CORPORATE INCOME TAX COMPETITION IN THE CARIBBEAN

KOFFIE BEN NASSAR

ABSTRACT

Motivated by the concern that corporate income tax (CIT) competition may have eroded the tax base, this paper calculates average effective tax rates to measure the impact of CIT competition on the tax base for 15 countries in the Caribbean. The results not only confirm erosion of the tax base, but also show that CIT holidays must be removed for recent tax policy initiatives (such as accelerated depreciation, loss carry forward provisions, and tax harmonization) to be effective. These findings suggest that the authorities should either avoid granting CIT holidays or rely more on other taxes (including consumption taxes such as the value-added tax) in order to broaden the tax base.

Keywords: Tax incentives, tax holidays, average effective tax rates, marginal effective tax rates, investment, Caribbean

JEL Classification Numbers: E22, E62, H25

1.0 Introduction

Corporate income tax (CIT) competition—commonly referred to as the lowering of a country's tax burden relative to foreign jurisdictions in order to attract foreign direct investment (FDI)—is a common phenomenon in developed as well as developing countries. As elsewhere in the world, CIT competition has intensified in the Caribbean during the last two decades. In particular, statutory CIT rates have fallen by about 30 percent on average since the mid-1980s. The main wave of reforms occurred in the mid-1990s, but the pace has continued in recent years. These reforms seem consistent with the prediction of economic theory. It has been argued that competition to attract FDI will lead to a "race to the bottom"—a term used to characterize the demise of capital income taxation as a source of government revenue. This paper calculates average effective tax rates (AETRs) for 15 countries in the Caribbean over the last 20 years to assess whether CIT competition has eroded the tax base.

The traditional method of measuring the impact of CIT on firms' investment decisions in small open economies is through the cost of capital. At the margin, the cost of capital should equal the required post–tax real rate of return on an investment project. Thus, a firm will invest up to the point at which the marginal product of capital is at least equal to the cost of capital—so that, at the margin, the project just breaks even. Typically, firms are assumed to be mobile and able to raise capital on the world market. In this framework, taxes push up the cost of capital and, therefore, act as disincentive to invest.

Two measures widely used to analyze the impact of taxes on investment decisions are marginal effective tax rates (METRs) and AETRs. Although the METR is widely reported in the literature, it is only appropriate for analyzing whether the threshold for profitability has been shifted by the tax system—i.e., it relates to projects that just break even. The AETR, developed by Devereux and Griffith (2003), is a broader and more relevant measure for assessing the impact of CIT reforms on revenue because it is defined for different levels of expected economic profit, allowing an impact analysis varying with the profitability of the

investment. Both measures have been used in empirical studies that assess CIT reforms in the European Union. For the Caribbean countries, Nallari (1998) and Sosa (2006) calculate METRs, but no previous work on the region has used the AETR approach.

The objective of this paper is to answer the following questions: (i) what is the impact of CIT competition on the ability to tax corporate income in the region?; (ii) what impact will recent tax policy proposals (i.e., accelerated depreciation, loss carry forward provisions, and tax harmonization) have on tax revenue?; and (iii) how can the tax base be broadened? The paper finds evidence suggesting that the use of CIT holidays has eroded the tax base and that they must be removed for recent tax policy initiatives to be effective. These findings suggest that the authorities should either avoid granting CIT holidays or rely more on consumption taxes in order to broaden the tax base.

The paper is organized as follows: Section 2 provides the background and motivation for the study. Section 3 summarizes the literature on tax competition, and Section 4 describes the evolution of CIT rates and the corporate tax base in the Caribbean. Section V analyzes the evolution of average effective tax rates and sheds light on recent tax policy proposals. Section VI concludes.

2.0 Background and Motivation

Tax concessions are a common feature of tax regimes in the Caribbean. Since the early 1980s, governments in the Caribbean have faced the challenge of promoting economic diversification from agriculture (bananas and sugar) to tourism. As a result, many of the countries ran fiscal deficits to provide the supporting infrastructure, contributing to a large debt overhang. Debt-to-GDP ratios in the region currently rank among the highest in the world. However, the use of tax incentives (including the widespread use of tax holidays) continue to limit the ability

of governments to raise revenue.[1] For example, the corporate tax structure of countries in the region is characterized by base erosion resulting from many special allowances and high standard deductions (allowed for different amounts of investment) and by the failure to tax large enterprises which would have been profitable without tax incentives. In addition, there is anecdotal evidence suggesting that tax holidays doled out to large domestic and foreign investors led to pressures from small investors for similar treatment. As a result, the corporate tax system has become complex, and its ability to raise revenue in an equitable and a less distorting manner impaired, which further perpetuate tax avoidance and tax evasion.

Empirical evidence has not been supportive of significant effects of tax policy on investment. Policymakers maintain that tax holidays play an important role in attracting foreign direct investment, while the literature (e.g., Chai and Goyal) questions their effectiveness. Nonetheless, the greater awareness of the potential for abuse of such incentives, coupled with the urgent need to raise revenue to finance the public debt as well as current infrastructure needs, have prompted calls for a thorough assessment of corporate income tax policies in the region.

3.0 Related Literature

The public finance literature is replete with arguments for and against tax competition. According to one school of thought dating back to the classic analysis of Tiebout (1956), tax competition among jurisdictions leads to an efficient provision of public goods and different equilibrium

[1] Available data show that average corporate tax revenues as a share of GDP for the region remain stable since 1990. See for example Chai and Goyal (2005, 2006) for an overview of tax concessions in the Eastern Caribbean Currency Union (ECCU). A closer look at the data in the ECCU, along with other indicators, suggests that only public enterprises pay corporate income taxes. Hence, buoyancy is low.

tax rates.[2] The idea is that different governments offer different bundles of public goods, including infrastructure, labor market institutions and environmental standards. In this framework, tax competition forces governments to impose efficient tax burdens on residents for the provision of public goods. Consequently, these models do not foresee international competitive pressures leading to tax convergence or a race to the bottom.

A second school of thought that dates back to Oates (1972) touts a contrary view. According to this school, tax competition for mobile capital could lead governments to adopt inefficiently low corporate income taxes and, as a result, provide sub-optimal level of public goods.[3] Working within this framework, Gordon (1983) and Mintz and Tulkens (1986) show that corporate income taxes levied by one country can impose spillover costs on other countries. In the same vein, Zodrow and Mieszkowski (1986) suggest that high corporate income taxes in one jurisdiction could cause the flight of mobile capital to low-tax jurisdictions. Diamond and Mirrlees (1971) and Razin and Sadka (1991), on their part, demonstrate that taxes on corporate income are no longer a viable option for small open economies.[4] These models suggest that international competitive pressures could drive corporate income taxes downward, hence a race to the bottom.

Yet others argue that international competition affects investors differently, and that this creates the opportunity for governments to design tax systems that tax relatively immobile capital more than mobile ones. Keen (2001), for example, shows that, under certain conditions, the abolition of preferential tax regimes can be welfare-*reducing*. Devereux et

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[2] See for example Kehoe (1989), Edwards and Keen (1996), Wooders, Zissmos, and Dhillon (2001), and Rogowski (2003).

[3] See for example Diamond and Mirrlees (1971), Zodrow and Mieszkowski (1986) Wilson (1999), and Brueckner (2003).

[4] See for example Bucovetsky (1991), Wilson (1999), Wellisch (2000), and Haufler (2004) for empirical evidence that supports the fact that small countries have much more elastic tax bases than larger ones.

al. (2002a; 2003; and 2004b), using the AETR methodology, argue that recent corporate tax reforms in Europe that broadened the tax base while lowering statutory tax rates enabled governments to compete more effectively for mobile investment. This suggests that there should be no pressure for a race to the bottom, but also that as the international competitive pressures on corporate income taxation increase, a convergence in CIT rates could be expected.[5]

The Caribbean region offers a "natural experiment" for testing the arguments just outlined. First, the 15 countries are mainly small islands that promote tourism as a development strategy. Second, with few exceptions, they are all endowed with sand, sea, and sun—i.e., they are close substitutes. Third, they all vie to lure brand products in the hotel industries in North America and Europe—thus, capital is relatively mobile. It is, therefore, highly likely that the empirical findings in the Caribbean would be stronger than elsewhere.

The literature on CIT competition in the Caribbean is relatively new but growing. Bain (1995) analyzes the revenue implications of tax concessions in the Eastern Caribbean Currency Union (ECCU),[6] concluding that considerable revenue is foregone. Chai and Goyal (2005, 2006) estimate forgone revenues at over 9 percent of GDP per annum in the ECCU. Alcock (2003) finds that the impact of tax harmonization in CARICOM states[7] is mixed. Nallari (1998) and Sosa (2006) adopt the METR approach to the case of Belize and the ECCU, respectively. Sosa shows that with tax holidays the tax burden on investment either disappears or becomes negative. The World Bank (2005) argues that CIT

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[5] See for example Stewart and Webb (2006) for a survey of the literature.

[6] The ECCU is a grouping of six countries (Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines) and two territories of the United Kingdom (Anguilla and Montserrat).

[7] CARICOM states include Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Granada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago.

holidays, as implemented in the Organization of Eastern Caribbean States, are not cost effective, and proposes that these be replaced with investment cost-recovery incentives (such as accelerated depreciation, loss carry forward provisions, and tax harmonization).[8]

4.0 Developments In Statutory Corporate Income Tax Rates and Bases

4.1 Corporate Income Tax Rates

The data show that CIT competition is indeed a worldwide phenomenon. The sources of the data are Bain (1995), PriceWater House and Coopers (various years), and *Worldwide Corporate Tax Guide* by Ernst and Young International (various years). Figure 1 shows the CIT rates for each country, along with the average for the region, as well as the average for the OECD and Asian countries. Between 1985 and 2005, statutory CIT rates fell in all countries in the Caribbean, except for The Bahamas, which kept its rate unchanged at zero. In 2005, CITs in the Caribbean ranged from a minimum of zero percent in The Bahamas to a maximum of 45 percent in Guyana. The average CIT rate for the region was only marginally higher than the average for the OECD and Asian countries, indicating that there was indeed a downward pressure on CIT rates worldwide.

In the Caribbean, larger countries are much more aggressive at cutting CIT rates than smaller ones. The time series of the average and the weighted average CIT (weighted by GDP, measured in U.S. dollars) for all countries in the Caribbean show a steady decline in average CIT rates during the period 1985–2005 (Figure 2). The weighted average follows a similar pattern, though with a slightly steeper fall during the late 1980s and

[8] Appendix 1 provides comparative merits of the proposed measures. See Zee et al. 2002 for a comprehensive discussion of alternative forms of tax incentives.

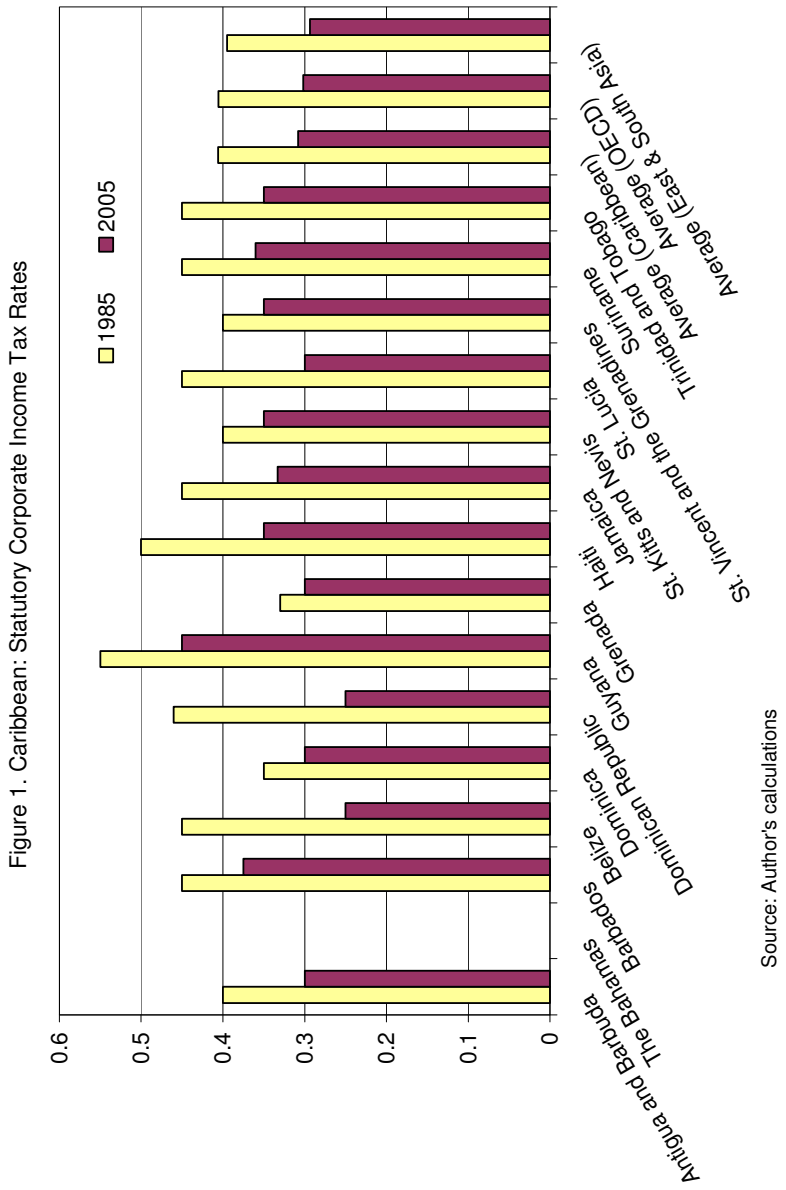


Figure 1. Caribbean: Statutory Corporate Income Tax Rates

Source: Author's calculations

early 1990s, indicating that the larger countries cut their tax rates by more than the smaller ones. In addition, the dispersion of CIT, measured by the standard deviation, has narrowed since 1994, implying that CIT rates have begun to converge.

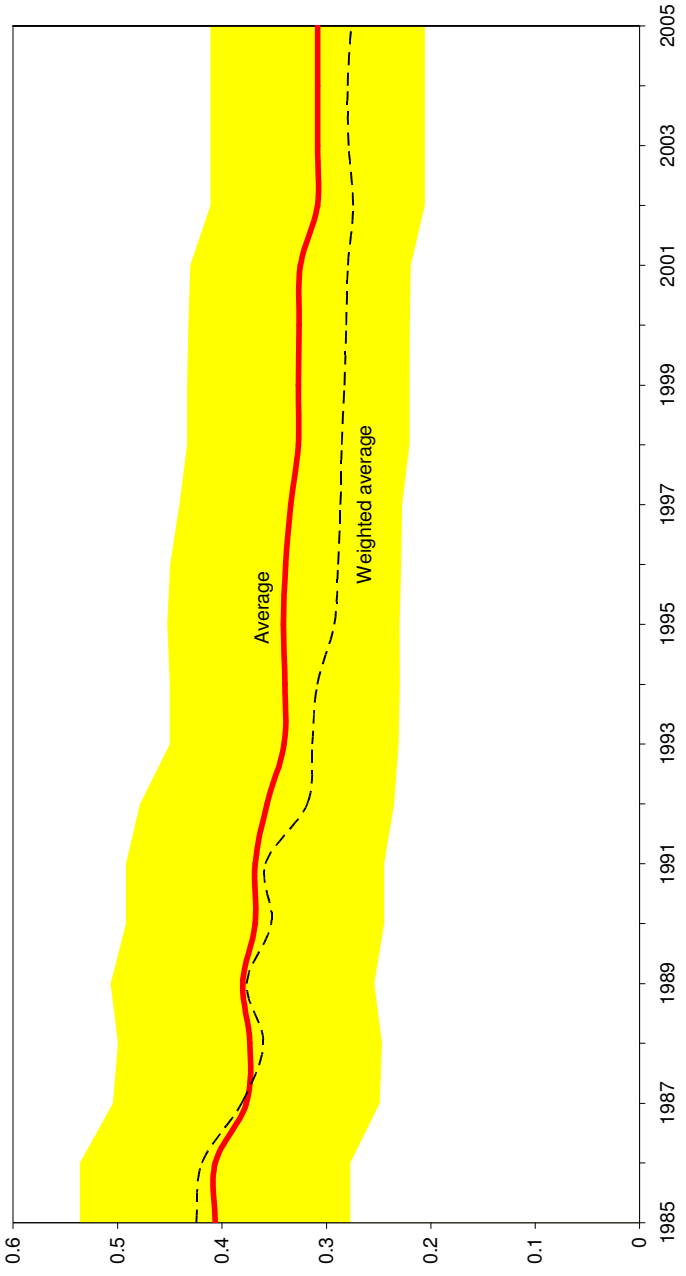


Figure 2. Average Statutory Corporate Tax Rates

Source Author's calculations.
Note: The shaded band around the average rate represents ±1 standard deviation.

4.2 The Tax Base

The definition of the corporate tax base in the Caribbean is complex. In line with the empirical literature, this paper focuses on depreciation allowances for capital expenditure in analyzing the tax base. The allowed depreciation rate depends on the type of asset; for example it varies between 4 and 10 percent for buildings. In addition, in some cases there are initial allowances ranging from 10 percent to 40 percent, which are not deducted from the initial investment (Table 1). Figure 3 shows the present discounted values (PDV) of such allowances for investment in buildings, expressed as a percentage of the initial cost of the asset. The PDV would be zero if there were no allowances at all, but would be 100 percent if the total cost of an asset could be deducted from taxable profits in the year in which it is incurred.

Surprisingly, most countries have left their tax base unchanged for over 20 years. The PDV of allowances for each country in 1985 and 2005 is based on a single nominal discount rate for all countries and for all years (13½ percent, reflecting 3½ percent inflation, and 10 percent real discount rate). A fixed discount rate for all countries allows one to abstract from changes in the inflation rate and the real interest rate and to focus on changes in the rates of allowance set by governments. While eight countries have left their tax base unchanged, seven have increased their depreciation allowances for investment in buildings—that is, they have narrowed their tax base—notably, Barbados and St. Lucia. This finding is in line with Keen and Simone (2004), who find that industrialized countries have reduced their CIT rates and broadened their tax base, while developing countries reduced their CIT rate but narrowed or left their tax base unchanged.[9]

[9] Keen and Simone (2004), pp. 327-328.

Table 1. Caribbean: Depreciation Allowances for Buildings
(In percent)

	Method of Depreciation	Economic Depreciation Rate	Depreciation Rate for Tax Purposes	Initial Allowance
Antigua and Barbuda	Declining-balance	4	4	20
The Bahamas	none	none	none	none
Barbados	Straightline	4	4	40
Belize	Straightline	4	5	none
Dominica	Declining-balance	4	4	20
Dominican Republic	Declining-balance	4	5	none
Grenada	Straightline	4	4	none
Guyana	Straightline	4	5	none
Haiti	Straightline	4	5	none
Jamaica	Straightline	4	5	none
St. Kitts and Nevis	Declining-balance	4	4	20
St. Lucia	Declining-balance	4	5	20
St. Vincent and the Grenadines	Declining-balance	4	4	20
Suriname	Straightline	4	4	none
Trinidad and Tobago	Declining-balance	4	10	10

Sources: Bain (1995); and *Worldwide Corporate Tax Guide* (various years).

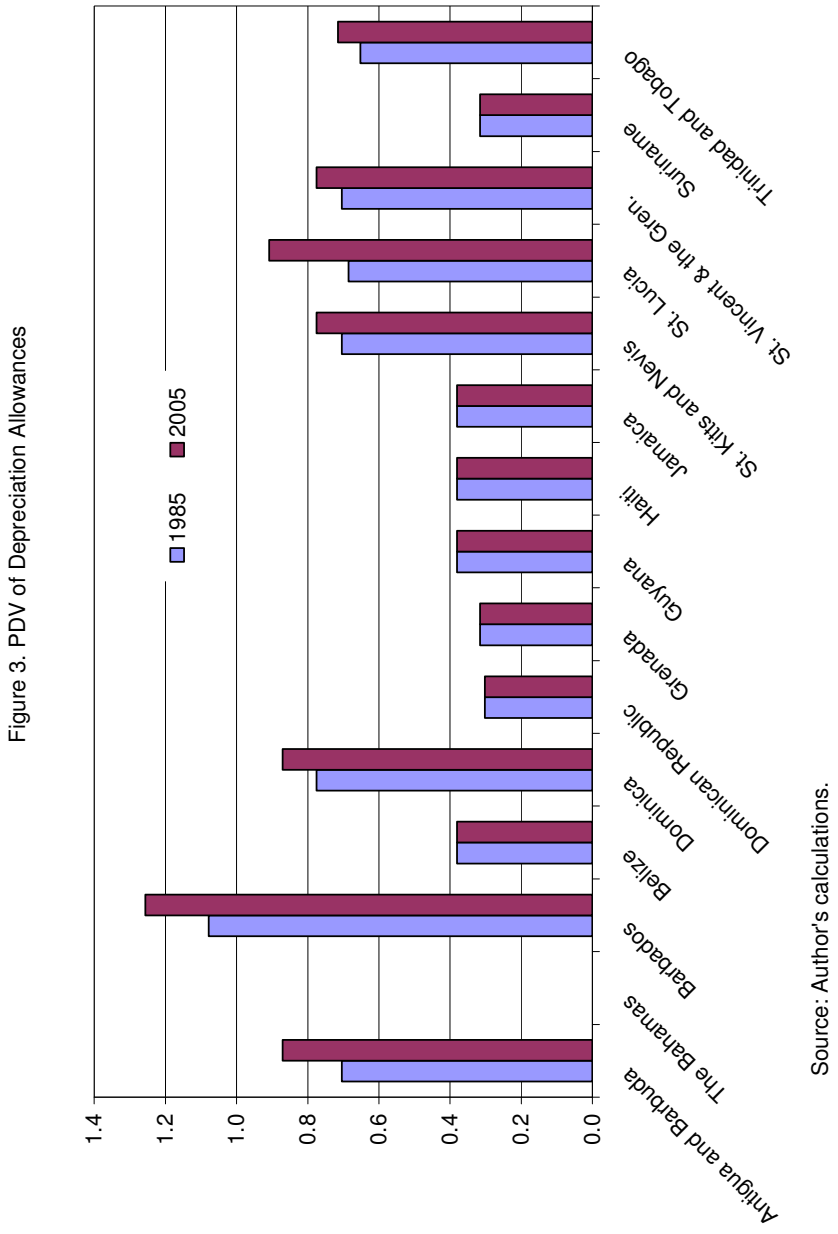


Figure 3. PDV of Depreciation Allowances

Source: Author's calculations.

There is no evidence that inflation expectations have played a role in determining the tax base. To examine whether governments have adjusted their depreciation allowances in response to observed or expected changes in inflation (which has generally fallen over the period analyzed),[10] we present the time series of the mean assuming constant and actual inflation (Figure 4). Surprisingly, the spread between the two PDVs has remained relatively stable, with both measures rising slightly over time. Lower inflation accounts for the tighter spread observed during the periods 1986–87 and 1997–2002.

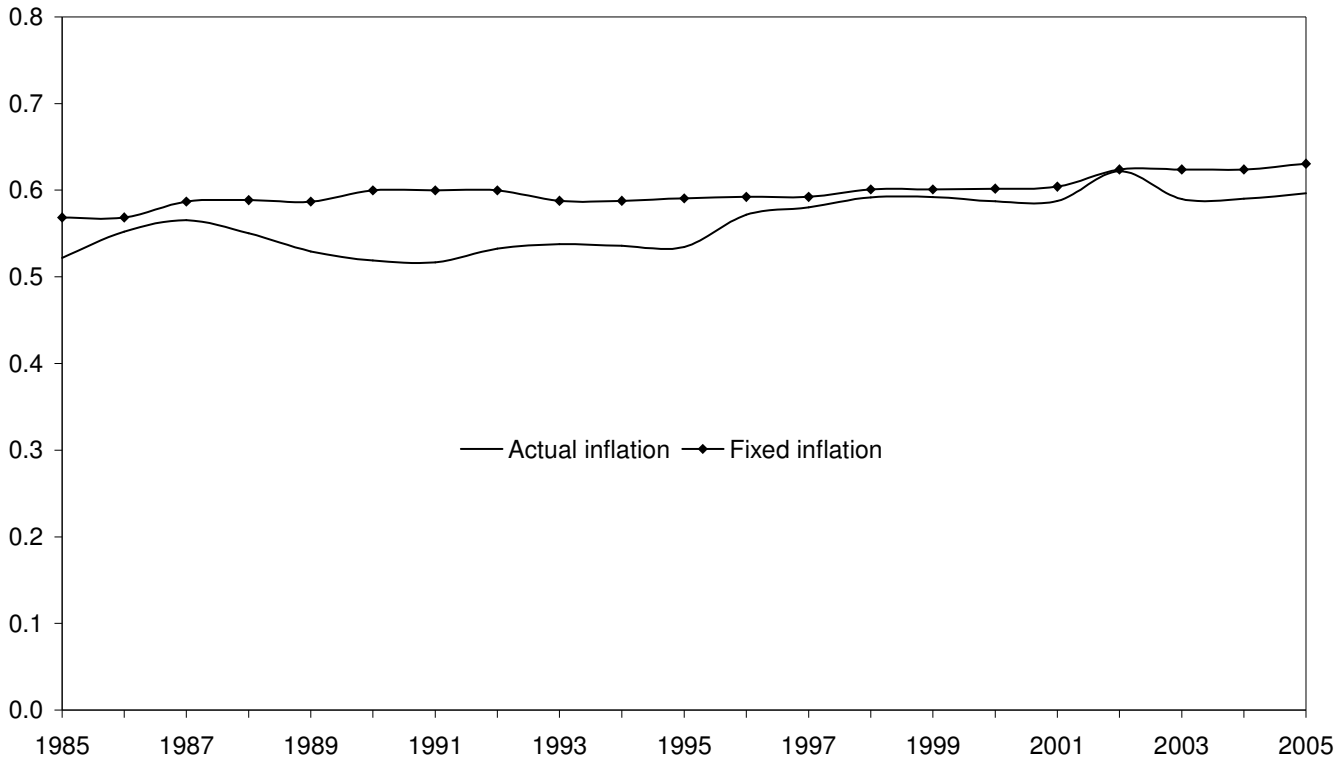
5.0 Evolution of Effective Tax Rates

5.1 Marginal Effective Tax Rates

The METRs show that tax reforms have contributed to an investor-friendly environment. The base case for the effective tax rates is assumed to be an investment in buildings, financed by new equity. Figures 5 and 7 show the development of METRs over time. Holding annual inflation constant at 3.5 percent and assuming no personal taxes, Figure 5 shows that the METR has declined for all countries, except The Bahamas, suggesting that the threshold for investment projects to be profitable has been shifted downward. Furthermore, the effective tax rates remain lower than the CIT rates (Table 2), indicating that the tax base favours investment.

[10] Note that allowances are based on the nominal cost of an asset, as a result, they are worth less during periods of high inflation.

Figure 4. PDV of Depreciation Allowances



Source: Author's calculations.

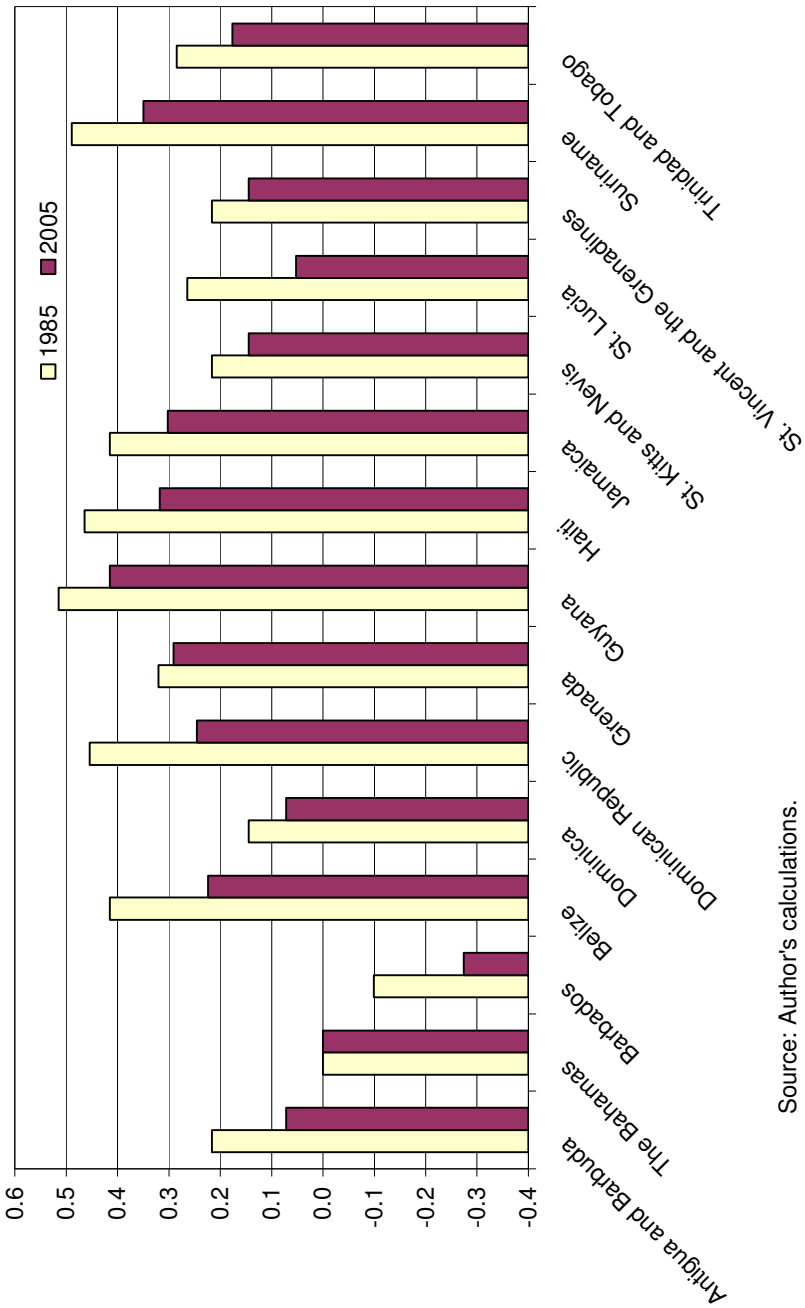


Figure 5. Caribbean: Marginal Effective Tax Rates

Source: Author's calculations.

Table 2. Caribbean: Comparison of CITs, METRs, and AETRs
(Excluding personal and capital gains taxes)

	CIT		METRs		AETRs	
	1985	2005	1985	2005	1985	2005
Antigua and Barbuda	0.40	0.30	0.19	0.04	0.31	0.21
The Bahamas	0.00	0.00	0.00	0.00	0.00	0.00
Barbados	0.45	0.38	-0.10	-0.27	0.28	0.21
Belize	0.45	0.25	0.42	0.22	0.43	0.24
Dominica	0.35	0.30	0.12	0.04	0.26	0.21
Dominican Republic	0.46	0.25	0.45	0.25	0.46	0.25
Grenada	0.33	0.30	0.32	0.29	0.33	0.30
Guyana	0.55	0.45	0.51	0.42	0.53	0.43
Haiti	0.50	0.35	0.46	0.32	0.48	0.33
Jamaica	0.45	0.33	0.42	0.30	0.45	0.33
St. Kitts and Nevis	0.40	0.35	0.22	0.14	0.32	0.27
St. Lucia	0.45	0.30	0.26	0.05	0.37	0.21
St. Vincent and the Grenadines	0.40	0.35	0.19	0.12	0.31	0.26
Suriname	0.45	0.36	0.49	0.35	0.49	0.35
Trinidad and Tobago	0.45	0.35	0.26	0.15	0.36	0.27

Sources: Country authorities; and author's calculations.

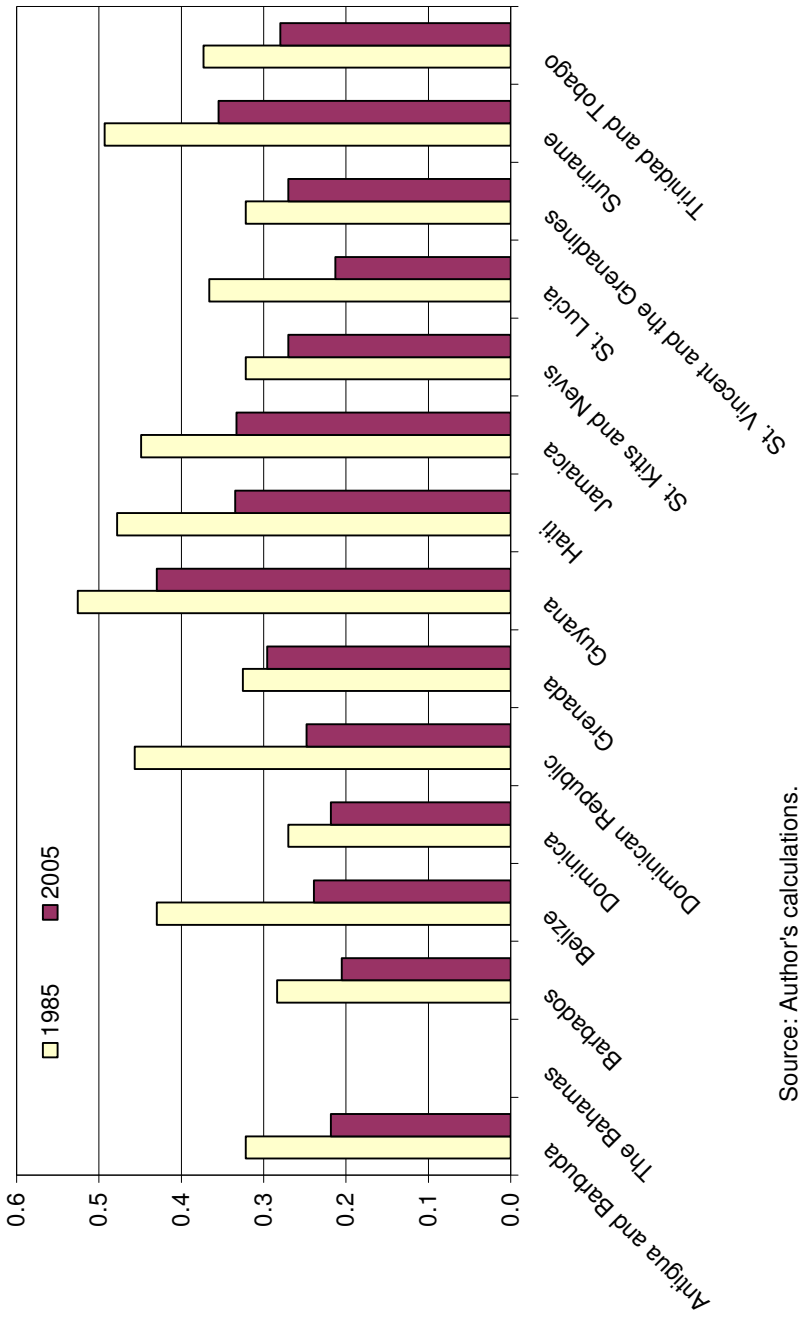


Figure 6. Average Effective Tax Rates

Source: Author's calculations.

5.2 Average Effective Tax Rates

The emerging trend is that CIT reforms favour investments that break even more than profitable ones (Figures 6 and 7). In each case, following Devereux et al. (2002a and 2004b), the investment project is assumed to have an expected real rate of economic profit of 30 percent (i.e., *p-phat*=0.30).[11] Figure 6 shows that, holding inflation constant, AETRs have declined in all countries, reflecting the pattern observed in the statutory tax rates. The evolution of both the AETRs and METRs in the Caribbean indicates that the latter have declined by more than the former (Figure 7), suggesting that the tax burden on less profitable investments has fallen by more than those on profitable investments.

Comparisons with AETRs calculated for European countries suggest that the existing corporate tax systems in the Caribbean are equally as generous as those in most of continental Europe. Similar studies in Europe report AETRs ranging from 11.7 percent in Ireland to 42.1 percent in France.[12] Results of recent studies by Devereux et al. (2002a, 2004a and 2004b), Devereux and Lammersen (2002b), and Eggert and Haufler (2006) generally confirm this impression. Note that, in addition, countries in the Caribbean resort to widespread use of CIT holidays and other incentives, including import duty exemptions, implying that AETRs are much lower than in Europe.

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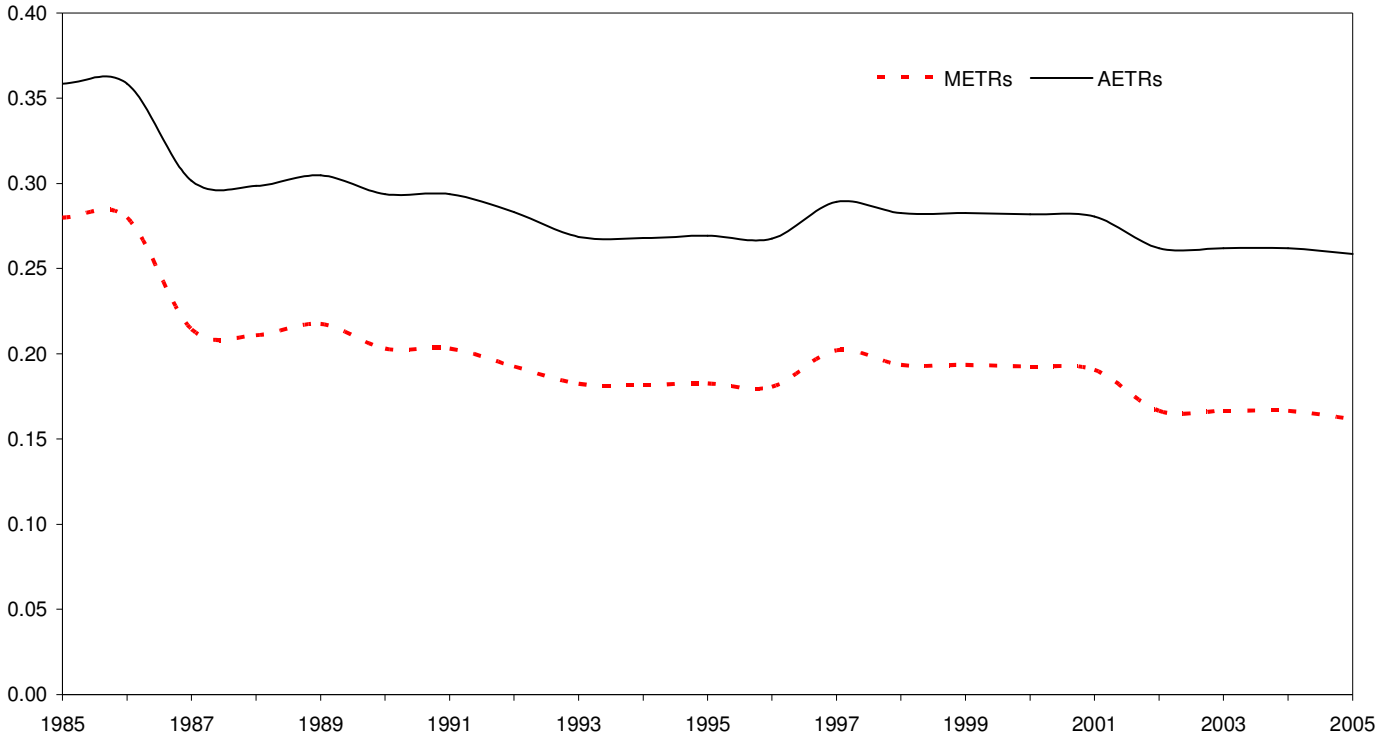
[11] The same assumption is made in the literature for countries in Europe.

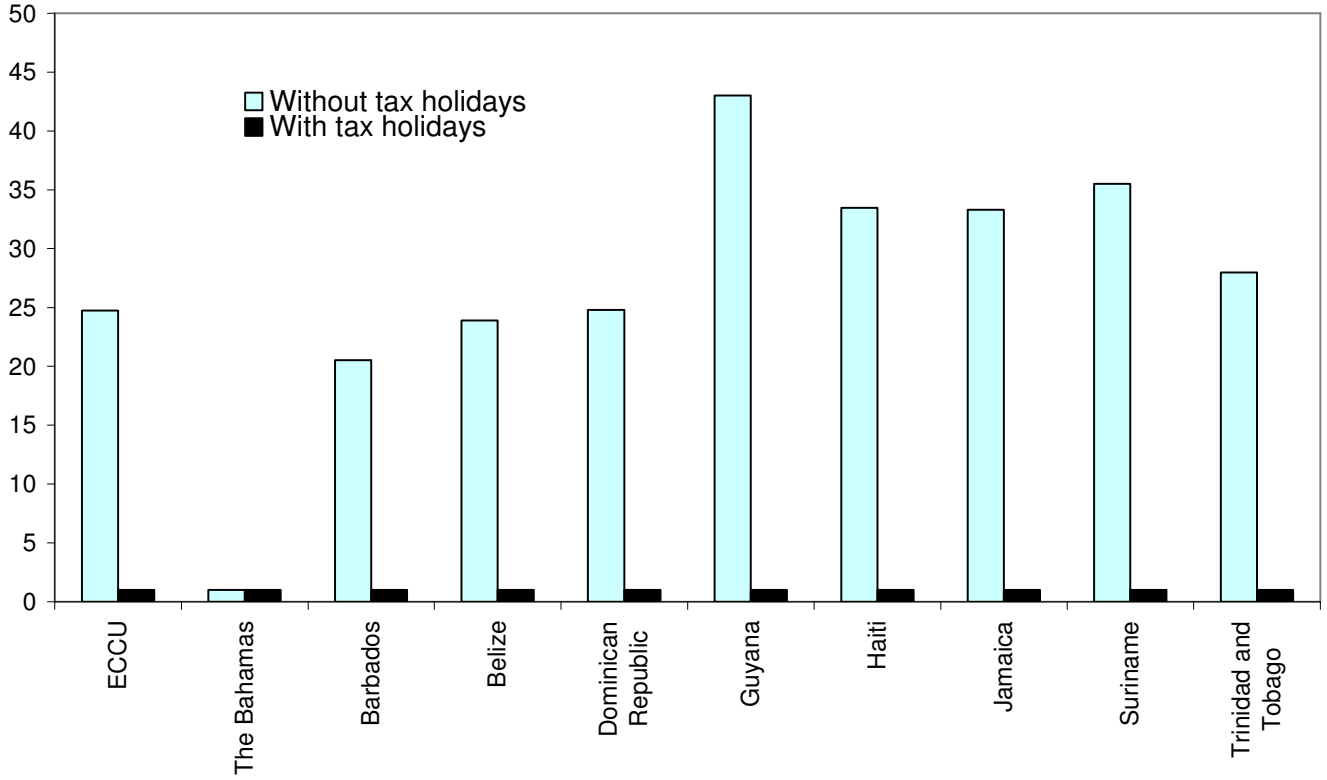
[12] See Devereux and Lammersen (2002b).

Figure 7. Effective Tax Rates for Buildings



Source: Author's calculations.

Figure 8. Caribbean: Average Effective Tax Rate on Investment, 2005
(In percent)



Sources: Country authorities; and author's calculations.

5.3 Policy Implications of CIT Holidays

Results show that tax holidays have eroded the tax base. As mentioned earlier, governments in the Caribbean have also resorted to widespread use of CIT holidays, which have been granted, in many cases, for periods exceeding 20 years. To assess the impact of the tax holidays, we set the statutory CIT rate (τ) equal to zero.[13] This implies that the net present value of allowances is $A = 0$ (Appendix II, equation 9). Using equation 10 can be shown that the minimum acceptable pre-tax rate of return on a project is $(phat)$ is equal to the real interest rate (r) and as a result METR=0 (equation 11). Similarly, the adjusted statutory tax rate is $T = 0$ (equation 18), since we assume no personal taxes (i.e., the discrimination factor between distributed and retained earnings $\gamma = 1)$ consequently we obtain AETR=0 (equation 17). Figure 8 confirms this outcome. In other words, tax holidays have eroded the tax base, which suggests that the race may have already reached the bottom in the Caribbean.

Recognizing that tax holidays are a permanent feature of the CIT regimes in the Caribbean, we now analyze recent tax policy proposals in the region (i.e., accelerated depreciation, loss carry forward provisions, and tax harmonization). First, we consider accelerated depreciation. We do so by imposing a higher rate at which capital expenditure can be offset against tax $\phi,$ say $\phi = 0.10,$[14] which allows companies to capture the tax savings on their investment earlier rather than later. The immediate impact of this measure is to increase A (equation 9); but $A = 0,$ due to CIT holidays. This implies that accelerated depreciation will have no impact on the framework. Second, we consider loss carry forward provisions, which amount to allowing firms to write off their before-tax profits against past losses within a specific period of time. Recall that tax

[13] Note that this is consistent with the anecdotal evidence suggesting that small, domestic, and less profitable investors clamour for similar treatments as foreign, large, and most profitable investors.

[14] Note, however, that The Bahamas has the lowest depreciation rate, which is zero.

holidays are granted for periods exceeding 20 years, while the economic life of the asset (buildings) is 25 years. This essentially means that companies will pay no taxes during the life of their investment. In other words, CIT holidays must be removed for loss carry forward provisions to have a discernible impact on revenue.

Finally, we consider whether convergence in CIT rates (tax harmonization) could prevent a race to the bottom. While the model presented in Appendix II suggests that the rate at which corporate income is taxed is relevant for location decision for very profitable investment projects, Chai and Goyal (2005, 2006) show that, even with tax holidays, the Caribbean's share of worldwide FDI has declined over the last two decades. This suggests that even if tax incentives are effective in attracting investment to individual countries within the region, they are ineffective in attracting investment to the region as a whole, since this may be determined more by nontax characteristics. In this case, total FDI may be considered CIT inelastic, which implies that tax harmonization could lead to higher taxation of corporate income. However, there are several reasons why tax harmonization may not be achieved in the Caribbean. The main drawback is the widespread use of tax holidays. Second, as Klemm (2004) demonstrates, tax harmonization, to be effective, requires convergence in both the CIT rate and the tax base. The sheer administrative burden that this entails makes such an outcome uncertain.

The loss of revenue from CIT raises the question of how to broaden the tax base. The foregoing arguments suggest that a policy choice is to avoid granting CIT holidays and broaden the tax base to offset the downward pressure on statutory CIT rates. A second option is to recover the foregone revenue from alternative sources,[15] such as taxes on domestic consumption—i.e., the value-added tax (VAT)—given that many countries in the Caribbean have begun to implement a modern

[15] In fact, Diamond and Mirrlees (1971) and Gordon (1986) conclude that a small open economy should not levy CIT if other tax instruments are available.

VAT regime.[16] In this case, it would be important that the integrity of the VAT be preserved through limited exemptions and a single VAT rate, to ensure that the tourism sector does not use highly-taxed inputs to produce lightly-taxed outputs.[17]

6.0 Concluding Remarks

This paper uses the AETR approach to analyze corporate income taxation in 15 countries in the Caribbean over the period 1985-2005. It finds evidence that METRs have declined by more than AETRs, suggesting that the tax burden on less profitable investments has fallen by more than those on profitable investments. Although this outcome has made the tax systems as generous as those in the industrialized countries, countries in the Caribbean have also resorted to widespread use of tax holidays, which have eroded the tax base.

The paper also analyzes the impact of recent tax policy proposals for countries in the Caribbean—i.e., accelerated depreciation, loss carry forward provisions, and tax harmonization. It finds that CIT holidays must be removed for these policy measures to have discernible revenue gains. The authorities are faced with the choice of not granting tax holidays, or relying more on consumption taxes in order to broaden the tax base. Thus, in the presence of CIT holidays, it is important that the integrity of the VAT be preserved through a single rate with limited exemptions.

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[16] For example, in the ECCU value-added taxes (VATs) have been recently introduced in Dominica, Antigua and Barbuda, and St. Vincent and the Grenadines.

[17] A single VAT rate will reduce the number of tax payers in net refundable status and the amount of net refunds. See Keen and Simone (2004).

REFERENCES

Alcock, O. 2003. "CARICOM Tax Harmonization: Implications of the Effects on Investment for Regional Integration," mimeo, Regional Tax Policy and Administrative Unit, CARICOM Secretariat. Georgetown, Guyana: CARICOM.

Bain, L. 1995. "Tax Concessions and Their Impact on the Revenue Base of the ECCB Territories," mimeo, Eastern Caribbean Central Bank.

Brueckner, J. K. 2003. "Strategic Interaction Among Governments: An Overview of Empirical Studies," *International Regional Science Review*, Vol. 26, No. 2, 175-188.

Bucovetsky, S. 1991. "Asymmetric Tax Competition," *Journal of Urban Economics*, 30, 167–181.

Chai, J. and R. Goyal. 2005. "Tax Concessions and Foreign Direct Investment in the ECCU," *IMF Country Report No. 05/305*, International Monetary Fund, 73–92.

Chai, J., and R. Goyal. 2006. "Tax Concessions and Foreign Direct Investment in the ECCU". In *The Caribbean: From Vulnerability to Sustained Growth*, edited by Ratna Sahay, David O. Robinson, and Paul Cashin, International Monetary Fund, 258-284.

Devereux, M. P. and R. Griffith. 1998. "The Taxation of Discrete Investment Choices," *Working Paper Series*, No. W98/16, University of Warwick and Institute for Fiscal Studies.

Devereux, M. P., R. Griffith, and A. Klemm. 2002a. "Corporate Income Tax Reforms and Tax Competition," *Economic Policy*, Vol. 17, 450–95.

Devereux, M. and L. Lammersen. 2002b. "Corporate Taxes and Economic Inefficiency in Europe." CEPR, Warwick University, Institute of Fiscal Studies, London.

Devereux, M. P. and R. Griffith. 2003. "Evaluating Tax Policy for Location Decisions," *International Tax and Public Finance*, Vol. 10, 107–126.

Devereux, M. P. and A. Klemm. 2004a. "Measuring Taxes on Income from Capital: Evidence from the UK," in *Measuring the tax Burden on Capital and Labor*, edited by P.B. Sorensen, MIT Press, Cambridge, MA, 73–98.

Devereux, M. P., R. Griffith, and A. Klemm. 2004b. "Why has the U.K. Corporate Tax Raised so much Revenue?" *Fiscal Studies*, Vol. 25, 367–388.

Diamond, P. A. and J. Mirrlees. 1971. "Optimal Taxation and Public Production, I: Productivity Efficiency; II: Tax Rules," *American Economic Review*, Vol. 61, 8:27, 261-78.

Eggert, W. and A. Haufler. 2006. "Company-Tax Coordination cum Tax-Rate Competition in the European Union," *FinanzArchiv*, Public Finance Analysis, Vol. 62, No. 4, 579–601.

Ernst and Young International, Ltd. Various years. *Worldwide Corporate Tax Guide.*

Edwards, J. and M. Keen. 1996. "Tax Competition and Leviathan," *European Economic Review*, Vol. 40, 113–134.

Gordon, R. H. 1983. "An Optimal Taxation Approach to Fiscal Federalism," *Quarterly Journal of Economics*, Vol. 98, 567–586.

Haufler, A. 2004. *Taxation in a Global Economy*, Cambridge: Harvard University Press, 240–280.

Keen, M. 2001. "Preferential Regimes Can Make Tax Competition Less Harmful," *National Tax Journal*, Vol. 54, No. 4, 757–762.

Keen, M. and A. Simone. 2004. "Tax Policy in Developing Countries: Some Lessons from the 1990s and some Challenges Ahead," in *Helping Countries Develop: The Role of Fiscal Policy*, edited by S. Gupta et. al. International Monetary Fund, 302–352.

King, M.A. and D. Fullerton. 1984. *The Taxation of Income from Capital*, Chicago: University of Chicago Press.

Klemm, A. 2004. "A Minimum Rate without a Common Base?" *Intereconomics*, Vol. 39, No. 4, 186–189.

Kehoe, P. J. 1989. "Policy Co-operation among Benevolent Governments may be Undesirable," *Review of Economic Studies*, Vol. 56, 289–296.

Mintz, J. and H. Tulkens. 1986. "Commodity Tax Competition between Member States of a Federation: Equilibrium and Efficiency," *Journal of Public Economics*, Vol. 29, 133–172.

Nallari, R. 1998. "Belize, An Evaluation of Fiscal Incentives," World Bank Country Policy Notes, (not published).

Oates, W. E. 1972. *Fiscal Federalism*, New York: Harcourt-Brace-Jovanovich.

Pricewaterhouse and Coopers. Various years. *Corporate Taxes, Worldwide Summaries*, New York: John Wiley & Sons, Inc.

Razin, A. and E. Sadka. 1991. "International Tax Competition and Gains from Tax Harmonization," *Economics Letters*, Vol. 37, 69-76.

Rogowski, R. 2003. "Implications of Tiebout models for a world of Mobile Factors". In *Governance in a Global Economy: Political Authority in Transition*, edited by M. Kahler and D.A. Lake. Princeton, NJ: Princeton University Press.

Sosa, S. 2006. "Tax Incentives and Investment in the Eastern Caribbean," IMF Working Paper WP/06/23, Washington D.C.: International Monetary Fund.

Stewart, K. and M. Webb. 2006. "Tax Competition," *Economic Policy*, Vol. 45, 154–201.

Tiebout, C. M. 1956. "A Pure Theory of Local Expenditures," *Journal of Political Economy*. Vol. 64, 416-24.

Wellisch, D. 2000. *Theory of Public Finance in a Federal State*, Cambridge: Cambridge University Press.

Wilson, J. D. 1999. "Theories of Tax Competition," *National Tax Journal*, Vol. 52, 269–304.

Wooders, M. H., B. Zissimos, and A. Dhillon. 2001. "Tax Competition Reconsidered," Working Paper, University of Warwick, Department of Economics.

World Bank. 2005. *Towards a New Agenda for Growth: Organization of Eastern Caribbean States*. Washington D.C.: The World Bank.

Zee, Howell H., Janet G. Stotsky and Eduardo Ley. 2002. "Tax Incentives for Business Investment: a Primer for Policy Makers in Developing Countries," *World Development* (UK), Vol. 30, No. 9, 1497-1516.

Zodrow, G. R. and P. Mieszkowski. 1986. "Pigou, Tiebout, Property Taxation and the Underprovision of Local Public Goods," *Journal of Urban Economics*, Vol. 19, 356–370.

APPENDIX I

Comparative Merits of Recent Tax Policy Initiatives

Description	Advantages	Disadvantages
1. Accelerated depreciation		
Accelerates the depreciation of an asset to the total allowable nominal depreciation at the original cost.	Has the fewest of the shortcomings associated with CIT rate incentives and all of the virtues associated with investment cost-recovery incentives. Does not generally discriminate against long-lived assets. Moves the CIT closer to a consumption-based tax, reducing the distortion against investment typically produced by the regular CIT.	Compared with other forms of investment cost-recovery incentives, its costs are not as readily ascertainable (requiring present-value comparisons between the stream of depreciation allowances under accelerated depreciation rates and that under the regular depreciation rates). Some administrative burden. Discriminates against investment with delayed returns if loss carry-forward provisions are inadequate.
2. Loss carry-forward provisions		
Allows to offset current financial year's net operating losses against the income earned in the succeeding year(s).	Revenue costs are more transparent. Does not discriminate against long-lived investment.	Greater administrative burden.

Comparative Merits of Recent Tax Policy Initiatives (CONTINUED)

3. Tax harmonization		
Formal coordination of CIT policies between countries.	Eliminates discriminatory CIT policies. Protects the revenue base.	Requires harmonization of both CIT rates and tax bases—an administrative nightmare. Not a politically feasible option. Can be welfare-reducing under specific circumstances (Keen 2001).

Sources: Adapted in part from Zee et al. 2002

APPENDIX II

Average Effective Tax Rate (AETR)

Following King and Fullerton (1984), the basic model by Devereux and Griffith (2003) starts with the capital market condition, which requires that the market value of the equity of the firm at the end of period t, denoted V_t, be determined by the following condition:

$$\{1+(1-m)i\}V_t = \frac{(1-m^D)}{(1-c)}D_{t+1} - N_{t+1} + V_{t+1} - z(V_{t+1} - N_{t+1} - V_t) \quad (1)$$

The left hand side of equation (1) is the post-tax return from investing an amount V_t in a deposit paying interest at a nominal rate i, on which tax is paid at rate m. The right hand side is the post-tax payoff—earned at the end of period $t+1$—to an individual owning the equity of a firm from the end of period t. It consists of net income from dividends, D_{t+1}, after personal tax at rate m^D and a tax credit at rate c, less new equity contributed to the firm, N_{t+1}, plus the value of the firm at the end of period $t+1$, V_{t+1}, net of capital gains tax at an effective rate z due on any change in the value of the firm. Thus, in equilibrium, the post-tax rate of interest on the value of the firm equals the amount of dividends and capital gains earned in $t+1$, adjusted for changes in equity capital due to new share issues and repayments of equity capital. For a risk neutral investor, these must be equal, which implies that V_t must also be the market value of the equity of the firm at the end of period t.

It follows from equation (1) that:

$$V_t = \frac{\gamma D_{t+1} - N_{t+1} + V_{t+1}}{1+\rho} \quad (2)$$

where

$$\gamma = \frac{(1-m^D)}{(1-c)(1-z)} \quad (3)$$

$$\rho = \frac{(1-m)i}{(1-z)} \quad (4)$$

γ denotes the discrimination factor between distributed and retained earnings, and ρ the shareholder's discount rate.

Equation (2) is related to real investment by the firm through the equality of sources and uses of funds within the firm in each period:

$$D_t = F(K_{t-1})(1-\tau) - q_t I_t + B_t - [1+i(1-\tau)]B_{t-1} + \tau\phi\left(q_t I_t + K_{t-1}^T\right) + N_t. \quad (5)$$

where $F(K_{t-1})$ is output in period t, which depends on the beginning of period capital stock, K_{t-1}, I_t is investment, q_t is relative price of capital goods at the end of period t, B_t is one-period debt issued in period t, τ is the statutory corporate tax rate, ϕ is the rate at which capital expenditure can be offset against tax, and K_{t-1}^T is the tax-written-down value of the capital stock at the beginning of period t. The prices of output and capital goods are normalized to unity in period t.

Two further expressions reflect the evolution over time of the capital stock and the valuation of the capital stock for tax purposes:

$$K_t = (1-\delta)K_{t-1} + I_t, \quad (6)$$

where δ is the economic rate of depreciation, and

$$K_t^T = (1-\phi)K_{t-1}^T + (1-\phi)q_{t-1}I_{t-1}. \quad (7)$$

It is assumed that the firm chooses the capital stock in any period to maximize the wealth of its shareholders, V_t, given by Equation (2), subject to equations (5), (6), and (7). Within this framework, one can study two separate types of decision faced by the firm: the optimal scale of the capital stock and the optimal composition of capital.

Marginal Effective Tax Rates

To obtain the METR, the model proceeds by combining equations (2), (5), (6), and (7), and then differentiating with respect to K_t. This yields the first order condition for the optimal capital stock:

$$(1-\tau)(1+\pi)F'(K_t) = (1-A)\{\rho + q_{t+1}\delta - (q_{t+1}-1)\} \quad (8)$$

where A is the net present value of allowances per unit of investment, discounted by ρ.

$$A = \tau\phi\left\{1+\left(\frac{1-\phi}{1+\rho}\right)+\left(\frac{1-\phi}{1+\rho}\right)^2+...\right\} = \frac{\tau\phi(1+\rho)}{\rho+\phi}, \quad (9)$$

and $(1-A)$ is the net cost of one unit of physical investment in period t. The left hand side of equation (8) is the post-corporate tax net revenue generated in period $t+1$ from increasing K_t. Note that the change in the capital stock is only for one period: K_{t+1} is unaffected. The right hand side represents the cost of increasing K_t. This includes the financial cost of tying up funds in the higher capital stock for one period, the fall in the value of the asset over the period due to depreciation, less any increase in the relative price of capital goods over the period.

For a given cost of increasing K_t for one period, equation (8) can be thought of determining the minimum acceptable real rate of return, $F'(K_t)$. All projects earning a return greater than this should be accepted; all those earning a rate of return less than this should be rejected. It is common to split this required rate of return into two components, reflecting the cost of depreciation and the remaining cost. To see this, define p to be the pre-tax rate of return on a project, over and above the rate of depreciation, so that $F'(K) = p + \delta$. The cost of capital is defined as the minimum acceptable value of p, denoted *phat*, where:

$$phat = \frac{(1-A)}{(1-\tau)(1+\pi)}\{\rho + \delta(1+\pi^K) - \pi^K\} - \delta, \quad (10)$$

where π^K is the increase in the price of the capital stock, so that $q_{t+1} = 1 + \pi^K$.

This is the basic expression for the cost of capital in much of the investment literature.[18] It is straightforward to see that a rise in the rate of allowances, A, reduces the cost of capital, and a rise in the tax rate, τ, increases the cost of capital (although such an increase also raises A).

[18] Note that this is not the only possible formulation of the impact of taxes on the marginal investment decision. One principal difference from the King and Fullerton (1984) formulation is that here the net present value of depreciation allowances, A, is derived using the shareholders' discount rate, ρ.

Personal taxes are relevant only by the extent to which they affect the discount rate, ρ.

In the absence of tax, the cost of capital is simply the real interest rate, r. One natural measure of the effective marginal tax rate is therefore the proportionate increase in the cost of capital which arises as a result of taxation:

$$METR = \frac{phat - r}{phat}. \tag{11}$$

Average Effective Tax Rates

To obtain the AETR, consider an investment that raises the capital stock in period $t = 0$ by one unit. In period $t = 1$, the net investment is reduced by an amount sufficient to return to the exogenous level of the capital stock. The effect of the additional investment on the value of the flow of dividends in $t = 0$ is measured. In the *absence* of tax, define the value to the shareholder of the project, which is also the net present value of the economic rent of the project, as

$$R^* = -1 + \frac{1}{1+i}\{(1+\pi)(p+\delta) + (1+\pi^K)(1-\delta)\}. \tag{12}$$

The first summand depicts the initial cost in $t = 0$ and the second summand depicts the present value in $t = 0$ of the cash flow in $t = 1$. The investment yields the financial return p and the economic depreciation at a rate δ of the initial cost, which is not derived from the cash flow generated by the investment, but from the replacement cost of the asset. The net investment is reduced by the amount $(1-\delta)$ when the firm returns to the exogenous capital stock in $t = 1$.

In the simpler case in which $\pi = \pi^K$, and $1 + i = (1+r)(1+\pi)$, equation (12) reduces to

$$R^* = \frac{(p-r)}{1+r}. \tag{13}$$

In the *presence* of tax, the net present value of the investment is determined by the change in net dividends due to the additional investment. If the project is financed by retained earnings, the net present value is obtained as

$$R = -\gamma(1-A) + \frac{\gamma}{1+\rho}\left\{(1+\pi)(p+\delta)(1-\tau) + \left(1+\pi^{K}(1-\delta)\right)(1-A)\right\}, \tag{14}$$

The investment reduces dividend payments by the amount γ. Furthermore, the present value of distributions rises, due to the depreciation allowances, by $\gamma * A$. In $t = 1$, the surplus $p + \delta$ is taxed. From the expenses $(1-\delta)$ that have been saved, the value of tax reductions $(1-\delta) * A$ lost due to the foregone depreciation allowance is deducted.

The AETR is based on the difference between the net present value (NPV) of the perturbation to the capital stock in the *absence* and *presence* of tax, $R^* - R$, which is a measure of the total impact of taxation on the investor. Following Devereux and Griffith (1998), this difference is scaled using the NPV of the pre-tax total income stream, net of depreciation, $p/(1+r)$. The AETR is therefore obtained as

$$AETR = \frac{R^* - R}{p/1+r} \tag{15}$$

To investigate the properties of the EATR, it is useful to rewrite R using the cost of capital as

$$R = (p - phat)\gamma(1-\tau)\frac{1+\pi}{1+\rho}. \tag{16}$$

Using equations (13) and (16) and the definition of METR in equation (11), AETR (equation 15) can be written as a weighted average of METR and an "adjusted statutory tax rate," T:[19]

$$AETR = \left(\frac{phat}{p}\right)METR + \left(1 - \frac{phat}{p}\right)T \tag{17}$$

where

$$T = 1 - \gamma(1-\tau)\frac{(1+r)(1+\pi)}{1+\rho} \tag{18}$$

[19] See Appendix III for the derivation.

and the weights reflect the actual pre-tax rate of return on the investment, p, and the pre-tax rate of return on a marginal investment, $phat$.

The two elements of equation (17) reflect the two extremes of the distribution of acceptable investment projects. For a marginal investment, $R = 0$ and $p = phat$, hence $AETR = METR$. At the other extreme, for a very profitable investment, as $R^* \to \infty$ and hence $p \to \infty$, $AETR \to T$. T differs from the actual statutory tax rate only because of personal taxes. In the absence of personal taxes, $1 + \rho = 1 + i = (1 + r)(1 + \pi)$ and $\gamma = 1$, implying that $T = \tau$. This is intuitive: for very profitable investment projects, allowances become insignificant and the only relevant factor is the rate at which income is taxed.

APPENDIX III

Derivation of Equation (17)

Recall Equation (15) and substituting in Equations (13) and (16) obtains

$$AETR = \frac{\left(\frac{p-r}{1+r}\right) - \left\{(p-phat)\gamma(1-\tau)\frac{(1+\pi)}{1+\rho}\right\}}{\frac{p}{(1+r)}} \tag{A1}$$

$$= \frac{1}{p}\left\{(p-r) - (p-phat)\gamma(1-\tau)\frac{(1+\pi)(1+r)}{1+\rho}\right\} \tag{A2}$$

Multiplying and dividing by $phat$ yields

$$= \frac{phat}{p}\left\{\frac{(p-r)}{phat} - \frac{(p-phat)}{phat}\gamma(1-\tau)\frac{(1+\pi)(1+r)}{1+\rho}\right\} \tag{A3}$$

Recall from Equation (18) that $1-T$ can be expressed as $\gamma(1-\tau)\frac{(1+\pi)(1+r)}{1+\rho}$. Hence, we can write (A3) as

$$= \frac{phat}{p}\left\{\frac{(p-r)}{phat} - \left(\frac{p}{phat}-1\right)(1-T)\right\} \tag{A4}$$

$$= \frac{phat}{p}\left\{\frac{(p-r)}{phat} - \left(\frac{p}{phat}\right) + 1 + T\frac{p}{phat} - T\right\} \tag{A5}$$

$$= \frac{phat}{p}\left\{-\frac{r}{phat} + 1 - \left(1-\frac{p}{phat}\right)T\right\} \tag{A6}$$

$$= \frac{phat}{p}\left\{\left(\frac{phat - r}{phat}\right) + \left(\frac{p - phat}{phat}\right)T\right\} \tag{A7}$$

Hence,

$$AETR = \left(\frac{phat}{p}\right)METR + \left(1 - \frac{phat}{p}\right)T \cdot \tag{A8}$$

APPENDIX IV

Definitions of Variables

V_t	market value of the equity of the firm at the end of period t
D_t	cash dividends paid by the firm at the end of period t
N_t	new equity issued by the firm at the end of period t
K_t	capital stock at the end of period t
I_t	investment in period t
$F(K_{t-1})$	net output generated at the end of period t
B_t	one period debt issued at the end of period t
r	real rate of interest
i	nominal rate of interest
π	inflation rate in price of output
π^K	inflation rate in price of capital
q_t	relative price of capital goods at the end of period t
δ	economic depreciation rate
τ	statutory corporate tax rate
ϕ	the rate at which capital expenditure can be offset against tax
K_t^T	value of the capital stock for tax purposes at the end of period t
A	present value of allowances per unit of investment
ρ	nominal, tax adjusted, discount rate
γ	tax discrimination variable
m	personal tax rate on interest income
m^D	personal tax rate on dividend income
c	tax credit on dividend income
z	personal effective capital gains tax rate
p	pre-tax rate of return on investment
$phat$	cost of capital
R^*	net present value of investment project in the absence of tax
R	net present value of investment project in the presence of tax
T	statutory corporate income tax rate, adjusted for personal taxes