

## The Great Escape: How Workforce Automation is the Answer to Japan's Secular Stagnation

Carl Benedikt Frey and Michael Osborne

Japan has become the world's prime case of secular stagnation. With nearly half of its workforce at risk of automation, its ability to adapt to the "robot revolution" will make or break Japan's economy.

Since the 1970s, the rapid decline in the cost of computers, and their expanding capabilities, has created enormous incentives for firms to substitute capital for labor. Commencing with the automation of blue collar manufacturing jobs, computerization has moved from production to services, as self-service checkouts, more flexible robots and sophisticated algorithms are making inroads to domains confined to human workers only a decade ago.

In Europe and the United States, pundits worry that the rise of smart machines will exacerbate already growing income disparities, and potentially reduce the overall demand for workers.<sup>1</sup> For example, in a 2013 paper entitled "The Future of Employment: How Susceptible Are Jobs to Computerization?" the authors of this article estimated that 47 percent of the US workforce is at risk of automation over the next decades.<sup>2</sup>

The impact of automation technology on Japan's workforce may be even larger: in a study to be published by the Oxford Martin School and Nomura Research Institute next month, we applied the same methodology to Japan, finding that 49 percent of Japanese jobs are automatable. Yet so far the problem for Japan has been too little investment in labour-saving innovation, not too much. With an official unemployment rate of just 3.3 percent, and job vacancies at their highest in 23 years, automation provides a solution to Japan's labour shortages. It could conceivably even help Japan break its way out of secular stagnation.

The Japanese "lost decade", commonly referring the 1990s, has arguably become the "lost two decades" as its economy has continued to stagnate. While the factors underlying Japan's secular stagnation have been subject of intense debate, Japan's economic problems are to a large extent structural. First and foremost, its demography is a ticking time bomb. Today, 25 percent of Japans population is 65 or older, relative to 15 percent in the United States. By 2060, this number will have increased to 40 percent, a recent government report suggests. During the boom years of the 1980s, Japan had more than two workers for every senior or child; roughly the same as the United States today. Over recent decades this number has steadily declined and by 2050, it will have halved.

As an economy's output will inevitably decline with its number of productive workers, unless there is a surge in productivity to offset the decline, a shrinking working population suggests that growth in Japan will continue to stagnate. While policies to attract foreign workers provides one potential

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<sup>1</sup> [http://www.oxfordmartin.ox.ac.uk/downloads/reports/Citi\\_GPS\\_Technology\\_Work.pdf](http://www.oxfordmartin.ox.ac.uk/downloads/reports/Citi_GPS_Technology_Work.pdf)

<sup>2</sup> [http://www.oxfordmartin.ox.ac.uk/downloads/academic/The\\_Future\\_of\\_Employment.pdf](http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf)

solution, it is an unlikely prospect given that Japan has one of the world's most homogeneous cultures. Boosting female labour force participation provides another option. Yet despite Japanese women having on average higher levels of educational attainment than their male counterparts, Japan's 1987 Equal Employment Opportunity Law has seemingly done little to get more women working.

In the light of Japan's shrinking workforce, it is particularly concerning that productivity also has faltered. According to a recent study by the Research Institute of Economy, Trade and Industry (RIETI), the annual growth rate in Japan averaged 0.9% between 1990 and 2011, relative to 4.4%, between 1970 and 1990. A large share of this decline, in turn, can be explained by faltering total factor productivity (TFP) growth, falling from 1.5% to 0.2%. A critical question is thus why productivity in Japan stagnated in the late 1990s, as it surged in the United States?

In 1987, the eminent economist Robert Solow remarked that "you can see the computer age everywhere but in the productivity statistics." About a decade later, productivity in the United States surged at last as corporations started to redesign their organizations to accommodate new technologies. Importantly, after 1995, the United States experienced an acceleration of TFP growth not only in the ICT-producing sector, but also in ICT-using sectors. The problem for Japan, however, is that TFP growth in ICT-using service sectors declined substantially after 1995, suggesting that Japan failed to adopt new technologies to the same extent.

There are several reasons for Japan's sluggish adoption of new technology. Perhaps most importantly, Japan exhibits relatively low levels of entrepreneurship: younger firms tend to invest more in ICT, but entry and exit rates in Japan are low.<sup>3</sup> Low levels of business dynamism has most likely been reinforced by Japanese banks continued financial support of inefficient and debt-ridden incumbents, commonly referred to as "zombie" firms, contributing to sluggish productivity in those industries and less investment in new technology.<sup>4</sup> Furthermore, high job security constitutes a barrier to the implementation of labor-saving technology, and Japan's ICT sector has been suffering from a shortage of software engineers for quite some time.

While Japan has been a slow adapter to the ICT revolution, it is determined to lead the robotics revolution. Prime Minister Shinzō Abe recently launched a five-year push to deepen the use of smart machines. According to Japan's Robot Revolution Initiative Council, opened earlier this year, robot technologies "possess the potential for solving social challenges, such as resolving labor shortages, releasing people from overwork, and improving productivity in a variety of sectors, ranging from production in the manufacturing industry, to medical services and nursing care, and to agriculture, construction and infrastructure maintenance."

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<sup>3</sup> <http://www.rieti.go.jp/jp/publications/pdp/10p004.pdf>

<sup>4</sup> <http://link.springer.com/article/10.1007%2Fs10368-005-0041-1>

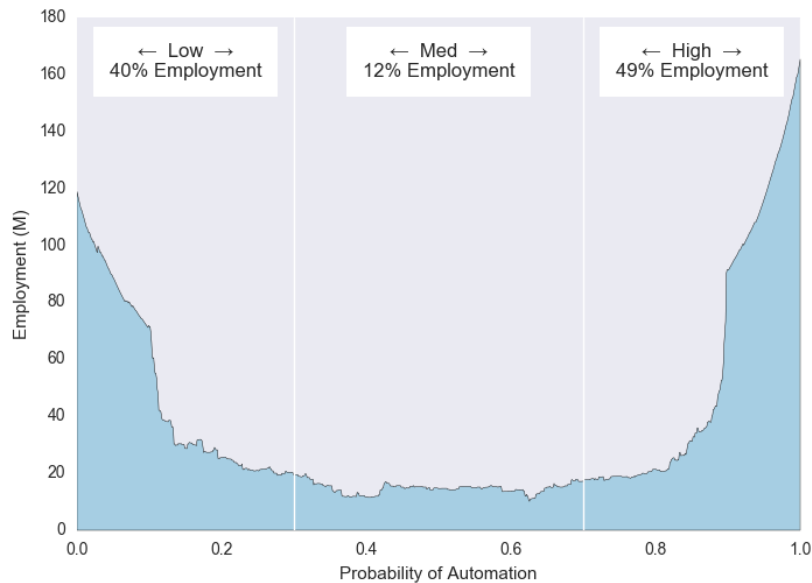


Figure 1: How Susceptible is Japan's employment to automation?

According to our estimates, the potential of workforce automation in Japan is indeed substantial: roughly 49 percent of Japanese jobs are automatable as a result of recent developments in machine learning and robotics (Figure 1). The jobs that are among the most susceptible to automation in Japan include train operators, accounting clerks, tax accountants, post office clerks, taxi drivers, and receptions. While driverless cars are still to be seen on the streets of Tokyo, some of these technologies are already being put into use. Komatsu Ltd. is developing autonomous vehicles for construction sites; the Bank of Tokyo Mitsubishi UFJ employs a receptionist robot speaking 19 languages, and one recently opened hotel in Nagasaki is largely operated by robots.

Workforce automation is also strikingly cheap: according to estimates by Citigroup the payback period for robots in the automotive industry is less than one year in Japan. One reason for this is that robots increasingly are used to assemble robots. As pointed out by Graeme McDonald at Citigroup, production at some of Japan's leading robotics companies is already nearly fully automated.

Over the next decades, the rise of smart machines could potentially constitute a watershed for the Japanese labour markets. While this should help solve Japan's labour shortages and boost productivity, it is not without risks. As new technologies are being adopted, some skills will be automated into obsolescence. In the United States, for example, there is concern that computer technology has caused the demise of middle income workers, and has contributed to a sharp reduction in labour force participation rates, in particular among low skilled men. Furthermore, while Western countries have experienced a surge in wage disparities since the computer revolution of the 1980s, Japan remains one of the most equal countries in the world. The challenge for Mr Abe is therefore to lead the robotics revolution while safeguarding Japan's equity.

To achieve this, the robot revolution needs to be accompanied by investments in skills and training. Although new technologies have arrived everywhere, greater increases in the supply of educated workers has moderated wages disparities between the skilled and the unskilled in some countries. As a result, evidence from the PIAAC survey suggests that returns to education vary between 12 percent in Sweden and 28 percent in the United States. In particular, educational efforts should focus on

allowing workers to switch into jobs that are at low risk of automation. The common denominator for these jobs---including the ones of software developers, judges, nurses, high school teachers, dentists and university lecturers--- is that they typically require a combination of creative and social skills.

Yet while these jobs are difficult to automate, they are not immune to technological change. Toyota Motor Corp. is now testing its videophone/remote-controlled “human support robot,” making it possible to take care of the elderly from a remote location; IBM’s Watson computer is now performing medical diagnostics more effectively than human doctors, and MOOCs are already transforming education. Besides focusing on creative and social skills, Mr Abe would thus do well in infusing the curricula with more technical skills.

Finally, although Japan is currently facing labour shortages, the potential for automation is so vast that it could cause underemployment, if Japan fails to create new employment opportunities. Thus, besides encouraging the adoption of new technology, reforms that incentivize entrepreneurialism is essential for Japan’s economic revival. For example, according to a recent study by the Joint Research Centre of the European Commission, among the top global R&D spenders, 50 percent of US firms were founded after 1975. The equivalent figure for Japan was just 2 percent.

Over the next two decades technology has the potential of resolving Japan’s labour shortages and improving productivity. It is up to Mr Abe to make sure that workers have the skills required to compete in the “Second Machine Age” and revive Japanese entrepreneurship to create new jobs.

*Carl Benedikt Frey is codirector of the Oxford Martin programme on technology and employment and Oxford Martin Citi fellow at Oxford university.*

*Michael Osborne is codirector of the Oxford Martin programme on technology and employment, and associate professor in machine learning at Oxford university.*