

# Artificial Intelligence, the Economy and Amnesty: A Look into the Future by the Numbers

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An argument for an adjustment in national fiscal priorities in an increasingly automated economy and a plea for consideration of the needs of the American middle class and working poor in the immigration debate

*“The next wave of economic dislocations won’t come from overseas. It will come from the relentless pace of automation that makes a lot of good middle-class jobs obsolete.”* Barack Obama 2016

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**“Change may not always bring growth, but there is no growth without change.”** Roy T. Bennett (Author)

Technology is good! We have more, work less and spend the limited time we have on this planet freed from unceasing toil thanks to technology. As our nation proceeds toward a brighter future of technology, automation, and abundance, we face significant short and intermediate term challenges. Perhaps unlike any other time in the last hundred years, our nation, its people, and our economy are in the beginnings of a revolutionary time reshaping the work we do and how we govern ourselves. The manner in which we prepare for this change will determine whether there is growth.

***These transformations will open up new opportunities for individuals, the economy, and society, but they have the potential to disrupt the current livelihoods of millions of Americans.*** (*Artificial Intelligence, Automation, and the Economy* Executive Office of President Obama December, 2016)

The Obama Administration in December 2016 released *Artificial Intelligence, Automation and the Economy*.<sup>i</sup> (*Artificial Intelligence*). The report observed, “jobs that are threatened by automation are highly concentrated among lower-paid, lower skilled and less educated workers”.<sup>ii</sup>

Retailers such as Walmart, Amazon, Kroger and McDonalds are steadily eliminating low skill or repetitive positions.<sup>iii</sup> Cashiers and clerks have been the first to see the impact of the implementation of technology. At the same time, competition by Amazon and other online retailers force the closure of their “brick and mortar” competitors. The continued loss of a great percentage of “low skill”, repetitive jobs to technology is significant. As an example, the Bureau of Labor Statistics (BLS) estimates, in 2016 more than:

- **3.5 million** Americans were employed as cashiers.<sup>iv</sup>
- **850,000** Americans were employed picking and sorting crops<sup>v</sup>
- **295,000** Americans were employed as bricklayers and masons<sup>vi</sup>
- **3.9 million** Americans were employed in warehouses and material transfer<sup>vii</sup>

Automation and artificial intelligence promise to make work less arduous, more efficient but, at the same time, will require fewer American workers in a wide variety of jobs-millions fewer.<sup>viii</sup>

The challenges to transitioning to this “new economy” are formidable. Flexibility in federal spending is hampered by a nearly 21 trillion dollar national debt<sup>ix</sup>, interest on the debt in 2017 consuming 485.5 billion dollars and unfunded mandatory liabilities outstanding (Medicare, Social Security) estimated in excess of 120 trillion dollars<sup>x</sup>. Educationally, the United States, when compared internationally in math, reading and science, does not rank in the top 10 educational systems.<sup>xi</sup> Finally, we are embroiled in the debate over amnesty and chain migration considering the extension of citizenship and benefits to millions.

***A helpful case in understanding the types of effects AI may have on productivity and labor demand is the development of automated vehicles (AVs). Like other forms of technological disruption, AV technologies will likely cause disruptions in the labor market as the economy adapts to new paradigms.***

(Artificial Intelligence, 2016)

In *Artificial Intelligence*, the Council of Economic Advisors (CEA) estimated between, “**2.2 and 3.1 million** existing part and full-time U.S. jobs may be threatened or substantially altered by AV (Automatic Vehicle) technology alone.”<sup>xii</sup> *Artificial Intelligence* identified **364,000** jobs in ride sharing (Uber, Lyft) which are threatened by AV technology.<sup>xiii</sup>

This technological revolution is spreading widely across many sectors of our economy impacting employment in unforeseen ways. Radiologists for example, are finding their jobs threatened or substantially altered by technology which can read tests more accurately, more efficiently and with a significantly lower error rate.<sup>xiv</sup> The trend to replace non-routine, cognitive tasks will only accelerate as programming and algorithms become more elaborate.<sup>xv</sup>

***Digital technologies are doing for human brainpower what the steam engine and related technologies did for human muscle power during the industrial revolution.***

Andrew McAfee

Historically, technological advances have caused job disruptions. In 1870 nearly 50 percent of Americans were employed in the agricultural industry. Today for example, “thanks in large part to

technological change, agriculture employs less than 2 percent of American workers and American food production exceeds domestic demand.<sup>xvi</sup> Industry going from horse or water power to steam and electric power made jobs more plentiful but the new 20th Century jobs required skills which were familiar or easily mastered. Job displacement in the early 21<sup>st</sup> Century however presents different challenges.

While early 20<sup>th</sup> Century displaced farm workers were able to find employment in an expanding manufacturing sector, researchers observe displaced workers in the late 20<sup>th</sup> Century have not experienced similar success in finding other employment. ‘Routine intensive’ jobs focusing on predictable tasks have been particularly vulnerable to replacement by technology.<sup>xvii</sup> **As costs decline and technology improves, it is expected labor in low-wage service occupations, an area where most job growth in the US has been concentrated over the past decades, will be replaced.**<sup>xviii</sup> As automation is increasingly utilized, workers without the requisite “new economy” skill set will struggle to find employment.

The continuing “technology trend” favoring high skill labor over unskilled labor is largely responsible for the low labor demand for less skilled workers.<sup>xix</sup> The 60% shift in employment favoring a college education from 1970 to 1998 is explained by, “reduced labor input needed for routine manual tasks and the increased labor input for non-routine cognitive tasks, which tend to be concentrated in higher-skilled occupations”.<sup>xx</sup>

The authors of *Artificial Intelligence*, as well as Oxford University’s *The Future of Employment: How Susceptible are Jobs to Computerization?* estimate up to 47% of U.S. jobs are at risk for being replaced or fundamentally altered by AI technologies in the near future.<sup>xxi</sup> 47% of U.S. jobs equates currently to approximately **60 million jobs**.<sup>xxii</sup>

President Obama’s Council of Economic Advisors (CEA) determined:

- **83%** of jobs making under \$20 per hour would be “under pressure” from automation
- **31%** of jobs making between \$20 and \$40 per hour would be “under pressure”
- **4%** of jobs making \$40 per hour and greater would be “under pressure”

**44%** of American workers with less than a high school degree hold jobs made up of highly automatable tasks while **1%** of people with a bachelor's degree or higher hold such automatable jobs.<sup>xxiii</sup>

### ***Automation and Job Displacement is a Concurrent Phenomena Presenting Worldwide Economic Impacts***

Jieun Choi, a World Bank economist noted many studies predict major job losses due to automation with nearly one half of the U.S. workforce impacted by automation by 2030. Choi disturbingly notes comparable job disruptions of low skilled workers by technology occurring simultaneously worldwide.<sup>xxiv</sup> The World Bank has projected automation, “threatens 69 per cent of the jobs in India, while 77 per cent in China” which would disrupt the pattern of economic growth in developing countries. World Bank President Jim Kim acknowledged, "As we continue to encourage more investment in infrastructure to promote growth, we also have to think about the kinds of infrastructure that countries will need in the economy of the future." “We all know that technology has and will continue to fundamentally reshape the world". "But the traditional economic path from increasing productivity of agriculture to light manufacturing and then to full-scale industrialization may not be possible for all developing countries.”<sup>xxv</sup>

***Negative shocks (due to job displacement) to local economies can have substantial negative and long-lasting effects on unemployment, labor force participation and wages. Perhaps more significantly, over time displaced workers' earnings recover only slowly and incompletely.*** (Artificial Intelligence, 2016)

Experienced workers who lost their jobs and have to start over find themselves, on average, earning wages at least 10 percent less than what they earned in the jobs they lost, and workers with more than 20 years of experience in their prior job face wages that are nearly a quarter less than they had been previously making.<sup>xxvi</sup>

Paradoxically, as more low skill, automatable jobs are replaced and, more and more low skill American workers compete for fewer jobs, the existing trend of declining wages in the face of rising

productivity will only deepen. Competition for low skilled jobs, depressed wages, increased income inequality and greater demands on our social welfare ‘net’ will conceivably worsen with an influx of millions of low skilled immigrants, particularly through chain migration.<sup>xxvii xxviii</sup>

***At a minimum, some occupations such as drivers and cashiers are likely to face displacement from or restructuring of their current jobs, leading millions of American’s to experience economic hardship in the short term absent new policies.***

(Artificial Intelligence, 2016)

Millions of employment disruptions will mark the beginning of the demand for the creation of new programs and the “investment” of enormous amounts of tax dollars in the social safety net to address American’s transition from low to high skilled jobs. Policy proposals from the Obama Administration in *Artificial Intelligence* include:

- Providing quality education opportunities addressing low levels of proficiency in math and reading for millions of Americans
- All Americans have access to affordable post-secondary education for high skilled job training
- Expand access to training, re-training, apprenticeships and lifelong learning
- Modernize and “strengthen” social safety net by increases to:
  - Unemployment insurance
  - Medicaid
  - Supplemental Nutrition Assistance Program (SNAP)
  - Temporary Assistance for Needy Families (TANF)
  - New programs of wage insurance to compensate for decreased wages due to displacement

Another policy consideration, Universal Basic Income for each man, woman and child replacing TANF and SNAP and Medicaid, was mentioned as a possible means to deal with severe employment disruptions. Universal Basic Income, an idea firmly rooted in the welfare rights movement of the 1960’s, has considerable support as a means of offsetting mass unemployment.

***Responding to the economic effects of AI-driven automation will be a significant policy challenge for the next Administration and its successors. AI has already begun to transform the American workplace, changing the types of jobs available and the skills that workers need to thrive.*** (Artificial Intelligence, 2016)

Proponent or pessimist about a future ‘enhanced’ by artificial intelligence, significant job disruption will occur as tens of millions of low skilled American workers struggle with unemployment and underemployment attempting to find footing in an increasingly “high skill” world. Unknowable is the other part of the “employment equation” how many jobs will be created? As one commentator points out, “In 1980, who could have predicted this decade’s market for app developers? <sup>xxix</sup> However, to take advantage of these new opportunities, workers still will require retraining, education and support during this transition period.

‘Transitioning’ to the new economy will require substantial increases in spending on the social safety net, training and retraining for displaced workers and their families. Additional tax dollars will be demanded from a government whose national debt is fast approaching 21 trillion dollars and whose discretionary spending is rapidly shrinking.

Immigration plays an important component in our ability to make the “new economy” leap. According to the Heritage Foundation, those covered by DACA have only achieved a 49% high school graduation rate.<sup>xxx</sup> Unless there is reform to the process of chain migration, millions more will enter this country without regard to the skills they possess, looking for employment in a job market saturated by already displaced workers and, in the majority of cases, struggling with a language barrier.<sup>xxxi</sup> The question is not how many people we want to welcome but how many can we afford to welcome? Immigration will be another financial component to be addressed in the transitioning economy along with our continued worldwide military commitments, proposed infrastructure spending, increasing payments for interest on the national debt and required mandatory spending.

Work is not going to disappear. The “automation revolution” is changing the way we work and the skills necessary to be part of the economy and new, unimagined opportunities will most

certainly present themselves. Our domestic policy must focus on education, training and job creation. The question is how we meet that challenge with the finite resources we have on hand.

Promises are being made to many people, Congress and the President need to assure they can be kept.



# Appendix

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## **Report to President Obama Artificial Intelligence, Automation and the Economy**

<https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/Artificial-Intelligence-Automation-Economy.PDF>

## **The Future of Employment: How Susceptible are Jobs to Computerization?**

[https://www.oxfordmartin.ox.ac.uk/downloads/academic/The\\_Future\\_of\\_Employment.pdf](https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf)

## **Andrew Ng wants a new “New Deal” to... - MIT Technology Review**

[www.facebook.com/technologyreview/videos/10155874291](http://www.facebook.com/technologyreview/videos/10155874291)

## **Relentless Pace of Technology**

<https://www.technologyreview.com/s/603465/the-relentless-pace-of-automation/>

## **Nearly half of Ohio workers hold jobs likely to be automated in the future**

<http://www.dispatch.com/news/20180206/nearly-half-of-ohio-workers-hold-jobs-likely-to-be-automated-in-future>

## **Robo-scoring of essays does not compute, some educators say**

<http://www.dispatch.com/news/20180210/robo-scoring-of-essays-does-not-compute-some-educators-say>

## Examples of Automation in the workplace

Brick laying robot	<a href="https://www.youtube.com/watch?v=2-VR4IcDhX0">https://www.youtube.com/watch?v=2-VR4IcDhX0</a>
Automatic Fruit Picker	<a href="https://www.youtube.com/watch?v=UaL3UxUclKY">https://www.youtube.com/watch?v=UaL3UxUclKY</a>
Automatic Tomato Picker	<a href="https://www.youtube.com/watch?v=FG1P65LMjCQ&amp;t=40s">https://www.youtube.com/watch?v=FG1P65LMjCQ&amp;t=40s</a>
Automatic Fruit Harvester	<a href="https://www.youtube.com/watch?v=rcgG2GmK9xY">https://www.youtube.com/watch?v=rcgG2GmK9xY</a>
Amazon Warehouse Robot	<a href="https://www.youtube.com/watch?v=Ox05Bks2Q3s">https://www.youtube.com/watch?v=Ox05Bks2Q3s</a>
Automated Warehousing	<a href="https://www.youtube.com/watch?v=QP8fNXPscss">https://www.youtube.com/watch?v=QP8fNXPscss</a>
Driverless Trucks	<a href="https://www.youtube.com/watch?v=k-AyR91UI2s">https://www.youtube.com/watch?v=k-AyR91UI2s</a>
Fewer Radiologists	<a href="https://www.youtube.com/watch?v=VqgkEqABBPO">https://www.youtube.com/watch?v=VqgkEqABBPO</a>

## Automation Talks

The Rise of the Machines-  
Why Automation is Different  
This Time

<https://www.youtube.com/watch?v=WSKi8HfcxEk>

Technology is Replacing Jobs  
Are you ready? CNNMoney

<https://www.youtube.com/watch?v=opdc8hQN0ew>

No Job is Safe from Technology  
Andrew McAfee

<https://www.youtube.com/watch?v=H95VPDsfLjo>

Roundtable: How till Automation  
Affect human employment?

<https://www.youtube.com/watch?v=laSkfo1EAXs>

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- i Report to President Obama Artificial Intelligence, Automation and the Economy  
<https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/Artificial-Intelligence-Automation-Economy.PDF>
- ii Artificial Intelligence, page 1
- iii <https://www.ft.com/content/e89f5c3e-bd55-11e6-8b45-b8b81dd5d080>
- iv <https://www.bls.gov/ooh/Sales/Cashiers.htm>
- v <https://www.bls.gov/ooh/farming-fishing-and-forestry/agricultural-workers.htm>
- vi <https://www.bls.gov/ooh/construction-and-extraction/brickmasons-blockmasons-and-stonemasons.htm>
- vii <https://www.bls.gov/ooh/transportation-and-material-moving/hand-laborers-and-material-movers.htm>
- viii In *The Future of Employment*, the authors compile a ranking of 702 employment classifications susceptible to computerization
- ix <https://www.treasurydirect.gov/NP/debt/current>
- x <https://www.forbes.com/sites/realspin/2014/01/17/you-think-the-deficit-is-bad-federal-unfunded-liabilities-exceed-127-trillion/#95c59b79bf8a>
- xi <http://www.businessinsider.com/pisa-worldwide-ranking-of-math-science-reading-skills-2016-12>
- xii Artificial Intelligence, page 15
- xiii Artificial Intelligence, page 15
- xiv <https://www.ibm.com/blogs/research/2016/11/ai-radiology/>
- xv The Future of Employment, page 44
- xvi Artificial Intelligence, page 8
- xvii Artificial Intelligence, page 11
- xviii The Future of Employment, page 22
- xix <http://www.nber.org/papers/w18334>
- xx <https://economics.mit.edu/files/11574>
- xxi The Future of Employment: How Susceptible are Jobs to Computerisation?  
[https://www.oxfordmartin.ox.ac.uk/downloads/academic/The\\_Future\\_of\\_Employment.pdf](https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf)
- xxii <https://www.statista.com/statistics/192361/unadjusted-monthly-number-of-full-time-employees-in-the-us/>
- xxiii Artificial Intelligence page 14
- xxiv The Future of Jobs and the Fourth Industrial Revolution: Business as Usual for Unusual Business  
<http://blogs.worldbank.org/psd/future-jobs-and-fourth-industrial-revolution-business-usual-unusual-business>
- xxv [economictimes.indiatimes.com/articleshow/54687904.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](http://economictimes.indiatimes.com/articleshow/54687904.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)
- xxvi Artificial Intelligence page 36
- xxvii For example in addition to increasing enrollment, immigration often creates significant challenges for schools by adding to the number of students with special needs. In 2014, 75 percent of students who spoke a language other than English were from immigrant households <https://cis.org/Report/Immigrants-United-States>
- xxviii According to the U.S. Census Bureau, *Educational Attainment in the United States: 2015 page 7* Hispanics were the only racial/ethnic group in which the native born population with bachelor's degree or higher was higher than the foreign-born Hispanic population. 20% of Native Hispanics had a bachelor's degree or better compared to foreign born Hispanics at 12% possessing a bachelor's degree. <https://www.census.gov/content/dam/Census/library/publications/2016/demo/p20-578.pdf> According to the Heritage Foundation, despite the length of their stay in the U.S. only 49 percent of DACA beneficiaries has a high school education, even though a majority are now adults. <https://www.heritage.org/immigration/commentary/not-so-beautiful-dreamers-the-reality-behind-the-media-airbrushing>
- xxix <https://www.technologyreview.com/s/603465/the-relentless-pace-of-automation/>
- xxx <https://www.heritage.org/immigration/commentary/dont-believe-the-myths-about-dreamers>
- xxxi By way of example, The Center for Immigration Studies estimates that “perhaps 24 percent of the DACA-eligible population fall into the functionally illiterate category and another 46 percent have only ‘basic’ English ability.”  
<https://www.heritage.org/immigration/commentary/not-so-beautiful-dreamers-the-reality-behind-the-media-airbrushing>  
The Washington Post noted in 2015 most illegal immigrants remain concentrated in lower-skilled, low-paying jobs, “much more so than U.S.-born workers,” according to a report released Thursday by the Pew Research Center  
[https://www.washingtonpost.com/local/majority-of-undocumented-immigrants-work-in-low-skill-jobs-report-finds/2015/03/26/dada9f2a-d3bc-11e4-a62f-ee745911a4ff\\_story.html?utm\\_term=.8d562e877fee](https://www.washingtonpost.com/local/majority-of-undocumented-immigrants-work-in-low-skill-jobs-report-finds/2015/03/26/dada9f2a-d3bc-11e4-a62f-ee745911a4ff_story.html?utm_term=.8d562e877fee)  
See also *Share of Unauthorized Immigrant Workers in Production, Construction Jobs Falls Since 2007*

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<http://www.pewhispanic.org/2015/03/26/share-of-unauthorized-immigrant-workers-in-production-construction-jobs-falls-since-2007/>