

Chapter 7

Approaches to Estimate
Economy-wide/Indirect
Cost (Both Cases)

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An important feature of the methodology used in the present exercise is that it is able to estimate the economy-wide impacts (cost) of VAW. There are three widely used approaches to capture the economy-wide impacts:

- i. a fixed price multiplier model based on an input-output table or matrix (IOM);
- ii. a fixed price multiplier model using a social accounting matrix (SAM) – which is a super set of the IOM encompassing activities, commodities, factors of production and institutions; and
- iii. a flex price computable general equilibrium (CGE) model – which invokes markets (e.g. product markets, the labour market etc.), behavioural specifications of all agents (e.g. producers, consumers etc.) and closure rules (e.g. defining how the accounts are balanced).

Since the CGE model is a highly data demanding exercise¹ and usually requires a longer time to reach a solution, it was agreed that a SAM-based fixed price model be used to assess the economy-wide impacts of VAW.

No SAM was available for Seychelles; nor was an IOM available for a recent year.

The Global Trade Analysis Project (GATP)² project at the University of Purdue is a repository of IOMs for most of the countries in the world, as the project regularly simulates the welfare impacts of global trade reforms or shocks. Seychelles is not yet included in the list of GTAP countries. However, there is an IOM for Seychelles for 1999 (Valenghi 2004). This IOM includes 16 activities and two factors of production (i.e. one labour and one capital).

The authors of the present example used this 1999 IOM to develop a SAM for 2016. In the *first step*, the 1999 IOM was adjusted upward using price information for 2016. In the *second step*, the Seychelles SAM for 2016 was developed using the 2016 IOM. The SAM 2016 consists of 22 accounts – these are shown in Figure 7.1.

The move from a SAM data framework to a SAM model (also known as a multiplier framework) requires decomposing the SAM accounts into

Figure 7.1 Basic structure of a social accounting matrix (SAM)

		Expenditure columns							
		Activities C1	Commodities C2	Factors C3	Households C4	Government C5	Investment C6	Rest of world C7	Total
Income rows	Activities R1		Domestic Supply						Activity income
	Commodities R2	Intermediate demand			Consumption spending (C)	Recurrent spending (G)	Investment demand (I)	Export earnings (E)	Total demand
	Factors R3	Value-added							Total factor income
	Households R4			Factor payments to households		Social transfers		Foreign remittances	Total household income
	Government R5		Sales taxes and import tariffs		Direct taxes			Foreign grants and loans	Government income
	Savings R6				Private savings	Fiscal surplus		Current account balance	Total savings
	Rest of world R7		Import payments (M)						Foreign exchange outflow
	Total	Gross output	Total supply	Total factor spending	Total household spending	Government expenditure	Total investment spending	Foreign exchange inflow	

Note: R = rows and C = columns.

‘exogenous’ and ‘endogenous’. Generally, accounts intended to be used as policy instruments (for example, government expenditure, investment and exports) are made exogenous and accounts specified as objectives or targets (for example, output, commodity demand, factor return, and household income or expenditure) must be made endogenous. For any given injection into the exogenous accounts of the SAM, influence is transmitted through the interdependent SAM system among the endogenous accounts.

The interwoven nature of the system implies that the incomes of factors, households and production are all derived from exogenous injections into the economy via a multiplier process. The multiplier process is developed here on the assumption that when an endogenous income account receives an exogenous expenditure injection, it spends it in the same proportions as shown in the matrix of average propensities to spend (APS). The elements of the APS matrix are calculated by dividing each cell by the sum total of its corresponding column (please Annex 2 for details on SAM-based modelling).

The multiplier analysis using the SAM framework helps to understand further the linkages between the different sectors and the institutional agents at work within the economy. Accounting multipliers have been calculated according to the standard formula for accounting (impact) multipliers, as follows:

$$y = A y + x = (I - A)^{-1} x = M_a x$$

Where:

y is a vector of endogenous variables (*which is 16 according to SAM 2016, with only the activities account considered endogenous*)

Figure 7.2 Description of Seychelles SAM 2016

SAM accounts	Detailed sector classification
Activities (16)	
	Agriculture and Forestry, Fishing (02)
	Food Processing, Petroleum Products, Other Manufacturing, Electricity and Water, and Construction (05)
	Distribution of Goods, Hotels, Restaurants, Land Transport, Air Transport, Sea Transport, Communications, Other Services and Public services (09)
Factors of Production (02)	
	Labour factor
	Capital factor
Institutions (04)	
	Household
	Government
	Rest of the World
	Savings or Gross Fixed Capital (consolidated capital)

x is a vector of exogenous variables (*which is also 16 according to SAM 2016*)

A is the matrix of average expenditures propensities for endogenous accounts, and

$M_a = (I - A)^{-1}$ is a matrix of aggregate accounting multipliers (generalised Leontief inverse).

The present multiplier model has only one endogenous account (i.e. activities), and hence it can calculate only one type of multiplier (activity multiplier) measures due to changes in any one of the various exogenous accounts.

The economy-wide impacts of the reduced income (resulting from VAW) are examined by changing the total exogenous injection vector, especially household consumption. More specifically, the income losses under the ‘typical’ case is SCR 16 million while it is SCR 239.8 million under the ‘full coverage’ case approach. The base year (i.e. 2016) consumption is adjusted downward for each of the 16 activities according to observed base year shares to determine two separate injections – one for the typical case and other for the full coverage case – into the multiplier framework as exogenous shocks. The simulated results are provided in Table 7.2.

Simulated output loss under the ‘typical’ case is nearly SCR 30 million or 0.155 per cent of 2016 GDP. The services sector was found to be most affected among the three broad sector categories, with a loss of SCR 13.4 million. The total loss to the tourism sector (hotels, restaurants and transport inclusive) was found to be more than SCR 4 million. The output loss for the industry sector has been simulated at SCR 11.8 million, with other manufacturing and food processing bearing the major loss. Agriculture is the least

Table 7.1 Simulated output loss (million SCR)

	Activity description	Output loss (typical case)	Output loss (full coverage case)
1	Agriculture and Forestry	2.87	37.01
2	Fishing	1.78	23.02
Agriculture		4.65	60.03
3	Food Processing	3.83	49.48
4	Petroleum Products	2.07	26.66
5	Other Manufacturing	4.83	62.39
6	Electricity and Water	1.12	14.52
7	Construction	0.00	0.00
Industry		11.86	153.05
8	Distribution of Goods	2.11	27.26
9	Hotels	0.10	1.26
10	Restaurants	0.54	6.99
11	Land Transport	0.72	9.34
12	Air Transport	1.72	22.16
13	Sea Transport	1.03	13.28
14	Communications	3.83	49.41
15	Other Services	3.32	42.89
16	Public Services	0.00	0.00
Services		13.37	172.59
Total		29.88	385.68
<i>Memorandum items</i>			
<i>As percent of GDP</i>		<i>0.155</i>	<i>1.997</i>
<i>Indirect effect</i>		<i>0.144</i>	<i>1.856</i>
<i>Induced effects</i>		<i>0.011</i>	<i>0.141</i>
Source: Based on Seychelles SAM model.			

affected sector, with an output loss of SCR 4.7 million. Indirect impacts are overwhelming large just over 0.14 per cent, while the induced impact is small at 0.011 per cent.

Simulated output loss under the ‘full coverage’ case is substantially larger than under the ‘typical case’ due to larger income loss of 239.8 million SCR (compared to only 16 million SCR in the typical case). The simulated output loss is SCR 385.7 million or 1.997 per cent of 2016 GDP. Again, the services sector is the most affected sector, with an output loss of SCR 172.6 million. The total loss to the tourism sector (hotel and transport inclusive) was found to be SCR 53 million. The output loss for the industry sector was simulated at SCR 153 million. Loss for agriculture is around SCR 60 million. Shares of

Table 7.2 Estimated economic cost of violence (Seychelles)

Cost category	Typical case				Full coverage case		
	Victims	SCR	\$		Victims	SCR	\$
A. Income Loss							
1. Irreversible (deaths)	1	304,288	23,407		12	3,651,456	280,881
2. Reversible (Income loss)	609	15,472,031	1,190,156		9,331	236,156,062	18,165,851
i. Employment Income loss	609	3,706,228	285,094		9,331	55,884,259	4,298,789
ii. Missing value of lost household work	609	11,765,803	905,062		9,331	180,271,803	13,867,062
Total		15,776,319	1,213,563			239,807,518	18,446,732
B. Healthcare							
1. Sexual violence	14,121	55,363,463	4,258,728		14,121	55,363,463	4,258,728
2. Domestic violence	75,085	60,504,810	4,654,216		75,085	60,504,810	4,654,216
Total		115,868,273	8,912,944			115,868,273	8,912,944
C. Law enforcement and judiciary							
1. Cost of service call by police	501	96,443	7,419		2,893	556,821	42,832
2. Registration and administration cost of case	501	521,040	40,080		2,893	3,008,282	231,406
3. Protection	262	225,320	17,332		1,513	1,300,910	100,070
4. Probation/Arrest	137	6,678,750	513,750		791	38,560,503	2,966,193
5. Eviction	58	94,250	7,250		335	544,163	41,859
6. Sexual offences	108	178,470	13,728		2,488	4,111,817	316,294
7. Long term detention (prison)	9	1,921,725	147,825		52	11,095,292	853,484
Total		9,715,998	747,384			59,177,788	4,552,138

(Continued)

Table 7.2 Estimated economic cost of violence (Seychelles) (Continued)

Cost category	Typical case		Full coverage case	
	Victims	SCR	Victims	SCR
D. Social services				
1. Case completion for Family Tribunal	252	201,600	2,893	2,314,063
2. Mediating self-referral cases	224	13,440	4,151	249,051
3. Counselling services	151	60,480	1,736	694,219
Total		275,520		3,257,333
E. Specialised services				
Hotline				
F. Education services				
Learning time lost				
G. Personal expenses				
1. Loss of personal property	122	1,827,000	579	8,677,737
2. Loss of personal income	104	1,552,950	492	7,376,076
3. Personal expenses incurred	122	3,288,600	579	15,619,927
Total		6,668,550		31,673,740
Total direct cost		205,978,759		507,458,753
Total economy-wide cost		29,876,327		385,676,228
Total cost		235,855,087		893,134,981
Total direct cost as % of GDP		1.067		2.628
Total economy-wide cost as % of GDP		0.155		1.997
Total cost as % of GDP		1.221		4.625
Source: Seychelles costing framework.				

the indirect and induced effects are 1.856 per cent and 0.141 per cent of 2016 GDP respectively.

Notes

- 1 Generally, all data and parameters required for numerical specifications may not be available for countries like Seychelles where a SAM is not readily available.
- 2 the GTAP 9 Data Base features 2004, 2007 and 2011 reference years, as well as 140 regions for all 57 GTAP commodities.

References

Valenghi, JP (2004), 'Sustainable Tourism Development in the Seychelles: Economic effects of possible tourism development scenarios for the Seychelles', Diploma Thesis, University of Zurich, October.