



Robot taxation as a fiscal policy instrument for sustainable employment: A scoping review with implications for developing economies

Chanelle Kistnasamy , Kiran Baldavoo 

School of Accounting, Economics and Finance, University of KwaZulu-Natal,
Westville, KwaZulu-Natal, South Africa



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Abstract: *Purpose:* Automation often displaces workers without adequate retraining, leading to unemployment and reduced income tax contributions, which worsens income inequality. This study explores the rationale for implementing a robot tax to mitigate these effects.

Design/Methodology/Approach: Using a pragmatic research philosophy, the study conducts a qualitative scoping review following the framework of Arksey and O'Malley to examine the existing literature on the topic.

Findings: Automation reduces employment-based tax revenue and increases public financial pressure. A robot tax is proposed to offset lost income tax revenue, fund workforce retraining, and address tax policy biases that favour capital over labour. This approach supports responsible automation, reduces inequality, and fosters sustainable economic growth.

Implications/Originality/Value: The study contributes to a limited body of research on robot taxation and offers guidance on adapting tax systems to technological change. It serves as a resource for policymakers and researchers addressing the economic and social impacts of robotics, artificial intelligence, and automation.

Keywords: robot tax, automation, unemployment, tax revenue, South Africa

Sustainable Development Goals (SDGs): **SDG 8:** Decent Work and Economic Growth; **SDG 10:** Reduced Inequalities; **SDG 17:** Partnerships for the Goals



1. Introduction

In 1983, Nobel Laureate Wassily Leontief predicted that human labour would gradually be replaced by machines, much like tractors replaced horses in agriculture. Decades later, this prediction has become increasingly relevant as automation, robotics, and artificial intelligence continue to transform workplaces and displace human workers across various sectors of the economy. One significant implication of this technological shift is a decline in personal income tax revenue collected by the South African Revenue Service, leading to reduced government earnings and the possibility of widening fiscal deficits. Against this backdrop, this study examines the need to introduce a robot tax as a policy response to offset lost tax revenue while also supporting the retraining, reskilling, and upskilling of workers displaced by advancing technologies.

Current tax policies in South Africa and globally incentivise capital investment over labour. The South African Income Tax Act allows generous deductions for machinery and automation-related assets (for instance, s11D, s12C, s12E, and s12BA), but no equivalent tax advantages exist for labour costs. Employers face high labour expenses and mandatory payments for non-working hours, while capital goods incur no such “user fees.” The South African Reserve Bank reported a 29.2-point increase in labour costs between July 2017 and July 2020. Kovacev (2020) even refers to payroll taxes as an “excise tax” on employment- yet no such tax applies to automation.

Although automation provides consumers with lower prices and improved efficiency, it also contributes to rising unemployment and widening income inequality. Consequently, the debate over introducing a robot tax has attracted significant global attention. In 2017, European Union parliamentarian Mady Delvaux proposed adopting such a tax; however, the proposal was rejected due to concerns that it could hinder innovation. Prominent figures, including Bill Gates, Stephen Hawking, and Elon Musk, later expressed support for the concept. South Korea subsequently became the first country to introduce a form of robot tax by reducing tax incentives for automation.

Against this background, this study examines the global discourse on robot taxation and underscores the need for South Africa to consider similar policy measures. While considerable attention has been devoted to the effects of automation on employment and inequality, scholarly literature on practical policy responses, such as robot taxation, remains limited, particularly in the South African context.

2. Literature review

To address this study’s objective of identifying the need for implementing a robot tax, the literature was reviewed across three key themes. The first theme explored the context and background of a robot tax, including definitions of what qualifies as a “robot” and who would be liable to pay it. This foundational understanding is critical to shaping an enforceable and equitable policy.

The second theme examined criticisms of introducing a robot tax and considered alternative models proposed by scholars as substitutes or complements to it. These critiques highlight potential drawbacks, such as stifling innovation, and offer insight into more balanced policy approaches.

The third theme investigated the impact of automation and robotics on employment and government revenue, emphasising how automation has displaced workers globally and reduced income tax bases, thereby straining national budgets.

Importantly, the literature reviewed spans multiple countries and economic contexts, thereby enabling broader applicability. Global research collaboration enables faster progress by sharing knowledge across borders. With the aid of modern tools like digital databases, academic insights become widely accessible, benefiting both developed and developing nations. This cumulative knowledge accelerates problem-solving for complex issues, including taxation, inequality, and automation, underscoring the need for a global research approach to shaping policies such as the robot tax.

The exploration within this chapter was conducted through the lenses of three theoretical frameworks. The first theoretical framework was developed by Adam Smith (1776), known as Smith’s Four Maxims of Taxation. The second is Christensen’s Theory of Disruptive Innovation (1997). The final framework underpinning the review of related literature in this chapter is Arthur Cecil Pigou’s (1920) Pigouvian Tax Theory. The interrelation between the theoretical frameworks and this study’s research objectives and questions has been illustrated in the conceptual framework presented in this chapter.

2.1. Theoretical literature

Smith's four maxims of taxation

This literature review is framed using Smith's (1776) Four Maxims of Taxation: ability to pay, certainty, convenience, and efficiency. The first, also called the equity principle, holds that taxpayers should contribute in proportion to the benefits they receive. Applied to a robot tax, this highlights the need for a fair distribution of the tax burden between businesses that use robots and those that rely on human labour. The second maxim, certainty, requires that tax rules be clear, predictable, and consistently applied. For a robot tax, this includes clearly defining taxable activities, calculating liabilities, and identifying responsible taxpayers. The third maxim, convenience, emphasises minimising administrative and compliance burdens. A robot tax should be easy to administer and pay. The fourth, efficiency, advocates maximising revenue while minimising economic distortions and bureaucracy. These principles will guide the analysis of the literature, providing a structured framework to evaluate the viability and fairness of a robot tax.

Christensen's theory of disruptive innovation

Christensen's Theory of Disruptive Innovation (1997) serves as a key theoretical foundation for this study. Disruptive technology refers to innovations that initially target underserved markets but eventually displace established products and services. Similarly, the rise of robots, AI, and automation has disrupted the labour market, leading to increased redundancy and unemployment (Bhaumik, 2018; Ivanov & Smith, 2019). This disruption negatively affects South Africa's tax base by reducing personal income tax revenue. The theory highlights the ripple effects of technological disruption on the workforce and supports the case for a robot tax. Such a tax could slow automation, giving employees more time to adapt, upskill, or transition into new roles (Silken, 2019). It would also allow governments to design and implement retraining programs, thus reducing the shock of immediate displacement. A robot tax, therefore, acts as a buffer against rapid disruption, preserving employment levels and stabilising the tax focus.

The Pigouvian tax framework

Taxation has long been central to shaping economic policy and addressing market inefficiencies. One key tool is the Pigouvian tax, introduced by economist Arthur Cecil Pigou (1920) in *The Economics of Welfare*. Pigou argued for taxing activities that generate negative externalities, unintended costs imposed on third parties, such as pollution, to align private incentives with social welfare. By imposing a tax equal to the marginal external cost, these externalities are internalised, encouraging producers and consumers to reflect the true social cost of their actions.

Pigouvian taxes are intended to reduce harmful activities to socially optimal levels by making them more expensive. For instance, a polluting factory may lower emissions if taxed for its environmental impact. The distinction between private and social marginal cost is critical for identifying market failures.

Pigouvian principles are widely applied, notably in carbon taxation, which is already implemented in countries such as South Africa, Sweden, Japan, and Canada, with others, such as Brazil and Turkey, considering adoption (Lai, 2021).

Pigouvian taxation aims to correct market inefficiencies by internalising external costs. Carbon taxes, for instance, are used to curb greenhouse gas emissions and mitigate climate change (Fullerton & Metcalf, 1997). Beyond environmental concerns, Pigouvian taxes also extend to health-related externalities, such as taxes on tobacco, alcohol, and sugary beverages. In South Africa, "sin taxes" are imposed on alcohol and tobacco (Choate, 2024), while the Health Promotion Levy targets sugar-sweetened drinks (Service, 2021). These taxes not only discourage harmful consumption but also generate revenue to address associated social costs (Fullerton & Metcalf, 1997).

Applying this framework to modern challenges, the rapid advancement of artificial intelligence and automation produces negative externalities, specifically, job displacement and widening income inequality. A robot tax could function as a Pigouvian tool by taxing automation and allocating the revenue toward reskilling programs or social protection schemes. This aligns with Pigou's (1920) call to identify and address emerging externalities absent from current tax systems.

While critics argue that such a tax may hinder technological innovation (Gonzalez, 2022), its intent is not to halt progress but to mitigate societal harm by introducing economic disincentives (Pettinger, 2024). Therefore, the Pigouvian tax framework provides a strong theoretical foundation for evaluating the implementation and potential benefits of a robot tax (Mazur, 2019).

Among the theories considered, the study finds the Pigouvian Tax framework as the most appropriate because it directly justifies taxation as a corrective mechanism for negative externalities. Automation and robotics often generate social costs such as unemployment and income inequality. A robot tax, therefore, aligns with the Pigouvian perspective by seeking to mitigate these adverse effects while promoting sustainable employment, social welfare, and balanced economic development in developing economies.

2.2. Empirical review

Understanding a robot tax: The background

A robot tax is a proposed levy on AI and automation use, aimed at curbing job displacement, reducing inequality, and compensating for lost income tax revenue (Seamans, 2021; Bottone, 2017): ... as robotics and artificial intelligence increasingly substitute for human labour without adequately compensating for lost employment opportunities, growing concerns emerge regarding unemployment, the sustainability of social welfare systems, and reduced pension contributions. If existing tax frameworks remain unchanged, economic wealth and influence may become increasingly concentrated and unevenly distributed. To maintain social cohesion and shared prosperity, consideration should be given to taxing robotic labour or introducing usage levies to finance welfare support and retraining programmes for displaced workers (Delvaux, 2017, p. 4).

The European Parliament rejected the 2017 robot tax proposal due to concerns about its potential impact on innovation and debates surrounding the classification of robots as electronic persons (Europeia, 2017). Shortly thereafter, Bill Gates argued that “the robot that takes your job should pay taxes” (Gates, 2017), a position similarly echoed by Elon Musk, who advocated for a universal basic income to support workers displaced by automation (Clifford, 2016). However, Nobel laureate Robert Shiller observed that such policy measures often face public resistance because they may be perceived as demeaning to beneficiaries: ... higher taxes on high incomes, often introduced during wartime, tend to be temporary. Many view taxing the successful to support the less successful as demeaning, even to recipients. Politicians rarely promote such policies. To address inequality from robotisation, taxes should be reframed. Taxing robots, rather than high earners directly, may be more politically acceptable and sustainable. This approach could still raise taxes on high incomes if they result from replacing human workers with automation (Shiller, 2017, para.11).

Shiller advocates for a moderate robot tax rather than higher taxation on high-income earners, arguing that it is likely to be more politically acceptable and economically sustainable (Shiller, 2017). In 2015, South Korea recorded the highest level of industrial automation globally, with 533 robots per 10,000 workers (Sung-won, 2017). Amid growing concerns about unemployment, the country became the first to introduce an indirect form of robot taxation by restricting tax incentives on capital investments (Silken, 2019). During this period, unemployment declined from 3.7% in 2017 to 2.5% in 2024 (Statista, 2023; Data, 2024). However, it remains difficult to isolate the direct effect of the tax policy due to limited and confounding data. Notably, new robot installations fell in 2017 for the first time since 2012, although attributing this decline solely to the policy is not conclusive (Kovacev, 2020). The discussion of a robot tax is further developed in the next section, which examines how “robots” may be defined to make taxation feasible.

Definition of a robot

A key challenge in implementing a robot tax is defining what qualifies as a “robot” (Marwala, 2018). The International Standards Organisation (ISO 8373) defines a robot as a programmed, actuated mechanism with autonomy to perform tasks like manipulation or locomotion (Organisation, 2012). The European Parliament (2017) adds that a robot must interact with its environment, have autonomy, and lack biological life. South Korea, the first country to implement a form of robot tax, defines a robot as a machine that autonomously recognises and responds to its environment (Young Lim Choi, 2019). Artificial intelligence, according to the same charter, mimics human functions like learning, reasoning, and language processing. These definitions suggest a robot is any machine capable of autonomous task execution.

However, some argue that “robot tax” is too narrow to cover all technologies displacing labour. Alternatives such as “automation tax” are preferred, especially for sectors that use self-service systems or digital processes (James, 2020). Distinctions between narrow, strong, and super-intelligent AI further complicate this debate (IBM Data and AI Team, 2023). The complexity of defining automation technologies underscores the challenge in crafting inclusive tax policies to

address labour displacement, caused by the Fourth Industrial Revolution (Acemoglu & Restrepo, 2022).

Who will pay the robot tax?

For robots to pay taxes, they need legally recognised personalities for tax purposes (Bogenschneider, 2020; Kisska-Schulze and Mock, 2020; Kovacev, 2020), just as companies are recognised legal entities responsible for corporate taxes.

Juristic personality, or legal personality, is an entity's ability to have rights and responsibilities like a natural person. In South Africa, it includes companies, government bodies, and non-profits (Schulenburg, 2024, para. 2).

Entities with juristic personality can own property, enter into legal proceedings, incur liabilities, enter into contracts, and pay taxes (Schulenburg, 2024). Since companies have legal personality, robots could too (Konusu, 2018). However, the European Parliament rejected this in 2017, and the European Commission's 2019 Expert Group also opposed it, stating that: ... there is no need to grant legal personality to emerging digital technologies. Harms from autonomous technologies can usually be linked to natural or existing legal persons, and new laws targeting individuals are preferable. Granting legal personality raises ethical issues and should only be considered if it helps address these challenges. Additionally, such entities must have funds to handle claims (Bertolini, 2020, p. 68).

To bypass this issue, Oberson (2019) suggests taxing the robot's income. If robots had legal tax personality, they could register as VAT vendors, allowing VAT on their taxable supplies. They could also claim input VAT as consumers (Oberson, 2019). Since capital assets used by companies aren't taxed directly, only their revenue is, which raises the question of why robotic assets should be taxed differently.

The design and purpose of a robot tax

A robot tax should be designed with its purpose in mind, affecting taxpayers and tax amounts accordingly (James, 2020). Guerreiro, Rebelo, and Teles (2017, 2020) studied the impact of automation in the U.S. using a model of routine and non-routine workers. They found that lowering automation costs would increase income disparity if taxes remain unchanged. Testing flat robot tax rates up to 5.7%, they observed that higher robot taxes reduce the wage premium for non-routine workers. The study concluded that taxing robot use could shift wage premiums, benefit routine workers and improve welfare (Guerreiro, Rebelo, & Teles, 2022).

Reduced capital tax incentives

Since 2017, South Korea's robot tax has reduced tax incentives for industrial automation investments by 2%, aiming to slow worker replacement by machines and protect the country's tax revenue (Fitness, 2023).

Neutralising current tax policy

Abbott & Bogenschneider (2018) argue policymakers must revise tax policies to ensure equality between humans and robots (Bottone, 2018; Oberson, 2019). They recommend removing income tax deductions for capital expenditure and limiting amortisation and depreciation of automation. This would stop write-offs once a certain automation level is reached. Alternatively, VAT input claims on capital expenditure could be disallowed, aligning with South Korea's robot tax approach.

Imputed income tax

Oberson (2017), a proponent of robots having legal personality, recommended a robot tax design in which imputed income is taxed. He explained it as follows: If robots gain legal personality, they could have tax responsibilities like humans. Their activities, such as work and the transfer of goods, would be taxable.

If employed by companies, a tax could be imposed on the hypothetical salary robots replace, taxing the amount human workers would have earned for the same work (Oberson, 2017, p. 254).

Mazur (2019) explored taxing robots based on an imputed hypothetical salary, simplifying tax administration by applying income and payroll taxes like for humans, payable to the robot or owner

if robots had legal personality. However, Mazur noted a flaw: robots often perform partial tasks, complicating links to replaced workers; for example, a floor-cleaning robot handling easy areas while a human cleans harder spots (Stahle, 2022).

Impact of automation on employment

The manufacturing sector first adopted automation (Westkämper, 2007), and advances in Robotics, Artificial Intelligence, and Automation (RAIA) have since spread across many sectors to reduce costs, speed production, and improve quality (Webster & Ivanov, 2019). RAIA now impacts supply chain management, farming, military, tourism, education, law, finance, and medicine (Baryannis et al., 2019; Ivanov, 2017; Remus & Levy, 2017; Miller & Brown, 2018). Examples include chatbots and self-driving vehicles (Xu et al., 2017; Tian et al., 2018).

However, RAIA often replaces routine jobs, reducing human work hours (Forum, 2018; Guerreiro et al., 2022). McKinsey (2017) found that 51% of U.S. activities could be automated; in South Africa, 35% of jobs are at risk of automation (Roux, 2018), a concern given the country's 32.6% unemployment rate (Stats, 2021). Some argue automation creates new jobs but requires costly retraining (Abbott & Bogenschneider, 2018; Malik, 2024).

Bill Gates proposed a robot tax to help cover these costs (French, 2017). South Africa offers tax incentives for skills development, but these reduce government revenue indirectly ("Tax Break Incentives," 2024). Capital costs have decreased, while labour costs have risen, making automation more attractive under current tax laws (Trading Economics, 2020; Abbott & Bogenschneider, 2018). South African tax law allows full and accelerated depreciation on machinery (S11D, S12E, S12C), unlike labour costs, which are taxed more heavily (South African Income Tax Act, 1962).

Profits from automation are taxed at a lower rate than payroll taxes (Mazur, 2019). To maintain fair taxation and preserve the tax base amid shifts in employment, tax policies should be reformed to balance incentives between human labour and automation (Abbott & Bogenschneider, 2018; Mazur, 2019).

Impact of automation on the tax fiscus

Hotte, Theodorakopoulos, and Koutroumpis (2022) conducted the only known study examining whether automation erodes a country's tax revenue. They analysed tax data from 19 EU countries between 1995 and 2016, breaking down tax revenue into categories such as income, corporate, payroll, and VAT. Their model found that automation negatively affected tax revenue from 1995 to 2007, but had no effect after 2008. They concluded automation affects taxation in stages with varying impacts. Due to limited evidence, no definitive link between automation and tax revenue can be confirmed, highlighting the need for further research in this area.

3. Research methodology

Research design

The research design outlines the procedures for collecting, analysing, and presenting study results (Kumar, 2019). It links gathered data to the research questions and conclusions (Creswell & Poth, 2016). This study aimed to explore the feasibility of implementing a robot tax and provide recommendations for its application. Research methodology depends on the data type and research objectives (Taguchi, 2018; Siedlecki, 2020).

Quantitative research involves numerical data and statistical analysis, offering objectivity and generalizability (Bell, Bryman, & Harley, 2022; Khaledi, 2014).

This study used a qualitative approach, analysing non-numerical data from existing literature via a scoping review. The five-step framework by Arksey and O'Malley (2005) guided this review to map research on robot tax. Scoping reviews summarise the literature, identify key concepts and research gaps, and inform policy (Daudt, Van Mossel, & Scott, 2013; Mays, Roberts, & Popay, 2004). They accommodate diverse study designs and are suitable for complex or underexplored fields (Davis, Green, & Reed, 2009; Peters et al., 2015; Sucharew & Macaluso, 2019). Given the variety of data sources, traditional meta-analyses were impractical, making a scoping review the most reliable approach for this research. Arksey and O'Malley (2005) presented a methodological structure for a scoping review that consists of the following five steps:

- i. Phase 1: Research question identification;
- ii. Phase 2: Relevant articles identification;
- iii. Phase 3: Study selection;

- iv. Phase 4: Data charting; and
- v. Phase 5: Compiling, summarising, and chronicling the research results.

Phase 1: Research question identification

The first step in Arksey and O'Malley's (2005) scoping review is formulating the research question. This study's question is, "What does the existing literature reveal about the feasibility, opportunities, and challenges of implementing a robot tax as a fiscal policy instrument?" However, the study systematically excludes likely inherent risks associated with the opportunities, which may create structural confirmation bias throughout the study.

Phase 2: Relevant articles identification

To ensure comprehensive and reproducible coverage, published studies were gathered from seven electronic databases: Google Scholar, Scopus, Web of Science, SSRN, EconLit, JSTOR, and UCT OpenUCT. In addition, grey literature was systematically searched across four sources: OECD reports and working papers, Asian Development Bank (ADB) Governance Briefs, IZA Policy Papers, and World Economic Forum (WEF) reports. Grey literature sources were included in the final data extraction table, with explicit labelling, given their policy relevance to the research question (Arksey & O'Malley, 2005). Studies published in languages other than English were excluded due to resource constraints, potentially leading to relevant research being missed (Arksey & O'Malley, 2005; Pham et al., 2014).

The search was conducted between 2018 and 2026. The following search terms were applied consistently across all databases:

Primary terms: "robot tax", "automation tax", "taxing robots", "robot taxation"

Extended terms: "automation and fiscal policy", "AI taxation", "digital labour tax", "fourth industrial revolution tax revenue", "technology displacement tax", "capital-labour tax neutrality", "automation and income tax revenue", "opportunities of a robot tax", "should robots be taxed", "empirical evidence on robot taxation"

The search began with each database independently, after which a snowball method was applied – reviewing reference lists within identified papers to surface additional studies (Hepplestone et al., 2011). This process continued until no new relevant articles were identified.

The search question "robot taxation" guided the database search strategy. After an initial test search, adjustments were made to refine the approach (Matenda, Sibanda, Chikodza, & Gumbo, 2021). The final search terms focused on identifying challenges, opportunities, and implementation recommendations for a robot tax, including phrases like "opportunities of a robot tax," "should robots be taxed," and "empirical evidence on robot taxation." The search began with Google Scholar, initially applying date limits. The search involved pooling relevant papers and using a "snowball" method, reviewing references within found papers to identify further studies (Hepplestone et al., 2011; Jaskiewicz & Tulenko, 2012). This approach continued until no new articles were found. The study focused exclusively on 21st-century literature, reflecting the contemporary nature of robot taxation (Selebogo, 2020).

Phase 3: Study selection

Sometimes the selected search strategy returned unsuitable papers because the scoping review prioritised breadth over depth. Studies that did not address the primary research question were removed. Duplicate references were also eliminated to ensure impartiality and avoid overrepresentation.

Eligibility criteria

Inclusion and exclusion criteria were based on carefully chosen standards to ensure quality and unbiased comparison. Following Arksey and O'Malley (2005), the main research topic guided these criteria. Although scoping reviews allow diverse sources, only peer-reviewed publications were examined to enhance the legitimacy of the study (Baxter & Jack, 2008). Research included focused on the merits of implementing a robot tax, while studies on robots used for tax collection were excluded. Additionally, only English-language publications were considered to maintain consistency and accessibility.

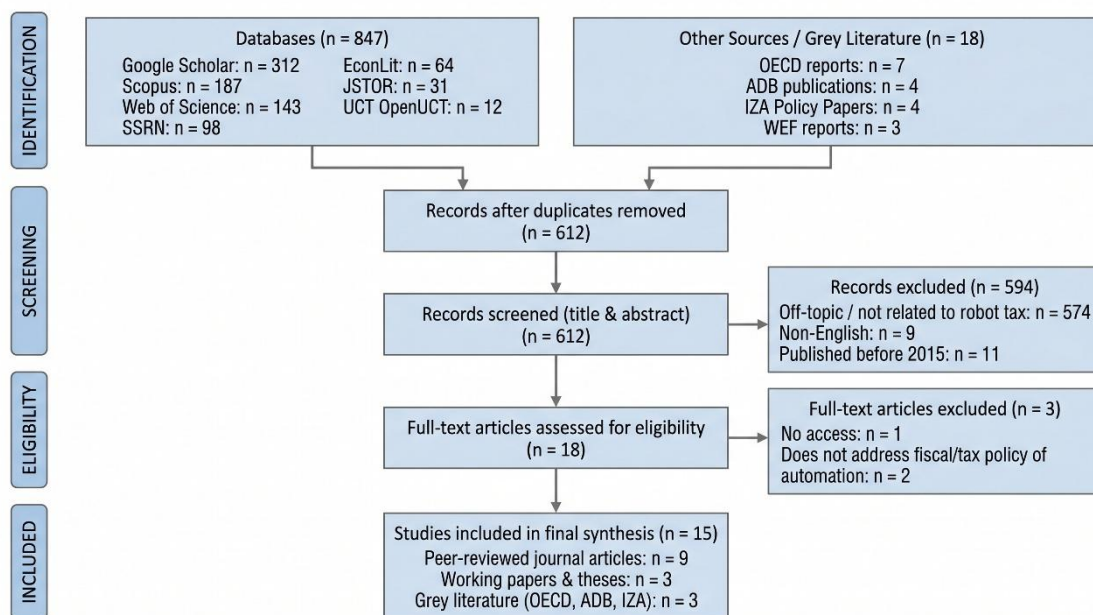
Title and abstract suitability vetting

Pham et al. (2014) state that titles and abstracts are initially screened to exclude irrelevant studies, using a pretested form (see Appendix A). If insufficient, the introduction or conclusion is reviewed. If still unclear, the full publication is examined to decide on inclusion in the review.

Data collection

Database searches across seven sources yielded 847 records. An additional 18 sources were identified through systematic grey literature searching. After removing duplicates ($n = 612$) and screening by title and abstract against the eligibility criteria in Appendix A, 18 full-text articles were assessed for eligibility. Three were excluded with documented reasons (no access to full text: $n = 1$; does not directly address fiscal or tax policy implications of automation: $n = 2$), resulting in 15 studies included in the final synthesis. Figure 1 illustrates the full selection process following the PRISMA-ScR framework (Page et al., 2021).

Figure 1: PRISMA-ScR Flow Diagram of the study selection process



Source: Authors' own creation (2026), adapted from PRISMA 2020 (Page et al., 2021)

Phase 4: Data charting

In this step, key findings from evaluated research were analysed and charted using Ritchie and Spencer's (2002) method for organising qualitative data. Following Arksey and O'Malley's (2005) descriptive-analytical approach, the same framework was applied to all articles. Data was recorded on a charting form (see Appendix B) as detailed by Matenda et al. (2021):

- author(s)
- publication year
- the title of the study
- aim of the study
- technique/ research methodology
- opportunities

Phase 5: Compiling, summarising, and chronicling the research results

The study's results were compiled and reported. Sucharew & Macaluso (2019) note scoping reviews focus on information diversity rather than quantitative counts. This involved charting data, evaluating selected studies, and providing a narrative description explaining findings and outlining key debates supported by the extensive available literature.

4. Results

Based on the readings in Table 1, relevant conclusions have been formed that indicate the following:

- a. Adapting current tax systems is essential to addressing the challenges posed by an increasingly automated economy.
- b. This adaptation will balance the economic advantages of automation with the need to safeguard societal welfare, as corporate profits currently grow at the expense of rising unemployment rates.
- c. Automation in the workplace reduces income tax revenues and places additional strain on public finances to support the unemployed through social benefits.
- d. A robot tax presents an opportunity to offset lost income tax revenue and to provide funding for workforce retraining programmes for those displaced by automation, thereby alleviating unemployment.
- e. A robot tax offers a solution to correcting biases in tax policies that currently incentivise capital assets over human assets.
- f. A robot tax serves to counteract the decreasing cost of capital and promotes a more responsible use of automation in the workplace.
- g. A robot tax, therefore, has the potential to reduce income inequality.
- h. A robot tax could serve as a policy tool to address the economic and social impacts of automation.
- i. These measures balance industrial progress with the broader goal of protecting societal welfare and promoting sustainable economic growth.

Oberson (2019) is a key proponent of the robot tax, addressing several challenges raised by its critics. A major concern is the definition of a "robot" for tax purposes. With the evolving nature of artificial intelligence and automation, limiting the tax to physical robots may be inadequate, as software, bots, or algorithms can perform similar tasks. Conversely, an overly broad definition might discourage the adoption of labour-enhancing technologies. Oberson thus recommends a functional definition based on a robot's impact on the labour market. In this context, robots include physical machines, algorithms, and bots that replace human labour.

Oberson acknowledges the concern of double taxation- since robots contribute to profits already taxed under corporate income taxes, an additional robot tax might seem duplicative. However, he distinguishes between ordinary capital assets and robots that replace human workers, arguing that the tax should specifically target the labour-substitution role of robots. The design and purpose of the tax should reflect this distinction to avoid unfair duplication.

Addressing the argument that robot taxation may hinder innovation, Oberson counters that automation often leads to higher productivity and increased revenues, which are taxed regardless. He draws a parallel to intellectual property taxation, which has not historically hindered research or development.

Despite these theoretical defences, Oberson concedes the practical difficulties of implementing a robot tax. These include identifying the responsible taxpayer, defining the tax base, setting tax rates, and managing the shifting nature of robot functions. Still, he insists that, just as tax systems have evolved in response to the digital economy, they must now adapt to the automation era while staying grounded in established tax principles.

Another challenge is international tax competition, as robots and AI can easily move across borders. However, Oberson believes global coordination- akin to previous international efforts against money laundering and for tax transparency- is possible. He advocates cooperative strategies among states to prevent tax avoidance and to develop harmonised standards.

Oberson outlines three major opportunities for the robot tax. First, it can help restore declining personal income tax revenues, which are being driven by automation-induced unemployment. Second, it can establish tax neutrality between human labour and robotic alternatives, reducing incentives to replace workers purely for tax savings. Third, he envisions a future where robots themselves- not just their activities- are directly taxed, similar to how corporations are taxed today. This would require international collaboration to avoid unfairly taxing both the robot and its output.

To mitigate the loss of income tax revenue, Oberson proposes an "imputed salary" model, where the value of a robot's work is assigned a hypothetical wage equivalent to what a human would earn for the same job. This notional salary could form the basis for taxation. While recognising the complexity of determining such salaries, Oberson suggests using market comparisons to estimate them. However, because corporate tax rates are typically lower than personal income tax rates, this approach alone may not fully offset the lost revenues. Nonetheless, Oberson argues that reduced salary deductions will raise taxable profits, partially compensating for the shortfall. In sum, Oberson

(2019) presents a comprehensive, future-focused framework for robot taxation that balances economic efficiency, fairness, and adaptability.

Bogenschneider (2022) conducted a technical analysis of literature from 2018 to 2022, examining empirical data on robot tax policies. The key finding was that investment in robots and capital assets is more prevalent in high-tax countries such as Germany, South Korea, Japan, and the Nordic nations. These countries offer greater tax deductions on capital investments, in contrast to tax havens like Ireland and the Cayman Islands, which provide no capital allowances and exhibit very low robot density. By plotting tax rates against GDP per capita, Bogenschneider found a strong correlation: higher tax rates often align with higher GDP per capita. He concluded that tax incentives on robot investments encourage reinvestment in the local economy, thereby facilitating economic growth. Thus, robot taxes should be seen as essential tools for sustainable development.

Bottone (2018) focused on the impact of artificial intelligence in production, particularly its displacement of low-skilled or routine workers. Drawing on data from the International Federation of Robotics, Bottone highlighted the growing need for public investment in retraining and upskilling displaced workers. A robot tax, he argues, could fund such initiatives while addressing the loss of labour tax revenue. Additionally, it could restore tax neutrality by balancing current incentives that favour capital investment over labour. To address rising wage disparities and the costs of automation, Bottone supports taxing robot output rather than imposing a tax on imputed robot salaries, which are difficult to calculate. He recommends implementing the tax through VAT, though he warns this could lead to double taxation if not carefully designed. Bottone concludes that, due to the potential for tax avoidance, a robot tax must be part of a coordinated international effort to ensure effectiveness and fairness in the global economy. Rahman and Afriza (2024) conducted a mixed-methods study on the feasibility of implementing a robot tax in Indonesia, highlighting both its potential benefits and challenges. They argued that a robot tax could balance the economic gains from automation with the need to address its negative social effects. Specifically, it could generate additional tax revenue to fund social programs such as unemployment benefits, basic income, and retraining initiatives, especially for workers in routine and repetitive jobs in manufacturing and agricultural sectors, which are highly vulnerable to automation.

Their study emphasised that retraining displaced workers would enable smoother transitions into other sectors, reducing automation-induced unemployment. Another key benefit is that a robot tax could encourage more responsible automation practices. If automation remains unregulated, it may lead to widespread job loss and increased inequality. While acknowledging the potential disincentive effect of such a tax, Rahman and Afriza view it positively- it discourages firms from replacing humans entirely and instead promotes human-robot collaboration.

They further noted that without intervention, the wealth generated by automation largely benefits capital owners, worsening income inequality. A robot tax, therefore, presents an opportunity for wealth redistribution and improved public services. Lastly, they concluded that such a tax could incentivise firms to retain human workers, positively impacting employment levels in Indonesia.

Table 1: Summary of literature

Aim of the study	Research methodology	Need for a robot tax
Oberson (2019): Taxing robots: Helping the economy to adapt to the use of artificial intelligence		
To critically discuss and analyse the possibilities and impact of a robot tax	Review of literature	1) A robot tax will be a source of additional tax revenue and supplement the reduced income tax base caused by unemployment. 2) A robot tax would enable neutrality between human labourers and robots. 3) The possibility of taxing the actual robot in the future.
Bogenschneider (2022): Empirical Evidence on Robot Taxation: Literature Review and Technical Analysis		
To review the empirical evidence of studies done on robot taxation	Literature review and technical analysis	1) The robot density in countries is directly correlated with the level of corporate tax rates; therefore, "taxes levied on robots should be presumed as necessary to facilitate economic growth."
Bottone (2018): A Tax on Robots? Some food for thought.		
To address the possible design and the effects of the introduction of a robot tax.	Literature review	1) A robot tax would provide a source of funding for the retraining of previously displaced workers. 2) Aid in balancing the taxation of capital and labour. 3) A robot tax would aid in balancing the rising labour cost with the declining cost of capital.
Rahman and Afriza (2024): Artificial Intelligence and Robot Tax Regulation in Indonesia: Prospect and Challenges		

<p>“This article aims to provide an overview of the future of work as AI has influenced economic regulation. Besides that, this article provides the AI regulations, and economic policies to assess their adequacy in addressing the challenges posed by AI.”</p>	<p>Mixed methodology</p>	<ol style="list-style-type: none"> 1) A robot tax allows a government to reap the benefits of using automation while reducing the disruptions caused in the workforce. 2) The revenue from a robot tax could fund social benefits, grants and retraining programmes. 3) A robot tax would encourage the responsible use of automation. 4) A robot tax helps to minimise the income inequality gap. 5) A robot tax may incentivise the employment of humans over robots.
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Refer to Appendix B on the following page

Source: Authors' creation (2025)

5. Discussion

The findings of this scoping review confirm that robot taxation represents a viable and necessary fiscal policy response to automation-induced employment displacement. Across all four included studies, a consistent theme emerges: existing tax systems create structural bias in favour of capital investment over human labour, which a robot tax could correct (Oberson, 2019; Abbott & Bogenschneider, 2018; Bottone, 2018).

The review identifies three primary mechanisms through which a robot tax could benefit developing economies such as South Africa. First, it would partially offset declining personal income tax revenues caused by automation-induced unemployment. Second, it would generate funding for workforce retraining programmes. Third, it would act as a Pigouvian corrective instrument by internalising the social costs of automation, including unemployment and rising income inequality (Pigou, 1920).

However, the evidence base remains limited. The only empirical study on the direct relationship between automation and tax revenue erosion (Hotte et al., 2024) found inconclusive results, underscoring the need for further country-specific research, particularly in African contexts. Implementation challenges, including the absence of a universally accepted definition of "robot," the risk of double taxation, and potential negative effects on innovation, require careful policy design and international coordination before any robot tax framework can be operationalised (Oberson, 2019; Gonzalez, 2022).

For South Africa specifically, the structural asymmetry between capital and labour taxation (sections s11D, s12C, s12E, s12BA of the Income Tax Act) combined with a 32.6% unemployment rate (Stats SA, 2021) and 35% automation risk exposure (Roux, 2018) creates a compelling policy case for exploring robot tax mechanisms adapted to the country's development context.

6. Conclusion

The advancement of robotics, artificial intelligence, and automation across successive Industrial Revolutions has resulted in their extensive integration into global industries (Ivanov, 2019). However, this transformation has also led to significant job displacement, especially among workers engaged in routine and low- to medium-skilled occupations, thereby contributing to rising unemployment. Consequently, governments are experiencing a narrowing tax base, as reductions in personal income tax and value-added tax (VAT) revenues result from lower employment levels and diminished consumer spending.

At the same time, public spending increases due to rising demand for unemployment benefits and social grants. Using Arksey and O'Malley's (2005) five-phase scoping review framework, this study examined literature on robot taxation. The review identified key motivations for implementing a robot tax: generating additional government revenue, addressing income inequality by redistributing wealth created by automation, and promoting the responsible use of robotics and AI. These themes underscore the need for policy responses to mitigate the fiscal and social impacts of technological advancement:

- a. A robot tax would serve as an additional source of tax revenue to offset revenue losses from personal income taxes resulting from automation-induced job displacements (Oberson, 2019; Rahman & Afriza, 2024).
- b. The implementation of a robot tax facilitates an equilibrium of existing tax provisions globally, which currently incentivise the employment of capital assets over human assets in the workforce (Abbott & Bogenschneider, 2018; Bottone, 2018; Oberson, 2019).

- c. The consequential higher level of taxation in a country due to the introduction of a robot tax would be matched by higher investment in capital assets, as higher-tax jurisdictions typically allow larger tax credits. The culmination of this domino effect would be improvements in that country's gross domestic product and overall economic growth (Bogenschneider, 2022).
- d. The revenue generated from a robot tax could fund programmes to retrain and upskill employees who have been made redundant and displaced by automation (Bottone, 2018; Rahman & Afriza, 2024).
- e. A robot tax would offset the declining cost of capital, making it more comparable to the cost of employing humans, which is increasing (Bottone, 2018).
- f. The additional tax revenue could also be utilised to fund unemployment benefits and universal basic income grants, which may be necessary given the unemployment caused by automation (Clifford, 2016; Oberson, 2019).
- g. A robot tax would encourage companies to use robotics, artificial intelligence, and automation more responsibly, regarding their impact on their human workforce (Rahman & Afriza, 2024).
- h. The income inequality gap between the "rich" and the "poor" in a country would be curtailed (Delvaux, 2017; Rahman & Afriza, 2024).
- i. Existing tax systems must adapt to an increasingly automated economy to balance the benefits of automation with the protection of societal welfare. While automation boosts corporate profits and cash flows, it also leads to rising unemployment, reducing income tax revenues and increasing reliance on social benefits, thereby straining the tax fiscus. A robot tax could address these issues by correcting biased tax policies and offsetting the falling cost of capital, encouraging more responsible use of automation. This would help reduce income inequality and support fairer economic outcomes. Revenue from the robot tax could replace lost tax income and fund retraining programs for displaced workers, further safeguarding social welfare.

Governments worldwide must take swift action to reduce the threat robotics, AI, and automation pose to employment and the tax base (Abbott & Bogenschneider, 2018; Mazur, 2019). Introducing a robot tax directly addresses this issue (Oberson, 2019; Rahman & Afriza, 2024). These scholarly findings support the study's conceptual framework, drawing from Christensen's Theory of Disruptive Innovation (1997) and Pigouvian tax theory (Pigou, 1920). Specifically, a robot tax can help slow workplace disruptions and job losses (Bottone, 2017), while also generating alternative tax revenue to support social welfare and economic stability.

Future research should define the term "robot" clearly for tax purposes and determine an appropriate tax rate or scale that ensures fairness among all stakeholders. Additional studies are needed to provide empirical evidence on whether a robot tax would significantly hinder innovation. Research should also assess whether revenue from a robot tax could offset losses in personal income tax caused by automation-induced unemployment, or at least estimate the potential tax revenue.

In conclusion, a robot tax can help balance the economic gains from robotics, AI, and automation against the societal costs of job displacement. This study highlights the importance of transforming theoretical discussions into practical policy solutions. It supports implementing a robot tax to ensure the benefits of automation are shared equitably, helping preserve employment and stimulate responsible innovation. The findings serve as a valuable guide for policymakers working to design tax frameworks that support both technological advancement and the broader public interest.

Conflicts of interest

The authors declare no conflict of interest.

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Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this manuscript, the authors used Grammarly to enhance the clarity, grammar, and readability of the English language text. Grammarly was employed solely for language

editing purposes, including correction of grammatical errors, improvement of sentence structure, and refinement of word choice.

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Appendix A: Title and abstract screening form

Study: Robot taxation as a fiscal policy instrument for sustainable employment: A scoping review with implications for developing economies

Authors: Kistnasamy, C. & Baldavoo, K.

PART 1: BIBLIOGRAPHIC DETAILS

Record ID: _____

Author(s): _____

Year: _____

Title: _____

Database / Source: _____

Type: Peer-reviewed Working paper Thesis Grey literature

PART 2: ELIGIBILITY CHECKLIST (Y = Yes / N = No / U = Unclear)

Inclusion criteria:

IC1 – Published in English [Y / N / U]

IC2 – Published in or after 2000 [Y / N / U]

IC3 – Addresses taxation of robots/automation/AI [Y / N / U]

IC4 – Discusses opportunities, feasibility or
design of a robot/automation tax [Y / N / U]

IC5 – Peer-reviewed, policy report (OECD/ADB/IZA),
or academic thesis [Y / N / U]

Exclusion criteria:

EC1 – Addresses robots used FOR tax collection
(not taxation OF robots) [Y / N / U]

EC2 – Duplicate of already-included record [Y / N / U]

EC3 – Does not address fiscal/tax policy
implications of automation [Y / N / U]

EC4 – Full text unavailable [Y / N / U]

PART 3: DECISION

INCLUDE — proceed to full-text review

EXCLUDE — reason: _____

UNCERTAIN — refer to full text

Screener: _____ Date: _____

Source: Authors' own creation (2026), adapted from Arksey & O'Malley (2005).

APPENDIX B: Full-Text Data Extraction Form (Charting Template)

Study: Robot taxation as a fiscal policy instrument for sustainable employment

SECTION 1: BIBLIOGRAPHIC INFORMATION

Record ID: _____

Author(s): _____

Year: _____

Title: _____

Journal / Publisher: _____

Country context: _____

Type: Peer-reviewed Working paper Thesis Grey literature

DOI / URL: _____

SECTION 2: STUDY CHARACTERISTICS

Aim / Research objective: _____

Research design: Literature review Empirical (quant.)

Empirical (qual.) Mixed methods Conceptual Policy analysis

Theoretical framework(s): _____

Country/region focus: South Africa EU USA South Korea

Indonesia Global Other: _____

Type of automation: Industrial robots AI/algorithms

Software General Other: _____

SECTION 3: KEY FINDINGS

RQ1 – Arguments supporting robot tax implementation:

RQ2 – Limitations, risks and counterarguments:

Opportunities identified: _____

Challenges/risks identified: _____

Policy recommendations: _____

Applicability to South Africa / developing economies: _____

SECTION 4: QUALITY NOTES

Strengths of study: _____

Limitations acknowledged by authors: _____

Potential bias noted by extractor: _____

Grey literature? Yes — institution: _____ No

SECTION 5: SUMMARY FOR TABLE 1

Aim (one sentence): _____

Methodology (one sentence): _____

Key finding re: robot tax need (one sentence): _____

Source: Authors' own creation (2026), adapted from Arksey & O'Malley (2005) and Matenda et al. (2021).



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