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Tax policy developments, donor inflows and economic growth in Malawi

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Government continuously operates with revenues below expenditures and taxation is increasingly becoming a sensitive political and economic tool to be relied upon as an instrument for revenue generation and economic growth. This study seeks to examine the impact of tax policy and donor inflows on economic growth in Malawi from 1970 to 2010 using data envelope analysis (DEA) and transcendental logarithm (Translog). In doing the Translog, the study employed the Engle and Yoo three step estimation process. Data analyzed shows that consumption taxes have on average contributed 60.0% to total tax revenue while income taxes take up 40.0%. Tax burden has ranged from 11.0% in the 1970s to around 16.0% in 2010. Results of the study show that a 1.0% decrease in tax burden can raise economic growth by 0.8% in Malawi while a similar reduction in collection of taxes through expenditure can raise growth by 0.6%. Another finding is that economic growth rises by 0.3% for a 10.0% rise in foreign grants. The study therefore finds that reduction in tax burden is more potent in influencing economic growth than fine tuning the proportion in which income and consumption taxes are collected in Malawi. Furthermore, a complete reversal in donor funding will reduce economic growth by 3.0%.

Key words: Data envelope analysis, direct taxes, indirect taxes, transcendental logarithm.

INTRODUCTION

Until the early 1990s, literature on economic growth focused on modeling the economy with a long-run equilibrium where output is exogenously determined by technological progress. Because in this model, economic growth is assumed to be determined outside the system, the instruments of government policy have no permanent impact on the growth rate. As stated by Solow (1956), the underlying fact behind this structure is that the Neo-classical view assigns economic growth to increases in physical and human capital where law of diminishing returns to scale is on duty.

Romer (1986) and Lucas (1988) hold a different view. Reflected in their endogenous growth theories, they argue that government policy for example, level of

taxation and tax composition can affect economic growth. Benos (2009) classifies taxation instruments under endogenous growth theories into distortionary, which discourage investment in physical and human capital and non-distortionary taxation which have neutral effects. While the neoclassical and new growth theories agree on level effects of taxation, they differ on long-run growth effects.

One of the implicit conclusions emanating from the endogenous growth theories is that fiscal stance through tax policy has growth effects. It is therefore necessary to have an efficient tax structure because this has a bearing on economic growth. An efficient tax structure is one that minimizes the loss of economic welfare due to tax-induced distortions in the incentives that guide private decisions on investment, production, technology, consumption, savings, work effort and financing. This efficiency is particularly important for less developed

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countries like Malawi that must avoid economic losses arising from avoidable resource misallocation. The intent of any tax incentive policy is precisely to alter economic behavior in a direction that enhances growth and improves national welfare.

In order to address efficiency and equity objectives, tax policies are often changed every year. This, in view of endogenous growth economists should have impact on short, medium and long run growth rates of the economy. The challenge comes from the fact that while delivering on equity and other motives, a tax policy may be stifling efficiency goals. Shalizi and Thirsk (1990) observe that the tax reforms that happened in Malawi in the 1980/1990s had such unintended consequences.

The apparent failure of the tax system to trigger economic growth and to generate sufficient revenues has triggered several tax reform processes. Kneller et al. (1999) find that setting the appropriate tax proportions is important because the growth effects of collecting revenue through direct or indirect sources can be different¹. Again, the fact that the way government spends the tax receipts is not exactly the way the taxed would have done, raises an important question of who between the two is an efficient spender.

This study therefore looks at tax structure developments by specifically focusing on evolution of tax revenue, the proportion in which income and consumption taxes are collected and the associated impacts on economic growth. It should however be recognized that, although quite volatile, a significant proportion of development expenditure (80.0%) is financed by donor resources. This provides substantial relief to tax policy in the country. Therefore, the study augments the analysis by assessing the impact of grants on economic growth. The methodology employed follows a two stage analysis developed by Branson and Lovell (2001).

Motivation of the study

Despite having the ability to raise taxes, government has persistently been running fiscal deficits. The other sources of financing government operations include borrowing and donor inflows which equally pose different challenges. For example, failure to disburse programmed donor resources in Malawi has frequently resulted in escalating domestic debt with accompanying destabilizing macroeconomic effects.

Financing using domestic borrowing equally has debilitating effects on the economy. Financing using

foreign borrowing is again a challenge for countries like Malawi which have narrow export base and unreliable foreign exchange positions. Frequent breakdowns in other financing mechanisms therefore render the study of the interaction between tax policies and economic growth more imperative now than ever before.

Where government runs persistent fiscal deficits and the political populace is highly expectant, a risk arises that tax policies may be geared at clearing the deficit and erecting quick and visible deliverables. This direction often is achieved at the expense of equity, external trade and long-term economic growth considerations. These considerations are rendering the study of the interaction between tax policy, government revenue, and economic growth more relevant now than before.

Very recent economic discussions in Malawi have centered on the expected impact of donor inflow freeze and possible devaluation on inflation and Balance of payments positions. While this is very important in terms of monetary policy options, the debate has excluded an important macro perspective regarding implications on economic growth. This paper therefore addresses the implications of donor resource freeze on economic growth.

Ease of collection, international tax competitions and spread of the burden of taxation are some of the major reasons advanced to move from income to consumption taxes. The implications of this change on economic growth has however often been ignored.

The rest of the document is arranged as follows: Subsequently, the study gives a brief background of developments in tax policy and grants. It thereafter presents theoretical and empirical review of literature. It also highlights the two stage estimation techniques. It presents, interprets and discuss the findings. Finally, concludes and presents implications of the results.

EVOLUTION OF THE TAX SYSTEM IN MALAWI

Taxes are grouped into two, income and consumption taxes. Income taxes are those levied directly on one's income e.g. PAYE while consumption taxes are those levied on expenditure e.g. VAT. A pronounced shift from income to consumption taxes was implemented in 1989. The tax base in Malawi consists of company profits (on which company tax is paid), earnings of employees (on which PAYE is paid), imports (on which import duties are paid) and domestic goods (on which VAT and excise duties are paid). The structure of taxation is further built on the need to raise revenue fairly, encourage growth and promote equity. From these reasons, it is apparent that the tax structure must probably evolve to meet these dynamic objectives. Between 1970 and 1979, the tax system largely remained unaltered on account of

¹ In literature, direct taxes are also referred to as income or production taxes while indirect taxes are also known as consumption or expenditure taxes. In this study these terms are used interchangeably.

balanced fiscal budgets.

Changes however have occurred in the relative importance of different taxes during the study period. Import duties, which were one of the largest source of revenue in the 1970/1980s lost that position in the 1990/2000s following a relative shift in the composition of imports from consumer goods, which were taxed more, to intermediate and capital goods, which were taxed less, and to the large increase in revenue from other taxes. Surtax shifted its position from third in 1970/1971 to first in 1979/1980 and remained so till 2010². Second in significant to VAT is PAYE, which between 2000 and 2010 contributed 24.0% to tax revenue compared to 37.0% from VAT. Within the income tax category, PAYE surpassed the contribution of corporate tax in the 1990s and remained a major source of income tax revenue till 2010.

Shalizi and Thirsk (1990) argue that although tax measures succeeded in raising revenue, they were inconsistent with long-term economic development. Chamley (1985) identified the following problems which compromised sustainability of the implemented tax reforms in Malawi: First, many taxes had multiple goals. The surtax which was designed to be a revenue tax, had built-in protective features, especially the higher rate on imports compared with its domestic counterpart. Second, the import levy, introduced as a proxy for devaluation, was retained even after devaluation to the extent that non-merchandise imports were exempted and exports were not subsidized by an equivalent rate. Third, the extension of import duties to imports of capital and intermediate goods reduced effective rates of protection for competitive imports, but unfortunately, it distorted incentives for exports. It created negative protection on the domestic production of essential final goods whose imports were exempted from import taxes thereby transforming the indirect tax system into a set of production taxes that looked like a system of turnover taxes.

Chipeta (1998) notes that high tax rates did not necessarily ensure high tax revenue and high rate of economic development because they reduced incentives to produce and to supply factors of production.

In reaction to these concerns, a series of other reforms started in the 1989/1990 fiscal year which included a medium-term programme of reducing direct taxes and indirect taxes. Notable one was a deliberate shift by government from income towards consumption taxes. In 1994, the country became a multiparty democracy and it adopted a cash budget system where only what was collected could be spent. Tax reforms during this period were geared at enhancing revenue generation to ensure

successful implementation of the system. Thereafter, reforms have also taken into account need for alignment with Southern Africa development community (SADC) and common market for Eastern and Southern Africa (COMESA) member states.

The contribution of direct taxes to total tax revenue declined from about 41.0% in the 1980s to 30.0% between 2000 and 2010 (Table 1). The contribution to total revenue by the indirect taxes rose from 55.0% in the 1980s to around 62.0% between 2001 and 2010. Within the Direct tax category, significance of corporate tax declined from 28.0% in the 1980s to around 5.0% in 2010 (Figure 1).

In the Indirect tax category, government shifted reliance from import duties as the ratio decreased from 25.0 to 14.0% over the study period towards VAT whose contribution to total revenue neared 40.0% in 2010 from an average of 23.0% between 1970/1980.

The tax burden averaged 12.0% between 1970 to 1979 with no upward trend. Of this amount, 6.5% were indirect taxes. During this period, the average growth rate was 6.2%. Between 1980 to 1992, tax burden averaged 16.2% while the growth rate averaged 2.0% with the highest growth rates registered in 1990 and 1991 at 5.7 and 8.7%, respectively. Of the 16.2%, 9.7% were indirect taxes (Figure 2).

Trend in foreign grants

During the period under study, grants to Malawi averaged 4.2% of GDP. The level of grants has been going up. Between 1970 and 1979 grants amounted to 1.6% of GDP. Between 1980 to 1989 grants rose to 2.2% of GDP before rising further to 3.5% between 1990 and 1999 and 6.6% between 2000 and 2010. In terms of financing, grants have financed about 80% of the development budget.

Analysis of tax developments and grants presented in this chapter shows that tax burden has been rising over time and that the economy has consistently collected more tax revenues through consumption taxes than income taxes. What is not known is whether these have had a bearing on economic growth.

LITERATURE REVIEW

Theoretical review

Tax studies have mostly used economic growth theories to uncover the impact of taxation on economic growth. One of these is the Solow (1956) growth model which is presented as follows:

$$\dot{y} = \alpha k + \beta m + \mu \quad 1$$

² The name surtax was changed to Value Added Tax (VAT) in 2005.

Table 1. Contribution of various taxes to total tax revenue*.

Year	PAYE	Corp tax	With tax	Total direct taxes	VAT/Surt	Import duty	Exc.	Total indirect taxes
1970-1980	13.00	28.00	0.00	41.00	23.00	25.00	7.00	55.00
1981-1990	13.00	24.00	0.00	37.00	31.00	24.00	4.00	59.00
1991-2000	18.00	12.00	1.00	31.00	39.00	22.00	4.00	65.00
2001-2010	24.00	5.00	1.00	30.00	37.00	14.00	11.00	62.00

Source: RBM financial and economic reviews, various issues. *Period averages.

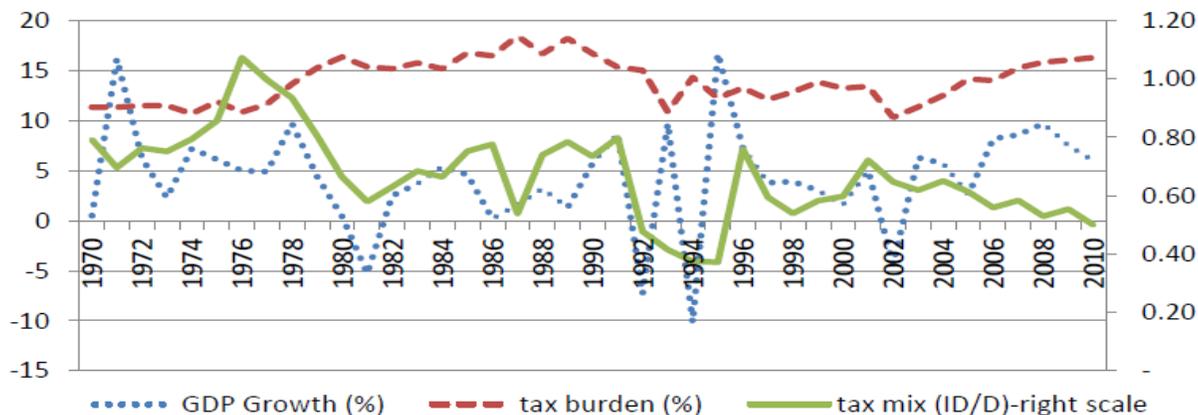


Figure 1. Evolution of growth, tax burden and tax mix. Source: Reserve bank of Malawi financial and reviews various issues.

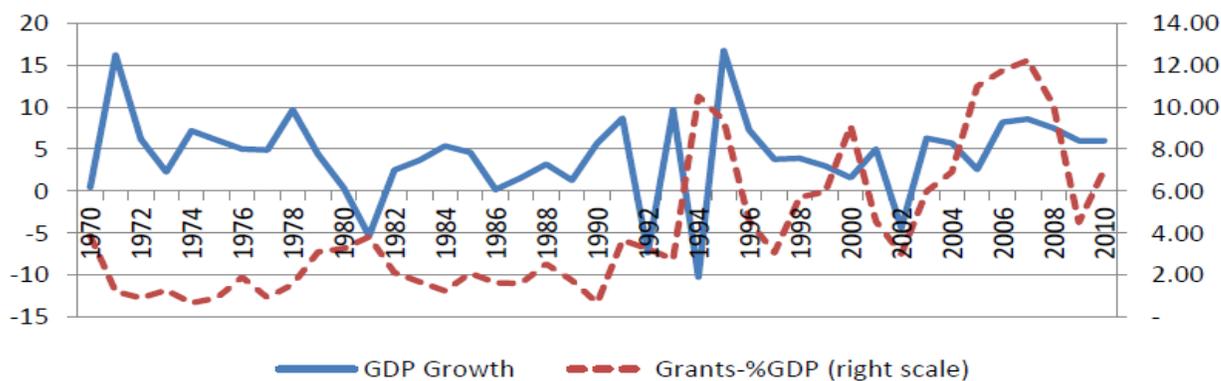


Figure 2. Real GDP growth (%) and level of grants (% GDP). Source: World Bank database and RBM financial and economic reviews various issues.

In this approach, the change in real GDP \dot{y} is determined by the change in its economic resources, namely change in physical capital \dot{k} , and change in human capital \dot{h} . In this model, μ represents

productivity. The other two ways in which output can be affected is through α and β which measure the marginal productivity of capital and output elasticity of labor, respectively. In principle, the structure of a country's tax system can influence each of the five

factors on the right side of equation thereby indirectly influencing real GDP growth. First, higher taxes can discourage net growth in the capital stock (k) through high tax rates on corporate and individual income, high capital gains tax rates, and low depreciation allowances. Second, taxes may attenuate labor supply growth by discouraging labor force participation or by distorting occupational choice. Third, tax policy can influence the marginal productivity of capital by distorting investment from heavily taxed sectors into more lightly taxed sectors with lower overall productivity.

The conventional Solow growth model implies that tax distortions only cause sudden decline in short-term growth rates but once the economy adjusts to the new tax regime, it would revert back to its original growth path, albeit at a lower absolute level than it would have been in the absence of the tax changes.

Romer (1986) and Lucas (1990) are some of the pioneers of the new growth theories. The characteristic element of this strand of theory consists in endogenizing the growth rate, overcoming a view of growth associated with exogenous factors, so that we speak now of a theory of endogenous growth. Under these theories, taxes can have long-term, persistent effects on output growth.

King and Rebelo (1990) show that in the endogenous growth theories, the stable growth rate of the Solow model, stapled down by technology and workforce productivity growth is replaced by steady-state growth rates which can differ persistently because of tax and expenditure policies pursued by the government. Zagler and Durnecker (2003) provide a simple but informative endogenous growth model for illustrating how a range of tax instruments can affect economic growth (Appendix 1).

The central theoretical purpose of exogenous growth theories appears precisely to build a neoclassical model of economic growth in which (i) there are positive (marginal) returns to capital, and (ii) the rate of growth is dependent on the preference of the community between present and future consumption and is, therefore, 'endogenous'. The long run growth rate depends on the growth rate of the labour force and on labour augmenting exogenous technical progress. Thus savings have no effect on the rate of capital accumulation.

The meaning of endogenous growth in the new growth literature is that output grows faster than the exogenous factors alone would make it grow. The innovation of these contributions relative to the Solovian model is that the rate of technological change, and a fortiori the rate of growth, is no longer taken as given from outside, but envisaged to depend on the behaviour of agents, that is, on their preferences or tastes. In some contributions, the emphasis is on the positive externalities of the actions of these agents. The fundamental argument for endogenous growth is that accumulation of capital can result in

constant (increasing) returns, therefore ensuring a long run positive growth rate. Tax policies are deemed to have an implication on decisions to save and accumulate capital and technology and therefore have a bearing on economic growth.

Empirical review

Skinner (1987) analyses the effect of taxation in sub-Saharan Africa over the period 1965 to 1982. He finds that taxes levied on personal and corporate incomes reduce economic growth, while sales and excise taxes have no significant effect on economic growth. From his analysis, it would be illogical to conclude that the tax structure be largely irrelevant in less developed economies.

Wang and Yip (1992) show that the proportion in which taxes are collected is more important than the level of taxation in explaining economic growth in Taiwan from 1954 to 1986. While their empirical estimates show negative impacts of specific taxes on economic growth, the effect of total taxation is not significant.

Pecorino (1994) conducts a study on United States and finds that should the US have moved away from income taxes towards consumption taxes, economic growth could have increased significantly from an average of 1.53 to 2.56% per annum. However, Stokey and Rebelo (1995) who employ endogenous growth models in their analyses, find insignificant negative effects of taxation on economic growth in developed economies.

Kim (1998) compares economic growth and taxation in the United States with that of Korea. His analysis shows that 35.0% of the differences between US and Korean economic growth can be explained by differences in the tax structure between the two countries. Keho (2010) argues that a common limitation of most empirical studies is that they are based on linear models which fail to account for the nonlinearity in the tax-growth relationship.

Consequently, he uses nonlinear estimation techniques developed by Scully (1996, 2000, 2003) to estimate optimal tax structure for Cote d'Ivoire. He finds tax structure to have significant impact on growth and finds 20.0% of GDP as an optimal tax burden for Ivory Coast. This implies that for values exceeding that level, taxes retard economic growth.

Marsden (1990) groups less developed countries in Africa into high and low tax regimes and finds that the low tax regimes grew at an average of 7.3% while the high tax group only averaged 1.1%.

Lovell and Branson (2001) combined the use of data envelope analysis and a log quadratic equation to find the impact of tax burden and tax mix on economic growth in New Zealand during the period of 1946 to 1995. The

study finds that the tax burden in New Zealand had trended upwards from 23.0 to 35.0% and the ratio of direct taxes to indirect taxes had varied between 0.31 and 0.75. These were found to be negatively affected by economic growth.

Koch et al. (2005) use a methodology similar to the one employed by Lovell and Branson (2001) to present evidence about tax distortions in South Africa. Using data from 1960 to 2002 and a two-stage modeling technique to control for unobservable business cycle variables, they find that decreased tax burdens are strongly associated with increased economic growth; in addition, contrary to most theoretical research, decreased indirect taxation is strongly correlated with increased economic growth potential. While the two studies resemble, they differ in the way they use results from the first stage, data envelope analysis (DEA).

These studies were however done on two developing economies and their findings cannot be generalized to other less developed countries like Malawi for several reasons. One of these is the fact that the budget in Malawi is supported by donors and this provides relief to tax policy. Secondly, the efficiency with which tax proceeds are repatriated to the economy is likely to be different in developed and less developed countries. For these and a number of other reasons, the impact of taxation on economic growth in the developed world is likely to be different from that in Africa, and, therefore, taxation in Africa, which has received little attention, merits further study.

In this study, the reported results are from a two stage analysis as developed by Branson and Lovell (2001) that carefully controls for all non-included variables. In upholding this methodology, Myles (2007) examines several econometric models. They range from country specific time series to cross country panel data analysis and notes that none truly makes a comprehensive assessment of the growth consequences of tax reforms. He concludes by noting that the methodology developed by Branson and Lovell (2001) is an interesting alternative worthy for further development.

METHODOLOGY

Assuming the economy is governed by simple constant returns to scale (CRS) production function $Y_t = F(A_t, K_t, N_t)$, where A_t represents technology, K_t represents capital stock and N_t represents human capital. Taking the natural log of the production function and differentiating with respect to time, yields the following:

$$y_t = \sigma_a a_t + \sigma_k k_t + \sigma_n n_t$$

Where, due to CRS $\sigma_a + \sigma_k + \sigma_n = 1$.

The lower case letters represent growth rates of their upper case counterparts, and the subscripted letters represent elasticities of inputs.

Two assumptions will underlie this stage of analysis. First, that in designing tax structure, the objective is one of increasing growth of GDP in the short-to-long-term. The second assumption in this analysis is that tax structure is adequately characterized by two dimensions: the tax burden, tax revenue/GDP and the tax mix (the proportion of indirect (ID) to direct (D) taxes).

In addition to tax burden and tax mix, grants are included as a factor explaining growth in Malawi. The methodology is set in two stages. In the first stage, a data envelope analysis (linear programming model) is used to generate efficiency scores which are used in the second stage of analysis, a Translog model.

Data envelope analysis (DEA)

Since taxes can influence all the variables on the right-hand side of Equation 1, the growth equation can be formulated as follows:

$$g_{yt} = f \left[\left(\frac{D}{Y} \right)_t, \left(\frac{ID}{Y} \right)_t, \left(\frac{GR}{Y} \right)_t \right] \quad 2$$

In this equation, economic growth is postulated as a function of tax policy and aid. Estimating this equation would however yield less meaningful results if other growth factors are left uncaptured. In order to capture the influence of these other factors, a blanket instrument Z_t is introduced in the model.

$$g_{yt} = f \left[\left(\frac{D}{Y} \right)_t, \left(\frac{ID}{Y} \right)_t, \left(\frac{GR}{Y} \right)_t, (Z_t) \right] \quad 3$$

The empirical problems with Equation 3 are fourfold; first, all factors in the vector Z_t cannot be identified and measured with ease. Second, at 40 observations, the sample size is relatively small rendering the use of any instrumental variable (IV) as a proxy of Z_t of little practical value because of the consistency property. Third, even if the IV was identified, parameter estimates from this estimation are likely to be sensitive to the selection of the instrument. Furthermore, if any elements of Z_t are correlated with D/Y , ID/Y and GR/Y , inferences will be adversely affected.

For the fact that the use of the IV practically breaks down, it is desirable to find an alternative approach to capture the influence of Z_t on g_{yt} prior to estimation. Although non-parametric in nature, the data envelope analysis lends itself quite handy in this analysis. The DEA model is owed to Charnes et al. (1978) who developed an input oriented DEA with constant returns to scale. This model assumes that as you increase inputs, output rises by a similar magnitude. Recognizing the pitfalls of the constant returns to scale model, Banker et al. (1984) developed an input oriented DEA but with variable returns to scale. This is the approach followed in this analysis.

In the DEA, for production to occur, there is need for decision making units (DMUs) and inputs. The DMUs are entities that combine the available inputs to produce output. In this context, the DMU is the economy itself evaluated in each year. This gives rise to 40 DMUs. The inputs in the programme are in two categories. First category is the tax ratios as controlled inputs. These are controlled inputs because the country has the ability to influence their levels.

The second inputs are grants which are entered as an uncontrolled input because often, the country has little control over the volume of aid it receives.

Next, the country's tax policy is summarized with the ratios of GDP to direct tax revenue (Y/D) and the ratio of GDP to indirect tax revenue (Y/ID). This exposition of tax reciprocals has two intuitions: First, instead of seeking maximum respective tax ratios (D/Y and ID/Y) consistent with observed growth rates, in this formulation, we seek minimum reciprocal tax ratios, (Y/D and Y/ID). As D and ID rise, D/Y and ID/Y are maximized while Y/D and Y/ID are minimized. The program has been converted from a burden-maximizing one to a reciprocal burden minimizing one for a technical reason.

Lovell and Pastor (1995) have shown that a maximizing problem is not invariant to a translation of outputs such as g_{yt} , but a minimizing problem is invariant to such a translation. Such a translation is required because g_{yt} is less than zero in some years of the sample period, and so g_{yt} must be replaced with Y_t/Y_{t-1} ³. Where Y_t is the present period output and Y_{t-1} is real output in the previous period. Secondly, the reciprocal formulation brings out a salient feature of tax efficiency. In terms of grants, it captures the index of relief to tax policy. Therefore Equation 3 is reformulated further as follows:

$$g_{yt} = f \left[\left(\frac{Y}{D} \right)_t, \left(\frac{Y}{ID} \right)_t, \left(\frac{Y}{GR} \right)_t, (Z_t) \right] \quad 4$$

The effect of the model here is to generate performance scores θ_t which will approximate Z_t . Since all inputs and the output in this model must be positive, restrictions are placed as follows:

$$\frac{Y}{D} > 0; \frac{Y}{ID} > 0; \frac{Y}{GR} > 0; g_{yt} > 0$$

Having observed Y/D, Y/ID and Y/GR from 1970 to 2010, the following linear programming problem, equation system (5), can be solved:

Min θ_t subject to:

$$\begin{aligned} \theta(Y/D)^n &\geq \sum_t \lambda^t (Y/D)^t \\ \theta(Y/ID)^n &\geq \sum_t \lambda^t (Y/ID)^t \\ \theta(Y/GR)^n &\geq \sum_t \lambda^t (Y/GR)^t \\ \sum_t \lambda(g_{yt}) &\geq g_{yt} \\ \lambda^t &\geq 0, \sum_t \lambda^t = 1 \end{aligned} \quad 5$$

This program is solved 40 times, once for each year in the sample period. For each year, the program seeks the largest equi-proportionate reduction in the ratios Y/D, Y/ID and Y/GR or equivalently the largest increase in that year's indirect and direct tax burden or index of relief to the kwacha consistent with the constraints in (5). The first two constraints require that the

³In addition to specifying the dependent variable as $g_{yt}=Y_t/Y_{t-1}$, an alternative specification $g_{yt}=[g_{yt}+a]$, where $a>|\min \{g_{yt}\}|$ was also considered in the DEA. Efficiency scores resulting from these specifications were virtually the same and the former was used for consistency with the second stage estimation which uses Translog estimation.

increased tax burden in each year should not exceed a linear combination of tax burdens observed in some other years. The third constraint requires that an increase in grants in each year should not exceed a linear combination of observed grants in all other years. The fourth constraint requires that the growth rate in each year not exceed a linear combination of growth rates observed in some other years. The last two constraints require that the weights and linear combinations of variables be nonnegative and convex, respectively.

The programme in Equation 5 will generate efficiency scores (scaling factor), θ_t , which will replace Z_t in the model and will provide an indication of the performance of the economy in various years in light of various tax ratios and grants. Regarding

interpretation, the resulting θ_t measures the degree to which the economy performed below where it ought to be, given the existing

tax policy and foreign aid. The solution values of θ_t satisfy $0 < \theta_t \leq 1$. If $\theta_t = 1$, that year's growth rate, tax burden and grants were not exceeded by a convex combination of growth rates, tax burdens and grants observed in any other years.

The economy managed to achieve its growth rate despite a relatively heavy tax burden, it therefore follows that non-tax influences on growth must have been relatively favorable in that

year. If $\theta_t < 1$, that year's growth rate and tax burden were exceeded by a convex combination of growth rates and tax burdens observed in some other years, implying that the economy achieved its growth rate with a relatively light tax burden, and it follows that non-tax influences on growth were relatively unfavorable that year.

In summary, as $\theta_t \rightarrow 1$, the effect of variables other than tax and

grants become more favorable, and as $\theta_t \rightarrow 0$, these factors

become less favorable. Thus θ_t is interpreted as a proxy for the

unobserved factors Z_t that affect economic growth. This θ_t will be used as a scaling factor. If the scaling factor is unity, then other determinants of growth were favorable and so the growth rate does not require scaling up.

In situations where the scaling factor is less than unity, potential economic growth is greater than actual growth but it was not realized because other factors that influence growth were unfavorable. The closer to unity the scaling factor is, the more favorable were the other factors and hence the little the boost required to get to the growth frontier (potential growth rate).

Intuitively, since inefficiency is relative underperformance compared to a frontier, the efficiency scores are used to boost performance up to the frontier, enabling the estimation of a trans-log production function of efficient output against the tax burden, the tax mix and grants. In the next stage therefore, use is made of the potential growth rates and a trans-log specification to determine the impact of the variables of interest that is, tax burden and tax mix on potential economic growth.

The Translog model

A three factor Translog model is specified in logarithms. The use of logarithms has the advantage of reducing heteroskedasticity by

reducing the effects of outlier observations. It also helps in finding

$$y_t = \beta_0 + \beta_b b_t + \beta_m m_t + \beta_g gr_t + \frac{1}{2} \beta_{bb} b_t^2 + \frac{1}{2} \beta_{mm} m_t^2 + \frac{1}{2} \beta_{gg} gr_t^2 + \beta_{bm} bm_t + \beta_{bg} bgr_t + \beta_{gm} grm + \varepsilon_t \quad 6$$

y_t = denotes adjusted GDP growth rate.

$$y_t = \ln \left[\frac{1}{\theta_t} \left(\frac{Y_t}{Y_{t-1}} \right) \right] = \ln(y_t) - \ln(y_{t-1}) + \ln\left(\frac{1}{\theta}\right)$$

Where, $\ln\left(\frac{1}{\theta}\right) \geq 0$, b is the log of the tax burden, m is the log of tax mix, gr is the log of grants, ε_t is a white noise error process.

Engle and Yoo 3 step procedure (EY3SP)

Fedderke (2003) argues that in the presence of cointegration, the Engle Granger approach rests on the super consistency property of the OLS estimator. He argues that short run dynamics and issues of endogeneity of variables can be ignored in a cointegrating relationship. Moreover, the standard regression techniques under cointegration are consistent even under conditions of simultaneity. The super-consistency result does not depend on exogeneity of the explanatory variables when there is co-integrating relationship. The reason is that where variables are I(1), the relationship gives residuals that are I(0). The means of the regressors will be time dependent and hence approach infinity as time goes.

Stock (1987) however demonstrates that while OLS has super-consistency property, there is a small sample bias in the OLS estimator of the co-integrating equation. The super consistency property is an asymptotic property and in finite samples the distribution of OLS estimator might be non-normal and could have non-zero mean. This in-turn effectively invalidates hypothesis testing. The problematic asymptotic distribution of OLS arises due to the presence of long-run correlation between the cointegrating equation errors and regressors.

With the twin problems of estimation and hypothesis testing in mind, and given the fact that small samples are the rule rather than exception in most economic analyses, Engle and Yoo (1991) developed a 3 Step estimation process which is employed to correct for the efficiency of parameter estimates. The method builds on Engle and Granger 2 step procedure.

Dorsainvil (2006) also notes that if residuals are heteroskedastic, hypothesis testing is impacted and the Engle and Yoo 3 step procedure (EY3SP) can be employed to correct the standard errors of the coefficients to produce efficient estimates. By adjusting the parameters of the cointegrating relationship, the EY3SP eliminates the bias from non-stationary series. In estimating the Translog model therefore, this study applies the Engle and Yoo 3 step estimation technique as detailed below:

$$\hat{\varepsilon}_{t-1} = y_{t-1} - x_{t-1} \hat{\alpha}^1$$

Where $\hat{\alpha}^1$ are long-run parameters obtained from Equation 6, x_t are explanatory variables, y_t is the growth rate and ε is the white

time varying conditional elasticities of growth.

noise error process.

$$\Delta y_{t-1} = \Delta x_t - (1 - \hat{\lambda}) \hat{\varepsilon}_{t-1} + \mu_t$$

Where $(1 - \hat{\lambda})$ is the adjustment term. The interest is in the residuals μ_t and the speed of adjustment estimate $(1 - \hat{\lambda})$.

$$\hat{\mu}_t = \delta \left[(1 - \hat{\lambda}) x_{t-1} \right] + v_t$$

The estimated $\hat{\delta}$, is a correction term required to correct initial estimates $\hat{\alpha}^1$ to obtain standard estimates. The adjustment is done by a simple addition as follows:

$$\hat{\alpha}^2 = \hat{\alpha}^1 + \hat{\delta}$$

Expected signs of the coefficients

β_b is expected to be negative. From economic theory, taxation disables and distorts allocation of resources to factors of production which negatively affects growth. β_m is expected to be positive. From theory, reliance on indirect taxes as opposed to direct taxes is less distortional and must therefore raise economic growth. β_g is expected to be positive. Normally, higher aid will result in higher growth.

Description of variables

The variables into the DEA comprise the DMUs, inputs and an output. The DMU is the economy in each year. Output is the real GDP growth. Inputs are indirect taxes, direct taxes and grants. All inputs are measured as reciprocal ratios of GDP. In the Translog estimation adjusted, GDP growth rate is the dependent variable. The independent variables are tax burden, tax mix and grants/GDP. Direct taxes are composed of withholding taxes, PAYE and corporate taxes. Indirect taxes consist of excise duty, VAT and customs duty. Grants are funds from various bilateral and multilateral donors.

Data sources and softwares issues

The study used annual data from the World Bank database, Malawi Revenue Authority (MRA), National Statistics Office (NSO) and the

Table 2. Efficiency scores.

Year	Score	Year	Score	Year	Score	Year	Score
1970	0.63	1980	0.93	1990	1.00	2000	0.77
1971	1.00	1981	0.88	1991	1.00	2001	0.78
1972	0.72	1982	0.84	1992	0.90	2002	0.60
1973	0.65	1983	0.89	1993	1.00	2003	0.72
1974	1.00	1984	0.98	1994	0.98	2004	0.82
1975	0.78	1985	1.00	1995	1.00	2005	0.85
1976	0.77	1986	0.92	1996	0.93	2006	0.86
1977	0.80	1987	0.95	1997	0.78	2007	0.96
1978	1.00	1988	0.93	1998	0.84	2008	1.00
1979	0.91	1989	1.00	1999	0.81	2009	0.92
						2010	0.96

Source: Own calculation using frontier 4.1.

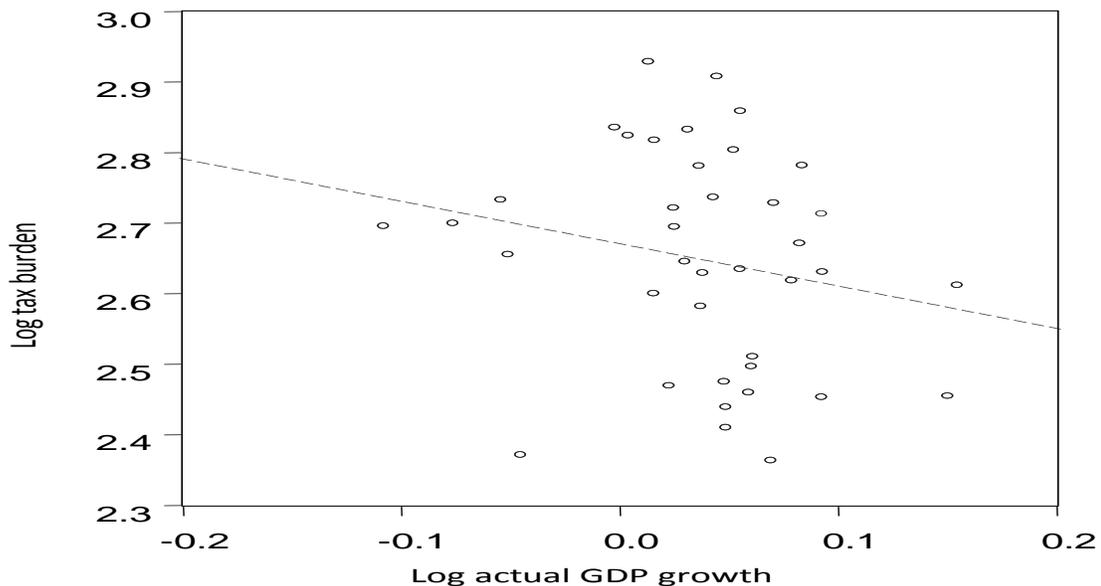


Figure 3. Correlation between actual GDP and Tax burden. Source: Author's calculations using data from World Bank and RBM financial reviews.

Reserve Bank of Malawi (RBM). The sample covers a period of 40 years from 1970 to 2010. Estimation has been done using two softwares. The first non-parametric stage uses the DEA Frontier Analyst® 4.1 obtained from, and developed by, Banxia Software Limited, United Kingdom. The Translog specification is estimated using E-views 7.

RESULTS AND DISCUSSION

Table 2 reports efficiency scores generated from running the DEA linear programming model in Equation 5.

Figures 3 and 4 shows the correlation between GDP and Tax Burden before and after applying the Linear Programme results. Clearly, the correlation at 0.7 is high in Figure 4 than in Figure 3 signifying the importance of the DEA stage.

Unit root tests

Stationarity results presented in Table 3 show that all the series are I(1). This finding prompts a search for a co-

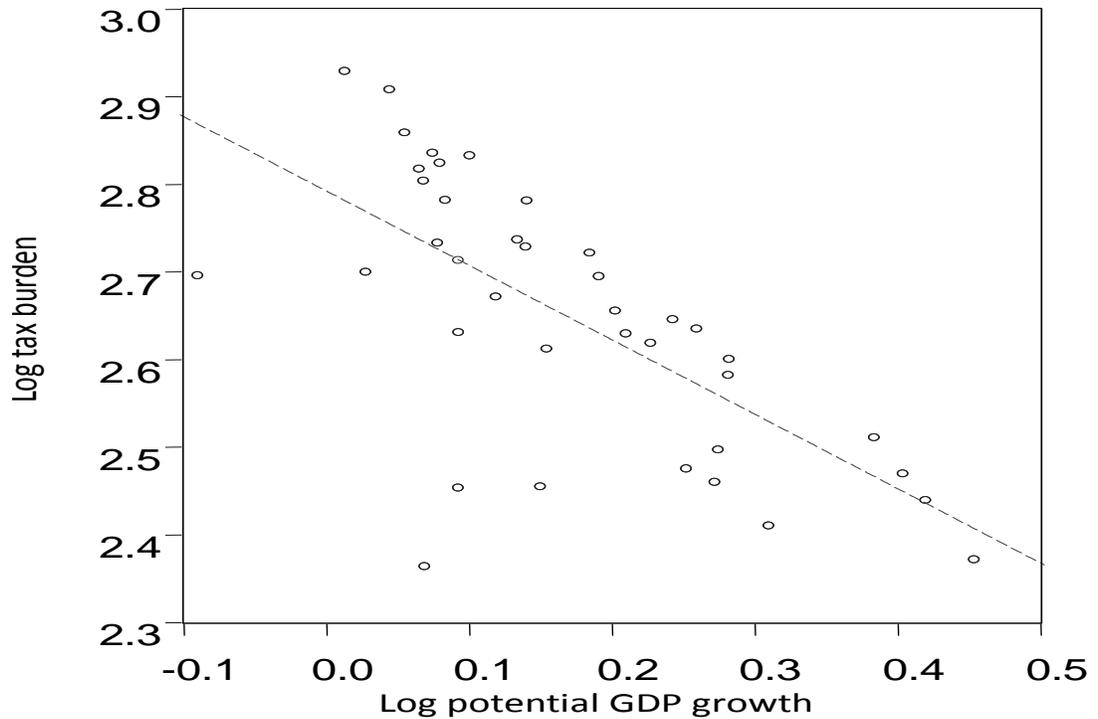


Figure 4. Correlation between growth rate and tax burden after DEA. Source: Author's calculations using data from World Bank and RBM financial reviews.

Table 3. ERS DFGLS-Stationarity results: Null hypothesis: Variable (i) has unit root.

Variable	Coefficient	Std. Error	t-Statistic	OI
y(-1)	-0.272868	0.141395	-1.929828*	1
b(-1)	-0.243351	0.106033	-2.295057*	1
m(-1)	-0.316562	0.120858	-2.619279*	1
gr(-1)	-0.401798	0.141186	-2.845889*	1
D(y(-1))	-1.244363	0.158339	-7.858849*	0
D(b(-1))	-1.283279	0.160138	-8.013559*	0
D(m(-1))	-1.016038	0.166951	-6.085850*	0
D(gr(-1))	-1.086049	0.164086	-6.618785*	0

Critical values are simulated from ERS (1996) 1.0%: -3.77000, 5.0%: -3.19000, 10.0%: -2.890000. * Significant at 1%.

integrating relationship which is done by appealing to Phillips Ouliaris and Engle Granger test for Cointegration (Table 4). The probability values of the Phillips Ouliaris tau and Z-statistics indicate that the null of no cointegration at 1.0 and 5.0% respective levels of significance cannot be accepted. This test was augmented by the Engle Granger residual test for cointegration which fails to accept the null of no cointegration at 1.0% for both the tau and the Z-statistics. On balance therefore, these results are indicative of the

existence of the long-run cointegrating relationship which is presented in Table 5. Diagnostic results point to model adequacy (Table 6) and results can be interpreted as meaningful.

Tax burden

Estimated results show that a rise in tax burden is associated with a decline in economic growth in Malawi with an overall elasticity of 0.88 (Table 7). However, the

Table 4. Phillips Ouliaris and Engle Granger test results for cointegration.

Null: Series are not cointegrated	Value	P-Value
Phillips-Ouliaris tau-statistic	-6.86049	0.0072*
Phillips-Ouliaris Z-statistic	-39.9436	0.0162**
Engle-Granger tau-Statistic	-6.79932	0.0081*
Engle-Granger Z-Statistic	-42.1436	0.0074*

Uses MacKinnon (1996) p-values. *Significant at 1.0%. **Significant at 5.0%.

Table 5. Long-run equation.

Variable	New coefficient	Std. Error	t-statistic
'b	-0.61232	0.137834	-4.44247*
'm	-1.30789	0.83802	-1.56069***
'gr	1.40072	0.247525	5.659128*
m ²	-0.90310	0.185658	-4.8643*
gr ²	-0.05432	0.024137	-2.25032**
b.m	0.63309	0.331998	1.90969**
b.gr	-0.49528	0.094459	-5.2433*
C	1.77037	0.414102	4.2752*

*Significant at 1.0%, **Significant at 5.0%, ***Significant at 10.0%, Critical t values: 1.0%: 2.423; 5.0%: 1.684; 10.0%: 1.303.

Table 6. Summary of diagnostic tests results.

Type of Test	Test statistics	P-Value	Decision
Breusch Godfrey serial correlation LM test H ₀ : Residuals are not serially correlated	0.8327	0.6594	Accept
Breusch Pagan Godfrey heteroskedasticity test H ₀ : Residuals are homoscedastic	19.64	0.0064	Reject
Jarque-Bera Normality H ₀ : Residuals are normally distributed	0.3919	0.8200	Accept
Ramsey's Reset H ₀ : model is correctly specified-(linear)	0.0945	0.9101	Accept
Goodness of fit (F-statistics)	21.07	0.0000	Accept

Table 7. Trend in growth elasticities.

Period	e_{gb}	e_{gm}	e_{ggr}
1970-1979	-0.65	0.08	0.14
1980-1989	-0.71	0.08	-0.04
1990-1999	-0.86	-0.26	0.00
2000-2010	-1.29	-0.15	0.00
Average	-0.88	-0.063	0.02

Source: Own calculation from Table 10.

responsiveness of economic growth to changes in tax burden has not been static with elasticity increasing between 2000 and 2010. Between 1970 and 1990, a 1% decrease in tax burden was associated with a 0.7% rise in growth while between 2000 and 2010, a similar

decrease was associated with a 1.3% increase in growth. The finding indicates that tax ratio in Malawi has become more growth constraining with time. The results confirm findings by Koch et al. (2005) who used data for the sample period 1960 to 2002 and found that high tax

burden negatively impacted growth in South Africa. Branson and Lovell (2001) found a similar result on Newzealand for a period covering 1946 to 1995.

Tax mix

The study finds that a move towards collecting tax revenue using consumption taxes is negatively related to economic growth. Theoretically, it is argued that such a move is less distortionary because it is applied after savings decisions have been undertaken by economic agents. It therefore must be associated with increased investment thereby increasing economic growth. A closer analysis reveals that between 1970 and 1989, consumption taxes were 1.2 times higher than income taxes and the elasticity of growth with respect to tax mix was 0.08. Between 1990 and 2000, consumption taxes were almost double the amount of income tax revenue. This was on account of a deliberate policy shift that started in 1989 towards collecting more revenue through consumption taxes. The elasticity of growth during this period shows that a 10.0% decrease in tax mix would have raised growth by 3.0%.

Between 2000 and 2010 consumption taxes were 1.6 times higher than income taxes, a reduction from the 1990 to 2000 levels. Consequently, during this period rebalancing would have resulted in growth responding by an increase of 2.0%. One channel, supported by economic theory through which a move from income to consumption taxes could raise growth is by increasing saving which would raise investment. Despite a shift in emphasis towards consumption taxes, savings rate has remained relatively low in Malawi. Gross national savings was 12.0% of GDP between 1970 and 1980 while it was around 8.0% between 2000 and 2010. Theoretically, this decline closes a forum through which a shift towards consumption taxes ought to work to raise economic growth.

Grants

Another finding in the paper is that grants have a positive impact on economic growth with elasticity of 0.03. From the findings, a complete reversal of donor inflows would reduce economic growth by an average of 3.0%.

Conclusion

Although theory suggests that higher taxes depress growth, empirics reveal no general evidence to support this across countries. Country specific factors play a big role in these conflicting results. This means that each country's decision on how to vary the pattern of taxation involves detailed technical analysis and a choice between

greater economic growth and greater equality.

Results from this study however point to a need for reduction in tax burden in order to raise economic growth in Malawi. Taxes have increased to the extent that they are negatively affecting economic growth.

The absence of the IMF programme and donor inflows provides a fertile ground for increasing domestic tax collections. But this has negative consequences on economic growth. Chipeta (2002) noted that consumption taxation in Malawi has driven economic behavior underground by moving part of taxed activities out of the formal market. He particularly noted that high excise taxes, high import duties and high VAT rates are among major factors behind growth of the parallel economy. This shrinks the formal economy and renders the operations of fiscal and monetary policies difficult because these policies are directed at the formal sector while the informal sector is equally booming and virtually goes unpoliced. This finding is confirmed by a World Bank study which shows that the parallel economy in Malawi is very significant and grows faster than the formal economy (in 2009 it was estimated at 40.3% of GDP). The reforms in VAT, import taxes and excise taxes may have had these unintended reverse impacts.

Equally, deemphasizing tax collection from consumption towards income taxes will raise economic growth. It is important to note that one major source of revenue in the consumption tax category is VAT which contributes about 40.0% to total tax revenue. This has grown from about 10.0% in the 1970s. The increased use of this tax is premised on its ease of collection. It is paid by every citizen regardless of the ability to earn. At 16.5% in 2010, the VAT may still be high such that it translates into higher prices that stifle domestic and foreign demand which eventually impact on economic growth.

In terms of grants, a 100% reduction in grants would reduce economic growth by 3.0%. This finding particularly re-inforces the importance of resumption of donor inflows. A part from reviewing the implications of a devaluation on inflation and BOP position, the wider perspective in terms of the cost (loss in economic growth) associated with the absence of the programme gives an additional dimension for consideration as the country weighs various policy options.

Despite several freezes in donor resources during the sample period, there has not been 100% economic growth. Therefore the costs in terms of lost economic growth are likely to fall in the range between 0 and 3%.

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Appendix 1: An endogenous growth model

Zagler and Durnecker (2003) provide a simple but informative endogenous growth model for illustrating how a range of tax instruments can affect economic growth. In this model, output is determined by the aggregate production function:

$$Y_t = X_t^\alpha G_t^\beta L_t^{1-\alpha}$$

where X_t denotes the quantity of a composite intermediate input. This aggregate is composed of a set of n specialized intermediate inputs via the defining relation:

$$X_t^\alpha = \sum_{i=1}^n x_{i,t}^\alpha$$

where $x_{i,t}$ is the quantity of intermediate input i . The input levels are chosen to minimize the cost of production:

$$C_t = (1 + \tau_l)w_t L_t + \sum (1 + \tau_{xi}) p_{i,t} x_{i,t}$$

$$= (1 + \tau_l)w_t L_t + (1 + \tau_x)$$

τ_l is the tax on labour τ_{xi} is the tax on intermediate good i , and P_t the aggregate price index with τ_x a corresponding aggregate tax. The necessary conditions for cost minimization can be solved to find:

$$(1 + \tau_x) p_t = \left(\sum_{i=1}^n [(1 + \tau_{xi}) p_{i,t}]^{\frac{\alpha}{\alpha-1}} \right)^{\alpha-1/\alpha}$$

Hence:

$$(1 + \tau_x) p_t = \left[\frac{(1 + \tau_{xi}) p_{i,t}}{(1 + \tau_x) p} \right]^{1/(\alpha-1)} X_t$$

It is assumed that each intermediate good is produced by a different monopolistic firm that maximizes profit subject to a demand function. This leads to the optimal price:

$$p_{i,t} = \frac{1}{\alpha}$$

This implies that the aggregate price when all intermediate taxes are equal is:

A concept of physical capital can then be defined by:

$$p_t = \sum_{i=1}^n x_{i,t} = n^{(\alpha-1)/\alpha} X_t$$

This allows output to be expressed as:

$$Y_t = K_t^\alpha G_t^\beta (nL)^{1-\alpha}$$

The equilibrium capital stock can be shown to be:

$$K_t = \alpha^2 \left(\frac{1 - \tau_y}{1 - \tau_x} \right) Y_t$$

This implies that the growth rate is given by:

$$\hat{Y}_t = \frac{\beta}{1 - \alpha} \hat{G}_t + \hat{n}_t + \hat{L}_t$$

A constant fraction, s , of disposable income is saved and used to finance the activities of R&D firms. Denoting the tax on saving by s and that on R&D by RD :

$$(1 - \tau_s) s Y_t^D = (1 + \tau_{RD}) w_t E_t$$

Innovations are assumed to arrive at the rate $\hat{n}_t = \phi h_t E_t$. Where ht is publicly provided human capital. Using these results the per capita $(\hat{Y}_t - \hat{N}_t)$ growth rate can be found to be:

$$\hat{Y}_t - \hat{N}_t = \frac{\beta}{1 - \alpha} \hat{G}_t + \phi \frac{s + \alpha s (1 + \tau_L) (1 - \tau_\pi - \tau_x)}{1 + \tau_{RD} + \tau_s + \alpha s (1 + \tau_L) (1 - \tau_\pi - \tau_x)} \frac{h_t n_t}{n_t}$$

where τ_π is the profit tax on the producer of intermediate goods. The first term captures the positive effect that taxation has on growth through the financing of the public input. The second term captures tax effects that operate through changes in the level of innovation. Both the tax on R&D and the tax on saving reduce the growth rate. In this model, higher taxes mean higher rates of distortions, which lead to higher loss of efficiency and, consequently, lower growth.