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Taxing Robots

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Abstract—**In recent years, the idea of taxing robots has been progressively gaining momentum. The potential impact of automation on employment, and consequently on income tax revenues, has led many to defend the introduction of a tax on robots, or on the use of robots, to either compensate for the potential revenue loss, or to slow down the process of automation. This paper argues that whilst automation presents significant challenges to tax systems, the introduction of a new tax on robots –or on their use– is not an effective mechanism through which to address these challenges. In order to explain the growing popularity of *taxing robots*, the paper draws insights from behavioral science. It concludes that the growing support for such a tax is more a reflection of unconscious and institutional biases, than it is of sound taxation principles.**

I. Introduction

We met Boris in March 2017, at a tax law conference in Barcelona. He was extremely knowledge, and responded with confidence and precision to all the audience's questions on Spanish tax law; we had no doubt that he had a bright future ahead. Except, Boris was a smooth, 1.5 meters high, anthropomorphised, robot. Our experience mimics that our others in legal practice [1] – robots are coming.

There is now strong evidence that ongoing developments in robotics will have a significant impact on the labour market [2], with a growing literature on the nature, magnitude, and consequences of those changes. There is a growing consensus on the long-term effects of robotics and automation, which are estimated to include increased labour demands through higher productivity (albeit experienced asymmetrically) [3], as well as addressing demographic challenges, such as ageing populations [4]. In the short-term, however, significant challenges are likely to arise. In particular, there is a displacement effect that may outweigh these positive impacts, leading to an overall decline in employment and wages [5]. These displacement effects are most evident on specific industries, such as manufacturing [6], specific workers, namely low-skills workers [7], and specific regions [8]. Further, it is also likely to increase over time, due to the "superstar effect", according towhich output is relocated to firms with lower and declining labour share [9]. Indeed, even for those who remain in work, their conditions are also likely to change, with workers expected to see a decrease in both wages and in working hours resulting in depressed incomes despite the increase in higher-paid jobs [10]. Certainly, automation is not a new phenomenon, and neither are societal anxieties around technological advance and change [11].

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Nevertheless, the ongoingdevelopments in the labour market are regarded as a cause for concern, not only because the speed of changes raises fears over the capacity of the world economies to adapt, but also because great leaps in automation have historically given rise to significant [economic?] upheaval [12].

From a public finance perspective, these fundamental labour changes are likely to be hard hitting, through a double-effect. On the one hand, labour displacement is likely to have a negative impacton revenues from personal income taxes, which are unlikely to be compensated by any potential increase on corporate income taxes. On the other hand –and occurring at the same time– both labour displacement and replacement are likely to require increased expenditure commitments. This will include unemployment benefits and the need to re-skill the work-force, but also the possible creation of an unconditional basic income (UBI) [13].

Acknowledgement of these challenges has led many, including Bill Gates in a now famous interview, to defend the introduction of a tax on robots or their use [14]. In 2017, the proposals gained a new momentum, with a Report from European Parliament, openly considering the possibility of either a robot tax, or a tax for using robots [15]. Since then, proposals for taxation of robots, or of their use, have been progressively gaining momentum. Under these proposals, the new tax would haveeither a proxy or a regulatory aim – or both. A proxy tax, to the extent that it would compensate for the potential revenue loss in personal income taxes to create an equal playing field between humans and robots [16], and a regulatory tax to internalise the negative externalities of robot use and slow down the process of automation [17].

In what follows, we work to bring critical nuance to the debate around taxing robots. In Section II, we consider the tax rationale for these proposals and their significant limitations, arguing that the introduction of a new tax on robots –or their use– is not an effective method of addressing the challenges that automation presents for tax systems. In Section III, we offer an explanation as to why these proposals have gathered such support, despite their limitations, and draw insights from sociology of technology and behavioural science. We conclude, in Section IV, that: (*i*) whilst automation is indeed likely to create challenges to tax systems in the near future, a new tax on automation is not the most appropriate instrument to address them; and (*ii*) the growing support for such a tax reflects political dynamics, unconscious and institutional biases, rather than sound taxation principles, such as equity or efficiency.

II. Why Taxing Robots is Problematic

Whilst the societal changes brought about by the digitalisation and automation of the economy are such that they affect all areas of the tax system, until recently most of the policy attention had been on their impact on corporate

income taxes and –to a lesser extent– consumption taxes. This has been progressively changing over the last few years, with the realisation that ongoing labour changes, brought about by automation and the spread of remote working, are also likely to present very significant challenges to personal income taxes [18].

It is hard to overestimate the importance of personal income taxes to tax systems globally. From a revenue perspective, in 2018 a combination of various labour taxes amounted to approximately 50 per cent of total tax revenues in OECD countries, and nearly 60 percent in European countries [19]. From an equity perspective also, personal income taxes are the most important instrument of tax progressivity worldwide, so that any decrease in relative importance of those taxes will have a negative impact on the overall progressivity of the tax system [20].

Given the relevance of these taxes to our global tax systems, it is unsurprising that ongoing labour changes have raised significant concerns from a tax perspective. Whilst the magnitude and distribution of these changes may not yet be known, what is certain is that they have the potential to destabilise what is arguably the most important tax instrument worldwide, with wide economic and societal ramifications.

It is against this background that proposals for taxation of robots have emerged. Although there are significant variations on the basic design of the proposed taxes [21], as previously mentioned they share common aims: to act as a proxy tax for revenue loss; and/or, to function as a regulatory tax to slow down the process of automation. Either way a new tax on robots would be problematic. As a proxy tax, it is unlikely to be an effective instrument to achieve its aim. As a regulatory tax, it is likely to be an effective instrument to achieve its goal, but the goal itself is problematic. Both as a proxy and as a regulatory tax, a new tax on robots or their use would create many conceptual, economic and legal challenges.

First, until robots have legal capacity, taxing robots can only amount to taxing the use of robots [22]. This has various implications, not least the fact that, regardless of its aim, this tax would not be a proxy personal income tax, but a *de facto* tax on capital, i.e. an additional corporate tax. Second, insofar as a tax on robots may function as a regulatory tax to slow down the diffusion of robotics, there are again concerns. Slowing down comes at the expense of thecreation of broader economic inefficiencies [23], and large welfare losses [24]. Indeed, once robots become cheaper, or current low-skills workers retire, the gains achieved from taxing robots differently to other capital equipment are close to zero [25]. Third, the regulatory aim of any tax on robots is in itself problematic. Whilst there are clear immediate negative externalities to increased automation, it is also true that it would negate the productivity and welfare gains that would be made in addressing future global challenges such as demographic changes [26] - taxing the use of robots could in effect amount to "shootingone-self in the foot" [27]. Fourth, the 'superstar effect' provides a clear indication of the risks, from an international competition perspective, of introducing such a tax: in the absence of international coordination, the imposition of and additional tax burden on the use of robots would most likely reduce the competitiveness of companies located in that jurisdiction [28]. Finally, conceptually there would be enormous problems in designing such a tax on the income ofrobots. Many legal design issues arise [29], but from the outset defining what constitutes a robot for the purposes of this new tax, given the difficulty of measuring the work that has been replaced by the robot [30], is not only problematic, but a nearly insurmountable task [31].

Given the significant challenges that a new robot tax would raise, the question that arises is why the idea has nevertheless gained such traction.

III. WHY TAXING ROBOTS IS APPEALING

The choice of a robot tax as an instrument to address the challenges posed by automation may feel intuitive [32], but on closer analysis, it is far from obvious. It can be better explained through the lenses of behavioural science, than that of taxation principles, such as efficiency or equity.

There is now growing evidence that tax policy choices and perceptions are influenced by a variety of institutional biases, as well as cognitive biases and heuristics [33]. Proposals for a new tax on robots may be hard to justify from a legal and economic basis, but is easier to understand when consideration is given to those biases.

First, as a behavioural regulating tool, the question that arises –as with other proposals for regulatory taxes– is whether tax policy is the most appropriate instrument to address the aim that has been set [34]. However, whilst there is theoretical evidence that a robot tax would be an effective way of slowing the pace of automation [35], there is limited evidence to indicate that –even if desirable– that this could be achieved in a competitive setting, in the absence of global tax coordination.

As a substitution tool, to compensate for the decrease in personal income taxes' revenues and decrease in tax progressivity, the key question is whether a proxy tax is the most appropriate instrument to address that aim. Arguably, the most appropriate benchmark for assessing revenue collection levels or progressivity is either the overall tax system –the tax mix– or even the public finance mix, i.e. the tax and expenditure systems put together. Different taxes have different aims, and it is the composition of that tax mix that will determine revenue levels, and the impact of the tax system on inequality [36]. Yet, this is not how we tend to think about revenue collections or progressivity. In practice, much of the analysis –as well as public perceptions– focusses on individual taxes, tax-per-tax, rather than on the tax mix. This is largely a result of a framing heuristic.

Individuals tend to focus on the component of the tax system that they are asked to consider, and fail to consider information on other components of the tax system [37]: thus if the problem is framed as a personal income tax problem, the tendency will be to present a solution to resolve that problem, rather than a solution to resolve the decrease of revenue or progressivity problem. This is coupled with what has been identified as a tax disaggregation bias: an extension of the mental accounting heuristic [38], according to which

individuals have an intuition about what tax fairness ought to look like, and will judge the fairness of each tax individually, failing to take into account other elements of their tax system in their appraisal [39].

Second, tax policy design can often be attributable to a fundamental public finance paradox, often expressed by reference to a sentence attributed to US Senator Russel Long: "Don't tax you. Don't tax me. Tax that fellow behind the tree!" [40]. Whilst views on increasing the role of taxation on tackling inequality and redistributing wealth can be widely held [41], those views often translate in a wish that "others" pay taxes – someone else who is not like us [42].Robots are, of course, not only the ultimate others, but are particularly cool others [43].

Third, as others, robots spark ethnocentric feelings [44]. From the early days of cinema, and science-fiction literature, popular representations of robots have tended to anthropomorphise them in the context of a dystopian future [45]. From the 1980s onwards in particular, in films such as the *Terminator* (1984) or the *Matrix* (1999), robots are consistently represented as an existential threat to humans. Whilst generally popular representations are known to activate ethnocentric views [46], in the absence of anti-racism social norms, the othering of robots, and the manifestation of intra-group bias in relation to them, presentsitself as socially acceptable. There is no shortage of historical examples of taxation as a manifestation of ethnocentric feelings [47], and in that context, taxation of robots can be seen also as a protectionist tool: taxes as our last resource against the rise of Skynet and human annihilation.

Finally, institutional biases are likely to play a role. The ongoing labour developments as a result of automation generate uncertainty that is likely to be experienced asymmetrically between losers and winners: while losses are easily identified, gains are more uncertain [48], not least because there are no guarantees they will indeed take place. Therefore, whilst in the long-term robotics and automation may have positive effects on labour demand or productivity, in the short-term, the displacement effects –and the negative effects they carry– are more acutely felt. There is therefore a natural institutional bias towards the status quo, which can be manifested through an attempt to slow down the pace of change, and maintenance of existing (proxy) revenue streams, via the introduction of a new tax on robots. Dependency of existing levels of personal incometax revenues [49] is also likely to enhance this natural bias, as are legal entrenchment [50] and sunk cost fallacy.

IV. CONCLUSION

The debate over the economic and societal consequences of labour changes brought about by automation and digitalisation of the economy is ongoing. Whilst these is still much that we do not know [51], it is now clear however that in the short term those changes present significant challenges to tax systems worldwide. These challenges will be felt particularly by countries –like those within the OECD or the EU– which rely heavily on personal income taxes, both as revenue generators and as key instruments to ensure the progressivity of tax systems.

Tackling them, however, is unlikely to be resolved by the deceivingly simple introduction of a regulatory proxy tax on robots [52]; and rather more likely to necessitate the adoption of a multi-pronged approach. The choice of a particular tax instrument to tackle these challenges – or indeed any others – should be preceded by a two part-test suitability, as follows: *(i)* is tax policy the best way to address the challenges in question?; and *(ii)* if the answer is yes, then what is the best tax instrument to address them. It does not necessarily follow that personal income tax problems, should have personal income tax solutions. Tax policy discussions tend to be framed primarily in terms of key taxation principles, such as efficiency and equity. The proposal for taxation of robots –or their use– are yet further evidence that tax policy discussions are often determined more by unconscious and institutional biases, than those taxation principles. Acknowledging this reality will – perhaps rather paradoxically– result in more efficient and equitable tax systems.

REFERENCES

[1] A. Burdry Carbo et al, "Law Revolution des Avocats 2.0", *Le Temps*, 2 December 2016.

[2] Despite a few dissenting voices, see E. Benmelech and M. Zator, "Robots and Firm Investment" (2021) *NBER Working Paper* 29676.

[3] W. Dauth et al, 'The Adjustment of Labour Markets to Robots' (2021) *Journal of the European Economic Association* 19(6), 3104–3153.

[4] K Eggleston, Y.S. Lee and T. Iizuka, "Robots and Labor in the Service Sector: Evidence from Nursing Homes" (2021) *NBER Working Paper* 28322.

[5] D. Acemoglu and P. Restrepo, 'Automation and New Tasks: How Technology Displaces and Reinstates Labor' (2019) *Journal of Economic Perspectives* 33(2), 3-30; and D. Acemoglu, C. Legarge and P. Restrepo, 'Competing with Robots: Firm-Level Evidence from France' (2020) *American Economic Association Papers and Proceedings* 110, 383-388.

[6] W. Dauth et al, 'The Adjustment of Labour Markets to Robots' (2021) *Journal of the European Economic Association* 19(6), 3104–3153.

[7] G. Graetz and G. Michaels, 'Robots at Work' (2018) *Review of Economics and Statistics* 100(5), 753-768.

[8] P. Aghion et al, 'Artificial Intelligence, Growth and Employment: The Role of Policy" (2019) *Economie et Statistique* 510-512, 149-164.

[9] D. Autor et al, 'The Fall of Labour Share and the Rise of the Superstar Firms' (2019) *Quarterly Journal of Economics* 135(2), 645–709.

[10] J. Dixon et al, 'The Robot Revolution: Managerial and Employment Consequences for Firms' (2020) *NYU Stern School of Business*.

[11] R. Boyd and R. Holton, "Technology, innovation, employment and power: Does robotics and artificial intelligence really mean social transformation?" (2018) *Journal of Sociology* 54(3), 331-345; and N. Carr, *The Glass Cage* (New York: Norton, 2014).

[12] R. Baldwin, *The Globotics Upheaval – Globalization, Robotics and the Future of Work* (Weidenfeld & Nicolson, 2019).

[13] M.G. Lexer and L. Scarcella, "Artificial Intelligence and Labor Markets. A Critical Analysis of Solution Models from a Tax Law and Social Security Law Perspective" (2019) *Rivista Italiana di Informatica e Diritto*1, 54-73.

[14] K. Delaney, "The Robot that Takes Your Job Should Pay Taxes, Says Bill Gates", *Quartz*, 17 February 2017.

[15] European Parliament, *Report with Recommendations to theCommission on Civil Law Rules on Robotics* (2015/2103(INL)), 27 January 2017.

[16] T. Falcao, 'Should My Dishwater Pay a Robot Tax?' (2018) *Tax Notes International* 1273, June 11, 2018; R. Baldwin, *The Globotics Upheaval – Globalization, Robotics and the Future of Work* (Weidenfeld & Nicolson, 2019), at 11.

[17] R. Abbot and B. Bodenschneider, 'Should Robots Pay Taxes? Tax Policy in the Age of Automation' (2017) *Harvard Law and Policy Review* 12.

[18] R. de la Feria and G. Maffini, "The Impact of Digitalisation on Personal Income Taxes" (2021) *British Tax Review* 2, 154-168.

[19] OECD, *OECD Global Revenue Statistics Database*, https://www.oecd.org/tax/tax-policy/global-revenue-statistics-database.htm.

[20] M. Iosifidi and N. Mylonidis, "Relative Effective Taxation and Income Inequality: Evidence from OECD Countries" (2017) *Journal of*

European Social Policy 27(1), 57-76; D. Akgun et al (2017). "The Effects of the Tax Mix on Inequality and Growth", *OECD Working Paper* 79.

[21] For a review, see J. Englisch, 'Digitalisation and the Future of National Tax Systems: Taxing Robots' in W. Haslenher et al (eds), *Tax and the Digital Economy* (Kluwer Law International, 2019), 261-282; M.G. Lexer and L. Scarcella, "Artificial Intelligence and Labor Markets. A Critical Analysis of Solution Models from a Tax Law and Social Security Law Perspective" (2019) *Rivista Italiana di Informatica e Diritto*1, 54-73.; and V. Chand, S. Kostic and A. Reis, "Taxing Artificial Intelligence and Robots: Critical Assessment of Potential Policy Solutions and Recommendations for Alternative Approaches" (2020) *World Tax Journal* 12(4).

[22] X. Oberson, "Taxing Robots? From the Emergence of an Electronic Ability to Pay to a Tax on Robots or the use of Robots" (2017) *World Tax Journal* 9(3).

[23] T. Staubhear, 'On the Economics of Universal Basic Income' (2017) *Intereconomics* 2, 74.

[24] A. Humlum, 'Robot Adoption and Labor Market Dynamics', (2019) *Princeton Working Paper*.

[25] U. Thuemmel, 'Optimal Taxation of Robots' (2018) *CESifo Working Paper Series* 7317; and J. Guerreiro, S. Rebelo and P. Teles, "Should Robots be Taxed?" (2019) *NBER Working Paper* 23806.

[26] K. Eggleston et al, "Robots and Labor in the Service Sector: Firm-level Evidence from Nursing Homes" (2021) *NBER Working Paper* 28322.

[27] R. Mann, "I Robot: U Tax? Considering the Tax Policy Implications of Automation" (2019) *McGill Law Journal* 64(4), 763-807.

[28] J. Englisch, 'Digitalisation and the Future of National Tax Systems: Taxing Robots' in W. Haslenher et al (eds), *Tax and the Digital Economy* (Kluwer Law International, 2019), 261-282.

[29] M.G. Lexer and L. Scarcella, "Artificial Intelligence and Labor Markets. A Critical Analysis of Solution Models from a Tax Law and Social Security Law Perspective" (2019) *Rivista Italiana di Informatica e Diritto*1, 54-73.

[30] C. García Novoa, "Impuestos atípicos en la era post BEPS", in A. Cubero Truyo (ed.), *Tributos asistemáticos del ordenamiento vigente* (Valencia: Tirant lo Blanch, 2018), 223-224.

[31] T. Falcao, 'Should My Dishwater Pay a Robot Tax?' (2018) *Tax Notes International* 1273, June 11, 2018; and J. Englisch, 'Digitalisation and the Future of National Tax Systems: Taxing Robots' in W. Haslenher et al (eds), *Tax and the Digital Economy* (Kluwer Law International, 2019), 261-282.

[32] On the power of intuition in decision-making, see H. Mercier, *Not Born Yesterday – The science of Who we trust and What we believe* (Princeton University Press, 2020).

[33] R. de la Feria and M. Walpole, "The Impact of Public Perceptions on General Consumption Taxes" (2020) British Tax Review 67/5, 637-669, and literature cited therein.

[34] R. de la Feria and R. Ness, "The EU Financial Transaction Tax as an Unsuitable and Unnecessary Proxy Tax" (2016) *Canadian Tax Journal* 64(2), 373.

[35] A. Humlum, 'Robot Adoption and Labor Market Dynamics', (2019) *Princeton Working Paper*; and U. Thuemmel, 'Optimal Taxation of Robots' (2018) *CESifo Working Paper Series* 7317.

[36] D. Akgun et al (2017). "The Effects of the Tax Mix on Inequality and Growth", *OECD Working Paper* 79.

[37] E. McCaffery and J. Baron, "The Humpty Dumpty Blues: Disaggregation Bias in the Evaluation of Tax Systems" (2003) *Organizational Behaviour and Human Decision Processes* 91, 230-242.

[38] R. Thaler, "Mental Accounting and Consumer Choice" (1985) *Marketing Science* 4, 199-214; and R. Thaler, "Mental Accounting Matters" (1999) *Journal of Behavioral Decision Making* 12, 183-206.

[39] E. McCaffery and J. Baron, "The Humpty Dumpty Blues: Disaggregation Bias in the Evaluation of Tax Systems" (2003) *Organizational Behaviour and Human Decision Processes* 91, 230-242.

[40] M. Keen and J. Slemrod, *Rebellion, Rascals and Revenue* (Princeton University Press, 2021), at 132.

[41] S. Stantcheva, "Understanding Tax Policy: How Do People Reason?" (2020) *NBER Working Papers* 27699.

[42] M. Keen and J. Slemrod, *Rebellion, Rascals and Revenue* (Princeton University Press, 2021), at 132.

[43] P. Singer, *Wired for War – The Robotics Revolution and Conflict in the 21st Century* (New York: The Penguin Press, 2009), at 1.

[44] R. Baldwin, *The Globotics Upheaval – Globalization, Robotics and the Future of Work* (Weidenfeld & Nicolson, 2019), at 8 et seq. On the instrumentalisation of ethnocentric feelings generally, see M. Sobolewska and R. Ford, *Brexit Land* (Cambridge University Press, 2020), 85-118.

[45] The etymology of the word itself – from the Czech for 'forced labour'– points towards an anthropomorphised view of AI.

[46] D. Ang, "The Birth of a Nation: Media and Racial Hate" (2020) *Harvard Kennedy School Working Paper* No. RWP20-038.

[47] M. Keen and J. Slemrod, *Rebellion, Rascals and Revenue* (Princeton University Press, 2021), at 145 et seq.

[48] R. Fernandes and D. Rodrik, "Resistance to Reform: Status quo bias in the presence of individual uncertainty" (1991) 81 *American Economic Review* 1146.

[49] R. de la Feria and G. Maffini, "The Impact of Digitalisation on Personal Income Taxes" (2021) *British Tax Review* 2, 154-168.

[50] J. Bell, "Path Dependence and Legal Development" (2012) 87 *Tulane Law Review* 787; and S. Ranchordas, "One Foot in the Door: Evidence-Based Limits on the Legislative Mandate" (2018) *Hukim - Journal on Legislation* 207.

[51] R. Boyd and R. Holton, "Technology, innovation, employment and power: Does robotics and artificial intelligence really mean social transformation?" (2018) *Journal of Sociology* 54(3), 331-345.

[52] On the appeal of simple solutions in public policy, see C. Sunstein, *Simpler: The Future of Government* (Simon & Schuster, 2015).