creative destruction” of different kinds of exchanges may be necessary before one emerges as the leading candidate.

U.S. labor laws that mandate large benefit packages make American workers more expensive than foreign workers (Meadows 1993). This is true with the physical economy and even more so with the virtual economy. Prices are even more transparent online than, for example, behind the desk of an HR manager running the Ford plant in Detroit. This is another reason why Americans need to specialize in more cognitive skills. Just as manufacturing outsourcing led large sectors of the population across the nation to retool for information economy jobs, so too must these populations pivot towards high-skilled knowledge work. As this transformation occurs, American workers’ benefits will still be affordable to employers because of their high productivity.

Conclusion

There’s no question that we are living in the midst of a revolution in robotics and AI. Just take a look at the amount of equity and venture capital directed toward automated driving, self-piloting

drones, household robots, and machines in manufacturing. This may lead one to believe that these robots will displace all humans from jobs, leading to mass unemployment and greater inequality.

History and economics suggest otherwise. Technology and humans historically have served as complements, not substitutes. They work together, rather than against each other. Nearly all the innovations in modern life—the transistor, gene mapping, aerospace, battery technology, social media, wireless networks, clean energy, and personalized drugs to name a few—make humans more productive, not less.

Yet, a crucial point is missed by this narrative: the general equilibrium. Machines do not exist in a vacuum, they operate in an economy collectively with humans. Prices and wages will adjust to reflect the economy-wide levels of skill, preference, and technology. When Nissan builds an auto plant in Japan, it deploys teams of robots and requires only a few engineers to oversee the machines. However, when it builds a plant in India, it chooses far fewer machines and relies more heavily on local labor. India's relative price of labor to capital is far below Japan's, making humans more affordable for the company. We cannot ignore examples like this because they counter the simple narrative that it is always more efficient to deploy machines in every circumstance.

Some view these future changes as inevitable and believe trends in AI are outside of anyone's control. However, just like the software that drives the new cadre of robots, the future can be designed, planned, engineered, and implemented. Entrepreneurs make choices, as do venture capitalists, governments, and civil society as a whole. We can choose to develop only machine technology and ignore human productivity, or we can think more holistically about the macro environment—the global mix of skill, education, demographics, and interconnectedness—to design a future that is better for all. This does not need to occur for reasons of equity and fairness, but for pure economic efficiency. The billions of people coming online in the next decade will be the economic transformation of our time. It is up to our society to use this as an opportunity to advance human potential and harness the most valuable asset in the world: human capital.

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