EERI

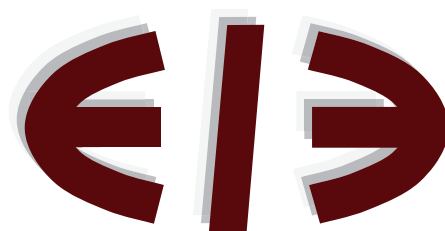## Economics and Econometrics Research Institute

The Quantitative Effect of the Thatcherism Taxation Programme: Computational Experiments based on a Dynamic General Equilibrium Model

Robbie Noel Wilson and Aleksandar Vasilev

EERI
Economics and Econometrics Research Institute
Avenue Louise
1050 Brussels
Belgium

Tel: +32 2271 9482
Fax: +32 2271 9480
www.eeri.eu

The Quantitative Effect of the Thatcherism Taxation Programme: Computational Experiments based on a Dynamic General Equilibrium Model

Robbie Noel Wilson, Independent Researcher. E-mail: rwilson@lincoln.ac.uk

Aleksandar Vasilev, University of Lincoln, UK. E-mail: avasilev@lincoln.ac.uk (Corresponding author)

Abstract

This paper analyses the quantitative welfare effects of the Thatcherism taxation programme reforms. Modern macroeconomic techniques are put into application to the important historical fiscal reforms. The Paper provides details of the Thatcherism taxation reform, the changes in taxation rates and brackets. Through a dynamic general equilibrium model, the paper provides counter-factual growth rates. A comparison between the factual and counter-factual growth rates is given. The paper finds that through both welfare measures, that welfare increased due to the Thatcherism taxation program. These results will provide use and benefit for; policymakers, those studying the Laffer-Curve, those with supply-side economic ideas or beliefs, and those studying the economic, political, and historical period under the Thatcher government.

Introduction

The British economy and political landscape in the 1970's, is often described as dark and turbulent time. The economy had been seen to be in a decline through the post-war era (Middleton, 2006). Trade unions appeared ever more powerful than the government, with consent strikes to demand higher wages. With governments throughout the seventies meeting the demands of paying increased wages and increased paid holidays, costs of productions spiralled out of control leading to massive, record-breaking levels of inflations. With 25% inflation in 1975 being the peak level (Matthew, and Minford, 1996) and with the extensive union powers and the lack of productivity, the United Kingdom was nick-named the sick man of Europe during the debate of whether the UK should join the European Communities, which would later become the European Union. Throughout the seventies, the UK appeared to be on the decline with regards to economic activity, prosperity, and power.

On the 3rd of May 1979, the United Kingdom elected the Conservative party, with a majority in the House of Commons holding 339 seats. The leader of that Conservative party was Margret Thatcher, the first female Prime Minister in UK history. The election win was on the back of manifesto promises to expand and increase the general health of the economy, tackle inflation and achieve a fair relationship with trade unions. The British people approved this message due to the years leading up to the 1979 election, which was riddled with record levels of inflation, continuous trade union strikes and continuous decline or stagnation. Mrs Thatcher's methods to tackle this were set out in the manifesto. It included; tackling inflation by cutting state spending, reducing the level of taxation with aims to increase work incentives and reward the newly employed. Thatcher's economic policies were seen as a deliberate reversal of the post-war consensus in Britain (Matthews and Minford, 1987).

Thatcher's central economic beliefs and principles were seen shortly after her election victory, in Sir Geoffrey Howe's maiden budget speech as Chancellor of the Exchequer. He listed four Principles; "To strengthen incentives by allowing people to keep more of what they earn, so that hard work, talent and ability are properly rewarded", "To enlarge the freedom of choice for the individual by reducing the role of the state", " to reduce the burden of financing the public sector, to leave room for commerce and industry to proser" and "to ensure, so far as possible, that those who take part in collective bargaining understand the consequences of

their actions for that is the way to promote a proper sense of responsibility" (Smith, 1988). In the same speech, the Chancellor significantly cut direct taxes, those aimed at people's income. A more detailed explanation of these tax cuts can be found in section 2.

Thatcher's economic ideas were initially conducted to resolve the stagnation and decline of the UK economy. However, her ideas formed the future basis of a new ideology of Thatcherism. Described by Nigel Lawson, Thatcher's Chancellor from 1983 to 1989, Thatcherism was a political platform that emphasised free markets with tax cuts and restrained government spending, partnered with British nationalism (Lawson, 1992). Today Thatcher is the embodiment of the Laissez-faire economic ideology and supply-side arguments. In today's economic and political debate, Thatcherism represents the ideal economic system for those who believe in free markets. Thatcher's policies were supply-side based, stemming to the belief that lowering taxes, decreased regulation, and free-markets/ free-trade would result in economic growth (Cronin, 2014: 92-120). Across the eleven years Thatcher was in power, deregulation, liberalisation and privatisation would become synonymous with her name.

Nevertheless, concerning these economic ideas and theories, stems the question of the effect on household consumption and therefore welfare. Do the supply side and laissez-faire economic ideology cause a positive or negative effect on the household. If so, should government steer clear of Thatcherism tax cuts or adopt her policies. Research into this field is not just for analytical, historical benefit but also for economic theories and their effect based from domestic fiscal policy changes.
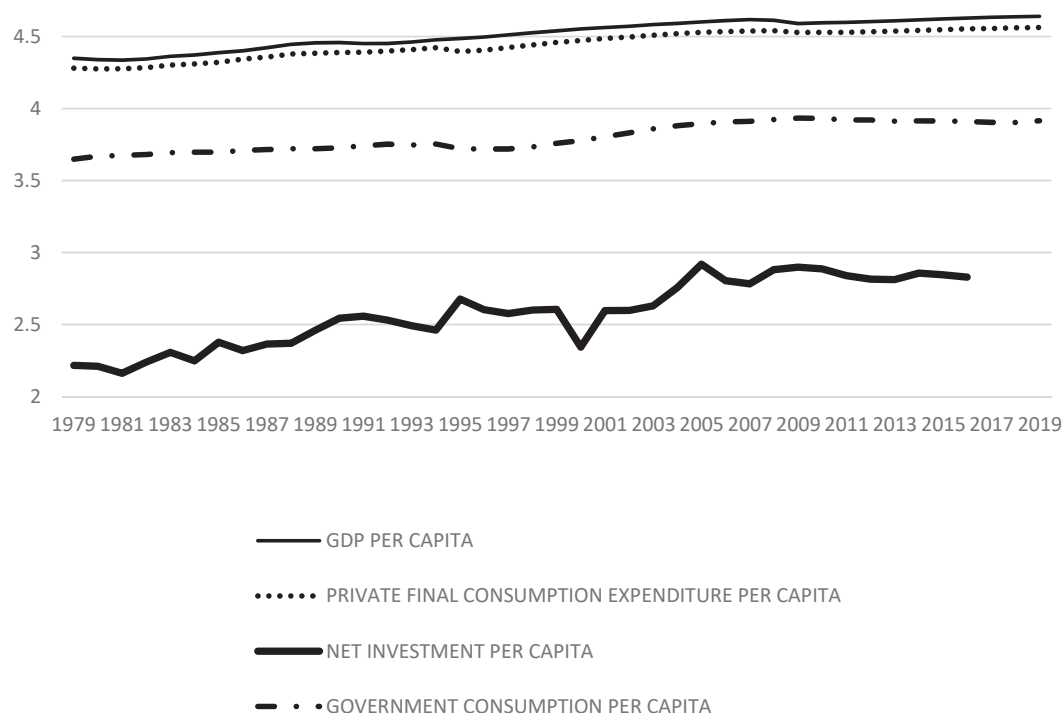
To examine the welfare effect of the Thatcherism taxation programme, the paper creates counter-factual growth rates for a situation in which the Thatcherism reforms did not take place. These counter-factual growth rates then project a path of consumption over the period since the original reforms. In measuring welfare through the level of consumption, we can compare the difference between factual welfare and counter-factual welfare. Therefore, this will allow us to answer the question, of the effect Thatcher's taxation programme had on the nation. Its finding will provide evidence backing the economic and political debate of today.

Distinctions between physical and human capital occur within this paper, which is unique for examining the welfare effects of individual taxation reforms. Using a simplified version of the

model from Lucas (1998), the distinction between physical and human capital is added to the endogenous growth model. Therefore for the first time, a model containing this unique element is being used to examine the effects of the Thatcherism taxation programme through a dynamic general equilibrium model.

Through the accession of both human and physical capital, a sustained level of growth will be delivered. The balanced growth path (BGP) describes this sustained level of growth. The BGP phenomenon takes place in the majority of developed economies. It assumes that GDP, government consumption and investment are growing at a constant rate.

Figure 1; Balanced growth path in United Kingdom

GDP PER CAPITA

••••• PRIVATE FINAL CONSUMPTION EXPENDITURE PER CAPITA

NET INVESTMENT PER CAPITA

- • • GOVERNMENT CONSUMPTION PER CAPITA

Source: World Bank, World Development Indicators

Above, Figure 1 shows the Balanced Growth Path for the United Kingdom over the period 1979-2019. As the economic variables have a constant growth rate, this suggests sustained economic growth and the BGP. The variable "Net Investment Per Capita" does have a volatile path across the period. However, as a trend, the variable does follow the constant growth path. The concept of the BGP has also been used by Stigliz (1978) in analysing the effect on the welfare of estate taxation and by Bilancini & D'Alessandro (2012) as a means of examining

externalities against welfare. This paper uses the BGP as a substitute for modelling the UK economy, as the assumptions made by the BGP are consistent with this paper.

All of this comes together in allowing the paper to evaluate the quantitative effect on welfare of the Thatcherism taxation programme, through the use of a dynamic general equilibrium model. The model allows us to use computational experiments to ascertain counter-factual growth rates for both the level of consumption after capital gains taxation and income taxation. These counter-factual results are then compared to the factual results, allowing for the comparison of the Thatcherism taxation reforms and no-reforms. The comparison will provide evidence for the controversial fiscal reforms and provide evidence on topical economic debate.

This paper is assembled in the following format: Section 2 is the detailed reforms of the Thatcherism Taxation programme. Section 3 is a literature review relating to the subject. Section 4 outlines the endogenous growth model concerning households, firms and government. Section 5 describes the calibrations for the model and the data used. Section 6 discusses the finding from the experiments. Section 7 rounds off the finding in a conclusion and discusses the limitations for the paper and any potential future work and research.

Thatcher's Taxation Reform Details

Within this section of the paper, we examine the Thatcherism taxation programme. Looking at the tax rates on income and capital gains, and briefly mentions the other economic and political matters that may affect the nation's welfare.

Margaret Thatcher was elected to power in 1979, the end of the seventies. The seventies had been a difficult time with regards to the economy. With record-breaking levels of inflation, in 1975 at 25%. At the time, significant levels of unemployment and increasing powers of workers unions crippled some industries. After these difficult times, the British people resonated with the conservative parties' manifesto in the election of 1979. It highlighted a dynamic economy with a reduced level of taxation to incentivise people to work. Thatcher's economic strategy was built on the work by the Meade committee. The Meade Report advocated the move from income tax to an expenditure tax as it would encourage saving and investment into capital but also incentivise work (Martin 2019).

Table 1 (below) presents the taxation brackets on income tax in 1978-1979. These were the taxation brackets that Thatcher inherited when coming to power. In the first budget under the Thatcher government, Geoffroy Howe, the new Chancellor of the Exchequer, rapidly implemented a significant shift in the taxation programme. The top income taxation bracket rate of 83% was cut to 60%, and the basic income bracket was reduced from 33% to 30%, along with the brackets being raised, meaning more citizens entered lower brackets.

TABLE 1	
1978- 1979	
Income Bracket	Income Tax Rate %
Up to 750	25
750 - 8,000	33
8,000 - 9,000	40
9,000 - 10,000	45
10,000 - 11,000	50
11,000 - 12,500	55
12,500 - 14,000	60
14,000 - 16,000	65
16,000 - 18,500	70
18,500 - 24,000	75
Over 24,000	83

Source: HMRC National Archives

However, as the Thatcher government had branded itself as fiscally responsible, it did not want to increase the deficit as a means of cutting income taxation. Therefore, the income tax cuts were coupled with value-added taxation (VAT) increases. Pre-Thatcher, the VAT rate had been a split, with an introductory rate of 8% and a luxury rate of 12.5%. In the same first budget, the Chancellor announced the VAT rate would be increased to a more straightforward single rate of 15%[1].

Table 2

1989-1990	
Income Bracket	Income Tax rate
Up to 20,700	25
Over 20,700	40

Source: HMRC National Archives

In 1990 when Thatcher left office, Thatcher's taxation programme left the UK with only two income tax brackets, as seen in Table 2, at just 25% and 40%. Capital gains tax had been indexed, meaning that savers could counter the inflation rate from the period they gain their assets. These are the two immediate changes in the taxation programme that will affect individual households. Therefore, for this paper, these methods of taxation will be examined. Other changes in taxation also took place, such as corporation tax cuts, this tax cut helped handle the level of inflation, and the cuts saw increases in revenue from corporation taxes (Johnson, 1991). This lies in the Laffer Curve's ideas, in which as the tax rate is lowered, more

---

[1] With regard to the VAT change, this will only affect demand for the first period that the change was implemented. The effect of this on the model will be small/ negligible due to the adjustment of government transfers being proportional to preserve the budget balance as the model does not take into account the government debt.

corporations enter the UK and call it their home and individuals are encouraged to start their businesses—resulting in more corporations paying the corporation's tax.

Graph 1; United Kingdom Tax revenue (% of GDP)


United Kingdom Tax revenue (% of GDP)
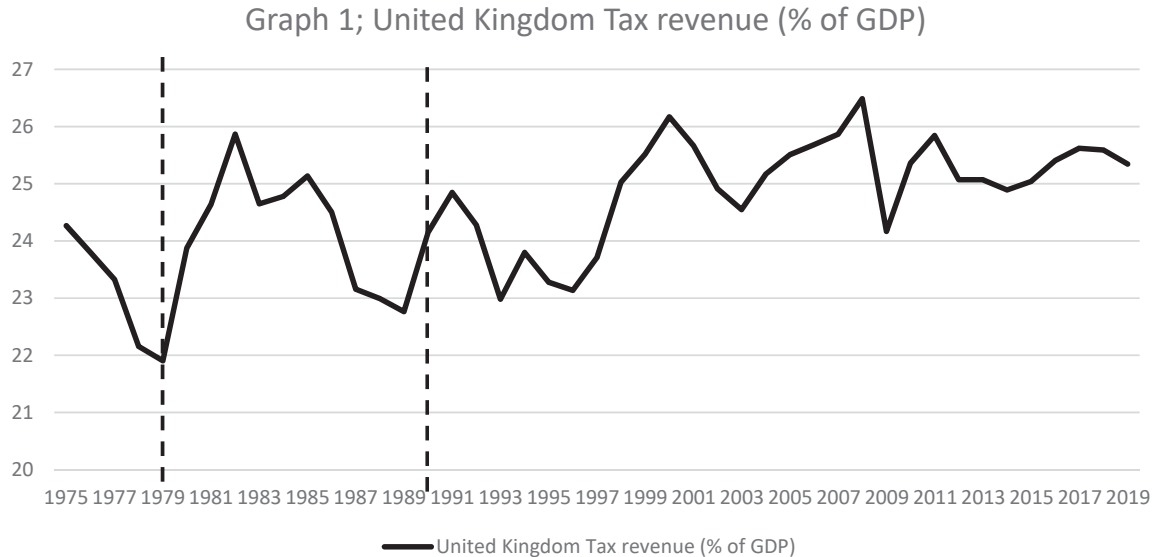
Source: World Bank, World Development Indicators

Graph 1 (above) shows the taxation revenue over the period 1975-2019. The space between the two vertical lines represents the period Thatcher was in office; 1979-1990. Also graph 2, (next page), shows the UK governments deficit/surplus. It provides no evidence of increased borrowing. Both the graphs provide evidence to suggest that the significant tax cuts that took place under Thatcher were revenue-neutral (Dilnot and Stark 1986). The reasoning behind this can be attributed to the counter increase in VAT as a means of being revenue-neutral, and the effect could also be linked to the economic theory of the Laffer Curve.

The Laffer Curve is an economic theory made popular by Arthur Laffer, an American economist and member of the Ronald Reagans Economic Policy Advisory Board. Arthur Laffer has stated that he advised both Reagan and Thatcher to cut their taxes in an effort to raise revenues (Sunday Telegraph, 2014). The theory displays a graphical representation of the tax rate (X-axis) and the government revenue (Y-axis). The basics of the theory suggest that higher tax rates past the optimal maximum revenue point will decrease the level of tax revenue. The theory played a part in many government debates concerning the tax rate.

Graph 2; Public Sector Net Lending(-)/Borrowing(+) in the
United Kingdom, Millions of British Pounds, Annual, Not
Seasonally Adjusted
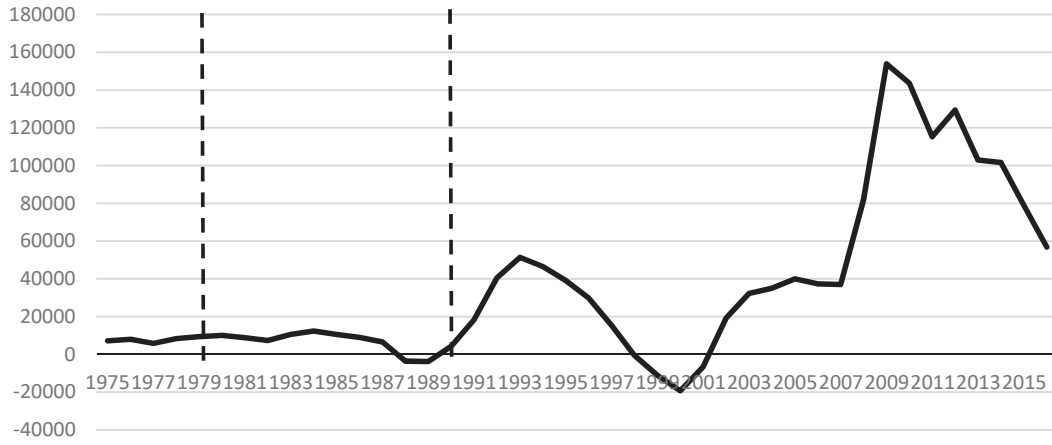
Literature Review

Many academics have previously worked on the effects of a taxation programme, and therefore work in this field is not uncommon, in fact, it is plentiful. However, many will evaluate the effect a taxation programme had on economic growth, trade, currencies and many more macroeconomic and microeconomic factors. Few, however, examine the effect a taxation programme has on welfare. In addition to this, some academic papers examine welfare through a variation of different methods. This leads to a gap in the research, examining the welfare effects of a taxation programme. There are only a handful of researchers who have worked in this field of study.

Nevertheless, due to the large array of taxation methods and taxation programmes, there are plenty of gaps in research with no experimentation. This leads to the welfare effects of the Thatcherism taxation programme. The Thatcherism taxation programme is a complex and highly debated topic, with many hailing it as a success story and some smearing it as an irreversible failure that still affects the UK today. This paper brings together the work of previous academics to apply modern macroeconomic models to this historical taxation programme as a means of learning from previous historical events.

The work of Se-Jik Kim (1998), which explores the growth effect of taxes in an endogenous growth model, provides this paper with a great resource. The model used within Kim's work provides the basis for the model this paper uses. Kim's model comprises the financial, human and physical capital choices that households are represented with. The paper examined the dissimilarity between physical and human capital, of which both are accumulated by the represented household. Although this paper's work is exceptionally reliant on the work of Kim and his model, this paper's research differs in the nature of progressive income taxation and the time period the work is applied to.

The Work of Aleksandar Vasilev (2015) is instrumental to this paper, as the use of an endogenous growth model which differentiates human and physical capital for flat taxation reform in Bulgaria. Not only does this paper heavily rely on his work due to similarity in computation experiments, but it also follows similar welfare analysis, described later in this section. The work of Lucas (1998) also acknowledges human capital in an original growth

model. Lucas's paper develops an endogenous growth model which includes human capital. He states that human capital is the "general skill level" when talking about the workforce.

When looking at measuring welfare, this paper finds an array of methods. Work from Castano (2002) looks at the qualitative principal component analysis, in the absence of reliable information, as a means of measuring welfare. Sahn and Stifel (2003) look at an asset-based alternative as a means of finding a similar way of measuring the welfare of households. However, work by Aleksandar Vasilev (2015) analyses the welfare effect of the flat income tax reform of 2008 in Bulgaria through the form of an endogenous growth model, which again differentiates physical and human capital. Provides a means of measuring the welfare effects from taxation reform. Vasilev's paper uses a compensating variation method of measuring welfare. A method described by Chipman and Moore (1980) as a useful cost-benefit tool when examining the welfare effect brough on by tax reforms. Therefore, this paper also uses the same method, as it provides reliable results through the uses of a logical and precise model.

When looking at welfare analysis, from taxation reforms, most models take a closed economy, as shall this paper, such as Lucas (1990) and Ben-Gad (2004), whose research also supports the idea for a model taking a closed economy. Some researchers, such as Kim Sunghyun(2007), apply the assumption of an open economy to a general equilibrium model with multi-goods.

Research from Hamed et al, (2019) which also uses a closed economy for its model, delves into the welfare effects of tax reforms for Morocco. The research uses a dynamic general equilibrium model, with institutional and structural characters for a developing economy, differing from this paper's model, as the BGP, along with other indicators, from section 2, details the UK to be a developed economy. However, the research's findings show relevance to the trade-off of cutting taxes and the resulting depressed level of government revenue. As outlined in section 2, the Thatcher government cut direct taxation but increased indirect taxation such as VAT, which Hamed et al's research advocates with the alinement of VAT as a means of sensibly managing the government revenue.

Debate on supply-side economics, being related to increased government deficit, is not unheard of. From the Thatcherism programme, we see the government redistribute its methods of generating government revenue from direct to indirect (Smith, 1988). Therefore,

the government revenue was not heavily affected by the direct taxation cuts. However, if tax cuts are not coupled with sizeable economic growth, then deficits can arise. This relates to the work of George Wilson (1984) who blames the increased federal deficit of the Reagan administration on fatigued GNP growth.

In contrary evidence to neo-classical economic ideas, Benjasak & Bhattari (2019) research finds that an increase in VAT within Thailand increase the level of utility for households. It cites that reduced spending power that increases in VAT brings is offset by compensation in the form of government spending. The level of government spending for this papers experiment has been taken as neutral. Work from Torres and Cordoba (2011) also provides evidence to suggest that an increase in VAT will only affect welfare for one period, the period it is implemented. These findings provide evidence to suggest that Thatcher's increases in VAT would harm the level of welfare within the nation, which is a critical point in examining the effect of direct taxation cuts, as one of the prominent counter-arguments is that increases elsewhere will reduce the level of welfare. Whereas due to the finding of Benjask & Bhattari, Torres & Cordoba and Hamed provide evidence to suggest that increases in VAT will not provide harmful effects on welfare.

Additional literature which has provided evidence and insight for the modelling within this papers work comes from Minford and Meenagh (2019). Their research examines the relationship between supply-side policy and economic growth between 1970 and 2019. There work observes the sizeable personal income tax rate cuts in the 1979 and 1988 budget and its relationship to the observed reversal of UK economic decline. Their work provides excellent evidence of tax cuts and their relationship to growth but provides no welfare effect. Minford and Meenagh also provide some model parameters, as their work also examines the UK real business cycle model. Other work also provides valuable research for this papers model, such as Economides, Philippopoulous and Vassilatos (2014), who uses a dynamical general equilibrium model in examining the public and private providers of goods in the UK.

When examining the fiscal policy changes and Thatcher's taxation programme, this paper uses literature from Johnson (1991). Johnson details the precise fiscal evens over the Thatcher years, taking time to explain each section of the taxation programme and the thinking behind the ideas. It also provides statistical evidence in relation to macroeconomic factors in the economy at the time, such as employment and the power of the union's effect on wages,

which leads to model limitations explained in the conclusion. Similar work can be found in Smith (1988), who also clarifies the reasonings behind Thatcher's taxation decisions and explains the drive to incentivise a nation to work and become a capital-owning society. In addition to explaining historical taxation decisions, work from Holmes (1989) and Keegan (1984) describes some of the political decisions and their impact on the economy and individual's welfare.

Through this section of the paper, literature has provided research into measuring welfare effects. Its provided methods of measuring welfare and reasons that may affect welfare. This section has also seen research that examines economic reactions to supply-side policy, such as taxes cuts. A limited number of papers have examined the welfare effect due to taxation reforms. However, there is a gap in research examining Thatcherism taxation reform and how it affects the levels of welfare households experience. This paper is unique in precisely examining the welfare effects of the Thatcherism taxation programme through a dynamic general equilibrium model. The results from this paper will provide additional resources for the supply side, laisse fair economic policy debate. This paper's research will also provide a reference in the long-debated topic of optimal taxation level and means of taxation.

Model Set-Up

For this paper to examine the Quantitative effect of the Thatcherism taxation programme, a model economy must be used to examine the taxation reforms. In this section of the paper, the way in which the economy is outlined by the model will be explained. The model consists of a representative household, firm, and government. As already mentioned in Section 3, the model within this paper is heavily dependent on the work of Kim (1998), Vasilev (2015), Lucas(1998) and Minford and Meenagh (2019).

<u>The Household</u>

There is an infinite number of representative households, all being identical. There is no growth in the population. The representative household maximises the instantaneous utility function.

$$\max\{C_t\}_{t=0}^{\infty} \ \sum_{t=0}^{\infty} \beta^t \ln(C_{-t}) \tag{1}$$

C_{-t} is consumption where $C_{-t} > 0$, β^t is the discount factor and it will take a value 0<β<1. The household does not value leisure, all available time is spent on labour. Labour is the household's sole endowment. The household supply's its labour to the firm inelastically. More detail on the utility function can be found in Technical Appendix 1.0.

The work of Kim (1998) delivers a budget constraint that will be used in this model. It outlies the choices faced as bonds, equities and investment in human capital. Where human capital is the measure of skill, education and other attributed of labour in relation to productive ability. The income of the household is therefore derived from these three different investments and from a government transfer (Kim 1998);

$$C_t + (b_{t+1} - b_t) + q_{t+1}(E_{t+1} - E_t) + i_{ht} \leq r_{bt}b_t + d_t q_t E_t + w_t H_t l_t + T_t - [\ \theta_t w_t H_t l_t$$

$$+ m_b(r_{bt})b_t + m_n d_t q_t E_t + m_c \left(\frac{Dq}{q}\right)_t q_t E_t\ ] \tag{2}$$

The left-hand side of the budget constraint represents household expenditures. Where b_{t+1} is the demand for bonds, q_{t+1} is the price of equities in terms of output, E_{t+1} is the number of equities demanded, i_{ht} is the investment in education / human capital. The right-hand side presents the net income for the household. r_{bt} is the real interest rate on bonds, d_t is the dividend yield from equities, w_t is the real wage rate, H_t is the level of human capital, l_t is the

supply of labour to the firm, T_t is the transfer payment, θ_t is the labour income tax rate and m_b is the interest tax rate on bonds.

The taxes imposed on the household are in the form of income tax, seen in the budget constraint as θ_t the labour income tax rate. This tax rate is applied to $w_t H_t l_t$, which denoted the wage rate, level of human capital, and labour supply. This multiplied by the labour income tax rate $\theta_t w_t H_t l_t$ will be the amount of tax paid in the form of income tax. The other form of taxation the household shall experience is Capital Gains income tax. This is represented in the budget constraint as m_b, the interest tax rate on bonds, m_n the tax rate on dividend yields and m_c the rate of capital gains tax.

The progressivity of income is represented by an adapted version of a function used in the work of Cassou and Lansing (2002) and similar work of Guo and Lansing (1998);

$$\theta_t = \eta \left(\frac{r_{bt} b_t + d_t q_t E_t + w_t H_t l_t + T_t}{\bar{r}_{bt} \bar{b}_t + \bar{d}_t \bar{q}_t \bar{E}_t + \bar{w}_t \bar{H}_t \bar{l}_t + \bar{T}_t} \right)^{\phi} \tag{3}$$

η is the average effective income tax rate in the steady-state, and the progressivity of the tax structure is represented by ϕ. With $0 < \eta < 1$ and $0 \leq \phi < 1$.

The representative household will determine the choices of the three factors of consumption to maximise the household's utility. λ_t denotes the Lagrangean multiplier, which is used when the consumer's utility function is the objective function, and the constraint is represented through the budget constraint. In maximising the choice variables; Consumption C_t, Demand for bonds b_t, Equities E_t and the level of human capital H_t. We set the derivatives $c_t c_{t+1}$ and b_{t+1} are set to zero.

$$max\{c_t, b_t, E_t, H_t\}_{t=0}^{\infty} \sum \beta^t \{ log(c_t) + \lambda_t \{ r_{bt} b_t + d_t q_t E_t + w_t H_t l_t + T_t - [\theta_t w_t H_t l_t +$$

$$m_b(r_{bt}) b_t + m_n d_t q_t E_t + m_c \left(\frac{Dq}{q} \right)_t q_t E_t] - C_t + (b_{t+1} - b_t) + q_{t+1}(E_{t+1} - E_t) +$$

$$i_{ht} \} \tag{4}$$

From this the FOC (First Order Condition) is as follows:

$$\frac{\partial L}{\partial c_t}: \quad \beta^t\left\{\frac{1}{c_t} - \lambda_t\right\} = 0 \qquad \Rightarrow \qquad \frac{1}{c_t} = \lambda_t \tag{5}$$

$$\frac{\partial L}{\partial c_{t+1}}: \quad \beta^{t+1}\left\{\frac{1}{c_{t+1}} - \lambda_{t+1}\right\} = 0 \qquad \Rightarrow \qquad \frac{1}{c_{t+1}} = \lambda_{t+1} \tag{6}$$

therefore,

$$\lambda_t = \beta\lambda_{t+1}\left[1 + (1 - m_b)r_{bt+1}\right] \tag{7}$$

Looking at the transversality conditions, with regard to rule that, households have stock of capital and equities at time period zero.

$$TVC_b = \lim_{t\to\infty} \beta^t \lambda_t b_{t+1} = 0 \tag{8}$$

$$TVC_E = \lim_{t\to\infty} \beta^t \lambda_t E_{t+1} = 0 \tag{9}$$

These transversality conditions, along with the Balanced Growth Path, forms the second condition of this paper. The transversality conditions implement boundaries for the growth path. The transversality condition affirms that capital must be equal to zero at the end of the household's life. i.e. at the end of the optimisation horizon, the value of equity and bonds will be equal to zero, resulting in nothing being left behind.

For the FOC to be used for the computational experiments in this paper, equation (7) is rearranged by dividing all by λ_{t+1} .

$$\frac{\lambda_t}{\lambda_{t+1}} = \beta[1 + (1 - m_b)r_{bt+1}] \tag{10}$$

Due to the derivative of C_t, which results in $1/C_t = \lambda_t$, we can conclude that the difference across two time periods for the Lagrangian multiplier is identical to the difference in consumption across the same two time periods, making the function dynamic. The ability to measure the difference in consumption across two time periods allows us to calculate the counter-factual growth rate.

$$\frac{c_{t+1}}{c_t} = \frac{\lambda_t}{\lambda_{t+1}} = \beta[1 + (1 - m_b)r_{bt+1}] = 1 + G \tag{11}$$

$(1 - m_b)r_{bt+1}$ represents a parameter that can be interchanged for different experiments dependent on which policy reform is being analysed. The connection between consumption, investment in human capital, equity, and bonds is displayed through the use of the dynamic first-order conditions. This details the optimal investment opportunity through two parallel

periods. This describes the intertemporal trade-off that takes place as a sacrifice is made between the purchase of bonds or equity, consumption or education.

The three equations below, 12, 13, and 14, are equated, resulting in generating a no-arbitrage result (15).

$$\frac{1}{(c_t)} = \frac{1}{(c_{t+1})}\beta[1 - \delta_h + (1 - \eta(1 + \phi))w_{t+1}/1 - \phi)] \tag{12}$$

$$\frac{1}{(c_t)} = \frac{1}{(c_{t+1})}\beta[1 + (1 - m_b)(r_{bt+1})] \tag{13}$$

$$\frac{1}{(c_t)} = \frac{1}{(c_{t+1})}\beta[1 + (1 - m_e)(r_{et+1})] \tag{14}$$

m_e Is the average tax rate on returns from equities, r_{et+1} represents the real interest rate on equities. Through the no-arbitrage condition, equation 12 shows the trade-off between consumption on the present period to future consumption, i.e. by reducing consumption in the present and investing instead, you can expect a higher return in the next period. Additionally, equation 12, presented the rules considering the optimal set of investment in human capital, the number of bonds and equities. Given no-arbitration, the conclusion of this equation can be made:

$$(1 - m_b)r_{bt} = (1 - m_e)r_{et} = (1 - \eta(1 + \phi))w_t - \delta_h \tag{15}$$

$(1 - \eta(1 + \phi))w_t - \delta_h$ represents the after-tax return on human capital, $(1 - m_b)r_{bt}$ represents after-tax return on bonds in period t, and $(1 - m_e)r_{et}$ being after-tax return on equities.

When informing this papers taxation programme analysis, this will provide the foundations. A substitution of consumption in the form of one unit, can be traded for another unit of one of these securities. This no-arbitrage condition, states that returns after-tax from these securities are equalised, depending on the condition that the economy is within the equilibrium.

The representative firm within this model uses labour and capital to produce its homogenous goods. As this model showcases a closed economy for simplicity, the goods from the firm are sold at a unity price within the domestic market. The goods from the firm have three prospects, to be either consumed, invested or attained by the government. For the firm to maximise its profits, it must maximise its variables of effective labour and physical capital. The firm's production follows the Cobb-Douglas outlined in "A Theory of Production" (Cobb and Douglas, 1928) in which, for simplicity, constant returns to scale are assumed.

$$max\{K_t, l_t, H_t\}_{t=0}^{\infty} \sum_{t=0}^{\infty} \beta_t\{ [(1 - \tau)[A_t K_t^{\alpha}(l_t H_t)^{1-\alpha} - w_t l_t H_t] - I_t\} \qquad (16)$$

β_t represents the firms discount factor, τ is the tax rate paid by the firm and subsequently 1-τ is the amount the firm keeps, A_t is the efficiency parameter or known for representing the technology level, K_t is the physical capital, $(l_t H_t)$ is the effective labour, w_t is the wage rate, and I_t is the investment.

Equation 17, known as the law of motion capital, implies that a firm optimally sets investment by choosing K_{t+1}. The depreciation rate of capital is represented by δ, and the discount factor devalues the assets held by the firm for future cash flow.

$$I_t = K_{t+1} - (1 - \delta)K_t \qquad (17)$$

As the firm is maximising both its inputs, effective labour and physical capital, we can derive first-order conditions for optimal labour employment and capital stock:

$$l_t H_t \quad : \quad (1 - \alpha)A_t K_t^{\alpha}(l_t H_t)^{-\alpha} = w_t \qquad (18)$$

$$K_{t+1} \quad : \quad -\beta_t + \beta_{t+1}(1 - \delta) + \beta_{t+1}(1 - \tau)f_k = 0 \qquad (19)$$

$$(1 - \tau)f_{k_{t+1}} + (1 - \delta) = \frac{\beta_t}{\beta_{t+1}} = \beta \frac{c_{t+1}}{c_t} = \frac{u'(C_t)}{u'(C_{t+1})} \qquad (20)$$

With regard to

$$u'(C_t) = \beta u'(C_{t+1})[((1 - \tau))f_{k_{t+1}} + (1 - \delta)] \qquad (21)$$

The first-order condition for optimal labour employment is equal to the marginal product of labour, and the first-order condition for capital stock is the asset price equation (Equation 19).

$u'(C_t)$ represents the Marginal utility costs of consumption. The marginal utility for consumption is brought about due to the reallocation between investment and consumption. As the economy must be in equilibrium, either consumption or investment must fall or rise given any reallocation in the equation.

$$C_t + I_t = Y_t \tag{22}$$

When entering the next period, t+1, an increasing effect to utility takes places, seen in equation 21, which describes the relationship between consumption and capital investment. The other remaining part of capital in the current period will be consumed, meaning that the consumption increases by $(1 - \delta)$. The use of equation 22 gives us the relationship between both capital investment and consumption.

As both physical and human capital are long-run assets, this making depreciation incomplete, i.e. 0<δ<1. Therefore, the function can be classed as a dynamic function due to the firm engaging with investment for both human and physical capital.

The Government

Through the uses of taxes imposed upon the private sector, the government raises funding that is then distributed through transfers to households and government spending. Within this model, the government raises taxes through labour income tax (θ_t) and corporate income tax (corporate income tax rate, τ). The government's budget constraint function;

$$G_t + T_t + i_{ht} = \theta_t w_t h_t l_t + m_b(r_{bt})b_t + m_n d_t q_t E_t + m_c \left(\frac{Dq}{q}\right)_t q_t E_t + \omega f(k_t, H_t l_t) +$$

$$\tau[(1 - \omega)f(k_t, h_t l_t) - (r_{bt})b_t]) \tag{23}$$

G_t is the government consumption, τ is the revenue from corporation tax, ω is the VAT (Value Added Tax).

Dynamic Stochastic General Equilibrium.

For explaining the effects of fiscal policy, the Dynamic Stochastic General Equilibrium model is a common tool in the field of macroeconomics. The model takes; households, firms and government as the three representatives for the economy. The model assumes the behaviour of each representative and then applies the interaction between each. With the model in equilibrium, quantities [$c_t, l_t, h_t, b_t, E_t, k_t$], prices [w_t, q_t], efficiency parameters [A_t, β_t], government spending [G_t, T_t] and taxes imposed [θ_t, m_b, m_n, m_c].

The representative in the model is to fulfil the following purposes;

1. Consumers are to maximise their utility function, dependent on the budget constraint. They must do this by determining their own optimal consumption path dependent on prices.

2. For firms to determine the optimum volume of capital inputs, dependent on the level of technology, resulting in maximised profits.

3. Government must balance their budget constraints throughout consecutive periods.

4. The markets must clear.

Model Calibration and Data

The aim for the model with this paper is to calibrate the counter-factual growth rates for the Thatcher Taxation Reforms. Data for these models is collected from the ONS, Office for National Statistics, this captures the factual growth rates from the period that Thatcher took office in 1979. In calibrating some of the parameters, data has also been taken from the World Bank and Federal Reserve Economic Data. To examine the effects of taxation reform, we split the effect into the effect the reform of capital gains tax had and the effect the reform in income tax had. We need two different equations to calculate the counter-factual growth rate for both taxation on bonds and taxation on incomes.

$$1 + G = \frac{c_{t+1}}{c_t} = \frac{\lambda_t}{\lambda_{t+1}} = \beta[1 + (1 - m_b)r_{bt+1}] \tag{24}$$

$$1 + g = \frac{c_{t+1}}{c_t} = \frac{\lambda_t}{\lambda_{t+1}} = \beta[(1 - \eta(1 + \phi))w_t - \delta_H \tag{25}$$

Equation (24) is used to calibrate the counter-factual growth rate for the consumption for capital gains taxation reform. All the variables are known to us except for the real interest rate. Equation 25 is used for the counter-factual growth rate for income taxation. All variables are known other than the wage rate. For both the real interest rate and for the wage rate calculations can be found in the Technical Appendix 3.0. The calculations of Growth can be found in Technical Appendix 5.0.

Table 3

Parameter	Definition	Value	Source
δ_h	Depreciation Rate of human Capital	0.0125	Meenagh 2010
M_b	Tax rate on bond returns/yields	0.27	Calibrated
A_t	Efficiency parameter	1	Meenagh 2010
K_t	Physical capital stock – estimation for capital-output	3.00	Minford and Meenagh 2019
a	Capital share/ technological parameter	0.3	Meenagh 2010
h_t	Stock of human capital	3.6	Calibrated

The values from table 3, above are mainly taken by the work of Meenagh et al (2010) or Minford and Meenagh (2019), who use a dynamic general equilibrium model for around the same period in the UK. Along with other pieces of work examine the same thing, these values

are typical for the UK economy. Some of the values have been calibrated; the working for these calibrations and more explanation on all these values can be found in the Technical Appendix 2.0.

Accounting for Progressivity.

As the consumer's income increases, the tax rate they experience will increase as they move up through the tax brackets. Therefore, the proportion of tax they pay increases, this means the tax structure is progressive. Thatcher's taxation programme reduced the number of taxes brackets and reduced the tax rates. This means that the level of progressivity in the UK tax system would decrease. When examining the effect income tax cuts had, the model must take into account the progressivity of the tax structures before and after the reforms. This will make the model more applicable to the real world and increase accuracy. Therefore, a regression is run between the amount of taxes owed over an average income, which will produce a coefficient φ, that will represent the progressivity of income taxation. In finding the cyclical component, $Log(y/\hat{y})$, log of income is run through a Hodrick Prescott filter.

$$\log \tau(y) = \log \eta + 0.282 * \log\left(\frac{y}{\hat{y}}\right) \tag{26}$$

$$\log \tau(y) = \log \eta + 0.078 * \log\left(\frac{y}{\hat{y}}\right) \tag{27}$$

With equation 26 being pre-reform and 27 being reform. This shows the decrease in the progressivity structure due to the Thatcherism taxation programme's tax cuts on income. Thoroughly examining these regressions, in terms of checking the robustness and checking other econometric interpretations, such as the standard error, takes place in the Technical Appendix 6.0.

Results from Tax Policy Experiments

For this paper to examine and measure the quantitative welfare effects, we use consumption expenditure as a proxy for the welfare effect measurement.

Using factual and counter-factual growth rates with relation to reforms in capital gains tax, an index form of the consumption path can be created (Figure 2). For this, we normalise the consumption, at the start of the period (1979), to an indexed number of one hundred in both the reform and No reform consumption expenditure paths. Both consumption paths starting at the same point means we can clearly see the difference in consumption paths and therefore examine whether the taxation reforms affected the consumption levels. At the end period, the factual level (with Thatcher reform), the index value of consumption stood at 141.77, and the counter-factual (without the Thatcher reform) stood at 99.13. The difference resulting from the reform in capital gains tax shows the significant effect on the levels of consumption in the economy.

Figure 2; Index of consumption expenditure following capital gains tax reforms
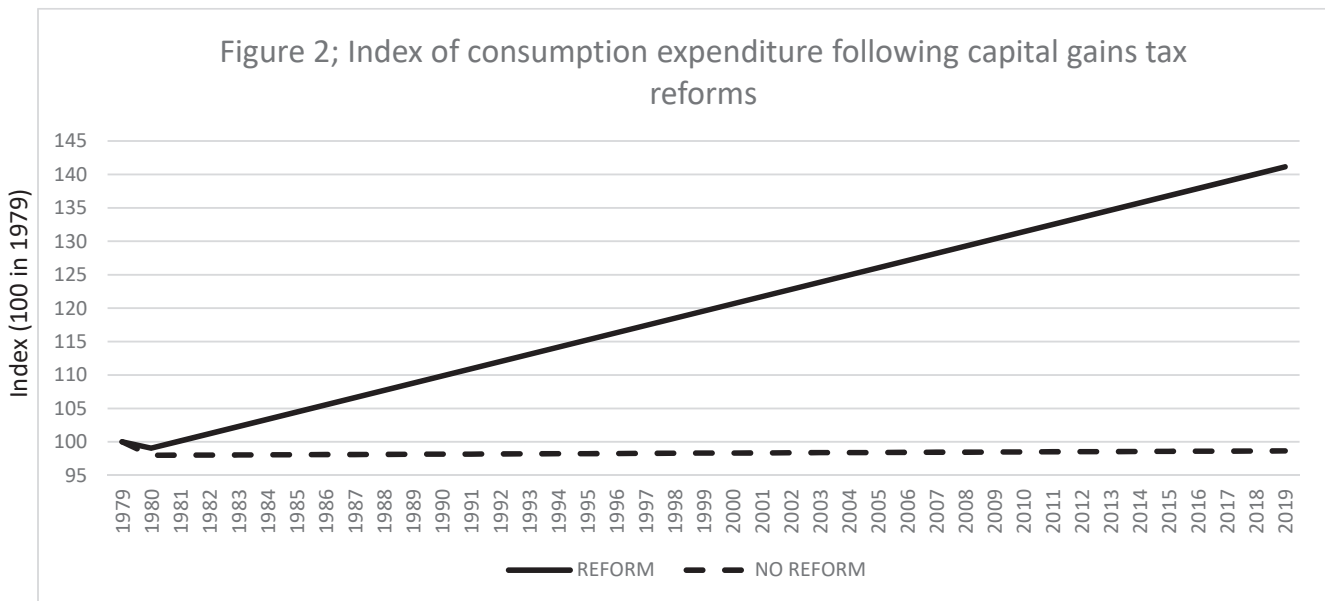
To examine the relationship in Income Tax reform and the effect on the consumption paths, a counter-factual growth rate for an economy with the reform taxation is applied. Figure 3 holds the same consumption expenditure for the reform as in the experiment with for capital gains tax, as it uses the factual data from the period. However, the counter-factual consumption expenditure path is different. With the counter-factual path ending at 98.69. From the model calculations, the growth rate in income is found to be 0.043, a minimal growth rate that gives an almost flat counter-factual consumption expenditure path, as shown in the graph below Figure 3.

Figure 3: Index of consumption expenditure following income tax reform
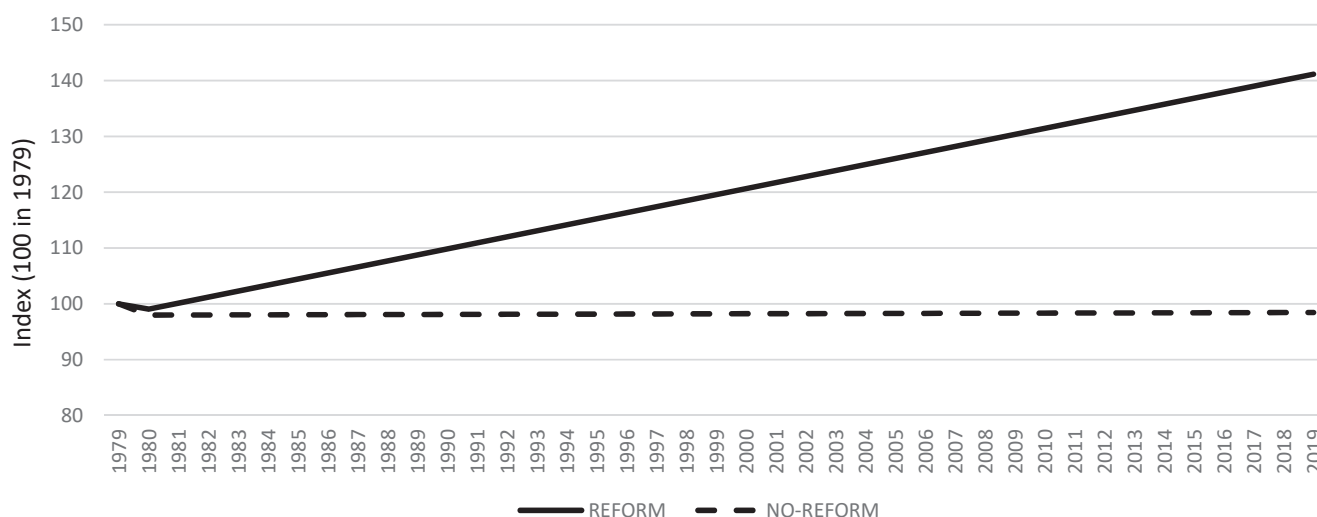
Both of these counter-factual consumption paths lay below the factual paths, remaining at a depressed level compared to the factual, showing that the taxation programme under the Thatcher government did increase the levels of consumption over the period. These results also provide evidence to suggest that if the levels of consumption can measure welfare, then the taxation reforms of the Thatcher government, did increase the level of welfare. These results differ from the Friedman Permanent income hypothesis. First developed by Milton Friedman, the model states that consumption is spread over an individual's lifetime and that the consumption level is not affected by short-run changes in income due to fiscal change. Nevertheless, it is affected by long-run averages, meaning that the consumer will not increase consumption until the fiscal changes are believed to be long-run (Friedman, 1957). However, as the model in the paper shows, the consumption level differs from the counter-factual within the short-run and stays on that increasing path. Friedman's hypothesis on permanent incomes in relation to consumption is challenged throughout other literature on

23

consumption. Work by Campbell and Deaton (1989) which analyses the effects of fiscal policy, concludes that consumption cannot be smooth as the permanent income is not smooth.

Welfare Analysis

In calculating the quantitative welfare effects, two methods can be used, the ordinal welfare method that represents the total present value of welfare at the end period in relation to whether the reform was carried out or not. The calculations for these values are found in the Technical Appendix 4.0.

Table 4 : Estimated Welfare from Tax Reform and No Reform

Experiment	Welfare Reform	Welfare No- Reform
Capital Gains Tax	1574.47	470.178
Income Tax	1191.01	468.832

This method is used in our measure of welfare but as the method is simply ordinal, it does not provide a great measure. This measure's only benefit is related to the level for reform being greater than the level with no-reform, bolstering the hypothesis that the taxation reforms increased consumption as the size indifference gives no interpretational meaning to this report. The size in the difference between reform and no reform has no meaning. The other method that can be used to measure the level of quantitative welfare effect due to the tax reform is the compensating variation analysis. This method is calculated in terms of the percentage change in consumption expenditure over the period, giving the gain in terms of consumption over the period due to the differences in the taxation level (See Table 5)(Varian, 1996). The Taxation reform from the Thatcher government on capital gain has increased the level of consumption expenditure by 273.55% by the end of the period. The reforms to the income tax have created an increased level of consumption of 273.89%. Both of these reforms show through the computational experiments a substantial increase in the level of consumption.

Table 5: Compensating Variation Analysis

Experiment	CV(% of consumption)
Capital Gains Tax	274.11%
Income Tax	273.89%

<u>Explanations for Distortion in Welfare</u>

<u>Progressive Taxations.</u>

As a consumer's income increases, the consumer will find that they move up through income tax brackets. This causes the effect of an increase in the effective tax rate. This, by nature, creates a progressive tax structure—the more tax brackets, the steeper the effective tax rate schedule. Before the reforms of the Thatcher taxation programme, there were eleven different tax brackets on income (1978-79); when Thatcher left office, the was just two income brackets. The different levels of the progressivity income are shown in Figure 4. This shows the effective tax rate that an individual would experience on different levels of income. The graph shows that without the reform, the level of the effective tax rate is much larger compared to the reform. The lower level of effective tax rate with the reform will influence the incentive to work and the incentives to aim for higher-income jobs, which was at the heart of the Thatcher economic and political agenda.

Figure 4 : Progressivity of Tax Structure
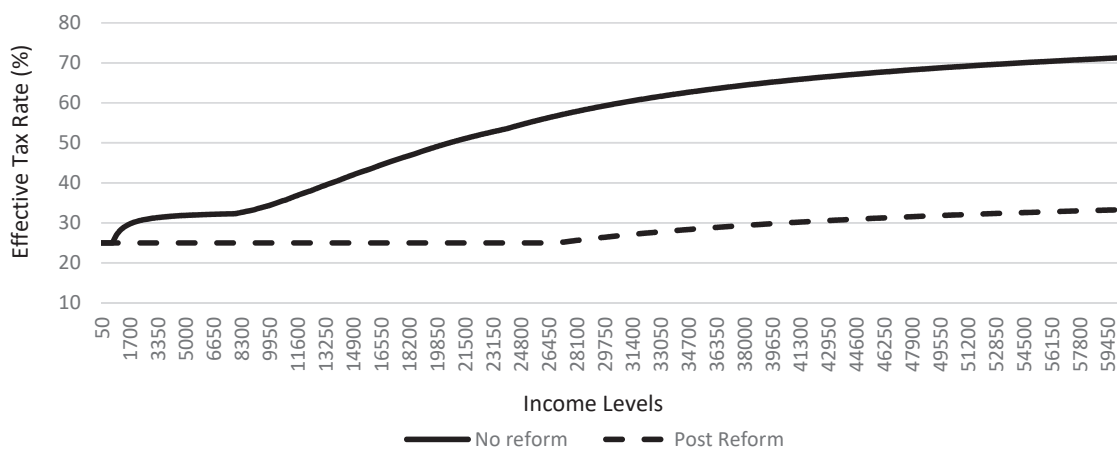
The level of progressivity can cause an economic trade off, as high levels of progressivity can distort the supply of labour and efficiency loss. With higher levels of progressivity and an effective tax rate, the problem of poverty and the unemployment trap can arise. This relates to the incentive to work and increase wealth, a primary driving factor in the desire to work and achieve, is related to the accumulation of wealth that individuals get from work, their income. With high tax rates, the desire to increase labour supply falls as the incentive to work also falls (Smith, 1988).

The Labour Supply

The taxation level will have a direct distortionary impact on the decisions of households with regards to the amount of labour they supply in the market. This is especially true of the level of income taxation, as this directly affects the incentives of work. Aaberge (1995) found that the reduction in the level of progression in income taxation in Norway has removed some of the distortions on worker behaviour caused by income taxation. Aabrages research also sees that the mean welfare does increase due to a lower progression taxation level.

As taxation is a crucial driver in the supply of labour due to the effect's taxation has on the overall production efficiency, as it applies as a disincentive on household's decisions to work. The decrease in the taxation level will act as an incentive for households to join the labour market. Work by Bhattarai describes labour supply as either being continuous or discrete. When continuous, this describes the choices households face in relation to working an extra hour, whereas when discrete, this describes the choice of whether a female member of the household works or not. The two subsections of labour supply that Bhattarai finds, continuous and discrete, will both respond differently to changes in taxation on income.

The Distribution of Income

The model used within the report is not an effective way of measuring the distribution of income, as the model uses a mean income for the representative citizens of the nation. Whereas, in reality the level of income is distributed unevenly across the nation, with the wealthiest taking the largest and the lowest earner taking the least. One part of this report that can provide some insight into the levels of distribution of income is the progressivity of the tax structure. As seen in the previous part of the results of this report, the level of progressivity was far lower due to the reforms of Thatcher. The new effective taxation rates were lower for all income earning citizens, however as seen in the introduction, the most extensive income tax cuts were applied to the top earners, which can also be seen in the new progressivity schedule. Although this new progressivity schedule would provide ample incentives for work and employment, it can also result in excess welfare and wealth being distributed towards the middle- and high-income earners. This would result in the wealth gap between the richest and poorest increasing, although all citizens in the nation would experience increased levels of wealth and, therefore, welfare.

In addition to the difficulty this model has in examining the distribution of income, it also fails to examine one of the main criticisms of the Thatcher taxation programme. As Thatcher cut income taxes, the move was coupled with increases in the value-added tax, commonly known as VAT, a tax on purchasing goods. As the Thatcher government arrived in office, the VAT rate was 8% (12.5% on luxury goods), the Thatcher government increased this to 15% for all goods (Johnson, 1991). This move was primarily criticised as moving tax from direct to indirect taxations gave the perception that the tax burden had been moved from the rich, middle, and upper-class to the poorer working class (Smith, 1998). Therefore, although the increased level of consumption found by this model can be related to increases in welfare, it is limited in examining the effects of increased VAT tax. This is highlighted in Alex Scott-Samuel et al's (2014) research, in which they highlight the increase in poverty rates across the period, which backs the argument that a tax burden was pasted down to lower income families.

Capital Accumulation

For the Thatcher government, one of the key beneficial beliefs of decreased levels of income taxation would be the increased level of utility that households would experience. Therefore, the ideas of finding an optimal taxation rate were high on the agender of the Thatcher government. Work by Ramsey (1927) examined the question of the optimal taxation rate of governments to impose on households as a means of maintaining government revenue and upholding the level of household utility. This question is asked by governments worldwide, but very few have seemed to be as successful as the Thatcher government. The Thatcher government seemingly increased levels of utility through income tax cuts but managed to increase government revenue by redistributing the taxation burden from direct to indirect taxation, mainly by increasing the VAT rate (Johnson, 1991).

During the time of the Thatcher government, the nation was encouraged to increase savings and capital accumulation, with the changes to capital gain tax being the main incentive. The results for this model do show increased levels of consumption due to decreases in capital gains taxation.

Conclusion

In 1979 Margaret Thatcher won the UK general election on the back of a manifesto that prioritised reducing the overall level of taxation to improve incentives to work and enterprise whilst sensibly managing the government debt and deficits. At the heart of Thatcher economic taxation programme was the move from direct taxation to indirect taxation. The tax reform efforts of the Thatcher government are overlooked in today's history books due to other political activities that the Thatcher government took. This paper aimed to quantify the welfare effects of the Thatcherism taxation programme. This paper has used a dynamic general equilibrium model, to view the quantitative effect of the change in fiscal policy.

The factual growth rates from the period were presented against the counter-factual growth rates computed by the model, which represented no reform to taxation. Presented against each other the factual and counter-factual growth rates, give computed growth paths for consumption expenditure through the period 1979-2019. The consumption expenditure rates for No-Reform laid below that of the Thatcherism taxation reform growth rates. Meaning that we can conclude that the taxation programme of Thatcher did, increase the levels of consumption expenditure. These more significant consumption expenditure levels are a natural ingredient in welfare.

This report also conducts welfare analysis using an ordinal and a cardinal measure. The model results state that the level of welfare was primarily due to the reforms of Margaret Thatcher when being compared to the results calculated with the counter-factual growth rate. This result was obtained for both the ordinal and the cardinal measure. The ordinal results showed that, for Capital Gains Tax, without a reform, the welfare measured 407.125, rising to 1369.38 with the reform. For Income tax, with reform, the measure was 467.248, rising to 1036.03. The ordinal measure is not the optimal measurement for examining welfare, as the size in the difference between reform and no-reform gives no meaning. The only beneficial evidence it provides is that the reform results were more prominent than the no reform, showing that welfare did increase. To measure the increase in welfare, the cardinal measure is a much greater method. As it gives a percentage increase from the utility level from that start of the period, for Capital Gains Tax, the increase is 274.11%, and for Income taxation, the increase

is 273.89%. This paper, therefore, concludes that the Thatcherism taxation programme did increase the welfare of the British population.

The progressivity of the tax structure in the UK was reduced under the Thatcher government. With the most favourable cut in income taxation going to the wealthiest. However, all tax brackets were cut, and the bracket levels were raised, pushing more people into lower taxation levels. However, this paper is not equipped with the tools to examine the entire distribution of welfare in the nation. The decreased level of progressivity due to the most extensive cuts in income tax at the top of the spectrum, coupled with the VAT increases, would lead to a disproportionate increase in welfare and income for middle and upper-income households, with either a small, zero or negative effect on the poorest households. This leads to one of the limitations of this paper, which is described in the next section.

<u>Limitations</u>

The model used within this paper makes an assumption that does not apply to the real world. The model believes there to be a closed economy, which is not represented in the real world for the UK during the period. With an open economy, the high level of consumption may sway the level of imports if foreign goods provide better utility for the consumer. Then an import preference over domestic goods will have a knock-on effect on employment. The model also assumes perfect capital markets, which again is not represented in the real world. All these limitations and more must be considered when understanding the results of this report.

Other limitations of the paper can be seen with regard to the representative household; the model used takes an average household within the economy, as it is the best way of representing the households in the nation, with regard to the academic level of this paper. By taking an average household, the paper cannot examine the full distribution of income and welfare the nation experienced. With the decreased level of progressivity, largest income tax cuts at the top and increases in VAT, this may provide evidence to the argument that Thatcher passed the tax burden onto the working class as a means of increasing growth and prosperity in the nation. Nevertheless, the paper also provides evidence of the Thatcher taxation programme cutting the tax burden on the working class by large increases in tax brackets, meaning the lowest income earners either no longer paid income tax or were pushed into a lower bracket.

A limitation can also be found in the dynamic of the model's labour market. In the model, the marginal product of labour is equal to the wage, i.e. W=MPL. But with the large problems of workers unions in the Thatcher era, this could be far from the truth; the labour market might not be perfectly competitive (Pearse, 2021). The worker's unions at the time often used their ability to remove important pieces of utility, such as causing mass power cuts by going on strike. This often resulted in the workers having high wages that were not proportional to the marginal product of labour. This, therefore, may result in the overestimation of income taxation reform, meaning the results should be taken with a grain of salt. To include this aspect in the model would demand much higher academic knowledge and more professional modelling. This, therefore, is an aim for future research.

In addition to these limitations, the papers evidence and results are limited to that of a segment of Thatcher's taxation programme, and its relationship between welfare through the form of consumption. This paper is limited to its commentary of the whole Thatcherism taxation programme, as the Thatcherism taxation programme crossed many different taxation methods. Therefore, this paper can make no commentary on any other taxation, economic policy and political fields.

Understandably these limitations will raise questions about the reasoning why the rectification has not taken place with regards to assumptions. The reason being that this is above and beyond the paper's academic level. Some of the additional problems, such as the effect of workers unions, would need more complex modelling, which is above the academic level of this work.

<u>Relevance and Further Research</u>

Regarding the relevance of this paper and what benefit it gives to examine the welfare effects of the Thatcherism taxation programme, it can be related to fiscal policy today and understanding the taxation effects and some additional content for research related to the Laffer curve. In Britain today, the conversation of fiscal taxation has become very topical and important due to the vast government support levels that have been plunged into the British economy due to Covid-19. Current chancellor Rishi Sunak was struck with a difficult choice with regards to taxation levels. Increase taxes but run the risk of negative or negligible growth

or decrease taxation in hopes of large economic recovery allowing the nation's economy to outgrow its debt but risk large debt payments in interest rates rise.

These styles of questions are asked by the government around the world. Many responses to this question depend on an understanding of the Laffer curve. The Laffer curve as described in Section 2 provides ideas for the optimal level of taxation to result in maximised revenue for the government. Nevertheless, understanding where a nation currently lays on the curve is hypothetically complex but highly beneficial for a government to know. This papers examination provides evidence to suggest that Britain under Thatcher laid on the side of the Laffer curve to the right past the maximum point. Meaning resulting cuts to taxation provided increased levels of government revenue whilst increase growth rates.

Further research that could lead on from this paper should aim to examine the positioning of governments fiscal policy with relation to the Laffer curve. Knowing the position and, therefore, the effect of changes in fiscal policy would provide valuable information for governments as it would allow them to understand better the results of changes in fiscal policy with relation to welfare and government revenue. Further research may also examine the effects of increases in VAT and the welfare effects of that increase. An understanding of the move from direct to indirect taxation may cause increased welfare and wealth between income levels, i.e. working class and upper/middle class. This would create foundations for future research into the effect of indirect taxation of different sectors of household's incomes.

Concluding Remarks

This paper has examined the Thatcherism taxation programme to analyse the welfare gains on the UK economy. The paper used modern macroeconomic methods in doing so. History tells us that the 80s under Thatcher were a significant period in modern British history. With the large-scale deindustrialisation in the 70s and 80s shifting to a service-based economy, but liberalising the nation from large state ownership, in the form of privatisation. The move from direct to indirect taxation and the significant cuts made to income and capital allowed and encouraged enterprise and business, allowing the country to grow and move forward. The Thatcherism taxation programme was key to all the described changes in the economy. This paper looked at how this taxation programme affects the welfare of the nation. It is accepted

in modern economics that when welfare is measured by consumption, tax cuts that increase disposable income are beneficial.

Nevertheless, the examination in this paper allows us to better understand the quantitative effect, the Thatcherism taxation programme had on welfare. This paper also provides supply side evidence to be used in policy and political debate. With many political and policy arguments based on ideas that tax increases will allow the government to better distributed welfare, this paper provides a counterargument. The paper has shown in Section 2 that the tax cuts provided increased tax revenue for government uses. The paper has shown how the tax cuts handed larger levels of income and welfare to citizens of the nation, along with more of an entrepreneurial, business activities, capital owning and dynamic economy. This paper is hoped to be used for supply-side arguments and for those who advocated a more accessible, liberal and entrepreneurial economy managed by a smaller government that allows greater consumer independence in a free-market capitalist economy.

References

Aaberge, R., Dagsvik, J.K. and Strom, S., (1995) Labor Supply Responses and Welfare Effects of Tax Reforms. *The Scandinavian Journal of Economics*, 635-659.

Ben-Gad, M.(2004) The Welfare Effects of the Reagan Deficits: A Portfolio Choice Approach. *Economic Inquiry*, Vol 42(3), PP 441-454.

Benjasak, C. and Bhattarai, K., (2019) General Equilibrium Impacts of VAT and Corporate Income Tax in Thailand. *International Advances in Economic Research*, 25(3), 263-276.

Bilancini, E. and D'Alessandro, S (2012) Long-run Welfare Under Externalities in consumption, leisure, and production: A case for happy degrowth vs. unhappy growth. *Ecological Economics*, 84, 194-205.

Campbell, J. and Deaton, A., (1989) Why is Consumption So Smooth? *The Review of Economic Studies*, 56(3), 357-373.

Castano, E. (2002) Proxy means test index for targeting social programs: two methodologies and empirical evidence. *Lecturas de Economía*, Vol 56, Pp 133-144

Chipman, J.S. and Moore, J.C., (1980) Compensating Variation, Consumer's Surplus, and Welfare. *The American Economic Review*, 70(5), 933-949.

Cronin, J.E (2014) Global Rules: American, Britain and a Disordered World. Yale University Press

Dilnot, A.W, Stark, G.K. (1986) The distribution Consequences of Mrs Thatcher. Fiscal Studies, 7(2). 48-53

Economides, G. Philippopoulos, A. Vassilatos, V. (2014) Public, or private, providers of public goods? A dynamic general equilibrium study. *European Journal of Political Economy*, 36 (1), 303-327.

Hamed, G. Gregory, A. Ntsama, N.N. Frederic, J (2019) Macroeconomic and welfare effects of tax reforms in emerging economies: A case study of Morocco. *Journal of Policy Modeling*, Vol 41(4), PP 666-700.

HMRC Nation Archives. Gov.UK

https://webarchive.nationalarchives.gov.uk/+/http://www.hmrc.gov.uk/stats/tax_structure/menu.htm [Accessed October 2020]

Holmes, M. (1989) Thatcherism; Scope and Limits, 1983-87. Hampshire. The Macmillan press.

Johnson, C (1991) The Economy Under Mrs Thatcher 1979-1990. Harmondsworth, Middlesex. Penguin Group.

Keegan, W. (1984) Mrs Thatcher's Economic Experiment. Middlesex, England. Penguin Books.

Kim, S.H (2007) Dynamic Welfare Effect of Tax Reform: Case of Korea. *KDI Journal of Economic Policy*, Vol 29 (2), PP 177-196

Kim, S.J (1998) Growth effect of taxes in an endogenous growth model: to what extent do taxes affect economic growth? *Journal of Economics Dynamics and Control*, 23, 125-158.

Lawson, N (1992) The View from No. 11: Memoirs of a tory radical. Bantam Press.

Lucas, R.E, (1998) On the Mechanics of economic development. *Economic Society Monographs*.

Lucas, R.E. (1990) Supply-Side Economics: An Analytical Review. *Oxford Economic Papers* Vol42 (2), PP 293 – 317

Martin ,C (2019) Incentives Inequality and taxation: The Meade Committee Report on the Structure and Reform of Direct Taxation (1978). *Business history*, 61(7) 1222-1236

Matthews, K. Minford, P (1987) Mrs Thatcher's Economics Policies; 1979-1987. *Economics Policy*, 2(5), 59 – 104.

Matthews, K. Minford, P (1996) British Inflation and Unemployment In the 1970s: A model-based decomposition. *Applied Economics*, 28(1), 103-116

Meenagh, D. Minford, P. Nowell, E. Sofat, P. (2010) Can a real business cycle model without price and wage stickiness explain UK real exchange rate behaviour?. *Journal of International Money and Finance*, 29, 1131 – 1150.

Middleton, R (2006) The Political Economy of Decline Geoffrey K. Fry, The Politics of Decline. An Interpretation of British Politics from the 1940s to the 1970s. *JOURNAL OF CONTEMPORARY HISTORY LONDON* 41 (3), 573 - 587

Minford, L. Meenagh, D. (2019) Supply-Side Policy and Economic Growth: A Case Study of the UK. *Open Economics Review*, 31(1), PP 159 – 194

Pearse, W (2021) A Critique of Neoliberalism, INOMICS. Available from https://inomics.com/blog/a-critique-of-neoliberalism-1379580

Ramsey, F.P., (1927) A Contribution to the Theory of Taxation. *The Economic Journal*, 37(145), 47-61.

Sahn, D.E. and Stifel, D., (2003) Exploring alternative measures of welfare in the absence of expenditure data. *Review of income and wealth*, Vol 49(4), 463-489.

Scott-Samuels, A. Bambra, C. Collins, C. Hunter, D.J. McCartney, G. Smith, K. (2014) The Impact of Thatcherism On Health and Well-Being in Britain. *International Journal of health Services*. 44, 53-71.

Smith, D. (1998) Mrs Thatcher's economics. King's Lynn and Guildford: Biddles

Stiglitz, J.E (1978) Notes on Estate Taxes, Redistribution, and the Concept of Balanced Growth Path Incidence. *Journal of Political Economy* Vol. 86, No. 2, Part 2 pp. S137-S150

Sunday Telegraph (2014) Still ahead of the curve, the man with a simple tax plan; Arthur Laffer advised Reagan and Thatcher to cut taxes to raise revenues. He tells Szu Ping Chan why that remains true. Sunday Telegraph, 15th June. London England.

The National Archives: HMRC, Library, Revenue-based Taxes and Benefits. Available from https://webarchive.nationalarchives.gov.uk/+/http://www.hmrc.gov.uk/stats/tax_structure /menu.htm Accessed [October 2020]

Torres, J.L and Cordoba, G.F. (2011) The Transitory VAT Cut in the UK: A Dynamic General Equilibrium Analysis. *Economic Issues Journal Articles*. 16(1), 1-18

Varian, H (1996) Intermediate Microeconomics: A Modern Approach. 4th Edition. USA. W.W. Norton & Company

Vasilev, A (2015) Welfare Effect of Flat Income Tax Reform: The Case of Bulgaria, Eastern European Economics, 53:3, 205-220, DOI: 10.1080/00128775.2015.1033364

Wilson, G.W (1984) Where Reaganomics succeeded, where it failed, and why. *Business Horizons*, Vol 27(4), 2-8.

The Quantitative Effect of the Thatcherism Taxation Program: Computational Experiments based on a Dynamic General Equilibrium Model

Technical Appendix

1.0 The Household:

Examining the utility function for the household.

In the main text the household's utility function was examined. When looking at the discount factor;

$$\beta \;=\; \text{Mean}\left(\frac{1}{1 + \text{Real Interest Rate}}\right)$$

Data is taken from the ONS for the real interest rate across the period and applied into a Excel sheet, using this formula the discount factor is taken as 0.9756. This value is almost identical to the work of Meenagh 2010 and Minford and Meenagh 2019 who both got 0.97.

From the main body of text, the rule of, $C_{\_t} > 0$, is found. This rule holds as consumption cannot be negative, nor can the value be equal to zero as for basic life at least some consumption is needed to maintain life. This consumption also dictates to use the utility, as the first derivative states there to be a positive relationship between consumption and utility. If the utility function is taken to its second derivative, then $\frac{\partial^2 u}{\partial c^2} < 0$. This provides evidence that through increasing consumption the utility gained increase but at a decreasing rate, i.e. the second derivate shows a concave function. This is to be expected as continuous infinite increases in consumption won't result in continuous utility.

2.0 Calibration of Parameters

As presented in section 5 of this paper some parameters where obtained by Meenagh 2010, and others were calibrated through data sets from ONS and World Bank.

Depreciation Rate;

Taken from Meenagh 2010 and also used again by Minford and Meenagh 2019, with the value of 0.0125

The Tax rate on bond returns.

This was done by taking the amount a bond yielded and then apply the tax rate through an effective tax rate, as the higher the return the larger tax brackets. The average effective tax rate on bond yields came out at 27%.

Physical capital stock

Done through the uses of Minford and Meenagh 2019, who use investment data applied through the use of equation $Kt = It + (1 − δ)Kt−1$. Which shows the capital series being constructed through the investment series.

Capital Share;

Also taken from Meenagh 2010 and found in Minford and Meenagh 2019.

Stock of Human capital;

$h_t =$ (Education Spending / GDP Spending) / δ_h

This is the ratio to education spending divided by the depreciation rate of human capital.

$h_t =$ 0.045 / 0.0125 = 3.6

This figure is in line with similar research of wealthy western nations.

3.0 Calculations for unknown variables.

The Wage Rate.

$$w_t = (1 - \alpha)(\frac{y}{L * h_t})$$

$$\alpha = 0.3$$

$$h_t = 3.6$$

$$y = 1 \; and \; also \; L = 1$$

Therefore

$$w_t = 0.19$$

The Real Interest Rate.

As stated in Section 5, the real interest rate will be equal to the marginal product of capital.

$$r_{bt} = \alpha \left(\frac{Y}{K}\right)$$

$$r_{bt} = 0.3 \left(\frac{1}{3}\right)$$

$$=0.099$$

4.0 Welfare Calculations

Ordinal Welfare Calculation

$$Welfare\ (Reform) = \log(C_{-0})[\sum_{t=0}^{40} \beta^t] + (1 + g^{reform}) \sum_{t=0}^{40} t * \beta^t$$

$$Welfare\ (No - Reform) = \log(C_{-0})[\sum_{t=0}^{40} \beta^t] + (1 + g^{No-reform}) \sum_{t=0}^{40} t * \beta^t$$

Compensatory Variation

$$\frac{C_{-0}(1 + g^{reform})^t}{C_{-0}(1 + g^{No-reform})^t} = 1 + \mu_t \quad \Rightarrow \quad \left(\frac{1 + g^{reform}}{1 + g^{No-reform}}\right)^t = 1 + \mu_t$$

5.0 Growth Rate Calculations;

Bonds / Capital Gains Tax Experiment:

The counter-factual growth rate is calculated by

$$1 + G = \frac{c_{t+1}}{c_t} = \frac{\lambda_t}{\lambda_{t+1}} = \beta[1 + (1 - m_b) * r_{bt+1}]$$

$$1 + 0.046107 = 0.9756 * [1 + (1 - 0.27) * 0.099]$$

Income / Income Tax Experiment:

The counterfactual growth rate is calculated by

$$1 + g = \frac{c_{t+1}}{c_t} = \frac{\lambda_t}{\lambda_{t+1}} = \beta[(1 - \eta(1 + \phi))w_t - \delta_H]$$

$$0.9756[(1-0.547(1+0.282))*0.19 - 0.0125$$

$$= 0.0432$$

6.0 Progressivity

Denoted $\tau(y)$, represented that tax is a function of the household's income. When examining progressivity, the theoretical model is:

$$\tau(y_t) = \hat{\eta}\left(\frac{y_t}{\bar{y}}\right)^{\hat{\phi}}$$

In this papers model, the estimation becomes:

$$\log \tau(y) = \log \eta + \phi \log\left(\frac{y}{\hat{y}}\right)$$

Through software package STATA 15, a regression of log tax amount against log income over average income takes place. Log Income over average income is found through a Hodrick Prescott Filter, creating a cyclical component.

Results of which are:

Pre-Reform:

$$\log \tau(y) = \log \eta + 0.282 * \log\left(\frac{y}{\hat{y}}\right)$$

The coefficient 0.282 has a Standard Error of 0.0029. For full transparency and checking robustness the estimate $\pm$ 2(S.E), gives a range of $0.2878 - 0.2762$. The paper takes the average but this robustness check, provides evidence for a possible minimal deviation.

Reform:

$$\log \tau(y) = \log \eta + 0.078 * \log\left(\frac{y}{\hat{y}}\right)$$

The coefficient 0.078 has a standard Error of 0.0023. For full transparency and checking robustness the estimate $\pm$ 2(S.E), gives a range of $0.0826 - 0.0734$. The paper takes the average but this robustness check, provides evidence for a possible minimal deviation.