

Online outsourcing and the future of work

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Abstract

Purpose – The purpose of this paper is to provide an argument supporting the growth of online outsourcing, which will exponentially increase in the coming years with the spread of internet availability to the less-developed regions of the world. In addition, this paper stresses the role of human decision-making in fostering this growth, rather than promoting inhibitory policies because of nationalism or fear of change.

Design/methodology/approach – First, globalization and the three “waves” of outsourcing are discussed. Next, the economic principles guiding online outsourcing (disintermediation, the rise of global internet connectivity and the benefits of output-based pay over input-based pay) are discussed. After explaining how artificial intelligence will complement rather than replace human laborers, a case study and evidence are provided. Then, suggestions for government policies going forward, including skill development and education are provided. Finally, the debate that will inevitably emerge regarding online worker benefits is introduced.

Findings – Evidence points toward the growth of online outsourcing and the resulting increased efficiency and gains through this type of trade. The increase in freelance workers and their earnings, the investments of Google and Facebook to develop internet capabilities in less-developed regions and the reducing costs of technology (such as laptops) provide support for this argument (Elance, 2013; Forbes, 2014; Pofeldt, 2015). Finally, a case study provides evidence illustrating how individuals may gain from these advances.

Originality/value – This paper contributes to the literature by providing a compelling argument for the upcoming transition to increased efficiency in work through online outsourcing. Technological advances will allow the modern worker to delegate his/her mundane tasks so that he/she is free to focus on more pressing issues. This shift will multiply the domestic and foreign labor markets, creating opportunities that have not been available to this point. As this transition is not inevitable, this paper further outlines suggestions for policymakers to ensure maximized gains in the future.

Keywords Globalization, Policy, Transformation, Market, Growth, Labor, Online outsourcing

Paper type Research paper

Introduction

The text you are now reading began as an audio file recorded in Texas: it was sent to the IBM Watson artificial intelligence (AI) 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 such as Facebook and Google (Facebook Investor Relations, 2017; Google Ventures, 2018). Mostly, the 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, this paper assembles preliminary evidence on this economic transformation, anchors the analysis in economic principles, speculates on long-term economic impacts and recommends 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). Here the distinction must be made that defines offshoring as work conducted offshore by subsidiaries of the enterprise, and outsourcing as work conducted offshore by non-subsidiary firms in the host country. The second wave of outsourcing took place during the first internet bubble of the late 1990s and early 2000s (Gereffi, 2005). 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 through dynamic and continuous auctions. Corporations will no longer only hire full-time employees who conduct all the tasks themselves, rather, these employees will interface with a global network of workers available on demand. This third wave of outsourcing will open whole new worlds of productivity, expand global economic opportunity and change the nature of work. According to Forbes, in 2014, 25 per cent of the US workforce were freelance or contingent workers. This increased to 36 per cent in 2017, according to the Freelancer's Union and is expected to surpass 40 per cent of the workforce or 60 million US workers, by 2020 (Pofeldt, 2015).

Outsourcing's initial wave brought with it passionate claims that foreign workers would steal American jobs (Levine, 2012; Mankiw and Swagel, 2006). 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 (USA Department of Labor, Employment and Training Administration, 2016). 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 is roughly equivalent to a laptop in the Philippines given that the service provided is impersonal. 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, the basis for 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. Importantly, the "offshorability" of these jobs will depend on factors specific to each job type (Blinder and Krueger, 2013).

To fix ideas, let me distinguish between online outsourcing and the "gig" economy. Companies such as Uber, TaskRabbit, Thumbtack and Airbnb all use cloud tools to 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 made is technically local trade because transportation is a physical transaction and, thus, is part of the gig economy. Alternatively, websites such as Upwork and Amazon

Mechanical Turk (AMT) match buyers and sellers of labor in global transactions. Upwork serves as a directory for entities to hire a wide variety of freelancers. In fact, because of global disparity in skills and wages, these labor 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, namely, Elance and oDesk. The company claims that 53 million Americans are freelancing at any point, contributing \$700bn to the economy (Upwork, 2019) while the McKinsey Global Institute reports that anywhere from 54 to 68 million Americans are independent workers (McKinsey Global Institute, 2016). This indicates that Americans participate in online labor markets both as workers and employers. Elance posted over 1 million jobs in the first quarter of 2011, and almost 3.5 million by the end of 2013. Freelancers earned \$285m 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, enabling buyers and sellers to contract through technology platforms. Indeed, the world's top five firms with regards to market value, have come from the following top five US technology companies alone; Facebook, Google, Amazon, Apple and Microsoft all run immense marketplaces (Statista, 2018). 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. This process will expand to the services markets.

This argument relies on the extensive, rather than the intensive, margin of labor supply (Heckman, 1993). 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 in the future. Of the world's population of 7.6 billion people, 4.20 billion people do not have any kind of internet access that would allow for the performance of online work (World Bank Group, 2016). If one-eighth of these people enter the workforce through online opportunities, the total global labor market would increase by 15 per cent. Also, projections show that from 2017 to 2050, half of the world's population growth will be concentrated in nine countries, several of which, such as India and Nigeria, are already heavily involved in online services (United Nations Department of Economic and Social Affairs, 2017).

These calculations are admittedly speculative, but so 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 D.E. Shaw in favor of starting Amazon.com was the internet's 2,300 per cent annual growth rate in 1994. With technology giants such as Facebook disclosing spending of \$860m per year on internet infrastructure, the droves of people coming online are virtually inevitable.

Importantly, machines do not exist in a vacuum, but 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.

For this reason, it is unlikely that the transformation will completely change all current work practices. Work requiring tight coordination, creative input and face-to-face feedback from multiple employees will always need full-time, in-person employment. As the trend toward agglomeration grows, the countervailing force will be the increased efficiency of urban centers, which will still make it efficient for some work to occur 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 and increase their own efficiency by sourcing some of their more mundane, yet essential, tasks from the on-demand network.

The underlying economics

The academic literature on the economics of organization can provide some guidance on the firm's boundaries and most importantly, the kind of work taking place within the firm versus the market. Nobel Laureates such as [Oliver Williamson \(1979\)](#) and [Ronald \(1937\)](#) established their careers by developing theories of transaction costs that help determine the location of work and the structure of the firm. Broadly speaking, when transaction costs are high, corporations are efficient at conducting work because a hierarchical control structure is an effective way to produce output. In contrast, when transaction costs are low, individuals can contract with each other at low cost through price-mediated markets.

The key economic feature of the internet has been a 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 business relationship or even the use of a lawyer. Now, the internet has replaced many of these requirements as buyers and sellers neither need to be in the same physical space, nor do they require local services. Instead, reputation mechanisms online serve the same functions to enforce behavior. This has led to a shift in the boundaries of the firm, as more and more work will move from within corporations into the marketplace.

There exists a vast number of examples of this widespread disintermediation in transactions. Previously, an entrepreneur in the USA would hire a graphics company to design its website. The graphics 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 contract directly with the entrepreneurs. The internet can serve many of the roles that were once performed by the company: online search can substitute for business development, PayPal can provide a payments vehicle 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 more direct contact between buyers and sellers. Chicago economist [Ronald \(1937\)](#) 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 reduce transaction costs to facilitate greater trade.

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 (Facebook Investor Relations, 2017; Google Ventures, 2018). As of 2016, only 3.5 billion individuals (46 per cent of the total world population) have access to the internet (Kende, 2015; Broadband Commission, 2014, 2015; World Bank Group, 2016). 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, not the usual audience that 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 where most workers are paid a set wage. Output-based pay is 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 an assembly line worker. The remote and distributed environment of the internet makes it a natural candidate for output-based pay. The academic support for output-based pay is long and deep. Output-based pay has three primary benefits for productivity as follows; it aligns incentives between the employer and the worker, it attracts better workers to the firm and it retains these talented workers over time. These three factors are called the incentive, selection and retention effects.

Notable labor economists such as Edward Lazear (2000) have shown performance pay can lead to a 44 per cent increase in productivity over fixed salaries and other input-based pay. The economic benefits of performance pay explain the widespread use of equity compensation among executives and directors of major corporations. 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.

The ability to measure human output is only advancing over time as sensor technology is becoming cheaper and more portable. 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. For these reasons, the self-quantification movement will eventually permeate most jobs.

Human vs artificial intelligence

A residual question lurking in the background is the interaction between human and AI. This is one of the deep philosophical debates of our time and will only become more acute as 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 the economic surplus. Historically, however, technology has served as a complement rather than a substitute for human output. Further, AI can help improve the quality of marketplaces coordinating labor in this new online world. For example, AI technology can assist in coordinating, contracting, assigning, distributing and evaluating work, even if humans are the ones performing the physical labor.

At its highest level, the core problems with online outsourcing are, first, who does the job and second, for what price. Auctions allow platforms to develop prices under highly uncertain environments through a variety of bidding rules (Kaganer *et al.*, 2013). 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 variables.

Assignment algorithms are a more direct approach to determine who performs the job. In general, auctions work better when there is uncertainty on price and skill (Han, 2013). Assignment algorithms are quicker and simpler than auction algorithms, but require more environmental knowledge about the optimal price and the set of workers best qualified for the job. There is a variation now in the assignment market, as websites such as Thumbtack use auctions to solicit bids, whereas others, such as TaskRabbit, use direct assignment. It is impossible to know exactly which method will dominate or what will be the appropriate mix between the two. Ultimately, both academic and industrial research will experiment with varying mixtures and different mechanisms will likely perform better under different circumstances.

Often, it takes time to realize the full potential of newly developed technologies. When Marconi first invented the radio in 1895, the primary form of communication was newspapers. Early media companies bought radios, and their shows involved reading newsprint over the airwaves. Eventually, companies realized that radio enabled new opportunities, marking the birth of radio talk shows. When television reached a mass audience in the late 1950s, early shows were videotapes of prior radio shows (Blanchard, 1998). Eventually, media companies realized that television provided new opportunities and made full use of the broad spectrum of formats now occupying modern TV.

This same shift is occurring through online outsourcing. The early entrant into the online marketplace was oDesk. 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 h of work time per week, and the company's annual earnings are projected to grow from \$1bn in 2012 to \$10bn by 2020. 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)[1]. If this trend continues to permeate the entire online labor market, the scope of the growth will be enormous (Kokkodis and Ipeirotis, 2016).

The existing online labor markets are still in their early stages. 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 and the work to be performed. A better, longer-term option is to automate all of these choices; software will set the price and 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 works 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.

Related to this, several limitations to these platforms still exist. Although mechanisms are in place to control for fake reviews, it is still possible for laborers to work around these regulations. In addition, there is no way to ensure that workers bidding on tasks have truly obtained the relevant experience or qualifications to complete the task. For example, with the expansion of internet access, it may be likely that workers cannot speak English as fluently as necessary to complete certain online tasks. Finally, the existing legal structure regarding online hiring platforms is largely specific to US market characteristics. There is

still much work to be done regarding international labor laws, particularly accounting for different minimum wage standards across countries.

As transaction costs fall over time, this information will be incorporated into compensation and will boost productivity. These productivity gains can be large and help with all manners of decisions, such as when to terminate a worker (Ray, 2007). 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.

Case study: the Philippines

The Philippines, a country of 92.3 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 past decade. The increase in the connectivity of the internet will bring online labor markets to even more remote regions of the islands.

For example, in 2012, R. sought cheap dictation transcription services for notes taken during academic conferences. R. located C.L. on oDesk, a nurse living in Cebu. She chose her town because her mother was sick, and she spent half of her time caring for her at home. She had to cut back on her hours at the hospital. She turned to oDesk to fill her spare time and earn extra income. R. used C.L. for two full years.

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 (Xia, 2014). 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 C.L. have a low opportunity cost because they may need to stay home for personal reasons.

Over time, people like C.L. 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 should follow the long-term rise in productivity once the market fully develops. 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 traditional and online outsourcing poses a challenge because the data are 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 located abroad. Publicly available data are much more readily available on the former, primarily because of aggregate government statistics.

At the highest level, some preliminary evidence from the [International Monetary Fund \(2018\)](#) and the [Bureau of Labor Statistics \(2018\)](#) shows that traditional outsourcing is increasing. For example, outsourcing in the finance category refers to functions traditionally performed in the finance department of a US 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 other services are steadily increasing over time.

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 Bureau of Labor Statistics (BLS) and the data from the Bureau of Economic Analysis of the Department of Commerce (Mankiw and Swagel, 2006). 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[2]. The BLS survey shows that most of these job losses did not involve any relocation of work. However, one limitation is that the study neither 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 the relocation of work.

What are the responses of companies to these macroeconomic trends? Again, the data is mixed. Some studies find US parent companies use more domestic 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, such as 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 New York University Professor calculated the average compensation per hour for an AMT worker in 2009 as \$2.30, well below the US minimum wage, though still above the income for much of the developing world (Guarino, 2015).

Some preliminary data published by Elance show that the total amount of outsourcing has increased over time, ranging from 1 million tasks outsourced in 2011 to 3.5 million tasks outsourced in 2013 (Elance, 2013). These facts show 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 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. The current level of outsourcing is just a sliver of what is possible, as connectivity in the world still reaches only half the globe[3]. 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 (2018) found that global spending for IT services was approximately \$932bn in 2013 and is expected to grow to \$3.7tn in 2018.

The market for BPO itself grew by approximately 6.2 per cent in 2013, and the five-year compound growth rate for worldwide BPO was approximately 5.3 per cent through 2016 (Gartner, 2018). 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.

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. 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 a 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.

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 understand that economic isolation can 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. For example, NAFTA may indeed have cost some manufacturing jobs in the USA, but American consumers are better off as a whole, due to the subsequent lower prices on commodity products imported from low cost countries.

Because of the amount of workers entering the online labor market, the next major debate will center on trade in labor, rather than trade in goods. Outsourcing will take center stage 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 USA but can now register online to work in the USA through online labor markets in seconds. As the debate on immigration shifts to the productivity of human capital, the location of that capital becomes irrelevant as 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.

Skill development and education

Although trade benefits an overall economy, it does create individual winners and losers. 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 \$710.6m[4], still a small sliver of the total \$3.68tn federal budget in 2015[5].

Overall, the TAA program is fairly uncontroversial. Most of the debate centers on the size and scope of the programs and does not follow traditional political 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 (ETA, 2016).

Regarding 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, 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.

A better approach is for the government to acknowledge the growth of online labor markets as inevitable and prepare workers. 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. However, it is risky to build government policy around technological innovations because those innovations change much quicker than Washington can move, so a potential alternative is to leave the details to the states. They can compete amongst themselves in offering training programs for those seeking to work online. If states focus on education and skill development, the federal government could play a more effective role by focusing on relevant law-making. For example, the government could implement uniform disclosure laws to ensure that firms are transparent about their online labor practices. One limitation of this approach, however, is the complexity of enforcing online labor laws for both workers and firms outside the USA.

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. It may require a more targeted approach, with a 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 (that TAA does) 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 coding 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 a national dialogue about developing companies that provide broad-based Python training to a wide class of workers.

Importantly, there may be limits to upskilling. 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. In other words, the government can monitor the development of the online labor market to ensure the skill development and education sector is providing appropriate resources for workers to learn the necessary skills. Again, the key is the government leaning on signals from the market with the main investment coming from the private sector.

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. For example, 10 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 systems distributed remotely. It is imperative for the online labor market to reflect timely, and even prospective, signals on labor demand.

Conclusion

There is no question that we are living in the midst of a revolution in robotics and AI. The amount of equity and venture capital directed toward automated driving, self-piloting drones, household robots and machines in manufacturing supports this argument. Understandably, this may lead one to believe that robots will displace all humans from jobs, leading to mass unemployment and greater inequality. Fortunately, technology and humans historically have served as complements. 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.

The discussion above yields some implications for future research. First, regarding investments in education and skill development, researchers can examine the current labor market, specifically that of the USA, to determine where weaknesses lie. For example, and as previously mentioned, researchers could examine whether US online workers need improvements in English skills or Python coding skills. This information will be useful for policymakers and future investors. Second, it is important to address the current limitations found in the online labor markets. Although there are currently mechanisms in place to scan for fake reviews, it is important that these platforms establish more rigorous standards for ensuring laborers' qualifications and experiences. In addition, it is important in going forward to tackle the complicated issue of differing legal standards for workers in different countries, specifically regarding minimum wage standards.

Some view these future changes as inevitable and believe trends in AI are outside of any individual's control. Nonetheless, 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.

Notes

1. Elance and oDesk merged in 2013 and Upwork launched in May 2015.
2. There is some controversy regarding the completeness of this data (Levine, 2012).
3. As of 2015, nearly 94 per cent of the world's population receives a mobile phone signal, 48 per cent are covered by mobile internet, and nearly 28 per cent have subscribed to a data package (Kende, 2015). As of 2014, there were nearly 711 million broadband connections worldwide (The State Broadband, 2014).
4. United States of America. Department of Labor. *Congressional Budget Justification: Employment and Training Administration*. 11.
5. United States of America. Congressional Budget Office. *Monthly Budget Review: Summary for Fiscal Year 2015*.

References

- Aws, N. (2011), *Discussion Forums: About How Many Workers Were on Mechanical Turk in 2010?*, Amazon Web Services.
- Blanchard, M. (1998), *History of the Mass Media in the United States: An Encyclopedia*, Routledge, New York, NY.
- Blinder, A.S. and Krueger, A.B. (2013), "Alternative measures of offshorability: a survey approach", *Journal of Labor Economics*, Vol. 31, pp. S97-S128.
- Broadband Commission (2014), *The State of Broadband 2014: Broadband for All*. ITU, UNESCO, Switzerland, Geneva.
- Broadband Commission (2015), *The State Broadband 2015: Broadband as a Foundation for Sustainable Development*. ITU, UNESCO, Switzerland, Geneva.
- Bureau of Labor Statistics (2018), International Statistics, Coase
- Elance (2013), "Global online employment report employee benefit research institute, (2002, March)", History of Health Insurance Benefits.
- Facebook Investor Relations (2017), available at: <https://investor.fb.com/home/default.aspx>
- Gartner, I. (2018), Global IT Spending to Grow 6.2 Per cent in 2018.
- Gereffi, G. (2005), *The New Offshoring of Jobs and Global Development*, International Institute of Labour Studies, ISBN 92-9014-805-5.
- Google Ventures (2018), available at: www.gv.com/
- Guarino, B. (2015), *How Many Full-Time Mechanical Turks Work for Amazon?: Can You Live at Two Cents a Microjob*, Inverse.
- Han, S. (2013), "Asymmetric first-price menu auctions under intricate uncertainty", *Journal of Economic Theory*, Vol. 148 No. 5, pp. 2068-2095.
- Heckman, J.J. (1993), "What has been learned about labor supply in the past twenty years?", *American Economic Review*, Vol. 83 No. 2, pp. 116-121.
- Holmstrom, B. (1979), "Moral hazard and observability", *Bell Journal of Economics*, Vol. 10 No. 1, pp. 74-91.
- Hornbeck, J.F. (2013), "Trade adjustment assistance (TAA) and its role in US trade policy", *Congressional Research Service*.
- International Monetary Fund (2018), *International Financial Statistics*.
- Ipeirotis, P. (2012), A Computer Scientist in a Business School.
- Kaganer, E., Carmel, E., Hirschheim, R. and Olsen, T. (2013), "Managing the human cloud", *MIT Sloan Management Review*, Vol. 54 No. 2, pp. 23-32.

-
- Kemeny, T., Rigby, D. and Cooke, A. (2013), *Cheap Imports and the Loss of US Manufacturing Jobs*, Spatial Economics Research Center.
- Kende, M. (2015), *The Shrinking Digital Divide*, TechCrunchNetwork.
- Kokkodis, M. and Ipeiritos, P.G. (2016), "Reputation transferability in online labor markets", *Management Science*, Vol. 62 No. 6, pp. 1687-1706.
- Lazear, E. (2000), *Performance Pay and Productivity*, American Economic Review.
- Levine, L. (2012), *Offshoring (or Offshore Outsourcing) and Job Loss among US Workers*, Congressional Research Service. Washington, DC.
- McKinsey Global Institute (2016), *Independent Work: Choice, Necessity, and the Gig Economy*.
- Mankiw, N.G. and Swagel, P. (2006), "The politics and economics of offshore outsourcing", *National Bureau of Economic Research*.
- Pofeldt, E. (2015), "Elastic-oDesk becomes 'Upwork'", in *Push to Build \$10B in Freelancer Revenues*, Forbes.
- Ray, K. (2007), "Performance evaluations and efficient sorting", *Journal of Accounting Research*, Vol. 45 No. 4, pp. 839-882.
- Ronald, H. (1937), "The nature of the firm", *Economica*, Vol. 4 No. 16, pp. 386-405.
- Statista (2018), *The 100 Largest Companies in the World by Market Value in 2018*.
- The Workforce in the Cloud (2013), *The Economist*.
- United Nations Department of Economic and Social Affairs (2017), *World Population Projected to Reach 9.8 Billion in 2050, and 11.2 Billion in 2100*.
- United States Department of Labor, Employment and Training Administration (2016), *Success Stories*.
- Upwork (2019), *Million Americans Now Freelance*, New study finds, Vol. 53.
- Williamson, O. (1979), "Transaction-Cost economics: the governance of contractual relations", *Journal of Law and Economics*, Vol. 22 No. 2, pp. 233-261.
- World Bank Group (2016), "Individuals using the internet", available at <https://data.worldbank.org/indicator/IT.NET.USER.ZS>
- Xia, B. (2014), "Digital labor in Chinese internet industries", *Communication, Capitalism, and Critique*, Vol. 12 No. 2, pp. 668-693.

Further reading

- Beito, D. (2000), *From Mutual Aid to the Welfare State: Fraternal Societies and Social Services, 1890-1967*, The University of NC Press. ISBN: 0-8078-4841-7.
- Department of Labor (2016), *Budget in Brief: Fiscal Year 2016. Excerpts for Employment and Training Administration (ETA)*, Department of Labor, USA.
- Guyton, G.P. (1999), "A brief history of workers' compensation", *The Iowa Orthopaedic Journal*, Vol. 19, pp. 106-110.
- Meadows, D. (1993), *The NAFTA Debate—More Than Al Gore and Ross Perot*.

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