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## TMD DISCUSSION PAPER NO. 95

# A 1998 SOCIAL ACCOUNTING MATRIX (SAM) FOR THAILAND

Jennifer Chung-I Li

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**July 2002** 

TMD Discussion Papers contain preliminary material and research results, and are circulated prior to a full peer review in order to stimulate discussion and critical comment. It is expected that most Discussion Papers will eventually be published in some other form, and that their content may also be revised. This paper is available at <a href="http://www.cgiar.org/ifpri/divs/tmd/dp.htm">http://www.cgiar.org/ifpri/divs/tmd/dp.htm</a>

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#### List of abbreviations

BOT Bank of Thailand

CGE Computable General Equilibrium

C.I.F. Cost, Insurance, Freight

EIA Energy Information Administration
GAMS General Algebraic Modeling System
GDP (f.c.) Gross Domestic Product at Factor Cost
GDP (m.p.) Gross Domestic Product at Market Prices

GFCF Gross Fixed Capital Formation

GNP (f.c.) Gross National Product at Factor Cost

F.O.B. Free on Board

macro SAM Macroeconomic Social Accounting Matrix micro SAM Microeconomic Social Accounting Matrix

NESDB National Economic and Social Development Board

NSO National Statistics Office

ROW Rest of the World

SAM Social Accounting Matrix SES Socio-Economic Survey

TDRI Thailand Development Research Institute
TMD Trade and Macroeconomics Division
USDA United States Department of Agriculture

#### Abstract

This paper documents the features of a 1998 social accounting matrix (SAM) for Thailand. It begins with a description of the overall economy both via a macro SAM and a national accounts balance sheet. The macro SAM was the result of aggregating a micro SAM; a mapping of the final micro SAM to the macro SAM is presented. The micro SAM was a modified version of a SAM obtained from the Thai Development Research Institute (TDRI). The paper describes the modification process in detail. The original dataset obtained from TDRI was a 'balanced' matrix. The converted SAM, after the modification, was still balanced. therefore unnecessary to apply any balancing procedure. The final 1998 micro SAM for Thailand has 61 sectors, 3 household types, and 3 factors (labor, agricultural capital, and non-agricultural capital). helpful for the intended analysis on energy and environmental policy is that it has 8 primary energy sectors, 5 transportation sectors, and a health and medical treatment commodity account.

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## 1.0 Introduction<sup>1</sup>

The author's research aims to study the effects of economy-wide environmental policies (such as a carbon content based energy tax) on economic growth and equity for the country of Thailand. As a first step in the country study, a social accounting matrix (SAM) was constructed, with emphasis on primary energy producers, energy-intensive manufacturing producers, poor households, and their linkages to the rest of the economy. The 1998 SAM for Thailand documented in this paper is intended to provide the benchmark data for economy-wide analyses, particularly for computable general equilibrium (CGE) modeling.

A SAM is a square matrix consisting of row and column accounts that represent the different sectors, agents, and institutions of an economy at the desired level of disaggregation. By convention, each account in the SAM is represented by one row and one column of the table and each cell represents an expenditure by the column account and an income to the row account. The underlying principle of double-entry accounting requires that total revenue (row total) must equal total expenditure (column total) for each account in the SAM. A SAM is a useful framework for preparing consistent, multi-sectoral, economic data that integrates national income, input-output, flow-of-funds, and foreign trade statistics into a comprehensive and consistent dataset. Once a SAM for a particular year is constructed, it provides a static image, or a snapshot, of a country's economic structure. A CGE model baseline is then calibrated to this base.

The 1998 SAM is presented in the following manner:

- i. Macro SAM: Some features of the Thai economy are better illustrated with a macro SAM, aggregated from the 1998 micro SAM after conversion. The macro SAM reports values that are comparable and consistent with the National Accounts values for 1998 published by the National Economic and Social Development Board (NESDB).
- ii. Micro SAM: The micro SAM is converted from the 1998 micro SAM obtained from the Thai Development Research Institute who updated the 1995 Input-Output table created by NESDB into a 1998 SAM with additional sources of information including household survey and wage data. The TDRI micro SAM, however, was meant to be used for CGE modeling using Hercules software, a software first adopted by the USDA in the early 1970s in running CGE models. Some work was necessary to convert the 1998 SAM obtained from TDRI into the SAM format compatible with the standard CGE model used at TMD. A more detailed description of the conversion process is provided below under section 3.2. From here onwards, the paper refers to the original micro SAM as the TDRI SAM, and the converted SAM as the "final micro SAM."

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<sup>&</sup>lt;sup>1</sup> The author would like to thank Dr. Somchai Jitsuchon and Nuntaporn Methakunavut at TDRI, Thailand for their 1998 micro SAM and generous assistance, as well as Dr. Sherman Robinson, Dr. Hans Lofgren, Marcelle Thomas, and Christen Lungren at TMD, IFPRI for their helpful comments.

#### 2.0 A macro SAM for 1998

A simplified framework for economy-wide analysis is shown in Figure 1. It traces the circular flow of incomes from producers/suppliers through factor payments to households and back to product markets through expenditures on final goods (or sales from activities). Additionally, income flows involving producers, government, rest of the world (ROW), and the capital account are included in the diagram (Dervis et al. 1982).

Most of the economic transactions represented in Figure 1 are quantified in the aggregate form in a country's national accounts.

Figure 1: Economy-wide circular income flow

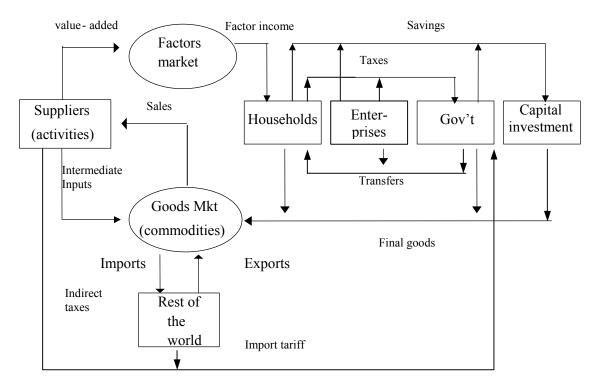


Table 1 on the next page presents the structure of a macro SAM. The cell entries of the macro SAM capture the flows between different sets of accounts. The accounts and flows in this table correspond with the boxed/circled elements and flows in Figure 1.<sup>2</sup>

Table 2 presents the actual numerical entries for the 1998 Thai macro SAM which contains 24 non-zero entries. The macro SAM presents figures that are aggregated from the final micro SAM.

<sup>2</sup> Most but not all payment flows in Table 1 are reflected in Figure 1 to preserve clarity in the figure.

2

Table 1 – Structure of the macro social accounting matrix

	Activities	Commodities	Factors	Enterprises	Households	Government	Capital	ROW	TOTAL
Activities		Sales							Total domestic production
Commodities	Intermediate inputs				Private consumption	Government Consumption	Investment Expenditures	Exports	Total market supply
Factors	Value added								Total factor income
Enterprises			Capital income		Interest/ insurance payments				Total enterprise income
Households			Labor			Transfers		Remittances	Total household income
Government	Indirect taxes	Import tariffs	Factor income paid to government	Corporate taxes	Income tax			Foreign grants	Total government income
Capital				Corporate saving	Household saving	Government saving			Total Saving
ROW		Imports		Enterprise income paid to ROW			Net investment abroad		Total foreign exchange outlays
TOTAL	Total cost of production	Total absorption	Total value added	Total enterprise expenditure	Total household expenditure	Total government expenditure	Total investment	Total foreign exchange earnings	

Table 2: 1998 macro SAM for Thailand (current 100 million Baht)

	Activities	Commodities Factors		Enterprises	Households	Government	Capital	ROW	TOTAL
Activities		113675.66							113675.66
Commodities	68821.67				25292.78	5007.05	8845.28	26837.18	134803.97
Factors	41602.89								41602.89
Enterprises			10224.18		437.62				10661.8
Households			30584.67			400.88		588.45	31573.99
Government	3251.09	1505.26	794.05	1195.74	1278.17			198.13	8222.44
Capital				7229.18	4565.42	2814.51			14609.11
World		19623.05		2236.88			5763.83		27623.76
TOTAL	113675.65	134803.97	41602.9	10661.8	31573.99	8222.44	14609.11	27623.76	

Table 3 below presents similar information in the macro SAM in the form of a balance sheet. Typically, countries present their national accounts data using a balance sheet. In this paper, rather than using national accounts data from the Bank of Thailand, figures from the macro SAM were utilized. Entries such as GDP at factor cost, final consumption by households and government, gross capital formation, exports and imports, and foreign saving are reported in the macro SAM as they appear in the balance sheet.

Entries requiring some level of disaggregation are associated with net current account transfer and net factor income flows between domestic institutions and ROW.

Table 3 - Thai National Accounts balance sheet for 1998 (million Baht)

Table 3 - Thai National A	ccounts balan	ce sheet for 1998 (million l	Baht)
<u>GDP</u>	INCOME		<b>EXPENDITURE</b>
GDP at Factor Cost	4,160,289.4	Government Consumption	500,705.4
Indirect Taxes	475,635.1	Private Consumption	2,529,278.2
		Gross capital formation	884,528.0
		Export	2,683,717.7
		Less imports	-1,962,304.8
Total (GDP m. p.)	4,635,924.5		4,635,924.5
<u>GNP</u>	INCOME		<b>EXPENDITURE</b>
Total GDP m. p.	4,635,924.5	Final Consumption	3,029,983.6
Net factor income payment	-145,030.0	Gross saving	884,528.0
		Current transfers to the rest of the world	576,383.0
Total (GNP)	4,490,894.5		4,490,894.6
Capital Accounts	INCOME		<b>EXPENDITURE</b>
Domestic Saving	1,460,900.0	Gross capital formation	884,528.0
Foreign Saving	-576,383.0		
Total	884,528.0		84,528.0
External Transactions	<i>INCOME</i>		<b>EXPENDITURE</b>
Exports of Goods and Services	2,683,718.0	Imports of Goods and Services	1,962,305.0
Net Factor Income payment from the rest of the world	-164,843.0		
Net Current Transfers from the rest of the world	-556,570.0		
Total	1,962,305.0		1,962,305.0

Source: 1998 Thai macro SAM aggregated from the 1998 micro SAM converted from TDRI data

## 2.1 Cell entries for the macro SAM

The following provides brief descriptions of the macro SAM cell entries. The cell entries are referenced by their "row-column" location, i.e., intermediate inputs are in the cell "commodity-activity" to reflect that the activity account pays to the commodity account for the intermediate inputs. All entries are in 1998 current 100 million Thai Baht.

**Intermediate input** ("commodities-activities")- 68821.67: Total intermediate input demand is assumed to be inclusive of imports, import tariffs, and marketing and transporting margins.

**Value added** ("factors-activities")- 41602.89: Total value added is the sum of the value of the primary factors of production, namely labor, agricultural capital and non-agricultural capital.

**Indirect taxes** ("government-activities")- 3251.09: Total indirect taxes include domestic taxes on goods and services and import tariffs. This cell entry is the domestic tax on production.

**Domestic production** ("activities-commodities")- 113675.66 : Domestic marketed product by all activities which is subject to marketing and transporting margins.

**Import tariffs** ("government-commodities")- 1505.26: Taxes on international trade and transaction.

**Imports** ("ROW-commodities")- 19623.05: Total imports of goods and services.

**Capital income** ("*enterprises-factors*")- 10224.18 : Factor income distributed to enterprises is the non-labor value added of GDP at f. c.

**Labor income** ("households-factors")- 30584.67: Wages and salaries paid to households, exclusive of compensations to employees paid to the rest of the world and capital income paid to enterprises.

**Government factor income**( "government-factors")- 794.05: Wages paid to government employees.

Corporate tax and net interest payments ("government-enterprises")- 1195.74: Taxes paid by enterprises (public and private) which include corporate income tax and tax on property; and net interest payments or transfers from enterprises to government.

**Corporate saving** ("capital-enterprises")- 7229.18: Gross savings of public corporations and private financial institutions.

**Enterprise income to ROW** ("*ROW-enterprises*")- 2236.88 : Net transfer from domestic enterprises to the rest of the world. These could include payments from domestic non-profit organizations to the rest of the world.

**Private consumption** ("*commodities-households*")- 25292.78 : Consumption of marketed commodities by households, inclusive of imports.

**Inter-household transfer** ("enterprises-households")- 437.62 : Transfer from households to enterprises. There is no documentation of these accounts; they could be interest payments and/or insurance installments.

**Income tax** ("government-households")- 1278.17: Individual income tax paid by households.

**Household saving** ("capital-households")- 4565.42: Total savings by households.

**Government consumption** ("commodities-government")- 5007.05 : Total government expenditures on goods and services, inclusive of imports.

**Government transfers to households** ("households- government")- 400.88: Total government transfers to households in the form of various social welfare programs.

**Government saving** ("capital-government")- 2814.51: Residual of government income after taking out government expenditures and transfers.

**Investment expenditures** ("commodities-capital")- 8845.28 : Sum of gross fixed capital formation and changes in stocks.

**Net investment to ROW** ("capital-ROW")- 5763.83: Difference between foreign saving/investment at home and domestic saving/investment abroad. The figure indicates a net positive domestic investment abroad.

**Exports** ("commodities-ROW")- 26837.18: Total exports of goods and services.

**Remittances** ("households-ROW")- 588.45 : Difference between the net current transfers from the rest of the world less foreign grants received by the government.

**Foreign grants** ("government-ROW")- 198.13 : Foreign grants received by the government.

#### 3.0 A micro SAM for 1998

#### 3.1 Data sources

The 1998 micro SAM was converted from a 1998 micro SAM developed by researchers at the Thai Development Research Institute (TDRI). Using mainly the 1995 Input-Output Table published by the NESDB of Thailand, TDRI updated the information using additional data sources listed as follows:

- Thai National Account and current and capital account data for 1998 from the BOT
- 1998 Thai household income and expenditure survey from the NSO
- 1998 Thai Labor Force Survey from the NSO

All data sources were reconciled to resolve the inconsistencies among them, the dataset was therefore "balanced" (TDRI, 2000).

# 3.2 Converting the 1998 TDRI micro SAM

Under the Standard Model-compatible SAM structure used at TMD, households pay directly to individual commodity accounts and to enterprises/business corporations. The 1998 dataset from TDRI, however, was formulated for running CGE models using *Hercules* software. The SAM carries flows of income and payments that are more "stepwise" than they would be if formulated for a typical SAM at TMD. For instance, households do not pay directly to individual commodity accounts. Instead they pay out of their "current account" first to a "disposal income account" from which payments are then made to three aggregated commodity accounts: "agricultural commodities," "non-agricultural commodities," and "service commodities." From the "current account," another allocation is made first to the "interest payment account" which then makes payments to the "business corporation accounts." Intermediate accounts applied to all institutional accounts (households, government, enterprises) as well as most of the remaining accounts.

The main task of converting the 1998 dataset into the final SAM involved removing these intermediate "steps" of payments or accounts to derive the direct payment flows. The final SAM contains only the accounts typically included in the Standard Model at TMD.

The 1998 dataset has fairly disaggregated sectoral wage information by education level and by formal versus informal wages. These wage data, however, are aggregated before mapping to individual households (agricultural, non-agricultural, and government-hired). To be more specific, the original data carry three types of wages (formal, informal, and public) paid by sectors to labor varied by education levels (6 levels). However, the wage information is then aggregated into two aggregate wage types: agricultural equivalent wage and the differential. From the two aggregate wage categories, payments are made to the three households each with 10 income deciles. Direct mapping of the three wage types (formal, informal, and public) to the households (preferable by income deciles) would have retained the richness in the wage/labor information. Without sufficient information to link the wage types (by formal, informal, and public and by education level) directly to the households, we were left to retain one labor/wage only mapped to three basic household types.<sup>4</sup>

<sup>&</sup>lt;sup>3</sup> Along with profits from agricultural and non-agricultural capital profits, the agricultural equivalent wage and differentials are traced to the three households.

<sup>&</sup>lt;sup>4</sup> The one wage is the summation of the agricultural equivalent wage and the differential.

As alluded to before, on the demand side the dataset aggregates individual consumption into three commodity types. The three commodity aggregates are: agricultural commodity (aggregate of 6 commodities), non-agricultural commodity (aggregate of 20 commodities), and service commodity (aggregate of 17 commodities). The three households have different share compositions for the three aggregate commodities. In order to obtain household consumption information of individual commodities, the author assumes that the aggregate relative shares of the three commodities holds at the lower level commodity consumption.

To sum up, the converted 1998 SAM is more aggregated in terms of wage/labor and household categories than the original dataset obtained from TDRI. In addition, it was assumed that household consumption of individual commodities follows the relative share of the consumption of the three aggregate commodities.

As was the case with the original TDRI SAM, the converted SAM was "balanced," which is to say a square matrix where the row sums and column sums equal. Therefore the author did not apply any balancing procedure to generate the final 98 SAM for Thailand.

The final micro SAM is presented in the Appendix.

# 3.3 Dimensions of the micro SAM

The disaggregated structure of the final micro SAM compared to the aggregated macro SAM is presented in Table 4. The primary factors, households, and enterprise accounts are all disaggregated as in the case of activities/commodities sectors. The original dataset carries individual tax accounts distinguished from the government account. We have kept the disaggregation here but the user can choose to integrate the tax accounts with the government account in which case all tax-related flows would flow directly to and from the government account.

Table 4: Macro and micro SAM disaggregation

Macro SAM Accounts	Sectors	Micro SAM Commodities	Micro SAM Activities
Activities/Commodities	Paddy	CPADDY	APADDY
	Other crops	COCROP	AOCROP
	Vegetable and fruits	CVGFRU	AVGFRU
	Other agricultural products	COAGR	AOAGR
	Livestock	CLIVSTK	ALIVSTK
	Fishing	CFISHIN	AFISHIN
	Forest	CFOREST	AFOREST
	Coal and lignite	CCOALIG	ACOALIG
	Crude petroleum and natura	al	
	gas	CPMPETR	APMPETR
	Other mining	COMINE	AOMINE
	Rice and flour	CRCEFLO	ARCEFLO
	Meat	CMEAT	AMEAT
	Canned food	CCANFDS	ACANFDS
	Other food	COFOOD	AOFOOD
	Other agricultural products	COAGRPD	AOAGRPD

Table 4: Continued			
Tubic 4. Continued	Beverage	CBEVER	ABEVER
	Tobacco	CTOBACO	ATOBACO
	Textile	CTEXTLE	ATEXTLE
	Apparel	CAPPARL	AAPPARL
	Leather and footwear	CLEAFOT	ALEAFOT
	Wood products	CWOODPR	AWOODPR
	Furniture	CFURNIT	AFURNIT
	Paper	CPAPER	APAPER
	Printing and publishing	CPRNTPB	APRNTPB
	Basic chemical	=	
	Gasoline	CBASCHM	ABASCHM AGASLNE
	Diesel	CGASLNE	
	Aviation fuel	CDEISEL	ADEISEL
	Fuel oil	CAVIFUL	AAVIFUL
		CFULOIL	AFULOIL
	Plastic and rubber	CPLASRB	APLASRB
	Non-metal products	CNONMTL	ANONMTL
	Basic metal	CBASMTL	ABASMTL
	Fabric metal	CFABMTL	AFABMTL
	Machine	CMACHIN	AMACHIN
	Electrical manufacturing	CELCMNU	AELCMNU
	Transport equipment	CTRANEQ	ATRANEQ
	Other industry	COINDST	AOINDST
	Electricity	CELCITY	AELCITY
	Gas distribution	CGASDIS	AGASDIS
	Water	CWATER	AWATER
	Construction	CCONSTR	ACONSTR
	Retail trade	CTRADE	ATRADE
	Restaurant	CRESTAU	ARESTAU
	Hotel	CHOTEL	AHOTEL
	Land transportation	CTRANLD	ATRANLD
	Ocean transportation	CTRANOC	ATRANOC
	Inland water transportation	CTRANWR	ATRANWR
	Air transportation	CTRANAR	ATRANAR
	Other transportation	CTRANOT	ATRANOT
	Communication	CCOMMUN	ACOMMUN
	Banking	CBANKIG	ABANKIG
	Insurance	CINSURE	AINSURE
	Real estate	CRESTAT	ARESTAT
	Business service	CBUSISR	ABUSISR
	Public administration	CPUBADM	APUBADM
	Education	CEDUCAT	AEDUCAT
	Health care and medical	CHLTHMD	AHLTHMD
	Nonprofit organizations	CNONPRF	ANONPRF
	Recreation	CRCREAT	ARCREAT
	Repairs	CRPAIRS	ARPAIRS
	Personal service	CPERSSR	APERSSR
Factors	Labor	LABOR	ALLINOON
	Agricultural capital	CAPAG	
	Non-agricultural capital	CAPNAG	
Enterprises	Private enterprise	ENT G	
Lincipii363	Public enterprise	<del>-</del>	
Household	Agricultural household	ENT_P	
i iousciioiu	-	HH AGR	
	Non-agricultural household	HH NAG	
Cavaramant	Gov't-employed household	HH GOV	
Government	Government	GOV	
	Excise taxes	ESETX	

Table 4: Continued		
	Value added taxes	VAT
	Special business taxes	SPBTX
	Import duty	IMPTAX
	Subsidy	SUBSIDY
	Direct taxes	DIRTAX
Capital	Savings & investment	SAVINV
ROW	Rest of the world	ROW

# 3.4 The structure of the Thai economy

Traditionally an agrarian economy, the Thai economy today is much more multifaceted. Several important factors have contributed to Thailand's growth. With its agrarian base as the bedrock, the economy has experienced steady growth. The principal comparative advantage of the economy has been in natural resources intensive productions. Today agricultural products such as tapioca and rice are produced in such quantities that Thailand is the largest supplier in the world. It is also a leader in the production of rubber, frozen shrimp, canned pineapple, and sugar. Thailand's industrial sector produces a wide variety of goods ranging from textiles (including the well-known Thai silk and ready made garments) to integrated circuits, plastics, footwear, and furniture. In recent years, manufacturing has surpassed agricultural products in contributing to Thailand's GNP, while tourism and related service sectors have replaced agricultural products as Thailand's largest source of foreign exchange (Mahidol University, 1998). The country's rich minerals are also eagerly sought after by the rest of the world.

Table 5 on the next page provides a look at the structure of the Thai economy based on the micro SAM perspective. As the table shows, by total output or GDP, energy intensive manufacturing is the largest sector in the economy (contributing about 41.2 percent of total GDP), followed by services and energy non-intensive manufacturing. Agriculture has already dropped to contributing about 9 percent of total output/GDP, though slightly higher than that contributed by primary energy sectors.

Table 5. Structure of the Thai economy in 1998 (percent)

Sector	Output	Value added	Final demand	Exports	Imports	Export/ Output	Import/ final
	(X)	(VA)	(Q)	(E)	(M)	(E/X)	demand (M/Q)
Agriculture	9.0	12.5	6.2	7.9	2.4	21.1	7.1
Primary Energy	5.8	10.7	3.7	1.9	6.4	7.8	32.2
Energy Intensive industries	41.2	22.3	48.4	54.0	64.2	31.4	24.3
Energy Non-intensive Industries	10.5	5.3	13.1	16.7	11.0	38.1	15.4
Transportation	6.4	6.7	6.1	5.1	3.6	19.3	10.6
Services	27.2	42.6	22.5	14.4	12.5	12.7	10.1
Total	100.0	100.0	100.0	100.0	100.0	-	-

Table 6 presents the composition of value-added by sector in the Thai economy in 1998. It shows that 65 percent of agricultural sector value-added is paid to agricultural capital as opposed to labor. In fact, the share of payable to capital is higher than that to labor across all 6 major sectors. This is especially pronounced for transportation, service, and primary energy sectors.

Table 6. Sectoral value-added by factor (percent)

Tuble of Sectoral fund added b	Labor		oital	Total
		Agricultural	Non- Agricultural	
Agriculture	33.0	67.0	-	100.0
Primary Energy	36.3	-	63.7	100.0
Energy	43.5	-	56.5	100.0
Intensive industries Energy Non-intensive Industries	42.0	-	58.0	100.0
Transportation	22.7	-	77.3	100.0
Services	32.1	-	67.8	100.0
Total	35.1	8.9	56.1	100.0

Table 7 allows us to look at the distribution of factors across the major sector categories, in contrast to the within-sector factor composition in the previous table. As we can see, the largest share of labor is paid to 15 service sectors. Energy intensive manufacturing and agricultural sectors are the second and third highest wage earners.

Considering non-agricultural investment, the service sector again tops the chart, receiving in this case more than half of such investment in 1998. Energy intensive manufacturing sectors total second highest investment income, but is a distant second from the service sector.

Table 7. Distribution of factor income by sector (percent)

	Labor	Car	oital
		Agricultural	Non- Agricultural
Agriculture	12.5	100.0	-
Primary Energy	5.3	-	5.8
Energy Intensive industries	29.4	-	23.7
Energy Non-intensive Industries	6.8	-	5.9
Transportation	4.6	-	9.8
Services	41.4	-	54.8
Total	100.0	100.0	100.0

## Imports and exports

Energy intensive manufacturing makes up more than half of total exports, followed by the other manufacturing and services sectors. Substantial two-way trade between Thailand and ROW is evident for the dominant export sectors, the two types of manufacturing, as well as the service sectors (see Table 5 on page 12).

Import tariffs are lowest for energy inputs (from 0.002 percent for liquefied petroleum gas to 4.5 percent for fuel oil), slightly higher for agriculture (from 0.07 percent for livestock to 1 percent for vegetables & fruits), and highest for several of the energy intensive manufactured goods (from 15.7 percent for apparels to a large 55.8 percent for plastic & rubber).

#### External transactions

Other transfers between the domestic economy and ROW are factor income and current transfers. Factor income from ROW consists of remittances, payments by foreign non-profit enterprises to domestic households and grants to the government. In 1998 the net factor income was negative, due to the fact that the factor income paid by Thailand to foreign workers exceeded remittances. Current transfers net of factor income payments

equal foreign savings/investment in the domestic economy. In 1998 a current account deficit was recorded, indicating that Thailand's investment abroad exceeded the foreign investment in Thailand.

#### 3.5 Data entries in the micro SAM

In this section we discuss some aspects of the final micro SAM structure further.

# Activity/commodity

There are seven agricultural sectors, namely paddy rice, other crops, vegetables and fruit, livestock, other agricultural products, fishing, and forestry. As categorized earlier, the remaining sectors can be divided into five additional aggregate sectors: energy intensive manufacturing (15 total), other or energy non-intensive manufacturing (11 total), primary energy (8 total), transportation (5 total), and service (15 total).

The fifteen energy intensive industries consist of: rice and flour, other agricultural products, other mining, beverages, textile, apparel, paper, basic chemical, plastic and rubber, non-metal, basic metal, machinery, electric equipments, other industry, and construction.

Energy non-intensive industries cover eleven sectors, namely meat, canned foods, other food, tobacco, leather & footwear, wood products, furniture, printing & publishing, fabric metal, transport equipment, and water supply.

There are eight primary energy sectors, producing coal and lignite, crude petroleum and natural gas, gasoline, diesel, aviation fuel, fuel oil, electricity, and liquefied petroleum gas (LPG).

Transportation data are available by five disaggregate categories, namely land transportation, ocean transportation, inland water transportation, air transportation, and other transportation.

Service sectors include as many as fifteen consisting of trade, restaurant, hotel, communications, insurance, real estate, banking, business services, public administration, education, health & medical services, non-profit, recreation, repairs, and personal services.

<sup>&</sup>lt;sup>5</sup> Energy intensity is determined by the product of CO<sub>2</sub> emission coefficients for energy inputs and the energy inputs used. The emission coefficients were obtained from the EIA.

#### Value added

In the micro SAM, value added is distributed among the three primary factors of production: one labor and two types of capital (agricultural and non-agricultural). Agricultural capital is used by the seven agriculture-producing sectors only.

Table 8 provides factor payment decomposition by the six major aggregate sectors. Half of the primary factor, labor, is used by two aggregate sectors - services and energy intensive industries - with the remaining wage paid mostly by transportation and agricultural sectors.

The aggregate transportation sector (an aggregate of 5 transportation sectors) makes the highest payable to non-agricultural capital. The service and energy non-intensive industries are the next highest investors in non-agricultural capital.

Table 8. Share of factor in value-added by sector categories (percent)

	Labor	Cap	oital	Total
		Agricultural	Non- Agricultural	
Agriculture	12.5	100.0	-	13.2
Primary Energy	5.2	-	5.7	5.1
Energy	29.4	-	23.9	23.7
Intensive industries Energy Non-intensive Industries	6.8	-	5.9	5.7
Transportation	14.0	-	37.3	25.8
Services	32.1	-	27.2	26.5
Total	100.0	100.0	100.0	100.0

#### Income distribution

The original SAM data, as in the cases of most SAMs, are in value term (price times quantity). Therefore for household income, what we have is 'final income' (income multiplied by number of population in each household group) rather than 'real income' (income alone). In order to find the benchmark average income by household type, we needed additional information on population distribution by household group applied in the SAM (see Table 9 below). We obtained this information from TDRI and using this information, average real household incomes were obtained by dividing final income in the SAM by the respective population (see Table 10). Comparing the three average incomes, the relationship among the three household groups (Agricultural, Nonagricultural, and Government-employed) can be represented as 1: 3.47: 8.76. This means that government-employed households, on average, enjoy the highest income - about 8.76 times that of agricultural households and about 2.5 times that of non-agricultural households.

Table 9. Population by household group in the 1998 SAM

			Cumulative
	Frequency	Percent	Percent
Agricultural Household	25,280,870	41.31	41.31
Non-Agricultural Household	29,857,064	48.79	90.1
Government-Employed Household	6,063,059	9.91	100.0
Total	61,200,993	100.00	-

Source: Macroeconomics Policy Program, Thailand Development Research Institute, Thailand

Table 10. Average household income derived from household frequency and SAM values

	SAM Value (million baht)	Frequency	Average Income
Agricultural Household	534327.8	25,280,870	21135.66
Non-Agricultural Household	2138979	29,857,064	71640.65
Government-Employed Household	497127.2	6,063,059	81992.81
Total	3170434.5	61,200,993	

The main source of household income is unsurprisingly factor income. The remaining sources include government transfers (which has incorporated transfers from enterprises to households and households to households) and foreign remittances. Considering factor income alone, wages form the most important source for non-agricultural households (see Table 11), whereas capital forms the most dominant source for the other two household groups.

Agricultural households receive 80 percent of their factor income from wages and rent from agricultural capital, with an almost even divide between the two. Non-agricultural households, on the other hand, receive 80 percent of their income from wages alone. The profit or rent from non-agricultural capital forms the largest share of income for government-employed households.

Table 11. Share of factor of production in household income by source (percent)

(factor endowment)\*

	Labor	Сар	Total	
		Agricultural	Non- Agricultural	
Agricultural Household	40.5	43.3	16.2	100.0
Non-Agricultural Household	86.8	1.1	12.2	100.0
Government-Employed Household	40.1	0.9	58.9	100.0

<sup>\*</sup>Only factor income; excludes transfers

Table 12 below presents a different look at the factor income distribution. We have considered the household factor composition, here we look at the distribution of factors across institution types: households, enterprises, and government. For capital income, the profit or rent from agricultural capital is mainly divided between private enterprises and agricultural households. Non-agricultural households and public enterprises receive most rent from non-agricultural capital. Wages flow to non-agricultural households mainly.

Table 12. Distribution of factor incomes to institutions (percent)

	Labor	Capital						
		Agricultural	Non- Agricultural					
Agricultural Household	13.9	58.7	3.5					
Non-Agricultural Household	56.9	5.1	52.2					
Government-Employed Household		1.4	2.6					
Public Enterprises	29.2	-	5.3					
Private Enterprises	-	34.7	33.0					
Government	-	-	3.4					
Total	100.0	100.0	100.0					

# Household expenditures

Based on the final SAM table, household expenditures are made to the following accounts:

Consumption: Households consume 43 marketed commodities (out of 61 commodities in the SAM). There is no recording of own consumption or informal labor market activity in this dataset.

*Income tax*: Tax rates derived from the SAM are 0.4 percent, 4 percent, and 8 percent for agricultural, non-agricultural, and government-employed households respectively.

*Savings*: Household saving rates, derived from the SAM, are -12 percent (dissaving) for the agricultural household, 10 percent for the government-employed household, and 23 percent for the non-agricultural household.

Payment to Public Enterprises: The payment likely includes interest payments and insurance installments. There is no documented information on this payment flow.

# Investment expenditures

Investment expenditures and change-in-stock information by sector are part of the SAM data. Individual sectors that saw the highest new investments in 1998 are construction (49 percent), machineries (19 percent), and electrical manufacturing (10 percent).

# Government budget

Government income sources and their shares are as follows:

Factor income to government employees (10 percent)

Direct taxes: Include income tax from households and corporate taxes (28 percent)

*Indirect taxes*: Include tariffs (7.8 percent), indirect taxes on activities (41 percent), and sales taxes (11 percent)

On the expenditure side, the government pays for commodities (59 percent), makes transfers (8 percent), and saves the remainder (33 percent). The following is a further decomposition of the individual expenditure categories.

Consumption expenditures: The largest single item share in expenditures is compensation to employees (40 percent), attributed to the payment to public administration. The remainders are payments to public education (35 percent), health and medical services (12 percent), and payments for goods and private services (13 percent).

*Transfers to other institutions*: Include interest payments on the domestic debt and paid to public enterprises (27 percent), transfers to households (72 percent), and transfers to ROW (1 percent).

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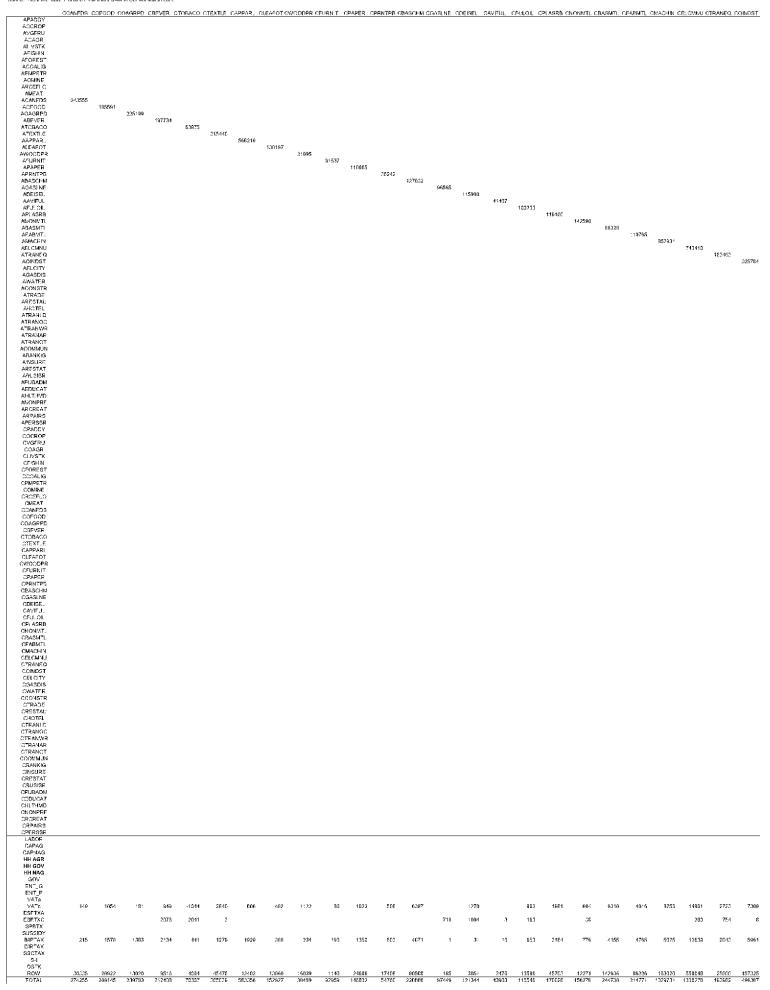
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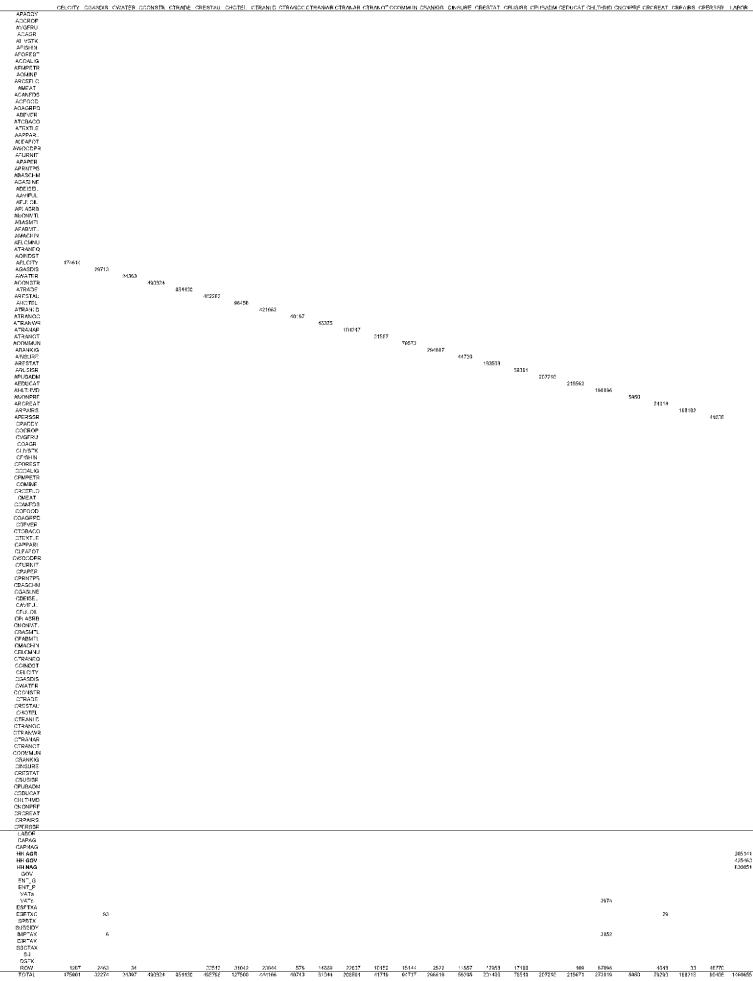
**APPENDIX** 

Table A1: 1998 Thai	land Final Micro	SAM in Curre	an: Million B:	ent																			
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CTRANCE 63 3499 79 93 24 743 5674 3779 985 2882 14837 \$5242 4686 \$6945 3194 27 1678 \$6725 \$578 \$1124 78 3333] 37 226 511  CTRANCE 61 3 1971 35 42 151 171 1729 288 513 2545 153 171 172 3 255 114 1 364 1 2 3333] 37 226 511  CTRANCE 7 6 155 38 3 14 12 14 14 14 64 40 80 335 261 265 170 190 40 80 1 11 1 1 374 866 166 400 400 4 1 1 1 1 1 374 866 166 400 400 4 1 1 1 1 1 1 374 866 166 400 400 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	CRESTAU	201	1050	11	13	5	324	2554	กกก	40.2	2301	8623	2365	2762	2002	6.37	14	157	87E1	75332	1659	1076	29359	210		517
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DSTK ROW	SSCTAX																									
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		36242	127032	96565	115997	41407	100231	119160	142590	38326	119765	852931	742411	160462	325704	174614	29712	24362	490E24	954430	462200	96453	421032	40167	46275	184247

Cont'o: Table At: 19	SE Trailand Fina	Micro SAM	In Current M	Illon Ban:									Ce	mmedity											
	ATRANO" AC				RESTAT A	BUSIST A	P.IGADM A	EDUCAT A	HLTHMD AN	IONPRE AF	ROBEAT A	ARPAIRS A		PACDY	COCROP	gVG#RU	SDAGO	CLIVSTK	CEISHIN C	FOREST C	COA.IG C	PMPETR (	COMINE (	CRCEFLO	CMEAT
APADDY ADCROP AVGERU														174305	43987	273929									
ACAGR ALVSTK																BAEDIA	157924	130458							
AFISHIN AFOREST																			234533	5651					
ACCALIG AFMPETR																					965.3	90220			
AOMINE ARGEFLO																							28335	227760	
AMEAT ACANEDS																									109067
ACFOCD ACAGRED																									
ABEVER ATCBACO																									
ATEXTLE AAPPAR																									
ALEAFOT AWOODPR																									
AFURNIT APAPER																									
APRINTES ABASCHM																									
AGASINE ADEIGEL																									
AAVIFUL.																									
AFJE OIL APLASRB ANONN'TL																									
ABASMTI																									
AFABMT AMACEIN																									
AELCMNU ATRANEQ																									
AOINDST AGLCITY																									
AGASDIS AWATER																									
ACONSTR ATRADE																									
ARESTAU AHOTEL																									
ATRANID ATRANOC																									
ATRANUS ATRANAR																									
ATRANCT ACOMMUN																									
ABANKIG ANSLERE																									
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CLIVSTK CEISHIN								.10 265	1257		116 143		-												
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CAPPARI	3 415	6 169	170 2919	14 224	26	7 557	20 27	n 1 <del>0</del> 1	.335 8967	217	63 2340	1143 138	26 65												
CLEAFOT CWOODER	1		5 20	3	1	10	79		4 00	3	3 25	295 561	3≠ 13												
CFURNIT CPAPER	1815 54	350	455 3621	5 77	5 75	2161 2009	20 3	2460 2507	:879	: 3	103 221	1262 175	22 119												
CPRNTPS CPASCHM	1	ລ 1	24	2	1 2	532		16 60	12 6590	1	4 7	7 1330	3 12												
CGASLNE CDEISE	514 11	47 162	793 32	102	532 5	3666 37	845 1786	64 235	915	144	790	465	657 43												
CAVIEJ. CEJ.OIL	11	1	177	9	3	53	47	J2	34	1	a	13	1												
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CBASMTL	4	•			5				33	2	1	1001													
CEABMTL CMACHIN	24 925	56 44	87 4	9	80 230	116	30	129	1520 665		50 19	7565 9469	103												
CELCMNU CTRANEO	72 36	263 17	700 30	49	13B 16	211	166	122 92	543 39	5	1755 26	38813 23	171												
COINDST	64 430	129 629	1267 2219	42 117	74 2503	1453 645	1508 606	060 1610	4256 4217	12 43	1404 2699	4500 3544	699 516												
OGASDIS CWATER	23	94	90	. 4	162	95	140	1006	145 489	â	35 168	147	172												
CCONSTR CTRADE	302 138	739 120	6956 2527	798 83	19591 433	3566 5366	15 091	11259 1493	19745	413 35	7823 1577	7949 22770	551 592												
CRESTAL: CHOTEL	610 1056	70 594	5520 2753	1739 266	1471 88	3099 2700	3022	532 417	1856 536	274 12	1422 080	5164 447	1051												
CTRANIC CTRANCC	106	190 560	1512	374	238	2521	249	209	1412	47	218	2172	97												
OTRANWR OTRANAR	57 754	1 2404	54 4003	23 489	a 336	71 1460	15	147 302	390 5783	13 135	151 1724	322 113	7 100												
GTRANGT GCOMMUN	219 122	213 1605	:639	4 64	16	4 445	2	5 106	154 02		15	16 145	34												
CEANKIG CINSURE	206 9:	1400 46	15020 696	215	23097 216	549 30		241 14	1157 200	9	754	1015 50	105												
CRESTAT CSUSISE	29	17 635	85 85	21 84	42 038	16 564	205	1 76	10 203	1	225 18 700	92	5 13												
CPUBADM	392 64	250	639	93	571	200	200	40	6.26	- 3	709 76	70	32												
CHUTHMD	2 12		90	1434 32	164	605		1017 79	6635 2091		76 7		20												
CNONPRE	25	46	537	32	12	93 1554	****	113	109	11	313 995	341	49												
CRPAIRS CPERSSE	415 697	3342 506	:5364 703	343 189	2033 1158	235 405	9069	4460 00	310° 4340	378 39	18207 1455		1753 999												
LABOR CAPAG	4541	14864	50272	10310	34132	3697	173706	77192	30476	1913	10440	22013	11690												
CAPNAG HH AGR	15-170	49952	100753	27339	90505	5372	14619	106415	42010	2500	14396	20246	16116												
HH GOV HH NAG																									
GOV ENT_G																									
ENT_P VATa	1710	213	1214	98	576	14251	ag.	36	600	2	1004	1247	5441												
VATa VATa ESFTXA	4746	4 1-1	12.4	:drū	u.n	enza)		-In	900	2		1034	July 1			2	68	46	3	671	5*8	7777	549	147	2
ESETXC			00407		***						7552														
SPBTX			20463 -278		4096 -78			-3147														_			
IMPTAX DIRTAX															502	551	405	17	44	9-1	10	2	258	351	15
SSCTAX S-I																									
DSTK ROW															55:0	5493	24460	2510	860	9012	:559	104014	7382	1489	4467
FOTAL.	31566	79573	294037	44727	100500	59361	207210	215561	198397	5957	74610	166162	41638	174305	19999	279933	182845	100000	205441	16227	11339	202012	36525	339747	113550





	CAPAG	CAPNAG	HH AGR	HH GOV	HH NAG	GOV	ENT 5	ENT F	VAŢa	VATo	ESETXA 8	semxc	SPETX S	SUBSIDY	MPTAX	DIRTAX	SSCTAX	S-I	DSTK	ROW	TOTAL.
APADDY ADGROP																					:74065 43967
AVGERU ADAGR																					273929 157924
AL VSTK AFISHIN																					100458 204500
AFOREST ACCALIG																					5651 9653
AFMPETR AOMINE																					90220 20335
ARCEFIC AMEAT																					337760 109067
ACANEDS ACECCD																					243555
AOAGRPD ABEVER																					225:99
ATCBACO ATEXTLE																					63975
AAPPAR																					315440 563219
ALEAFOT AWOCEPR																					133197 21095
AFURNIT APAPER																					9:537 ::8965
APRNTPB ABASCHM																					36342 127032
AGASI NE ADEIGEI.																					96565 115900
AAVIFUL AFJE OIL																					41407 100233
APLASRB ANONM TI																					119160 112590
ABASMTI AFABVIT																					99329 19765
AMACEIN AELCMNU																					05293 : 743410
ATRANEQ AOINDST																					160460 025784
AFLCITY AGASDIS																					174614 29713
AWATER ACONSTR																					24363 490624
ATRADE ARESTAL:																					954430 462283
AHOTEL ATRANI D																					96453 421063
ATRANOG ATRANVS																					40167 46375
ATRANAR ATRANOT																					104247 31567
ACOMMUN																					79573
ABANKIG ANSLERE																					294007 44720
ARESTAT AALSISR																					193509 5936!
APUBADM AEDUCAT																					207210 215562
AHLT:PMD ANONPRE																					:99896 5958
ARCREAT ARPAIRS																					74614 168182
APERSSR CPACCY						62													7294		41633 174385
COCROP CVGFRU			:252 49996	491 19591	2018 00623	161 166													19006	22947 12236	49999 279366
COAGR CLIVSTK			1508 2450	594 930	2431 3850	36† 66												276	5727 -1519	00070 5700	133033
CFISHIN CFOREST			14331 1021	5635 400	23191 1646	22													-1636	09260 1646	235441 16226
OCCALIG CPMPETR																			740 3950	1 3794	11009 202010
COMINE			50940	24911	95990	14												1	-18016 -12357	4600 105107	36524 339747
CMEAT COAMFOS			30374 607.2	15399 2939	58178 11441	21													-850	193 93090	113550 274255
COFGOD			9357 7462	9433 3349	36475 14060	17 2													16091 2340	76329 4255	209:45 239702
CTOBAGO			53955 15512	29931	111093	ŧ													149 345	7916	2:2403 70306
CTEXT.E CAPPARI			:6003 37262	7593 7929 42374	39164 164435	2												1170	-14679 5362	3212 120963 141159	365039 503356
CLEAFOT			7071	3459	13324	583												16	13806	110972	152925
CWOODER CEURNIT			6969	4393	16939	f B												72 16043	-3266 -2530	15691 20170	38439 92959
CPAPER CPRNTPS			12043	3231	24202	4134 761													-9266 -1973	22692 11851	:46032 54759
CEASCHM CGASLNE			2532	1233	4771	5													-6037 -99	52991 7171	220000 97449
CDFISE CAVIFJ			603	295	1138														580 529	0031 1 <b>776</b> 0	121344 43903
CFJLOIL CPi ASRB						453 66													1973 -7046	3617 121606	115546 170020
CNONEXT CBASMTL						10												2013 510	-13261 21749	29541 54337	156277 244728
CFABMTL CMACHIN						698 E3												16096 201906	12329 9823	49949 33223	214771
CELCMNU			16730 13239	9192 5499	31525 25041	1106 5152												103664 77605	-11570 -26537	643075 65436	1000278
COINDST			1943 4667	5940 2292	22505 8795	9050 4790												16239	117598	120122 253	495337 175901
OGASDIS CWATER			1267 3054	520 1995	2388 7262	406 1366													-136	10670 26	32274 24397
CCONSTR			2534	3135	12330	761 5215												506561 67710	-212900 22771	409 150110	490624 954429
CRESTAL: CHOTEL			32702 2032	40405 3494	156404 13514	3962 3847												weett.	22111	70971 54354	495796 127500
CTRANIC CTRANOC			21670	28739	103388	3067												6766	226	72459 22297	127500 444106 40743
OTRANWR			2024	3491	13475	1001												2294	39	11356	6:043
CTRANAR CTRANCT			5°45 2498	3341 3379	24545 11919	4834														29135 4616	206384
CCOMMUN CBANKIG			9526 1935	13508 2252	40677 8785	11066 226														10016 1006	94716 295609
CINGURE CRESTAT			2410 24000	2974 29379	11500 114885	22 614												2607		3766 26034	56205 201464
CSUSISE CPUBADM			273	337	1304	1215 198040														22974	76540 2072:0
CHUTHMD			2279 24071	2933 29339	16872 114043	176616 58305													60	01 19113	215675 273619
CNONPRE			10007	13319	5155B	202														.ე 040	5957 79289
CRPAIRS CPERSSE			52: 4497	542 5543	2486 21455	1066 1666														25 30026	160215 90409
LABOR CAPAG			2665																		1460656 069020
CAPNAG HH AGR	216700	01223				11443														19020	2332976 534327
HH GOV	5324 16990	59560 1210672				2945 24063											12005			3826 35199	497:27 2:30990
GOV ENT_G	10000	79405 125496					34199	12007	:39645	99491	167578	6008	32559	-14673	62035	219291	15727			20679	057013 124496
ENT_P VATa	120309	769612	1011	13903	20048	16976														70901	1039641
VATo																					30481 167578
ESFTXA ESFTXC SPBTX																					167578 3809 32559
SUSSIDY																					14673
IMPTAX DIRTAX			2576	41133	84075	3ma		91464													62035 219201
SSCTAX S-I			-63394	45973	10369 478963	17363 261451	90297	632621										1027917		390300	27732 2079120
DSTK ROW						933		302669										-143369 966663		2629245	-140369 5901767
TOTAL.	369323	2002976	534326	497127	2138979	657612	124496	1009641	:39645	90491	167570	ECCS	32559	-14673	62005	219291	27712	2679127	-143389	5901767	43603555

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