BROOKINGS

Report

Tax not the robots

Robert Seamans Wednesday, August 25, 2021

A number of highly regarded business people and politicians, including Microsoft founder Bill Gates and NYC Mayor Bill De Blasio, have commented on the potential need for a "robot tax." Interest in such a tax appears to be founded on the belief that robots, and automation more generally, will lead to large job losses. The basic idea behind a robot tax is that firms pay a tax when they replace a human worker with a robot. Such a tax would in theory have two main purposes. First, it would disincentivize firms from replacing workers with robots, thereby maintaining human employment. Second, if the replacement were made anyway, a robot tax would generate revenues for the government that would cover the loss of revenue from payroll taxes. Some proponents of a robot tax also suggest that the revenue could then be used for worker re-training programs or other forms of support for the displaced worker.

While the arguments in favor of a robot tax may be well-intentioned, robot taxes are a misguided idea that would have negative consequences for firms, their workers, and ultimately the economy. To begin with, the assertion that robots are taking jobs is not well founded. Recent research shows that firms that adopt robots experience more employment growth than those that do not. These firms also appear to be more productive, potentially benefiting consumers, although the gains experienced by the adopting firm may come at the expense of firms that do not adopt. Moreover, defining a "robot" turns out to be non-trivial; depending on this definition, a robot tax may affect some industries more than others, regardless of the impact on human labor. Ultimately, a robot tax would lead to slower adoption of robots, especially in industries such as manufacturing where it may be easier to define a "robot," and this slower adoption will likely lead to less economic growth. Instead of robot taxes, policymakers who want to help workers displaced by automation should focus on other policies, such as addressing disparities in taxes on capital and labor and easing labor market frictions. Doing so would benefit workers, firms, and the economy more so than would a tax on robots.

Firms adopting robots see more employment and better performance

Over the past couple of years there have been several firm-level studies on the effects of robot adoption in industrial settings. These papers all find that firms that adopt robots see an increase in employment. For example, a recent paper by Dixon, Hong, and Wu (2021) uses data on robot imports to identify Canadian firms that adopt robots.[1] They then compare employment, behavior, and performance between robot-adopting and non-adopting firms. They find that the robot-adopting firms experience a subsequent increase in employment and that the employment increase is predominantly from low-skill workers. As another example, Acemoglu, Lelarge, and Restrepo (2020) find that, among French manufacturing firms, those firms that adopted robots add jobs.[2] A similar finding is in a paper by Koch, Manulov, and Smolka (2019), who use firm level data from Spain.[3] These studies also find that the firms that adopt robots see an increase in performance (measured as an increase in firm-level total factor productivity or revenue). Interestingly, the studies find that the non-adopting firms in the same industry as the robot adopting firms see decreases in employment. This may be due to reallocation from slower-growing, more poorly-performing firms to faster-growing, better-performing firms. In some cases, the decreases in employment at the non-adopting firms more than outweigh the employment gains at the robot-adopting firms, causing a location- or industry-wide fall in employment (as shown for example in Acemoglu and Restrepo (2020)).[4]

There have also been papers on robot adoption in service settings. A paper studying the effects of robots on workers in Japanese nursing homes by Eggleston, Lee, and Iizuka (2021) finds that robots complement human labor and reduce labor turnover.[5] The physically demanding nature of work in nursing homes can often lead to high turnover, so robots in these settings are intentionally designed to assist with the most physically demanding tasks such as lifting patients out of beds. The paper also highlights an interesting feature of the Japanese setting: that many Japanese prefectures provide subsidies for nursing homes that adopt robots. If indeed robots complement human labor, then subsidies make sense and may help spur adoption of robots in these settings.

The evidence from this academic literature has two implications for the idea of a robot tax. First, there is no evidence that robots are directly substituting for human labor—indeed, robots may actually be complementing labor, resulting in increases in employment. Taxing firms that are adopting robots may then have the perverse effect of slowing employment growth. Second, while robots may in part be responsible for some labor reallocation within an industry, the bigger question is what to do about the non-robot adopting firms, since these are the firms experiencing employment decreases. Should these firms be allowed to shrink, perhaps ultimately going out of business, since they are less productive to begin with? Should there be robot subsidies, so that more firms are able to adopt robots, thereby presumably taking part in employment growth? Also, given the positive performance benefits for firms that adopt robots, why aren't more firms adopting? Potential reasons could include lack of knowledge about the benefits that robots provide, lack of capital to invest in robots, or lack of skilled human capital at the firm or in the local labor market for adopting firms to hire, among other reasons. These are important questions for researchers and policymakers to study.

How do you define robot?

One of the challenges with a robot tax is defining what is meant by a "robot." In a manufacturing context, a robot typically refers to a robotic arm. As defined by ISO 8373, an industrial robot is an "automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications." However, even if we restrict our attention to industrial settings, defining a robot is not so simple. This is one lesson from recent work by Buffington, Miranda, and Seamans (2018).[6] The authors report on the cognitive testing involved in their attempts to define a robot for use in the Census Bureau's Annual Survey of Manufacturers (ASM). The definition ultimately included in that survey explained that robots should encompass machines that can perform the following tasks: palletizing, pick and place, machine tending, material handling, dispensing, welding, and packing/repacking. Respondents were told to exclude automated guided vehicles (AGVs), driverless forklifts, automatic storage and retrieval systems, and computer numerical control (CNC) equipment. For the purposes of this survey, the inclusion of robotic arms that can do welding and other tasks, and the exclusion of things like driverless forklifts, makes sense given that robotic arms are much more prevalent than driverless forklifts in the manufacturing industry, whereas the reverse is likely true of the warehouse and transport industry. The exclusion of driverless forklifts from the ASM highlights the difficulty of defining a robot for the purposes of a robot tax. While a driverless forklift may not technically be a robot, as implied by the name it would appear to be an automating technology that substitutes for human workers.

This example points to a big danger with a robot tax: depending on how a "robot" is defined, it may create disproportionate burdens on some industries and not others. In this example, if "driverless forklifts" were excluded from the definition of robot, then manufacturers investing in robotic arms would bear more of a tax burden than warehouse owners investing in driverless forklifts. Manufacturing comprises about 9% of the U.S. economy on average, but up to 15% of employment in some states. Taxing investment in automating technology such as a robotic arm in a handful of states based on an arbitrary definition of what does or does not comprise a "robot" does not seem equitable. One can only imagine the amount of political strategy efforts by various industry trade groups to shape what is or is not included in the definition of robot.

Moving from industrial to service settings provides another definitional challenge. The term "robot" is also used to refer to software algorithms, including Robotic Process Automation (RPA) which uses software to automate digital tasks. Will the definition of "robot" include software as well? If so, what type of software? For example, if the definition is wide enough to include any type of software that potentially substitutes for human labor, then the definition would presumably also cover accounting and bill payment software, which has automated many of the bookkeeping tasks that were traditionally done in businesses. As this example illustrates, the wider the definition of "robot," the more types of investment in capital and IT are included.

Consider other policies instead

Instead of taxing robots, policymakers should consider other policy options to help support workers while they find new jobs. If a tax is desired, with the revenue used for worker re-training, then it would be better to focus on adjusting the tax code to treat capital and labor differently than they are now, perhaps by raising taxes on capital investment more broadly rather than taxes on a specific form of capital such as robots, as such an approach would avoid the definitional issues highlighted above.

A number of authors argue that the U.S. tax system currently favors investment in capital over labor. A recent paper by Acemoglu, Manera, and Restrepo (2020) highlights that the tax rate on capital invested in software and equipment is around 5 percent whereas labor taxes are over 25 percent.[7] According to the authors, the large difference in tax rates is due to favorable depreciation provisions from a series of tax laws enacted over the past 20 years, spanning the Bush, Obama and Trump administrations. The authors estimate that eliminating the capital bias in the tax code would increase employment by about 4 percent. Mazur (2019) also highlights the differences in tax rates on capital and labor when arguing against robot taxes.[8] Mazur argues that one approach to address this imbalance is to abolish the distinction between different types of investment and to apply a single tax rate.

While it is widely acknowledged that the current tax system favors investment in capital instead of labor, the differing recommendations from these two studies highlight that one of the difficulties of adjusting the tax system is in deciding how it should be adjusted. Mazur's proposal essentially calls for a flat tax—all investment is taxed the same. In contrast, Acemoglu, Manera, and Restrepo, consistent with arguments of many other economists, argue for taxes that vary in elasticities to the availability of capital and labor.

There are also policy options other than tax policies, including policies to reduce labor market frictions and support displaced workers, that could be considered. For example, Mazur suggests that more could be done using new technologies to better match human labor to available jobs. An example of such an approach is provided by Peter Q. Blair and coauthors who propose a data-driven approach to match the skills of workers in one occupation to higher paying jobs requiring similar skills in a different occupation.[9] Blair et al. use detailed, skill-level information on each occupation available in the Bureau of Labor and Statistics' O*NET occupational database to identify the similarity between occupation. For example, they report that "the skill distance between the Brickmasons, Blockmasons, and Stonemasons occupation and Welding, Soldering, and Brazing occupation is in the 25th percentile of all skill distances in our sample, indicating a high degree similarity in the skills required for the two roles." The authors go on to point out that the first occupation pays an average of $13.71 in Florida, whereas the second occupation pays an average of $23.91 in Florida. Thus, investing in data-driven tools to help workers transition across careers with similar skill requirements, as well as educating workers about these tools, may be a policy approach that addresses automation-driven job displacement and helps workers move to higher wage jobs.

Policymakers can address other frictions in the labor market by making it harder for firms to require and enforce non-compete agreements (NCA). Starr, Prescott, and Bishara (2020) document that NCAs are used in a wide variety of occupations and industries including even hairstylists and yoga instructors.[10] Lipsitz and Starr (2021) show that removing NCAs can make it easier for workers to switch from one job to another.[11] In a recent Executive Order titled "Promoting Competition in the American Economy," President Biden encouraged the Federal Trade Commission (FTC) to ban or limit non-compete agreements as well as occupational licensing restrictions. Policymakers concerned about labor displacement from automation should encourage the FTC to follow through on enacting these limits and bans on NCAs, as it would reduce frictions in the labor market making it easier for any displaced workers to find new employment. In general, supporting broad-based policy changes that help to reduce labor market frictions across multiple industries and geographies are a better approach than a targeted policy such as a robot tax.

Conclusion

Many are concerned that robots and other new technologies will lead to large-scale displacement of human workers and thus that a "robot tax" is potentially a good policy tool to address this effect. However, the existing research suggests that firms adopting robots actually experience an increase in employment, undercutting a main argument in favor of a robot tax. In addition, a robot tax would necessitate a definition of what comprises a robot. Settling on an appropriate definition will not be easy. Instead, policymakers should consider other policy changes to help workers, potentially including changing how capital and labor are taxed, but also focusing more broadly on labor market reforms.

Footnotes

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5. 5 Eggleston, K., Lee, Y. S., & Iizuka, T. (2021). *Robots and Labor in the Service Sector: Evidence from Nursing Homes* (No. w28322). National Bureau of Economic Research.
6. 6 Buffington, C., Miranda, J., & Seamans, R. (2018). *Development of survey questions on robotics expenditures and use in US manufacturing establishments*. Working Papers 18-44, Center for Economic Studies, U.S. Census Bureau.
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8. 8 Mazur, O. (2019). Taxing the Robots. *Pepperdine Law Review,* (46) 277
9. 9 Blair, Peter Q., Tomas G. Castagnino, Erica L. Groshen, Papia Debroy, Byron Auguste, Shad Ahmed, Fernando Garcia Diaz, and Cristian Bonavida. Searching for STARs: Work Experience as a Job Market Signal for Workers without Bachelor's Degrees. No. w26844. National Bureau of Economic Research, 2020.
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11. 11 Lipsitz, Michael, and Evan Starr. "Low-wage workers and the enforceability of noncompete agreements." Management Science (2021).