Ex S3.1 Interpreting Model Results 1 Example

Background

For this project you interpret results from a 75% reduction in tariffs on all commodities in South Africa. Since the government will lose tariff revenue, it is important to review possible tax replacement strategies such as income tax changes and value added tax changes. A value added tax works through the price system so affects decisions at the margins, while a change in income tax operates like a "lump sum" tax and does not affect choices at the margin.

Preliminary Analysis

Note the initial tariffs, there is a high tariff on textiles (23%) and on food products (10%), see Table 1. There is a high value added tax charged against a number of commodities such as other manufacturing (31%), minerals (30%), vehicles (28%), metal & minerals (26%), and machinery (25%), see Table 1.

Table 1 Initial tax rates on imports and value added

	Tariffs	Value added
Agriculture	0.07	0.10
Minerals	0.00	0.30
Food products	0.10	0.03
Textiles	0.23	0.07
Petroleum & chemicals	0.04	0.13
Metal & minerals	0.03	0.26
Machinery	0.03	0.25
Vehicles	0.04	0.28
Other manufacturing	0.05	0.31
Services	0.00	0.13

In the base data, tariff revenue is 8.31 and accounts for is 3.88% of government income.

Table 2 Direct tax rates on households

	Direct tax rate
African fem low ed	0.03
African fem mid ed	0.04
African fem high ed	0.09
African male low ed	0.05
African male mid ed	0.06
African male high ed	0.11
Coloured and Asian low ed	0.08
Coloured and Asian high ed	0.12
White low ed	0.12
White high ed	0.20

Direct tax rates differ by households. White high educated households pay the highest income tax at 20%, followed by White low educated households and Coloured and Asian high educated households at 12%, see Table 2.

The replacement of lost tariff income with a tax on household income affects households differently. The tax rates are adjusted equiproportionately, but the initial rates are different (as seen in Table 2). The White high educated household will experience a bigger absolute increase in its income tax rate.

Table 3 Income to households, YH (percent change)

	base closure	TYH tax replace	TV tax replace
	75% Tarriff cut	75% Tarriff cut	75% Tarriff cut
African fem low ed	1.05	1.19	-0.34
African fem mid ed	1.16	1.24	-0.41
African fem high ed	1.02	1.13	-0.14
African male low ed	1.21	1.34	-0.48
African male mid ed	1.20	1.44	-0.31
African male high ed	1.08	1.20	-0.24
Coloured and Asian low ed	0.73	0.93	-0.15
Coloured and Asian high ed	0.85	1.05	-0.13
White low ed	0.89	1.44	0.24
White high ed	0.92	1.33	0.11

Interestingly, when lost tariff revenue is replaced by a direct tax, household incomes increase for all households and it increases more than in the base case where government savings adjusts.

The tax adjustors indicate that the household tax rate has increased by 6%, see Table 4 (as expected for this tax replacement option). However, the savings rate also declines so household income increases as less is needed to finance investment. Investment volumes are fixed in the income tax replacement closure and the cost of investment spending declines so expenditure on investment declines and households can save more.

Table 4 Tax adjustors

	base closure	TYH tax replace	TV tax replace
	75% Tarriff cut	75% Tarriff cut	75% Tarriff cut
VAT scaling	1.00	1.00	1.10
Household Income Tax Scaling Factor	1.00	1.06	1.00
Household and Enterprise Income Tax Scaling Factor	1.00	1.00	1.00
Government consumption demand scaling factor	1.00	1.00	1.00
Savings rate scaling factor for BOTH households and enterprises	1.00	0.95	0.96
Investment scaling factor	0.98	1.00	1.00

Investment spending declines because the price of goods consumed by the investment account (machinery, vehicles, and other manufacturing) decline, see Table 5.

Table 5 Purchaser price (PQD(c)) (percent change)

	base closure	TYH tax replace	TV tax replace
	75% Tarriff cut	75% Tarriff cut	75% Tarriff cut
Agriculture	0.21	0.22	-0.96
Minerals	0.40	0.39	-0.81
Food products	-0.01	-0.01	-1.15
Textiles	-2.50	-2.50	-3.62
Petroleum & chemicals	0.01	0.01	-1.06
Metal & minerals	0.00	0.02	-1.19
Machinery	-0.78	-0.76	-1.93
Vehicles	-1.04	-1.03	-2.20
Other manufacturing	-0.69	-0.68	-1.86
Services	0.72	0.71	-0.48

Table 6 Factor income for distribution, YFDISP (percent change)

	base closure	TYH tax replace	TV tax replace
	75% Tarriff cut	75% Tarriff cut	75% Tarriff cut
Capital	1.16	1.18	-0.23
Land	0.42	0.37	-0.98
African unskilled	1.60	1.63	-0.99
African skilled	0.97	0.92	-0.23
Coloured and Asian unskilled	0.68	0.71	-0.42
Coloured and Asian skilled	0.87	0.83	-0.32
White unskilled	0.83	0.89	-0.23
White skilled	0.92	0.90	-0.25

Furthermore, income from all factor types increases for both the base and the income tax replacement closures, see Table 6. This is because as imports become less expensive, the cost of intermediates in production declines, so there is more income available to pay primary factors.

As seen in Table 7, the value added price increases for all activities in the base closure and with the income tax replacement closure – consistent with the increase in factor incomes.

Table 7 Value added price, PVA (percent change)

	base closure	TYH tax replace	TV tax replace
	75% Tarriff cut	75% Tarriff cut	75% Tarriff cut
Agriculture	0.93	0.95	-0.27
Minerals	1.01	1.02	-0.20
Food products	1.01	1.01	-0.21
Textiles	0.82	0.83	-0.23
Petroleum & chemicals	1.06	1.07	-0.23
Metal & minerals	1.02	1.03	-0.21
Machinery	0.95	0.95	-0.23
Vehicles	1.05	1.06	-0.24
Other manufacturing	0.99	1.00	-0.23
Utilities	1.09	1.10	-0.22
Construction	0.86	0.88	-0.18
Trade	1.01	1.01	-0.22
Services	0.98	0.98	-0.23

Table 8 Welfare changes, Equivalent variation

	base closure	TYH tax replace	TV tax replace
	75% Tarriff cut	75% Tarriff cut	75% Tarriff cut
African fem low ed	0.50	0.48	-0.04
African fem mid ed	0.24	0.21	-0.05
African fem high ed	0.27	0.14	-0.06
African male low ed	0.74	0.66	-0.19
African male mid ed	0.52	0.48	-0.09
African male high ed	0.78	0.39	-0.19
Coloured and Asian low ed	0.22	0.14	-0.02
Coloured and Asian high ed	0.33	0.07	-0.12
White low ed	0.23	0.17	0.03
White high ed	1.33	-0.54	-0.33

Table 9 Household expenditure, HEXP (percent change)

	base closure	TYH tax replace	TV tax replace
	75% Tarriff cut	75% Tarriff cut	75% Tarriff cut
African fem low ed	1.05	1.01	-0.32
African fem mid ed	1.17	1.00	-0.40
African fem high ed	1.02	0.58	-0.11
African male low ed	1.24	1.10	-0.50
African male mid ed	1.22	1.13	-0.29
African male high ed	1.08	0.55	-0.20
Coloured and Asian low ed	0.73	0.49	-0.12
Coloured and Asian high ed	0.85	0.30	-0.08
White low ed	0.89	0.72	0.29
White high ed	0.92	-0.06	0.18

Welfare and household expenditure decline for White high educated households, when there is tax replacement see Tables 8 and 9. However, household income increases for White high educated households, see Table 3. Why does expenditure decline (slightly) when income increases? The White high educated households have a high expenditure share on services (their share is the highest over all households, see the parameter `comhoav(c,h)` in the code) and the price of services increases the most (see Table 5).

To replace tariff revenue lost with a tax on income for white households with high education, `hwhhigh`, let `DTYH` be flexible in the closure file, `stg_int_cl_tyh.inc`

and assign `tyh01(hwhhigh)= 1.` Then, the adjustment to income taxes is applied only to white households with high education.

When value added taxes increase to replace lost tariff revenue, welfare declines for all households except White low educated. The income to all factors declines (see Table 6), consistent with the reduction in the price of value added (see Table 7).

With this closure choice, households pay more for goods and services because they pay the value added tax. As a result, household demand declines.

When value added taxes replace the lost tariff revenue, it hurts the economy's competitiveness on global markets – real exports decline (see Table 10). Total domestic production declines, consistent with the decline in exports.

Table 10 Real macroeconomic totals (percent change)

	base closure	TYH tax replace	TV tax replace
	75% Tarriff cut	75% Tarriff cut	75% Tarriff cut
private consumption	0.90	0.39	-0.18
government consumption	-0.36	-0.38	0.12
investment consumption	-1.79		
absorption	0.22	0.18	-0.09
import demand	2.80	3.09	1.53
export supply	2.63	2.89	1.34
GDP from expenditure	0.25	0.21	-0.10
total domestic production	0.30	0.39	0.12
total intermediate inputs	0.44	0.59	0.30

Challenges

Private consumption increases with income tax replacement but decreases with value added tax as the replacement instrument, see Table 10. When income tax is the replacement instrument, household income actually increases (see Table 3) because household savings declines to meet the fixed volumes of investment spending (see Table 4)– the cost of investment goods decline so total savings declines (see Table 5). Also, the income to all factors increases as intermediate costs decline due to lower tariffs (see Table 7). However,

when a value added tax is used, households pay more for goods. This reduces private consumption for goods. Recall, only households pay the value added tax.

Real government spending declines with income tax replacement closure but increases with the value added tax replacement closure. When there is a value added tax increase, household demand declines, reducing the purchaser price of all goods (see Table 5). Only households pay the value added tax. Real government spending therefore increases. When there is an increase in the income tax, households pay a higher tax rate, but also save less because the cost of fixed investment declines (and there is fixed investment spending in the income tax replacement closure). The net effect on prices is mixed; the price of services increases 0.71percent. Since government only purchases services, real government spending declines.

Welfare for all households is lower under value added tax closure than under the income tax closure, except for white high educated households (see Table 8). Since white educated households have a higher initial tax rate, they have a bigger increase in their income tax rate when income taxes adjust. For all households' payments to factors decline with the value added tax closure (see Tables 6).

Real aggregate exports increase in the base closure and when there is income tax replacement (see Table 10). Domestic production does not increase by as much. But production is moved from the domestic market to the export market as imports displace domestic goods in consumption.