

Chapter 6

Mawlamyine's Social Accounting Matrix and its implications

6.1 Introduction

In Chapters 4 and 5 we have presented partial analyses of the economic conditions of Mawlamyine, Myanmar by exploring the kinds of job that are significantly important determinants of household expenditures. More specifically, the determinants of food, transportation, and health care expenditures for the sample area have been presented and analyzed by applying the Seemingly Unrelated Regression method in Chapter 4. General poverty and inequality conditions for Mawlamyine and some policy implications were explained in Chapter 5. However, neither chapter has shown the relationship between income and expenditures, nor the linkages among sectors of the Mawlamyine macroeconomy. Chapter 6 will present a mesoeconomic bottom-up Social Accounting (SAM) matrix, as well as the SAM based multipliers and an optimized general development plan for the Mawlamyine township economy. This chapter is the revised version of paper which has been accepted to publish in Chiang Mai University Journal.

6.2 Assumptions in Model

Although our Township SAM is not based upon complete data sets from business, government and other institutions; we have tried to estimate the missing

data to the best extent possible. For example, government expenditures on production activities for Myanmar have not been officially published since 2000 and those data have been estimated based on the national government budget year 2000, as experts have suggested.³⁰ Myanmar does not provide data in very much detail at a regional level either. In contrast, there is no need to disaggregate Thai data as the Thai provincial governments provide the disaggregated data for top down or bottom up social accounting matrix construction. It is well known that a SAM will be inconsistent if data from disparate years have been used to estimate it. Therefore, there are no alternative data from Myanmar for government spending although we notice that the SAM will be inconsistent since we cannot use the updated secondary data. Additionally, the SAM for Mawlamyine's transactions are recorded in Kyat (the national currency). The unemployment rate is assumed to be 25%, which is much larger than the official estimate. No government expense for transfer to households is reported at all for government expenditure for households.

6.3 Hypotheses

This study will test two research hypotheses:

- (1) The income, employment, and poverty-alleviation multipliers of the transportation sector and the infrastructure-related construction sector are significantly higher than for other sectors.
- (2) Overall income per capita and the number of jobs in the Mawlamyine area could increase by at least 20% if sector-by-sector investment patterns were adjusted according to the optimal SAM.

³⁰. E.g. government expenditures on production activities= (Mawlamyine Population / Myanmar Population)* national government expenditure on that specific sector).

6.4 Mawlamyine SAM Structure

We have reviewed the literature on SAMs in chapter 2, so we start here directly with a discussion of the construction of the Mawlamyine SAM. Our SAM is a pioneering tool for the Myanmar economy, including the macro and meso levels. As the Myanmar economy has had no official publication and computations on I-Os or SAMs during the last 10 years, our first difficulty is how to present and construct a township level SAM. The second difficulty is the limited availability of detailed data, especially at the firm level, in Mawlamyine, Myanmar as a SAM adequate for policy guidance needs to construct detailed cells within a disaggregated business sector.

Here we lack *a priori* data in SAM structure and I-O table which can be used directly in constructing township level SAM. Therefore, we perform technical estimation by assumption on our primary and secondary data for Mawlamyine. Furthermore, we do estimate some data based on their availability. For instance, some data that we have obtained exist only at the national level. So we have had to approximate the data from our study area according to Mawlamyine's proportion of the national population.

6.5 Sector disaggregation for Mawlamyine's SAM

Through our primary surveys, the agricultural, small industrial, handicraft, metal working, and services sectors including transportation have been assessed in Mawlamyine. The Mawlamyine Township SAM will therefore include the sectors listed in Table (6.1)

Table 6.1 Sectors in Mawlamyine's SAM

Codes	Sectors	Categories
<i>AG</i>	<i>Agriculture and Livestock</i>	Rice, vegetables, crops, fruits and flowers, and livestock
<i>AG_Pro</i>	<i>Agriculture Processing</i>	Forestry products, rubber fumigate firms
<i>Hand</i>	<i>Handicraft (blacksmith, herb digestion pill, chops)</i>	Harrow, blacksmithing, knives, silversmith Natural Indigestion pill
<i>Trans</i>	<i>Transportation (trishaw, ponycart, bus, cycle)</i>	Trishaw, pony carts, cycle taxi, car driver, spare, truck, Bus including special transportation (trips to somewhere)
<i>Commu</i>	<i>Communication</i>	Phone, internets, public phones
<i>Shops</i>	<i>Shops and services</i>	Rice, cooking oil, Meat, Carpenters, seamstresses, barbershops, weaving, TV games, brokers,hotels
<i>Gas-Resi-Ele</i>	<i>Gasolines, residence electric shops</i>	Gasoline, residence shop, electronic shops
<i>Tea-Food Wa-Ice</i>	<i>Snack, tea, meals</i>	Food, tea, snacks, water and ice shops
<i>Buss_Ser</i>	<i>Business service providers</i>	Advertising, seminars, warehouse costs, R and D, copyright, and law consultant
<i>Gam-Lot</i>	<i>Gambling and lottery</i>	
<i>Cons</i>	<i>Construction</i>	Highways and some dwelling expenditures
<i>Incomes (Tips, NON)</i>	<i>Transfer, tips, interest, dividend</i>	Gifts, interest income, dividends, investing oversea, compensations for loss, bonus, overtimes and tips, value of non-money income
<i>Labour</i>	<i>Labours</i>	
<i>Cap</i>	<i>Capital</i>	Capital including machines, buying properties for firms
<i>Gov</i>	<i>Institutions (Tax and Special gov fees) GOV</i>	Tax, Special Government fees, wealth index (public utilities
<i>Tran-Fees</i>	<i>Transnational money transfer fee</i>	The cost for money in and out
<i>Sav-Bank</i>	<i>Savings banks</i>	Firms' and Households' Saving
<i>Lend_Ins</i>	<i>Lending institutions</i>	Financial intermediaries
<i>Others_Ins</i>	<i>Institutions (NGO, education, monastery, disaster, wedding)</i>	Education, monastery, disaster reliefs, wedding, and other social
<i>ROW</i>	<i>Rest of world</i>	Export /Import

Institutions in Mawlamyine

As income flows from various household categories are necessary to achieving our analytical goals, households are divided into 15 classes based on their income ranks with three rurality categories (rural, semi-urban and urban). Table (6.2) presents the categories of households status in Mawlamyine.

Table 6.2 Households by rurality class

Rurality	Household Income Quintile	Rank In SAM
Rural	Lowest income	HH1
	Second Lowest	HH2
	Middle	HH3
	Second highest	HH4
	Highest	HH5
Semi-urban	Lowest income	HH6
	Second Lowest	HH7
	Middle	HH8
	Second highest	HH9
	Highest	HH10
Urban	Lowest income	HH11
	Second Lowest	HH12
	Middle	HH13
	Second highest	HH14
	Highest	HH15

As our study is also interested in the town of Mawlamyine, there are some government institutions which consist of branches of banks, saw mills, electricity diffusion plants, and public hospitals in the urban area. However, we do emphasize the survey data and estimate some secondary official data to get an accurate social accounting matrix for our study.

Some difficulties for the Mawlamyine industry sector

The industrial sector in Mawlamyine has not yet boomed due to some major obstacles. For example, electricity shortage is one of the most binding constraints. Although there is an industrial park named the “Mawlamyine Industrial Zone,” in reality it belongs to another township, Kyaikmayaw. Due to the rules and regulations of industrial zones in Myanmar, the name of an industrial zone should be the same as that of the city, state or division. Taxes from industrial zones go to other townships’ internal revenue department. Firms such as small car production, chopping hoe production, private guest houses and inns, natural herb medicine production, and exchange centres can be seen as private agents within Mawlamyine proper.

6.6 Data entry into a SAM

Before entering our survey and secondary data into the SAM matrix, we checked the data, especially secondary data, to ensure that the data cells are as accurate as possible. For instance, in order to get production activity income from institutions (government), we came to government expenditures through simple estimation. However, the government budget data have not been openly shown to the public since 2000. Therefore, we firstly inflated the data by the CPI for each year and then prorated then by the ratio of population in Mawlamyine to the national population in order to obtain reasonable estimates of the 2009 government budget data for various sectors.

Although Mawlamyine is a transit and trading city not only domestically, but also with the border town of Maesot, Thailand, the secondary export and import data cannot be obtained. Some might suggest that the Maesot data could be estimated. The

problem of estimating the Maesot data is we do not know whether the exports from Maesot flow to Mawlamyine or to other destinations. Some will go to Pha-Ann, Kayin State while others will go to Yangon, the capital of the country. As a result, we relied on the firms' survey data and estimated again by using secondary data sources to fill in the remaining gaps. For example, *Mon State Facts and Figures* reported that Mawlamyine Township itself could not fulfill its total rice demand. We then estimated the amount of imports for the agriculture sector. However, we did have complete and reliable data on the fishery sectors, as well as their exports to Yangon and China.

Agriculture and Livestock

This subaccount represents agriculture and livestock in Mawlamyine. Although the Mawlamyine economy is principally based on agriculture, we came to know that Mawlamyine Township does not produce enough to meet township demand for rice and cooking oil. Based on the facts and figures of the State Peace and Development Council, Mawlamyine Township alone cannot support its citizens' rice demand; the shortfall is imported from the rest of the world (ROW). Mawlamyine does have some exports in fishery, some fruits and flowers. Income comes from three main sources: production activities, shops and the ROW.

Agriculture Processing Sector

First of all, we have disaggregated the sector into forestry products; animal products such as milk, rubber fumigating firms and rubber plantations. The difficulty in data availability arises when one endeavors to fill up the cell of each subsector in each activity. For example, we interviewed rubber fumigating firms to generate the precise data necessary to fill in the cells for that subsector. However, some enterprises

such as furniture and rubber plantation firms do not really have data on how much is going to capital expenditures or to nurturing rubber. Based on the official data on rubber plantations and the respondents of rubber orchard firms, we have estimated the breakdown for labour, capital, transportation, communication, etc. Regarding income from government to those sectors, we have estimated government expenditure by using the simple estimation method shown in the section “Data Entry Into The SAM.”

Handicrafts

One of our sample villages focuses on work as blacksmithing, where skilled artisans make metal objects such as knives and tweezers; while another significant trade in the village is producing natural indigestion pills from moonseeded vine, liquorices, and citron. Therefore, this subsector represents our sample villages. Moonseeded vine, liquorices, and citron come from not only Mawlamyine town but also from the rest of Myanmar. The same is true for the blacksmithing village. Consequently some expenses of that sector go to the ROW.

Transportation

Trishaw, pony cart, motorcycle taxi, taxi, bus, highway express and trucks comprise the transportation sector. People nowadays in Mawlamyine mostly use motorcycles. According to survey responses by trishaw riders, the income from trishaws and pony carts in 2008-2009 was not as good as before. Although the road quality in Mawlamyine has been upgraded and people may prefer to use a bicycle, the role of pony carts and trishaws is still important within quarters and wards. For instance, housewives use trishaws to go to market and parents feel safer to use trishaws to send their children to schools. There is also a bus system in Mawlamyine.

The firm survey helps us to get data for respective subsectors such as households, government, other institutions, communication, gasoline and shops, etc.

Communication

Actually, the communication system in Myanmar is much less evolved than that of other Southeast Asia countries. In 2008, 33 percent of the population had cellular phone subscriptions³¹ in Laos while the corresponding figure for Myanmar is only one percent (World Bank, 2010). As a result, it is quite costly to invest in the communication sector in Myanmar. For example, cell phone rental from the Ministry of Communication costs around \$ 550 (the cost is calculated with current market exchange rate) in Myanmar. During the survey period, the sector was run by the public and very few internet cafés were open in Mawlamyine. In order to get internet access, the people of Mawlamyine had to contact the authorized organizations from Yangon. So, some amount of expenses goes to the ROW.

Shops and other services

Shops are an intermediate or buffer connecting production activities with institutions, especially households. Firstly, we disaggregated the hotel and inn subsector as a service subsector in our study. After setting up the sector to be in the SAM, the sector is quite small compared to others. With reference to the firm survey respondents in 2009, the opening of the “Thanlwin Bridge (Mawlamyine)” part of the Union Highway actually depressed the income of hotels and inns in Mawlamyine.

Travelers and guests stayed at Mottama³² as the Thanlwin bridge closes at 8 p.m. for

³¹. Mobile cellular telephone subscriptions are subscriptions to a public mobile telephone service using cellular technology, which provide access to the public switched telephone network. Post-paid and prepaid subscriptions are included.

³². Mottama is a small town of Thaton distinct in Mon State. Thanlwin bridge connects the city of Mawlamyine with Mottama.

security reasons. As a result, the role of hotels and inns in Mawlamyine became smaller than before, according to our interviewees. Other small services shops such as seamstresses, vehicle and machinery repair commonly used by production activities and households were added to the SHOPS subsector. Adding those sectors might not be pertinent to the goals of the study as Mawlamyine is not a tourism promotion township and any tourists who wish to go to Golden Rock Pagoda (*Kyaikhteeyoe* in Myanmar language) can go without staying in or even visiting Mawlamyine. Large hotels in Mawlamyine were making money through wedding receptions and serving meals for special occasions, while small inns and motels were more certain to get guests such as domestic travelers.

Gasoline, Residence and Electronic Shops

Gasoline shops in our study site are rather small and not quite legal. Residence shops like small grocery shops in the semi-urban area are sources of household income. Electronic shops in Mawlamyine are mostly in the urban area and the data for this sector has been estimated via mixture of firm survey and household survey.

Food, Tea, Snacks, Water and Ice subsector

Tea shop culture can be found ubiquitously not only in Mawlamyine but also throughout Myanmar; food and small traditional snack shops are essential for a small and medium households' family. Drinking water is important to almost all households. However, the economic size of each group is not very large due to the nature of the business. As a result, all of these disparate activities can be aggregated together as one subsector.

The Special Case of Gambling and Lotteries

We have separated this account as we would like to show how much households rely on gambling and the lottery. Surely the authority provides the National Lottery, however, the majority of people living in the border of Myanmar are mostly interested in playing the neighbouring country's lottery system. Currently, people in Mawlamyine area are paying rapt attention to playing the Thai lottery which generally opens twice (on the first and 16th calendar days) each month. Since those kinds of lotteries are opened illegally, the respondents may be hesitant to discuss gambling or lottery during the interviews. Even though the amount of lottery tickets purchased might be understated by the households, it is still some amount which is deducted from their consumption. Based on the interview facts, income from illegal lottery and gambling may not go to the households. Actually, given the tiny probability of actually winning, the household's net income from that sector is surely negative.

Construction

The account for construction is a symbol of civilization in Mawlamyine. Part of the construction account comes from households. According to the interviewees and secondary literature, some semi-urban areas are developing recently due to Asia highway projects. Currently those costs are from constructing highways such as Yangon – Myeik (Union Road, Mawlamyine Segment); and from expenditures by households for dwelling expenditures. As a result, the construction income consists of a part from households, a part from the government, and part from the ROW as some projects are coming from the rest of Myanmar.

Income from other sources and labour income

This income is from various sources such as bonuses and overtime pay, dividends, gifts, tips, transfer income such as pensions, and non-money income such as uniforms and meals. Labour income data come from the household and firm surveys again.

Households Expenditures on various activities

Our household expenditure survey in 2009 helps us to calculate the household expenditure in various activities such as food and non food items. As households are not buying directly from farmers or agriculture sectors, those items pass through the intermediary of SHOPS. Thus, household expenditures have been paid to SHOPS for meat, rice items and some nonfood items.

Government Income

This income includes wealth index taxes for water, lighting and house frontage which are paid by households, indirect taxes paid by firms and are found from our households and firms survey. Additionally, the tax income data from Mawlamyine township gazetteer was a supplement to add the township government income in each sector.

Government Expenditures on various sectors

For those cells, the expenditures came from government budget for 2001-02 and those values have been inflated by CPI from year to year. Once inflated, the estimates were multiplied by the ratio of the Mawlamyine population to the Union population at the suggestion of several experts.

A SAM may not be balanced when it has been constructed and there are many technical methods to balance a SAM. However as we have presented balancing

techniques in Chapter 2, we have chosen the technique based on the expert's judgment on balancing. Because Mawlamyine is a transit and trading town, experts have suggested that we give more weight to ROW accounts. For example, the majority of people from Mawlamyine are on migration (Chapter 2) because they are working somewhere outside Mawlamyine, especially the border area of Thailand, Malaysia and Singapore. They reported to us amounts which were much lower than their actual income from remittances. Household heads had no answer sometimes when we requested what kind of odd jobs they are working since they had claimed that that they were only working odd jobs. However, many times we have seen that facilities in those houses are more than normal houses meaning there is extra income coming from the outside.

Another weak point in our SAM is that there are no published government expenditures on households, although in reality such data collection might be occurring. This is a weak point of the whole government consumption data system in Myanmar, as we lack separate estimates of public and private consumption. The Mawlamyine SAM constructed for this research is shown in the successive segments of Table (6.3).

Table 6. 3 The Mawlamyine SAM

	<i>AG</i>	<i>AG_Pro</i>	<i>Hand</i>	<i>Trans</i>	<i>Commu</i>	<i>Shops</i>	<i>Gas-Resi-Ele</i>	<i>Tea-Food Wa-Ice</i>	<i>Gam-Lot</i>	<i>Cons</i>	<i>Labour</i>	<i>Capital/machines</i>	<i>HH1</i>	<i>HH15</i>	<i>Gov.</i>	<i>Tran-Fees</i>	<i>Sav-Bank</i>	<i>ROW</i>	Total income
<i>AG</i>	26463	0	57	0	0	35049	0	0	0	0	0	0	0	0	1606	0	0	7457	70632
<i>AG_Pro</i>	0	1036	0	0	0	486	0	0	0	119	0	0	0	0	101	0	0	2054	3796
<i>Hand</i>	0	0	0	0	0	1471	0	0	0	0	0	0	0	0	180	0	0	435	2086
<i>Trans</i>	54	0	5	0	0	1605	1	24	0	4533	0	0	19	130	617	0	0	7981	16311
<i>Commu</i>	8	2	2	9	0	4	2	2	0	0	0	0	22	636	208	0	0	95	5036
<i>Shops</i>	4270	623	4	1622	295	18641	0	1190	0	410	0	0	2807	13401	5	0	0	12878	140404
<i>Gas-Resi-Ele</i>	81	1	9	1873	0	6190	0	270	0	0	0	0	104	1467	4	0	0	825	14353
<i>Tea-Food Wa-Ice</i>	0	1	1	516	0	17469	23	2	0	0	0	0	168	675	0	0	0	4613	30376
<i>Gam-Lot</i>	0	0	0	0	0	0	0	0	0	0	0	0	3	119	0	0	0	0	580
<i>Cons</i>	0	0	0	0	0	0	0	0	0	0	0	0	25	43	1355	0	0	4395	6393
<i>Labour</i>	16058	1845	1617	11517	70	26919	7779	24822	0	580	0	0	0	0	0	0	0	0	91207
<i>Capital/machines</i>	486	40	85	198	361	11	32	0	0	737	0	0	0	0	0	0	0	0	1950
<i>HH1</i>	0	0	0	0	0	0	0	0	0	0	675	53	0	0	0	0	0	1885	2627
<i>HH15</i>	0	0	0	0	0	0	0	0	0	0	29614	188	0	0	0	0	0	9306	39243
<i>Gov.</i>	144	2	24	241	1996	1446	200	1060	0	14	0	134	14	42	0	0	0	0	7473
<i>Tran-Fees</i>	0	0	0	0	0	0	0	0	0	0	0	0	12	256	0	0	0	19092	19531
<i>Sav-Bank</i>	0	0	0	0	0	0	0	0	0	0	0	0	-973	19484	0	0	0	590	73769
<i>ROW</i>	20859	246	271	259	2221	26173	6285	2891	327	0	0	476	0	0	3162	19531	73670	0	173701
Total expense	70632	3796	2086	16311	5036	#####	14353	30376	580	6393	91207	1950	2627	39243	7473	19531	73769	#####	
Value added	16902	1884	1702	11715	431	28050	7824	24867	253	1317	0	0	0	0	0	0	0	0	
% value	23.9	49.6	81.6	71.8	8.6	20.0	54.5	81.9	43.6	20.6									
% Township VA	17.8	2.0	1.8	12.3	0.5	29.5	8.2	26.2	0.3	1.4									

Table (6.3) represents the Mawlamyine's SAM by looking at how incomes by rurality classes are distributed.

The next step is to make a standardization of that matrix which is called the "A" matrix. Calculating the "A" matrix in EXCEL is simple; it involves the process of dividing the element of transaction matrix by column total.

$$a_{ij}^1 = \frac{a_{ij}}{A_j}$$

a_{ij}^1 = each standardized elements in the A Matrix

a_{ij} = the corresponding elements in transaction matrix

A_j = Column total

The next step is to create the conformable matrix which is called (I-A) matrix i.e the subtraction of two matrices (the identity matrix - A matrix). An identity matrix is in which has all the elements being "0" except for diagonal values. As it is a kind of square matrix I, our matrix is going to be "29*29" Identity matrix.

The next step is creating the (I-A)⁻¹ matrix. For this step, we need to choose only our I-O matrix and do not need to apply exogenous accounts. Sometimes this is called a "multiplier matrix" or "Leontief Inverse matrix".

Mawlamyine's multiplier matrix is shown in Table (6.4). Given the theme of this dissertation, special attention should be paid to transportation and construction sectors, which deal wholly or principally with transportation.

Table 6.4 Mawlamyine's multipliers matrix

	<i>AG</i>	<i>AG Pro</i>	<i>Hand</i>	<i>Trans</i>	<i>Cons</i>	<i>Commu</i>	<i>Shops</i>	<i>Gas-Resi-Ele</i>	<i>Tea-Food_Wa-Ice</i>	<i>Buss_Ser</i>	<i>Gam-Lot</i>	<i>Incomes (Tips,NON)</i>	<i>Labour</i>	<i>Cap</i>
<i>AG</i>	1.79	0.37	0.31	0.32	0.34	0.06	0.65	0.18	0.29	0	0.18	0.42	0.32	0.28
<i>AG Pro</i>	0	1.38	0	0	0.03	0	0.01	0	0	0	0	0.01	0	0
<i>Hand</i>	0	0.01	1.01	0.01	0.01	0	0.02	0	0.01	0	0	0.01	0.01	0.01
<i>Trans</i>	0.01	0.02	0.02	1.02	0.73	0	0.03	0.01	0.02	0	0.01	0.03	0.02	0.02
<i>Cons</i>	0	0	0	0	1	0	0	0	0	0	0	0.01	0	0
<i>Commu</i>	0.01	0.02	0.02	0.02	0.02	1	0.01	0.02	0.02	0	0.01	0.03	0.03	0.02
<i>Shops</i>	0.47	0.91	0.67	0.81	0.85	0.16	1.62	0.44	0.73	0	0.46	1.05	0.8	0.7
<i>Gas-Resi-Ele</i>	0.04	0.08	0.07	0.19	0.15	0.01	0.1	1.04	0.08	0	0.04	0.09	0.08	0.06
<i>Tea-Food Wa-Ice</i>	0.08	0.15	0.12	0.17	0.17	0.03	0.23	0.08	1.13	0	0.09	0.2	0.15	0.14
<i>Buss Ser</i>	0.01	0.03	0.02	0.02	0.02	0	0.04	0.01	0.02	1	0.01	0.03	0.02	0.02
<i>Incomes</i>	0.01	0.01	0.01	0.01	0.01	0	0.02	0.01	0.01	0	0.44	1.01	0.01	0.01
<i>Labour</i>	0.6	1.12	1.14	1.2	1.09	0.09	0.73	0.77	1.19	0	0.24	0.55	1.42	0.37
<i>HH1</i>	0	0.01	0.01	0.01	0.01	0	0.01	0.01	0.01	0	0.01	0.01	0.01	0.03
<i>HH2</i>	0.01	0.01	0.01	0.01	0.01	0	0.01	0.01	0.01	0	0.02	0.05	0.02	0.01
<i>HH3</i>	0.01	0.02	0.02	0.02	0.02	0	0.01	0.01	0.02	0	0.02	0.05	0.03	0.01
<i>HH4</i>	0.01	0.02	0.03	0.03	0.03	0	0.02	0.02	0.03	0	0.03	0.06	0.03	0.02
<i>HH5</i>	0.07	0.14	0.14	0.15	0.14	0.01	0.09	0.1	0.15	0	0.06	0.13	0.18	0.08
<i>HH6</i>	0.02	0.04	0.05	0.05	0.05	0.01	0.03	0.03	0.05	0	0.05	0.12	0.06	0.05
<i>HH7</i>	0.02	0.04	0.05	0.05	0.05	0.01	0.03	0.03	0.05	0	0.05	0.11	0.05	0.12
<i>HH8</i>	0.03	0.05	0.06	0.06	0.06	0.01	0.04	0.04	0.06	0	0.05	0.11	0.07	0.05
<i>HH9</i>	0.05	0.09	0.09	0.1	0.09	0.01	0.06	0.06	0.1	0	0.06	0.14	0.12	0.06
<i>HH10</i>	0.12	0.22	0.22	0.23	0.22	0.02	0.14	0.15	0.23	0	0.09	0.21	0.27	0.13
<i>HH11</i>	0.01	0.02	0.02	0.02	0.02	0	0.01	0.01	0.02	0	0.03	0.06	0.02	0.05
<i>HH12</i>	0.01	0.01	0.01	0.01	0.02	0	0.01	0.01	0.01	0	0.03	0.08	0.02	0.04
<i>HH13</i>	0.01	0.03	0.03	0.03	0.03	0	0.02	0.02	0.03	0	0.04	0.09	0.03	0.04
<i>HH14</i>	0.04	0.06	0.07	0.07	0.08	0.02	0.04	0.04	0.07	0	0.04	0.08	0.08	0.16
<i>HH15</i>	0.2	0.37	0.37	0.39	0.37	0.04	0.24	0.25	0.39	0	0.11	0.25	0.46	0.22

By looking at the multiplier matrix Table (6.4), we can demonstrate the direct and indirect effects of our target sector – transportation sector as follows.

Table 6.5 Decomposition of direct and indirect impact of income multiplier on Transportation sector within production activities

<i>Impacts</i>		4	11
		<i>Trans</i>	<i>Cons</i>
1	<i>AG</i>	0.32	0.34
2	<i>AG_Pro</i>	0.00	0.03
3	<i>Hand</i>	0.01	0.01
4	<i>Trans</i>	1.02	0.73
5	<i>Commu</i>	0.02	0.02
6	<i>Shops</i>	0.81	0.85
7	<i>Gas-Resi-Ele</i>	0.19	0.15
8	<i>Tea-Food_Wa-Ice</i>	0.17	0.17
9	<i>Buss_Ser</i>	0.02	0.02
10	<i>Gam-Lot</i>	0.00	0.00
11	<i>Cons</i>	0.00	1.00

Direction injection of transportation sector Kyat 1 millions

<i>Direct Impacts</i>		4	11
		<i>Trans</i>	<i>Cons</i>
1	<i>AG</i>	0	0
2	<i>AG_Pro</i>	0	0
3	<i>Hand</i>	0	0
4	<i>Trans</i>	1.00	0
5	<i>Commu</i>	0	0
6	<i>Shops</i>	0	0
7	<i>Gas-Resi-Ele</i>	0	0
8	<i>Tea-Food_Wa-Ice</i>	0	0
9	<i>Buss_Ser</i>	0	0
10	<i>Gam-Lot</i>	0	0
11	<i>Cons</i>	0	1.0

<i>Indirect Impacts</i>		4	11
		<i>Trans</i>	<i>Cons</i>
1	<i>AG</i>	0.32	0.34
2	<i>AG_Pro</i>	0.00	0.03
3	<i>Hand</i>	0.01	0.01
4	<i>Trans</i>	0.02	0.73
5	<i>Commu</i>	0.02	0.02
6	<i>Shops</i>	0.81	0.85
7	<i>Gas-Resi-Ele</i>	0.19	0.15
8	<i>Tea-Food_Wa-Ice</i>	0.17	0.17
9	<i>Buss_Ser</i>	0.02	0.02
10	<i>Gam-Lot</i>	0.00	0.00
11	<i>Cons</i>	0.00	0.00

Based on the above table, investing one million kyats in the transportation sector will have high positive indirect impacts on agriculture and shops. Induced effects of the *transportation* sector in Table (6.4) will be “2.46” the summation of column sum from Labour to HH15. When there is “1” million kyat direct effect injections to construction sector, it gives higher positive indirect effects, mostly on shops and transportation. Induced effects of *construction* sector will be “2.43” of Table (6.4).

We therefore will observe the multiplier so as to focus the policy implication on the poor firstly and most importantly. This is because one of the remedies for poverty reduction is creating jobs for the poor and we have seen in Chapter (5) that poverty in semi-urban area is worse than that of others.

Hypothesis testing

To test hypothesis 1, we generated the $(I-A)^{-1}$ multiplier matrix, shown in Table (6.4) with the transportation and construction sectors highlighted in yellow. Based on the table, investing one million *kyats* in the transportation sector will have high positive indirect impacts on agriculture and shops. When we consider factors and institutions (labour and households), “the additional effect is attributed to the assumption that the factor payment passed back to institutions (wage paid to household), are assumed to stimulate additional sets of consumption (i.e. increase in final demand). This is the induced effect of the SAM output multipliers.” (Hara, 2008, p. 130).

To further explore these induced effects, we may decompose the overall multiplier into value added, employment, and zone-by-zone value added multipliers (Table 6.6). These all reflect the various induced effects of each investible sector. The

value added multipliers for the transportation and construction sectors are the highest, and the employment multipliers are the highest and third highest.

In parallel research(Chapter 5), we have also determined that the greatest poverty in the Mawlamyine economy lies in the semi-urban zone. The most favourable activities for that zone (shown in red boldface) are not only the transportation and construction sectors, but also agri-processing, handicrafts and the food/ snacks/ice/ water sector.

We therefore fail to reject hypothesis (1), which states that *the income and employment, and poverty-alleviation multipliers of the road infrastructure and transportation-related economic sectors are significantly higher than for other sectors*. Table (6.6) presents the decomposition of SAM-based multiplier in Mawlamyine.

Table 6.6 Decomposition of total Mawlamyine's SAM-based Multiplier

Decomposition of total Mawlamyine's SAM-based Multiplier	Gross income multiplier	Value added multiplier	Employment multiplier	Rural income multiplier	Semi-urban income multiplier	Urban income multiplier
Transportation	5.04	1.23	1.20	0.22	0.48	0.52
Construction	5.76	1.23	1.09	0.21	0.47	0.51
Agriculture, livestock	3.67	0.62	0.6	0.11	0.25	0.26
Agr. Processing	5.26	1.15	1.12	0.21	0.45	0.48
Handicraft	4.63	1.19	1.14	0.21	0.46	0.5
Communication	1.57	0.16	0.09	0.02	0.05	0.06
Shops and services	4.23	0.76	0.73	0.14	0.3	0.32
Gasolines , electronic	3.35	0.78	0.77	0.14	0.31	0.33
Food, ice	4.73	1.21	1.19	0.22	0.48	0.51
Business services	1	0	0	0	0	0
Gambling, lottery	3.18	0.68	0.24	0.13	0.3	0.25

Policy implications from the multiplier matrix

The semi-urban income multipliers in different activities give an idea of how to formulate policies to increase the income of semi urban people. The most favourable activities for the semi-urban sector are not only transportation and agri-processing but also food, snacks, ice, water sector and also the construction sector which gives a bit higher multiplier value for those poor populations.

If our policy goal is to create the jobs for Mawlamyine, then we should look at the employment multipliers from the labour row. When choosing the policy sector in which to create jobs, the transportation sector is the best again in terms of the value added (VA) multiplier or employment multiplier value which is the highest one with 1.20.

To upgrade the income level for those who are rural people, transportation and food, water and ice shops will be appropriate with the highest income multiplier value again. Based on the facts from our study, a rural development plan should be set up. This is despite the fact that, although rural area in Mawlamyine is rather close to the urban and semi-urban areas, income creating conditions are quite unfavourable in the rural area when we compare with semi-urban and urban areas. The policy planner should care about creating new jobs and encouraging existing sectors. In developing countries, creating new jobs with currently no potentials for trade might be very costly and difficult. Therefore the handicraft sector should be encouraged again to get the expectation of rural society.

Generally, the multiplier matrix gives us some overall policy formulation suggestions, but it cannot be said which individual activity or which overall plan is

optimal for the town. The next section will present the optimization problem with land and labour constrained.

To test hypothesis 2, we must convert the SAM of table (6.3) into a linear program. Linear programming is a special case of optimization problem such that the objective function and parameters are assumed to be linear and in which constraints may either be weak inequalities (greater than or equal to some minimum level, less than or equal to some maximum limit) or exact equalities. In our case the decision variables are importantly assumed to be the total products of the township laid out in columns or unit budgets of 1 million *kyat*. Accordingly, agriculture and the remaining sectors have been also been determined by how much those sectors' outputs should be increased or decreased. Therefore, our objective is going to be the maximization of the value added for the township output, It is the macroeconomic equivalent of net returns at the firm level. The coefficients for value added in the linear program are identical to the third line from the bottom of Table (6.3). The coefficients in the model are simply the I-A matrix rows all constrained to equal 0 (i.e., expenditures may not exceed income for any sector in the economy, including households and institutions). Additional constraints allow the land, labour, capital of the township itself to be used fully or underused, but never to be over-used; and a non-negativity constraint (no activity may be produced at a level less than 0).

6.7 Constrained Optimization for Value of Mawlamyine Township

Linear programming is a special case of optimization problem such that the objective function and parameters are assumed to be linear and in which constraints may either be weak inequalities (greater than or equal to some minimum level, less

than or equal to some maximum limit) or exact equalities. In our case the decision variables are importantly assumed to be the total products of the township. Accordingly, agriculture and the remaining sectors have been also been determined by how much those sectors' outputs should be increased or decreased. Therefore, our objective is going to be the maximization of the value added for the township output. Constraints are resources which are payments to the land, labour, capital and management resources owned by the township itself. It is the macroeconomic equivalent of net returns at the firm level.

Our Objective function;

$$y = f(x_1, x_2, x_3, \dots, x_n),$$

$$y = f(ag, ag - pro, handi, trans, commu, \dots, Row)$$

The constraint function;

$$g(x_1, x_2, \dots, x_n) \geq 0$$

OR

The linear program for a SAM becomes:

$$\text{Max } V = v \cdot x$$

$$\text{s.t. } I - A \geq 0$$

$$r \leq b$$

$$x \geq 0.$$

Where V = total township value added

v = value added for a given activity

x = the output level of a given activity in million kyat

r = resource (land, labour, capital)

b = maximum available level of a given resource

Getting Land and Labour constraints for Mawlamyine

Secondary data sources for land utilization of Mawlamyine provided adequate data to lay down the land constraint in the agricultural sector which is firstly the constraints with 23445 acres which are cultivable land in Mawlamyine (Mon State Facts and Figures, 2010). We assumed that the double cropping system in Mawlamyine's agriculture sector could potentially allow an increase of less than or equal to 10% in agriculture land. Therefore, land utilization could be increased ($23445 + 2344 =$) up to 25790 acres. This last number was therefore set as the upper bound of agricultural land use in the optimization model.

Labour constraints are calculated as the ratio of country wide estimation from employment (Review of the Financial, Economic and Social Conditions for 2001/2002). According to an official estimation on employment in various sectors, the highest employment is in the agriculture sector, representing around 60% of total employment. Although there is a little adjustment based on employment of the actual sectors in agriculture as 40% of employment is working at that sector, mostly labour constraints come from the countrywide data estimation by multiplying the ratio of total people who can work (for the working age, see Chapter 2) and by assuming an unemployment rate of 25% by personal observation of the situation of Mawlamyine as a developing country township. (The officially announced rate of unemployment of just 4% seems implausible). Since our SAM cannot fill the data for government employment for some sectors, we leave some numbers for those sectors blank. After creating the ratio of employment generated per million kyats of total output value, a labour constraints row was added to the (I-A) matrix for the linear programming operation as our parameters. However, labour enjoys a much greater slack than land.

Employment can be increased up from the current level of 127,986 person up to 209,104 persons, i.e., the total amount of Mawlamyine's people who can work (see Chapter 3, Table (3.1)).

In order to get the optimal output with our resource constraints, the Solver routine in MS EXCEL 2007 is an extremely useful tool for solving this problem. As the (I-A) matrix is a unit net income matrix and very useful for linear programming matrix (Calkins, 2009), we have used (I-A) matrix in our optimization problem. Running the model by forcing all the I-A constraints to balance has a limit, first detected by Walras, that solution meaningful solution other than zero or completely parallel changes in all activities cannot be obtained. So the essence of running our model in practice is to allow one variable to be unconstrained. Most importantly, the researcher or policy planner should decide which variable should not impose or impose with exception. As we plan to make smaller amounts of agriculture import for Mawlamyine town and we have noticed a huge level of inefficiency in using local resources, we set the ROW (rest of the world constraint) to go no higher than about 20% less than its current level, i.e. 140,000 (million Kyats), less than the current level 173701 (million Kyats).

Table (6.7) presents the optimal solution and range analysis for Mawlamyine Township meso-economy.

Table 6.7. Estimated optimal solution and range analysis for the Mawlamyine Economy

Name	Final Value	Level Today	% change
Township Value added	178941	94947	88%
Reorganization of township value added			
<i>AG</i>	81701.2	70632.5	16%
<i>AG Pro</i>	3453.6	3795.9	-9%
<i>Hand</i>	2402.3	2085.8	15%
<i>Trans</i>	15787.9	16310.5	-3%
<i>Commu</i>	6213.8	5036.1	23%
<i>Shops</i>	171030.4	140403.9	22%
<i>Gas-Resi-Ele</i>	145106.2	14353.1	911%
<i>Tea-Food Wa-Ice</i>	35365.0	30376.5	16%
<i>Buss Ser</i>	4692.2	3859.6	22%
<i>Gam-Lot</i>	743.3	579.6	28%
<i>Cons</i>	6305.8	6392.7	-1%
<i>Incomes(Tips, NON)</i>	2289.8	1789.8	28%
Factor Employment			
Agriculture Land	25790.0	23445.0	10%
Labours	169160.0	129786.0	30%
Capital (agri machines)	2401.1	1950.1	23%
Income Redistribution			
<i>HH1</i>	2892.4	2627.1	10%
<i>HH2</i>	4462.6	4070.6	10%
<i>HH3</i>	6506.4	5681.1	15%
<i>HH4</i>	7336.4	6337.2	16%
<i>HH5</i>	22792.9	12792.8	78%
<i>HH6</i>	9374.6	6699.1	40%
<i>HH7</i>	10158.9	7807.8	30%
<i>HH8</i>	12448.1	9476.0	31%
<i>HH9</i>	20207.1	14858.9	36%
<i>HH10</i>	62745.2	53729.9	17%
<i>HH11</i>	6753.6	6751.0	0%
<i>HH12</i>	7772.3	8146.2	-5%
<i>HH13</i>	11028.8	10925.2	1%
<i>HH14</i>	17568.8	14795.9	19%
<i>HH15</i>	64481.6	39242.5	64%
Returns to external institutions			
Institutions (Tax and Special gov fees) GOV	10797.3	7472.6	44%
Transnational money transfer fee	16032.9	19531.4	-18%
Savings banks	98032.6	73768.7	33%
Lending institutions	12874.2	10333.9	25%
Institutions (NGO , education , monastery ,disaster, wedding)	7609.9	5825.6	31%
Rest of the world	140000.0	173701.1	-19%

Land and Labour utilization under new plan

As we presumed earlier, land and labour have been emphasized on our model since capital is beyond our control. Under the new plan of optimization, the result gives favor on the macroeconomic stability of employment creation. Based on our optimization solution, employment opportunity could be employed from 129786 to 169160. On the other hand, land is most binding constraint apart from capital as Mawlamyine lies on the mountain ranges. Though land utilization could be increased 2345 acres (from current level 23445 persons to 25790 persons) under new plan. However, land policy could carefully be considered as residence normally does not like land reform and new plan.

The result show that we may accept hypothesis 2, to the effect that overall per capita and the number of jobs in the Mawlamyine area could increase by at least 20% if the sectoral distribution of economic size were adjusted according to the optimal SAM.

Policy implications of optimal solution

The optimal plan results tell us that transportation, the target sector in our study could be decreased by 3% in terms of employment and 1% in terms of road construction, instead of increased. The value of this sector has already surpassed the maximum efficient level with respect to current labour and capital conditions. This is undoubtedly due in large part to the very rudimentary means of transportation (trishaw, pony cart, cycle and dilapidated buses) and the feeble job creation possibilities in this sector. The optimal decline in transportation signals to the policy planner that the optimization policy should be set up and applied in Mawlamyine. The apparently contradictory results of the multiplier matrix and of linear programming

should pose no dilemma for policy planners. Multipliers are calculated independently of both other activities and economic constraints; they correspond to unconstrained partial equilibria. The linear programming, on the other hand, yields a unique optimum under constrained optimization of all activities simultaneously. It is therefore an example of complete equilibrium.

From our viewpoint, the result of not encouraging transportation is quite reasonable for a small town like Mawlamyine. The fact that a majority of households own at least one bicycle depresses income of the transportation sector. Even though the EWEC network is not fully connected through to Thinguannyinaung, Myawaddy, a number of highways and township roads have been paved and upgraded. This has reduced the demand by households for trishaws, motorcycles, and pony carts. Planners should probably upgrade the public transportation system instead of encouraging the private sector.

According to official statistics, the sufficiency rates of Mawlamyine Township's rice consumption in 2008-09 and 2009-2010 were only 16.8% and 21.3% respectively (Mon State's Facts and Figures, 2010, p. 29-30). Our optimization plan gives a very close guide to implementing policy in reality. Currently, the optimization calls for no new investment and no labour. Facts from the sensitivity report confirm that it would be better to increase the agriculture sector including vegetables, fruits and rice production because the survey experience indicates that the majority of fruits (Thai longan, Thai durian, Malay durian, Thai rambutan and Thai orange) are most famous not only in Mawlamyine but also in the rest of Myanmar. As a result, orchard planters have been giving up doing business in that sector although Mon State was a famous fruit exporting town several years ago.

In addition, the handicraft sector such as blacksmithing and the fabrication of herbal indigestion pills and chopping hoe should be encouraged. Mostly those artisans hail from the rural area. Encouraging those businesses will have at least two benefits. Firstly, it will give more chance for income generation for those rural families in terms of both business owners and labourers. Secondly and consequently, it will be a policy for eradication rural poverty as well. The problem of policy planner is how to encourage that sector. According to focus group interviews during the 2009 survey, people in those sector did not have any motivation to carry on their home business as they thought that income from going to work on the border or in factories in Thailand offered more opportunities to do things that they want.

The result from gambling and lottery comes out to be considerable, as we know that income from that sector is only going to tips and the non-monetary sector and to the rest of Myanmar and the world. When we consider the problem logically, the probability of winning the lottery is infinitesimally low. However, people in that area hope that they can win that lottery, which makes the illegal lottery a popular business among the people. Based on the survey experience, people in different classes – rich or poor - play the lottery since their hopes of winning the illegal lottery are generally quite elevated. Even if the lottery offers the chance to significantly increase the income level, this sector should not be encouraged to grow.

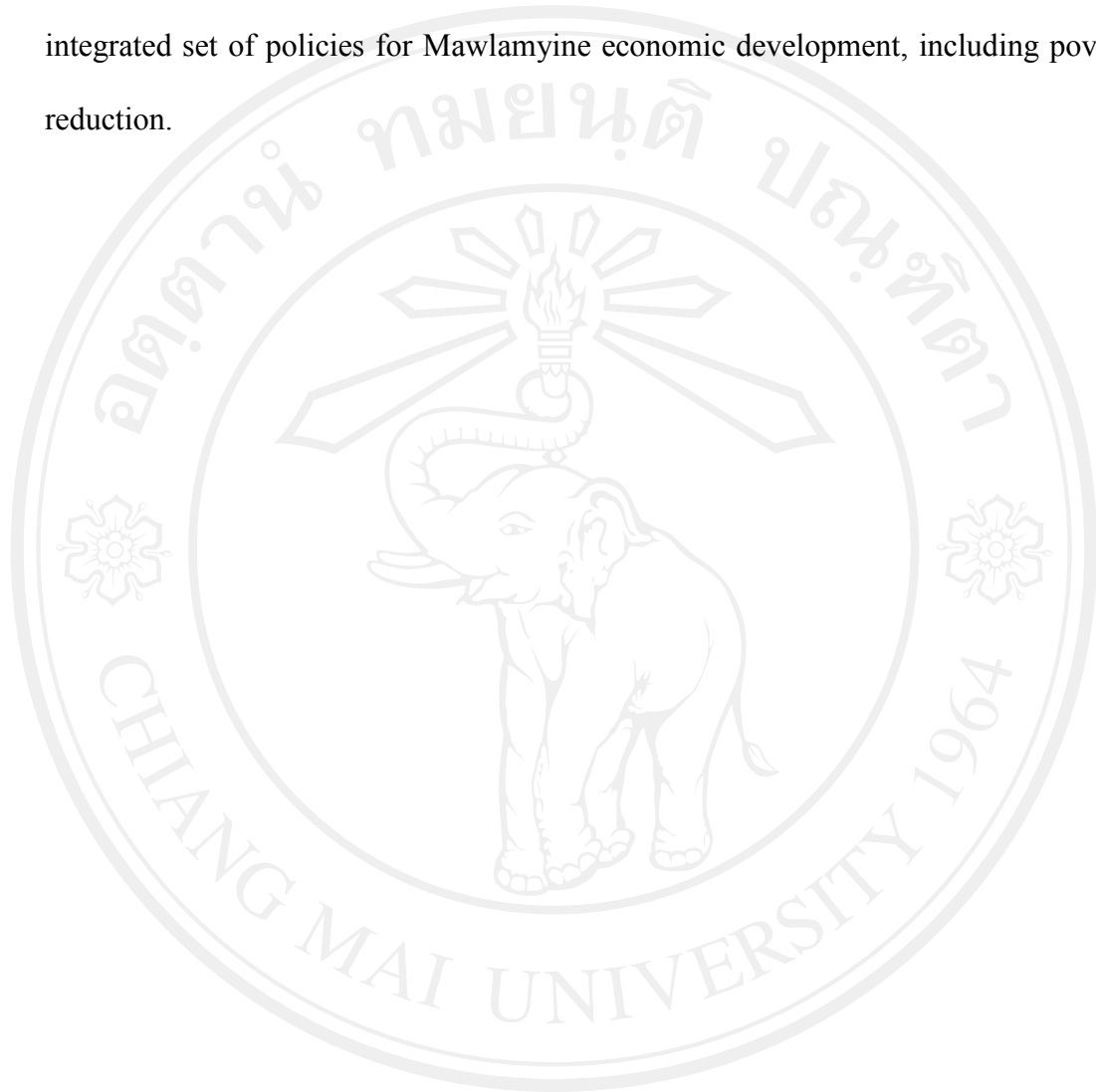
On the other hand, drinking water, ice, food and snack shop could be targeted for upgrading. With reference to the survey experience, people in Mawlamyine do have some burden for finding water not only for drinking but also water for general uses. Small food and snack shops should be encouraged too as those kinds of income mostly contribute to the poor people in the rural areas.

A primary sector that could promote the economic development of Mawlamyine town is apparently gasoline, residence shops and electronic shops. But the data on which the optimization results are based come from 2009, when private gasoline shops were unofficial and illegal. We therefore cannot recommend that a large sum of money be invested in them. Rather, our target should be to upgrade the agriculture sector and reduce agriculture import. That is why we consider reducing the ROW account by some twenty percent. Unless there is a corresponding rise in price, such a reduction might have some favorable effects on the gas and electronic shops as Mawlamyine imports 100% gas and electronic products. Generally participants in small gasoline shops are from medium income households. Electronic shop businessmen are from higher income classes.

6.8 Conclusion

We see from the multiplier matrix and sensitivity report that combining primary survey and adjusted secondary data have some valuable policy implications for the authorities. First and foremost is for the government to decide for what kind of goals they wish to apply to public policy. In the case that the goal is increasing income, only multiplier analysis is not giving complete information to decide. What about the target goal of creating both employment and income? Accordingly, the policy planner should pay careful attention to the structure of employment composition. On the other hand, the sector which has the greatest economic potential with respect to economic conditions in the long run must be considered before final policy formulation.

What then will be the appropriate policy for poverty reduction for Mawlamyine? The final and concluding chapter will propose an appropriate, integrated set of policies for Mawlamyine economic development, including poverty reduction.



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