ISIM-MAMS Exercises: Interpretation of Results; Increase in Government Tertiary Education Spending – Alternative Financing Mechanisms

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Definition of Scenarios: Shocks

- **edutspnd-taxdir** = increase in edut spending; growth rate is 8.5% higher than in base; with direct-tax financing
- **edutspnd-fbor** = increase in edut spending; growth rate is 8.5% higher than in base; with foreign-borrowing financing
- **edutspnd-dbor** = increase in edut spending; growth rate is 8.5% higher than in base; with domestic-borrowing financing

Definition of **edutspnd-taxdir** Scenario: Macro Closure

- Government (**govclossim**) = **direct tax rate** 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 edutspnd-taxdir Scenario: Rules Gov Spending (**govspndrulesim**)

- c-edupgov = fixed educ quality at ref values
- c-edusgov = fixed educ quality at ref values
- c-edutgov = exog growth rate
- For the rest, we keep BASE default!

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

- Question: do we need to introduce any change?

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

- Question: do we need to introduce any change?

Exercise: can you define the edutspnd-fbor and spndpnd-dbor scenarios?

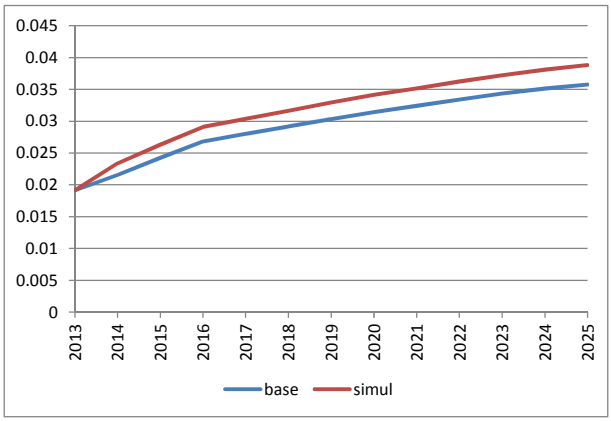
Definition of Scenarios: Tertiary Education Spending; Growth Rate

govspndgrwsim(sim,ac,t growth in government spending on ac in t1

		2007	2008	2009	2010	2011	2012	2013
edutspnd-taxdir	c-edutgov	0.068	0.052	0.052	0.021	0.016	0.016	0.019
edutspnd-fbor	c-edutgov	0.068	0.052	0.052	0.021	0.016	0.016	0.019
edutspnd-dbor	c-edutgov	0.068	0.052	0.052	0.021	0.016	0.016	0.019

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
0.023	0.026	0.029	0.030	0.032	0.033	0.034	0.035	0.036	0.037
0.023	0.026	0.029	0.030	0.032	0.033	0.034	0.035	0.036	0.037
0.023	0.026	0.029	0.030	0.032	0.033	0.034	0.035	0.036	0.037

Definition of Scenarios: Tertiary Education Spending; Growth Rate



Key Aspects of Base Year: Detailed Gov Budget; Incomes

		GDPshr
inc	f-capprv	4.22
inc	hhd	12.07
inc	row	4.91
inc	tax-com	8.38
inc	tax-imp	2.40
inc	tax-dir	8.55
inc	cap-hhd	-2.25
inc	cap-row	0.93
inc	total	39.21

Key Aspects of Base Year: Detailed Gov Budget; Expenditures

		GDPshr
spnd	c-watergov	0.05
spnd	c-edupgov	1.25
spnd	c-edusgov	1.21
spnd	c-edutgov	0.34
spnd	c-healthgov	1.55
spnd	c-publicadm	12.99
spnd	c-othinfra	0.07
spnd	hhd	5.07
spnd	row	0.20
spnd	int-dom	1.09

		GDPshr
spnd	int-row	1.64
spnd	inv-edupgov	0.55
spnd	inv-edusgov	0.54
spnd	inv-edutgov	0.15
spnd	inv-watergov	0.16
spnd	inv-healthgov	1.36
spnd	inv-publicadm	3.23
spnd	inv-othinfra	3.71
spnd	total	39.21

Key Equations and Variables: Government Recurrent Expenditure

$$EG = f\begin{pmatrix} PQ_c,\ QG_c;\ trnsfr_{h,gov}; \\ gintrat_h,\ GDEBT_h; \\ fintrat_{gov},\ FDEBT_{gov},\ EXR \end{pmatrix}$$

$$\begin{bmatrix} \text{government recurrent expenditure} \end{bmatrix} = f\left[\begin{bmatrix} \text{government consumption of c, price of c} \end{bmatrix} + \begin{bmatrix} \text{transfers to households} \end{bmatrix} + \begin{bmatrix} \text{interest on domestic and foreign debt: debt levels and interest rates; exchange rate} \end{bmatrix} \right]$$

Key Equations and Variables: Government Savings

$$GSAV = YG - EG$$

$$\begin{bmatrix} \text{government} \\ \text{savings} \end{bmatrix} = \begin{bmatrix} \text{government} \\ \text{recurrent} \\ \text{revenue} \end{bmatrix} - \begin{bmatrix} \text{government} \\ \text{recurrent} \\ \text{expenditures} \end{bmatrix}$$

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: Household Income and Consumption Spending

$$YI_{i,t} = \sum_{f \in F} YIF_{i,f,t} + \sum_{i' \in insdng} TRII_{i,i',t} + YIINT_{i,t}$$
$$+ trnsfrpc_{i,gov,t} \cdot POP_{i,t} \cdot \overline{CPI}_t + trnsfrpc_{i,row,t} \cdot POP_{i,t} \cdot EXR_t$$

$$EH_{h,t} = \left(1 - \sum_{i \in insdng} shii_{i,h}\right) \cdot \left(1 - MPS_{h,t}\right) \cdot \left(1 - TINS_{h,t}\right) \cdot YI_{h,t}$$

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: Non-Government Investment Demand

$$\sum_{f \in FCAP} PK_f \cdot DKINS_{insng,f} = HSAV - BOR_{gov,h}$$

$$\begin{bmatrix} \text{fixed investment value for non-gov't i (hhd or RoW): sum over product of prices and investments} \end{bmatrix} = \begin{bmatrix} \text{house-hold savings} \end{bmatrix} - \begin{bmatrix} \text{government direct borrowing from hhd h} \end{bmatrix}$$

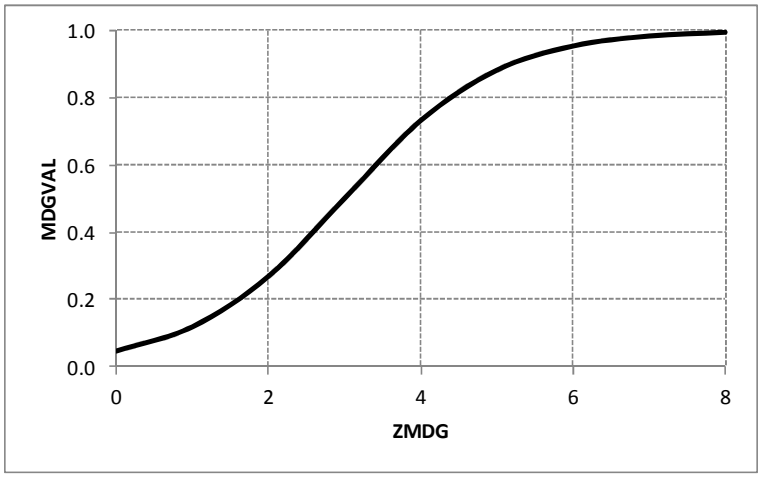
$$- \overline{BORMS}_h + \left(\overline{BOR}_{h,row} + fdi_{row} \right) \cdot EXR_t$$

$$- \begin{bmatrix} \text{net borrowing of monetary system from household h} \end{bmatrix} + \begin{bmatrix} \text{net borrowing from RoW plus FDI} \end{bmatrix}$$

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.

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

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

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

Important!

- Before Running the Setup, Adjust Reporting Period to 2006-2025.

Macro Results; average growth rate 2006-2025 (%)

		Final year			
Indicator	**2006**	**base**	**edutspnd-taxdir**	**edutspnd-fbor**	**edutspnd-dbor**
Absorption	156667.43	3.57	3.57	3.57	3.57
Consumption - private	84687.78	4.70	4.70	4.70	4.70
Consumption - government	26188.88	3.47	3.47	3.47	3.47
Fixed investment - private	32825.10	-0.26	-0.26	-0.26	-0.30
Fixed investment - government	11833.00	3.12	3.12	3.12	3.12
Stock change	1132.66	Eps	Eps	Eps	Eps
Exports	55056.04	5.61	5.61	5.61	5.60
Imports	89878.14	3.90	3.90	3.90	3.90
GDP at factor cost	108719.07	4.43	4.43	4.43	4.42
Total factor employment (index)	Eps	2.86	2.86	2.86	2.85
Total factor productivity (index)	Eps	1.57	1.57	1.57	1.57
Real exchange rate (index)	Eps	-0.04	-0.04	-0.04	-0.04
Headcount poverty rate (%)		Eps	Eps	Eps	Eps

MDG Indicators 2025

	1990	2006	goal2015	base	edutspnd-taxdir	edutspnd-fbor	edutspnd-dbor
mdg1	15.0	65.0	7.5	45.0	0.0	0.0	0.0
mdg2	0.0	58.2	100.0	70.0	70.0	70.0	70.0
mdg4	39.0	21.0	13.0	10.3	10.3	10.3	10.3
mdg5	48.0	19.0	12.0	12.7	12.7	12.7	12.7
mdg7w	92.8	98.4	99.0	98.8	98.8	98.8	98.8
mdg7s	48.0	62.1	70.0	67.1	67.1	67.1	67.1

Why there is no change w.r.t. base? hint: analyze the determinants.

Gross Enrollment and Completion Rates by Cycle 2025 (%)

Indicator	2006	base	edutspnd-taxdir	edutspnd-fbor	edutspnd-dbor
GER-primary	99.1	128.8	128.8	128.8	128.8
GER-secondary	87.0	136.3	136.3	136.3	136.2
GER-tertiary	45.5	80.2	80.2	80.2	80.2
GCR-primary	78.7	108.4	108.4	108.4	108.4
GCR-secondary	31.4	64.2	64.2	64.2	64.2
GCR-tertiary	18.4	38.8	38.9	38.9	38.9
NCR-primary-per	58.2	70.0	70.0	70.0	70.0

Sectoral Results: Government Consumption; average growth rate 2006-2025 (%)

Commodity	2006	base	edutspnd-taxdir	edutspnd-fbor	edutspnd-dbor
c-agr	0.12	4.87	4.87	4.87	4.87
c-textiles	24.92	4.57	4.57	4.57	4.57
c-clothing	143.29	4.79	4.79	4.79	4.79
c-leather	0.03	4.60	4.60	4.60	4.60
c-refinery	528.59	4.53	4.53	4.53	4.53
c-chemicals	173.17	4.77	4.77	4.77	4.77
c-rubplast	0.15	4.70	4.70	4.70	4.70
c-nonmetmin	3.25	4.65	4.65	4.65	4.65
c-metals	0.97	4.57	4.57	4.57	4.57
c-machinery	76.17	4.58	4.58	4.58	4.58
c-vehicles	0.53	4.55	4.55	4.55	4.55
c-othmnf	200.49	4.68	4.68	4.68	4.68
c-elect	344.03	4.64	4.64	4.64	4.64

Sectoral Results: Government Consumption; average growth rate 2006-2025 (%) – cont.

Commodity	2006	base	edutspnd-taxdir	edutspnd-fbor	edutspnd-dbor
c-watergov	66.33	3.59	3.59	3.59	3.59
c-construc	60.99	4.80	4.80	4.80	4.80
c-trade	144.68	4.77	4.77	4.77	4.77
c-hotelrest	221.02	5.14	5.14	5.14	5.14
c-transp	419.50	4.61	4.61	4.61	4.61
c-edupgov	1517.16	5.62	5.63	5.62	5.66
c-edusgov	1476.20	3.01	3.01	3.01	3.04
c-edutgov	417.51	3.01	3.35	3.35	3.35
c-healthgov	1891.78	3.52	3.52	3.52	3.52
c-publicadm	15825.99	2.84	2.84	2.84	2.84
c-othinfra	79.53	4.79	4.79	4.79	4.79
c-othsvc	2572.46	4.50	4.50	4.50	4.50
total	26188.88	3.47	3.47	3.47	3.48

Real Per Capita Consumption; average growth rate 2006-2025 (%)

Household	2006	base	edutspnd-taxdir	edutspnd-fbor	edutspnd-dbor
hhd-q1	7,940	2.26	2.26	2.26	2.24
hhd-q2	10,636	2.13	2.13	2.13	2.11
hhd-q3	13,686	1.99	1.98	1.98	1.97
hhd-q4	16,728	2.21	2.21	2.21	2.19
hhd-q5	27,824	3.55	3.54	3.55	3.52
total	15,363	2.69	2.69	2.69	2.67

Units 2006 = JD.