A technical note on the construction of a 2004 SAM for Yemen[1]

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1. INTRODUCTION

The aim of this technical note is to document in detail the steps that have been followed to build a Social Accounting Matrix (SAM) for Yemen, expressed in millions of Yemeni rials of 2004.

The basic concepts that define the SAM are introduced in Section 2. The data requirements to construct the SAM for Yemen are identified and described in Section 3. The next section spells out the steps that have been followed to construct the SAM and further adapt it for MAMS (***Ma****quette* for **M**DG **S**imulation).[2] Finally, the resulting SAM for Yemen 2004 and some final remarks around this are presented.

[1] This note has been elaborated in the framework of the project "Assessing Development Strategies to Achieve the MDGs in the Arab Region" that UNDP/RBAS and UN-DESA/DPAD are implementing in collaboration with the World Bank. The invaluable suggestions and help of Martin Cicowiez and Marco Sánchez are gratefully acknowledged. All the collaboration of Yemen's country team in compiling key information is highly appreciated and duly recognized. The usual disclaimer applies.

[2] For more details on MAMS, see, Lofgren and Díaz-Bonilla (2008).

2. A STANDARD SAM

A SAM is a matrix representation of the interrelationships existent on an economy at the level of individual production sectors, factors, and institutions. As stated in Round (2003), "it is a comprehensive, flexible, and disaggregated framework which elaborates and articulates the generation of income by activities of production and the distribution and redistribution of income between social and institutional groups".

The SAM is composed of accounts. For each of these, a cell represents a payment column-wise and a receipt row-wise. Hence, columns represent expenditures for each account whereas rows record the matching incomes. Due to the accounting consistency of the SAM, total expenditure of every account must be equal to its total income. In other words, the total of every row must be equal to the corresponding total of the column. The basic structure of a SAM is presented in Table 1.

Table 1: A schematic SAM

	Expenditures								
Receipts	Activities	Commodities	Factors	Enterprises	Households	Government	Capital account	ROW	Total
Activities		Gross output							*Total sales*
Commodities	Intermediate Demand				Household consumption	Government consumption	Investment	Exports	*Aggregate demand*
Factors	Value added							Factor service exports	*Factor income*
Enterprises			Gross profits			Transfers			*Enterprise income*
Households			Wages	Distrib. profits		Transfers		Foreign remittance	*Household income*
Government	Indirect taxes	Tariffs	Factor taxes	Enterprise taxes	Direct taxes				*Government revenues*
Capital account				Retained earnings	Household savings	Government savings		Cap. trans. from abroad	*Savings*
ROW		Imports	Factor service imports		Transfers abroad	Transfers abroad	Capital transfers abroad		*Foreign exchange payments*
Total	*Total costs*	*Aggregate supply*	*Factor expenditure*	*Enterprise expenditure*	*Household expenditure*	*Government expenditure*	*Investment*	*Foreign exchange receipts*	

Source: Reinert, K. A. and Roland-Holst, D. W. (1997)

The logic behind the SAM transactions is the following. Activities buy intermediate inputs; pay for factors of production, thus generating the value added at factor prices; and pay indirect taxes. All these expenditures are financed with the payments that each activity receives for the sale of its output.

Aggregate supply and demand are both recorded in the commodities accounts. For each commodity, the corresponding accounts records for the sell of the aggregate supply (domestic output plus imports and related taxes) as follows: to activities as these demand intermediate goods; to households, government and investment as these demand final goods; and to the rest of the world as this demands the country's exports.

Factors earn returns from their involvement in domestic and foreign production, and they distribute them, net of taxes, to their owners (generally, households and enterprises).

Institutions (households, enterprises[3], government and rest of the world, ROW) receive incomes from production factors and net transfers that can be either expended in purchasing commodities or saved.

Savings from household, the government (that is, the current account balance) and the rest of the world (that is, the current account balance with opposite sign) add to aggregate savings and these, in turn, are equal to the level of investment of the economy.

Gross domestic product (GDP) at factor cost builds as activities remunerate factors of production (that is, value added). GDP at market prices equals GDP at factor cost plus indirect taxes and tariffs, which should also be equal to total final demand plus exports minus imports.

3. DATA

The main source of information for the construction of the Yemeni SAM is the Input-Output (I/O) tables for Yemen 2004 provided by the Yemeni team. They present information on production, intermediate consumption, final demand (i.e., household and government consumption), exports and added value. The figures are expressed in millions of current rials.

[3] Deviating somewhat from the standard setup as this is adapted for MAMS, Yemen's SAM does not separate enterprises from the households. A single account, *hhd*, is taken as representative of the domestic private sector.

The activities are classified according to the International Standard Industrial Classification (ISIC). The commodity breakdown, on the other hand, goes according to the Central Product Classification (CPC).

Information from the balance of payments is the most important input to build the external accounts of the SAM. For the government accounts, data for 2004 from the 2008 Bulletin of Government Finance Statistics provides what was required to build the government account. Additionally, in order to complete the SAM, data computed from the 2005 Household Budget Survey was also used. All these data were provided by the Yemeni team in the framework of the project.

4. STEPS OF THE SAM BUILDING

This section presents a detailed explanation of the steps followed in building the 2004 SAM for Yemen and further adapting it for MAMS. The process has a top-down structure,[4] entailing the following steps: (i) construction of an aggregate SAM (hereafter, macro-sam), (ii) disaggregation of the macro-sam into a matrix with a relatively large sectoral breakdown (hereafter, micro-sam), and (iii) adaptation of the micro-sam to make it suitable for the calibration of MAMS.

4.1. MACRO-SAM

In the first step of the SAM building, a very schematic representation of the economy was generated, using macroeconomic aggregates from the I-O tables.

Information from other sources, adjusted to keep the consistency, was next used to improve the representation of the economy. In particular, data on public finances and balance of payment were factored in to complete the formation of the macro-sam; especially to adjust the current account balances of the government and the rest of the world, among others.

[4] See Sánchez (2006).

The balance of payments provided us with net current transfers between domestic institutions (households and government) and the rest of the world. Data -embedded in Excel file "National -(1990-2000) ACCOUNTS FAIN.xls"- provided by the Yemeni team were used for these purposes. In order to distinguish the value of transfers to households from that of transfers to the government, we used the proportion implicit in the September 2007 IMF document on Republic of Yemen.[5]

As for the government account, the I-O tables only provide information on governmental expenditure, import taxes, indirect taxes and subsidies. But the government also collects direct taxes, oil related income and labor taxes. The government also makes net transfers and interest payments to households and the rest of the world. All the government-related information that was missing in the I-O tables was completed using the 2008 Bulletin of Government Finance Statistics information for the year 2004.

Direct-tax revenue is made up by the total collection through the *Zakat*, the *tax on income and capital returns* and the *property tax*.

Oil revenues include the income earned by the government as it owns part of oil production for which it receives a royalty and also the return to the capital of public companies. This amount is recorded in the SAM as a payment from the capital factor to the government.

Savings from the rest of the world, the negative of the current account balance, were obtained as the difference between foreign-exchange earnings and foreign-exchange spending just as this is recorded in the balance of payments.

Net transfers from the government to the households were calculated residually in order to keep the consistency with the government savings as given in the *Bulletin of Government Finance Statistics*[6]. In order to balance the SAM, household savings were calculated as the difference between household incomes and household expenditures.

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[5] IMF. Republic of Yemen. Statistical Appendix. September 2007. Table 22, page 23.

[6] Notice that government savings, as given by this bulletin, also include the current account balance of public firms in the face of lack of more detailed information for the government balance.

The outcome of these procedures was the macro-sam that is presented in Table 2. By construction, GDP from the macro-sam is equal to GDP as reported in the national accounts, that is, 2563.49 billons of rials.

Table 2: Macro-sam for Yemen 2004 (*billions of rials*)

	a	c	f-lab	f-cap	hhd	gov	row	tax-imp	subs-com	tax-com	tax-fac	tax-dir	s-i	mrg-trade	mrg-trans	dstk	total
a		4424.5															4424.5
c	1803.7				1698.1	321.9	932.4						538.4	357.0	459.6	-18.6	6092.5
f-lab	704.8						13.3										718.1
f-cap	1916.1						-248.9										1667.2
hhd			718.1	1161.8		80.6	223.4										2183.9
gov				505.4			30.0	51.9	-165.7	56.5	0.03	141.6					619.7
row		908.7															908.7
tax-imp		51.9															51.9
subs-com		-165.7															-165.7
tax-com		56.5															56.5
tax-fac			0.03														0.0
tax-dir					141.6												141.6
s-i					344.3	217.1	-41.5										519.9
mrg-trade		357.0															357.0
mrg-trans		459.6															459.6
dstk													-18.6				-18.6
total	4424.5	6092.5	718.1	1667.2	2183.9	619.7	908.7	51.9	-165.7	56.5	0.03	141.6	519.9	357.0	459.6	-18.6	5275.9
Check	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Source: Author's construction based on Yemeni I/O Tables for 2004, and 2004 data from the Balance of Payments and the Bulletin of Government Finance Statistics.

4.2. STANDARD MICRO-SAM

At this stage the aim became to build a more disaggregated SAM, one that would be as large as the data available would allow it. The macro-sam and sectoral information from the I/O tables were used as the main inputs to initiate the disaggregation for activities and commodities. The account totals and different macroeconomic aggregates of the macro-sam were also used as controls during the disaggregation stage.

To use the relevant sectoral detail from the I-O tables, the information from the supply table had to be transposed to fit into the SAM setup. During this transposition the totals of the macro-sam were used as controls. Various other complementary adjustments were implemented:

- Following a suggestion from the Yemeni team, the value for incomes of agriculture's activity of the I/O tables was first changed from 3 million rials to 87.914 millions rials.
- Non-profit final consumption was added to be part of the private sector account, *hhd*.

- Financial intermediation services indirectly measured were registered as an input for the financial sector, following the procedure in Sanchez (2006) whereby they are treated as an input used by the financial sector so that they are at the same time subtracted from this sector's operating surplus.
- The I/O tables separate final demand for health from that for education but the intermediate demand and stock variation for both commodities (services) appear aggregated in a single line. Shares of total demand for both the health and the education sectors were used to distribute intermediate demand.
- Subsidies have positive sign in the I/O tables, but they had to be recorded with opposite sign in the SAM setup.
- Trade and transport margins were consolidated with the transport and trade sectors.
- Direct purchases[7] were consolidated with the transport and communications sector (*c-transpcom*).
- Imports, exports and cif/fob adjustments are all accounted for in the single SAM account pertaining to the rest of the world, *row*.
- The stock variation is a component of the total gross investment; this is expressed in the SAM as a payment done by the savings-investment account, *s-i* to the stock variation account, *dstk*.

The implementation of all these adjustments yielded a micro-sam made up of 30 activities and 39 commodities.[8]

[7] Direct purchases usually represent the expenditure on transport and communication services of the governmental and private sector abroad and from foreign individuals in the country.

[8] The number of activities is not exactly the same as the number of commodities because some activities produce more than one commodity: that is, some activities record "secondary" production.

4.3. A SAM FOR MAMS

The standard micro-sam was further adapted to make it suitable to calibrate a CGE model such as MAMS. The adaptation was to attain the 23 activities and 23 commodities breakdown in Table 3 among other adjustments.

Table 3: Activities and Commodities Classification for the SAM for MAMS

Activities	I-O Table	SAM for MAMS
Agriculture	agric	a-agric
Crude oil	oil	a-oil
Gas	gas	
Other Mining	othmin	
Food	foodprd	a-foodprd
Beverages	bever	
Textile yarn and fabric	textil	a-textil
Apparel	cloth	
Leather and leather products, including footwear	leather	
Wood products	wood	a-paper
Paper products	paper	
Printing and Publishing	print	
Liquid petroleum products	oilref	a-oilref
Petrochemicals, including polyethylene	petrochem	a-chem
Basic chemicals	baschem	
Fertilizers and pesticides	pestfert	
Other chemical products	othchem	
Rubber products industry	rubbprd	
Plastic products industry	plasprd	
Glass and glass products	glass	a-nonmetal
Cement	cement	
Other metals products	othnplast	
Iron and steel industry	steeliron	a-metequip
The price of minerals and non-ferrous metals	jewelry	
Manufacturing machinery and equipment and machinery	machequip	
Industry and transport, vehicles	vehic	
Furniture industry	furnit	a-othmnf
Other industry	othmnf	
Electricity and water	elewat	a-wtsn, a-oinf
Construction	const	a-const
Trade and maintenance	trade	a-othsvc
Hotels and restaurants	hotres	
Transport, storage and communications	transpcom	
Finance and insurance	insur	
Services real estate and business services	realstate	
Recreation and entertainment services	entertain	
Domestic Services	hhdsvc	
Health	health	a-healthng
Education	educ	a-edup, a-edus, a-edut, a-edupng, a-edusng, a-edutng
NGO Education	educngo	a-edupng, a-edusng, a-edutng
NGO Health	healthngo	a-healthng
Public Education	educgov	a-edup, a-edus, a-edut
Public Health	healthgov	a-health
Public administration	pubadm	a-pubadm

Commodities	I-O Table	SAM for MAMS
Agriculture	c-agric	c-agric
Oil		
Gas	c-oilgas	c-oil
Other Mining	c-othmin	
Food (including beverages other than tobacco)	c-foodprd	c-foodprd
Beverages (including tobacco)	c-bever	
Textile yarn and fabric	c-textil	
Apparel	c-cloth	c-textil
Leather and leather products	c-leather	
Footwear industry	c-shoes	
Wood products	c-wood	
Paper products	c-paper	c-paper
Printing and Publishing	c-print	
Petroleum refinery products	c-oilref	c-oilref
Basic Chemicals	c-chemic	
Fertilizers and pesticides	c-pestfert	
Other chemical products	c-othchem	c-chem
Rubber products industry	c-rubbprd	
Plastic products industry	c-plasprd	
Non-metallic minerals products	c-nplasprd	c-nonmetal
Iron and steel industry	c-steeliron	
Precious metals and non-ferrous metals	c-metal	
Machinery and equipment industry	c-machin	
Machinery and electrical appliances	c-electricequip	c-metequip
Equipment, radios, television and communication	c-electronicequip	
Medical devices and measurement instruments, watches	c-medmachin	
Industry and means of transport (vehicles)	c-vehic	
Furniture Industry	c-furnit	c-othmnf
Other industries	c-othmnf	
Electricity and water	c-elewat	c-wtsn, c-oinf
Construction	c-const	c-const
Trade	c-commer	
Hotels and restaurants	c-hotres	
Transport and communications	c-transpcom	
Finance and insurance	c-finsvc	
Services real estate and business services	c-realstate	c-othsvc
Personal services (barber and beauty salons, laundries)	c-persvc	
Recreational services	c-entertain	
Home Services	c-hhdsvc	
Vehicle repair services and personal goods	c-repair	
Financial settlement for activities unclasified products	c-othsvc	
Health	c-health	c-health, c-healthng
Education	c-educ	c-edup, c-edus, c-edut, c-edupng, c-edusng, c-edutng
Public Administration	c-pubadm	c-ogov

Source: Author's construction.

In addition to expanding and adapting the activity and commodity setup, the following adjustments were implemented.

First, following the indications in Cicowiez and Sanchez (2008), a savings account per institution is used instead of only an aggregated savings-investment account *s-i.* Institutions' savings are passed on, in full, to an also institution-specific capital account (i.e., *cap-hhd, cap-gov* and *cap-row*).

Transactions between institutional capital accounts representing lending or borrowing depending on their sign. Payments to investment accounts from an institutional capital account stand for investment in physical capital (leading to ownership of part of the capital stock in question). In the particular case of the rest of the world, this payment represents Foreign Direct Investment (FDI) just as this is recorded in the balance of payments.

The current account surplus implies that the rest of the world is borrowing funds from Yemen; and by definition this surplus must be compensated by the sum of the capital account balance and variation of the foreign exchange reserves. Those funds may be destined to (i) foreign direct investment, (ii) lending (net) to the government and, (iii) lending (net) to the households. The net lending to the government includes the net direct borrowing to the government from the rest of the world, minus the increases in foreign exchange reserves, plus the errors and omissions account of the balance of payments. The net lending to the households equals the net value of the other investments account without the government loans, which were included in the previous item[9].

The difference between the savings from the private sector and the net lending to them from the rest of the world and the value of the private investment equals to the net borrowing of the government from private sector. This includes the net direct borrowing to government from household (on which the government pays interest) and the net increase in the claims of the household sector on the monetary sector (changes in broad money minus the monetary sector credit to the household).

Typically, a SAM specifies the investment in a slightly different setup to that of the SAM for MAMS. The SAM for MAMS includes several investment accounts: one for the private sector, *inv-prv*, and various others for the services that are provided by the government: (i) water and sanitation, *inv-wtsn*, (ii) other infrastructure, *inv-oinf*, (iii) health, *inv-hlt*, (iv) education by level: *inv-edup*, *inv-edus*, *inv-edut*, and (v) other government (mainly, public administration), *inv-ogov*.

[9] See Table 4 in the annex.

This disaggregation implies that investment by sector of origin and by sector of destination had to be specified. We assume that the composition of the capital commodity is the same independently of the sector of destination by keeping the disaggregation of investment by sector of origin as this is initially accounted for in the SAM.

In order for us to disaggregate investment by sector of destination, the column for the *s-i* account of the SAM had to be split up into the aforementioned seven investment accounts. As a first step investment was separated into public and private using the ratio of public investment to total investment.[10]

The information on the destination of public investment initially followed a classification different from what MAMS would require.[11] To make it suitable for MAMS this information was regrouped as follow:

- To compute the investment in the public sectors of health (*inv-hlt),* education by level (*inv-edup, inv-edus and inv-edut*) and other government (*inv-ogov*), the value of investment on "Producers of Government Services" and "Community and personal services" was first summed up and subsequently this was slit up using these sectors' share of VA as these appear in the I-O tables.
- For the investment on water and sanitation, *inv-wtsn*, the value of investment in electricity and water was multiplied by the ratio of value added on water provided by the Yemeni team over the value added on water and electricity on the I/O tables (i.e., 26.3% of investment in water and electricity was assigned to be carried out only in the water and sanitation sector).[12]
- Investment on other government infrastructure, *inv-oinf*, is basically comprised of investment in electricity, transport, storage and communications, once, as

[10] This ratio is calculated using the information presented in the investments.xls excel file provided by the Yemeni team.
[11] See Table 5 in the annex. This information was provided by the Yemeni team in the excel file "investments.xls".
[12] This procedure was followed because the labor income share was the only available piece of information to disaggregate the sectors, given that in the I/O tables water and sanitation provision is accounted for together with the provision of electricity.

explained in the previous step, investment in water and sanitation had been accounted separately.

- All public investment in agriculture, forestry and hunting, mining and quarrying, manufacturing, construction and building, wholesale and retail trade, restaurants, hotels and repairs, and financing and insurance was considered as public investment having been made in the private capital stock.

The use of this reclassification enable the computation of shares (see Table 6 in the annex) the use of which, in turn, permitted to split up public investment in accordance with the MAMS setup.

Second, the SAM for MAMS includes two accounts for domestic and external interest payments (that is, *int-dom* and *int-row*, respectively). To fill in these accounts, interest payments by the government were taken out of current transfers from the government to the private sector in the domestic economy and to the rest of the world, and the net external financing obtained by the government as declared in the Bulletin of Finances.

Third, labor was disaggregated into three types according to the educational level as follows: (i) unskilled, for workers with incomplete secondary education; (ii) semi-skilled, for individuals who have completed secondary education, with or without incomplete tertiary education, and (iii) skilled, only for workers with complete tertiary education. In order to do so, labor income shares by level of education and sector were calculated from the 2005 Budget Household Survey.[13]

Fourth, the education sector comprising both the activity and the commodity (service) that this produces was split up by educational cycle (primary, secondary[14] and tertiary[15]) and provider (public and private). Data on enrolment and cost per enrolled

[13] See Table 7 in the Annex.

[14] Secondary education includes vocational training.

[15] Tertiary education includes technical education.

student provided by the Yemeni team -in Excel file "education data.xls"- was used to disaggregate the education accounts.[16]

Private education (commodity-wise) by level is produced by the corresponding private activity and demanded by households. Public education, on the other hand, is produced by the public education activities and exclusively demanded by the government.

Fifth, the standard micro-sam separately specified two activities for public health and private health, but a similar breakdown at the commodity level had not been carried out. To account for such commodity breakdown the following was assumed: that the private health activity produces the private health commodity that is consumed by households, and that the public health activity produces the public commodity that is demanded by the government.

Finally, MAMS specifies a single sector (activity + commodity) for the provision of water and sanitation. In the I/O tables, on the other hand, water and sanitation provision is accounted for together with the provision of electricity. In order to separate electricity from water and sanitation for the activity/commodity setup, the same strategy that had been used to separate investment was followed here. That is, using the information provided by the Yemeni team on the value added, intermediate demand and production of water over the total of water and electricity. The remaining share, corresponding to electricity, was included as part of the so-called "other public infrastructure" sector.

[16] See Table 8 in the Annex.

4.4. FINAL ADJUSTMENTS

Measurement Unit

As a technical issue, the software used to run the CGE model works better if the values are not very large. Because of this, the SAM was ultimately denominated in billions of rials rather than in millions of rials.

Balancing

Yemeni I/O Tables present very significant statistical discrepancies. Given this, and the use of different sources of information, various accounting discrepancies between column and row totals needed to be eliminated. Various methods have been proposed in the literature to balance SAMs.[17] One of the more common techniques being used is the cross-entropy method. This one minimizes the distance between the original unbalanced SAM and a newly balanced SAM, subjecting the process to a constrained problem to keep corresponding row and column sums in balance. That is, the following minimization problem is solved:

$$\min H = \sum_i \sum_j t_{ij}^1 \ln \frac{t_{ij}^1}{t_{ij}^0} = \sum_i \sum_j (t_{ij}^1 \ln t_{ij}^1 - t_{ij}^1 \ln t_{ij}^0)$$

$$\sum_i t_{ij}^1 = \sum_j t_{ij}^1 \qquad 0 \le t_{ij} \le 1$$

$$\sum_i \sum_j t_{ij}^1 = 1$$

where: t_{ij} is the value of the cell (i, j) divided by the total sum of the SAM; t^0_{ij} is the value in the initial moment, and t^1_{ij} is the value after the optimization. For more details on this method see Robinson, Cattaneo and El-Said (2001).

[17] See for example: Robinson, Sherman; Cattaneo, Andrea and El-Said, Moataz (2001) and Fofana, Ismaël; Lemelin, André and Cockburn, John (2005).

The method allows us to set other constraints: for example, keep the total product of the economy unchanged. In particular, totals from the macro-sam were fixed and used as constraints.

The outcome of running the cross-entropy algorithm was a micro-sam adapted for MAMS, with row and column totals duly balanced and macroeconomic aggregates used as controls maintained exactly as they were in the original data source.[18]

5. FINAL REMARKS

For presentation purposes, Table 9 in the annex shows a version of the final SAM for MAMS for Yemen 2004 without including the disaggregation for activities and commodities. The complete version of the SAM, with all its sectoral detail, is presented in the excel file "2004_for_Yemen.xls" which accompanies this document (see worksheet "SAM").

The SAM for MAMS was constructed taking into account all the information readily available. Important shortcomings had to be overcome as significant statistical discrepancies in the I/O Tables and incomplete information to disaggregate accounts (for sectors such as water and electricity) and public investment by destination resulted in accounting imbalances. These were ultimately removed using the cross-entropy method.

[18] The exercise can be fully reproduced by unzipping the file "2004_for_Yemen.zip", which is part of this technical note, and by running the optimization problem set up in the file "sambal.gms" in GAMS. The "gms" file calls on the input SAM and its sets (included in worksheet "sam_unbal" in the file "2004_for_Yemen.xls") in order to solve the cross-entropy algorithm and result in a fully balanced SAM (which is dumped into worksheet "sam_bal" the file "2004_for_Yemen.xls").

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ANNEX

Table 4: Balance of payments. Million of rials

Current Account	41,541.4
Capital and Financial Account	47,212.4
Direct Investment	*26,599.4*
Other Investment	*20,613.0*
Government loans	*4,780.7*
Others	*15,832.3*
Errors and Ommissions	9,651.6
Financing	-98,405.0
Net reserves (increase -)	*-114,325.1*
Debt relief and arears	*15,920.1*

Source: Author's construction based on Review of Monetary and Banking Developments: April 2008

Table 5: Investment by sector of destination. Million of rials

	Total
Agriculture, Forestry and hunting	3199
Mining and Quarrying	1460
Manufacturing	3679
Electricity and water	27302
Construction and building	3095
Wholesale and Retail Trade, rastaurants, hotels and repairs	271
Transport, storage & communications	17332
Financing and insurance	920
Real Estate & Business Services	0
Community and personal services	1388
Producers of Government Services	221169
Total Public Investment	279815

Source: Author's construction based on 2004 investment data.

Table 6: Distribution of the public investment for MAMS by destination

	share
inv-edup	0.042
inv-edus	0.015
inv-edut	0.020
inv-hlt	0.080
inv-wtsn	0.049
inv-oinf	0.310
inv-ogov	0.382
inv-prv	0.102
Total	1.000

Source: Author's construction based on 2004 investment data.

Table 7: Share of Labor Income by Sector and Level of Education

	f-labn	f-labs	f-labt
Agriculture	0.929	0.065	0.006
Oil	0.356	0.297	0.346
Food Production	0.763	0.109	0.128
Other Manufacture	0.762	0.140	0.098
Electricity and Water	0.443	0.198	0.359
Construction	0.830	0.137	0.033
Other Services	0.673	0.222	0.105
Health	0.432	0.126	0.442
Education	0.159	0.134	0.707
Other Government	0.390	0.265	0.345
Average	0.621	0.171	0.208

Source: Author's construction based on household survey data

* To separate the income from the labor tax payments and the income of the labor from the rest of the world we used the average share of labor income by level of education.

Table 8: Enrolment by Level of Education

	Number of Students	Current Expenditure*	Cost per Enrolled Student*	Share by Level
Public				
Primary Level	3,977,443	80,080	0.020	0.663
Secondary Level[1]	590,605	21,227	0.036	0.176
Tertiary Level[2]	178,226	19,499	0.109	0.161
Total Public	*4,746,274*	*120,806*	*0.025*	*1.000*
Private				
Primary Level	94,851	5,729	0.060	0.343
Secondary Level	11,871	1,228	0.103	0.073
Tertiary Level	29,859	9,760	0.327	0.584
Total Private	*136,581*	*16,717*	*0.491*	*1.000*

Source: Author's construction based on education data.

*In millions of rials.

[1]: Includes Vocational Training.

[2]: Includes Technical Education.

Table 9: SAM for MAMS – Yemen 2004 – Aggregated version

	a	c	f-labn	f-labs	f-labt	f-capprv	f-capoinf	apwtsn	apedup	apedus	capedut	phealth	f-capogov	hhd	gov	row	tax-com	subs-com	tax-fac	tax-dir	tax-imp	sav-hhd	sav-gov	sav-row	int-dom	int-row	cap-hhd	cap-gov	cap-row	inv-prv	inv-edup	inv-edus	inv-edut	inv-hlt	inv-wtsn	inv-oinf	inv-ogov	dstk	total
a		6059.2																																					6059.2
c	3437.4													1698.1	321.9	932.4														301.7	11.2	4.5	5.9	20.6	13.0	81.1	100.2	-20.4	6907.8
f-labn	420.9															8.1																							429.0
f-labs	119.0															2.1																							121.1
f-labt	164.8															2.6																							167.4
f-capprv	1893.7																																						1893.7
f-capoinf	12.7																																						12.7
f-capwtsn	4.0																																						4.0
f-capedup	0.2																																						0.2
f-capedus	0.1																																						0.1
f-capedut	0.1																																						0.1
f-caphealth	0.2																																						0.2
f-capogov	6.2																																						6.2
hhd			429.0	121.1	167.4	1162.1									34.6	223.4									44.9														2182.5
gov						482.7	12.7	4.0	0.2	0.1	0.1	0.2	6.2			40.0	56.5	-168.5	0.0	141.6	51.9																			627.6
row		908.7				248.8																				9.1														1166.6
tax-com		56.5																																						56.5
subs-com		-168.5																																						-168.5
tax-fac				0.0																																				0.0
tax-dir														141.6																										141.6
tax-imp		51.9																																						51.9
sav-hhd														342.9																										342.9
sav-gov															217.1																										217.1
sav-row																-42.0																									-42.0
int-dom															44.9																										44.9
int-row															9.1																										9.1
cap-hhd																						342.9							31.2											374.0
cap-gov																							217.1				145.7		-99.5											263.3
cap-row																								-42.0																	-42.0
inv-prv																											248.8	26.6	26.4											301.7
inv-edup																												11.2												11.2
inv-edus																												4.5												4.5
inv-edut																												5.9												5.9
inv-hlt																												20.6												20.6
inv-wtsn																												13.0												13.0
inv-oinf																												81.1												81.1
inv-ogov																												100.2												100.2
dstk																											-20.4													-20.4
total	6059.2	6907.7	429.0	121.1	167.4	1893.7	12.7	4.0	0.2	0.1	0.1	0.2	6.2	2182.5	627.6	1166.6	56.5	-168.5	0.0	141.6	51.9	342.9	217.1	-42.0	44.9	9.1	374.0	263.3	-42.0	301.7	11.2	4.5	5.9	20.6	13.0	81.1	100.2	-20.4	
Check	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Source: Author's construction based on I/O tables, and balance of payments, public finances and household survey information.