Double Blind and Open Access Journal
ISSN: 2734-262X
The Primary version of the journal is the on-line version

African Journal of Corporate Governance Research
Volume 1, Issue 2, pp. 140-161

ROBOT TAXATION AND ECONOMIC PERFORMANCE: A STUDY OF SELECTED OECD COUNTRIES

FALANA Abolade and AJIBADE Ayodeji T.

Abstract

The increasing concern about the distributional consequences of robotisation concerning the disrupt of the labour market, leading to massive unemployment and income inequality, ultimately adversely affecting the economic performance of countries, have raised the question of how countries through policies should respond to robotisation. Suggestions have been to either tax robots or not. This study, therefore, examined the effect of robot taxation on the economic performance of selected OECD countries. This study employed the ex-post facto research design and sampled two randomly selected companies from twenty (20) OECD countries. Data were extracted from the annual reports of the sampled companies as well as from the websites of the countries and OECD. The data used for this study covered a period of 2000-2017 The data were analyzed using trend analysis, descriptive, and inferential statistics employing ordinary least square regression analysis. The study revealed that robot taxation has a significant positive relationship with government performance. The study, therefore, recommends that countries should pay close attention to robotisation consequences because if left without control, it can hurt the countries, however, proper regulation through broader policies will go a long way in positively affecting their economies.

Keywords: Robotisation, Robot taxation, Economic Performance, Unemployment, Unemployment Benefit (UB), OECD countries

1. INTRODUCTION

This paper aims to enrich prior literature on the effect of robot taxation on economic performance. Existing literature (Gasteiger, & Prettner, 2019; Uwe, 2018), majorly focused on the optimality of robot tax as well as the long-run growth effect of automation and recommended a cautionary tale to the overlapping generation model. This study investigated the implication of robot taxation by empirically identifying the effects of the various reduction in research and development which fosters the robotic workforce through trend analysis of unemployment benefit of selected OECD countries. Purposive sampling method was used to select the sampled firms and countries, our theoretical framework was progressive tax theory. Diagnostic tests like Hausman test, Breusch and Pagan Lagrangian test and Bresch-Pagan/ Cook-Weisbeerg test for homoscedasticity were carried out on the impact of robot taxation on the economic performance of selected OECD countries.

The performance of any country is usually measured in terms of the achieved laid down economic objectives. Economic performance is the influence that the organization's activities have on the economies of the country. Prior studies have traced economic performance from the era of classical political economy which is centered on the production of income Ormazabal (2004), in which had been critiqued by the neo-classical economist, positing that the theory of capital has been exploiting the theory of labour, due to the fact that labour also create value in the production process. The neoclassical economist also posits that the theory lacks human development indexes (Victor, 2010), thus, making workers poorer (Mikael, 2016; Will, 2019). Neo-classical economist supports technological change which enhances labour efficiency (Korkmaz & Korkmaz, 2017; Mason, 2015).

Influence of technological change alters the structure of OECD economies Eh, John and Stephen (1997) and the ability to create wealth as a result of constant increase in productivity to maximize profit and save time. In favour for technological change, Corwin and Puckett (2016) stated that factory robot

population in Europe rose about 43%, boosting about 63% of export, Acemoglu (2019), Beicher & Stanley (2016), supported that automated systems must be put in place that encourages future research activities which in turn boot GDP, Corwin *et al* (2016), also opined that digitization is a germane economic factor for job creation.

Opposing on the impact of automation on non-routine workers, Strauss (2018), supported that up to 15 million jobs were lost in the United Kingdom, 80 million jobs in United State was at risk due to industrial automation Carl & Michael (2013) and Golstein (2015) and also, 40% robotic population in business processes of Japan because of demand of increase wages (Alli, 2017). Prior studies discovered a negative effect of industrial automation on the workforce, increase in redundancy in offshore jobs and also decline in the economic growth of emerging economies that majorly have a large share of research and development workers or technological innovations (Francesco, Ekkehard & Enzo, 2018; Pauline & Eric 2003).

On top of the concern, scholars posited that support for R&D increases unemployment Postel-Vinay (2002), increasing cost reduces companies' effort investing in R&D Miyamoto (2009) and reducing R&D incentives is robot tax (Abbott & Bogenschneider, 2017). We discovered in 2008 Belgium experienced the rising of UB because it was the year in which tax incentive support for BERD and R&D tax support was increased. In New Zealand UB in the year 2007 accounted for 0.57% of GDP and also increased to 0.63% in the year 2008 because the R&D tax credit legislation was presented in Parliament to support R&D. In Ireland and other OECD countries, the reduction of the indirect funding of BERD resulted in the fall on unemployment benefit expenditure. In Italy, drastic fall again in 2012 due to the introduction of Robot taxation in the form of a reduction in R&D.
Unemployment distorts any economic performance of any nation Levine (2013) thus, escalating social unrest (Renn, Jovanovic & Schroter, 2011). Technological unemployment reduce personal income tax revenue Abbott *et al* (2017), crime rates of OECD countries Quintini & Montt (2016) and Sharkey, Goodman & Ross (2010), even in the era where OECD economies nosedives (OECD, 2019).

A research report shows that up to 15 million jobs were lost in the United Kingdom and 80 million jobs in the United State was at risk due to industrial automation (Strauss, 2018), also World development report (2016) discovered technological unemployment of about 47% of American jobs, 35% UK jobs, and non-OECD countries in which OECD has relations with like South Africa 67% jobs, OECD average 57% jobs like China 77%, distorting income tax of human workforce.

Thus, the major problem is technological unemployment plummeting personal income tax accrued to the government. We discovered tax on personal income in the USA dropped from 11.91% of GDP in the 2000s to 10.49% of GDP in 2017 and the country's tax on company income dropped from 2.23% in 2000 to 1.92% in 2017. Slovenia experienced a sharp decrease in tax on personal income from 2005 of 5.63% of GDP to a sharp decrease of 5.12% of GDP. Norway's tax on personal income in 2000 was 10.08% of GDP and later dropped to 10.04% in 2017. New Zealand experienced a sharp decline from 2000 of 14.01% of GDP to 12.05% of GDP (OECD, 2018). This study, therefore, seeks to investigate the impact of Robot taxation on economic performance to expose automation's contribution to unemployment and subsequent reduction in government revenue.

2. REVIEW OF LITERATURE

Prior studies have dated back the development of robotic technology fro3m the Greek myth and a clock jack by Zeus in 13th century Ishan (2019),, miniature robots as toys (a duck can flap its wings, eat and digest grains invented by Jacques de Vaucanon in the 18th century) Dennis (2018), a human-like robot called Elektro (can talk and smokes) Franck (2013), to the first programmable robot by George Devol in 1954 called Unimte which was used by General Motor factory in 1954 (Lars, 2000). Historically,

Trallfa was the first to make use of a robot which they invented to initially spray their wheelbarrows because of the bad labour environment in Norway but later, this electrohydraulic robot became a commercial success which resulted in drastic improvement in the robotic arm (Greggory & Jakrit, 2002).

Industrial robots or automated machines are machines that use control systems Laurent (2013); and IT solutions to foster efficient products that could be done manually or traditionally contracted or conducted by workers (Mamudu & Lamido, 2017 Xing & Marwala, 2018). This disruptive technology of artificial intelligence is an efficient cost-saving machine to provide an enhanced level of organizational services and waste reduction. Large industrial companies opined by Acemoglu, Restrepo (2016); Benioff (2017) Buller (2011), Martin (2015) Eden and Gaggi (2018), Graetz and Michaels (2015), Hemous and Olsen 2016), Schwab (2016), Steigumm (2011) employs digital signatures to save time and reduce cost but in the processes of resolving business and eco-sustainability but they indulge in redundancy.

Scholars have opined the reason to compensate displaced workers Erdoğdu and Karaca, (2017) and government by taxing robot and robotic processes (Jaimovich & Siu, 2017). Robot tax is an increase in income taxes on hyper-scale companies or the provision of a tax credit for hyper-scale companies (Abbott & Bogenschineiteder, 2017; Marwala, 2018). Prior literature posited that it is optimal to tax automation and also provided a cautionary tale to the overlapping generation model (Gasteiger *et al*, 2019; Uwe, 2018).

Various robot policies and technological reforms have been implemented in some number of OECD countries but the current approaches are not properly infused into the problems present in digitalized economies which sub maximize the contributions of robots to employment like coherent, broader structural reforms and integrated technological reforms which eliminate institutional inertia and enable other members of the OECD countries to mutually evaluate policies on previous best practices on the growth of the robotic workforce. Integration of technological reforms put control measures against institutions furthering their interest OECD (1998) and also should be reinforced on lifelong vocational and technical training displaced workers IFR, (2017), and also robots and humans should work together (Oberson, 2016).

The study of Gasteiger *et al* (2019) sate that taxing robots have a positive significant effect on per capita of higher wages of human workers in when the proceeds are redistributed to labour income which fosters short-rum economic growth. The scholars also stated that robot taxation through taxing capital income reduces the imbalances between the capital owners and the human workforce in which tax preferences given on capital encourages large companies to become more capital intensive on robotic workforce.

Another support on taxing robot is the previous studies of Aghion, Akcigit & Fernand ez-Villaverde (2012) and Guerreiro, Rebelo & Teles (2019) opined that robot taxation compresses wage inequalities, reduces tax over-burden of labour income, fostering savings and welfare of human workforce. These scholars opined that taxing robots or reducing tax incentives enjoyed by capital income will mitigate the reduction in wages of human workers.

However, Guerreiro *et al* (2019) opined that it is not optimal taxing robots due to the fact that it increases efficiency loss when the company employs full robotic workforce (completely automated). Consequently, it is a better approach of taxing non-routine workers who are highly earned to mitigate purnishing technological innovation when full robotisation occurs. The scholars also asserted that the income tax of low-skilled workers becomes zero in a company that fully employs robotic workforce and their non-routine workers are not affected by technological unemployment

In contrast in the study of Guerreiro *et al* (2019), the study of Uwe (2018) asserted that taxing non-routine occupations, on the other hand, leads to occupational shifting of skilled workers to perform routine works which distort robot tax as a wage compressing instrument that relaxes the wage distortions of both routine and non-routine workers. The scholar also stated that even though robot tax is used to reduce wage disparity at the top, taxing robots also increases inequalities at the bottom in terms of welfare impacts -when it comes to occupational switch and reorganization of labour supply.

Similarly, Acemoglu & Autor (2011).stated that the higher the robot tax the more there will be a wide wage gap between the routine and non-routine workers and if the government decides to collect lower or no robot tax the more the routine workers will lose their jobs to automation on the other hand Uwe (2018), opined that taxing robots is inelastic, looking at the US robot tax rate of 4% in the short run, the country having fixed jobs but now the tax rate on the robot is 0.4% and at the medium run, the rate of fixed jobs approaches zero due to the fact that robot is getting cheaper. Thus, based on all these arguments, this study must examine the impact of robot taxation on economic performance of selected OECD countries.

First and foremost, the studies of (Gasteiger *et al*, 2019; Uwe, 2018), opined the optimality of robot tax as well as the long-run growth effect of automation and recommended a cautionary tale to the overlapping generation model. Also, the studies of (Acemoglu *et al*, 2011; Acemoglu *et al*, 2017; Guerreiro, *et al*, 2019, Uwe, 2018) only use USA data. This study investigated the impact of robot tax on economic performances of 20 selected OECD countries through exploratory and empirical analysis.

Theoretical Literature

Progressive tax theory propounded by Lincoln (1862), is adopted for this study. The theory states that taxpayer who has the greatest ability to pay should pay the highest percentage of taxes Crystal (2018); lightens the burden of the taxpayers vis-à-vis improve the economy Rachael (2017).

The theory was proposed during a period when the United States of America was faced with economic depression to fund the first Civil War, World War I by Woodrow Wilson and during the era of the bubbled economy of the 1930s. In the 1930s, it became imperative to raise enough revenue for governance – the principles of the theory facilitated tax payments. However, the theory was later expanded by Maynard Keynes during the period of the 1930's economic crisis. She opined that a method is needed to reduce the extreme effect of the unmitigated speculation that initially led to the bubble (Tamahome, 2009).

Ronald Reagan opposed this theory in 1970 by shifting the tax burden to the working class during the period of economic stagflation where inflation and unemployment were out of control when the Middle Eastern oil producers formed a cartel as OPEC and placed an embargo on Western Europe and the USA. The increase in the world's petroleum prices led to the dramatic increase in basic needs which resulted in the theory of progressive tax not sufficient to deal with the economic strain of increasing labour cost and energy which led many businesses to liquidate (Hetzel, 2007).

The Reaganomics theory applied to part of the Friedman economic philosophy which believed that any government policies put in place to reduce unemployment beyond its threshold will further alleviate unemployment (Haggerson, 2016; Hetzel, 2007). Contradictory, progressive tax principles argue that Reaganomics has failed to address economic issues that are stimulated by necessity and time frames (Amadeo, 2019). This paper opines that the principles of progressive tax theory can facilitate government tax companies employing robots to pay taxes accordingly. The taxes could be as forms of incentives that can help the companies reduces their tax deductibility.

Prior literature have stated that consumption tax which is also progressive tax generates construct is; ability to pay Dauth, Findeisen, Suedekum & Woessner (2017), promotion of investment Griffith

(2019), increase in total income, spending power of the economy Oishi, Kuslev & Schimmack (2018), happiness and success in bringing unemployed people into the tax net (OECD, 2012). However, not all the constructs of the theory were adopted because they are outside the scope of the paper. The adopted construct comprises the ability to pay in which automated companies are tax according to their capability to pay.

Hyper-scale companies employ efficient cost-saving automated machines to provide an enhanced level of organizational services and waste reduction Laurent (2013), taxing robots boost the spending power of the economy in which income is given back to laid-off non-routine workers (Rachael, 2017). Success in bringing unemployed back into the tax net is one of the constructs of this theory in which greater percentage of those companies income who employed industrial automation to boost profitability are used to sustain the unemployment benefit scheme and bringing the unemployed back into the income tax net by also organizing training programs and supporting the SMEs.

3. METHODOLOGY

The ex-post facto research design was adopted for this study. Thus, secondary data were extracted from the OECD website as well as the annual reports of the sample companies in this study. Forty (40) companies were selected from twenty (20) OECD countries, two (2) companies from each country, over 17 years (2000 - 2017). Purposive sampling method was used to select twenty (20) OECD countries as the sample for this study from the total population of thirty-six (36) OECD countries. To achieve the objective of this paper, five (5) variables (Robot tax, GDP, Inflation rate, exchange rate, total sales) were identified and the ordinary least square (OLS) regression analysis was adopted for this study.

Model Specification

Aggregated Functional Relationship

$Y = f(X, Z)$

$Z = z_1, z_2, z_3$

Where,

Y= Economic Performance (EP)

X = Robot Taxation (RT)

Z_1= inflation rate (IR)

Z_2 =exchange rate (ER)

Z_3 = total Sales (TS)

Functional Relationship

EP = f (RT)…….FI

EP = f (RT IR, ER, TS)……..F2

The Models

$GDP_{it} = \alpha_0 + \alpha_1 RT_{it} + \alpha_2 IR_{it} + \alpha_3 ER_{it} + \alpha_4 TS_{it} + \mu_{it})$ ---------- (1)

$\alpha 0$ = Constant

μ = stochastic variable

The stochastic term is included in the model to accommodate the effect of other variables that affect the GDP other than those in this model.

3.1 Variable measurements

Robot tax (RT): A dummy variable was adopted for this. The study traced the year in which the law in favour of robot tax was introduced as the benchmark year. Period from year 2000 till that year was assigned 0 while from that year till the year 2016 was assigned 1. Thus, robot tax variable were 0s and 1s.

GDP: The gross domestic product is a monetary measure of the total market value of all goods and services produced within a specific period in an economy. Since the focus of this study is the use of automation which is mostly utilized by the manufacturing industry, this study adopted the GDP of the manufacturing sectors for the countries sampled.

Inflation rate (IR): Inflation rate represents the rate at which prices increase due to several factors over time, leading to a decline in the purchasing value of money. These figures were extracted for the individual countries from the OECD website.
Exchange rate (ER): This is the exchange rate of each of the country's currency as compared to the US dollars over the period studied. These figures were also extracted for the individual countries from the OECD website.
Total Sales (TS): This is the aggregate sales revenue of the sampled companies for the samples period. Figures for this were extracted from the individual annual reports and financial statements of the sampled companies.

***A priori* Expectations**

A positive relationship is expected between RT, TS and economic performance (EP) proxied by the manufacturing sector GDP of the selected countries. While, a negative relationship is expected between ER, IR and GDP. However, RT may lead to a decrease in EP of the selected OECD countries, if there are no coherent, broader structural reforms and integrated technological reforms which eliminate institutional inertia and enable other members of the OECD countries to mutually evaluate policies on previous best practices on the growth of robotic workforce

4.0 DATA ANALYSIS, RESULTS AND DISCUSSION OF FINDINGS

This section presents the data overview, the descriptive analysis of the data, the data analysis as well as its interpretation.

4.1 Explorative Analysis

The study adopted the use of graphs to reveal the trend of unemployment benefits of the selected OECD countries for the sampled periods (2000-2017). The line drawn inside the graph represents the year when the robot taxation laws were enacted in the countries. Downward slopes observed after the line, indicating the reduction in the unemployment benefit born by the government which suggests that the introduction of robot taxation reduced unemployment in as observed in each country's graph.

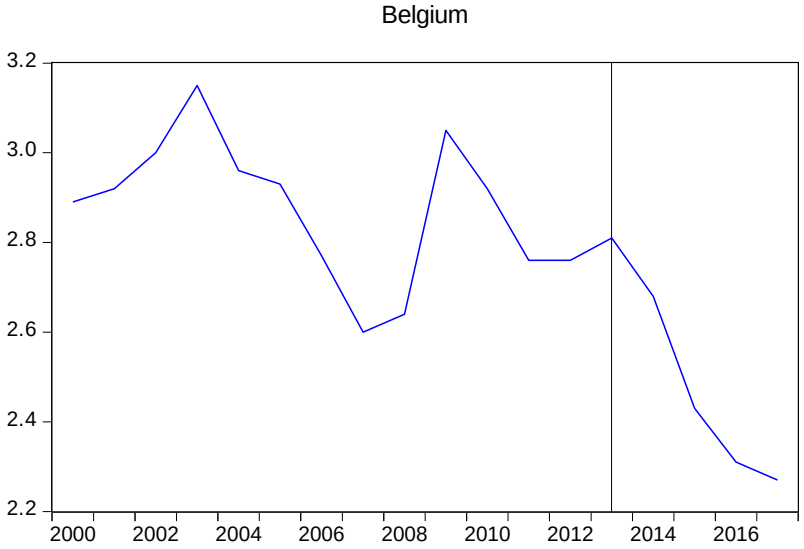


Figure 1: Trend of Belgium's unemployment benefit
Source: Researcher's Computation (2019)

From figure 1, the introduction of robot taxation makes it fall in the year 2013 in which there was a reduction in tax incentives for BERD and government direct funding of BERD. In 2013, government economic policies introduced an overall strategy of prevention and activation into the unemployment insurance scheme and to address dismissal rules and high debt levels. Also, youth unemployment rate in Brussels capital region declined from 40% in 2013 to 36% in 2016 (the youth unemployment rate was 28% in the Walloon region, this was due to the establishment of a youth guarantee which offers

80% of newly registered young jobseekers either employment, training or a traineeship opportunity within six months of registration.

The Flemish region focused on talent which gives tailor-made guidance to workers and jobseekers, by supporting companies to improve their human resource policies. Policies to improve the employment performance of vulnerable groups were thoroughly discussed in the last two Economic Surveys and remain relevant (International Social Security association ISSA, 2013; Sustainable governance indicators (SGI, 2017; OECD, 2013).

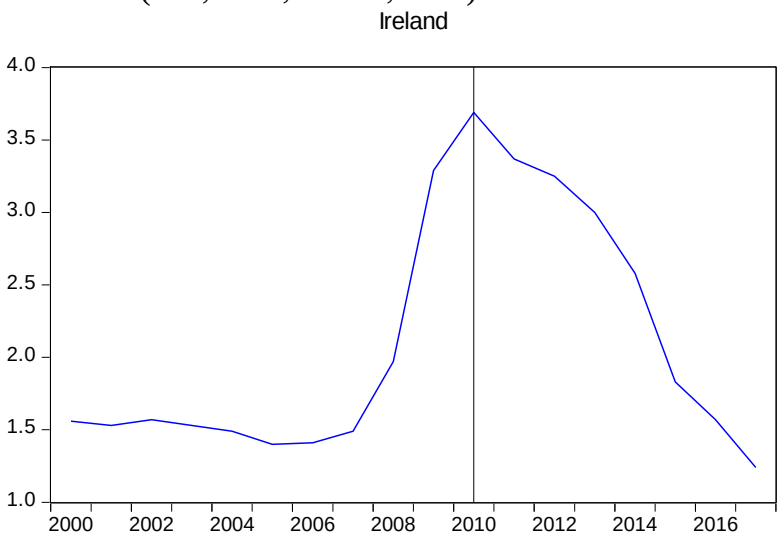


Figure 2: Trend of Ireland's unemployment benefit
Source: Researcher's Computation (2019)

From figure 2, the graph shows a lack of an increase in government direct funding of BERD leads to an increase in the cost of research and development. With the introduction of robot tax in 2010, it heralds the reduction of the indirect funding of BERD. In 2010, the government enacted welfare reform and structural reforms on focusing public resources on high priority projects and a gradual decrease of unemployment spell and stricter job search requirement. Better regulation was introduced which was supportive of fiscal consolidation (Nicva, 2010).

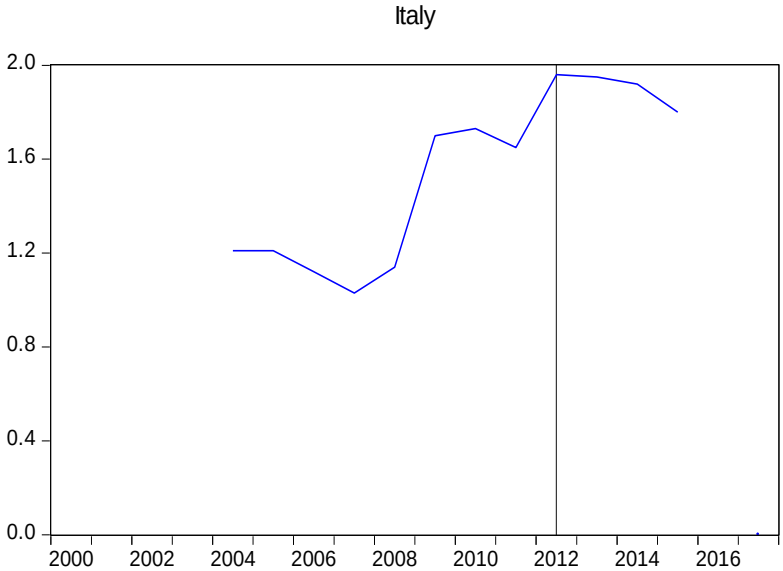
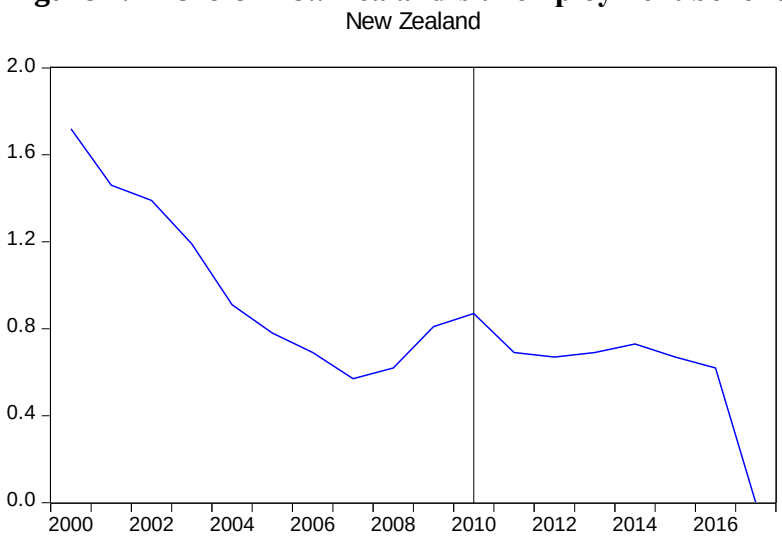


Figure 3: Trend of Italy's unemployment benefit
Source: Researcher's Computation (2019).

From figure 3, the graph shows a sharp increase in 2009 of 1.7% of GDP due to a reduction in government direct funding of BERD. This graph also shows a drastic fall again in 2012 due to the introduction of Robot taxation. This is the point where government through their various economic policies came up to reduce R&D tax supports which resulted in the rate of unemployment in the country.

Figure 4: Trend of New Zealand's unemployment benefit



Source: Researcher's Computation (2019).

From figure 4, there is a drastic reduction in the expenditure of the government on UB in the year 2000 of 1.75% of GDP to year 2007 of 0.57% of GDP and also a slight increase in year 2007 from 0.57% of GDP to 0.63% in year 2008 because the R&D tax credit legislation was presented in Parliament to support R&D which was announced on 25 July 2006. Government policy on the decrease in support for BERD around 2008 to 2015 resulted in a slight increase in government expenditure on unemployment benefit from 2007 to 2010. During this period government support for BERD as a percentage of GDP decreased in the country.
Also, the country's tax incentive support for BERD as a percentage of GDP decreased. To reduce public debt after the aftermath of the global, the country in the year 2010 came up with an economic policy of fiscal prudence (OECD 2010).

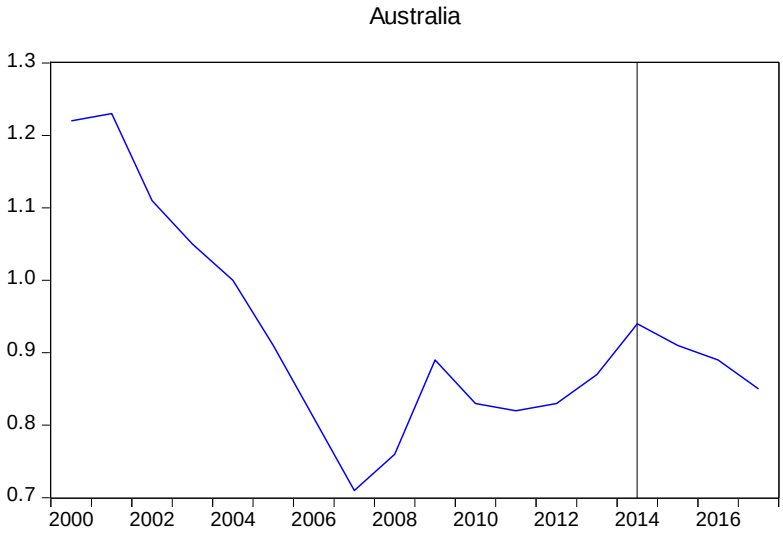


Figure 5: Trend of Australia's unemployment benefit

Source: Researcher's Computation (2019)

From figure 5, the graph showed a drastic fall in government expenditure on UB due to the low direct funding of business R&D which oscillated between 0.02% of GDP to 0.04% of GDP from the year 2000 to 2001 and 2004. Also, there is a low tax incentive support for BERD from 2000 to 2011. From 0.10% of GDP to 0.24% of GDP. There is a fall in the expenditure of UB in the year 2014 because of the introduction of robot tax in which the government decreased 2% in current price terms and 4% in chain volume terms on expenditure on research and development.
In 2014, government economic policy to reduce its spending by addressing a perceived deficit crisis (Australia Government, 2014).

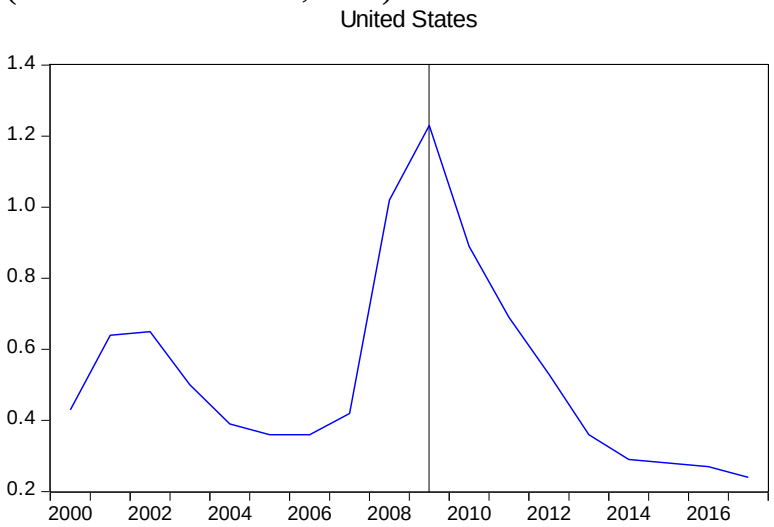


Figure 6: Trend of USA's unemployment benefit
Source: Researcher's Computation (2019).

From figure 6, the graph showed an increase of government UB from 2007of to 0.4%, a sharp increase in the year 2008 of 1% of GDP and a sharp decline in the year 2009. The global financial crisis affects the government revenue which resulted in the decline in R&D tax support. In 2009, America recovery and reinvestment act (ARRA) which was a stimulus package enacted by the 11th US congress and signed into law by President Barrack Obama in February 2009 in response to the great recession with the primary objective to save existing jobs and create new ones as soon as possible GPO (Levy, 2009).

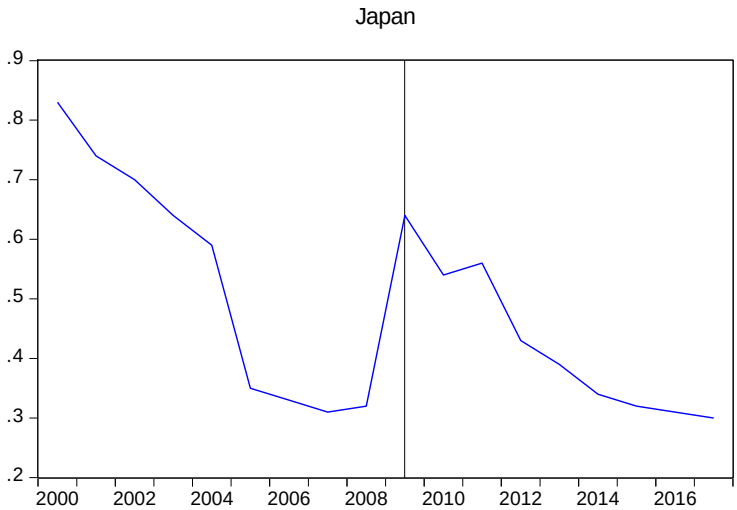


Figure 7: Trend of Japan's unemployment benefit
Source: Researcher's Computation (2019).

From figure 7, the graph also showed a decline in government expenditure on unemployment benefit due to the government policy in reducing investment in R&D in 2009 in which the global financial crisis affected the economy. The percentage of part-time workers was at a peak in 2009 of more than 30% in which was a signal that businesses seek to cut employment costs to a minimum. The electoral victory of the Democratic Party of Japan, the Hatoyama administration was a focus on the microeconomic policies (Naoki, 2010). The economic policy created that lead to a 3.1% drop in the unemployment rate was due to bold monetary policy and fiscal stimulus package of 10.3 trillion yen (Bill 2016). The economic policy of Yukio Hatoyama was centered on not just leaving everything to the markets but having a balance between government regulations and free-market activities (World Economic Forum, 2019).

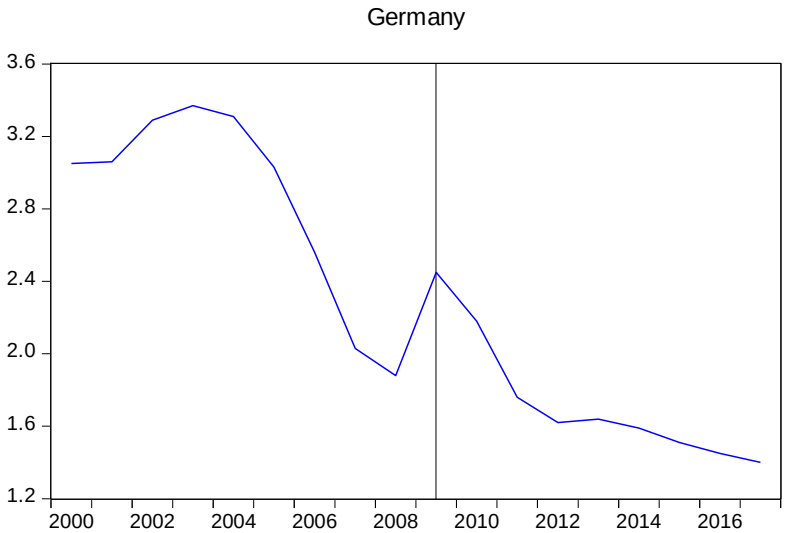


Figure 8: Trend of Germany's unemployment benefit
Source: Researcher's Computation (2019).

From figure 8, this graph shows a sharp decline in the expenditure of the government towards UB from year 2003 of 3.4% of GDP to 2008 of 1.65% of GDP, as a result of the major manufacturing sector in the country (electricity and gas companies reduce substantially their investment in R&D due to the global financial crisis in which affected the country's economy.
In 2009, labour market reforms and policy instruments led to a decline in the unemployment rate. 3 economic policies were enacted in response to the recession which is 1. The economic stability Plan 1 and 2 enacted 2008 and 2009, 2. Growth acceleration law enacted in 2009 and future package which are expansionary measures that reduce public spending (Maximillan, Mathias, Clemens, Max & Andreas 2015).

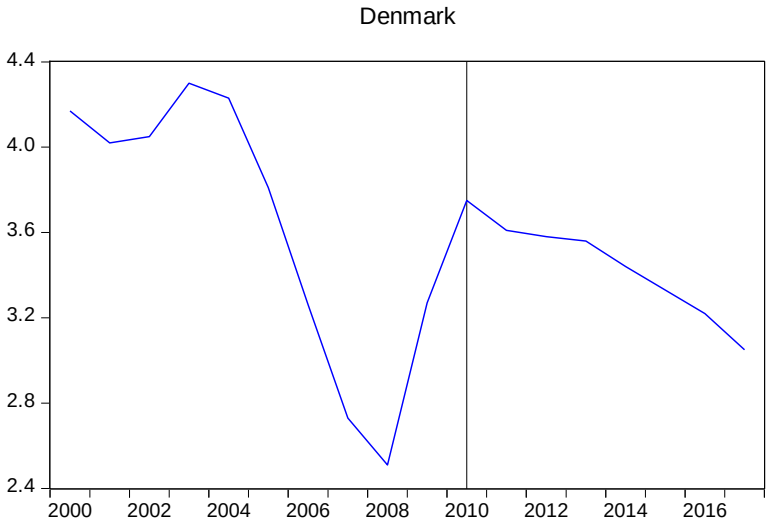


Figure 9: Trend of Denmark's unemployment benefit
Source: Researcher's Computation (2019)

From figure 9, the graph shows a drastic reduction in government expenditure on UB from the year 2003 of 4.2% of GDP to the year 2008 of 2.42% of GDP because of the reduction in government expenditure on UB, this is because there was government policy in the country to decrease R&D tax support even though there was an increase in direct funding of BERD and tax incentives support for BERD. In 2010, George Oshorne announced the deepest cut by ordering all government department to slash an average of 25% from their annual budget (Polly, 2010)

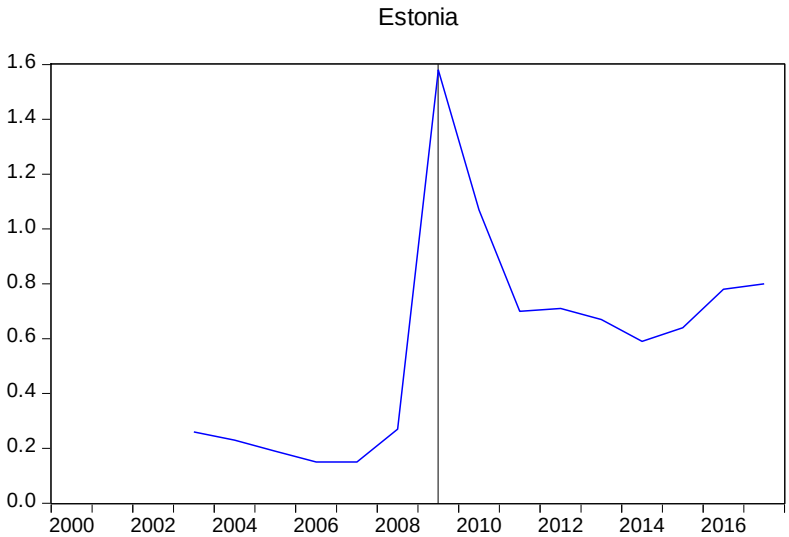


Figure 10: Trend of Estonia's unemployment benefit
Source: Researcher's Computation, 2019

From figure 10, the graph shows a sharp increase of government expenditure on UB starting from the year 2008 to 2009 of 1.56% of GDP. in the year 2009 global financial crisis occurred which affected the growth in the country and resulted in robot taxation in which there where drastic reduction in the investment of R&D from 3.26billion Kroons to 3.09 billion Kroons. This resulted in government expenditure on UB from 1.56% of GDP to 0.65% of GDP.
Total government expenditure was cut drastically, explaining to the Estonian people that the surging revenue growth of the previous years had been driven by illusory prosperity. Total spending was cut by 10 percent in just two years, with operational expenditures in the public sector taking the biggest hit. (Ryan, 2012).

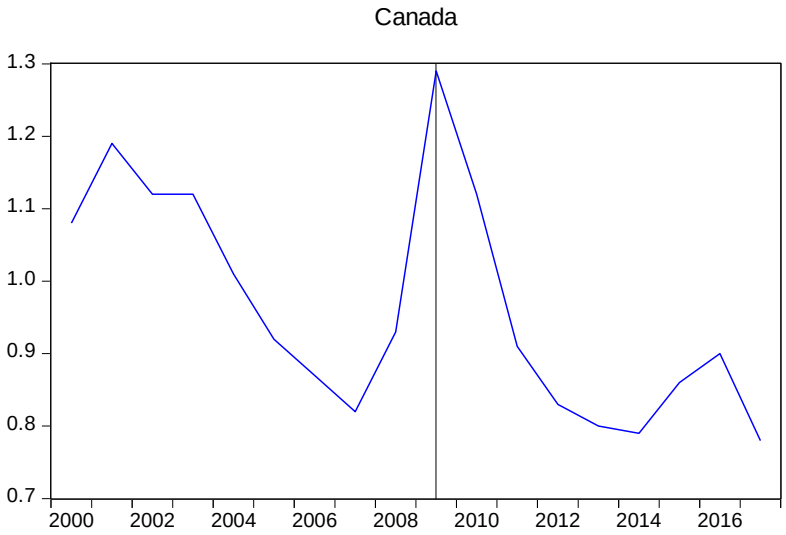


Figure 11: Trend of Canada's unemployment benefit
Source: Researcher's Computation, 2019

From figure 11, the graph showed a zigzag expenditure on UB of the government because of the Zigzag direct funding of BERD, tax incentive support for BERD and R&D tax support. The graph showed a sharp fall in government expenditure on UB in the year 2007. The sharp fall of the expenditure on UB in 2007 was caused by a sharp fall of R&D from $16.8 billion to $15.8 billion in 2010.
Also, in 2009, economic policy was enacted to cut taxes and whether large deficit and also boosting infrastructure and worker training. Fiscal stimulation was spent on infrastructural projects to aid for worker training, cash for enhanced employment insurance benefit (CBC, 2019).

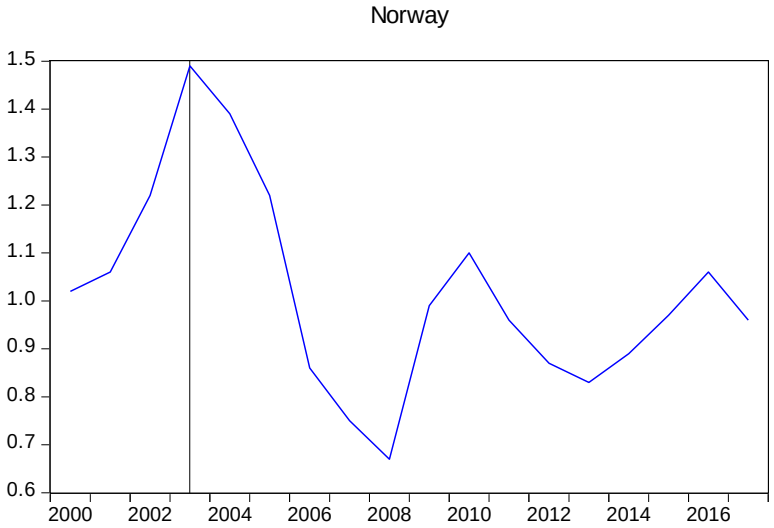


Figure 12: Trend of Norway's unemployment benefit
Source: Researcher's Computation, 2019

The graph in figure 13 shows a sharp reduction of government expenditure on UB due to the policy that limited growth direct funding of BERD in the year 2002, 2003 2004.
In 2003, a National report on youth policy in Norway was enacted also addresses unemployment among young people (Elisabeth, 2003).

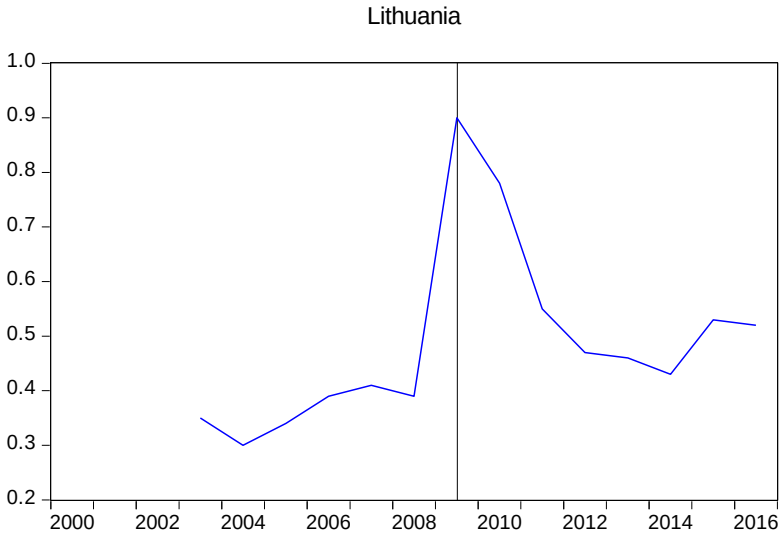


Figure 13: Trend of Lithuania's unemployment benefit
Source: Researcher's Computation (2019).

From figure 13, the Year 2009, the global financial crisis occurred with affected the country's growth in which the government created an economic policy to slow down R&D. The government enacted an economic policy of slashing 870 million Euros spending in April and also further cuts in June (Danuta, 2009).

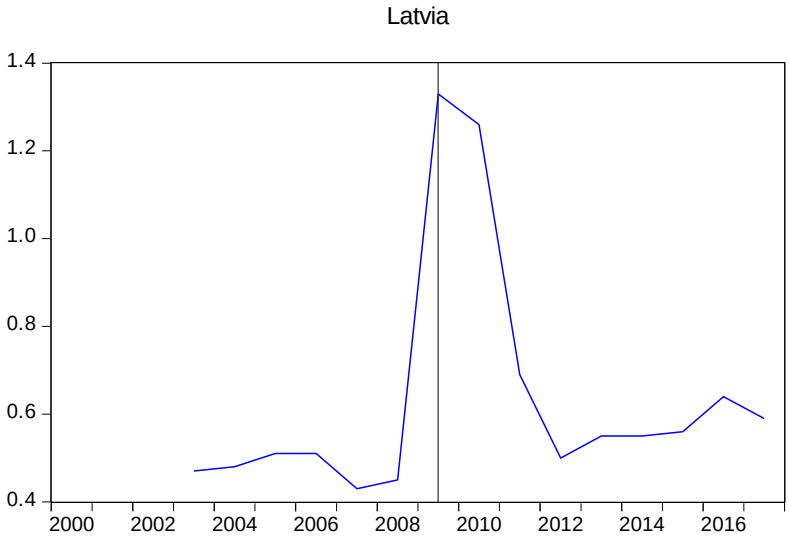


Figure 14: Trend of Latvia's unemployment benefit
Source: Researcher's Computation (2019).

From figure 14, the financial crisis of 2008 had a major impact on the government budget for R&D, resulting in a 49% decrease between 2008 and 2009 according to Deloitte (2014) In 2009, economic policy was enacted to cut government spending under the conditions set by a $10.7bn bailout by the International monetary fund (IMF) and European Union (Elizabeth, 2009).

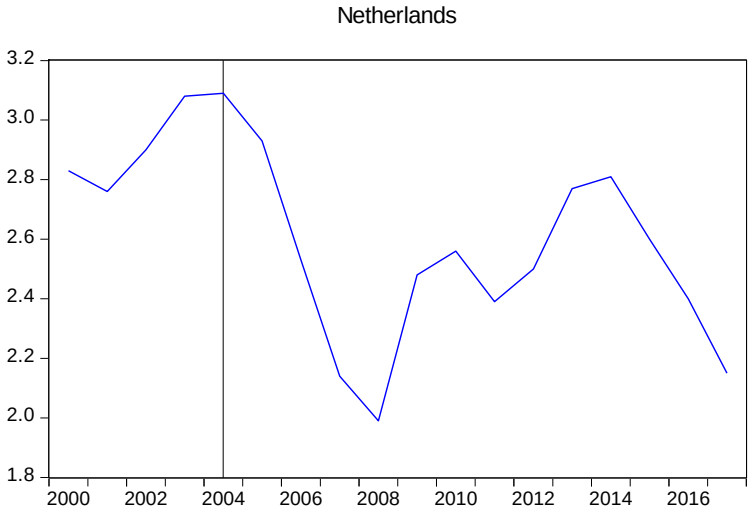


Figure 15: Trend of Netherland's unemployment benefit
Source: Researcher's Computation, 2019

Figure 15 shows a zigzag expenditure of UB because of the zigzag direct funding of business R&D, tax incentive support for BERD and also R&D tax support. The Dutch R&D fiscal incentive scheme knows as WBSO. The graph also shows a sharp decline in the year 2004 when the unemployment rate rose to 5.6% of GDP in 2004. In 2004, economic policy was enacted to reduce Dutch spending to 130.1billion euros. The social provision accounts for the largest spending category of 24.5billion euros (Fred, 2005).

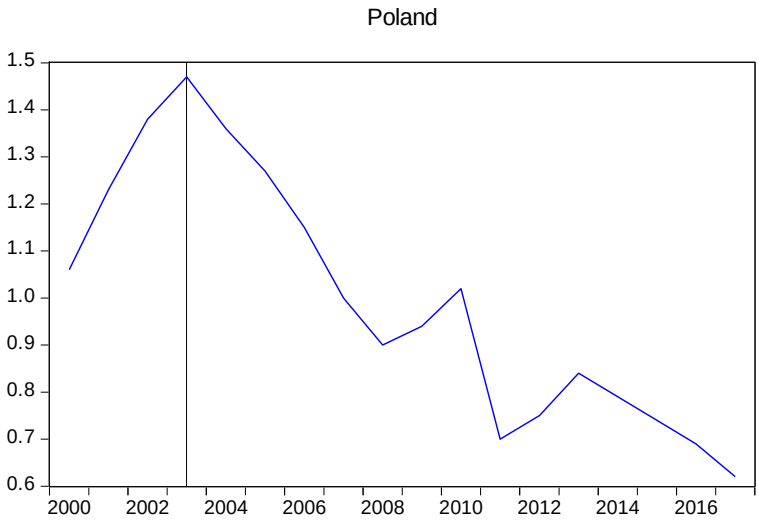


Figure 16: Trend of Poland's unemployment benefit
Source: Researcher's Computation, 2019.

Figure 16 shows an increase in the UB expenditure of the government from the year 2000 to 2003 of 1.05% to 1.45% of GDP. In the year 2000, the company income tax (CIT) was 2.39% of GDP and the expenditure on UB was 1.05% of GDP, in 2001 CIT dropped to 1.79% of GDP, the year 2002 to 1.98% of GDP. In 2003, economic policy was enacted to cut government spending up to 7 billion zlotys to join the Eurozone (AP, 2003).

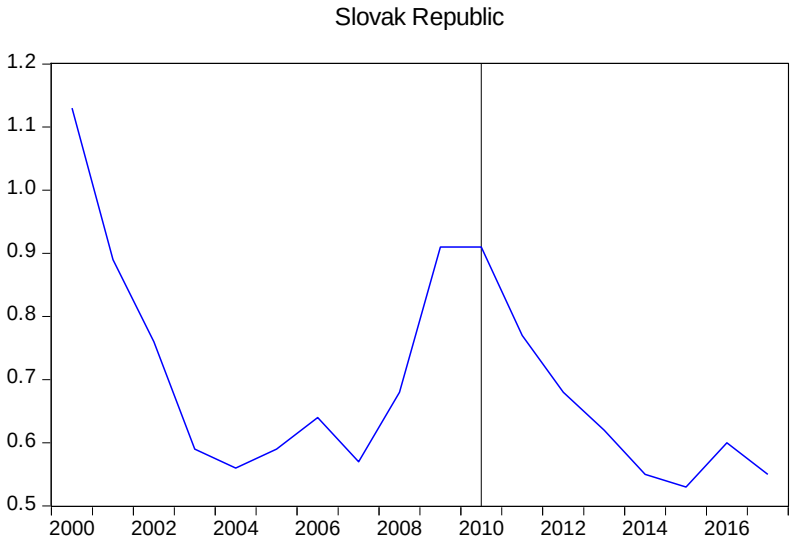


Figure 17: Trend of Slovak Republic's unemployment benefit
Source: Researcher's Computation, 2019

From figure 17, the graph showed a sharp decline in the expenditure on unemployment benefit from the year 2000 of 1.15% to 2003 of 0.58% and 2004 of 0.55%. In the year 2007, there is `an increase in unemployment benefit due to the increase in the allocation of R&D by 19%, the enactment of Act of 23 April 2009 on incentives for R&D and also received EU structural fund of EUR 1.103 million (Deloitte, 2014). In 2010, economic policy was enacted to government spending to reduce the budget deficit. The country was facing a deep economic crisis and the irresponsible decisions of past leaders (Mladá, 2010).

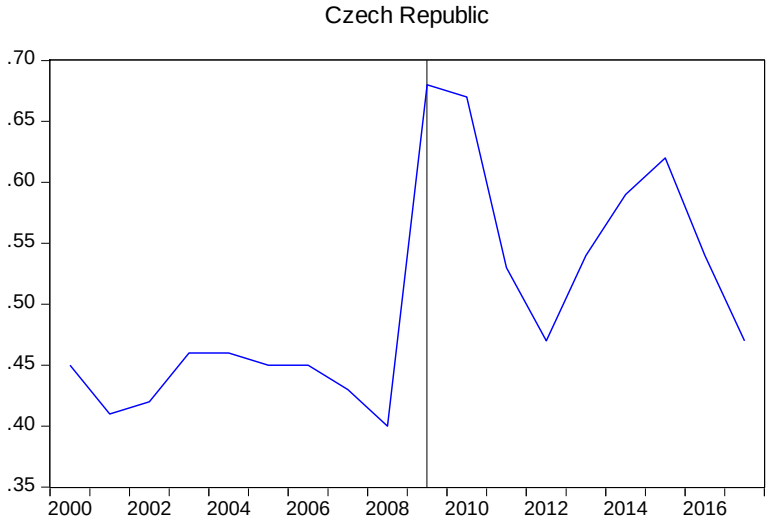


Figure 18: Trend of Czech Republic's unemployment benefit
Source: Researcher's Computation, 2019

From figure 18, the graph shows a reduction in expenditure on unemployment benefit, in 2009, economic policy was enacted to reduce government operational expenditure and social benefit decreases due to the global economic crisis affecting the country's export revenue generation (OECD, 2011).

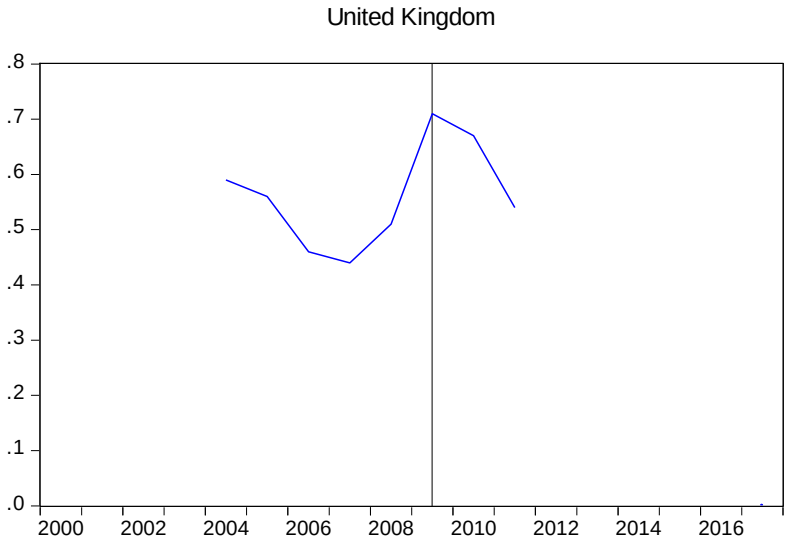


Figure 19: Trend of UK's unemployment benefit
Source: Researcher's Computation (2019).

Figure 19, shows a sharp reduction in expenditure on UB from 2004 of 0.58% to 2007 of 0.43%. of GDP due to the sharp decline in the direct funding of BERD from 2004 of 0.10% of GDP to the year 2005 of 0.07% of GDP. Also, in the year 2006 of 0.065% of GDP and 2007 of 0.052% of GDP. Despite the consistent decline in indirect funding from 2005 to 2007, the graph showed a sharp increase in government expenditure on UB because of the progressive percentage increase in R&D tax support. The graph also showed a sharp drop in the expenditure of the government in UB in the year 2009 because of the global financial crisis which affected the growth of the country and resulted in creating economic policies in reducing investment in R&D.
In 2009, economic policy was enacted to cut spending as hard as nations in the Eurozone crisis. The Britain coalition government slashed spending as deeply as countries embroiled in the Eurozone crisis (Ferdinando, 2015), it already plans to scrap a research program on urban seagulls, which will save £250,000, education of £450million (BBC, 2015).

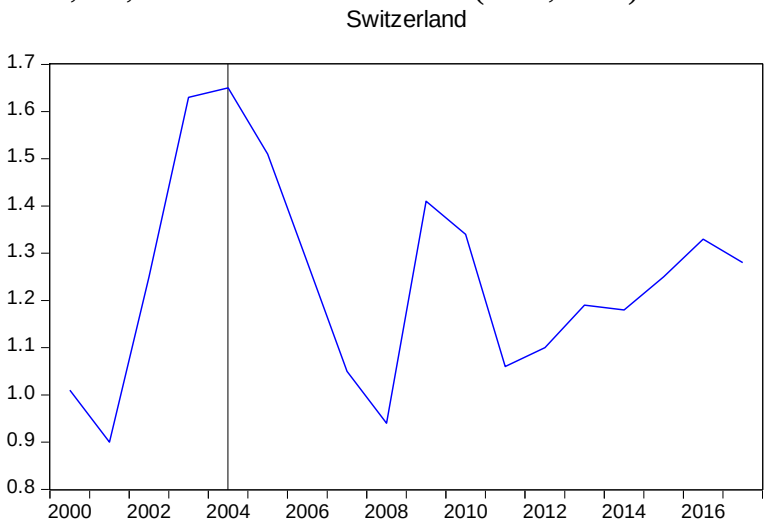


Figure 20: Trend of Switzerland's unemployment benefit
Source: Researcher's Computation (2019).

In 2004, due to the high unemployment of Switzerland of 4.3% due to closely linked to the economies of Western Europe and the United State, to cope the rising unemployment rate, economic policies was enacted in 2004 base on the recommendations made by cash magazine that private consumption should be promoted with a decent wage increase. In addition to those families with children should get a

discount on their health insurance, the country's national bank should revive investments by lowering interest rates. Besides, that monetary institutions should increasingly credit consumers and offer cheaper land to be built on, the apex bank should also devalue the Swiss
Franc especially compared to the Euro. Cash magazine also made some recommendations that the government should implement the anti-cyclical measure of increasing budget deficits i.e. government spending should increase in the infrastructure and education sectors. Lowering taxes would make sense to promote private household consumption and flexible work schedules should be instituted, thus avoiding low demand dismissals. These measures were applied with successful results while the government strove for the magical hexagon of full employment, social equality, economic growth, environmental quality, and positive trade balance and price stability.

Table 4 Regression Analysis for the Model

Variable	**Coeff**	**Std Error**	**t/z-Stat.**	**Prob.**
Robot tax	10026.65	553.6678	18.11	0.000*
exchange rate	-1.166039	0.4863224	-2.40	0.016*
Inflation	-115.6007	175.4585	-0.66	0.510
total sales	-0.0000691	0.0009545	-0.07	0.942
Cons	29578.21	1853.779	15.96	0.000*
F-Stat			618.39	
Prob (F-Stat)			0.000	
R-Squared			0.2240	
Adjusted R-Squared			0.2193	
Hausman Test			0.2558	
Breusch and Pagan Lagrangian multiplier test			2913.22*	
Wooldridge test for autocorrelation			14.131*	
Breusch-Pagan / Cook-Weisberg test for heteroscedasticity			22.71*	

Dependent Variable: GDP; Obs.: 680 ***significant 5%**

The ordinary least square (OLS) result of the regression analysis, as well as the tests, carried out for ascertaining the appropriateness of the model is captured in Table 4.
The Hausman test was carried out to determine whether fixed effect, random effect or pooled ordinary least square estimation technique is appropriate for the model. The result of the Hausman test indicated that fixed effect estimation technique is not appropriate for the model. The study, therefore, went further to test the appropriateness of the random effect estimation technique.
The Breush Pagan Langragian multiplier test was conducted to test the appropriateness of the random effect estimation technique. The result of this test showed that the random effect estimation technique is appropriate for this study. Also, the Breusch-Pagan / Cook-Weisberg test for heteroscedasticity was carried out to determine if the variance of the residual are constant. The test result showed a probability value lower than 5%. This suggests that the study do not reject the null hypothesis of constant variance indicating that the variance of the residual is constant for the model. In testing for autocorrelation in the panel data, the Wooldridge test was conducted. The result of this test showed probability values lower than the 5% level of significance which suggests that the study rejects the null hypothesis and hence, the presence of autocorrelation in the model.
To deal with the combination of econometrics issues the study remedied the issues by estimating the model with the use command options that produced robust standard error estimates for linear panel models.
The results, therefore, indicate that there is a positive and significant relationship between robot taxation and the government performance of a country, measured by her manufacturing GDP value of all the sampled countries. Also, there is a significant negative relationship between the exchange rate and

government performance of the countries. There is also a significant combined influence of robot taxation, exchange rate, inflation, and total sales on the government performance of the countries. The combination of these variable causes about 22% of the variation in the manufacturing sector's GDP of the sampled countries for the sampled period. The negative significance of the exchange and inflation rates are in line with the apriori expectation of this study. This is because they both serve as impediments to the progress and development of a nation in different ways which includes having a negative effect on manufacturing companies' consumption, manufacturing, exporting and thus profitability.

This study agrees with Germana (2017) that a robot tax neutrally slows the growth rate of unemployment and economic distortion and provides the needed public resources. The study is also in line with the study of Gasteiger *et al* (2019) which state that taxing robots have a positive significant effect on per capita of higher wages of human workers when the proceeds are redistributed to labour income which fosters short-rum economic growth. These are line with other similar studies like Aghion, Akcigit & Fernand ez-Villaverde (2012) and Guerreiro, Rebelo & Teles (2019).

5. CONCLUSION AND RECOMMENDATION

The study, therefore, concludes that robot taxation has a significant impact on the economy of countries and that countries of the world should start paying particular importance to robotisation as this will go a long way in subsequently determining their performance. It is recommended that broader structural reforms should be enacted to accommodate the concern of automation with respect to its contributing impact to unemployment and subsequent reduction in government revenue.

References

Abbott, R. & Bogenschneider, B. 2017. 'Should robots pay taxes? Tax policy in the age of automation'. *Harvard Law & Policy Review*, 12. Retrieved from https??papers.ssm.com/sol3/papers.cfm?abstract_id=2932483.

Acemoglu, D. & Resrepo, P. 2016. 'The race between man and machine: implication of technology for growth, factor shares, and employment'. *NBER Working Paper*, 22252. Retrieved from https://www.nber.org/papers/w22252

Acemoglu, D & Author, D. 2011. 'Skills, tasks and technologies: implications for employment and earning'. *NBER Working Paper*, 16082. Retrieved from https://www.nber,org/papers/w16082

Acemoglu, D. 2019. 'Its good jobs, stupid'. *Research Brief.* Retrieved on 7/16/19 from https://econfip.org/wp-content/uploads/2019/06/Its-Good-Jobs-Stupid.pdf

Alli, F. 2017, January 12. 'Robots taking over jobs from factory workers'. *Vanguard*. Retrieved on October 9, 2018 from http://www.vanguardngr.com/2017/robots-taking-jobs-factory-workers/amp/

Amadeo, K. 2019. 'What is Reaganomics? Did it work?' *The Balance*. Retrieved on 7/16/19 from https://www.thebalance.com/reaganomics-did-it-work-would-it-today-3305569

Australia Government. 2014. '*Budget 2014-2015'*. Retrieved from https://budget.gov.au/2014 15/content/bp1/html/bp1_bst6_chart_data.htm

AP News 2003. '*Poland to cut spending to join Euro zone'*. Retrieved from https://www.apnews.com/300de8d b9be69974e8e4ce1c04c059b8

Benioff, M. 2017. '4 ways to close the inequality gap in the Fourth Industrial Revolution'. World Economic Forum, Retrieved from: https://www.weforum.org/agenda/2017/01/4-ways-to- close- the-inequality-gap-in-the-fourth-industrial-revolution/

Beyza, T. 2018. 'Impact of industry 4.0 on occupations and employment in Turkey'. *European Scientific Journal* 14(10).

BBC 2015. '*Spending cuts: Department by department'*. Retrieved from https://www.bbc.com/news/uk-politics-33013567

Bleicher, J. & Stanley, H. 2016. 'Digitalization as a catalyst for business model innovation a three-step approach to facilitating economic success'. Journal of business Management 12, 62-71.

Buller, T. 2011. 'Compliance with institutional imperatives on environmental sustainability: Building theory on the role of green'. The *Journal of Strategic Information Systems*, *20*(1), 6–26. doi:10.1016/j.jsis.2010.09.006

Boston Consulting Group. (2015). '*The Robotics Revolution'*. Retrieved 7/23/2019 from file:///C:/Users/BOLADE/Documents/robot%20txxation%20(robotic%20revolution%20of%20manufacuring)%20.pdf

Carl, F. & Michael, O. 2013. 'The future of employment: How susceptible are jobs to computerization'. *oxfordmartin.*
Retrieved from http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

Carnell, R. 2019. 'Is the South Korean economy headed for a recession?' *ING*. Retrieved 7/18/2019 from https://think.ing.com/articles/is-south-korea-economy-headed-for-recession/

Corwin, J. & Puckett, R. 2016.' Japan's manufacturing competitiveness strategy: Challenges for Japan, opportunities for the United States. US Department of Commerce', *International Trade Administration*. Retrieved on April 30, 2019 from https://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1651&context=key_workplace

CBC 2019. '*Bad-times budget delivers billions in tax cuts, spending'*. Retrieved from https://www.cbc.ca/news/canada/bad-times-budget-delivers-billions-in-tax-cuts-spending-1.804794

Crystal, A. 2018. '11 biggest progressive tax pros and cons'. *Vittana.org*. Retrieved on April 30, 2019 from https://vittana.org/11-biggest-progressive-tax-pros-and-cons.

Dauth, W., Findeisen, S., Suedekum, J., & Woessner, N. 2017. 'German Robots – The impact of industrial robots on workers'. *Discussion Paper* 12306, CEPR.

Dennis, S. 2018. 'From Single-task machines to back flipping robots: The evolution of robots'. *Ctemag.com*. Retrieved on June, 3, 2019 from https://www.ctemag.com/news/articles/evolution-of-robots

Eden, M & Gaggi, P. 2018. 'On the welfare implications of automation'. *Review of economic dynamics*, 29, 15-43.

Eh, B., John, B. & Stephen, M. 1997. 'Implications of skilled-based technological change. International evidence'. *National bureau of economic research working paper* 6166

Elisabet, E. S. 2003. 'National Report on Youth Policy in Norway. *Ministry of Children and family affairs'*. Retrieved from www.youthpolicy.org/library/wp-content/uploads/library/Norway_2003_National_Report_On_Youth_Policy_In_Norway_ eng.pdf

Elizabeth, D. 2009. 'Vulnerable hit by Latvia cash cuts: Latvia's economic woes hit healthcare and education as spending cuts take hold. *Aljazeera'*. Retrieved from https://www.aljazeera.com/focus/2009/09/2009938735701279.html

Elliot, S., and Binney, D. 2008. 'Environmentally Sustainable ICT: Developing Corporate Capabilities and an Industry Relevant IS Research Agenda', *Proceedings of PACIS 2008*, 4-7 July Suzhou, China

Erdoğdu, M. M., & Karaca, C. 2017. 'The Fourth Industrial Revolution and a Possible Robot Tax', *IJOPEC publication*, ISBN: 978-1-9997035

Francesco, C., Ekkehard, E., & Enzo, W. 2018. 'Robots worldwide: The impact of automation on employment and trade'. *Research Department working paper* 36.

Franck, L. 2013. 'A brief history of robots'. *Paris Innovation Review, com*. Retrieved on June 2, 2019 from parisinnovationreview.com/articles-en/a-brief-history-of-robots

Fred, A. 2005. 'Government spending down slightly in 2004'. *CBS.* Retrieved from https://www.cbs.nl/en-gb/news/2005/41/government-spending-down-slightly-in-2004

Gasteiger, E & Prettner, K. 2019. 'Automation, Stagnation and the implications of a robot tax'. School of Businss & Ecoomics Frele Universaitat, Berlin.

Germana, B. 2017. '*A tax on robot? Some food for thought'*. Retreived from http://www.finanze.it/opencms/it/il-dipartimento/documentazione/collana-di-lavori-e-di-ricerca/

Gregory, S. C. & Jackrit, S. 2002. 'Toward self-replicating robots. Conference paper'. Retrieved on June 3, 2019 from https://www.researchgate.net/publication/220806689

Graetz, G. & Michaels, G. 2015. 'Robots at work'. *CEEPR discussion paper*. 110477

Griffith, T. 2019. 'Progressive taxation and happiness'. Retrieved on 7/16/19 from https://www.bc.edu/content/dam/files/schools/law/lawreviews/journals/bclawr/45_5/12_TXT.htm

Goldstein, S. 2015. 'Eighty million U.S jobs at risk from automation, central bank official says. Market watch'. Retrieved 7/19/2019 from https://www.marketwatch.com/story/eighty-million-us-jobs-at-risk-from-automation-central-bank-official-says-2015-11-12

Haggerson, F. 2016. 'The failures of reaganomics and neoliberalism Munich', *GR*. Retrieved on 7/16/2019 from https://www.grin.com/document/339340

Hemous , D. & Olsen, M. 2016. 'The rise of the machines: Automation, horizontal innovation and income inequality'. Mimeo.

International Federation of Robotics 2018. '*Definition of an industrial robots: Definitions and Types'*. Retrieved on October 5, 2018 from https://ifrs.org/industrial-robots.

International Social Security Association. 2013.'*The prevention and activation strategy in the Belgium unemployment insurance scheme'*. Retrieved from https://www.issa.int/en_GB/-/the-prevention-and-activation-strategy-in-the-belgian-unemployment-insurance-scheme

International Federation of Robotics 2017. 'The impact of robots on productivity, employment and jobs'. *A positioning paper by the IFR*. Retrieved 7/17/2019 from *https://ifr.org/img/office/IFR*_The_Impact_of_Robots_*on*_Employment*.pdf*

Jaimovich, N., & Siu, H. E. 2017. 'Disappearing routine jobs: Who, how and why?' *Journal of Monetary Economics*, vol. *91*, pp. 69-87.

Joseph, F., Dirk, S., & Steven, D. 2017. 'Industry 4.0 and its potential impact on employment demographics in the UK'. Conference paper DOI: 10.3233/978-1-61499-792-4-239

Korkmaz, S. & Korkmaz, O. 2017. 'The relationship between labour productivity and economic growth in OECD countries'. *International Journal of Economics and Finance*, *9*, 71. Doi: 10.5539/ijef.v9n5p71.

Khadem, N. 2019. '*Robots set to take 20m jobs globally by 2030, SA and Victoria will be hard hit, warns report'*. Retrieved 7/23/2019 from https://www.abc.net.au/news/2019-06-26/sa-among-worst-hit- by-20m-jobs-lost-globally-to-robots/11245092

Laurent, P. 2013. 'Advanced manufacturing processes for Engineering Materials'. 5th Ed.

Levine, L. 2013. 'Economic growth and the unemployment rate'. *Congressional research service* 7-5700. Retrieved 7/18//2019 from https://fas.org/sgp/crs/misc/R42063.pdf

Levy, M. 2009. '*America recovery and reinvestment Act*.' Retrieved 7/19/2019 from https://www.britannica.com/topic/american-recovery-and-reinvestment-act

Mamudu, F., & Lamido, A. A. 2017. 'A Comparative analysis of the effects of robots on Nigeria economy'. *IOSR Journal of Computer Engineering*, vol. *19*, no. 5, pp. 36-40.

Marwala, T. 2018. 'On robot revolution and taxation'. *Allen Institute for Artificial Intelligence*. Retrieved September 26, 2018, from https://www.arxiv.org/pdf/1808.0166.

Martin 2015. '*Rise of Robots, Technology and the Threat of a Jobless Future'*. New York: Basic Books.

Mason, P. 2015. *Post Capitalism: A Guide to our Future*. Allen Lane.
Maximilian, B., Mathias, D. Clemens, F. Max, L & Andreas, P. 2015. '*German public finances through the financial crisis'* Retrieved 7/19/2019 from http://ftp.zew.de/pub/zew-docs/dp/dp15041.pdf

Macrotrends 2019. '*South Korea Murder/Homicide rate 2012-2019.*' Retrieved 7/18/19 from https://www.macrotrends.net/countries/KOR/south-korea/murder-homicide-rate

Mladá, F. 2010. 'Slovenský prezident pověřil vytvořením vlády Radičovou. Fico přiznal' prohru. https://www.idnes.cz/zpravy/zahranicni/slovensky-prezident-poverilvytvorenim-vlady-radicovou-fico-priznal-prohru.A100623_114453_zahranicni_aha

Mikael, M. 2016. 'Economic Values and Resource Use'. *Sustainability.* 8. 490.10.3390/su8050490.
Miyamoto, H. 2009. 'R&D, unemployment, and labour market policies'. *Japan and the world* 22, 198-205
.
NICVA 2010. '*The Impact of welfare reform on Northern Ireland*.' Retrieved from http://www.nicva.org/resource/impact-welfare-reform-northern-ireland

Ormazabal, K. M. 2004. 'Smith on Labor Value. Bilbo, Biscay', Spain: University of the Basque Country Working Paper.

OECD 1998. 'Technology, productivity and job creation: best policy practices'. *The OECD Job strategy*. Retrieved from *https://*www.oecd.org*/sti/ind/2759012.pdf*
OECD (2010). 'Sustaining the economic expansion in New Zealand'. *Economics department working paper*, 1247.
OECD 2011.'Country Notes:' *Czech Republic*. Retrieved from www.oecd.org/governance/budgeting/47840724 .pdf.
OECD 2012.' Tracking income inequality: the role of taxes and transfers'. *OEECD*. Retrieved 7/19/2019 from http://dx.doi.org/10.1787/19952856
OECD 2019. '*Global growth weakling as some risk materializes'*. Retrieved 7/18/22019 from https://www.oecd.org/economy/outlook/global-growth-weakening-as-some-risks-materialise-OECD-interim-economic-outlook-handout-march-2019.pdf
Oishi, S., Kushlev, K., & Schimmack, U. 2018. 'Progressive taxation, income inequality and happiness'. *American Psychologist*, 73(2). Retrieved on 7/16/2019 from http://dx.doi.org/10.1037/amp0000166
Polly, C. 2010. 'Budget 2010: Public sector faces deepest ever spending cut'. *The Guardian*. Retrieved from https://www.theguardian.com/uk/2010/jun/22/2010-budget-public-sector-cuts.
Postel-Vinay, F. 2002. 'The dynamics of technological unemployment'. *International Economic Review*. Vol. 43, pp. 737-760.

Pauline, G., Eric, M. 2003.'Changes in job security and their causes: an empirical analysis for France, 1982-2002' *European economic review*, vol. 48, no. 3, pp. 595-615.

Quintini, G., Montt, G. 2016. 'Automation and task-based change in OECD countries'. *OECD.* Retrieved 7/18/2019 from https://oecdskillsandwork.wordpress.com/2016/05/19/automation-and-task-based-change-in-oecd-countries/
Oberson, X. 2016. 'Taxer les robots? Bilan: 16': Retrieved September 11, 2018 from https://www.coursera.org/payments/checkout?cartId=21359790.
Rachael, M. 2017. 'The pros and cons of keeping a progressive tax system'. *IVN*. Retrieved on April 30, 2019, from https://ivn.us/2017/02/22/pros-cons-progressive-taxation/
Renn, O., Jovanovic, A, Schroter, R. 2011. 'Social unrest: multi-disciplinary issues international future program'. *OECD.* Retrieved 7/18/2019 from http://www.oecd.org/gov/risk/46890018.pdf
Ryan, B. 2012. '*Estonia proves that it's possible to cut spending and continue to grow'*. Retrieved from http://estonianworld.com/business/estonia-proves-that-its-possible-to-cut-spending-and-continue-to-grow/

Sabine, P. 2018. 'Robots, industry 4.0 and humans or why assembly work is more than routine work'. *Mdpi.com*. Retrieved from https://www.mdpi.com/2075-4698/6/2/16/htm on July 2, 2019. *Societies*, vol. 6, no. 2, pp. 16.

Strauss, D. 2018. 'Job threat from automation is overdone, says BoE's Mark Carney'. *Financial Times*. Retrieved on October, 9, 2018 from http://www.ft.com/content/23f11012-b81c- 11e8-b3ef-799c8613f4a1

Sharkey, N., Goodman, M., & Ross, N. 2010. 'He coming robot crime wave'. *Research Gate*. Retrieved 7/19/2019 from https://www.researchgate.net/publication/220476058_The_Cominng_Robot_Crime_Wave

Schwab, K. 2016. 'The Fourth Industrial Revolution. Geneva'. World Economic Forum. Retrieved from: https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/

SGI 2017. '*Belgium economic policies'*. Retrieved from http://www.sginetwork.org/2017/Belgium/Economic_ Policies

Tamahome, J. 2009. 'A brief history of the federal income tax'. *Saylor.org*. Retrieved from https://resources.saylor.org/wwwresources/archived/site/wp-content/uploads/2012/06/A-Short-History-of-the-Federal-Income-Tax.pdf

Trading Economics 2019. 'South Korea Youth Unemployment rate'. Retrieved 7/18/19 from https://tradingeconomics.com/south-korea/youth-unemployment-rate

Victor, P. 2010. 'Questioning economic growth'. *Nature.* doi: 468. 370-1.10.1038/468370a.

Uwe, T. 2018. '*Optimal taxation of robots'*. Retrieved from http://uwethuemmel.com/wpcontent/uploads/2017/02/Thuemmel2018_OptimalTaxation of Robots_June.pdf

Will, K. 2019. 'Normative economics definition'. *Investopedia*. Retrieved on 7/18/19 from https://www.investopedia.com/terms/n/normativeeconomics.asp

World Economic Forum 2019. 'Yukio Hatoyama addresses' *World Economic Forum Japan Meeting*. Retrieved from https://www.weforum.org/agenda/2009/09/world-economic-forum- establishes-its-presence-in-japan/

World Development Report 2016. 'Digital dividends'. *World Bank* ISSN: 0163-5085

Xing, B. & Marwala, T. 2018. '*Smart maintenance for human-robot interaction: An intelligent Search Algorithmic Perspective'*. London: Springer.

Yanis, V. 2017. 'A tax on robots? Innovation and technology'. *PS*. Retrieved on October, 2, 2018 from http://www.project-syndicate.org/commentary/bill-gates-tax-on-robots-by-yanis- varoufakis-2017-02?barrier=accesspaylog