

**A TAXING DILEMMA: ROBOT TAXES AND THE
CHALLENGES OF EFFECTIVE TAXATION OF AI,
AUTOMATION AND ROBOTICS IN THE FOURTH
INDUSTRIAL REVOLUTION**

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I. Introduction

Michele Wucker coined the phrase “gray rhino” to describe a “highly probable, high impact threat” that leaders “ought to see coming but nevertheless fail to recognize and react to in time.”¹ The impact of the rise of artificial intelligence (“AI”), robotics, and automation on the tax system falls squarely within the definition of a gray rhino. Technological change promises major dislocations in the economy, including potentially massive displacement of human workers. At the same time, government revenues dependent on the taxation of human employment will diminish at the very time displaced workers will increasingly demand social services. It is undeniable that drastic changes will have to be made, but until recently there has been little appetite among policymakers for addressing the situation.

One potential solution to this dilemma has emerged in the public discourse over the past few years: the “robot tax.”² This proposal is driven by the idea that if robots (and AI and automation) are displacing human workers, and thereby reducing tax revenues from labor-based taxes, then the robots themselves should be taxed. In theory, this kills two birds with one stone: the robot taxes make up the shortfall caused by reductions in income and payroll taxes, and the revenues raised are used to support and retrain the displaced workers. To supporters of a robot tax, “a taxation of robots, or the use of robots, represents a powerful and interesting alternative solution to a potential crucial issue: the decline, or at least the complete change, of labor market and the distributional implications on persons of the growing use of automation.”³

¹ MICHELE WUCKER, *THE GRAY RHINO* 7 (2016).

² While the term “robot tax” has gained the widest currency, many of the proposals embrace AI, robotics, and other types of automation. The common thread between these proposals being the advancement of technology that threatens to displace human workers. *See generally* XAVIER OBERSON, *TAXING ROBOTS: HELPING THE ECONOMY TO ADAPT TO THE USE OF ARTIFICIAL INTELLIGENCE* 1-4 (2019) (describing proposals to tax AI and robotics as a “robot tax”). Accordingly, while I will refer to “robot tax” herein, my analysis applies with equal force to taxes directed specifically at AI, robotics, and automation.

³ *Id.* at 3-4.

Robot tax proposals have attracted academic interest among economists,⁴ legal scholars in the technology and employment fields⁵ and, increasingly, tax law scholars.⁶ Much of the focus has been on

⁴ See, e.g., Pengqing Zhang, *Automation, Wage Inequality and Implications of a Robot Tax*, 59 INT'L REV. OF ECON. & FIN. 500 (2019); Germana Bottone, *A Tax on Robots? Some food for thought*, (Ministro dell'Economia e delle Finanze DF Working Paper No. 3 (Sept. 2018), https://www.finanze.it/export/sites/finanze/it/content/Documenti/Varie/dfwp3_2018.pdf); Arnaud Costinot & Ivan Werning, *Robots, Trade, and Luddism: A Sufficient Statistic Approach to Optimal Technology Regulation*, (Nat'l Bureau of Econ. Research Working Paper No. 25103, 2018), <https://www.nber.org/papers/w25103.pdf>; Joao Guerreiro, Sergio Rebelo, & Pedro Teles, *Should Robots Be Taxed?* (Nat'l Bureau of Econ. Research, Working Paper No. 23806, 2019), <https://www.kellogg.northwestern.edu/faculty/rebelo/htm/robots.pdf>; Vincent Ooi & Glendon Goh, *Taxation of Automation and Artificial Intelligence as a Tool of Labour Policy* (SMU Ctr. for AI & Data Governance, Research Paper No. 2019/01, 2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3322306; Uwe Thuemmel, *Optimal Taxation of Robots* (CESifo, Working Paper No. 7317, 2018), http://uwethuemmel.com/wp-content/uploads/2017/02/Thuemmel2018_OptimalTaxationOfRobots_August.pdf; see also Anton Korinek & Joseph E. Stiglitz, *Artificial Intelligence and its Implications for Income Distribution and Unemployment* (Nat'l Bureau of Econ. Research, Working Paper No. 24174, 2017), <https://www.nber.org/papers/w24174.pdf>.

⁵ See, e.g., Ryan Abbott & Bret Bogenschneider, *Should Robots Pay Taxes? Tax Policy in the Age of Automation*, 12 HARV. L. & POL'Y REV. 145 (2018); Ryan Calo, *Artificial Intelligence Policy: A Primer and Roadmap*, 51 U.C. DAVIS L. REV. 399, 426-27 (2017); Ana Čulo, *Oporezivanje Robota: Utjecaj Automatizacije Na Radna Mjesta I Održivost Postojećeg Fiskalnog Sustava*, 7 ZAGREB L. REV. 71 (2018); Cynthia Estlund, *What Should We Do After Work? Automation and Employment Law*, 128 YALE L.J. 254, 315-18 (2018); A. Michael Froomkin et al., *When AIs Outperform Doctors: Confronting the Challenges of a Tort-Induced Over-Reliance on Machine Learning*, 61 ARIZ. L. REV. 33, 92-93 (2019).

⁶ See, e.g., OBERSON, *supra* note 2; Sami Ahmed, *Cryptocurrency & Robots: How to Tax and Pay Tax on Them*, 69 S. C. L. REV. 697 (2018); Christina Dimitropoulou, *Robot Taxes: Where Do We stand?*, in CFE TAX ADVISERS EUROPE – 60TH ANNIVERSARY LIBER AMICORUM 55 (2019); Stefano Dorigo, *Robots and Taxes: Turning an Apparent Threat Into an Opportunity*, 92 TAX NOTES INT'L 1079 (2018); Orly Mazur, *Taxing the Robots*, 46 PEPP. L. REV. 27 (2019); Xavier Oberson, *Taxing Robots? From the Emergence of an Electronic Ability to Pay to a Tax on Robots or the Use of Robots*, 1 WORLD TAX J. 247 (2017); Joachim Englisch, *Digitalisation and the Future of National Tax Systems: Taxing Robots?* (Sept. 5, 2018) (unpublished manuscript), <https://ssrn.com/abstract=3244670>; Vasiliki Koukouloti, *What Are You Taxing About? Balancing Out the Tax System to Avoid the Consequences of Automation in the Welfare System*, CTR. FOR LEGAL & CT. TECH. (April 24, 2019), https://legaltechcenter.openum.ca/files/sites/159/2019/04/Koukouloti-What-Are-You-tAxIng-About-Balancing-Out-the-Tax-System-to-Avoid-Consequences-of-Automation-in-the-Welfare-System.docx_.pdf; Shu-Yi Oei, *So about that Robot Tax...*, SURLY SUBGROUP (Aug. 16, 2017), <https://surlysubgroup.com/2017/08/16/so-about-that-robot-tax/>; Kerry Ryan, *Taxing R2-D2? ABA Tax Section Panel on Automation and AI*, SURLY SUBGROUP (Feb. 16, 2018), <https://surlysubgroup.com/2018/02/16/taxing-r2-d2/>. This is by no means an exhaustive list. For a U.S. tax practitioner's perspective, see Robert J. Kovacev, *The Challenges of Administering a Robot Tax*, LAW360 (Sept. 25, 2017, 11:30 AM), <https://www.law360.com/articles/967115/the-challenges-of-administering-a-robot-tax>.

economic and policy arguments for and against robot taxes. There has been far less analysis of the practical difficulties of drafting and administering such a tax. This is hardly surprising, given that the field is so new, and few proposals have actually been boiled down to statutory language. From the perspective of a tax lawyer, however, the statutory language is vitally important to the administrability and feasibility of a robot tax proposal. Therefore, this article examines the practical aspects of a robot tax, including ways in which such a tax could be drafted and implemented.

Part II of this article sets forth the current tax regime's inherent preference for capital over labor. Part III discusses the effect of AI, robotics and automation both on employment and on tax revenues. Part IV outlines the emergence of robot tax proposals as a potential remedy for those effects. Part V addresses the challenges arising from these proposals. Part VI analyzes specific legislative robot tax proposals from the United States and internationally. Part VII considers whether a robot tax could be designed that would address the challenges discussed in Part V. Part VIII concludes.

II. The Current Tax Regime Favors Capital Over Labor

Taxes on labor income form the backbone of the tax regimes of the United States and other developed nations. Across the member states of the Organization for Economic Co-operation and Development ("OECD"),⁷ approximately 50% of all tax revenues in 2015 came from either individual income taxes or social insurance taxes.⁸ In the United States, this reliance on tax revenue from human effort is even more pronounced. In 2015, 64.2% of all tax revenue came either from individual income taxes or payroll taxes.⁹

⁷ *Where: Global Reach*, OECD, <http://www.oecd.org/about/members-and-partners/> [<https://perma.cc/R5ZR-GYEP>] (the OECD is an international intergovernmental organization with 36 nations as members, including the United States).

⁸ Amir El-Sibaie, *Sources of Government Revenue in the OECD, 2018*, TAX FOUNDATION (Mar. 22, 2018), <https://files.taxfoundation.org/20180322141501/Tax-Foundation-FF581.pdf>.

⁹ *Id.* at 3.

In the United States in particular, the tax code favors capital over labor income.¹⁰ Employers and employees must pay payroll taxes that are, in effect, excise taxes for the privilege of employing human workers.¹¹ No such taxes apply to capital investments in AI, robotics, or automation. Instead, businesses receive substantial tax benefits from developing, purchasing, and deploying AI, robotics, and automation equipment.¹²

This effect was amplified by the recent tax reform legislation. On December 22, 2017, President Trump signed into law sweeping tax legislation commonly known as the Tax Cuts and Jobs Act (“TCJA”).¹³ Supporters of the TCJA emphasized the legislation’s reduction of income tax rates, particularly on corporations, which it was asserted would create jobs. One of the most significant features of the TCJA was the so-called 100% expensing provision, which allowed businesses to deduct the entire expense of certain capital investments in the year of acquisition, rather than having to take depreciation deductions over time.¹⁴ The TCJA contained no corresponding tax benefit for hiring more employees.

Given the structure of the U.S. tax code, many commentators have come to the conclusion that “many businesses are investing in automation simply because the tax code is urging them to do so.”¹⁵

¹⁰ Abbott & Bogenschneider, *supra* note 5, at 150-51; Mazur, *supra* note 6, at 292-93.

¹¹ I.R.C. §§ 3101, 3111; *see* Estlund, *supra* note 5, at 309 n.210 (“Payroll taxes in general are the most regressive large category of taxes (in Europe as well as in the United States)”). *See generally* I.R.C. §§ 3101-3512 (“Employment Taxes”).

¹² *See, e.g.*, I.R.C. §§ 41, 162, 167, 174, 179, 197. Sometimes seemingly neutral tax incentives can have the effect of encouraging deployment of robots. *See, e.g.*, Carrie Healy, *To Keep Operating, New England Dairy Farm Looks To 'Milking Robots,' Tax Credits*, NEW ENGLAND PUBLIC RADIO (Nov. 20, 2017), <https://www.nepr.net/post/keep-operating-new-england-dairy-farm-looks-milking-robots-tax-credits> (explaining dairy tax credits used to subsidize installation of milking robots).

¹³ Pub. L. No. 115-97, Title I, § 13305(a), 131 Stat. 2126 (2017).

¹⁴ Pub. L. No. 115-97 Title I, § 13201 (2017) (codified at I.R.C. § 168(k)); *see* Mazur, *supra* note 6, at 295; *see also* Andrew Tangel & Patrick McGroarty, *Tax Incentive Puts More Robots on Factory Floors*, WALL ST. J. (Jan. 26, 2018, 3:41 PM), <https://www.wsj.com/articles/tax-incentive-puts-more-robots-on-factory-floors-1516962600> [<https://perma.cc/7Q8C-C56X>].

¹⁵ Eduardo Porter, *Don't Fight the Robots, Tax Them*, N.Y. TIMES (Feb. 23, 2019), <https://www.nytimes.com/2019/02/23/sunday-review/tax-artificial-intelligence.html> [<https://perma.cc/5V7W-LH8E>]; *see also* Chris Arnold, *Tax Bill Favors Adding Robots Over*

Certainly, the current tax structure does little to preserve employment in the face of growing pressure from AI, robotics and automation.

III. Effect of AI and Robotics

The effect of technological improvements on the economy and society has been widely debated for centuries.¹⁶ The rise of AI, robotics, and automation may bring about change of a different order than past innovations, however.¹⁷ The effect of the rise of AI and robotics has been described as a “fourth industrial revolution,” reflecting the significant impact on the economy and society that is widely anticipated.¹⁸ While “it was previously possible to automate a large number of work processes, it has now become practicable.”¹⁹ And automation of tasks may lead to the elimination of the jobs and livelihoods of those humans currently employed in those tasks.²⁰ While estimates vary, some studies place the estimate of lost jobs as high as 57% among OECD countries, and even higher in India and China.²¹

Workers, Critics Say, NPR (Dec. 8, 2017, 5:01 PM), <https://www.npr.org/2017/12/08/569118310/tax-bill-favors-adding-robots-over-workers-critics-say> [<https://perma.cc/W6R8-WF7V>].

¹⁶ See, e.g., Abbott & Bogenschneider, *supra* note 5, at 156-58; see also Bruno Colmant, *Faut-il Taxer les Robots? [Should Robots be Taxed?]*, L'ECHO (Sept. 26, 2017), <https://bruxselsfuture.files.wordpress.com/2019/04/taxer-les-robots-colmant.pdf> (citing the work of nineteenth-century Swiss economist Jean de Sismondi, who proposed a tax on the owners of machines).

¹⁷ MARTIN FORD, *RISE OF THE ROBOTS: TECHNOLOGY AND THE THREAT OF A JOBLESS FUTURE* 29-61 (2016); JAMES MANYIKA ET AL., *A FUTURE THAT WORKS: AUTOMATION, EMPLOYMENT AND PRODUCTIVITY*, MCKINSEY GLOB. INST. (2017), https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Digital%20Disruption/Harnessing%20automation%20for%20a%20future%20that%20works/MGI-A-future-that-works_Full-report.ashx; see also MICROSOFT, *THE FUTURE COMPUTED: ARTIFICIAL INTELLIGENCE AND ITS ROLE IN SOCIETY* 87-136 (2018).

¹⁸ Klaus Schwab, *The Fourth Industrial Revolution: what it means, how to respond*, WORLD ECON. F. (Jan. 14, 2016), <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/> [<https://perma.cc/D4NZ-DHUU>].

¹⁹ Abbott & Bogenschneider, *supra* note 5, at 153.

²⁰ *Id.* at 159. But see Jeff Spross, *How Robots Became a Scapegoat for the Destruction of the Working Class*, THE WEEK (Apr. 29, 2019), <https://theweek.com/articles/837759/how-robots-became-scapegoat-destruction-working-class> [<https://perma.cc/5MUA-FQX8>] (arguing that “the automation we’re seeing now is little different from the technological advances we’ve seen in every other era”).

²¹ CARL B. FREY ET AL., *CITI GPS, TECHNOLOGY AT WORK v2.0: THE FUTURE IS NOT WHAT IT USED TO BE* 7 (Jan. 2016), https://www.oxfordmartin.ox.ac.uk/downloads/reports/Citi_GPS_Technology_Work_2.pdf; Carl Benedikt Frey & Michael A. Osborne, *The Future*

The rise of AI, robotics, and automation will have a concomitant effect on government tax revenues. As noted in Part I above, the tax base in the OECD, particularly in the United States, is heavily dependent on labor (through individual income taxes or payroll taxes). In a vicious circle, at the same time that automation increases the need for government spending to support displaced workers, it will also decrease tax receipts.²² It is not at all clear that other forms of taxation, such as corporate taxes, would be sufficient to pick up the slack.²³

IV. The Rise of Robot Tax Proposals

The first prominent robot tax proposal came from the European Union. In 2017, Mady Delvaux, Member of the European Parliament from Luxembourg, prepared a report with recommendations to the European Parliament for the regulation of robotics.²⁴ The recommendation included an explicit statement in favor of considering a robot tax.²⁵

of Employment: How Susceptible Are Jobs to Computerization? 44 (Oxford Martin Programme on Tech. and Emp., Working Paper, 2013), https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf (predicting that 47 percent of total US employment is in the high risk category, meaning that associated occupations are potentially automatable over some unspecified number of years, perhaps a decade or two); *see also* Ed Husic & Mike Priddis, *Australia Unprepared for Automation of its Workforce*, FIN. REV. (Jul. 31, 2017, 11:00 PM), <https://www.afr.com/technology/australia-unprepared-for-automation-of-its-workforce-20170730-gx1wj5> [<https://perma.cc/X4LH-8ZBK>]. *But see* CTR. FOR THE NEW ECON. & SOC'Y, WORLD ECON. FORUM, THE FUTURE OF JOBS REPORT 2018 viii (2018), http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf (estimating that AI, automation and robotics will create 58 million net jobs between 2018 and 2022); Melanie Arntz, Terry Gregory & Ulrich Zierahn, *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis*, (OECD Soc., Working Paper No. 189, 2017 <https://doi.org/10.1787/1815199X> (arguing that estimates of job losses are exaggerated); Michael Koch, Ilya Manuylov, & Marcel Smolka, *Robots and Firms*, (CESifo Working Paper No. 7608, 2019), https://www.econstor.eu/bitstream/10419/198968/1/cesifo1_wp7608.pdf (finding that robot adoption leads to net job creation).

²² Abbott & Bogenschneider, *supra* note 5, at 156.

²³ *See, e.g.*, Sam Mitha, *Robots, Technological Change and Taxation*, TAX J. (Sept. 14, 2017), <https://www.taxjournal.com/articles/robots-technological-change-and-taxation-14092017> (former head of Central Tax Policy Group at Her Majesty's Revenue & Customs; "Unless corporate profits were to increase very substantially indeed, it would be necessary for the government to increase the corporation tax rate by a significant amount to recoup the personal tax revenues lost through automation.").

²⁴ Mady Delvaux (Rapporteur), Comm. on Legal Affairs, Report with Recommendations to the Commission on Civil Law Rules on Robotics, E.U. Doc. A8-0005/2017 (Jan. 1, 2017).

²⁵ *Id.* at 4.

The recommendation noted that the development of robotics and AI raised “concerns about the future of employment, the viability of social welfare and security systems and the continued lag in pension contributions, if the current basis of taxation is maintained, creating the potential for increased inequality in the distribution of wealth and influence.”²⁶ The corrective for these risks was identified as “the likelihood of levying tax on the work performed by a robot or a fee for using and maintaining a robot should be examined in the context of funding the support and retraining of unemployed workers whose jobs have been reduced or eliminated.”²⁷

The EU robot tax proposal gained early support from a high profile source. In a controversial interview with Quartz magazine shortly after the proposal was publicized, Bill Gates endorsed a proposal for a tax on robots.²⁸ Other prominent figures soon announced their support for the Gates robot tax idea. For example, Robert Shiller, Nobel laureate in economics known for predicting the 2008 financial crisis,²⁹ endorsed a “moderate tax on robots” as a “natural component of a policy to address rising inequality.”³⁰ Elon Musk³¹ and Stephen Hawking³² also joined the fray.

Others were decidedly less keen. The International Federation of Robotics took a strong stand against robot taxes, noting that such a tax

²⁶ *Id.*

²⁷ *Id.*

²⁸ Kevin J. Delaney, *The Robot That Takes Your Job Should Pay Taxes, Says Bill Gates*, QUARTZ (Feb. 17, 2017), <https://qz.com/911968/bill-gates-the-robot-that-takes-your-job-should-pay-taxes/> [<https://perma.cc/H8RR-UCN5>].

²⁹ Robert J. Shiller, *Bubble Trouble*, PROJECT SYNDICATE (Sept. 17, 2007), <https://www.project-syndicate.org/commentary/bubble-trouble?barrier=accesspaylog> [<https://perma.cc/72U9-TGRQ>].

³⁰ Robert J. Shiller, *Robotization Without Taxation?*, PROJECT SYNDICATE (Mar. 22, 2017), <https://www.project-syndicate.org/commentary/temporary-robot-tax-finances-adjustment-by-robert-j--shiller-2017-03?barrier=accesspaylog> [<https://perma.cc/479B-BHRG>].

³¹ Catherine Clifford, *Elon Musk: Robots Will Take Your Jobs, Government Will Have to Pay Your Wage*, CNBC (Nov. 4, 2016, 2:19 PM), <https://www.cnbc.com/2016/11/04/elon-musk-robots-will-take-your-jobs-government-will-have-to-pay-your-wage.html>.

³² Doug Bolton, *Stephen Hawking Says Robots Could Make Us All Rich and Free—But We’re More Likely to End Up Poor and Unemployed*, THE INDEPENDENT (Oct. 9, 2015, 6:35 PM), <https://www.independent.co.uk/life-style/gadgets-and-tech/stephen-hawking-says-robots-could-make-us-all-rich-and-free-but-were-more-likely-to-end-up-poor-and-a6688431.html> [<https://perma.cc/N5KM-PAED>].

would “have a negative impact on competitiveness and employment.”³³ So did European politicians like former Greek finance minister Yanis Varoufakis³⁴ and EU Commissioner Andrus Ansip,³⁵ as well as former U.S. Treasury Secretary Lawrence Summers.³⁶ After considerable debate, the final version of the motion proposed by MEP Delvaux and adopted by the European Parliament contained no reference to a potential robot tax.³⁷

Despite this setback, support for robot tax proposals has increased globally.³⁸ While most of these endorsements have come from the left of the political spectrum,³⁹ some in the political right have also favorably discussed robot tax proposals.⁴⁰

³³ Press Release, Int’l Fed’n Robotics, World Robotics Federation IFR: Why Bill Gates’ Robot Tax Is Wrong (Feb. 27, 2017), <https://ifr.org/ifr-press-releases/news/world-robotics-federation-ifr-why-bill-gates-robot-tax-is-wrong> [<https://perma.cc/AM7B-A7EP?type=image>]; see also Steve Cousins, *Is a ‘Robot Tax’ Really an ‘Innovation Penalty’?*, TECHCRUNCH (Apr. 22, 2017, 12:30 PM), <https://techcrunch.com/2017/04/22/save-the-robots-from-taxes/> [<https://perma.cc/2ZV2-RDLY>]; cf. Tshilidzi Marwala, *On Robot Revolution and Taxation* (Aug. 5, 2018) (unpublished manuscript), <https://arxiv.org/abs/1808.01666>.

³⁴ Yanis Varoufakis, *A Tax on Robots?*, PROJECT SYNDICATE (Feb. 26, 2017), <https://www.project-syndicate.org/commentary/bill-gates-tax-on-robots-by-yanis-varoufakis-2017-02?barrier=accesspaylog> [<https://perma.cc/2CX2-F3NT>].

³⁵ Kate Samuelson, *EU Commissioner Says No to Bill Gates’ Robot Tax Idea*, FORTUNE (June 2, 2017, 9:07 AM), <http://fortune.com/2017/06/02/andrus-ansip-bill-gates-robot-tax/> [<https://perma.cc/8LHG-M4NZ>].

³⁶ Sarah Kessler, *Lawrence Summers Says Bill Gates’ Idea for a Robot Tax is ‘Profoundly Misguided’*, QUARTZ (Mar. 6, 2017), <https://qz.com/925412/lawrence-summers-says-bill-gates-idea-for-a-robot-tax-is-profoundly-misguided/> [<https://perma.cc/UTM4-MP9Z>].

³⁷ Civil Law Rules on Robotics, E.U. DOC. P8_TA(2017)0051 (Feb. 16, 2017); Georgina Prodhon, *European Parliament Calls for Robot Law, Rejects Robot Tax*, THOMAS REUTERS (Feb. 16, 2017, 2:03 PM), <https://www.reuters.com/article/us-europe-robots-lawmaking/european-parliament-calls-for-robot-law-rejects-robot-tax-idUSKBN15V2KM>.

³⁸ Mazur, *supra* note 6, at 297.

³⁹ See, e.g., Cheryl Chan, *Green Party’s Elizabeth May Proposes ‘Robot Tax’ to Prepare for Future of Automation*, VANCOUVER SUN (Sept. 30, 2019), <https://vancouversun.com/news/local-news/green-partys-elizabeth-may-proposes-robot-tax-to-prepare-for-future-of-automation> [<https://perma.cc/M37Q-UNHT>]; Ewin Hannah, *‘Robot Tax’ to Help Retrain Displaced Workers*, THE AUSTRALIAN (Dec. 13, 2018, 12:09 AM), <https://www.theaustralian.com.au/nation/labor-plans-robot-tax-to-help-retrain-displaced-workers/news-story/966b5534e8a68239a727a783a66e731a>; Gordon Rayner, *Jeremy Corbyn Plans to ‘Tax Robots’ Because Automation is a ‘Threat’ to Workers*, THE TELEGRAPH (Sept. 26, 2017, 10:00 PM), <https://www.telegraph.co.uk/news/2017/09/26/jeremy-corbyn-plans-tax-robots-automation-threat-workers/> [<https://perma.cc/M5BT-ZGMK>]; Marie Théobald, *Taxe sue les Robots, Revenu Universel, Énergie . . . Benoît Hamon Détaille son Programme Économique [Tax on Robots, Universal Income, Energy . . . Benoît Hamon Details his Economic Program]*,

Proposals have also surfaced in the United States. In 2018, Jane Kim, a candidate for mayor of San Francisco, ran on a platform that included a tax on AI, robots, and algorithms displacing human workers.⁴¹ A political candidate in Chicago, Ameya Pawar, has proposed ordinances clawing back relocation subsidies given to companies who fail to create the promised number of jobs due to automation and imposing a tax on companies who replace human employees with automation, in the amount of the annual salary of the displaced workers.⁴²

The most recent high-profile endorsement of the concept of a robot tax came from U.S. Representative Alexandria Ocasio-Cortez.⁴³ Rep. Ocasio-Cortez suggested in a speech at SXSW that a tax rate of 90% on businesses using robots may be necessary, referencing Mr. Gates' robot tax proposal.⁴⁴ At least two U.S. presidential candidates in the 2020 Democratic primary have explicitly adopted a robot tax proposal.⁴⁵

LE FIGARO ÉCONOMIQUE (Mar. 3, 2017, 8:39 AM), <http://www.lefigaro.fr/conjoncture/2017/03/03/20002-20170303ARTFIG00144-taxe-sur-les-robots-revenu-universel-energie8230-benoit-hamon-detaille-son-programme-economique.php> [<https://perma.cc/G5U4-DW5W>].

⁴⁰ See, e.g., Federica Meta, *Tassa sui Robot, si Riapre il Dibattito, Salvini: 'Imposta a Tutela del Lavoro.'* [Tax on the Robots, the Debate Reopens, Salvini: 'Tax to Protect Labor'], CORCOM (Feb. 8, 2018), <https://www.corrierecomunicazioni.it/elezioni-2018/tassa-sui-robot-si-riapre-dibattito-salvini-imposta-tutela-del-lavoro/> [<https://perma.cc/X46F-SHG4>]

(discussing independent robot tax proposals made by Deputy and Italian Socialist Party member Oreste Pastorelli and Deputy Prime Minister and Lega party member Matteo Salvini).

⁴¹ See also *About Us*, JOBS FOR THE FUTURE FUND, <https://www.jobsofthefuturefund.com/about/> [<https://perma.cc/BQ4U-WUNV>]; Emily Price, *Bill Gates' Plan to Tax Robots Could Become a Reality in San Francisco*, FORTUNE (Sept. 5, 2017, 3:57 PM), <http://fortune.com/2017/09/05/san-francisco-robot-tax/>.

⁴² Fran Spielman, *Pawar Proposes Claw-back Clause, Robot Tax to Guard Against Amazon Automation*, CHI. SUN-TIMES (Feb 12, 2019, 2:25 PM), <https://chicago.suntimes.com/2019/2/12/18314110/pawar-proposes-claw-back-clause-robot-tax-to-guard-against-amazon-automation> [<https://perma.cc/2XZ6-M48U>].

⁴³ Jeffrey Bartash, *Bill Gates Finds an Ally in Washington for his Idea to Tax Robots: Alexandria Ocasio-Cortez*, MARKETWATCH (Mar. 11, 2019, 1:59 PM), <https://www.marketwatch.com/story/bill-gates-finds-an-ally-in-washington-for-his-idea-to-tax-robots-alexandria-ocasio-cortez-2019-03-11> [<https://perma.cc/X9KX-S2P5>]; SXSW, *Alexandria Ocasio-Cortez | SXSW 2019*, YOUTUBE (Mar. 10, 2019), <https://www.youtube.com/watch?v=JU-SE5eNt04> (The robot tax discussion begins at 57:40).

⁴⁴ SXSW, *supra* note 43, at 57:40.

⁴⁵ Bill De Blasio, *Why American Workers Need to Be Protected from Automation*, WIRED (Sept. 5, 2019, 3:16 PM), <https://www.wired.com/story/why-american-workers-need-to-be-protected-from-automation/> [<https://perma.cc/2EBH-L9DZ>]; Team Delaney, *Delaney Releases Living Wage Plan to Increase Take Home Pay, Create Universal Paid Family Leave*,

V. Challenges with Robot Tax Proposals

While there have been many proposals for a robot tax, few of those proposals include any specifics about how such a tax would be implemented or administered. Put bluntly, “[t]he enthusiasm of robot tax proponents is matched by the lack of detail on how such a tax would work.”⁴⁶ There is good reason for this omission: while broad policy statements about taxing robots is easy, addressing the many practical challenges of such taxes is much more difficult. As Professor Mazur has put it, “these proposals involve substantial elements of arbitrariness and complexity in implementation, likely increasing compliance and administrative burdens on companies and tax authorities.”⁴⁷ The most significant hurdles are discussed below.

a. What is a robot?

There is a fundamental definitional problem plaguing robot tax proposals: what is a taxable robot?⁴⁸ “Few complex technologies have a single, stable, uncontested definition. Robots are no exception.”⁴⁹ This is a significant problem for dealing with robots in a legal context and not unique to tax.⁵⁰ To be sure, there are various technical definitions that attempt to define what a robot is.⁵¹ While the details

DELANEY FOR PRESIDENT 2020 (June 21, 2019), <https://www.johndelaney.com/2019/06/21/delaney-releases-living-wage-plan-to-increase-take-home-pay-create-universal-paid-family-leave/> [<https://perma.cc/KXS5-UE7H>].

⁴⁶ Robert J. Kovacev, *Don't Tax the Robots*, S. F. CHRONICLE (Jan. 21, 2018, 5:21 PM), <https://www.sfchronicle.com/opinion/openforum/article/Don-t-tax-the-robots-12511631.php> [<https://perma.cc/TQJ6-HSEV>]. For a rare example of a robot tax proponent willing to grapple with such details see OBERSON, *supra* note 2, at 112-137.

⁴⁷ Mazur, *supra* note 6, at 303.

⁴⁸ *Id.* at 299. Even scholars who are generally favorably disposed to the concept of the robot tax concede the challenge posed by this basic definitional problem. *See, e.g.*, Xavier Oberson, *How Taxing Robots Could Help Bridge Future Revenue Gaps*, OECD (2017), <http://www.oecd.org/employment/how-taxing-robots-could-help-bridge-future-revenue-gaps.htm> [<https://perma.cc/3FMH-SZQH>] (“clear and agreed definition of robots would be required”).

⁴⁹ Ryan Calo, *Robotics and the Lessons of Cyberlaw*, 103 CAL. L. REV. 513, 529 (2015).

⁵⁰ *See, e.g.*, Mohammad Iqbal, *Defining Cyberterrorism*, 22 MARSHALL J. COMPUTER & INFO. L. 397 (2004); Raymond Nimmer & Patricia A. Krauthaus, *Copyright and Software Technology Infringement: Defining Third Party Development Rights*, 62 IND. L.J. 13 (1986).

⁵¹ *See* Oberson, *supra* note 6, at 249-250.

vary, the “common thread is that they tend to focus on the autonomy and decision-making process of robots.”⁵² These technical definitions, while they may be useful in a scientific context, would do little to assist a lay judge or tax administrator without a technical background. The European Union tried its hand at determining a “common definition of smart autonomous robots” to include the following characteristics: “acquires autonomy through sensors and/or by exchanging data with its environment (inter-connectivity) and trades and analyses data; is self-learning (optional criterion); has a physical support; [and] adapts its behaviours and actions to its environment.”⁵³ Despite this attempt, the EU recognized that “defining robots is no easy task in the absence of any real consensus within the global scientific community.”⁵⁴ In sum, there simply is no commonly-accepted legal definition of a “robot.”⁵⁵

The definitional problem is simply one manifestation of the difficulty judges (and by extension, tax authorities, taxpayers, and tax professionals) have in dealing with inanimate objects that exhibit features of autonomy that we commonly associate with robots. A bizarre example of the gymnastics required to address the tax implications of robots comes from, of all places, Chuck E. Cheese.⁵⁶ At the time, Maryland gave its counties the authority to impose an admissions and amusement tax on the gross receipts of entities providing “refreshment, service or merchandise at any roof garden, cabaret or similar place where there is furnished a performance.”⁵⁷ Chuck E. Cheese is a “family dining and entertainment center”

⁵² *Id.* at 250.

⁵³ Comm. on Legal Affairs, European Civil Law Rules in Robotics: Study, E.U. Doc. PE 571.379, 8 (2016).

⁵⁴ *Id.*

⁵⁵ Mazur, *supra* note 6, at 298-99; Oberson, *supra* note 6, at 249-250; Ryan Calo, *Robots in American Law* (Univ. Wash. Sch. L., Research. Paper No. 2016-04 (Feb. 24, 2016), <https://ssrn.com/abstract=2737598>; Kovacev, *supra* note 6.

⁵⁶ *Comptroller of the Treasury v. Family Entm't Ctrs.*, 519 A.2d 1337 (Md. 1987), *overruled on other grounds by* 318 N. Market St., Inc. v. *Comptroller of the Treasury*, 554 A.2d 453 (Md. 1989). Thanks to Professor Calo for suggesting this example.

⁵⁷ MD. CODE ANN., ART. 81 § 402(A) (1957). The current successor statute uses the term “entertainment” instead of “performance.” MD. CODE ANN., TAX-GEN. § 4-101 (2017). There are no subsequent judicial decisions analyzing whether this statutory change would change the result for Chuck E. Cheese.

including , among other amusements, an animatronic Chuck E. Cheese, an “iconic, energetic mouse mascot, performs music and entertainment shows along with his friends, providing free entertainment to our guests and driving strong brand recognition.”⁵⁸ The Maryland Comptroller of Treasury assessed this tax against the owner of three Chuck E. Cheese restaurants in the state, alleging that the performance of Chuck E. Cheese and his animatronic friends constituted a performance for purposes of the admissions and amusement tax statute. The Maryland Court of Special Appeals disagreed, based on its interpretation of the term “performance:”

According to Webster's New Universal Unabridged Dictionary (2d edition, 1983), one definition of the word “performance,” among others clearly less applicable, is “(4) a formal exhibition of skill or talent as a play, musical program, etc.; a show.” We recognize that “performance,” as used in § 402(a), has connotations of inherent human input that leaves room for spontaneous imperfections during the exhibition of skill or talent. A “performance” is a method to measure human skill or talent. In other words, a pre-programmed robot can perform a menial task but, because a pre-programmed robot has no “skill” and therefore leaves no room for spontaneous human flaw in an exhibition, it cannot “perform” a piece of music anymore than can a jukebox. Just as a wind-up toy does not perform for purposes of § 402(a), neither does a pre-programmed mechanical robot.

Appellees' mechanical puppets are designed to give the impression that they are performing; however, because there is no human skill necessary in their control, there is no “performance.”⁵⁹

⁵⁸ CEC ENTERTAINMENT, INC., FISCAL 2018 FORM 10-K 5 (2018). To parents who have raised children in the United States over the past 40 years, this particular iconic, energetic mouse mascot needs no introduction, for better or worse.

⁵⁹ *Family Entm't Ctrs*, 519 A.2d at 1339; *cf. Louis Marx & Co. v. United States*, 66 Cust. Ct. 139, 142 (1971) (mechanical robots are not “figures or images of animate objects” for purposes of the Tariff Act of 1930).

If you accept that Chuck E. Cheese and friends are little more than glorified jukeboxes, then this decision seems reasonable. Yet, robots and AI are capable of much more sophisticated tasks than replaying canned tunes for pizza-fueled children's birthday parties. As Professor Calo points out, robots increasingly engage in emergent behavior that displays the "ability or tendency of a system to behave in complex, unanticipated ways."⁶⁰ Would the result be different if the cybernetic mouse could compose its own music, choose what songs to perform and reflect a unique style in performing it? It is not at all clear that judges will have the technical knowledge to make the distinction between a simple machine and an emergent-behavior robot.⁶¹ Even if they did, it is unlikely that a bright-line rule could separate robots from mere machines. Resolving that question would therefore revolve around the facts and circumstances of each particular case. There is no reason to expect tax authorities, taxpayers, or tax professionals to have better luck managing that difficult task.⁶²

So, when discussing a robot tax, does a "robot" refer to any labor-saving machine (say, an ATM), or something more complex? What degree of autonomy (or emergent behavior, if you prefer) must it exhibit? Does it include an intangible algorithm embedded in code, or must it be a physical actor? Does it include a machine that enhances rather than replaces human activity?⁶³ Any robot tax must answer these questions, and reduce that language to statutory text. From a practitioner's standpoint, the difficulty in nailing down such a basic element creates compliance nightmares and planning opportunities, and is not a sound basis for an administrable tax.

⁶⁰ Ryan Calo, *Robots as Legal Metaphors*, 30 HARV. J.L. & TECH. 209, 227 (2016).

⁶¹ *Id.* at 229-31.

⁶² Consider, for example, the distinction between an employee and an independent contractor for employment tax purposes has been "riven with controversy and ambiguity" for decades and promises to remain so. Kovacev, *supra* note 6. If a tax authority has difficulty sorting that out after repeated iterations and disputes, it is difficult to imagine a smooth interpretation and implementation of the definition of an emerging and evolving technology.

⁶³ See, e.g., Signe Brewster, *This \$40,000 Robotic Exoskeleton Lets the Paralyzed Walk*, MIT TECH. REV. (Feb. 1, 2016), <https://www.technologyreview.com/s/546276/this-40000-robotic-exoskeleton-lets-the-paralyzed-walk/> [<https://perma.cc/Q7V7-GAKS>].

b. Who actually pays the tax?

There is an even more fundamental problem with robot taxes: robots do not pay taxes, rather, humans (or entities formed and controlled by humans) do. Robots do not own property, nor do they earn wages. Should a robot collect money, it does so on behalf of its human owner, and legally must do so in the name of that human agent.⁶⁴ The Internal Revenue Code defines a taxpayer as “an individual, a trust, estate, partnership, association, company or corporation.”⁶⁵ A robot is none of those things, at least under present law. A “robot tax” is really a tax on humans (or entities formed and run by humans) who own, use, or benefit from the use of robots.⁶⁶

It has been proposed that robots be granted a separate legal personality, akin to a corporate entity, that would be charged with paying taxes.⁶⁷ In reality, this would not change the analysis of who pays the tax, however. Calling a robot a person via a legal fiction does not change the fact that the money paying the tax must, in substance, come from and be controlled by human actors.⁶⁸ Further, there are

⁶⁴ *Oberson*, *supra* note 6, at 260.

⁶⁵ I.R.C. § 7701(a)(1), (14) (1992).

⁶⁶ At common law, an inanimate object could be held responsible for the death of a human, and the object “forfeited to the Crown as a deodand.” *Calero-Toledo v. Pearson Yacht Leasing Co.*, 416 U.S. 663, 681 (1973) (citation omitted). There does not appear to be a common-law equivalent to holding an inanimate object independently liable for taxes, however, even if taxes are sometimes erroneously described that way. For example, a real property tax may be described as a “tax on land,” but the tax is actually paid by the owners of the land, not the land itself. *See, e.g.*, JOAN M. YOUNGMAN, *CHAPTER 9: TAX ON LAND AND BUILDINGS*, in 1 *TAX LAW DESIGN AND DRAFTING* 264 (Victor Thuronyi ed., 1996); *cf.* *Automatic Vending Sales Co. v. City of Johnstown*, 19 Pa. D. & C. 474 (Pa. Ct. Comm. Pleas 1933) (invalidating ordinance that purported to impose a license tax upon vending machines; “literally construed [the ordinance] would subject these robots to fine and imprisonment upon noncompliance with its terms.”)

⁶⁷ *OBERSON*, *supra* note 2, at 17-24.

⁶⁸ An *in rem* action may be maintained nominally against an item of property (such as a ship under admiralty law or property subject to forfeiture). *See* FED. RS. CIV. P. A-G. This is properly understood as a device allowing the determination of rights of persons to the property, however, not a vesting of legal personhood on the property itself. *See, e.g.*, *Tyler v. Judges of the Court of Registration*, 175 Mass. 71, 76-77 (Mass. 1900) (Holmes, C.J.) (“All proceedings, like all rights, are really against persons. . . . Personification and naming the res as defendant are mere symbols, not the essential matter. They are fictions, conveniently expressing the nature of the process and the result; nothing more.”)

considerable difficulties in holding such an artificial legal “person” accountable for its actions, leading to potential moral and ethical objections.⁶⁹

There are important policy ramifications to choosing which humans would pay the tax. Either the tax is imposed on: (1) the manufacturers of robots, (2) the businesses purchasing the robots, or (3) on consumers of goods or services provided by robots. The incidence of a robot tax varies with the type of tax employed and it is not always clear who ultimately bears the incidence of taxation. Most obvious is a sales tax, value-added tax, excise tax or use tax imposed at the retail level on products produced or services provided by AI, robotics, or automation.⁷⁰ Clearly, the consumer pays those taxes. For other taxes, the ultimate bearer of the tax burden is less clear.⁷¹

A popular proposal involves taxing robots in the equivalent amount to the foregone taxes of displaced employees.⁷² This assumes, of course,

⁶⁹ See Joanna J. Bryson, Mihailis E. Diamantis, & Thomas D. Grant, *Of, for, and by the People: The Legal Lacuna of Synthetic Persons*, 25 ARTIFICIAL INTELLIGENCE & L. 273 (2017).

⁷⁰ See, e.g., Alexis Carey, *MPs Want Shoppers to be Charged a Self-checkout Machine Tax*, NEWS.COM.AU (May 21, 2019, 9:20 PM), <https://www.news.com.au/finance/business/retail/mps-want-shoppers-to-be-charged-a-selfcheckout-machine-tax/news-story/78e9353a938bb9cfl17f5935ce1521ed> [<https://perma.cc/CZ3P-C7Q3>].

⁷¹ An analogy can be drawn to the question of who bears the burden of corporate taxes. The incidence of corporate taxation is a highly controversial subject. See, e.g., Clemens Fuest, Andreas Peichl & Sebastian Sieglöck, *The Incidence of Corporate Taxation and its Implications for Tax Progressivity*, VOX: CEPR POLICY PORTAL (Oct. 10, 2017), <https://voxeu.org/article/incidence-corporate-taxation-and-implications-tax-progressivity> [<https://perma.cc/HG2H-X8SP>].

⁷² *FAQs*, JOBS OF THE FUTURE FUND, <https://www.jobsofthefuturefund.com/faq/> [<https://perma.cc/W9KG-7X3R>]; see also OBERSON, *supra* note 2, at 114 (proposing a tax based on an “imputed salary” allocated to robots, based on the equivalent salary paid to human workers for similar activities, analogous to the Swiss tax on “imputed rent” imposed on homeowners). “Imputed rent” is the theoretical income that homeowners enjoy as a result of not having to pay rent in order to live in their own homes. William Gale, Jonathan Gruber, & Seth Stephens-Davidowitz, *Encouraging Homeownership Through the Tax Code*, 155 TAX NOTES 1171, 1173 (2007). While the concept of imputed rent is mercifully absent from the United States’ tax code, see *id.* at 1173 n.3, a handful of European jurisdictions including Switzerland do tax imputed rent, notionally based on a valuation of market rent for similar properties minus associated expenses. *Id.*; see also Dan Andrews, Aida Caldera Sánchez & Åsa Johansson, *Housing Markets and Structural Policies in OECD Countries* 39, 43 (OECD Econ. Dep’t, Working Paper No. 836, 2011), <https://doi.org/10.1787/18151973>.

that there is a demonstrable correspondence between acquiring a particular robot and lost human jobs. What if a business acquires a robot without firing any existing employees? Or lays off a number of low-skill employees but hires new skilled employees to work with the robot?⁷³ Answering these questions would necessarily involve subjective judgment calls, inviting complexity and uncertainty from a tax administration perspective. This complexity and uncertainty would increase compliance costs for taxpayers, while creating opportunities for tax avoidance designed to exploit the ambiguities inherent in this proposal.⁷⁴

Another type of proposal calls for a tax based on income derived from AI, robots, or automation. Unless a business derives all its income from using robots, however, this would require some sort of allocation of income in order to calculate the tax. This would necessarily be a fact-driven case-by-case analysis, analogous to the analysis required in the context of transfer pricing.⁷⁵ Transfer pricing is famously driven by complexity and costly disputes,⁷⁶ and the same pattern would likely

⁷³ Mazur, *supra* note 6, at 302; Kovacev, *supra* note 6.

⁷⁴ See, e.g., Leigh Osofsky, *The Case Against Strategic Tax Law Uncertainty*, 64 TAX L. REV. 489, 536-37 (2011). Regarding the analogy to “imputed rent,” see *supra* note 72, the experience with taxation of imputed rent in Switzerland is not encouraging. The tax on imputed rents incentivizes homeowners to hold large mortgages, inflate expenses, and undervalue the hypothetical imputed rent. As a result, the Swiss tax on imputed rents actually generates negative net tax revenues. Petar Vujanovic, *Policies to Tame the Housing Cycle in Switzerland* 22-23 (OECD Econ. Dep’t, Working Paper No. 1279, 2016), <https://doi.org/10.1787/18151973>.

⁷⁵ “Whenever business transactions take place across the boundaries of two or more jurisdictions, there is a need to determine what portion of the income is subject to tax by each jurisdiction.” Masahiro Max Yoshimura, *The ‘Tax War’ Between the United States and Japan Under Internal Revenue Code § 482: Is There a Solution?*, 12 WISC. INT’L L.J. 401, 401-02 (1994). Transfer pricing is the term for the process by which that allocation is made. In the United States, transfer pricing is governed by I.R.C. § 482 and attendant Treasury Regulations.

⁷⁶ See, e.g., *Eaton Corp. v. Comm’r*, T.C.M. 2017-147 (2017); *Medtronic, Inc. v. Comm’r*, T.C. M. 2016-122 (2016), *vacated and remanded*, 900 F.3d 610 (8th Cir. 2018); *Amazon.com, Inc. v. Comm’r*, 158 T.C. 108 (2017); *Altera Corp. v. Comm’r*, 145 T.C. 91 (2015), *rev’d*, 2018 WL 3542989 (9th Cir. 2018), *op. withdrawn*, 898 F.3d 1266 (9th Cir. 2018), *rev’d by superseding op.*, 926 F.3d 1061 (9th Cir. 2019); *Xilinx Inc. v. Comm’r*, 125 T.C. 37 (2005), *rev’d*, 567 F.3d 482 (9th Cir. 2009), *op. withdrawn*, 592 F.3d 1017 (9th Cir. 2010), *aff’d by superseding op.*, 598 F.3d 1191 (9th Cir. 2010); see generally Reuven S. Avi-Yonah et. al., *Allocating Business Profits for Tax Purposes: A Proposal to Adopt a Formulary Profit Split*, 9 FLA. TAX REV. 497 (2009).

emerge if a robot tax required allocation of income between robot-sourced and non-robot-sourced income.⁷⁷

An excise tax charged against the manufacturers or purchasers of robots is another possible approach. But there are also distributional effects to be considered. For example, such excise taxes would be regressive, because a business would pay the same amount of tax per robot no matter how large or profitable the business is.⁷⁸ A small family business would likely be less able to absorb the cost of a per-robot tax than a Fortune 500 company.

c. Effects on innovation

Robot tax proponents generally assume that the rise of AI, robotics, and automation will be a net negative for society, at least in the short run. The negative effects of robotization, particularly job displacement and increased economic inequality, have been characterized as negative externalities, like pollution or alcoholism.⁷⁹ The assumption, therefore, is that a robot tax would be a Pigouvian tax,⁸⁰ designed to disincentivize activities giving rise to the negative externalities.⁸¹

⁷⁷ An analogous proposal involves defining robots as separate “taxable persons” for purposes of a value-added tax (“VAT”), rather than as part of an enterprise, thereby adding an additional layer of VAT tax liability on any products and services involving a robot. OBERSON, *supra* note 2, at 87-111. This creates similar difficulties in allocating the value attributable to the robot, as opposed to the enterprise as a whole.

⁷⁸ A study by the Tax Policy Center concluded that excise taxes in general are regressive, “because both the share of income burdened by excises and the share of consumption spending on taxed goods and services is higher, on average, for lower income households.” JOSEPH ROSENBERG, TAX POLICY CENTER, THE DISTRIBUTIONAL BURDEN OF FEDERAL EXCISE TAXES 15 (2015), <https://www.taxpolicycenter.org/publications/distributional-burden-federal-excise-taxes/full>.

⁷⁹ Abbott & Bogenschneider, *supra* note 5, at 152; *Why Taxing Robots is Not a Good Idea*, THE ECONOMIST (Feb. 25, 2017), <https://www.economist.com/finance-and-economics/2017/02/25/why-taxing-robots-is-not-a-good-idea> [<https://perma.cc/REG2-KMUQ>].

⁸⁰ The term “Pigouvian tax” refers to a tax designed to impose costs on private actors who, in maximizing their own private gain, produce effects that are deleterious to society as a whole. A tax on the distribution of alcoholic beverages, which increases the cost of such beverages and therefore reduces consumption, is an example of such a tax. ARTHUR C. PIGOU, THE ECONOMICS OF WELFARE 98-105 (4th prtg. 2010). The economic basis for the concept was first discussed by the economist Arthur C. Pigou, hence the term “Pigouvian tax.”

⁸¹ See Abbott & Bogenschneider, *supra* note 5, at 152; Ooi & Goh, *supra* note 4; see also Englisch, *supra* note 6, at 19. The recent proposal in the United Kingdom for a tax on shoppers using automated checkouts is premised in part on supposed loss of “valuable

What if that assumption is wrong? AI, robotics, and automation provide benefits to society, as even some robot tax proponents admit.⁸² Indeed, as a general rule, technological advancement has led to increases in both employment and living standards, at least over the long term.⁸³ Increasing the tax burden on the still-budding fields of AI and robotics could slow down the course of automation considerably, by increasing the cost of developing and deploying such technologies.⁸⁴ As UK Business Minister Andrew Stephenson recently testified before a Parliamentary committee, robot taxes are “perverse,” precisely because they would disincentivize innovation.⁸⁵

d. Tax competition

Robot taxes, imposed at any level short of universal global acceptance, gives rise to the potential for tax competition.⁸⁶ A tax imposed on businesses in San Francisco may simply cause businesses to relocate their robots across the bay; a tax in California may cause moves to Nevada; a tax in the United States may cause moves to Mexico or China.⁸⁷ This suggests that a global, multilateral solution would ultimately have to be found in order to impose an administrable robot tax. Easier said than done.

everyday human contact” arising from use of those machines. SAM DALTON, ALL PARTY PARLIAMENTARY GROUP ON SOCIAL INTEGRATION, HEALING THE GENERATIONAL DIVIDE: INTERIM REPORT ON INTERGENERATIONAL CONNECTION 30 (2019), <https://socialintegrationappg.org.uk/wp-content/uploads/sites/2/2019/05/Healing-the-Generational-Divide.pdf>.

⁸² See, e.g., Abbott & Bogenschneider, *supra* note 5, at 147 (“Automation has the potential to create widespread benefits. Not only will automation increase productivity, it will also improve safety and lead to new scientific breakthroughs.”).

⁸³ Ooi & Goh, *supra* note 4.

⁸⁴ Mazur, *supra* note 6, at 299-300.

⁸⁵ BUSINESS, ENERGY, AND INDUSTRIAL STRATEGY COMMITTEE, ORAL EVIDENCE: AUTOMATION AND THE FUTURE OF WORK, 2019, HC 1093, at Q303 (UK), <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/business-energy-and-industrial-strategy-committee/automation-and-the-future-of-work/oral/102291.pdf>.

⁸⁶ See Mazur, *supra* note 6, at 300-01. See generally Reuven S. Avi-Yonah, *Globalization, Tax Competition, and the Fiscal Crisis of the Welfare State*, 113 HARV. L. REV. 1574 (2000) (discussing tax competition).

⁸⁷ Kovacev, *supra* note 6.

The recent “digital tax” debate provides a useful illustration of this problem. One of the hallmarks of the modern economy is the prevalence of multinational corporations whose economic reach extends far beyond their country of origin, or even those countries where they have a physical presence.⁸⁸ Many goods are tradeable across borders, and many services even more so due to the internet.⁸⁹ Historically, the lynchpin of international taxation has been that businesses may be taxed in a country only if they have a permanent establishment in that country.⁹⁰ In the internet era, where goods and services can be ordered online from a company without any presence in the country, many businesses pay little or no tax in countries from which they derive considerable profits.⁹¹ Accordingly, the EU and several nations have proposed “digital tax” regimes that would tax the gross receipts or profits earned in jurisdictions where the business has no traditional permanent establishment.⁹² Discussions at the OECD-level toward a consensus approach have continued for several years, but agreement seems elusive.⁹³ A cross-border robot tax, imposing a

⁸⁸ OECD/G20 BASE EROSION AND PROFIT SHIFTING PROJECT, OECD, ADDRESSING THE TAX CHALLENGES OF THE DIGITAL ECONOMY, ACTION 1 – 2015 FINAL REPORT, 65-67 (2015), <https://doi.org/10.1787/23132612>.

⁸⁹ *Id.* at 66-67.

⁹⁰ See OECD, *Commentary on Article 5: Concerning the Definition of Permanent Establishment*, in MODEL TAX CONVENTION ON INCOME AND ON CAPITAL: CONDENSED VERSION 116, 116 (10th ed. 2017); OECD, *Commentary on Article 7: Concerning the Taxation of Business Profits*, in MODEL TAX CONVENTION ON INCOME AND ON CAPITAL: CONDENSED VERSION 173, 173 (10th ed. 2017).

⁹¹ OECD/G20 BASE EROSION AND PROFIT SHIFTING PROJECT, *supra* note 88, at 79.

⁹² *A Fair and Efficient Tax System in the European Union for the Digital Single Market*, at 8-10, COM (2017) 547 final (Sept. 21, 2017).

⁹³ See, e.g., OECD Livestream, *BEPS Public Consultation on the Tax Challenges of Digitalization*, OECD (Nov. 1, 2017), <http://www.oecd.org/tax/beps/public-consultation-on-tax-challenges-of-digitalisation-1-november-2017.htm>; Econ. and Soc. Council, Comm. of Experts on Int'l Cooperation in Tax Matters, *The Digitalized Economy: Selected Issues of Potential Relevance to Developing Countries*, U.N. Doc. E/C.18/2017/6 (Aug. 8, 2017); Comm. of Experts on Int'l Cooperation in Tax Matters, *Tax Challenges in the Digitalized Economy: Selected Issues for Possible Committee Consideration*, U.N. Doc. E/C.18/2017/CPR.22 (Oct. 11, 2017); Stephanie Soong Johnston, *Saint-Amans Warns Against Unilateral Moves to Tax Digital Economy*, 87 TAX NOTES INT'L 1157 (2017); Tom O'Shea, *The EU's Proposed "Significant Digital Presence" Framework*, 90 TAX NOTES INT'L 1295 (2018); Monica Gianni, *OECD BEPS (In)Action 1: Factor Presence as a Solution to Tax Issues of the Digital Economy*, 72 TAX LAW. 255 (2018); Press Release, U.S. Dept't of the Treasury, Secretary Mnuchin Statement on Digital Economy Taxation Report (2018), <https://home.treasury.gov/news/press-releases/sm0316>. The details of the various proposals for

tax related to the use of AI, robotics, and automation outside the taxing jurisdiction, poses the same challenges of lack of international consensus and difficulty of administration and enforcement.

VI. Statutory Attempts at Robot Taxes

While there are many advocates of robot tax proposals, actual legislative proposals are few and far between. To date, only a handful have actually been reduced to legislative language, as shown in the following sections. Each of these takes a different approach, illustrating both the variety of paths for a robot tax and the many pitfalls for such a tax. It is instructive to review these attempts to go beyond policy musings into actual legislation.

a. South Korea

The Republic of Korea has held the title of highest robot density in the world since 2010 – a record 710 robots per 10,000 employees in the manufacturing industry in 2017.⁹⁴ In part, this is due to a generous tax regime specifically designed to promote automation. Article 24 of the Restriction of Special Taxation Act (“RTSA”) provides a tax credit for investment in “productivity increase facilities.”⁹⁵ This is a literal tax credit for automation. That tax credit was 3% of the investment amount (7% for small or medium enterprises) against income tax or corporate tax.⁹⁶ The automation tax credit has been extended many times since its initial enactment in order to “[s]upport job creation through furthering economic vitality.”⁹⁷

a digital tax regime, and the numerous challenges to implementing such a regime on a global basis, are beyond the scope of this article.

⁹⁴ INT’L FED’N OF ROBOTICS, EXECUTIVE SUMMARY WORLD ROBOTICS 2018 INDUSTRIAL ROBOTS, 18 (2018), https://ifr.org/downloads/press2018/Executive_Summary_WR_2018_Industrial_Robots.pdf.

⁹⁵ Restriction of Special Taxation Act, Act No. 11614, Jan. 1, 2014, art. 24(1) (S. Kor.), translated in Korea Legislation Research Institute online database, http://elaw.klri.re.kr/kor_service/lawView.do?hseq=27406&lang=ENG.

⁹⁶ *Id.*

⁹⁷ *E.g.*, MINISTRY OF STRATEGY & FIN., KOREAN TAXATION 46, 55 (2012) (S. Kor.), <https://www.nts.go.kr/eng/data/KOREANTAXATION2012.pdf>.

The Act provides no definition for what constitutes a “productivity increase facility,” leaving that task to administrative guidance.⁹⁸ The Presidential Decree enforcing the RTSA refers in turn to “facilities specified by Ordinance of the Ministry of Strategy and Finance, in which investment is made for improving production process, automation of facilities, or informatization.”⁹⁹ The Ministry of Strategy and Finance’s Decree in turn sets forth a laundry list of specific categories of equipment that qualify for the tax credit.¹⁰⁰ The categories set forth in the Ordinance include such items as computer-aided manufacturing (CAM) and computer-aided design (CAD) devices, process control systems, and warehouse loading equipment.¹⁰¹ In 2017, the administration of President Moon Jae-in announced its intention to reduce the automation tax credit, in response to which legislation was enacted by the National Assembly in early 2018.¹⁰² This announcement received much attention in the press, where it was frequently hailed (incorrectly) as a robot tax instead of a reduction in a tax benefit for automation.¹⁰³ Press reports indicated that the proposal was motivated by a desire to slow the implementation of automation in Korea’s high-tech manufacturing sector.¹⁰⁴ Under the new law, the automation tax credit was reduced by two percentage points, and the

⁹⁸ *Id.* (“Facilities prescribed by Presidential Decree which belong to those for the improvement and automation of processes”).

⁹⁹ Enforcement Decree of the Restriction of Special Taxation Act, Presidential Decree No. 26070, Feb. 3, 2015, art. 21(2) (S. Kor.), *translated* in Korea Legislation Research Institute online database, https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=43444&type=sogan&key=5.

¹⁰⁰ Enforcement Rule of the Restriction of Special Taxation Act, Ministry of Economy and Finance Decree No. 614, Mar. 17, 2017, art. 12(1) (S. Kor.), *Translated* in Korea Legislation Research Institute online database, https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=48860&type=sogan&key=5.

¹⁰¹ *Id.* at tbl.2.

¹⁰² *Korea’s Robot Tax*, 3 ROBOTICS L. J. 1 (Aug. 24, 2017); Yoon Sung-won, *Korea Takes First Step to Introduce Robot Tax*, KOREA TIMES (Aug. 7, 2017), http://www.koreatimes.co.kr/www/news/tech/2017/08/133_234312.html [<https://perma.cc/Z2X5-7XEH>].

¹⁰³ *Korea’s Robot Tax*, *supra* note 102; Yoon, *supra* note 102; *see also* Greg Nichols, *South Korea Mulling World’s First Robot Tax*, ZDNET (Aug. 9, 2017, 6:09 PM), <https://www.zdnet.com/article/south-korea-mulling-worlds-first-robot-tax/> [<https://perma.cc/5Z4G-YV27>].

Unfortunately, this error has been propagated widely in academic and journalistic circles.

¹⁰⁴ *South Korea Considers Amending Tax Laws to Slow Speed of Automation*, E&T (Aug. 10, 2017), <https://eandt.theiet.org/content/articles/2017/08/south-korea-considers-amending-tax-laws-to-slow-speed-of-automation/> [<https://perma.cc/53YN-U7GZ>].

sunset date extended from December 31, 2017 until December 31, 2019.¹⁰⁵

The Korean approach is almost unique, due to the prior existence of an explicit automation tax credit.¹⁰⁶ Korea's solution to the definitional problem is to create a white list, setting forth every single category that qualifies with specificity. This makes some sense for a tax credit, as to which a taxpayer must establish that it is entitled to the claimed tax benefit. Further, the taxpayer has an incentive to self-identify and will seek an expansive definition of the items of the list. For imposing a tax, the incentive goes the other way, and there would be a considerable resource cost for a tax authority to keep abreast of the latest technology to include on that list without taxpayers clamoring to get that new technology added.

There is some anecdotal evidence that the reduction in the automation tax credit has slowed investment in robotics, new industrial robot installations in Korea decreased in 2017 for the first time since 2012.¹⁰⁷ Whether this reflects a causative effect of the reduction in the automation tax credit is unclear. At any rate, Korea remains the most-automated economy in the world and there is no indication of widespread abandonment of AI, robotics, or automation.

b. Italy

In 2017, a Socialist deputy in the Chamber of Deputies filed the first European robot tax bill.¹⁰⁸ The proposal was to increase the corporate

¹⁰⁵ *2018 Tax Amendments in Effect*, DELOITTE: TAX@HAND (Jan. 9, 2018), <https://www.taxathand.com/article/9020/Korea/2018/2018-tax-amendments-in-effect> [https://perma.cc/S3NB-A7SF].

¹⁰⁶ South Korea is not the only jurisdiction with an automation tax credit. North Dakota recently enacted a tax credit "for purchases of manufacturing machinery and equipment for the purpose of automating manufacturing processes in this state to improve job quality or increase productivity." N.D. Cent. Code § 57-38-01.36 (2019).

¹⁰⁷ INT'L FED'N OF ROBOTICS, *supra* note 94, at 14. The South Korean government recently announced plans to reverse course and increase the tax incentive in light of slowed economic growth. Jung Min-kyung, *Korea to Raise Tax Credit Rate for Corporate Facility Investments, R&D*, KOREA HERALD (July 25, 2019, 4:43 PM), <http://www.koreaherald.com/view.php?ud=20190725000653> [https://perma.cc/VTB2-QJLJ].

¹⁰⁸ Proposta di Legge 3 agosto 2017, n.4621 (It.).

income tax rate by 1% for companies “if the production activity of the company is implemented and managed predominantly from artificial intelligence systems and robotics.”¹⁰⁹ Interestingly, the rate increase is abated for a company that invests at least 0.5% of its revenues each year in professional requalification projects.¹¹⁰ It appears this bill was referred to committee in the Chamber of Deputies with no further action taken.¹¹¹

The legislation provides no definition of “artificial intelligence systems” or “robotics.” Nor does it suggest any methods by which the Italian tax authority would determine whether a company’s production activity was “predominantly” implemented and managed by AI or robotics. This opens the door to definitional problems as to what constitutes an AI system or robot. It also creates compliance and enforcement headaches, because taxpayers and the tax authority would somehow have to allocate every company’s production activity between AI/robotics versus human activity. While no doubt the tax authority would propose regulations and guidance interpreting this legislation had it been enacted, the breadth and ambiguity of the language would make that a Herculean task.

Further, there is nothing in this legislation that would impose a tax on businesses outside Italy (or otherwise not subject to Italian corporate tax). The tax would burden Italian businesses, while doing nothing to prevent competing businesses in other countries from adopting AI and robotics in order to gain a competitive advantage. (by lowering process or increasing efficiency). Jobs would still be lost, but to foreign competition instead of domestic robots.

c. Geneva

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

¹¹¹ OPENPOLIS, *C.4621: Tax Benefits for the Use of Artificial Intelligence Systems in the Production of Goods*, OPENPARLAMENTO, https://parlamento17.openpolis.it/singolo_atto/88576 [<https://perma.cc/6MLP-NBW8>] (tracking the progress of bill introduced to Chamber by the Honorable Oreste Pastorelli).

Another example comes from the Grand Council of the canton of Geneva, Switzerland.¹¹² In 2017, members of the Grand Council proposed legislation “for the maintenance of employment, quality and locality in the retail sector (introduction of a tax on automated cashiers).”¹¹³ Under this proposal, retail stores would be assessed a tax of 10,000 Swiss francs per month (roughly equivalent to \$10,000 in U.S. dollars at current exchange rates)¹¹⁴ for each automated cashier installed in the store. An automated cashier is defined as “any device for the payment of purchases that the customer can use without the intervention of store personnel.”¹¹⁵ A store subject to the tax may reduce its tax liability by multiplying 10% of its tax base by a ratio between the number of monthly hours of operation by human employees operating cashiers over the total number of monthly hours of operation for all types of cashiers (with the assumption that automated cashiers are in operation for the entire time the store is open).¹¹⁶

The tax would be paid to a newly-formed Geneva Foundation for Trade and Local Employment, which in turn would pay out 30% of the taxes (net of the Foundation’s expenses) to a preexisting foundation for vocational and continuing education, and 70% as a subsidy to stores with no automated cashiers.¹¹⁷ The Foundation would be given the power to issue fines for noncompliance as well as recover unpaid taxes.¹¹⁸ There is also a potential 5-year prison sentence for noncompliance, which may be the first example of a proposed criminal

¹¹² PROJET DE LOI [PL] [PROPOSED LAW] Feb. 22, 2017, PL 12064 (Switz.), <http://ge.ch/grandconseil/data/texte/PL12064.pdf>. I am grateful to Xavier Oberson for bringing the Geneva legislation to my attention.

¹¹³ *Id.*

¹¹⁴ *Swiss Francs to United States Dollar*, XE: CURRENCY CONVERTER, <https://www.xe.com/currencyconverter/convert/?Amount=1&From=CHF&To=USD> (follow hyperlink; then type “10000” into box and press yellow enter button) (last visited July 9, 2019).

¹¹⁵ PROPOSED LAW, PL 12064, art. 7 (Switz.).

¹¹⁶ *Id.* art. 10.

¹¹⁷ *Id.* art. 3, 5.

¹¹⁸ *Id.* art. 15.

sanction in connection with a robot tax.¹¹⁹ This proposal was ultimately sent to committee, and no further action has been taken.¹²⁰ This proposal addressed the definitional problem by being narrowly targeted to a specific type of automation – automated cashiers – for which it was able to provide a reasonably precise definition. It also attempts to create a direct link between the tax and remediation of job displacement costs, which is an oft-stated goal of robot tax proponents. Nonetheless, the result of the tax, had it been enacted, would have been to slow innovation while raising prices on consumers and essentially creating a class of employees dependent on a government foundation and a tax on automation for their livelihood.¹²¹ Nor is it clear that Geneva’s cashiers are uniquely threatened by automation or otherwise more deserving than employees in other occupations.

d. United States Autonomous Vehicle Tax Legislation

While there has been extensive talk from various politicians in the United States about a robot tax, there have been few proposals actually reduced to legislative language. Indeed, the only such examples in the United States to date deal with one specific type of automation: autonomous vehicles.¹²²

¹¹⁹ *Id.* art 16.

¹²⁰ *République et canton de Genève, Séance du Jeudi 16 Mars 2017 À 17h, PL 12054* [Session Thursday, March 16, 2017 at 17H], *Grand Conseil: Mémorial*, <http://ge.ch/grandconseil/memorial/seances/010401/1/14/#1562618> (explaining that Bill 12054 was sent without debate to the Committee on the Economy) (last visited July 9, 2019) (Switz.).

¹²¹ See Jürg Müller, *Eine Robotersteuer ist Unsinn* [A Robot Tax is Nonsense], *NEUE ZÜRCHER ZEITUNG* (Aug. 22, 2017, 6:41 PM), <https://www.nzz.ch/meinung/science-fiction-im-steuerrecht-eine-robotersteuer-istunsinn-ld.1312133> [<https://perma.cc/4GWH-QY6D>] (Switz.).

¹²² For a survey of autonomous vehicle legislation in general in the United States, see Rustin Diehl & Matthew L. Thue, *Autonomous Vehicle Testing Legislation: A Review of Best Practices from States on the Cutting Edge*, 21 U. FLA. J. TECH. & POL’Y 197 (2017). There is also an emerging debate on the taxation of unmanned aerial vehicles (i.e., drones). Pending legislation in Washington State would impose the existing aircraft excise tax on drones. See S.B. 5137, 2019 Leg., Reg. Sess. (Wash. 2019); see also Haye Kestelco, *Boulder City, Nev. Wants to Charge Recreational and Commercial Drone Pilots \$25/\$100 Per Day*, *DRONE DJ* (Mar. 16, 2018, 9:44 AM), <https://dronedj.com/2018/03/16/boulder-city-nevada-drone-charge/> [<https://perma.cc/ZG4L-KBLY>] (proposed municipal tax on UAVs). These proposals are not directed at autonomous drones in particular, however, so they are beyond the scope of this article.

In many ways, autonomous vehicles provide a microcosm of the revenue effects that governments will face if automation becomes the norm.¹²³ The United States uses a per-gallon tax that pays into a Highway Trust Fund to fund road infrastructure.¹²⁴ Autonomous vehicles promise to be more fuel-efficient, and many are also intended to be fully electric. An electric autonomous vehicle may pay no tax at all, even though it adds to the wear and tear of the highway system as much as a conventional car. It is not necessarily the case that revenues will decrease with the rise of autonomous vehicles.¹²⁵ A study conducted by the Conservation Law Foundation on the economic and fiscal impact of autonomous vehicles in Massachusetts concluded that privately owned autonomous vehicles may actually lead to higher municipal tax revenues from excise taxes. While there may be a state-level decrease in gas tax revenues that reduction would depend on the adoption of electric vehicle technology. Alternatively a gasoline-powered autonomous vehicle could actually increase gas tax revenues.¹²⁶ Nonetheless, policymakers have attempted to address this perceived problem before autonomous vehicles are widely adopted.

There have been discussions of many alternatives to autonomous vehicles. For example, a vehicle miles traveled (VMT) fee has been proposed, charging a per-mile fee to fund public infrastructure investments.¹²⁷ To date, however, California and Nevada are the only two jurisdictions in the United States that have enacted legislation providing for the taxation of autonomous vehicles, specifically in the

¹²³ See generally Stephen Ratner, *Taxation of Autonomous Vehicles in Cities and States*, 71 TAX. LAW. 1051 (2018).

¹²⁴ I.R.C. § 9503 (2019).

¹²⁵ Many of the supposed negative revenue effects for autonomous vehicles are really based on the assumption that they will be electric, not gas-powered. This begs the question whether a tax on electric vehicles (whether autonomous or human-driven) would be a superior alternative to a tax on autonomous vehicles.

¹²⁶ RAFAEL MARES, CHRIS STIX, & SARA DEWEY, CONSERVATION LAW FOUND., HOW AUTONOMOUS VEHICLES WILL DRIVE OUR BUDGETS: AN ANALYSIS OF THE ECONOMIC AND FISCAL IMPACTS OF SELF DRIVING CARS ON THE COMMONWEALTH OF MASSACHUSETTS 3 (2018), https://www.clf.org/wp-content/uploads/2018/07/CLF_AV_Report.pdf.

¹²⁷ PAUL LEWIS & ALICE GROSSMAN, ENO CTR. FOR TRANSP., BEYOND SPECULATION 2.0: AN UPDATE TO ENO'S ACTION PLAN FOR FEDERAL, STATE, AND LOCAL POLICYMAKERS 39-40 (2019), <https://www.enotrans.org/wp-content/uploads/2019/04/4-1-AV-Paper-FINAL-with-Cover.pdf>.

context of their use by transportation network companies (TNCs).¹²⁸ At present there are few autonomous vehicles used by TNCs which meet the statutory definitions of “autonomous vehicle” – although that will soon change.¹²⁹ Nonetheless, the existing legislation provides a window into ways a legislature could approach the robot tax problem.¹³⁰

In 2017, the Nevada legislature adopted sweeping legislation regulating the use of autonomous vehicles in the state.¹³¹ Among other things, the statute imposed an excise tax on TNCs using fully autonomous vehicles:

[A]n excise tax is hereby imposed on the use of a dispatch center, software application or other digital means by an autonomous vehicle network company to connect a passenger to a fully autonomous vehicle for the purpose of providing transportation services at the rate of 3 percent of the total fare charged for transportation services, which must include, without limitation, all fees, surcharges, technology fees, convenience charges for the use of a credit or debit card and any other amount that is part of the fare. The Department shall charge and collect from each

¹²⁸ Generally speaking, a TNC may be defined as a company or organization that provides transportation services using an online-enabled platform to connect passengers with drivers using their personal vehicles. CAL. PUB. UTIL. COMM’N, DECISION ADOPTING RULES AND REGULATIONS TO PROTECT PUBLIC SAFETY WHILE ALLOWING NEW ENTRANTS TO THE TRANSPORTATION INDUSTRY, Decision 13-09-045, at 2 (2013), <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M077/K192/77192335.PDF>.

¹²⁹ Andrew J. Hawkins, *Waymo’s Self-Driving Cars Are Now Available on Lyft’s App in Phoenix*, VERGE (May 7, 2019, 6:01 PM), <https://www.theverge.com/2019/5/7/18536003/waymo-lyft-self-driving-ride-hail-app-phoenix> [<https://perma.cc/22FS-SP9S>].

¹³⁰ Two other states (Massachusetts and Tennessee) have considered, and so far rejected, such legislation. *See infra* note 141 and accompanying text.

¹³¹ Assemb. B. 69, 79th Sess., (Nev. 2017) (“An Act relating to transportation; revising requirements for the testing or operation of an autonomous vehicle on a highway within this State; authorizing the use of driver-assistive platooning technology; authorizing the use of a fully autonomous vehicle to provide transportation services in certain circumstances by persons licensed by the Department of Motor Vehicles, Nevada Transportation Authority or Taxicab Authority, providing for the regulation of autonomous vehicle network companies; providing penalties; and providing other matters properly relating thereto.”).

autonomous vehicle network company the excise tax imposed by this subsection.¹³²

The statute defines “autonomous vehicle network company” as “an entity that, for compensation, connects a passenger to a fully autonomous vehicle which can provide transportation services to the passenger.”¹³³ A “fully autonomous vehicle” is defined as “a vehicle equipped with an automated driving system which is designed to function at a level of driving automation of Level 4 or 5 pursuant to SAE J3016.”¹³⁴

In 2018, the California legislature enacted Assembly Bill 1184, which authorizes San Francisco to impose a local tax on TNCs using autonomous vehicles, among other things.¹³⁵ San Francisco in turn has proposed a so-called “Traffic Congestion Mitigation Tax,” a per-ride tax on rides given by TNCs using autonomous vehicles.¹³⁶ The measure contains the following definition for “autonomous vehicle passenger services: “‘Autonomous Vehicle’ means a vehicle, other than a Taxicab or Limousine, with or without a driver, equipped with and into which has been integrated technology that has the capability to drive the vehicle without the active physical control by a human operator, regardless of whether the vehicle is in driverless operation. An Autonomous Vehicle includes any vehicle capable of being driven by a remote driver.”¹³⁷ Funds raised by this tax would be applied to a dedicated Traffic Congestion Mitigation Fund, funding the local mass

¹³² Nev. Rev. Stat. § 372B.145(1).

¹³³ Nev. Rev. Stat. § 706B.030, incorporated by reference in Nev. Rev. Stat. § 372B.015.

¹³⁴ Nev. Rev. Stat. § 482A.036, incorporated by reference in Nev. Rev. Stat. 706B.040. SAE J3016 refers to standards set by SAE International establishing Levels of Automated Driving by reference to the degree of autonomy of the AV in relation to the driver, level 5 being complete autonomy and ability to drive in all conditions without human intervention. Jennifer Shuttleworth, *SAE Standards News: J3016 Automated-Driving Graphic Update*, SOC’Y OF AUTOMOTIVE ENGINEERS (Jan. 7, 2019), <https://www.sae.org/news/2019/01/sae-updates-j3016-automated-driving-graphic> [<https://perma.cc/SP24-88QK>]. These standards have been adopted by the United States Department of Transportation in developing voluntary guidance for automated driving systems. U.S. DEP’T OF TRANSP., AUTOMATED DRIVING SYSTEMS 2.0: A VISION FOR SAFETY (2017), https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf.

¹³⁵ Cal. Assemb. B. 1184, (Cal. 2018), codified at Cal. Pub. Util. Code § 5446 (2018).

¹³⁶ S.F., CAL., ORDINANCE 190584, § 3204(a)(2) (July 23, 2019).

¹³⁷ *Id.* § 3203.

transit authorities.¹³⁸ This ordinance was placed on the November 2019 ballot as Proposition D and overwhelmingly approved by the San Francisco electorate in that election.¹³⁹

Two other states, Massachusetts and Tennessee, have considered,¹⁴⁰ but so far not enacted,¹⁴¹ similar legislation regarding taxation. Both proposals involved a per-mile “use tax” on autonomous vehicles.¹⁴² The Massachusetts proposal, like the Nevada law, incorporated a technical definition derived from the SAE standards of automation.¹⁴³ The Tennessee legislation, like the San Francisco ballot proposal, provided a nontechnical definition of autonomous vehicle to mean a motor vehicle equipped with “a system that enables the operation of a motor vehicle without the active physical control of, or monitoring by, a human operator.”¹⁴⁴

¹³⁸ *Id.* § 3208.

¹³⁹ S.F. DEPT. OF ELECTIONS, “Nov. 5, 2019 Election Results, Summary,” <https://sfelections.sfgov.org/november-5-2019-election-results-summary>.

¹⁴⁰ Sen. B. 1561/H.B. 1564, 109th Gen. Assemb., § 12(a) (Tenn. 2016); Sen. B. 2115, 191st Leg. (Mass. 2019).

¹⁴¹ The Tennessee bill was amended in the Tennessee Senate to remove the use tax provisions of the bill, which subsequently became law without the tax provisions. Legislative History, Sen. B. 1561/H.B. 1564, 109th Gen. Assemb. (Tenn. 2016), <http://wapp.capitol.tn.gov/apps/Billinfo/default.aspx?BillNumber=SB1561&ga=109>. The Massachusetts bill was referred to committee in the Massachusetts State Senate on January 22, 2019, and as of the date of publication has not been reported out of committee. Legislative History, Sen. B. 2115, 191st Leg. (Mass. 2019), <https://malegislature.gov/Bills/191/S2115/BillHistory>.

¹⁴² Sen. B. 1561/H.B. 1564, 109th Gen. Assemb., § 12(a) (Tenn. 2016) (“A use tax is imposed on autonomous vehicles that operate on the public highways within this state pursuant to Sections 4, 5, 9, and 10. Autonomous vehicles shall be taxed according to the number of axles. Autonomous vehicles with two (2) axles shall be taxed at a rate of one cent (1¢) per mile. Autonomous vehicles with more than two (2) axles shall be taxed at a rate of two and six-tenths cents (2.6¢) per mile.”); Sen. B. 2115, 191st Leg., § 63E(A) & (C)(1) (Mass. 2019) (“A road usage charge is imposed on autonomous vehicles that operate on the public ways within this state . . . [at] a base per-mile rate on autonomous vehicles of no less than 2.5 cents per mile”).

¹⁴³ Sen. B. 2115, 191st Leg., § 1(A)(2) & (3) (Mass. 2019).

¹⁴⁴ Sen. B. 1561/H.B. 1564, 109th Gen. Assemb., § 12(a) (Tenn. 2016). The amended Tennessee bill, as enacted without the tax provisions, actually contained two different definitions of “autonomous technology” in non-tax contexts. The first definition, which bars municipalities from banning the use of autonomous vehicles, defines “autonomous technology” as “technology installed on a motor vehicle that has the capability to drive the vehicle on which the technology is installed in high or full automation mode, without any supervision by a human operator, with specific driving mode performance by the automated driving system of all aspects of the dynamic driving task that can be managed by a human

These examples attempt to define a particular type of robot—e.g., an autonomous vehicle—but in divergent ways.¹⁴⁵ The Nevada statute and Massachusetts proposals both explicitly incorporate a generally accepted technical definition, while the San Francisco and Tennessee proposals use a more general, nontechnical definition without such a reference. The Nevada and Massachusetts definitions would be easily understood in the autonomous vehicle industry, but not necessarily by judges or tax officials. If a dispute arose, the outcome could hinge on a “battle of the experts,” with a lay decision maker with limited knowledge having to choose sides on the basis of conflicting expert testimony.

On the other hand, the definitions in the San Francisco and Tennessee proposals are subject to interpretation. Even standard cruise control technology could be said to drive a vehicle without active physical control by a human operator.¹⁴⁶ It is also noteworthy that the technology need not actually be used, but merely must be integrated into the vehicle. This could result in overbroad taxation of vehicles that are not truly autonomous.

All of these proposals tend to disincentivize innovation by discouraging development of autonomous vehicle technology. To a certain extent, however, the taxes on autonomous vehicles may be considered an attempt to equalize the tax burdens of autonomous and

driver, including the ability to automatically bring the motor vehicle into a minimal risk condition in the event of a critical vehicle or system failure or other emergency event” Tenn. Code § 55-8-202(b)(1) (2016). The second definitions, applying to an exception to penalties for operating a motor vehicle with a television or video screen visible to the driver, defines “autonomous technology” as “technology installed on a motor vehicle that has the capability to drive the motor vehicle without the active physical control or monitoring by a human operator.” Tenn. Code §55-9-105(c)(6)(B) (2016).

¹⁴⁵ Many states have defined “autonomous vehicle” or “autonomous technology” in a non-tax driving regulatory context. *See, e.g., id.*; Nev. Rev. Stat. § 482A.030; Fla. Stat. § 316.003(3); Cal. Veh. Code § 38750(a)(1)-(2); Mich. Comp. Laws § 257.2b(1); La. Rev. Stat. Ann. § 32:1(1.2). D.C. Code § 50-2351(1). In that context, “[t]he definition of ‘autonomous vehicle’ should be precise to avoid unintentional restrictions on existing, semi-autonomous technology.” Deihl & Thue, *supra* note 122, at 211.

¹⁴⁶ In a non-tax context, state legislatures use more precise language specifically to avoid this type of overbreadth. *See supra* note 145.

non-autonomous vehicles, ensuring that operators of autonomous vehicles contribute to the support of the road infrastructure.¹⁴⁷

VII. Shaping the Future of Taxation

This article highlights the many challenges involved in creating an enforceable, administrable, and practical robot tax. However, these challenges may not stop policymakers from trying. As Adam Smith pointed out in *The Wealth of Nations*, “[a]fter all the proper subjects of taxation have been exhausted, if the exigencies of the state still continue to require new taxes, they must be imposed upon improper ones.”¹⁴⁸ In the face of an economic recession leading to dramatic unemployment, it may be politically expedient to blame AI, robotics and automation and target them for punitive taxation. Robots cannot vote, after all, nor do they make campaign contributions (although their owners might), so they may appear to be a safe target for a new tax.¹⁴⁹ Therefore, it is important to consider how to avoid the worst policy harms from a robot tax, if political necessity requires that one be enacted.

The worst possible robot tax legislation would have an ambiguous all-embracing definition of what a taxable robot is, would require an allocation between robot-generated and non-robot-generated income, and would attempt to tax activity by robots that are, or could easily be moved, outside the jurisdiction. Such a proposal would invite controversy and litigation and disincentivize innovation while doing little to address the underlying challenges of automation on employment or government revenues.

What, then, would a coherent, enforceable and practical robot tax look like? There are two potential approaches that ameliorate (although they do not eliminate) the practical difficulties of a robot tax:

¹⁴⁷ See, e.g., S.F., CAL., ORDINANCE 190584, § 3204(a)(1) (July 23, 2019).

¹⁴⁸ ADAM SMITH, *AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS*, Book V, Chapter II, Part II, Article IV (1776) (ebook).

¹⁴⁹ Compare SXSU, *supra* note 43, at 57:40 (“easier to say tax a robot” than to say “tax corporations at 90%”).

Restructure incentives or implement a strict structure of which robots can be taxed.

The first approach would be to structure tax incentives in ways that favor, or at least do not disincentivize, human employment. The South Korean roll-back of automation tax credits discussed in Part V.A above provides a real-world example. Explicit tax subsidies for automation are rare, however. It is much more common for there to be tax incentives that have the effect of encouraging investment in AI, automation and robotics without explicitly saying so, and meaningful reforms must address those facially neutral incentives as well.¹⁵⁰

Tax benefits can be structured in ways that tie the claimed benefit to employment of human workers. The recently-repealed domestic production activities deduction (known affectionately in tax circles as “Section 199” after the relevant Code section) tied the tax benefit explicitly to employment by placing a W-2 limitation on the deduction.¹⁵¹ The passthrough deduction in Section 199A also has a W-2 limitation, although that limitation can alternatively be met by reference to the unadjusted basis of tangible assets.¹⁵² There is precedent, therefore, for structuring a tax benefit in a way that ties that benefit to employment. Because this is an affirmative tax subsidy of employment, not a tax on “robots,” the definitional problems are minimized.

¹⁵⁰ Cf. Abbott & Bogenschneider, *supra* note 6, at 169-71 (disallowing corporate tax deductions for automated workers); Ooi & Goh, *supra* note 4, at 18 (suggesting the adoption of “decelerated depreciation” or “reverse depreciation,” reducing or reversing the tax benefits generally accorded for the deployment of capital assets for assets deemed to be employment-substituting).

¹⁵¹ I.R.C. § 199(b)(1) (“The amount of the deduction allowable under [Section 199] for any taxable year shall not exceed 50 percent of the W-2 wages of the taxpayer for the taxable year”), *repealed by* Tax Cuts and Jobs Act of Dec. 22, 2017, Pub. L. No. 115-97, Title I, § 13305(a), 2017 (131 Stat. 2126), effective for taxable years beginning after December 31, 2017.

¹⁵² I.R.C. § 199A(b)(2) (2017) (“The amount determined under this paragraph with respect to any qualified trade or business is the lesser of— (A) 20 percent of the taxpayer’s qualified business income with respect to the qualified trade or business, or (B) the greater of— (i) 50 percent of the W-2 wages with respect to the qualified trade or business, or (ii) the sum of 25 percent of the W-2 wages with respect to the qualified trade or business, plus 2.5 percent of the unadjusted basis immediately after acquisition of all qualified property.”).

By tying a tax benefit to W-2 wages (which presumably would produce income and payroll tax revenues), the revenue impact of the tax subsidy is reduced and may slow the process of job dislocation (leading to a reduction in those sources of revenue), without providing as large of a hurdle to innovation.

Of course, as with any tax expenditure, there is a risk that the benefit is merely subsidizing what taxpayers would do anyway. Featherbedding also becomes an issue.¹⁵³ This approach also does little to increase net revenue. Nonetheless, such a proposal would be preferable to a straight “robot tax.”

The second approach would be to implement a narrowly-targeted tax on specific, easily-defined types of AI, robotics, or automation, imposed at the level at which consumers could not practically choose alternative sources outside of their jurisdiction. The narrowness of the targeted technology avoids the definitional issues surrounding “what is a robot” disputes. It is easier to define a narrower subset, such as a “robot barista” than to attempt an all-encompassing definition of a “robot.” This task becomes even easier if the definition of a taxable robot can be tied to a non-tax technical standard (such as the SAE standards for autonomous vehicles) – so long as judges and tax administrators are able to understand and apply those standards. A South Korea-style white list is also a possibility, although an all-encompassing list of taxable AI, robots, and automation equipment seems impractical, particularly given the pace of technological change that would quickly make such a list obsolete.

The appropriate jurisdictional level of taxation would depend on the targeted type of robot. A barista must be within close physical

¹⁵³ See, e.g., *Am. Newspaper Publishers Ass’n v. NLRB*, 345 U.S. 100, 103 (1953) (showcasing that featherbedding is not just a theoretical concern. In response to the introduction of a linotype machine for printing newspapers, which eliminated the need for human compositors to set type by hand, the International Typographical Union arranged with newspaper publishers to employ compositors to produce unnecessary duplicates for linotype-set advertisements by hand, a practice known as “setting bogus” that the Supreme Court described as “a wasteful procedure.”). It does not tax the imagination to conceive of a business hiring unnecessary employees to reach a W-2 threshold in order to claim a tax benefit, should the amount of benefit exceed the cost of the employees’ wages.

proximity of a customer buying a latte, so a tax on robot baristas would be appropriate on a local level. A tax on autonomous vehicles using a country's road system would be best enforced and most practically handled at a national level.

The major weakness of this second approach is the narrowness of the effect. A tax on robot baristas would likely, at least in the short run, encourage the employment of human baristas. However, it would do little for employees in other businesses or professions. Further, this approach encourages special pleading by influential interest groups, whose interests may not necessarily coincide with sound public policy. Another, related weakness to the "rifle shot" approach is that it is most effective as to specific types of activities that can be effectively taxed at a local, regional, or national level. Viewed from an international lens, the justification for such narrowly-based taxes weakens considerably. Preserving a handful of barista jobs in a particular metropolitan area would be a drop in the bucket in the face of massive job dislocation across industries and geographic borders. International coordination could prove as elusive as in the digital tax context. Alternatively, if political pressures require implementation of a robot tax, a rifle-shot approach targeted to politically-sensitive job categories would be superior to a blunderbuss "tax all robots" proposal.

It is possible that technological advancement could permit a more direct solution. Perhaps eventually a robot or AI would become sufficiently advanced that it would be able to enter into contracts and manage bank accounts on its own behalf. In that instance, it is not far-fetched to conceive of such an advanced technology to be capable of being taxed directly, much like a human taxpayer.¹⁵⁴ For example, a cryptocurrency-based system of taxation could be constructed for such advanced robots to facilitate payment.¹⁵⁵ However, such technology is sufficiently far in the future that one cannot consider this to be a practical proposal.

¹⁵⁴ Oberson, *supra* note 6, at 260-61.

¹⁵⁵ See generally Ahmed, *supra* note 6.

VIII. Conclusion

Any tax system that relies on human effort to raise revenues, through income or payroll taxes, is vulnerable to dislocation with the rise of AI, automation, and robotics. Alternative revenue sources must be found, somewhere, somehow, to alleviate these burdens.¹⁵⁶ While the practicalities of implementing and administering a robot tax do not support widespread adoption of such a tax to solve this dilemma, the robot tax debate has had the salutary effect of initiating the conversation about how to address this challenge.

¹⁵⁶ Some recommended alternatives include imposing a payroll tax or other additional taxes on capital income, or a VAT (in the United States, which does not currently have a VAT). *See, e.g.,* OBERSON, *supra* note 2, at 139-42; Abbott & Bogenschneider, *supra* note 5, at 171-73; Mazur, *supra* note 6, at 309-22. The search for such alternatives is beyond the scope of this article, however.