

RWANDA AS A FREE TRADE ZONE: AN INQUIRY INTO THE ECONOMIC IMPACTS

**ADDENDUM ON FISCAL REVENUE IMPACTS
AND TAX POLICY OPTIONS**

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1. Introduction

FTZ Proposal and Fiscal Revenues

In a recent paper, the authors employed a simple economic model to investigate the quantitative impacts of a bold proposal to establish Rwanda as an economywide free trade zone (FTZ), following in the footsteps of Hong Kong and Singapore.¹ The analysis identified potential "gainers" and "losers" among Rwandan producers of traded goods under the proposal, and broad gains to the Rwandan economy stemming from greater labor and resource efficiency, and greater economic welfare for consumers. However, the analysis also called attention to, among other issues, the absolute loss of tariff revenues that would be faced by Rwanda. Indeed, roughly Frw12.5 billion in tariff revenues -- nearly 20 percent of total fiscal revenues in 2001 -- would be lost if Rwanda were to become an economywide free trade zone.

This paper investigates the fiscal impacts of the Rwanda FTZ proposal further. The remainder of this section reviews sources of fiscal revenues in emerging market countries globally. Next Section 2 lays out some fiscal policy enhancements to the specifications of the Rwanda trade simulation model (RTSM) used previously by the authors. Then Section 3 discusses a series of simulation results using the enhanced model that assesses more accurately the trade-related, fiscal revenue implications of the FTZ proposal and considers the impacts of possible compensatory adjustments to Rwanda's domestic value-added tax (VAT) and excise taxes to partially if not fully offset the tariff revenue losses. Conclusions from the analysis are offered in Section 4.

Emerging Market Country Experience

In becoming an economywide free trade zone, Rwanda would emulate the free trade policy of Hong Kong, Singapore, and emerging market countries globally. Broadly speaking, the emerging market countries are upper middle-income developing countries that, during the last decade or more, have not only significantly increased their openness to international trade but also embraced other important economic policy and commercial law reforms, such as more prudent and stable monetary and fiscal policies,

¹ D.A. DeRosa and V.O. Roningen, "Rwanda as a free trade zone: An inquiry into the economic impacts," U.S. Agency for International Development, Kigali, Rwanda, June 25, 2002 <<http://www.adr-intl.com/w.htm>>.

privatization of public sector enterprises, and increased protection of private property rights, with appreciable affect on their economic growth and well-being.²

Improved economic growth tends to enhance fiscal revenues. Thus, to the extent that trade liberalization and other economic policy reforms improve economic growth, countries reducing or eliminating import tariffs can anticipate eventual offsetting their lost import tariff revenues, through increased collections from direct taxes on income and profits, and indirect taxes on goods and services. Of course, in the short-run to intermediate-run, before the benefits of higher growth may emerge, the efficiency of tax collections, and possibly tax rates themselves, must be raised in order to maintain total fiscal revenues. Also, government programs and their efficacy must be reviewed in order to identify possibilities for reducing government expenditures. In these ways, emerging market countries have reduced their reliance on international trade taxes during the last decade and increased their reliance on direct and indirect domestic taxes, which in many cases, unlike import (and export) duties, do not necessarily reduce international trade flows by distorting domestic relative prices in favor of domestically produced goods over internationally produced goods.

The three accompanying charts compare the sources of government revenues from taxes on international trade (Chart 1), indirect taxes on goods and services (Chart 2), and direct taxes on income and profits (Chart 3) in Rwanda relative to the major industrial countries (OECD), Singapore, upper middle-income countries, and lower middle-income countries, during 1980 to 1997.³ Among the trends revealed by the charts is the evident (gradual) decline in reliance on international trade taxes in all countries except Rwanda. Whereas international trade taxes today generally account for less than 10 percent of government revenues in most countries, they remain much higher in Rwanda. Other countries have offset this decline by (gradually) increasing indirect taxes on goods and services (but, notably, not direct taxes on incomes and profits). They have also made up for the decline in international trade taxes through (relatively sharp) increases in "other taxes," which include property taxes, and user fees and other taxes assessed on individuals and businesses in connection with their use of specialized government services (e.g., maritime

² See for instance, J.D. Sachs and A.M. Warner, "Economic reforms and the process of global integration," *Brookings Papers on Economic Activity*, 1995, pp. 1-118.

³ Matching series for Hong Kong and low-income countries could not be compiled from the World Bank statistical publication, *World Development Indicators*.

and air transport facilities).⁴ In recent years, Rwanda seems to have also increased its reliance on indirect taxes on goods and services. Moreover, Rwanda has raised its reliance on direct taxes on income and profits to levels roughly matching those found today in OECD countries and Singapore. However, Rwanda has not apparently made an effort to increase its reliance on other taxes as a source of fiscal revenues.

Finally, Table 1 provides recent information about detailed sources of government revenue in Hong Kong and Singapore. In Hong Kong, taxes are levied principally on profits, salaries, and property, all at a rate of about 15 percent. There are no VAT or other sales taxes, or taxes on capital gains.⁵ In Singapore, personal and business taxes are levied at higher rates than in Hong Kong, but still at very moderate rates from an international perspective. For instance, beginning in 2003, the corporate tax rate will be reduced from 24.5 percent to 22 percent (and subsequently during the next few years, to 20%). Also, Singapore levies a VAT-like, goods and services tax (GST) of just 3 percent.⁶ Both Hong Kong and Singapore maintain a mandatory provident fund.

Table 1 reveals that in addition to general direct and indirect taxes, both Hong Kong and Singapore levy a number of specialized taxes, including specialized user fees and charges. These additional taxes and fees are levied at very moderate rates. Finally, by maintaining a very favorable environment for business and commerce, and very low rates of taxation, these two "real world" economywide free trade zones enjoy a very broad, revenue-buoyant tax base. In such circumstances, "tax avoidance" and non-taxed informal (or underground) markets are not major concerns of government in either Hong Kong or Singapore, unlike in many industrial countries and less developed countries that impose high rates of direct and indirect taxation on households and enterprises.

2. The Enhanced Rwanda Trade Simulation Model

The Rwanda trade simulation model is a quantitative economic model developed by the authors to investigate the potential impacts of the Rwanda FTZ proposal on major sectors of the Rwandan economy, and on the country's economic welfare and employment. As discussed in their previous paper, the model

⁴ User fees are sometimes considered nontax revenue, along with income from public owned properties and investments.

⁵ Government of Hong Kong, Inland Revenue Department (<http://www.info.gov.hk/hkbrief/livinge3.htm>).

⁶ Government of Singapore, Ministry of Finance (http://www.mof.gov.sg/taxation/business_user/index.html).

developed by the authors is simple in design. It focuses principally on export and import trade by Rwanda in over 100 commodity and product categories, and on the proximate relationship of trade in these categories to domestic production and employment, taking into account changes in domestic prices of import and exports, and changes in the exchange rate necessary to maintain balance of payments equilibrium in the aftermath of trade liberalization or other changes in economic policy that affect Rwanda's international trade or balance of payments.

Unfortunately, the basic Rwanda trade simulation model does not consider the fiscal implications of changes in trade policy beyond their impact on import tariff revenues. This paper, however, is motivated by the fact that forgone tariff revenues under the Rwanda FTZ proposal might be offset to some extent by increased fiscal revenues from the existing VAT and excise taxes, which are levied on imported goods as well as domestically produced goods. Additionally, Rwanda could endeavor to make up for lost tariff revenues through some upward adjustment of both VAT and excise tax rates, especially on luxury items such as tobacco and beverages that are typically relatively inelastic in demand. Indeed, this is a frequent recommendation by international organizations such as the International Monetary Fund and World Bank to developing countries that unilaterally liberalize their trade and tariff regimes.⁷

Domestic versus International Trade Taxes

Tariffs and other duties applied only to imports discriminate against like goods produced abroad, giving rise to reduced trade, less efficient allocation of productive resources at home (and abroad), and, typically, reduced economic welfare for domestic consumers. In the presence of nontraded goods (the usual real world case), such import trade taxes also cause the real exchange rate to appreciate, giving rise to expansion of the nontraded goods sector and reduced international competitiveness of the domestic traded goods sector.

In contrast, indirect taxes on domestic consumption of goods and services, in the form of uniform *ad valorem* sales taxes or value-added taxes, are generally non-trade distorting. Indeed, they are widely considered neutral in the economy as a whole. This is so because such indirect taxes do not appreciably

⁷ See for instance, V. Thomas, J. Nash, *et al.*, *Best practices in trade policy reform*, Oxford University Press for the World Bank (London), 1991; and V. Tanzi and H. Zee, *Tax policy for developing countries*, Economic Issues No. 27, International Monetary Fund, Washington, D.C., 2001.

affect domestic relative prices, and hence they do not affect domestic consumption or resource allocation decisions. In addition to the assumption that the indirect taxes are levied against all goods and services at a uniform rate, two other important conditions making this outcome possible in economic theory include (1) that revenues from the indirect taxes are rebated to the economy through lump-sum transfers to consumers, and (2) that border tax adjustments are consistent with the so-called destination principle, whereby indirect taxes are levied on all imports but rebated on all exports. If these two conditions are not met, then indirect taxes can have real effects on trade and, more generally, on domestic consumption and production decisions in the general economy.⁸

Rwanda levies both value-added taxes and excise taxes (Table 2). By their nature, excise taxes applied at different rates on a limited number of luxury or other goods in Rwanda should be expected to have real impacts on trade and the general economy. On the other hand, the value-added tax in Rwanda, which is levied at a uniform rate of 15 percent on goods and services, may be neutral depending upon the extent to which it is comprehensively levied on nontraded goods and services, and actually rebated on exports. Economic theory suggests that ineffective (or zero) taxation of nontraded goods, under not only VAT but also the excise tax system, would tend to diminish trade and expand production of nontraded goods. The failure to rebate indirect taxes on exports under either tax system would tend to expand production of import-competing goods while also diminishing trade.⁹

Enhanced RTSM

The equation system of the fiscal policy-enhanced Rwanda trade simulation model is presented in Exhibit 1.¹⁰ The principal fiscal policy enhancements to the original model (indicated in bold typeface) are seen in the import price equation and the definitional equations for trade-related VAT and excise tax revenues.

⁸ On the trade neutrality of value-added taxes, see M. Feldstein and P. Krugman, "International trade effects of value-added taxation," in A. Razin and J. Slemrod, eds., *Taxation in the global economy* (Chicago: University of Chicago Press, 1992). On border tax adjustments, see G.M. Grossman, "Border tax adjustments: Do they distort trade?" *Journal of International Economics* 10 (1980), pp. 117-128. Additionally, see A. Dixit, "Tax policy in open economies," in A.J. Auerbach and M. Feldstein, eds., *Handbook of public economics* (Amsterdam: Elsevier Science Publishers, 1985).

⁹ Feldstein and Krugman, "International trade effects of value-added taxation," 1992.

¹⁰ For detailed presentation and discussion of the basic Rwanda trade simulation model, see DeRosa and Roningen, "Rwanda as a Free Trade Zone," June 25, 2002 <<http://www.adr-intl.com/w.htm>>.

In the enhanced specification of domestic prices for imports (Equation 1), consumers of imported goods face not only an *ad valorem* import tariff but also *ad valorem* VAT and excise taxes. Notably, the VAT tax on imported goods (v_k) must be deflated by the VAT tax on nontraded goods (v_n) because prices of traded goods in RTSM are defined relative to the aggregate producer price of nontraded goods.¹¹ Thus, the import price equation illustrates that so long as the VAT is levied at a uniform rate on all goods, the VAT is largely neutral in the model. Indeed, if there were no excise taxes on traded goods, the VAT would not impinge at all on import prices and would lead to no real effects in RTSM on international trade flows, employment, or the exchange rate.

Completing the fiscal policy enhancements to RTSM are equations for *trade-related* VAT and excise tax revenues. The Rwanda trade simulation model is solely capable of determining border tax collections (and rebates). Fiscal revenues from indirect taxes levied on goods and services produced and consumed domestically are not simulated by the model. Note also that following common international practice, both VAT and excise tax revenues are computed with respect to the tariff-inclusive value of imports.¹² Finally, also following common international practice, export sales are assumed "zero-rated" under the VAT system, and therefore VAT payments with respect to purchased inputs used in production of exports (the second term in brackets in Equation 6) are assumed rebated by the Government.¹³

3. Quantitative Results

The starting point of the present quantitative analysis (the base case) is the economic impacts of the proposal to establish Rwanda as an economywide free trade zone reported previously by the authors using RTSM. The base case simulation results are reproduced in the first panel of Table 3, but they now include changes in all trade-related fiscal revenues simulated by the enhanced Rwanda trade simulation model.¹⁴ At base VAT and excise tax rates, the overall loss in trade-related revenues from indirect taxes is about Frw 12.6 billion, of which Frw 12.5 billion is lost import tariff revenues. Under the proposed economywide FTZ, total trade-related VAT revenues rise by Frw 44 million (Frw 317 million for

¹¹ In RTSM, excise taxes are assumed not to be levied on nontraded goods.

¹² A.A. Tait, *Value added tax: International practice and problems* (Washington, D.C.: International Monetary Fund, 1988).

¹³ *Ibid.*

¹⁴ Table 3 provides a summary of the RTSM simulation results discussed in Section 3. The detailed simulation results are reported in Tables 4-8.

manufacturing imports) as a result of the expansion of imports, but trade-related excise tax revenues decline by Frw 115 million (Frw 145 million for mineral imports) as a result of the elimination of import tariffs.¹⁵

As indicated in Table 3, four simple options to minimize trade-related losses in government revenues from indirect taxes were considered using the enhanced RTSM.¹⁶

The first tax policy option raises the uniform VAT rate from 15 percent to 20 percent (including on nontraded goods), leaving excise taxes at their base rates. In this case, the enhanced Rwanda trade simulation model finds, as expected, that the economic impacts of the economywide FTZ on domestic prices, trade and employment, and economic welfare are largely the same as found in the base case. However, the overall loss in trade-related revenues from indirect taxes falls by over 50 percent, from Frw 12.6 billion in the base case to Frw 5.8 billion.

The second tax policy option is the same as the first tax policy option but simultaneously raises all existing excise tax rates to 100 percent. Because excise taxes are non-neutral in RTSM, sharp increases in domestic prices for minerals occur (28 percent), and domestic price incentives to exporters are lower (export prices rise by only 5.2 percent compared to 8.5 percent in the base case).¹⁷ As a result, trade and employment gains are lower than in the base case. Also, economic welfare is lower under the second tax policy option because higher excise taxes sharply reduce consumer welfare. However, the increase in excise tax rates to 100 percent results in increased trade-related excise tax collections of Frw 4.2 billion, and the overall loss in trade-related revenues from indirect taxes falls by over 75 percent, from Frw 12.6 billion in the base case to Frw 3.0 billion.

The third tax policy option raises the uniform VAT rate to 25 percent (including on nontraded goods), again leaving excise taxes at their base rates. As before, the enhanced Rwanda trade simulation model finds that the economic impacts of the economywide FTZ on domestic prices, trade and employment, and economic welfare are largely unchanged from the base case. However, the sharp (67

¹⁵ Recall that excise (and VAT) taxes are computed in RTSM on the basis of the tariff inclusive price of imports.

¹⁶ The four tax policy options in Table 3 are not exhaustive of the possibilities that might be simulated using RTSM.

¹⁷ In Table 3, changes in the domestic price of exports are uniform across sectors because in RTSM they mirror (inversely) the change in the real exchange rate, so long as international prices of goods remain unchanged.

percent) increase in the uniform VAT rate causes overall trade-related revenues from indirect taxes to rise, from a loss of Frw 12.6 billion in the base case to a positive gain of Frw 1.0 billion. This dramatic increase in government revenues is mainly attributable to the substantial increase in trade-related VAT revenues from imports of manufactures (Frw 9.8 billion).

The fourth and last tax policy option raises the VAT rate to 20 percent and excise taxes to 100 percent only on goods that are inelastic in demand ($\eta_k < -1.0$). This option is suggested by the frequent recommendation of the Bretton Woods institutions, the International Monetary Fund and the World Bank, to developing countries undergoing unilateral trade liberalization, that they should increase domestic indirect taxes only on goods for which demand is relative insensitive to price changes, so that distortions to consumption and production patterns in the economy might be minimized.¹⁸ In the analysis here, it has been additionally assumed that VAT and excise tax rates have been raised solely on *traded* goods that are inelastic in demand, with the result that the tax hikes are applied non-uniformly between traded and nontraded goods.

The economic impacts of the fourth tax policy option on domestic prices, trade and employment, and economic welfare are very similar to those found for the second tax option (uniform 20 percent VAT and all excise taxes raised to 100 percent). However, the expansion of both imports and exports is discernibly less than found for the second tax option, owing to the non-uniformity of the VAT tax increases and the resulting protectionist-like distortion to domestic relative prices (favoring producers of import competing goods).¹⁹ Also the impacts resulting from higher excise taxes, particularly the trade-related excise tax gains themselves, are nearly the same found for the second tax option because excise taxes in Rwanda are levied on traded goods that are already predominantly inelastic in demand. Note, however, that the fourth tax policy option leads to still greater losses in consumer welfare than under the second tax policy option. Finally, with respect to the impact on overall trade-related revenues from indirect taxes, it is clear that the fourth tax policy option is inferior to the other tax policy options in Table 3. The increase in excise tax rates yields increased trade-related excise tax revenues of Frw 3.8 billion, but trade-related VAT

¹⁸ Given that in principle the VAT is non price-distorting, the rationale for this recommendation over simply raising the general VAT rate is somewhat illusive.

¹⁹ See Feldstein and Krugman, "International trade effects of value-added taxation," 1992.

revenues actually decline by Frw 1.0 billion. Overall, trade-related revenues from indirect taxes fall by Frw 9.7 billion, only about 25 percent less than in the base case (Frw 12.6 billion).

4. Conclusion

The present investigation of the economic impacts of establishing Rwanda as an economywide free trade zone using the Rwanda trade simulation model, updated by the authors to include fiscal enhancements for domestic indirect taxes, indicates that the significant loss of import tariff revenues under the Rwanda FTZ proposal might be offset appreciably -- and even entirely eliminated -- by setting VAT and excise taxes at sufficiently higher rates to substantially increase other trade-related fiscal revenues. Higher excise tax rates would have adverse real effects (reducing simulated trade, employment, and welfare gains from adopting an economywide FTZ). In principle, however, higher VAT rates applied uniformly to both traded and nontrade goods would have minimal real effects because they would not appreciably distort relative prices in the Rwandan economy. Finally, the present investigation finds that the frequent recommendation of international organizations and donor agencies, that developing countries increase domestic indirect taxes on goods that are inelastic in demand while liberalizing their trade regime, does not appear to be especially effective in minimizing losses in trade-related tax revenues for Rwanda by comparison to fiscal policy options to increase domestic indirect tax rates, especially VAT rates, across a wider spectrum of consumer and producers goods.²⁰

While VAT systems are widely considered neutral in simple economic models such as RTSM, in more sophisticated economic models in which not only government revenues but also government expenditures on goods and services are explicitly considered, value-added taxes and the uses to which they are put may not be neutral -- especially when VAT rates are relatively high from an international perspective. Moreover, the record of Hong Kong, Singapore, and other emerging market countries worldwide is one of reducing indirect (and direct) rates of taxation, to encourage the widest possible latitude for private sector growth and development (supported by government provision of basic public services, legal institutions governing civil and commercial property rights, and national defense). In this

²⁰ To extent that this frequent recommendation is applied solely to traded goods in inelastic demand (the interpretation of the present analysis), it also threatens to reduce potential gains from trade, similarly as an import tariff, by taxing traded goods more heavily than nontraded goods and by discriminating against foreign products.

context, if Rwanda is to pursue an economywide free trade zone in an effort to improve its trade and growth performance, and join the ranks of emerging market countries worldwide, it is difficult to imagine Rwanda raising uniform VAT rates much above 20 percent or excise tax rates much above their present levels. Indeed, if Rwanda prospers as expected from the adoption of the FTZ proposal, then higher growth and general expansion of the Rwandan economy, including especially expansion of the formal sector and hence the domestic tax base, would be expected to add to fiscal revenues far beyond the levels captured by the present analysis using the simple Rwanda trade simulation model.

Chart 1. Taxes on International Trade (% Current Revenue), 1980-1997

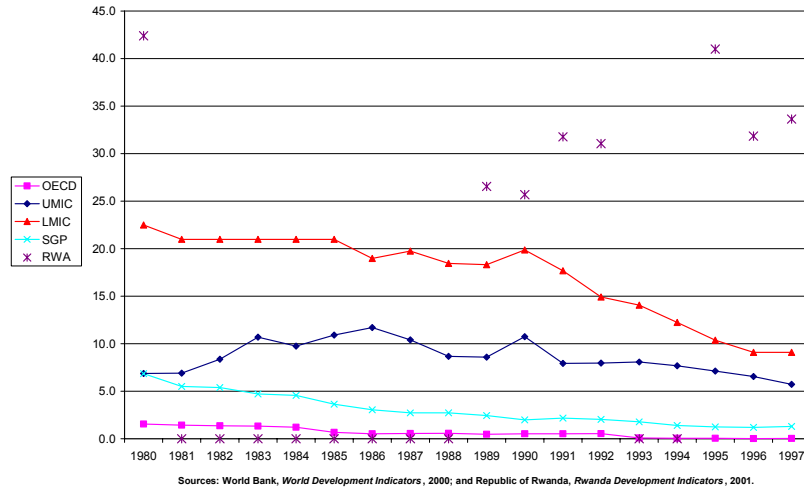


Chart 2. Taxes on Goods and Services (% Current Revenue), 1980-1997

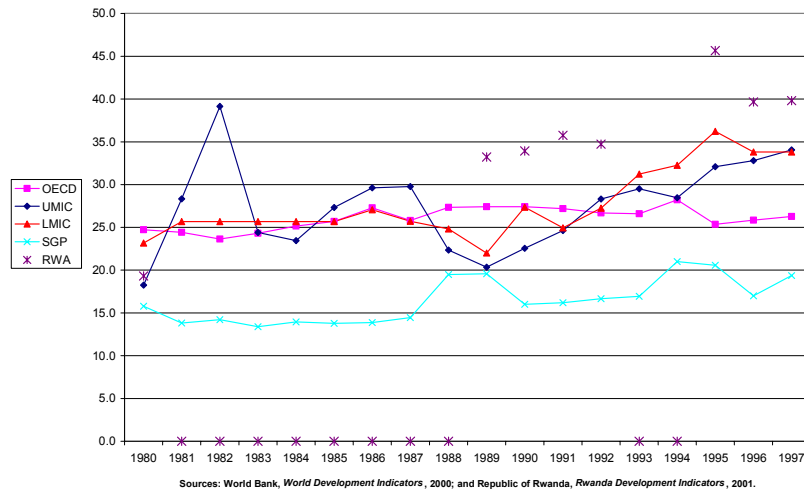


Chart 3. Taxes on Income, Profits, and Capital Gains (% Current Revenue), 1980-1997

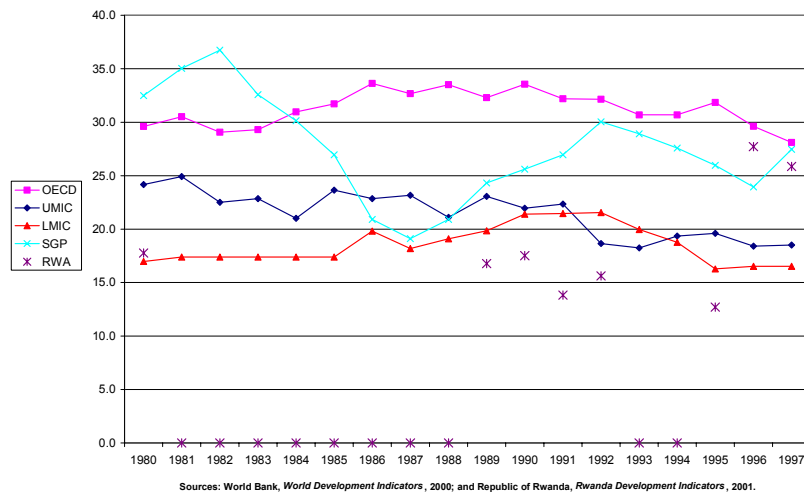


Table 1. Hong Kong and Singapore: Sources of Government Revenue, FY1998-2000
(Percent of Current Revenue)

Hong Kong			
	FY1998	FY1999	FY2000
Tax Revenue	71.9	67.6	71.1
Direct taxes	42.3	15.8	43.4
Earnings and profits tax	41.6	44.5	42.6
Estate duty	0.7	0.7	0.8
Indirect taxes	29.6	22.4	27.7
Duties	3.8	4.5	4.7
General rates	2.8	2.1	4.5
Internal revenue	20.1	13.7	15.8
Bets and sweeps tax	6.1	7.2	7.6
Hotel accommodation tax	2.3	0.1	0.1
Stamp duties	13.2	6.0	7.7
Air passengers' departure tax	0.5	0.3	0.3
Cross Harbor Tunnel passage tax	0.1	0.1	0.1
Motor vehicles taxes	1.9	1.3	1.7
Royalties and concessions	0.9	0.8	1.0
Taxi concessions	0.0	0.0	0.0
Nontax Revenue	28.1	32.4	28.9
Fines and penalties	1.6	0.8	7.1
Properties, investments, and interest	7.9	18.4	14.7
Of which: interest	4.1	12.7	9.8
Reimbursements and contributions	3.2	4.4	4.5
Utilities	3.1	2.6	2.1
Fees and charges	5.1	6.2	6.9
Land transactions	8.1	...	...
Current Revenue	100.0	100.0	100.0

Singapore			
	FY1998	FY1999	FY2000
Tax Revenue	69.8	65.9	60.9
Direct taxes on income and profits	28.8	29.1	27.1
Statutory boards contributions	2.1	5.5	4.5
Taxes on assets	7.1	4.7	3.5
Real estate	6.9	4.6	3.4
Death and gift taxes	0.2	0.1	0.2
Indirect taxes	24.5	21.4	19.6
Goods and services tax	5.8	5.1	5.4
Selective excises on goods	2.7	2.6	1.9
Petroleum products	1.8	1.6	1.3
Tobacco	0.4	0.4	0.2
Liquor	0.5	0.5	0.4
Selective taxes on services	4.2	4.2	4.1
Entertainment duty	0.0	0.0	0.0
Betting said gambling taxes	3.9	3.9	3.7
Tax on public utility and telephone bills	0.3	0.3	0.4
Motor vehicle taxes	5.3	3.7	4.6
Other taxes on goods and services	6.4	5.9	3.6
Import duties	2.2	2.2	2.4
Petroleum products	0.0	0.0	0.0
Tobacco	0.8	0.8	0.8
Liquor	0.5	0.5	0.5
Motor vehicles	0.9	0.8	1.0
Other	0.0	0.0	0.0
Stamp duties	5.1	2.9	3.8
Nontax Revenue	30.2	34.1	39.1
Fees and charges	12.1	9.6	12.3
Investment income	11.5	14.7	17.5
Other	6.6	9.8	9.3
Current Revenue	100.0	100.0	100.0

Source: International Monetary Fund, IMF country reports (<http://www.imf.org/external/pubind.htm>).

**Table 2. Rwanda Excise and Value-Added Tax Rates
(Percent)**

	Excise Tax	Value-Added Tax
Mineral Water	10	15
Soft Drinks	39	15
Locally Manufactured Beer	40	15
Beer	57	15
Wines, Liquors	70	15
Petroleum Products	37	15
Cigarettes	60	15
Other Goods and Services	0	15

Source: Rwanda Revenue Authority, *Taxes and Duties in Rwanda*, no date.

Exhibit 1

Rwanda Trade Simulation Model with Fiscal Policy Enhancements in Bold Typeface

Import Demand

$$(1) \quad M_k^d = C_k^m [P_k^m - \lambda_k \sum_j (a_{jk} P_j^m)]^{\eta_k}$$

where

$$P_k^m = P_k^* (1 + t_k) (1 + s_k + v_k) (1 + v_n)^{-1} / e$$

Export Supply

$$(2) \quad X_k^s = C_k^x [P_k^x - \sum_j (a_{jk} P_j^m)]^{\alpha_k}$$

where

$$P_k^x = P_k^* / e$$

Balance of Payments Equilibrium

$$(3) \quad \sum_k (P_k^* X_k^s - P_k^* M_k^d) + K^* = 0$$

Trade-Related Fiscal Revenues

$$(4) \quad TR = \sum_k t_k (P_k^* M_k^d) / e \quad (\text{Tariff Revenues})$$

$$(5) \quad SR = \sum_k s_k [(1 + t_k) P_k^* M_k^d] / e \quad (\text{Excise Tax Revenues})$$

$$(6) \quad VR = \sum_k \{ v_k [(1 + t_k) P_k^* M_k^d] / e - [\sum_j v_j P_j^m (a_{jk} X_k^s)] \} \quad (\text{VAT Revenues})$$

where

t_k = Tariff rate

s_k = Excise tax rate

v_k = VAT rate (traded goods)

v_n = VAT rate (nontraded goods)

Table 3. Rwanda as an Economywide FTZ: Economic Impacts under Different Indirect Tax Options (Changes in Variables)

Tax Policy Option, Product Sector	Domestic		Trade and Employment					Economic Welfare			Trade-Related Fiscal Revenues			
	Prices		Imports	Exports	Imports	Exports	Employ	Prod.	Con.		Import	Excise		
	Imports	Exports	Qty.	Qty.	Qty.	Qty.	-ment	Surplus	Surplus	Total	Tariff	Tax	VAT	Total
	(Percent)		(Base Frw Mill.)		(Percent)		(MYrs)	-----			(Frw Million) -----			
<u>Base Case: Uniform 15% VAT and Base Excise Taxes</u>														
Agriculture	-1.8	8.5	542	3,462	3.0	24.1	4,130	2,491	20	2,511	-1,923	0	-198	-2,121
Minerals	2.4	8.5	-831	158	-4.1	4.2	113	246	-18	228	-1,207	-145	-75	-1,427
Manufacturing	-2.4	8.5	4,101	192	4.9	18.7	-43	148	145	293	-9,397	30	317	-9,050
All Products	-1.7	8.5	3,812	3,812	3.1	19.9	4,200	2,886	147	3,033	-12,527	-115	44	-12,598
Relative to base (%) <u>1/</u>	...	...	...	...	...	...	0.1	0.4	0.0	0.4	-1.7	0.0	0.0	-1.7
<u>Tax Option 1: Uniform 20% VAT and Base Excise Taxes</u>														
Agriculture	-1.6	8.7	522	3,479	2.8	24.2	4,189	2,513	19	2,532	-1,923	0	302	-1,621
Minerals	1.6	8.7	-590	160	-2.9	4.2	96	251	-8	242	-1,207	-38	1,353	108
Manufacturing	-2.3	8.7	3,901	194	4.7	18.8	-32	150	140	290	-9,397	46	5,074	-4,277
All Products	-1.7	8.7	3,833	3,833	3.1	20.0	4,252	2,913	152	3,065	-12,527	8	6,729	-5,790
Relative to base (%) <u>1/</u>	...	...	...	...	...	...	0.1	0.4	0.0	0.4	-1.7	0.0	0.9	-0.8
<u>Tax Option 2: Uniform 20% VAT and 100% Excise Taxes</u>														
Agriculture	-4.2	5.2	1,024	3,054	5.6	21.3	2,713	1,979	49	2,028	-1,923	0	392	-1,531
Minerals	28.0	5.2	-7,152	97	-35.1	2.6	577	149	-1,981	-1,832	-1,207	3,915	-655	2,052
Manufacturing	-5.3	5.2	9,433	155	11.3	15.1	-328	108	400	508	-9,397	283	5,606	-3,507
All Products	-2.3	5.2	3,305	3,305	2.7	17.3	2,962	2,237	-1,532	704	-12,527	4,198	5,343	-2,986
Relative to base (%) <u>1/</u>	...	...	...	...	...	...	0.1	0.3	-0.2	0.1	-1.7	0.6	0.7	-0.4
<u>Tax Option 3: Uniform 25% VAT and Base Excise Taxes</u>														
Agriculture	-1.5	8.8	504	3,496	2.7	24.4	4,244	2,534	19	2,552	-1,923	0	800	-1,123
Minerals	1.0	8.8	-363	163	-1.8	4.3	79	254	-2	253	-1,207	64	2,813	1,670
Manufacturing	-2.2	8.8	3,712	195	4.4	19.0	-21	152	137	289	-9,397	61	9,824	489
All Products	-1.7	8.8	3,853	3,853	3.2	20.1	4,302	2,940	154	3,093	-12,527	125	13,437	1,035
Relative to base (%) <u>1/</u>	...	...	...	...	...	...	0.1	0.4	0.0	0.4	-1.7	0.0	1.8	0.1
<u>Tax Option 4: Base Case Plus 20% VAT and 100% Excise Tax on Traded Goods in Inelastic Demand ($\eta_k < -1.0$)</u>														
Agriculture	-2.9	5.2	845	2,622	4.6	18.3	2,804	1,748	40	1,788	-1,923	0	-140	-2,063
Minerals	29.8	5.2	-7,468	96	-36.7	2.5	600	148	-2,210	-2,062	-1,207	3,577	-1,590	779
Manufacturing	-5.3	5.2	9,495	154	11.4	15.0	-332	108	403	511	-9,397	258	706	-8,433
All Products	-1.9	5.2	2,872	2,872	2.3	15.0	3,071	2,004	-1,767	237	-12,527	3,834	-1,024	-9,717
Relative to base (%) <u>1/</u>	...	...	...	...	...	...	0.1	0.3	-0.2	0.0	-1.7	0.5	-0.1	-1.3

Sources: Simulation of the Rwanda trade simulation model and Table 2.

1/ Relative to 2001 labor force (3 million persons) for employment, 2001 GDP (Frw 750 billion) for economic welfare and tax revenues.

Table 4. Detailed Solution Results – Base Case: Uniform 15% VAT and Base Excise Taxes

Solution-> free		Description----->	Economywide_FTZ with base VAT and excise tax rates								Trade Related Revenue Changes					
Solution exchange rate ----->		0.921									Excise Value					
(resulting domestic price change		8.5%	Import	Export	Imports	Exports	Imports	Exports	Employ-	Producer	Consumer	Total	Tariff	Tax	Added Tax	Total
Change in.....			Price	Price	Imports	Exports	Imports	Exports	ment	Surplus	Surplus	Welfare	Revenue	Revenue	Revenue	Revenue
			(%)	(%)	(Million Frw)		(%)	(%)	(Man Yrs.)				(Million Frw)			
I	A - LIVE ANIMALS AND ANIMAL PRODUCTS - I		-5.6	0.0	176	0	10.8	0.0	-14	0	6	6	-244	0	13	-231
II	B - VEGETABLE PRODUCTS - II		-1.4	8.5	307	3,462	2.4	24.1	4,143	2,491	14	2,505	-1,282	0	-212	-1,494
	IRISH POTATOES		3.4	8.5	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	BEANS		3.4	8.5	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	SWEET POTATOES		3.4	8.5	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	OTHER VEGETABLES, TUBERS		-5.6	8.5	68	0	3.5	6.3	0	0	2	2	-288	0	-8	-295
	COFFEE		-13.2	8.5	63	1,636	20.6	24.8	2,123	1,169	5	1,174	-76	0	-108	-184
	TEA		-13.2	8.5	0	1,806	24.9	24.8	2,416	1,291	0	1,291	0	0	-122	-122
	MAIZE		3.4	8.5	-5	0	-0.7	N/A	115	0	0	0	-37	0	3	-34
	RICE		3.4	8.5	-38	0	-1.3	N/A	66	0	-1	-1	-146	0	9	-137
	SORGHUM		3.4	8.5	-1	0	-0.5	N/A	9	0	0	0	-5	0	0	-5
	MILLING PRODUCTS		-5.6	8.5	256	0	6.6	6.3	-769	0	8	8	-585	0	4	-581
	SOYBEANS		3.4	8.5	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	LAC; GUMS AND RESINS		3.4	8.5	-3	17	-2.3	4.2	140	27	0	27	-6	0	0	-6
III	C - FATS AND OILS - III		-1.3	8.5	59	0	1.5	0.0	0	0	0	0	-398	0	1	-397
IV	D - MANUFACTURED FOODSTUFFS- IV		-6.9	8.5	676	1	9.2	6.3	-37	1	42	44	-1,232	30	23	-1,179
V	E - MINERAL PRODUCTS - V		2.4	8.5	-831	158	-4.1	4.2	113	246	-18	228	-1,207	-145	-75	-1,427
	CEMENT		3.4	8.5	-35	0	-3.9	4.2	2	0	-1	-1	-45	0	-1	-46
	CASSITERITE		8.5	8.5	0	1	N/A	4.2	0	2	0	2	0	0	0	0
	WOLFRAMITE		8.5	8.5	0	2	N/A	4.2	0	3	0	3	0	0	0	0
	COLUMBITE-TANTALITE		8.5	8.5	0	155	N/A	4.2	41	242	0	242	0	0	0	0
VI	F - CHEMICALS - VI		3.0	8.5	-295	9	-3.1	9.1	68	9	-7	2	-503	0	-3	-506
	PHARMACEUTICAL PRODUCTS		5.9	8.5	-334	0	-9.0	N/A	70	0	-10	-10	-93	0	-21	-114
	FERTILIZERS		8.5	8.5	-113	0	-12.6	N/A	23	0	-5	-5	0	0	-7	-7
	OTHER ESSENTIAL OILS		-5.6	8.5	47	4	10.0	8.5	-10	4	2	5	-70	0	3	-67
	SOAP ETC., WAXES, POLISHES		-5.6	8.5	227	1	30.4	31.9	-41	0	7	8	-112	0	30	-82
VII	G - RUBBER AND PLASTICS - VII		-3.3	8.5	244	4	5.6	8.5	-34	4	7	11	-538	0	15	-522
VIII	H - HIDES AND LEATHER PRODUCTS - VIII		-5.6	8.5	19	29	12.1	8.5	5	31	1	31	-24	0	2	-22
	RAW HIDES AND SKINS		3.4	8.5	0	29	-2.3	8.5	7	31	0	31	0	0	0	0
IX	I - CORK AND WOOD ARTICLES - IX		-5.6	8.5	37	0	8.4	8.5	0	0	1	2	-65	0	2	-63
X	J - PULP AND PAPER PRODUCTS - X		-2.2	8.5	510	0	3.1	21.1	-25	0	17	17	-1,803	0	22	-1,780
XI	K - TEXTILES AND APPAREL - XI		-5.6	8.5	706	139	12.9	34.0	-19	93	23	115	-821	0	48	-773
	TEXTILES		-5.6	8.5	146	135	10.1	33.8	17	90	5	95	-217	0	-4	-221
	APPAREL		-5.6	8.5	560	4	13.9	40.0	-37	2	18	21	-604	0	52	-552
XII	L - FOOTWEAR AND OTHER MADE-UP ARTICLES - XII		2.0	8.5	-40	0	-5.5	8.5	4	0	0	0	-46	0	-4	-50
XIII	M - STONE AND MINERAL PRODUCTS - XIII		-5.6	8.5	188	1	13.5	18.2	-6	1	6	7	-208	0	17	-191
XIV	N - PRECIOUS STONES AND JEWELLERY- XIV		-1.3	8.5	0	0	3.1	8.4	0	0	0	0	0	0	0	0
XV	O - BASE METALS AND METAL PRODUCTS - XV		0.5	8.5	-87	3	-1.1	8.5	2	3	3	5	-660	0	-7	-667
XVI	P - MACHINERY- XVI		-1.8	8.5	937	3	5.3	8.5	-5	3	12	15	-1,876	0	99	-1,777
XVII	Q - TRANSPORT EQUIPMENT - XVII		-5.5	8.5	1,126	0	13.7	8.5	0	0	36	36	-1,227	0	105	-1,122
XVIII	R - PROFESSIONAL EQUIPMENT - XVIII		-1.4	8.5	73	0	3.5	8.5	0	0	1	1	-209	0	7	-202
XIX	S - ARMS AND AMMUNITION - XIX		-3.5	8.5	0	0	2.9	0.0	0	0	0	0	0	0	0	0
XX	T - MISCELLANEOUS MANUFACTURES - XX		-2.8	8.5	-13	0	-1.0	8.5	4	0	2	2	-155	0	-8	-163
	FURNITURE, BEDDING, ETC.		-1.3	8.5	-52	0	-7.4	N/A	9	0	0	0	-69	0	-10	-79
XXI	U - WORKS OF ART - XXI		-13.2	8.5	18	3	15.2	8.5	1	3	2	4	-30	0	0	-30
GR	AGRICULTURE = I + II + III		-1.8	8.5	542	3,462	3.0	24.1	4,130	2,491	20	2,511	-1,923	0	-198	-2,121
MIN	MINERALS = IV		2.4	8.5	-831	158	-4.1	4.2	113	246	-18	228	-1,207	-145	-75	-1,427
MAN	MANUFACTURING = IV + sum(VI:XXI)		-2.4	8.5	4,101	192	4.9	18.7	-43	148	145	293	-9,397	30	317	-9,050
ALL	ALL PRODUCTS		-1.7	8.5	3,812	3,812	3.1	19.9	4,200	2,886	147	3,033	-12,527	-115	44	-12,598

Table 5. Detailed Solution Results -- Tax Option 1: Uniform 20% VAT and Base Excise Taxes

Solution-> frva		Description----->		Economywide_FTZ with vat rates all set to 20%					Trade Related Revenue Changes						
Solution exchange rate ----->		0.920													
(resulting domestic price change		8.7%													
Change in.....		Import Price (%)	Export Price (%)	Imports (Million Frw)	Exports (Million Frw)	Imports (%)	Exports (%)	Employment (Man Yrs.)	Producer Surplus	Consumer Surplus	Total Welfare	Tariff Revenue	Excise Revenue	Tax Added Tax Revenue	Total Revenue
I	A - LIVE ANIMALS AND ANIMAL PRODUCTS - I	-5.5	0.0	174	0	10.7	0.0	-13	0	6	6	-244	0	111	-133
II	B - VEGETABLE PRODUCTS - II	-1.2	8.7	295	3,479	2.3	24.2	4,202	2,513	14	2,526	-1,282	0	-29	-1,311
	IRISH POTATOES	3.5	8.7	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	BEANS	3.5	8.7	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	SWEET POTATOES	3.5	8.7	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	OTHER VEGETABLES, TUBERS	-5.5	8.7	66	0	3.5	6.4	0	0	2	2	-288	0	100	-187
	COFFEE	-13.1	8.7	62	1,644	20.5	24.9	2,135	1,179	5	1,184	-76	0	-339	-415
	TEA	-13.1	8.7	0	1,815	24.7	24.9	2,428	1,302	0	1,302	0	0	-399	-399
	MAIZE	3.5	8.7	-5	0	-0.7	N/A	124	0	0	0	-37	0	43	6
	RICE	3.5	8.7	-40	0	-1.4	N/A	69	0	-1	-1	-146	0	166	20
	SORGHUM	3.5	8.7	-1	0	-0.6	N/A	10	0	0	0	-5	0	6	1
	MILLING PRODUCTS	-5.5	8.7	250	0	6.4	6.5	-752	0	8	8	-585	0	229	-356
	SOYBEANS	3.5	8.7	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	LAC; GUMS AND RESINS	3.5	8.7	-3	18	-2.4	4.2	142	27	0	27	-6	0	7	1
III	C - FATS AND OILS - III	-1.2	8.7	54	0	1.3	0.0	0	0	0	0	-398	0	220	-178
IV	D - MANUFACTURED FOODSTUFFS- IV	-7.0	8.7	688	1	9.4	6.4	-37	1	46	47	-1,232	46	503	-683
V	E - MINERAL PRODUCTS - V	1.6	8.7	-590	160	-2.9	4.2	96	251	-8	242	-1,207	-38	1,353	108
	CEMENT	3.5	8.7	-37	0	-4.1	4.2	2	0	-1	-1	-45	0	46	1
	CASSITERITE	8.7	8.7	0	1	N/A	4.2	0	2	0	2	0	0	0	0
	WOLFRAMITE	8.7	8.7	0	2	N/A	4.2	0	3	0	3	0	0	0	0
	COLUMBITE-TANTALITE	8.7	8.7	0	157	N/A	4.2	41	246	0	246	0	0	0	0
VI	F - CHEMICALS - VI	3.2	8.7	-314	9	-3.3	9.2	72	9	-8	1	-503	0	490	-13
	PHARMACEUTICAL PRODUCTS	6.0	8.7	-342	0	-9.2	N/A	72	0	-11	-11	-93	0	162	69
	FERTILIZERS	8.7	8.7	-114	0	-12.8	N/A	23	0	-5	-5	0	0	35	35
	OTHER ESSENTIAL OILS	-5.5	8.7	46	4	9.8	8.7	-10	4	1	5	-70	0	31	-39
	SOAP ETC., WAXES, POLISHES	-5.5	8.7	225	1	30.1	32.1	-41	0	7	8	-112	0	82	-30
VII	G - RUBBER AND PLASTICS - VII	-3.2	8.7	235	4	5.3	8.7	-33	4	7	11	-538	0	266	-271
VIII	H - HIDES AND LEATHER PRODUCTS - VIII	-5.4	8.7	19	30	11.9	8.7	5	31	1	32	-24	0	11	-12
	RAW HIDES AND SKINS	3.5	8.7	0	30	-2.4	8.7	7	31	0	31	0	0	0	0
IX	I - CORK AND WOOD ARTICLES - IX	-5.5	8.7	36	0	8.2	8.7	0	0	1	2	-65	0	27	-38
X	J - PULP AND PAPER PRODUCTS - X	-2.1	8.7	479	0	2.9	21.2	-24	0	16	16	-1,803	0	936	-866
XI	K - TEXTILES AND APPAREL - XI	-5.5	8.7	690	139	12.6	34.1	-18	93	22	115	-821	0	363	-458
	TEXTILES	-5.5	8.7	143	135	9.9	34.0	17	91	5	95	-217	0	64	-153
	APPAREL	-5.5	8.7	547	4	13.6	40.2	-36	2	17	20	-604	0	299	-305
XII	L - FOOTWEAR AND OTHER MADE-UP ARTICLES - XI	2.2	8.7	-42	0	-5.8	8.7	4	0	0	0	-46	0	33	-13
XIII	M - STONE AND MINERAL PRODUCTS - XIII	-5.5	8.7	183	1	13.2	18.3	-6	1	6	6	-208	0	102	-106
XIV	N - PRECIOUS STONES AND JEWELLERY- XIV	-1.2	8.7	0	0	2.8	8.8	0	0	0	0	0	0	0	0
XV	O - BASE METALS AND METAL PRODUCTS - XV	0.6	8.7	-110	3	-1.3	8.7	4	3	2	5	-660	0	434	-226
XVI	P - MACHINERY- XVI	-1.7	8.7	867	3	4.9	8.7	-4	3	11	14	-1,876	0	1,104	-772
XVII	Q - TRANSPORT EQUIPMENT - XVII	-5.4	8.7	1,099	0	13.3	8.5	0	0	35	35	-1,227	0	610	-617
XVIII	R - PROFESSIONAL EQUIPMENT - XVIII	-1.3	8.7	66	0	3.2	8.7	0	0	1	1	-209	0	123	-86
XIX	S - ARMS AND AMMUNITION - XIX	-3.4	8.7	0	0	2.8	0.0	0	0	0	0	0	0	0	0
XX	T - MISCELLANEOUS MANUFACTURES - XX	-2.7	8.7	-15	0	-1.2	8.7	4	0	1	2	-155	0	63	-92
	FURNITURE, BEDDING, ETC.	-1.2	8.7	-53	0	-7.6	N/A	10	0	0	0	-69	0	25	-45
XXI	U - WORKS OF ART - XXI	-13.1	8.7	18	3	15.0	8.7	1	3	1	4	-30	0	8	-23
GR	AGRICULTURE = I + II + III	-1.6	8.7	522	3,479	2.8	24.2	4,189	2,513	19	2,532	-1,923	0	302	-1,621
MIN	MINERALS = IV	1.6	8.7	-590	160	-2.9	4.2	96	251	-8	242	-1,207	-38	1,353	108
MAN	MANUFACTURING = IV + sum(VI:XXI)	-2.3	8.7	3,901	194	4.7	18.8	-32	150	140	290	-9,397	46	5,074	-4,277
ALL	ALL PRODUCTS	-1.7	8.7	3,833	3,833	3.1	20.0	4,252	2,913	152	3,065	-12,527	8	6,729	-5,790

Table 6. Detailed Solution Results -- Tax Option 2: Uniform 20% VAT and 100% Excise Taxes

Solution-> fret		Description----->		Economywide_FTZ with all vat rates at 20% and all excise rates at 100%								Trade Related Revenue Changes				
Solution exchange rate ----->		0.951														
(resulting domestic price change		5.2%														
Change in.....		Import Price (%)	Export Price (%)	Imports (Million Frw)	Exports (Million Frw)	Imports (%)	Exports (%)	Employment (Man Yrs.)	Producer Surplus	Consumer Surplus	Total Welfare	Tariff Revenue (Million Frw)	Excise Revenue	Added Tax Revenue	Total Revenue	
I	A - LIVE ANIMALS AND ANIMAL PRODUCTS - I	-8.5	0.0	239	0	14.7	0.0	-19	0	12	12	-244	0	112	-132	
II	B - VEGETABLE PRODUCTS - II	-4.4	5.2	585	3,054	4.6	21.3	2,732	1,979	32	2,012	-1,282	0	58	-1,225	
	IRISH POTATOES	0.2	5.2	0	0	N/A	N/A	0	0	0	0	0	0	0	0	
	BEANS	0.2	5.2	0	0	N/A	N/A	0	0	0	0	0	0	0	0	
	SWEET POTATOES	0.2	5.2	0	0	N/A	N/A	0	0	0	0	0	0	0	0	
	OTHER VEGETABLES, TUBERS	-8.5	5.2	105	0	5.5	3.9	0	0	5	5	-288	0	95	-193	
	COFFEE	-15.8	5.2	73	1,445	24.3	21.9	1,857	932	7	939	-76	0	-284	-360	
	TEA	-15.8	5.2	0	1,596	28.6	21.9	2,134	1,029	0	1,029	0	0	-338	-338	
	MAIZE	0.2	5.2	4	0	0.6	N/A	-100	0	0	0	-37	0	40	3	
	RICE	0.2	5.2	-2	0	-0.1	N/A	4	0	0	0	-146	0	154	8	
	SORGHUM	0.2	5.2	1	0	0.7	N/A	-12	0	0	0	-5	0	5	0	
	MILLING PRODUCTS	-8.5	5.2	401	0	10.3	3.8	-1,204	0	20	20	-585	0	232	-353	
	SOYBEANS	0.2	5.2	0	0	N/A	N/A	0	0	0	0	0	0	0	0	
	LAC; GUMS AND RESINS	0.2	5.2	0	11	-0.1	2.6	86	16	0	16	-6	0	6	0	
III	C - FATS AND OILS - III	-4.4	5.2	200	0	5.0	0.0	0	0	5	5	-398	0	223	-175	
IV	D - MANUFACTURED FOODSTUFFS- IV	-7.8	5.2	723	1	9.8	3.9	-42	1	41	42	-1,232	283	425	-524	
V	E - MINERAL PRODUCTS - V	28.0	5.2	-7,152	97	-35.1	2.6	577	149	-1,981	-1,832	-1,207	3,915	-655	2,052	
	CEMENT	0.2	5.2	-2	0	-0.2	2.6	0	0	0	0	-45	0	47	2	
	CASSITERITE	5.2	5.2	0	1	N/A	2.6	0	1	0	1	0	0	0	0	
	WOLFRAMITE	5.2	5.2	0	1	N/A	2.6	0	2	0	2	0	0	0	0	
	COLUMBITE-TANTALITE	5.2	5.2	0	95	N/A	2.6	25	146	0	146	0	0	0	0	
VI	F - CHEMICALS - VI	-0.1	5.2	177	5	1.9	5.7	-32	5	18	23	-503	0	531	27	
	PHARMACEUTICAL PRODUCTS	2.6	5.2	-156	0	-4.2	N/A	33	0	-2	-2	-93	0	178	85	
	FERTILIZERS	5.2	5.2	-71	0	-8.0	N/A	15	0	-2	-2	0	0	39	39	
	OTHER ESSENTIAL OILS	-8.5	5.2	74	2	15.8	5.2	-16	2	4	6	-70	0	33	-37	
	SOAP ETC., WAXES, POLISHES	-8.5	5.2	278	1	37.3	27.8	-50	0	14	14	-112	0	87	-25	
VII	G - RUBBER AND PLASTICS - VII	-6.3	5.2	482	2	11.0	5.2	-66	2	20	23	-538	0	286	-252	
VIII	H - HIDES AND LEATHER PRODUCTS - VIII	-8.4	5.2	31	18	19.3	5.2	1	18	2	20	-24	0	13	-11	
	RAW HIDES AND SKINS	0.2	5.2	0	18	-0.1	5.2	4	18	0	18	0	0	0	0	
IX	I - CORK AND WOOD ARTICLES - IX	-8.5	5.2	58	0	13.3	5.2	0	0	3	3	-65	0	29	-37	
X	J - PULP AND PAPER PRODUCTS - X	-5.2	5.2	1,263	0	7.7	17.4	-61	0	48	48	-1,803	0	984	-818	
XI	K - TEXTILES AND APPAREL - XI	-8.5	5.2	1,095	122	20.0	29.9	-47	75	54	128	-821	0	410	-411	
	TEXTILES	-8.5	5.2	202	118	13.9	29.7	12	73	10	83	-217	0	70	-147	
	APPAREL	-8.5	5.2	894	3	22.2	35.7	-59	2	44	46	-604	0	340	-264	
XII	L - FOOTWEAR AND OTHER MADE-UP ARTICLES - XI	-1.1	5.2	13	0	1.8	5.2	0	0	1	1	-46	0	39	-6	
XIII	M - STONE AND MINERAL PRODUCTS - XIII	-8.5	5.2	295	1	21.2	14.5	-9	0	14	15	-208	0	115	-94	
XIV	N - PRECIOUS STONES AND JEWELLERY- XIV	-4.4	5.2	0	0	10.6	5.2	0	0	0	0	0	0	0	0	
XV	O - BASE METALS AND METAL PRODUCTS - XV	-2.6	5.2	470	2	5.7	5.2	-53	2	24	26	-660	0	499	-160	
XVI	P - MACHINERY- XVI	-4.8	5.2	2,706	2	15.2	5.2	-16	2	75	76	-1,876	0	1,362	-514	
XVII	Q - TRANSPORT EQUIPMENT - XVII	-8.4	5.2	1,807	0	21.9	5.0	0	0	89	89	-1,227	0	694	-532	
XVIII	R - PROFESSIONAL EQUIPMENT - XVIII	-4.4	5.2	246	0	11.9	5.2	0	0	6	6	-209	0	146	-63	
XIX	S - ARMS AND AMMUNITION - XIX	-6.5	5.2	0	0	5.5	0.0	0	0	0	0	0	0	0	0	
XX	T - MISCELLANEOUS MANUFACTURES - XX	-5.8	5.2	44	0	3.3	5.2	-5	0	4	4	-155	0	66	-89	
	FURNITURE, BEDDING, ETC.	-4.4	5.2	-23	0	-3.3	N/A	4	0	1	1	-69	0	27	-43	
XXI	U - WORKS OF ART - XXI	-15.8	5.2	23	2	18.8	5.2	0	2	2	4	-30	0	8	-23	
GR	AGRICULTURE = I + II + III	-4.8	5.2	1,024	3,054	5.6	21.3	2,713	1,979	49	2,028	-1,923	0	392	-1,531	
MIN	MINERALS = IV	28.0	5.2	-7,152	97	-35.1	2.6	577	149	-1,981	-1,832	-1,207	3,915	-655	2,052	
MAN	MANUFACTURING = IV + sum(VI:XXI)	-5.3	5.2	9,433	155	11.3	15.1	-328	108	400	508	-9,397	283	5,606	-3,507	
ALL	ALL PRODUCTS	-2.3	5.2	3,305	3,305	2.7	17.3	2,962	2,237	-1,532	704	-12,527	4,198	5,343	-2,986	

Table 7. Detailed Solution Results -- Tax Option 3: Uniform 25% VAT and Base Excise Taxes

Solution-> frhv		Description----->		Economywide_FTZ with all vat rates set at 25%								Trade Related Revenue Changes			
Solution exchange rate ----->		0.919										Excise Value			
(resulting domestic price change)		8.8%										Added Tax			
Change in.....		Import Price (%)	Export Price (%)	Imports (Million Frw)	Exports (Million Frw)	Imports (%)	Exports (%)	Employment (Man Yrs.)	Producer Surplus	Consumer Surplus	Total Welfare	Tariff Revenue (Million Frw)	Excise Revenue	Added Tax Revenue	Total Revenue
I	A - LIVE ANIMALS AND ANIMAL PRODUCTS - I	-5.4	0.0	171	0	10.5	0.0	-13	0	5	5	-244	0	209	-35
II	B - VEGETABLE PRODUCTS - II	-1.1	8.8	284	3,496	2.2	24.4	4,257	2,534	13	2,547	-1,282	0	153	-1,129
	IRISH POTATOES	3.6	8.8	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	BEANS	3.6	8.8	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	SWEET POTATOES	3.6	8.8	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	OTHER VEGETABLES, TUBERS	-5.4	8.8	65	0	3.4	6.5	0	0	2	2	-288	0	209	-79
	COFFEE	-13.0	8.8	62	1,651	20.4	25.0	2,145	1,189	5	1,194	-76	0	-571	-647
	TEA	-13.0	8.8	0	1,824	24.6	25.0	2,439	1,313	0	1,313	0	0	-677	-677
	MAIZE	3.6	8.8	-6	0	-0.8	N/A	132	0	0	0	-37	0	82	46
	RICE	3.6	8.8	-41	0	-1.4	N/A	71	0	-1	-1	-146	0	323	177
	SORGHUM	3.6	8.8	-1	0	-0.6	N/A	10	0	0	0	-5	0	11	6
	MILLING PRODUCTS	-5.4	8.8	245	0	6.3	6.5	-735	0	8	8	-585	0	455	-130
	SOYBEANS	3.6	8.8	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	LAC; GUMS AND RESINS	3.6	8.8	-3	18	-2.5	4.3	144	28	0	28	-6	0	13	7
III	C - FATS AND OILS - III	-1.1	8.8	48	0	1.2	0.0	0	0	0	0	-398	0	439	41
IV	D - MANUFACTURED FOODSTUFFS - IV	-7.1	8.8	699	1	9.5	6.5	-37	1	50	51	-1,232	61	987	-184
V	E - MINERAL PRODUCTS - V	1.0	8.8	-363	163	-1.8	4.3	79	254	-2	253	-1,207	64	2,813	1,670
	CEMENT	3.6	8.8	-38	0	-4.2	4.3	2	0	-1	-1	-45	0	93	48
	CASSITERITE	8.8	8.8	0	1	N/A	4.3	0	2	0	2	0	0	0	0
	WOLFRAMITE	8.8	8.8	0	2	N/A	4.3	0	3	0	3	0	0	0	0
	COLUMBITE-TANTALITE	8.8	8.8	0	159	N/A	4.3	42	250	0	250	0	0	0	0
VI	F - CHEMICALS - VI	3.3	8.8	-332	9	-3.5	9.3	76	9	-9	0	-503	0	983	480
	PHARMACEUTICAL PRODUCTS	6.2	8.8	-349	0	-9.4	N/A	73	0	-11	-11	-93	0	345	252
	FERTILIZERS	8.8	8.8	-116	0	-13.0	N/A	24	0	-5	-5	0	0	77	77
	OTHER ESSENTIAL OILS	-5.4	8.8	45	4	9.6	8.8	-9	4	1	5	-70	0	59	-11
	SOAP ETC., WAXES, POLISHES	-5.4	8.8	223	1	29.9	32.2	-40	0	7	7	-112	0	135	23
VII	G - RUBBER AND PLASTICS - VII	-3.1	8.8	226	4	5.1	8.8	-32	4	6	11	-538	0	517	-21
VIII	H - HIDES AND LEATHER PRODUCTS - VIII	-5.3	8.8	18	30	11.6	8.8	5	32	1	32	-24	0	21	-3
	RAW HIDES AND SKINS	3.6	8.8	0	30	-2.5	8.8	7	32	0	32	0	0	0	0
IX	I - CORK AND WOOD ARTICLES - IX	-5.4	8.8	35	0	8.1	8.8	0	0	1	2	-65	0	53	-12
X	J - PULP AND PAPER PRODUCTS - X	-2.0	8.8	450	0	2.8	21.4	-22	0	15	16	-1,803	0	1,850	47
XI	K - TEXTILES AND APPAREL - XI	-5.4	8.8	676	140	12.3	34.3	-17	94	21	115	-821	0	677	-144
	TEXTILES	-5.4	8.8	141	136	9.8	34.2	18	92	4	96	-217	0	132	-85
	APPAREL	-5.4	8.8	534	4	13.3	40.4	-35	2	17	19	-604	0	545	-59
XII	L - FOOTWEAR AND OTHER MADE-UP ARTICLES - XI	2.3	8.8	-44	0	-6.0	8.8	5	0	0	0	-46	0	69	23
XIII	M - STONE AND MINERAL PRODUCTS - XIII	-5.4	8.8	179	1	12.9	18.5	-6	1	6	6	-208	0	187	-22
XIV	N - PRECIOUS STONES AND JEWELLERY - XIV	-1.1	8.8	0	0	2.5	8.8	0	0	0	0	0	0	1	0
XV	O - BASE METALS AND METAL PRODUCTS - XV	0.8	8.8	-131	3	-1.6	8.8	6	3	1	4	-660	0	874	215
XVI	P - MACHINERY - XVI	-1.6	8.8	801	3	4.5	8.8	-4	3	10	13	-1,876	0	2,106	230
XVII	Q - TRANSPORT EQUIPMENT - XVII	-5.3	8.8	1,073	0	13.0	9.0	0	0	33	33	-1,227	0	1,114	-113
XVIII	R - PROFESSIONAL EQUIPMENT - XVIII	-1.2	8.8	60	0	2.9	8.8	0	1	0	1	-209	0	238	29
XIX	S - ARMS AND AMMUNITION - XIX	-3.3	8.8	0	0	2.7	0.0	0	0	0	0	0	0	0	0
XX	T - MISCELLANEOUS MANUFACTURES - XX	-2.6	8.8	-17	0	-1.3	8.8	4	0	1	2	-155	0	133	-21
	FURNITURE, BEDDING, ETC.	-1.1	8.8	-54	0	-7.7	N/A	10	0	0	0	-69	0	60	-10
XXI	U - WORKS OF ART - XXI	-13.0	8.8	18	3	14.9	8.8	1	3	1	4	-30	0	15	-15
GR	AGRICULTURE = I + II + III	-1.5	8.8	504	3,496	2.7	24.4	4,244	2,534	19	2,552	-1,923	0	800	-1,123
MIN	MINERALS = IV	1.0	8.8	-363	163	-1.8	4.3	79	254	-2	253	-1,207	64	2,813	1,670
MAN	MANUFACTURING = IV + sum(VI:XXI)	-2.2	8.8	3,712	195	4.4	19.0	-21	152	137	289	-9,397	61	9,824	489
ALL	ALL PRODUCTS	-1.7	8.8	3,853	3,853	3.2	20.1	4,302	2,940	154	3,093	-12,527	125	13,437	1,035

Table 8. Detailed Solution Results -- Tax Option 4: Uniform 20% VAT and 100% Excise Taxes on Traded Goods in Inelastic Demand

Solution-> flat		Economywide_FTZ with 20% vat rate and 100% excise tax on traded goods with import demand elas. <1, 15% vat on non-trade goods										Trade Related Revenue Changes			
Solution exchange rate ----->		0.951										Excise Value			
(resulting domestic price change		5.2%										Revenue Revenue Added Tax Total			
Change in.....		Import Price (%)	Export Price (%)	Imports (Million Frw)	Exports (Million Frw)	Imports (%)	Exports (%)	Employment (Man Yrs.)	Producer Surplus	Consumer Surplus	Total Welfare	Tariff Revenue (Million Frw)	Excise Revenue	Value Added Tax	Total Revenue
I	A - LIVE ANIMALS AND ANIMAL PRODUCTS - I	-8.5	0.0	249	0	15.3	0.0	-19	0	12	12	-244	0	16	-228
II	B - VEGETABLE PRODUCTS - II	-1.6	5.2	395	2,622	3.1	18.3	2,823	1,748	23	1,771	-1,282	0	-159	-1,441
	IRISH POTATOES	4.5	5.2	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	BEANS	4.5	5.2	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	SWEET POTATOES	4.5	5.2	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	OTHER VEGETABLES, TUBERS	-4.6	5.2	55	0	2.9	3.8	0	0	1	1	-288	0	84	-204
	COFFEE	-12.2	5.2	55	1,240	18.0	18.8	1,603	822	4	826	-76	0	-264	-339
	TEA	-12.2	5.2	0	1,370	21.2	18.8	1,832	908	0	908	0	0	-311	-312
	MAIZE	4.5	5.2	-12	0	-1.7	N/A	292	0	0	0	-37	0	36	-1
	RICE	4.5	5.2	-51	0	-1.7	N/A	88	0	-1	-1	-146	0	144	-3
	SORGHUM	4.5	5.2	-2	0	-1.7	N/A	28	0	0	0	-5	0	5	0
	MILLING PRODUCTS	-8.6	5.2	403	0	10.3	3.8	-1,211	0	20	20	-585	0	6	-579
	SOYBEANS	4.5	5.2	0	0	N/A	N/A	0	0	0	0	0	0	0	0
	LAC; GUMS AND RESINS	4.5	5.2	-4	11	-3.0	2.5	85	16	0	16	-6	0	6	0
III	C - FATS AND OILS - III	-4.4	5.2	202	0	5.1	0.0	0	0	5	5	-398	0	3	-395
IV	D - MANUFACTURED FOODSTUFFS- IV	-7.7	5.2	706	1	9.6	3.8	-43	1	39	40	-1,232	258	-34	-1,009
V	E - MINERAL PRODUCTS - V	29.8	5.2	-7,468	96	-36.7	2.5	600	148	-2,210	-2,062	-1,207	3,577	-1,590	779
	CEMENT	0.1	5.2	-2	0	-0.2	2.5	0	0	0	0	-45	0	0	-45
	CASSITERITE	9.7	5.2	0	1	N/A	2.5	0	1	0	1	0	0	0	0
	WOLFRAMITE	9.7	5.2	0	1	N/A	2.5	0	2	0	2	0	0	0	0
	COLUMBITE-TANTALITE	9.7	5.2	0	94	N/A	2.5	25	145	0	145	0	0	0	0
VI	F - CHEMICALS - VI	-0.2	5.2	184	5	2.0	5.7	-33	5	18	23	-503	0	26	-477
	PHARMACEUTICAL PRODUCTS	2.6	5.2	-153	0	-4.1	N/A	32	0	-2	-2	-93	0	-9	-102
	FERTILIZERS	5.2	5.2	-71	0	-8.0	N/A	15	0	-2	-2	0	0	-4	-4
	OTHER ESSENTIAL OILS	-8.6	5.2	75	2	15.9	5.2	-17	2	4	6	-70	0	5	-65
	SOAP ETC., WAXES, POLISHES	-8.6	5.2	279	1	37.4	27.8	-50	0	14	14	-112	0	33	-79
VII	G - RUBBER AND PLASTICS - VII	-6.3	5.2	485	2	11.0	5.2	-66	2	21	23	-538	0	30	-508
VIII	H - HIDES AND LEATHER PRODUCTS - VIII	-8.5	5.2	31	18	19.4	5.2	1	18	2	20	-24	0	3	-21
	RAW HIDES AND SKINS	4.5	5.2	0	18	-3.0	5.2	4	18	0	18	0	0	0	0
IX	I - CORK AND WOOD ARTICLES - IX	-8.6	5.2	58	0	13.4	5.1	0	0	3	3	-65	0	3	-63
X	J - PULP AND PAPER PRODUCTS - X	-5.3	5.2	1,274	0	7.8	17.3	-62	0	49	49	-1,803	0	57	-1,745
XI	K - TEXTILES AND APPAREL - XI	-8.6	5.2	1,101	122	20.1	29.8	-47	74	54	129	-821	0	83	-738
	TEXTILES	-8.6	5.2	202	118	14.0	29.7	12	72	10	82	-217	0	1	-216
	APPAREL	-8.6	5.2	899	3	22.3	35.7	-59	2	44	46	-604	0	82	-522
XII	L - FOOTWEAR AND OTHER MADE-UP ARTICLES - XI	-1.1	5.2	14	0	1.9	5.2	0	0	1	1	-46	0	1	-45
XIII	M - STONE AND MINERAL PRODUCTS - XIII	-8.6	5.2	296	1	21.3	14.5	-9	0	15	15	-208	0	26	-182
XIV	N - PRECIOUS STONES AND JEWELLERY- XIV	-4.4	5.2	0	0	10.7	5.2	0	0	0	0	0	0	0	0
XV	O - BASE METALS AND METAL PRODUCTS - XV	-2.6	5.2	479	2	5.8	5.2	-53	2	25	26	-660	0	40	-619
XVI	P - MACHINERY- XVI	-4.9	5.2	2,732	2	15.4	5.2	-16	2	76	78	-1,876	0	287	-1,589
XVII	Q - TRANSPORT EQUIPMENT - XVII	-8.5	5.2	1,818	0	22.0	5.0	0	0	90	90	-1,227	0	166	-1,060
XVIII	R - PROFESSIONAL EQUIPMENT - XVIII	-4.5	5.2	248	0	12.0	5.2	0	0	6	6	-209	0	24	-185
XIX	S - ARMS AND AMMUNITION - XIX	-2.5	5.2	0	0	2.0	0.0	0	0	0	0	0	0	0	0
XX	T - MISCELLANEOUS MANUFACTURES - XX	-5.8	5.2	45	0	3.4	5.2	-5	0	4	4	-155	0	-6	-160
	FURNITURE, BEDDING, ETC.	-4.4	5.2	-22	0	-3.2	N/A	4	0	1	1	-69	0	-9	-78
XXI	U - WORKS OF ART - XXI	-15.9	5.2	23	2	18.9	5.2	0	2	2	4	-30	0	0	-30
GR	AGRICULTURE = I + II + III	-2.9	5.2	845	2,622	4.6	18.3	2,804	1,748	40	1,788	-1,923	0	-140	-2,063
MIN	MINERALS = IV	29.8	5.2	-7,468	96	-36.7	2.5	600	148	-2,210	-2,062	-1,207	3,577	-1,590	779
MAN	MANUFACTURING = IV + sum(VI:XXI)	-5.3	5.2	9,495	154	11.4	15.0	-332	108	403	511	-9,397	258	706	-8,433
ALL	ALL PRODUCTS	-1.9	5.2	2,872	2,872	2.3	15.0	3,072	2,004	-1,767	237	-12,527	3,834	-1,024	-9,717