ISIM-MAMS Exercises: Interpretation of Results; Fiscal Space

Martín Cicowiez
(CEDLAS-UNLP)

Marco V. Sanchez
(UN-DESA/DPAD)

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Definition of Scenarios: Shocks

- **aid-hd** = increase in foreign aid; during 2011/12 – 2015/16; 10% GDP share 2011/12-2015/16; spending on human development
- **aid-infra** = increase in foreign aid; during 2011/12 – 2015/16; 10% GDP share 2011/12-2015/16; spending on infrastructure
- **dirtax-hd** = increase in direct tax rate; during 2011/12-2015/16; three times relative the base year value; spending on human development
- **dirtax-infra** = increase in direct tax rate; during 2011/12-2015/16; three times relative the base year value; spending on infrastructure

Definition of Scenarios: Closure

- Government (**govclossim**) = **government spending** is the clearing variable for the government budget
- Savings-Investment (**siclossim**) = **household investment** is the clearing variable (i.e., endogenous real growth, GDP and absorption shares).

Definition of Scenario aid-hd: Rules Gov Spending (**govspndrulesim**)

- c-edupgov = flexible government consumption
- c-edusgov = fixed educational quality
- c-edutgov = fixed educational quality
- c-healthgov = flexible government consumption
- c-wtsn = flexible government consumption
- c-oinf = fixed growth rate at ref values
- c-publicadm = fixed growth rate at ref values

Definition of Scenarios: Rules Gov Receipts (**govrecrulesim**)

- tax-dir = fixed rates at ref values
- tax-vat = fixed rates at ref values
- tax-imp = fixed rates at ref values
- trgovrow = fixed GDP share
- trgovngov = fixed growth rate at ref values
- gborz = fixed growth rate at ref values
- gbormsz = fixed growth rate at ref values
- fborgov = fixed growth rate at ref values

Definition of Scenarios: Rules Non-Gov Payments (**ngovpayrulesim**)

- trngovrow = fixed growth rate at ref values
- trfacrow = fixed growth rate at ref values
- fborngov = fixed growth rate at ref values
- fdiz = fixed growth rate at ref values

Definition of Scenarios: Transfers from RoW to Gov; GDP Share

	A	B	C	D	E	F	G	H	I	J
23		**govrecgdpsim(sim,ac,t1)**				government receipt ac (GDP share)				
24		**sim**	**ac**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
25	X	aid-hd	trgovrow	0.02627611	0.02627611	0.1	0.1	0.1	0.1	0.1
26		Add row								

Key Aspects of Base Year: BoP

INDICATOR		GDPshr
Outflows	Imports	33.5
	Private transfers to RoW	3.0
	Official transfers to RoW	0.0
	Factor income to RoW	1.6
	Net interest income of RoW	0.2
	Total	38.2
Inflows	Exports	20.6
	Private transfers from RoW	6.5
	Official transfers from RoW	2.6
	Factor income from RoW	0.0
	Government borrowing	2.5
	Private borrowing	1.3
	FDI	4.7
	Total	38.2

Key Aspects of Base Year: Gov Budget

INDICATOR		GDPshr
Receipts	Direct taxes	4.0
	Import tariffs	5.9
	Export taxes	0.0
	Other indirect taxes	2.2
	Private transfers	0.3
	Foreign transfers	2.6
	Factor income	0.0
	Domestic borrowing	2.3
	Foreign borrowing	2.5
	Total	19.9
Spending	Consumption	9.7
	Fixed investment	5.5
	Stock change	0.0
	Private transfers	3.6
	Foreign transfers	0.0
	Domestic interest payments	0.9
	Foreign interest payments	0.2
	Domestic capital transfers	0.0
	Total	19.9

Key Aspects of Base Year: Factor Intensity

Activity	f-labn	f-labs	f-labt	f-capprv	f-land	total
a-agric	20.5	1.5	0.7	6.6	70.7	100.0
a-flowers	29.6	2.2	0.9	21.8	45.4	100.0
a-coffee	39.7	3.0	1.3	18.1	37.9	100.0
a-tea	55.6	4.1	1.8	8.5	30.0	100.0
a-fish	11.5	0.9	0.4	87.3		100.0
a-mining	11.3	5.3	1.8	81.7		100.0
a-othfood	13.5	6.4	2.1	78.0		100.0
a-beveragestobacco	17.1	8.0	2.7	22.4	49.9	100.0
a-textil	15.9	7.5	2.5	74.2		100.0
a-petrochemical	11.2	5.3	1.7	81.8		100.0
a-othmnf	16.2	7.6	2.5	73.7		100.0

Key Aspects of Base Year: Factor Intensity – cont.

Activity	f-labn	f-labs	f-labt	f-capprv	f-land	total
a-elect	14.0	7.6	5.0	73.4		100.0
a-wtsn	10.2	17.0	72.9			100.0
a-construc	6.0	3.3	2.1	88.6		100.0
a-publicadm	8.3	12.8	78.9			100.0
a-edupprv	4.2	12.5	66.5	16.9		100.0
a-edusprv	4.2	12.5	66.5	16.9		100.0
a-edutprv	4.2	12.5	66.5	16.9		100.0
a-edupgov	4.8	14.5	80.7			100.0
a-edusgov	7.0	21.1	71.9			100.0
a-edutgov	2.9	7.4	89.8			100.0
a-healthprv	3.1	9.2	48.8	38.9		100.0
a-healthgov	5.0	15.0	80.0			100.0
a-oinf	10.1	17.0	72.9			100.0
a-othsvc	14.4	7.8	5.1	72.7		100.0

Key Equations and Variables: Government Income

$$YG_t = \sum_{i \in INSDNG} TINS_{i,t} \cdot YI_{i,t} + \sum_{f \in F} tf_{f,t} \cdot YF_{f,t} + \sum_{a \in A} ta_{a,t} \cdot PA_{a,t} \cdot QA_{a,t}$$

$$+ \sum_{a \in A} tva_{a,t} \cdot PVA_{a,t} \cdot QVA_{a,t} + \sum_{c \in CM} tm_{c,t} \cdot pwm_{c,t} \cdot QM_{c,t}$$

$$+ \sum_{c \in CE} te_{c,t} \cdot \overline{PWE}_{c,t} \cdot QE_{c,t} \cdot EXR_t + \sum_{c \in C} tq_{c,t} \cdot PQ_{c,t} \cdot QQ_{c,t}$$

$$+ \sum_{f \in F} YIF_{gov,f,t} + \sum_{i \in INSDNG} TRII_{gov,i,t} + \overline{TRNSFR}_{gov,row,t} \cdot EXR_t$$

Key Equations and Variables: Government Consumption

$$QG_{c,t} = QG_{c,t-1} \cdot \left(1 + qggrwbar_{c,t} + \sum_{c' \in C} qg01_{c,c',t} \cdot QGGRW_{c',t} \right)$$

Key Equations and Variables: Total Factor Productivity

$$QVA_{a,t} = ALPHAVA_{a,t} \cdot \left(\sum_{f \in F} \delta_{f,a}^{va} \cdot \left(fprd_{f,a,t} \cdot QF_{f,a,t} \right)^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}}$$

$$ALPHAVA_{a,t} = ALPHAVA2_{a,t} \cdot \prod_{f \in FCAP} \left[\frac{\sum_{i \in INS} QFINS_{i,f,t}}{\sum_{i \in INS} QFINS_{i,f}^{0}} \right]^{tfpelasqg_{a,f,t}}$$

$$\cdot \left(\frac{\sum_{t' \in T} tfptrdwt_{t,t'} \cdot TRDGDP_{t'}}{TRDGDP^{0}} \right)^{tfpelastrd_a}$$

Key Equations and Variables: Balance of Payments (in FCU)

$$\sum_{c} pwm_{c,t} \cdot QM_{c,t} + \frac{\sum_{f} YIF_{row,f,t}}{EXR_t} + \frac{\sum_{i \in insdng} TRII_{row,i,t}}{EXR_t}$$

$$+\overline{TRNSFR}_{row,gov,t} + \sum_{i \in insd} fintrat_{i,t} \cdot FDEBT_{i,t} =$$

$$\sum_{c} pwe_{c,t} \cdot QE_{c,t} + \sum_{i \in insdnh} \overline{TRNSFR}_{i,row,t} + \sum_{h} trnsfrpc_{h,row,t} \cdot \overline{POP}_{h,t}$$

$$+\sum_{f} \overline{TRNSFR}_{f,row,t} + \sum_{i \in insd} \overline{FBOR}_{i,t} + fdi_{row,t}$$

In words, outflows of foreign exchange (left) = inflows of foreign exchange (right)

Key Equations and Variables: Import and Export Prices

$$PM_{c,t} = pwm_{c,t} \cdot \left(1 + tm_{c,t}\right) \cdot EXR_t$$

$$\frac{QM_{c,t}}{QD_{c,t}} = \left(\frac{PDD_{c,t}}{PM_{c,t}} \cdot \frac{\delta_c^q}{1-\delta_c^q} \right)^{\frac{1}{1+\rho_c^q}}$$

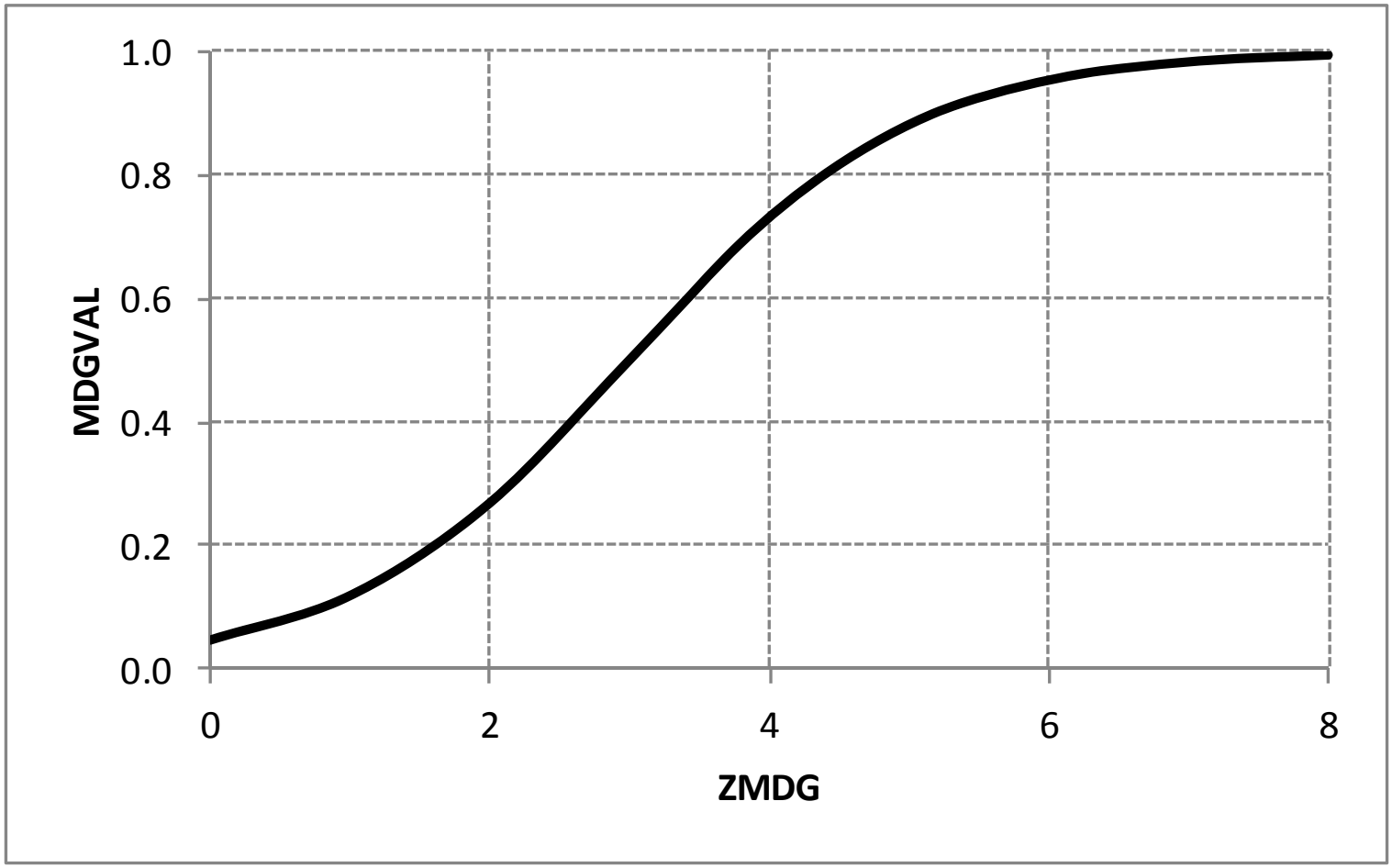
$$PE_{c,t} = pwe_{c,t} \cdot \left(1 - te_{c,t}\right) \cdot EXR_t$$

$$\frac{QE_{c,t}}{QD_{c,t}} = \left(\frac{PE_{c,t}}{PDS_{c,t}} \cdot \frac{1-\delta_c^t}{\delta_c^t} \right)^{\frac{1}{\rho_c^t - 1}}$$

MDG and Education Module Elasticities and Determinants

MDG	Service per capita or student	Consump-tion per Capita	Wage incen-tives	Public infra-structure	Other MDGs
2–Primary schooling	X	X	X	X	4
4-Under-five mortality	X	X		X	7w,7s
5-Maternal mortality	X	X		X	7w,7s
7w-Water	X	X		X	
7s-Sanitation	X	X		X	

Logistic Function



ZMDG = intermediate variable for standard MDGs defined by constant-elasticity function

Key Equations and Variables: MDG Production

$$MDGVAL_{mdg,t} = ext_{mdg}^{mdg} + \frac{\alpha_{mdg}^{mdg}}{1 + e^{\left(\gamma_{mdg}^{mdg} + \beta_{mdg}^{mdg} \cdot ZMDG_{mdg,t}\right)}}$$

where

mdg = selected MDG indicators

t = time

ext = maximum value MDGs 7w and 7s; minimum value MDGs 4 and 5

α = calibration constant

β = calibration constant

γ = calibration parameter

MDGVAL = value for MDG indicator

ZMDG = intermediate variable; defined by constant elasticity

Key Equations and Variables: MDG Production – cont.

$$ZMDG_{mdg,t} = \alpha_{mdg}^{mdgce} \cdot \prod_{\substack{cmdg \in \\ CMDG}} \left(\sum_{c \in C \,|\, (cmdg,c) \in MCM} \frac{QQ_{c,t}}{pop_t^{tot}} \right)^{\varphi_{mdg,cmdg}^{m}}$$

$$\cdot \prod_{\substack{f \in \\ FCAPGOVINF}} \left(\sum_{i \in INS} QFINS_{i,f,t} \right)^{\varphi_{mdg,f}^{m}}$$

$$\cdot \left(\prod_{\substack{mdg' \in \\ MDGSTD}} MDGVAL_{mdg',t}^{\varphi_{mdg,mdg'}^{m}} \right) \cdot QHPC_t^{\varphi_{mdg,hhdconspc}^{m}}$$

Macro Results

		Final year		
Indicator	2009	base	aid-hd	aid-infra
Absorption	392.01	6.26	7.83	7.83
Consumption - private	276.70	6.09	6.79	6.72
Consumption - government	33.60	6.59	13.55	7.46
Fixed investment - private	61.73	6.64	6.77	6.23
Fixed investment - government	19.03	7.74	14.19	23.28
Stock change	0.96	Eps	Eps	Eps
Exports	71.53	7.37	2.90	3.96
Imports	116.28	6.33	7.78	8.09
GDP at factor cost	319.17	6.50	6.92	6.94
Total factor employment (index)	Eps	4.96	5.71	5.73
Total factor productivity (index)	Eps	1.54	1.21	1.21
Real exchange rate (index)	Eps	0.25	-1.14	-0.73
Headcount poverty rate (%)		Eps	Eps	Eps

MDG Indicators

	1990	2009	goal2015	base	aid-hd	aid-infra
mdg1	56.00		28.00			
mdg2		15.50	100.00	60.06	97.90	91.94
mdg4	160.00	126.73	56.00	89.52	67.27	75.82
mdg5	506.00	388.94	131.00	279.58	213.07	238.78
mdg7w	44.00	73.80	89.00	77.63	78.26	80.62
mdg7s	43.00	63.78	71.50	65.49	65.78	66.89
Units: % for MDGs 1, 2, 7a, and 7b; per 1000 for MDG 4; per 100,000 for MDG 5						

why there is an improvement? hint: analyze the determinants

Sectoral Results: Government Consumption

	2009	base	aid-hd	aid-infra
c-wtsn	0.02	6.42	26.65	6.42
c-publicadm	23.19	6.58	6.58	6.58
c-edupgov	5.19	6.56	26.79	8.93
c-edusgov	0.93	6.57	21.66	16.53
c-edutgov	1.33	6.59	0.30	9.17
c-healthgov	2.83	6.72	26.96	6.72
c-oinf	0.10	5.58	5.58	18.60
total	33.60	6.59	13.55	7.46

Real Wages by Factor -- Annual Growth from Base Year to Final Year (%)

	2009	base	aid-hd	aid-infra
f-labn	0.38	0.95	1.41	1.29
f-labs	3.18	0.47	1.44	0.80
f-labt	15.82	0.13	1.92	0.27
f-capprv	0.25	1.33	1.91	3.35
f-land	1.00	3.68	2.80	2.21

Real Per Capita Consumption; annual growth from base year to final year (%)

	2009	base	aid-hd	aid-infra
hhd	839.65	2.74	3.42	3.34
total	839.65	2.74	3.42	3.34

Direct Tax Scenarios: Macro Results

		Final year				
Indicator	2009	base	aid-hd	aid-infra	dirtax-hd	dirtax-infra
Absorption	392.01	6.26	7.83	7.83	6.39	6.44
Consumption - private	276.70	6.09	6.79	6.72	4.95	4.90
Consumption - government	33.60	6.59	13.55	7.46	13.60	7.92
Fixed investment - private	61.73	6.64	6.77	6.23	5.43	5.05
Fixed investment - government	19.03	7.74	14.19	23.28	14.05	22.79
Stock change	0.96	Eps	Eps	Eps	Eps	Eps
Exports	71.53	7.37	2.90	3.96	7.24	8.25
Imports	116.28	6.33	7.78	8.09	6.27	6.79
GDP at factor cost	319.17	6.50	6.92	6.94	6.69	6.74
Total factor employment (index)	Eps	4.96	5.71	5.73	5.60	5.68
Total factor productivity (index)	Eps	1.54	1.21	1.21	1.08	1.06
Real exchange rate (index)	Eps	0.25	-1.14	-0.73	0.13	0.15
Headcount poverty rate (%)		Eps	Eps	Eps	Eps	Eps

Additional Fiscal Space Scenarios

- **domborr-hd** = increase in domestic borrowing; during 2011/12 – 2015/16; 10% GDP share 2011/12-2015/16; spending on human development
- **domborr-infra** = increase in domestic borrowing; during 2011/12 – 2015/16; 10% GDP share 2011/12-2015/16; spending on infrastructure

Domestic Borrowing Scenarios: Macro Results

		Final year				
Indicator	2009	base	aid-hd	aid-infra	domborr-hd	domborr-infra
Absorption	392.01	6.26	7.83	7.83	4.92	5.01
Consumption - private	276.70	6.09	6.79	6.72	5.26	5.28
Consumption - government	33.60	6.59	13.55	7.46	12.29	7.98
Fixed investment - private	61.73	6.64	6.77	6.23	-5.44	-5.76
Fixed investment - government	19.03	7.74	14.19	23.28	10.70	18.40
Stock change	0.96	Eps	Eps	Eps	Eps	Eps
Exports	71.53	7.37	2.90	3.96	5.10	6.12
Imports	116.28	6.33	7.78	8.09	4.71	5.20
GDP at factor cost	319.17	6.50	6.92	6.94	5.08	5.20
Total factor employment (index)	Eps	4.96	5.71	5.73	4.35	4.55
Total factor productivity (index)	Eps	1.54	1.21	1.21	0.73	0.65
Real exchange rate (index)	Eps	0.25	-1.14	-0.73	-0.15	-0.13
Headcount poverty rate (%)		Eps	Eps	Eps	Eps	Eps