

# Where to Invest: Man vs. Machine



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## Takeaways

- There are two types of capital investments businesses can make: those in physical capital, like machinery and software, and those in human capital, like worker training.
- Economists have long emphasized the need to invest in physical capital. But due to automation and the rising demand for a more skilled workforce, human capital investment is becoming increasingly important for economic growth.
- Federal policy over the last few decades has strengthened incentives to invest in physical capital, but not human capital. At the same time, employer investment in workers has fallen by more than one-third over 20 years.

An owner of a franchised McDonald's has a difficult decision to make. Customers are complaining about the quality and speed of service from the cashiers. They're slow with the registers and they don't interact well with customers. To improve efficiency and productivity, the franchise owner can either invest in five new self-service kiosks, or she can send her employees to Hamburger University, to improve their skills.<sup>1</sup> If she invests in the machines, let's assume she'll be able to eliminate two cashiers from her payroll. If she invests in workers, they'll make more money but also stay at the store longer, reducing turnover costs.

From a societal perspective, which should we want the owner to pick: the training or the kiosks? The downsides to the machines are the most obvious: two people will lose their jobs. Replacement by automation is one of the core fears of workers in today's economy. Yet, economists have always said that investments in physical capital, like the kiosks, are the true driver of productivity growth and, ultimately, rising living standards. However, economics also tells us that investments in human capital—training or educating workers to improve their efficiency—drive productivity growth.

This issue will go to the forefront of America's debate on creating more jobs and higher wages. Senator Mark Warner and the Aspen Institute have done groundbreaking work on this topic, which can be found in the report, "[Toward a New Capitalism](#)." It turns out, though, that government already has its thumb on the scale in the human vs. physical capital dilemma. And despite politicians' relentless talk about job creation, policy over the last few decades has been adjusted to favor the machines. This report will demonstrate how and call for action to rebalance the scales.

## **The Investment Dilemma**

For the McDonald's store owner, the investment decision will come down to math: which investment—in training or kiosks—will yield a higher internal rate of return (IRR)? An

investment's IRR measures the profitability to the firm's owner. If an investment is projected to yield a return of 10% and the firm can borrow at 7%, the project is profitable, and the firm should invest. When comparing multiple projects, the firm should pick the one with the highest IRR.

We can base the costs in the McDonald's scenario on some real numbers:

- McDonald's recently installed self-service kiosks in many of its restaurants around the country. The cost of installation for one store is about \$60,000.<sup>2</sup>
- The average wage for a McDonald's cashier is \$9 per hour, which translates to \$18,000 per year.<sup>3</sup> For service sector jobs, worker benefits and payroll taxes cost about 28% of an employee's salary, which means an additional \$5,040 in costs for McDonald's.<sup>4</sup>
- Initial training costs for large corporations, like McDonald's, run about \$500 per new employee.<sup>5</sup>
- Nationally, the turnover rate for people who make what our McDonald's cashiers make is about 40% per year, and replacement costs are roughly 16% of the lost employee's salary.<sup>6</sup>

The exact information we need to compare the IRR for the two investments is not publicly available, so we make a few assumptions based on available data:

- The worker training programs will cost an additional \$1,000 per employee.<sup>7</sup>
- Once the cashiers are trained, they will be promoted to a job with stature equivalent to an assistant manager, for which the base pay is \$12 per hour.<sup>8</sup>
- After the training, the turnover rate for workers drops to 20%, so that McDonald's only loses one employee per year instead of two.

- Running and maintaining the kiosks and required software will cost \$50,000. <sup>9</sup>
- Both the training and kiosks will boost store sales by \$40,000 per year. <sup>10</sup>

Altogether, these inputs make up a not-exactly-real, but based-on-true-events example that can illustrate how policy affects investment decisions.

## Costs and benefits to alternative business investments

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**Physical capital investment:**  
Purchasing self-order kiosks

**Human capital investment:**  
Training workers to improve their productivity

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Initial investment: \$60,000  
Maintenance costs: \$50,000 per year  
Sales increase: \$40,000 per year over 5 years  
Opportunity to fire 2 employees <sup>11</sup>

Initial investment: \$5,000  
Wage increase: \$3 per worker  
Sales increase: \$40,000 per year over 5 years  
Worker turnover rate drops by half

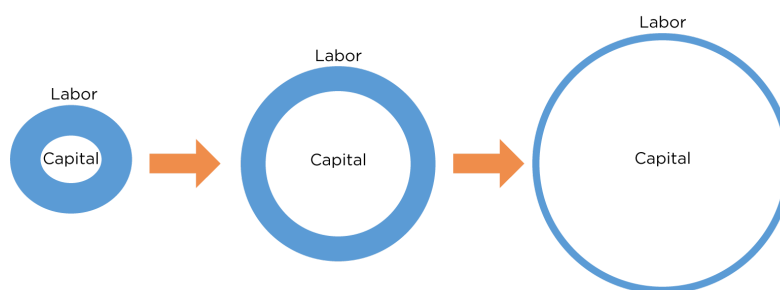
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## Factors of Production and Growth

What exactly is the difference between physical capital and human capital? Physical capital refers to tangible assets that assist in the production of a good. This includes machinery, buildings, transportation, computers, and software. Human capital refers to the economic value of an employee's skill set. When an employer trains an employee, she is increasing that employee's human capital. When an individual pursues an education, he is increasing his human capital by broadening his knowledge and skills.

These sorts of investments are integral to how economists look at economic growth. As the graphic shows, the process of firms accumulating an ever-larger amount of physical capital—enabled by technology—has historically shifted jobs to new sectors as productivity and efficiency increased in the old sectors.

## How the Economy Grows



As the supply of capital increases, the supply of labor doesn't decrease. Tasks that used to need people now only need machines. People venture into new industries that have new jobs and that increases the size of our total output. This is how the economy grows. Ideally, the labor force benefits from both higher wages and a higher standard of living.

Source: Steve Strongin et al, "Narrowing the jobs gap: overcoming impediments to investing in people," Report, Global Markets Institute, Goldman Sachs, July 2016, page 2, Print. Available at: <http://www.goldmansachs.com/our-thinking/public-policy/narrowing-the-jobs-gap-report.pdf>

Once millions of people no longer needed to farm to get food, they didn't merely stop working, but rather just moved into new industries. Physical capital accumulation allowed the economy to produce more and more goods and services.

However, these transitions into new industries have never been easy. Since the industrial revolution, investments in physical capital that displace labor have made certain people worse off in the short term while dramatically improving the fortunes of the country in the long term. Consider that in the late 19th century, 80% of the workforce in America was employed in agriculture. Today, it's around 2%, yet we produce far more food.<sup>12</sup>

When agricultural jobs were destroyed, many of the new jobs created were in factories. Both were relatively low-skilled professions. Rapid advances in technology though have ensured that an increasing share of jobs created in the new economy will require a higher level of skill. With this new reality, investments in human capital, whether worker-training or higher education, are critical to ensuring a smoother transition into new jobs. The economic anxiety created by such displacement of low-skilled professions is already palpable. This is a problem not only for labor, but also for the economy as a whole. If the newly created positions

cannot be filled by suitable workers, then growth will suffer, and people will feel displaced.

The recognition by the economics profession of the importance of human capital in economic growth is relatively new. It wasn't until the 1990s when endogenous growth theory gained traction. Endogenous growth theory explains that growth in technology and productivity are usually achieved through investments in human capital. Evidence has shown that human capital investments are important for any country, developing or developed. However, in a knowledge-based economy like that of the United States, the returns to investment in human capital are much greater.<sup>13</sup> The intuition is simple: as capital becomes more and more advanced, with automation consuming a larger fraction of routine tasks, the new jobs created require a higher degree of cognition. The demand for high-skilled workers is there; we need the supply.

What does all this mean for our McDonald's store? Not every routine, low-skilled job will be saved. And that shouldn't be the goal. But when it's a close call between physical and human capital investment, you can see the upside of going with the worker: a high-school grad with no college, for example, will get a first step up the rung of a career ladder. Maybe several years out, when newer, cheaper kiosks are available, it won't be a close call. But by then, that extra bit of worker training will have contributed to the upskilling of the American workforce. And the more training each employer can contribute, the better equipped the workforce will be to succeed in a more demanding workplace. The next section looks at exactly how policy affects the close-call decisions for the economy generally and for our hypothetical McDonald's.

## **Incentives to Invest**

### **Tax Incentives for Physical Capital**

There are a number of tax incentives for companies that invest in physical capital. Traditionally, a piece of equipment considered as a capital expense will depreciate over time.

Companies write off the costs of depreciation each year according to a set of classification standards set by the government. The logic is that capital equipment produces income each year it is in use, so it should not be written off all at once. The current system we have set up has an accelerated timeline for asset depreciation.

For example, the IRS defines the class life of a locomotive to be 14 years. Therefore, the locomotive should be amortized over 14 years. However, our current system allows a company to amortize a locomotive over 7 years.<sup>14</sup> Because of the time value of money, this is a substantial tax break for businesses and an incentive to invest in physical capital. Almost all of the equipment businesses buy can now be amortized faster than the expected life of the machine. The primary intent behind this law, passed as part of comprehensive tax reform in 1986, wasn't just to give big corporations a break, but to make it less expensive to buy the locomotive. This would then entice companies to buy more locomotives, which would create more jobs in the industry. The effectiveness of such a supply-side policy is a topic of discussion for another time. It certainly hasn't been good for the budget though. The Office of Management and Budget estimated that accelerated depreciation cost nearly \$70 billion in foregone tax revenue in 2012.<sup>15</sup>

According to the system of accelerated depreciation in place right now, the kiosks in our example have a class life of 5 years and can be written off over 5 years.<sup>16</sup> This means that each year, the McDonald's franchise can deduct \$12,000 from its taxable income, because the kiosks cost \$60,000. Here's what the kiosk investment's cash flows and return on investment looks like with accelerated depreciation factored in:

**Kiosk return on Investment: Accelerated depreciation**

Project Start	Year 1	Year 2	Year 3	Year 4	Year 5	Internal Rate of Return (IRR)
-\$60,000	-\$6,044	+\$25,780	+\$25,780	+\$25,780	+\$25,780	<b>14.3%</b>

An IRR of 14.3% is a great return, but it gets better. There is another incentive that the government often uses to encourage additional investment in physical capital: bonus

depreciation. The Protecting Americans from Tax Hikes Act of 2015 extended bonus depreciation of 50% for 2015, 2016, and 2017. This means that when a company purchases a new piece of equipment, it can write off half of the cost in the first year.

Bonus depreciation is generally used as a fiscal stimulus program, one that has proven to be effective in spurring investment during downturns. According to economists Eric Zwick and James Mahon, bonus depreciation raised investment in capital by 10.4% between 2001 and 2004, and by 16.9% between 2008 and 2010.<sup>17</sup> This stimulus, though, is supposed to be temporary, which makes it all the more strange that it was extended in 2015, years after the economy had pulled out of the recession. The Committee for a Responsible Budget estimates that a one-year extension costs the government \$9 billion, while a permanent extension of bonus depreciation would cost the government \$380 billion.<sup>18</sup> In our example, the incentive to invest in the kiosks becomes even greater when we account for bonus depreciation. The IRR rises to 15.5%.

**Kiosk return on Investment: Including accelerated and bonus depreciation**

Project Start	Year 1	Year 2	Year 3	Year 4	Year 5	Internal Rate of Return (IRR)
-\$60,000	+\$2,356	+\$23,680	+\$23,680	+\$23,680	+\$23,680	15.5%

Finally, in addition to the aforementioned tax incentives for all businesses, small and new businesses are entitled to their own set of deductions for capital investments under Section 179, which says that cars, office equipment, business machinery, and computers can be fully expensed up to \$500,000 for small businesses. This means the entire cost of the piece of equipment can be written off right when it's purchased. The logic is that new and small businesses need extra help and that they benefit from simpler rules. To qualify for Section 179, a business cannot purchase more than \$2 million worth of equipment in a year. Our McDonald's franchise would qualify for Section 179 and full expensing of the kiosks, which would further increase the IRR to 16.9%.<sup>19</sup>

**Kiosk return on Investment: Section 179**

Project Start	Year 1	Year 2	Year 3	Year 4	Year 5	Internal Rate of Return (IRR)
-\$60,000	+\$10,576	+\$21,580	+\$21,580	+\$21,580	+\$21,580	16.9%



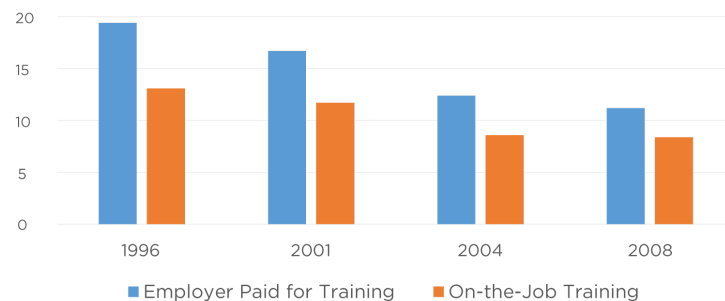
# Tax Incentives to Invest in Human Capital

Businesses' worker training costs are fully deductible from corporations' taxable income in the year they are spent. This would include training workers on how to use a new piece of equipment or teaching them new skills through classroom-type settings.

When it comes to education expenses for employees—should the employer choose to enroll employees in outside courses at a university or community college—the rules are a little more complicated. Employers can deduct employee education expenses up to \$5,250 from their taxable income, provided that the employer creates a written plan for the IRS explaining the need for such a program.

Despite the incentives in place, the share of workers receiving on-the-job training has fallen from 13.1% in 1996 to 8.4% in 2008. The share of workers receiving employer-paid training (outside education) has fallen from 19.4% in 1996 to 11.2% in 2008.<sup>20</sup>

**The Decline of Investment in Human Capital:  
Percentage of Workers Receiving Training**



Source: The White House of President of Barack Obama, “2015 Economic Report of the President,” Report, February 2015, page 147, Accessed March 20th, 2017. Available at:

<https://obamawhitehouse.archives.gov/administration/eop/cea/economic-report-of-the-President/2015>

*The Economist* writes that between automation, offshoring, and crowdsourcing, companies just have a broader range of options for getting the job done.<sup>21</sup> Market forces have reduced the incentive for employers to invest in human capital. The decline of worker-sponsored training is an

ominous sign for the stock of human capital in the economy. It likely means workers will be less capable of adapting to a rapidly changing 21st-century economy.

In our example, the training costs for our workers are fully deductible. Since McDonald’s is training five workers at \$1,000 each, the store can immediately deduct \$5,000 from its taxable income. With this deduction factored in, the IRR for the worker training investment (without including turnover costs) is an impressive 15.1%, meaning that compared to the physical capital investment without the option of bonus depreciation or Section 179, our franchise owner would actually choose to invest in workers.

**Worker training return on investment (turnover not included)**

Project Start	Year 1	Year 2	Year 3	Year 4	Year 5	Internal Rate of Return (IRR)
-\$5,000	+\$2,790	+\$1,040	+\$1,040	+\$1,040	+\$1,040	15.1%

When we include turnover costs though, cash flows become negative in the years following the investment, meaning that when we account for the possibility of workers leaving, it’s not even close to worth it for the owner to invest.<sup>22</sup>

**Worker training return on investment (turnover included)**

Project Start	Year 1	Year 2	Year 3	Year 4	Year 5	Internal Rate of Return (IRR)
-\$5,000	+\$294	-\$1,456	-\$1,456	-\$1,456	-\$1,456	<0%

Human capital is owned by the employee. A machine can’t grow legs and walk out the door. An employee almost always can walk away from a job at any time he or she chooses. When there’s a close call between an investment in physical capital and one in human capital, the physical capital will almost always be more enticing—unless we can find a way to adjust to this reality. Thus, when we included the cost of turnover in our model for investing in human capital, the IRR dropped to the point where the investment in people would actually lose money. When including turnover, we see the benefit of being able to lay off two workers with the kiosk investment.

As long as it is so easy for a company to lose out on the benefits of worker training they pay for, this fundamental aspect of our labor markets will keep labor at a disadvantage moving forward. Goldman Sachs economists propose that the

U.S. introduce stricter labor contracts to protect employers from losing out on their human capital investments; indeed, that would make the investment more appealing to the owner of the McDonald's.<sup>23</sup> In our example, with labor contracts, and without the availability of bonus depreciation or Section 179, the logical investment choice for our franchise owner would have been improving the performance of her workers and raising their human capital.

However, labor contracts have downsides too. They would reduce worker mobility and perhaps deter workers from accepting a job knowing they would be locked into a commitment. From the employer's perspective, it would make it more difficult to fire workers, inhibiting the freedom employers like to hold on to.

## **Rethinking conventional wisdom**

It is important to emphasize that the scenario presented above is a stylized example, based on real information and some assumptions, used to prove a point. Some of the assumptions may differ from real-world data. For example, maybe it's cheaper to maintain restaurant kiosks. If so, the kiosk investment could be the better option, regardless of what government incentives exist. The point of the example is that there are millions of corporate finance decisions similar to the one presented above that take place in boardrooms and offices across the country every year. Even if the McDonald's scenario isn't perfectly accurate, there are undoubtedly numerous real tradeoffs between human and physical capital investment that are close calls—easily influenced by tax benefits and, of course, the fear of employee turnover. This is what needs to change.

Incentives to invest in physical capital have enjoyed bipartisan support for a long time on Capitol Hill. This is generally for good reason. Capital investments and capital accumulation have been and still are important for economic growth. But human capital investments in an advanced

economy like the United States are arguably becoming more important.

The incentives to invest in human capital have not adjusted to a changing economy that continues to provide fewer reasons for employers to invest in employees. Even though investments in human capital are fully deductible, while physical capital investments have to be amortized, it is often not enough to make the IRR favor the workers. Such is true not only in our scenario above but also in reality, as evidenced by the steady decline of employer-sponsored worker training.

Automation is poised to cause (and in many ways already has) massive disruption in the labor market. The jobs that surface from the change are going to be mostly high-skill jobs, and if we want to fill those jobs, we are going to have to make a more concerted effort to lead businesses toward human capital investments. Worthwhile ideas are emerging. Senator Warner and Governor Daniels, in their Aspen Institute report, have proposed a tax credit for employers that spend more than the industry average on worker training.<sup>24</sup> Another solution in their proposal includes lifting the cap on deductible education expenses that employers provide for their workers. Many approaches will be worth exploring, because the status quo is simply inadequate to meet the needs of our changing economy.

#### TOPICS

**TAXES** 78

**WORKFORCE & TRAINING** 62

#### END NOTES

1. Hamburger University is a training center owned by McDonald's located just outside of Chicago, Illinois.

- 2.** Chris Prentice and Lisa Baerstein, “McDonald’s USA in tech push plans self-serve kiosks, mobile ordering,” Reuters, November 17th, 2016, Accessed March 20th, 2017. Available at: <http://www.reuters.com/article/us-mcdonalds-technology-idUSKBN13C241>
- 3.** “McDonald’s Cashier Salaries,” Glassdoor, Updated March 17th, 2017. Accessed March 20th, 2017. Available at: [https://www.glassdoor.com/Hourly-Pay/McDonald-s-Cashier-Hourly-Pay-E432\\_D\\_KO11,18.htm](https://www.glassdoor.com/Hourly-Pay/McDonald-s-Cashier-Hourly-Pay-E432_D_KO11,18.htm)
- 4.** Assumes that benefits and payroll taxes cost the employer 28% of wages. Based on BLS report on nonwage compensation costs.

United States Department of Labor, Bureau of Labor Statistics, “Employer Costs for Employee Compensation-December 2016,” Report, March 17th, 2017. Accessed March 20th, 2017. Available at: <https://www.bls.gov/news.release/pdf/ecec.pdf>

- 5.** “2016 Training Industry Report,” Training Mag, November/December 2016, page 31, Accessed March 20th, 2017. Available at: [https://trainingmag.com/sites/default/files/images/Training\\_Industry\\_Report\\_2016.pdf](https://trainingmag.com/sites/default/files/images/Training_Industry_Report_2016.pdf)
- 6.** Heather Boushey and Sarah Jane Glynn, “There are Significant Business Costs to Replacing Employees,” Report, Center for American Progress, November 16, 2012, Accessed on March 20th, 2017. Available at: <https://www.americanprogress.org/issues/economy/reports/2012/11/16/44464/there-are-significant-business-costs-to-replacing-employees/>
- 7.** This is an estimate based on the fact that our McDonald’s owner has to pay \$145 for the actual class at Hamburger University plus airfare and lodging.

Jessica Wohl, “Hamburger University grills students on McDonald’s operations,” Chicago Tribune, April 18th, 2015, Accessed March 20th, 2017. Available at: <http://www.chicagotribune.com/business/ct-mcdonalds-hamburger-university-0419-biz-20150407-story.html>

- 8.** “McDonald’s Assistant Manager Salaries,” Glassdoor, Updated November 17, 2016. Accessed March 20, 2017. Available at: [https://www.glassdoor.com/Hourly-Pay/McDonald-s-Assistant-Manager-Hourly-Pay-E432\\_D\\_KO11,28.htm](https://www.glassdoor.com/Hourly-Pay/McDonald-s-Assistant-Manager-Hourly-Pay-E432_D_KO11,28.htm). Correspondingly, benefits and payroll will now cost \$6,720.
- 9.** This maintenance cost includes updating software, cleaning the machine, having repairmen fix the kiosks when they break, and training employees to use the kiosks.
- 10.** These last two numbers are estimates.
- 11.** The model assumes that all 5 workers are kept on for the first year after the kiosks are installed to help customers learn how to use machines. For years 2-5 though, there will only be 3 workers.
- 12.** Steve Strongin et al, “Narrowing the jobs gap: overcoming impediments to investing in people,” Report, Global Markets Institute, Goldman Sachs, July 2016, page 5, Print. Available at: <http://www.goldmansachs.com/our-thinking/public-policy/narrowing-the-jobs-gap-report.pdf>
- 13.** Giorgio Canarella and Stephen K. Pollard, “The Augmented Solow Model And the OECD Sample,” Report, International Business & Economics Journal, CSU Los Angeles, 2003, Accessed March 20, 2017. Available at: <https://www.cluteinstitute.com/ojs/index.php/IBER/article/view/3824/3868>
- 14.** Internal Revenue Service, Publication 946, page 106. Available at: <https://www.irs.gov/pub/irs-pdf/p946.pdf>
- 15.** “The Tax Break-Down: Accelerated Depreciation,” Blog, Committee for a Responsible Budget, September 20, 2013, Accessed March 20th, 2017. Available at: <http://crfb.org/blogs/tax-break-down-accelerated-depreciation>
- 16.** Internal Revenue Service, Publication 946, page 107. Available at: <https://www.irs.gov/pub/irs-pdf/p946.pdf>

- 17.** Eric Zwick and James Mahon, "Tax Policy and Heterogeneous Investment Behavior," Report, National Bureau of Academic Research, January 2016, Accessed March 20, 2017. Available at: <http://www.nber.org/papers/w21876>
- 18.** "Paying the Costs of Bonus Depreciation," Blog, Committee for a Responsible Budget, March 24th, 2014, Accessed March 20th, 2017. Available at: <http://crfb.org/blogs/paying-costs-bonus-depreciation>
- 19.** For clarification, had our restaurant not been a franchised McDonald's, it certainly wouldn't have qualified for Section 179. As a corporation, McDonald's invests far more than \$2 million a year in capital equipment.
- 20.** The White House of President of Barack Obama, "2015 Economic Report of the President," Report, February 2015, page 147, Accessed March 20th, 2017. Available at: <https://obamawhitehouse.archives.gov/administration/eop/cea/economic-report-of-the-President/2015>
- 21.** "Lifelong learning is becoming an economic imperative," The Economist, January 12th, 2017, Accessed March 20th, 2017. Available at: <http://www.economist.com/news/special-report/21714169-technological-change-demands-stronger-and-more-continuous-connections-between-education>
- 22.** Excel cannot calculate the IRR here because the sum of the future cash-flows is negative. For an alternative measurement, the return on investment with turnover is around -210%. The point remains: when including turnover, we quickly see how unprofitable it is to invest in people instead of machines.
- 23.** Steve Strongin et al, "Narrowing the jobs gap: overcoming impediments to investing in people," Report, Global Markets Institute, Goldman Sachs, July 2016, page 18, Print. Available at: <http://www.goldmansachs.com/our-thinking/public-policy/narrowing-the-jobs-gap-report.pdf>

**24.** Senator Mark Warner and Governor Mitch Daniels, “A Policy Agenda to Restore the Promise of Work,” Report, The Aspen Institute, January 12, 2017, Accessed March 20th, 2017. Available at:  
<https://www.aspeninstitute.org/programs/future-of-work/toward-a-new-capitalism/>