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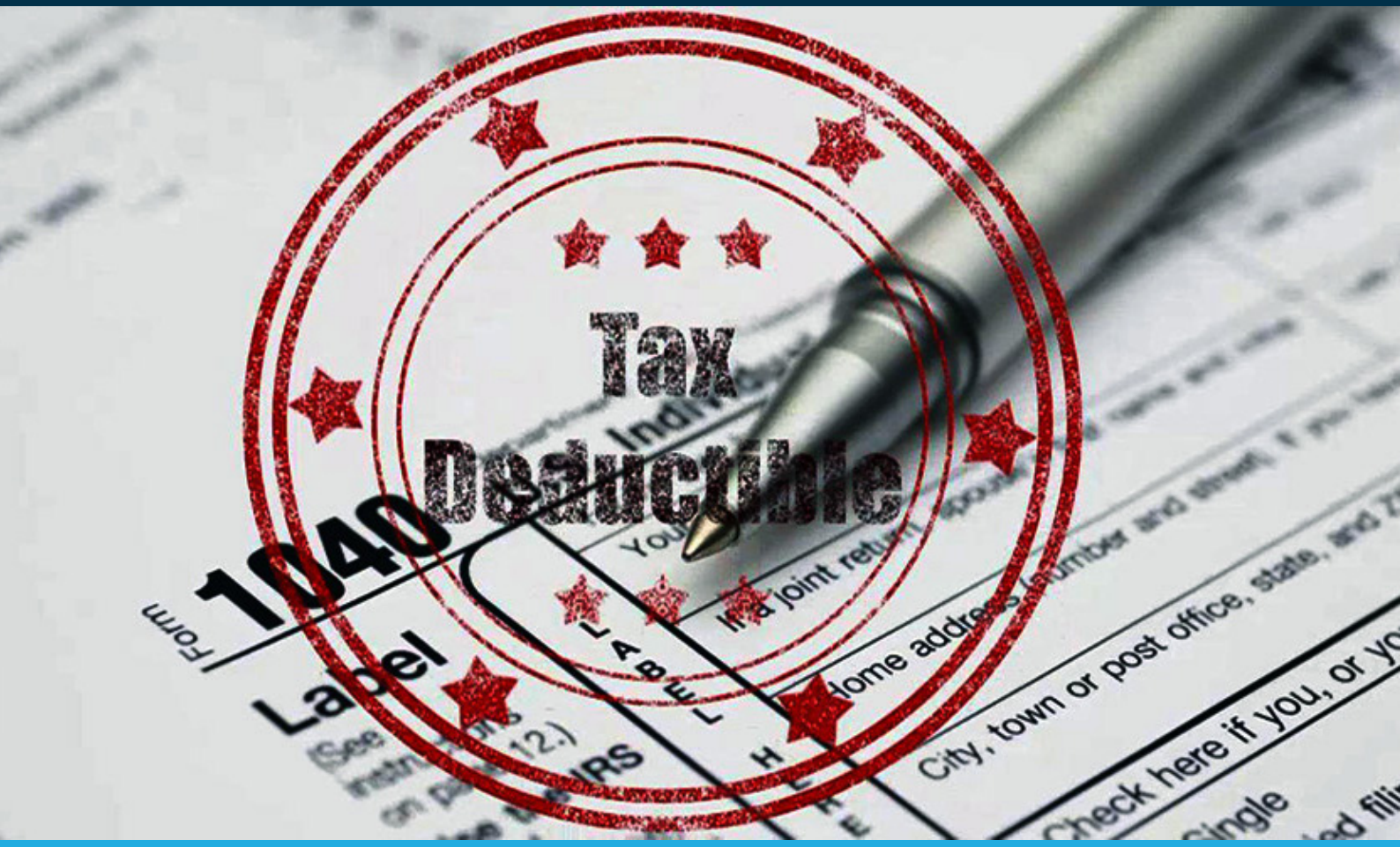
ATTRACTING INVESTMENTS USING TAX INCENTIVES IN UGANDA: THE EFFECTIVE TAX RATES



CORTI PAUL LAKUMA

April 2019

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Any enquiries can be addressed in writing to the Executive Director on the following address:
Economic Policy Research Centre
Plot 51, Pool Road, Makerere University Campus
P.O. Box 7841, Kampala, Uganda
Tel: +256-414-541023/4
Fax: +256-414-541022
Email: eprc@eprcug.org
Web: www.eprcug.org

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TABLE OF CONTENTS

ABSTRACT

Uganda operates a wide array of tax incentives schemes to attract investments like other countries in East Africa. However, due to significant amount of revenue foregone due to such schemes, Uganda has embarked on the process of rationalizing its overall incentive regime. This study examines the tax burden of various tax incentives schemes operational in Uganda by estimating the effective marginal tax rates (EMTR) and effective average tax rates (EATR). We find sectoral variations in effective average tax rates due to a selective tax holiday and preferential income tax. Overall, tax holidays and preferential income tax rates lower the effective tax burden to a single digit percent and encourage individual tax avoidance strategies. We find that the surge inflation registered during 2010/11 had an adverse effect on effective tax rates. Furthermore, our results confirm in previous findings that tax holidays effectively reduce EATR and favour high-profit short-lived (less than 5 years) investment projects raising doubts about their overall rationale.

1. INTRODUCTION

The Government of Uganda is in the process of reforming both tax policy and tax administration to establish a sound tax environment to increase revenue in the medium term through various policy and tax administration measures. In this regard, reforming tax incentives is one of key tax policy item on Uganda's legislative agenda. Tax incentives are very costly to the Ugandan economy—estimated at 1 percent of the gross domestic product (GDP) in foregone revenue (Lakuma 2018; Lwanga *et al*., 2018). Given Uganda's GDP of 109 Trillion in 2018, tax incentives are estimated to cost 1.09 Trillion and this is more than what was allocated to the agricultural sector (UGX 828 Billion) during the 2018/2019 financial year. As such, there is an urgent need to eliminate the provision of tax incentives for activities that would have been undertaken anyway—as highlighted by previous authors. For example, James and Van Parys (2010) suggest that the overall economic characteristics of a country are more important for the business environment than any tax incentive scheme. On the other hand, in a bid to reform the tax system.

Uganda is faced with a hostile environment. Specifically, any unilateral reform of tax holidays and exemptions are often constrained by regional tax competition. Consequently, Uganda retains tax incentive to remain competitive in attracting private and foreign investments relative to other East Africa Community and COMESA region members (Othieno and Shinyekwa 2011). Furthermore, corporate tax rates differ across companies and vary according to the company's activities and the economic sector of the company's business.

The need to remain competitive is, most often, interpreted in the narrow sense of the length of a tax holiday, rather than low effective tax rates, to encourage investment and attract firm-specific, internationally mobile capital. The same consideration makes it difficult to reform the incentives regime, despite the recognition in Uganda that tax holidays and exemptions may come at a significant revenue cost. The consensus is that the overall economic characteristics of a country is more important for the business environment than any tax incentive scheme (James and Van Parys 2010).

In this context, there is a need to examine the effects of the overall taxation regime on investment. This paper, therefore, calculate the Effective marginal Tax Rate (EMTR) and the Effective Average Tax Rate (EATR) for Uganda's Corporate Income Tax regime between financial year 2010/11 and 2018/19 and accommodate for the prevailing tax incentive regime by using an extended Devereux-Griffith methodology in Klemm (2008) as used by Nguyen-Thanh and Strupat (2012). The paper uses this forward-looking approach of taxation because it summarizes all tax rules in two measures. Therefore, we are able to calculate the effective tax burden for different corporate taxpayers, make comparisons across them and show the full tax regime with all discretionary exemptions.

The rest of this study is as follows: section 2 gives an overview of the capital income tax regime in Uganda. Section 3 deals with the theoretical model. In section 4 we establish the link between the model and the country-specific variables. Section 5 present the results. Section 6 concludes with a summary of the main findings.

2. THE CAPITAL INCOME TAX REGIME IN UGANDA

Uganda follows the classical system of corporate taxation. Corporate-source income is taxed at the corporate level at a rate of 30 percent, below the top personal rate (40 percent), and again when dividends are distributed to the individual shareholder at a rate of 15 percent. The latter is a final withholding tax. Taxation of labor income differs from taxation of capital income. Capital gains on business assets, shares and commercial buildings are subject to tax at a rate of 30 percent. Interest paid to residents and nonresidents is

subject to a withholding tax at a rate of 15 percent. The withholding tax rate for interest paid on government securities is 20 percent. Furthermore, a wide range of tax exemptions and preferential tax rates characterizes Uganda's income tax regime. Corporate tax rates differ according to the company's activities and the economic sector of the company's business. Highly reduced tax rates apply to agro-processing and manufacturing businesses with the goal to foster investment in these sectors (table A1 in appendix). In addition, the system provides tax holidays to specific taxpayers, to promote investment in selected industries, and classifies them as discretionary tax exemptions. The taxpayers are selected based on investments and the benefits are exclusively for the benefit of the selected taxpayers. In this regard, the benefits neither extend to all the firms in the sector, nor extend to firm engaged in a similar business (Uganda Revenue Authority, 2013). The tax holiday covers a period of 10 to 25 years.

Table A2 in the appendix shows sector where a select group of companies have been granted tax holidays. In some cases, these tax holidays are combined with general allowances and deductions provided for in the Income Tax Act (2018). Examples of allowances and deduction are expenses for scientific research, depreciation, initial allowance for plant and machinery and building, industrial building, other capital depreciation and loss carted forward. Of particular interest is depreciation allowances, which vary widely for different assets ranging from 20 to 40 percent. The highest depreciation rates apply for Computers and data handling equipment, while the lowest rates are granted for Railroad cars, locomotives, equipment vessels, barges, tugs and similar water transportation equipment, aircraft, specialized public utility plant, equipment and machinery, office furniture, fixtures and equipment, and depreciable assets not included in another class (Table A3 in the appendix).

3. METHODOLOGY

We follow the methodology by King (1974) modified by Devereux and Griffith (1999) and Klem (2008) and used by Nguyen-Thanh and Strupat (2012) to summarize all tax rules into a single measure, an effective tax rate. Incremental domestic investment is best measured by the Effective Marginal Tax Rate (EMTR), while discrete rent-earning investments of multinationals are best measured by the Effective Average Tax Rate (EATR). Statutory rates are important as incentives for profit shifting—for example, through manipulation of transfer prices (Botman, Klemm and Baqir 2008).

We follow the Devereux and Griffith (2003) methodology to calculate "effective average tax rate" (EATR) by constructing a forward-looking hypothetical investment project for which the impact of tax on the cost of capital can be computed (see appendix for a formal derivation of effective tax rate). We incorporate discrete investment decisions, while assuming a value-maximizing firm. The EATR is incorporates the post-tax net present value of an investment project and its location. However, the magnitude of investment depends on the "effective marginal tax rate" (EMTR). In most cases, the size of EATR drives the duration of tax holidays as countries race to become internationally competitive.

The impact of a country's tax regime is measured by the difference between the net present value of income generated with and without taxes. This difference is multiplied to net present value of income generated in the absence of tax. In this case EATR is equivalent to weighted average of the EMTR and the statutory tax rate (adjusted for personal income taxes, if they are included, see below). In this case, marginal investment, investment whose after-tax rate of return is zero, are equal to the EMTR. It should be noted that the measure converges to the statutory corporate income tax rate, as the rate of profit increases (Devereux and Griffith 2003).[1]

The calculation of effective tax rate take into consideration a country's income taxation legislation: statutory rate, local rates and the depreciation methods. In this case, we differentiate between the depreciation regimes that govern investment in buildings and

1 "Marginal investment" thus has this specific meaning here and does not refer to any incremental investment (in case of a firm which already has the optimal capital stock, however, any additional investment will be marginal in both senses).

plant and machinery. The choice of financing is also of paramount importance, in particular the interest deductibility in the case of debt finance.

We also extend the Devereux and Griffith (2003) methodology to incorporate the effects on effective tax rates of tax holidays. The original derivation in the study by Devereux and Griffith is calculated for a one-period perturbation in the capital stock; i.e., they analyze an investment of one unit of capital that is held for one year and then sold at its remaining value. While this is simple and in many cases appropriate, it is not useful for the study of tax holidays, which typically last longer than one period. We follow Klemm (2008) and (Botman, Klemm and Baqir 2008) who adapted the framework to study a permanent increase in the capital stock by one unit, which is slowly disinvested over time through depreciation.[2] Returns to capital are tax-free during the tax holiday and taxed thereafter, with carry forward of unused depreciation out of the holiday period. It should be noted, however, that the effective tax rate methodology does not include every aspect of the tax legislation, effective tax rates are based on the most important features of the system only.

4. DATA

Table A4 presents the variables we used to calculate the effective tax rates for the financial years 2010/11 to 2018/19. We assume an investment in plant and machinery and an average depreciation range of ten years. This results in a linear deprecation rate δ of 10 percent for a marginal investment. The capital allowance rate for plant and machinery was 30 percent and based on the declining balance method in the time between 2010/11 and 2018/19. In 2010/11 the calculated present value of depreciation allowances in Uganda is 0.23. While Uganda has an open capital accounts and the provider of funds are foreign individuals or firms, personal income taxation does not discriminate between residents and non-residents. Unlike, the standard approach in the literature we consider personal income taxation in our calculations.

For the calculation of the EATR, the pre-tax profit rate of 20 percent is calculated and we used the annual average and 30 interest and inflation rate provided by the Bank of Uganda.

5. RESULTS

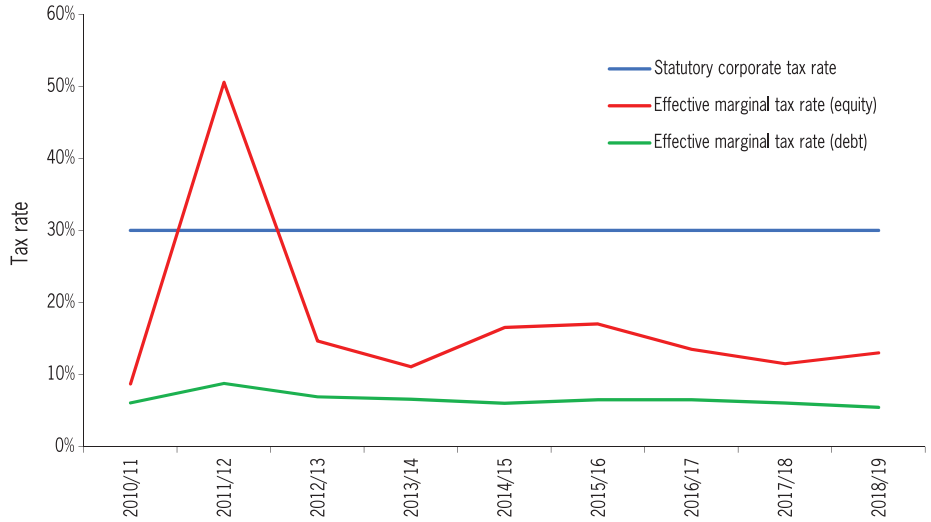
We start with calculating the effective marginal tax rates (see figure 1) and the effective average tax rates (see figure 2) for a manufacturing company. This will enable us to analyse the changes in effective tax rates over time. Across all years, we adopt Uganda's statutory corporate tax rate, which is 30 percent.

As shown figure 1 and 2, the effective tax rates for equity financing are significantly lower than the statutory corporate tax rate. In 2010/11, equity financed EMTR and EATR were estimated at 8 and 4 percent respectively. Due to the interest deductibility in Uganda's tax legislation, the debt-financed investments trigger lower effective tax rates. This suggest investor that use debt financing enjoy more tax benefits than those who reinvest their equity. Regardless of the choice of financing, equity or debt, EMTR is higher than EATR. This suggest that domestic investors as measured by EMTR pay more taxes than multinationals as measured by the EATR.

Figure 1 and 2 also show that high inflation and market interest rates offered a discouraging investment environment in 2011/12, which resulted in extremely high equity financed EMTR (51 percent). In 2011/12, annual inflation rate increased from 6 percent to 24 percent. The easing of inflation and interest rate years 2012/13 and 2018/19 leads to a significant decline of effective tax rates. Effective marginal tax rates decrease by 71 percent, while effective average tax rates are reduced by 15 percent. In 2012/13, inflation returned to the historical average of 5 percent. As the nominal interest rate is the same for 2012/13 and 2018/19, we find that a one percent reduction of the inflation rate lowers effective average tax rates by 0.16 percent. Altogether, these findings highlight the importance of macroeconomic fundamentals in terms of effective taxation in Uganda. The significant

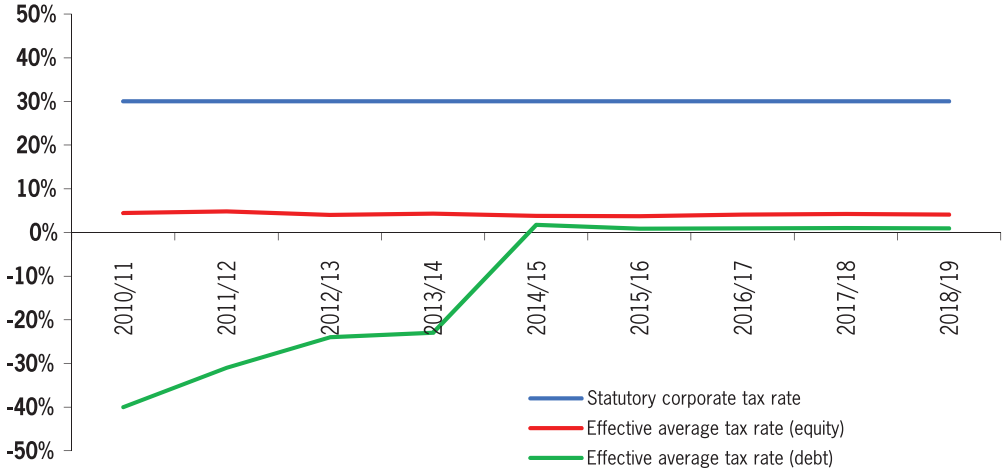
2 For details see Klemm (2008).

Figure 1: **Marginal Tax Rate on Investment in Plant and Machinery**



Source: Author's Calculations

Figure 2: **Average Tax Rate on Investment in Plant and Machinery**



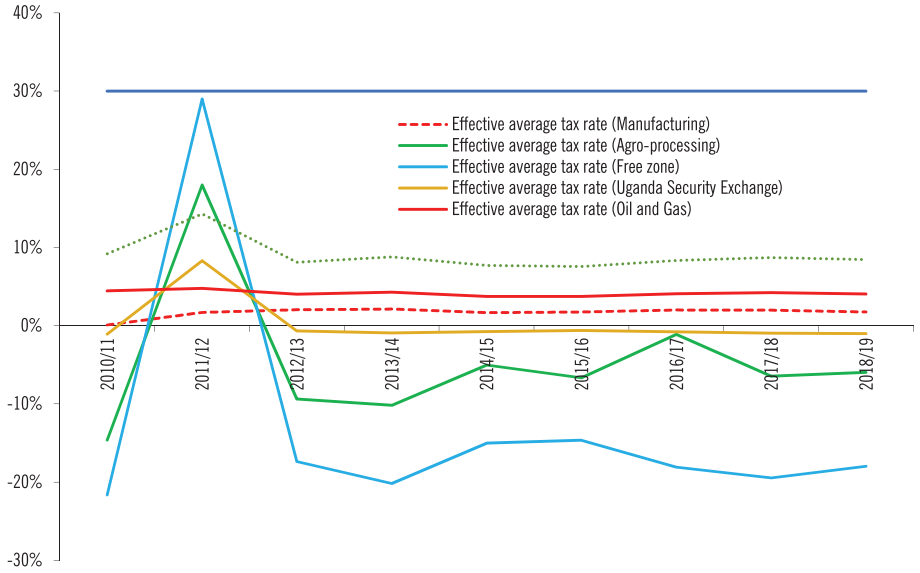
Source: Author's Calculations

decrease of inflation fairly produces low effective tax rates and makes a strong case for coordination of monetary and fiscal policy.

In order to show to which extent tax incentives in Uganda affect the effective tax burden of corporations, we present the calculated effective average tax rates with equity financing for companies from seven representative business sectors (figure 3). The highest level of effective tax rates paid is that paid by downstream oil and gas sector.[3] Beside capital allowances, companies in the downstream oil and gas sector cannot claim any tax incentives and have to pay corporate income tax according to the standard rate of 30 percent. Companies operating in the manufacturing and oil and gas sector have stable and fairly low (between 2- 4 percent), but positive average effective tax rate. Companies that are listed at the Uganda Security Exchange (USE) pay a reduced dividend withholding tax rate of 10 percent and additionally can claim 10 years of tax holiday. Some agro-processing companies and enterprises that are operating in demarcated free zones are exempt from corporate tax. In addition, they are exempted from any tax payments for 10 years and, therefore, have the lowest and negative effective average tax rates over the time.

3 Companies providing services in the Oil and Gas Sector.

Figure 3: **Average Tax Rate on Investment in Plant and Machinery for Different Sectors**



Source: Author's Calculations

Figure 3 also demonstrate the impact of high rate of inflation and nominal interest rate, experienced during the fiscal slippage of 2010/11, on the average tax rate.[4] Companies in the free zone were the most affected, followed by agro-processing and downstream oil and gas.

Altogether, the range of tax incentives leads to a high variation of effective average tax rates, which reveals the discretionary design of the capital income tax regime in Uganda. Beside capital allowances, the difference in the effective tax burden between companies with and without tax incentives amount to 28 percent.[5] Downstream oil and gas companies pay an average of 8 percent effective income taxes, while companies operating in free zones have a negative effective tax burden (-20 percent).

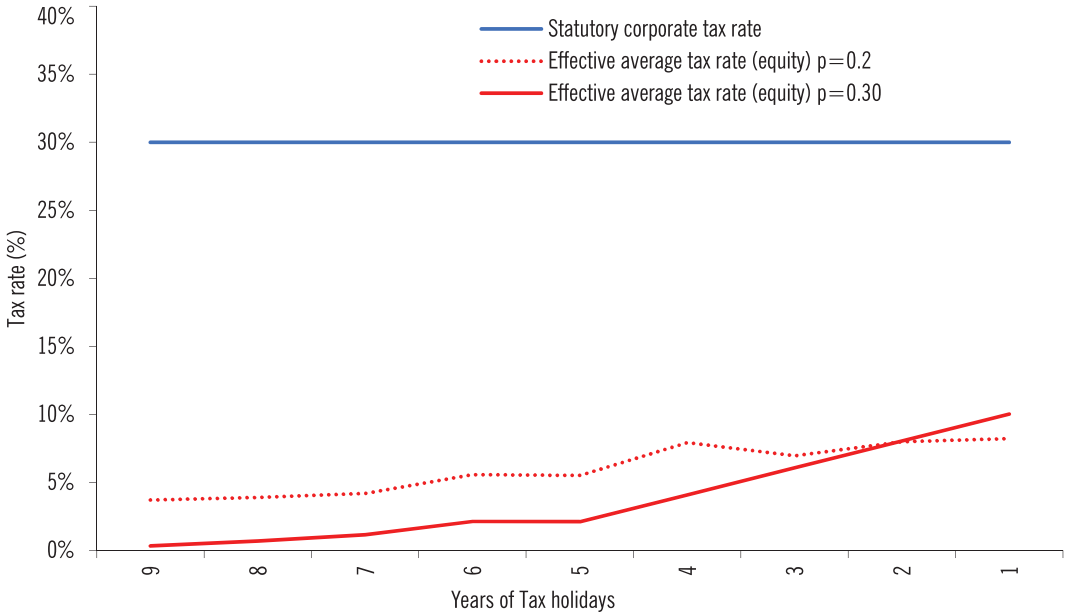
In addition, we illustrate in figure 4 that the most profitable investment projects will gain most from tax holidays, especially an extended holiday. Most benefits from tax holidays are generated in the first 4 years as economic depreciation declines, and effective average tax rates start to increase in the 5th year as the holiday expires. This supports one important criticism that footloose industry benefits most from such kind of tax exemptions (Mclure 1999). In the extreme, effective tax rates are below 5 percent for investment projects in short-term capital that fully depreciates before the end of the holiday. In this case, firms have the incentive to make all investments during the holidays and are encouraged to stop investments thereafter.

This result is consistent with Mintz (1990) who also concludes that tax holiday provisions for investment in long-lived assets are not as generous to the firm as one might initially believe. This characteristic of holidays implies on the one hand an advantage, in the sense that the benefits are provided upfront, but also has the undesirable side effect that firms have an incentive to lump all investment together at the moment the holiday starts. It also highlights the incentives for firms as the holiday progresses to try to organize new investment by registering a new company or through a joint venture, or instead to leave the country altogether as the holiday expires. As suggested by the slope of effective tax rates (figure 4) two years to expiry of the holiday period, the difference between the effective tax rate with high and low profitability at some point becomes smaller than the cost to the firm from not being able to deduct depreciation.

4 Fiscal slippage was the abnormal rise in inflation—from an average of 6.5% in FY 2010/11 to an average of 23.5% in FY 2011/2012.

5 This value ignore the outlier in 2010/11

Figure 4: **Effective Average Tax Rate for Different Tax Holiday Regimes**



Source: Author's Calculations

6. CONCLUSION

We examine effective tax rates to assess Uganda's tax policy and inform policy-makers about the likely effect of existing tax incentives. In this study we estimate and compare the effective tax burden imposed by tax incentives on domestic and foreign corporations. In this regard, we calculate both marginal and average effective tax rates using the well-known Devereux-Griffith approach and its extension – an exercise that has not been done so far for the case of Uganda.

The study find a high level of discretion in Uganda's capital income tax system. In this regard, there are differences in effective average tax rates driven by a mix of tax incentives, tax discrimination and preferential treatment. Beside capital allowances, the difference in the effective tax burden between companies with and without tax incentives amount to 28 percent. The study also finds that domestic investors pay more taxes than multinationals.

The effective tax rates for equity financing are significantly lower than the statutory corporate tax rate. However, debt-financed investments trigger a relatively lower effective tax rates, due to the interest deductibility. In both cases, high inflation and market interest rates have discouraged investment environment in Uganda highlighting the importance of macroeconomic fundamentals in terms of effective taxation in Uganda.

Downstream oil and gas companies, that cannot claim preferential corporate tax rates or tax holidays, pay an average of 8 percent effective income taxes. Meanwhile, companies operating in free zones, with a preferential tax treatment have a negative effective tax burden (-20 percent). Most benefits from tax holidays are generated in the first 4 years as economic depreciation declines, and effective average tax rates start increasing in the 5th year as the holiday expires. This supports one important criticism that footloose industry in Uganda benefits most from such kind of tax exemptions.

The study also reveals discretion in granting preferential corporate income tax rates in Uganda. As a result, some companies have been granted special capital allowances for specific assets and tax holidays. These policy actions present several challenges key among them a complexity in tax administration, obscurity in the real effects of tax burden, and sizable tax revenue loss. Furthermore, tax incentives like tax holidays produce tax avoidance strategies and substantially lower compliance across taxpayers.

This calls for reforms of the tax system with a view to disposing or reducing tax holidays and the large number of preferential corporate tax rates. The reforms can add transparency to the tax system as a whole, save resources within the administration, and most likely will improve tax revenue. Moreover, additional revenue will be conducive to improving sustainability of public finances, thereby contributing to the improvement of the macroeconomic environment. This in turn has the potential to reduce effective tax rates significantly, as our findings highlight the importance of macroeconomic variables such as the inflation rate in terms of effective taxation in Uganda.

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APPENDIX

Appendix 1: Tables

Table A1: Corporate income tax rates in different business sectors and regions

Nature of income/location	Rate of CIT (%)
Corporate Income Tax Rate+	30
Branch Tax Rate	30
Capital Gains Tax Rate	30
Withholding Taxes	
Dividends	15
Dividends paid by companies listed on the stock exchange	10
Interest	15
Interest paid on government securities	20
Royalties from Patents, Know-how*	15
Management Fees*	15
Reinsurance Premiums*	10
Professional Fees	
Residents	6
Nonresidents	15
Payments by Government Entities	6
Payments by purchasers of assets from nonresidents	10
Payments of winnings from sports or pool betting	15
Income Derived from Transmission of Messages by Equipment Located in Uganda*	5
Shipping Income	2
Branch Remittance Tax	15
Sectoral	
Income derived from agro processing	Exempt
Export of 80 percent of production	Exempt
Free zone enterprise / developers	Exempt

Source: Income Tax Act (2018)

+ For mining companies, the tax rate ranges from 25% to 45%, depending on the profitability of the mine. However, the tax rate applicable to a mining licensee is 30%.

* Applicable to non- residents

Table A2: Tax holidays

Business Sector	Exemption period (years)
Agro -processing	25
Steel and Iron sheets	10
Pharmaceutical	10
Rubber	10
Coffee	10
Free Zones	10
Industrial parks	10
Cement	10

Source: Income Tax Act 2018

Table A3: Depreciation rates

Class	Assets	Rate
1	Computers and data handling equipment	40
2	Automobiles, buses and minibuses with a seating capacity of less than 30 passengers, goods vehicles designed to carry or pull loads of less than 7 tons, and construction and earth-moving equipment	35
3	Buses with a seating capacity of 30 or more passengers, goods vehicles designed to carry or pull loads of more than 7 tons, specialized trucks, tractors, trailers and trailer-mounted containers, and plant and machinery used in farming, manufacturing or mining operations	30
4	Railroad cars, locomotives, equipment vessels, barges, tugs and similar water transportation equipment, aircraft, specialized public utility plant, equipment and machinery, office furniture, fixtures and equipment, and depreciable assets not included in another class	20

Source: Income Tax Act 2018

Table A4 – Variables of the model based on Uganda's tax data

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Nominal Interest (i)	0.20	0.25	0.25	0.22	0.22	0.24	0.23	0.20	0.18
Inflation (π)	0.07	0.24	0.06	0.07	0.03	0.03	0.05	0.05	0.04
Depreciation (δ)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Capital allowance rate (ϕ)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Present Value allowance (A)	0.23	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23
Corporate tax rate (τ)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30

Appendix 2: Formal Derivation of the Model – Effective Tax Rates

Effective Marginal Tax Rate (EMTR)

We base our calculation of effective tax rates on a traditional investment decision approach set out by King (1974) and modified by Devereux and Griffith (1999), and implemented by Nguyen-Thanh and Strupat (2012). We assume a risk neutral shareholder who own a profit maximizing corporation operating in small open economy that takes the world interest rate as given. For simplicity we take account of corporate taxes only and assume that the effects of other taxes on investment are neutral. We take a hypothetical investment in period (t) that is divested in period (t+1). Taking account of statutory corporate tax rate and relevant personal tax rates, we calculate the pre-tax and post-tax income of the investment. The difference between the two incomes determines the effective tax rate. The model incorporates three different sources of finance: Retained earnings, new equity and debt.

The first order condition for the optimal capital stock is the initial point for the derivation of the effective tax rates with retained earnings financing (Devereux 2003):[6]

$$(1+\tau)(1+\pi).F'(K_t) = (1+A).[\ \rho\ +\delta.(1+\pi)-\pi]. \quad (1)$$

τ represents the statutory corporate tax rate, π shows the annual inflation rate and K_t is the current capital stock. ρ describes the tax adjusted nominal discount rate of the shareholders:

$$\rho = \ (1+m).i\ . \quad (2)$$

i is the nominal interest rate, m and z represent the personal income tax rate on interest income and personal tax rate on capital gains, respectively. The rate of economic depreciation is represented by δ, and A is the present value of depreciation allowances, which is mainly determined by the capital allowance rate (King and Fullerton 1984):

$$A = \tau.\phi.\sum_{i=0}^{\infty}\left(\frac{1-\phi}{1-\rho}\right)^t = \frac{\tau.\phi.(1+\rho)}{\rho+\phi}. \quad (3)$$

After the investment, in the first period, the highest amount of tax depreciation, $\tau.\phi$, is realized. The amount decreases according to $(1-\phi)^t$ in subsequent periods. The present value per unit of investment A increases in the capital allowance rate ϕ. The left hand side of equation (1) shows the real net value added of $(1+\tau)(1+\pi).F'(K_t)$, which will be realized in period (t+1). We assume the disinvestment in the same period. The right hand side of equation (1) represents the capital cost of the marginal investment.

The marginal investment has to generate, at least the tax- adjusted interest rate of the shareholders, ρ , defined by the nominal market interest rate less the personal income tax on interest income. In addition, the return of the marginal investment has to compensate for the decrease in the value of the asset over the period due to depreciation δ, less any increase in the relative price of capital goods over the period. The present value of depreciation allowances A reduces the cost of capital. Rearranging equation (1) yields:

$$F'(K_t) = \frac{(1+\mathrm{A})}{(1+\tau)(1+\pi)}.[\ \rho\ +\delta.(1+\pi)-\pi]. \quad (4)$$

The value added of a marginal investment $F'(K_t)$ has to equate the cost of capital on the right hand side.

6 The derivation of this equation is presented in Devereux (2003) and Devereux (1999).

Therefore, all investments earning a return greater than this should be accepted; all those earning a rate of return less than this should be rejected. This required rate of return is defined in the literature as $F'(K_t) = (\rho + \delta)$ (Devereux 2003). The pre-tax value of earnings ρ has to exceed the rate of depreciation δ and the capital cost of a marginal investment $F'(K_t)$ Substituting equation (4) and rearranging gives the minimum acceptable pre-tax value of earnings $\rho *$ (King and Fullerton 1984, Schreiber et. al 2002):

$$\rho * = \frac{(1+A)}{(1+\tau)(1+\pi)} . [\ \rho + \delta . (1+\pi) - \pi] - \delta . \tag{5}$$

An increase in the present value of future tax savings due to a rise of the capital allowance rate ϕ, results in a fall of capital costs. Conversely, an increase in the statutory corporate tax rate intuitively raises the cost of capital. The minimum acceptable pre-tax value of earnings is also affected by the personal income tax rates on interest income and capital gains. The real discount rate of the shareholders ρ^{real} determines the post- tax value of earnings from a marginal investment:

$$\rho^{real} = \frac{(1-m).i}{1+\pi} . \tag{6}$$

The difference between pre-tax and post-tax value of a marginal investment yields the effective marginal tax rate (EMTR):

$$EMTR = \frac{\rho * - \rho^{real}}{\rho *} . \tag{7}$$

In a perfect capital market without a tax system, both rates of return would be equal, $\rho * = \rho^{real}$. An increase of the statutory corporate tax rate or a decrease of the capital allowance rate result in a rise of the marginal pre-tax value, which in the end raises the effective marginal tax rate. The investment will be realized if the rate of return exceeds or at least equalizes the cost of capital, otherwise an additional investment in the capital stock will not be made. In general, the higher the effective marginal tax rate, the smaller the incentive to undertake a marginal investment in the capital stock.

Effective Average Tax Rate (EATR)

By calculating effective marginal tax rates (EMTR), the capital stock is assumed to be continuously divisible. The corporation will invest until the point it becomes unprofitable. If we relax this assumption, the corporation has to choose between different kinds of investment possibilities. For example, a firm can choose between two production locations with different tax regimes. The effective average tax rates of both locations indicate the differences in terms of capital income taxation. Assuming a profit maximizing behavior, the corporation will select the location with the highest achievable rate of return. Once the investment is made, the real gross present value of the capital stock in period t is (Schreiber et.al. 2002):

$$R_t^* = F(K_t) = -1 + \frac{1}{1+i} . [(\rho + \delta)(1+\pi) + (1-\delta)(1+\pi)]. \tag{8}$$

As we have indicated above, retained earnings, which results in a fall of dividend distribution, finance the investment. Therefore, the initial costs in period t are -1. The second term on the right hand side represents the present cash flow in period (t+1). The discounted value is determined by the rate of return ρ , the required revenue to finance the economic depreciation δ and the revenue from selling the investment less the economic depreciation $(1-\delta)$. The higher the rate of return ρ, the higher the pre-tax present value of the investment. The investment will be located according to the highest gross present value assuming there is no tax regime.

Introducing taxes, the real net present value is (Devereux 2003):

$$R_t = F(K_t) = -1.\gamma + \frac{\gamma}{1+\rho}.[(\rho + \delta)(1+\pi)(1-\tau) + (1+\pi)(1-\delta)(1-A)]. \quad (9)$$

The parameter represents the tax discrimination variable:

$$\gamma = \frac{(1-d)}{(1-c).(1-z)} \quad (10)$$

d is the personal tax rate on dividend income, c shows the rate of tax credit available in an imputation system on dividends paid, and z is the personal tax rate on capital gains. The discrimination variable measures the impact of taxes on capital income for two types of finance: new equity and retained earnings. An investment of 1 Ug. Shs. financed by new equity comes at a cost of 1 Ug. Shs. to the shareholders. However, if retained earnings finance the investment, cash dividends paid by the firm are reduced by 1 Ug. Shs. as well, but then the net cost to the shareholder depends on the personal tax which would have been paid had the cash dividend not been reduced.

If $\gamma < 1$, then the net cost is lower with retained earnings and the distribution of dividends is discriminated, while equity finance becomes the preferred mode of finance if $\gamma < 1$. Under the assumption of a classical tax system with if $c = 0$, both sources of finance are treated equally, If $m^d = z$ which results in $\gamma = 1$. The tax discrimination variable and the present value of future tax savings A weighs the initial cost (-1) in equation (9). In accordance to equation (7), the second term on the right hand side is the present cash flow reduced to period (t+1) including the statutory corporation tax rate and weighted by the tax discrimination variable . In addition, the revenue from selling the investment is reduced by unrealized tax savings $(1-\delta)$ in period (t+1). In general, a rise in the statutory corporation tax rate leads to a fall in the real net present value. The corporation will choose the production location with the highest net present value of the investment. The difference between gross and net income of the investment in relation to the gross income determines the effective average tax rate (Devereux and Griffith 1999):

$$EATR = \frac{R_t^* - R_t}{\rho/(1+r)} \quad (11)$$

An increase in the statutory corporation tax rate or a decrease of the capital allowance rate results in a fall of the real net income R_t and hence an increase in the effective average tax rate.

To incorporate the effect of tax holidays in the calculation of effective average tax rates we have to relax the assumption of a one period perturbation of the capital stock. According to Klemm (2008) we assume an investment that is never sold and the capital stock only changes due to depreciation. In order to adapt the EATR to an infinite horizon, we have to consider the profits of all future periods in equation (11). Therefore, the denominator needs to be changed, assuming that the rate of return p remains constant and the capital stock only decline yearly by the true economic depreciation rate (Klemm 2008):

$$EATR_{inf} = \frac{R_t^* - R_t}{\rho/(r+\delta)}. \quad (12)$$

The real gross present value of the capital stock also has to be adapted in the same way:

$$R_{inf1}^* = F(K_t) = -1 + \frac{1}{r+\delta}.[(\rho + \delta)(1+\pi) + (1-\delta)(1+\pi)]. \quad (13)$$

In a second step we adjust the real net present value by leavening out the reduction of revenue from selling the

investment due to unrealized tax savings $(1-\delta)$ in period (t+1):

$$R_{inf1} = F(K_t) = -1.\gamma(1-\mathrm{A}) + \frac{1}{\rho+\delta-\pi.(1-\delta)}.[(\rho+\delta)(1+\pi)(1+\tau)]. \quad (14)$$

Consequently, the second term on the right hand side becomes the infinite cash flow from the investment. Accordingly, the denominator needs to be replaced by the gross economic depreciation rate. In order to include tax holidays, i.e. the period of Y years during which tax rates are set to zero, equation (14) has to be modified by weighing the tax rate with the present value of tax savings due to tax holidays (Klemm 2008)

$$R_{inf1} = F(K_t) = -1.\gamma(1-\mathrm{A}) + \frac{1}{\rho+\delta-\pi.(1-\delta)}.(\rho+\delta)(1+\pi)[1+\tau.(\frac{(1-\delta)(1+\pi)}{1+\rho})^{Y}] \quad (15)$$

The effective marginal tax rate (EMTR), financed by equity, is calculated by using the equations (5), (6) and (7) while the equations (8), (9) and (11) are used for the calculation of the effective average tax rate (EATR). For the calculations of the effective average tax rates with tax holidays we used the equations (12), (13) and (15).

To incorporate new equity and debt financing in the model, the additional cost of these sources of finance must be defined. In the case of new equity finance, the company increases the amount of shareholders' equity by $(1-\phi\tau)$. A physical investment of 1 is financed while an immediate tax allowance worth $\phi\tau$ can be claimed in period t. In period (t+1), the firm will repurchase the shares at the same price. To finance the investment with debt, the company loans $(1-\phi\tau)$ in period t and amortizes it in period (t+1). Thus, interest payments have to be considered. Summing up the additional cost of new equity financing yields:

$$F^{NE}t = \frac{-\rho^{real}*(1-\gamma)*(1-\phi\tau)}{1+\rho} \quad (16)$$

The investment of 1 is reduced by the immediate tax allowance and is multiplied with the tax adjusted discounted post- tax value of earnings of the investment which the new shareholders will earn less the discrimination of new equity financing due to personal income taxation. The additional cost of debt financing is:

$$F^{D}t = \frac{(\rho^{real}-\rho^{real}*(1-\tau))}{1+\rho} * (1-\phi\tau) * \gamma \quad (17)$$

Like new equity financing, the investment of 1 is reduced by the immediate tax allowance. The discounted post-tax value of earnings equals the real interests which the firm has to pay to the financier less interest subsidy. The additional costs of these sources of finance will be implemented in equation (5) and equation (9) to calculate the effective tax rates in the case of new equity and debt financing. Therefore the cost of capital of a marginal investment is defined as:

$$F^{**} = \frac{(1-A)}{(1+\tau)} * (\rho^{real}+\delta) - \frac{F^{x}t*(1+\rho^{real})}{\gamma*(1-\tau)} \quad (18)$$

The additional costs are added to the real net present value of a long term investment:

$$R_t = -1.\gamma(1-\mathrm{A}) + \frac{1}{1+\rho}.[(\rho+\delta)(1+\pi^{k})(1-\tau) + (1+\pi^{k})(1-\delta)(1-A)] + F^{x}t \quad (19)$$

The modified cost of capital and real net present value will be used in the calculation of the effective tax rates.

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51, Pool Road, Makerere University Campus,
P. O. Box 7841 Kampala, Uganda
Tel: +256414541023/4 Fax: +256414541022
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