

Consumption Patterns Analysis in Thailand with Linear Approximate Almost Ideal Demand System, 1980–2014

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Abstract

The study focuses, in particular, on the allocation of the private consumption expenditures among the aggregate food and non-food commodities during the observation period of 1980–2014 using a collective data of National Income of Thailand published by the Office of the National Economic and Social Development Board (NESDB). The study attempts to signify and characterize the consumption allocations among different aggregate commodities of the Thai consumers as per capita real disposable income increased when the country progressed from a low-income to a middle-income economy, and their responses as the crisis took place in the economy. The Linear Approximate Almost Ideal Demand System (LA/AIDS), an extension of the demand system which was developed by Deaton and Muellbauer (1980), is applied with the data for the purpose of the demand system analysis. The results suggest that changes in income provide significant impacts on the consumption decisions among Thai consumers whereas the external shocks such as crisis indicate no significant impacts on changes in consumption behavior. In addition, the empirical results indicate significant improvements in both food and non-food consumption baskets as per capita income increases over the time period for the Thai consumers, particularly food consumption. Well-being enhancement related commodities such as housing utilities, transport, and communication were proven to remain as luxuries while access to consumption in regards to human capital development such as health care and education remained limited among average consumers, especially the lower income consumers.

Keywords: Consumption, Consumption patterns, Consumption analysis, Consumption in Thailand, Food and non-food, Aggregate consumptions, AIDS, LA/AIDS, well-being, welfare, Thailand

1. Introduction

In general, a nation becomes richer over time and just like most countries real disposable income per capita in Thailand has been on the rise over the past decades while it is commonly known that changes in income also bring about changes in the consumer's expenditure on some commodities. As one particular empirical findings of Engel's law pointed out the declines in the proportion of income spent on food as income increases (Ernst Engel, 1857). The empirical law suggests that as the standard of living of households increases, the proportion of the budget allocated to food expenditure decreases allowing bigger portions of the budget shares to be

allocated among other commodities or become able to afford more luxury goods. Thus, the objective of this study is to observe changes in the well-being of individual consumers through the analysis of their material consumptions. The study focuses, in particular, on the changes in the consumers' expenditures on food and nonfood commodities as the country's per capita income improved from the low-income economy to the middle-income economy.

To ensure the consistency of the estimated results and the microeconomic theories, the study takes into account the consumer theory in an attempt to construct the demand systems for the Thai consumers which correspond well with the economic theory. As a result, the Almost Ideal Demand System (AIDS), suggested by Deaton and Muellbauer (1980), is employed for the purpose of the study and the analysis of the consumption situation in Thailand. To the study advantage, the AIDS claims to give the results which satisfy the axioms of choice as stated in the consumer study while allowing the particular restrictions of homogeneity and symmetry to be easily tested and imposed. The Laspeyres price index is chosen to avoid the complications of the nonlinearity in the parameters of the price index and to avoid the problem of having the budget share acting as both the dependent and independent variables in the estimating systems (Moschini, 1995; Asche and Wessells, 1997). The application of the Laspeyres price index gives an alternative functional form of the demand system known as the Linear Approximate Almost Ideal Demand System (LA/AIDS), which is the system employed in this study. The data collected from the National Income Account of Thailand over the observation period of 1980–2014 are applied in the analysis and are adjusted in real terms at 2002 constant price.

The structure of the paper is as follows. In section II, the study observes the characteristics and consumption patterns of particular commodities in Thailand in regards to the study's interests as well as reviews of the relevant literature. Section III focuses on the theory of consumer demand necessary to the construction of demand systems, and how it may be applied and used in the demand analysis. In section IV, the development of the AIDS model is shown along with the estimation and restriction methods of the study. Lastly, in section V, the empirical results are shown and further discussion of the study are carried out.

2. Consumption in Thailand and Related Literature Reviews

In the past, GDP per capita used to be the most important tools indicating the well-being of the people in the country. However, using GDP alone does not bring about any understanding in terms of people's quality of life nor the basic needs provided to the people while income, on the other hand, provides people with means and greater accesses to commodities and services, which in turn bring about the better quality of life and the better living conditions. Moreover, the study by Sen (1985) suggests that the indicators of the material well-being may be based on both income and non-income dimension of material well-being such as health, education, work, personal activities etc. For instance, following the basic theory of the human capital, higher educational attainment and good health, in particular, may enable a person to be more work efficient, more productive and higher chances of getting better-paying jobs, as a result, higher income and higher standards of living as well. Therefore, not only the focus of the study is on the

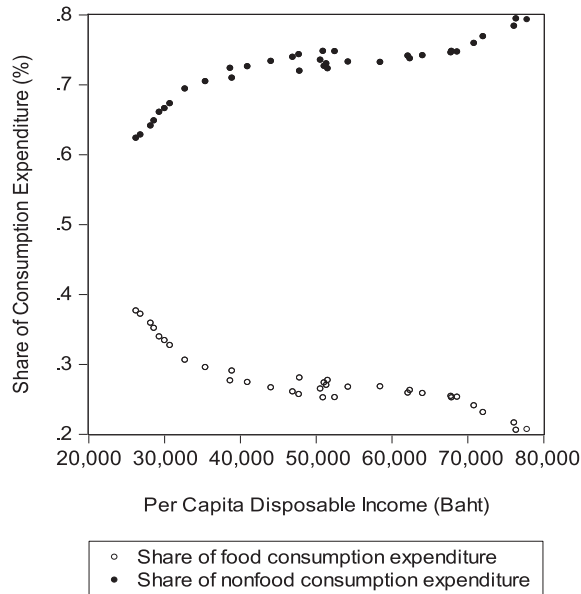
consumptions of food and nonfood commodities but, also, the study will pay attention to other consumptions of material well-being which may enable an individual with more productivity and more chances in leading a better life.

Over decades, private consumption expenditure has played an important role in contributing towards the Thai economic growth since consumption alone already takes up more than half the country's GDP. While it is commonly known as one of the major economic stimulus in macroeconomics, it is better known in the Microeconomic study as one of the variables determining consumer's happiness or utility. In 1980, Deaton pointed out the significance of household consumptions as a means of measuring poverty and the living standards of the people. He insists that data collected on consumption and expenditure are better indicators in regards to welfare measurement as they are easier to collect than income, especially in low-income countries, and tend to be smoothed out over the longer period of consumption and less subjected to seasonal variation (Deaton and Grosh, 2000).

In this study, one of the main objectives is to observe the allocation of expenditures between two aggregate commodities, food and nonfood consumptions. During the observation period of 1980–2014, like most developing countries, the data collected on expenditures suggests food consumption expenditure in Thailand occupies the biggest portion of the consumer's total expenditures dominating the budget shares. In 1980, the data indicates food expenditure alone accounted for almost 40 percent of the private expenditure budget share and slowly declines over time as per capita income increases. The more recent data in 2014 shows the average budget share of the private expenditure, devoted to the consumption category, have been lessen to around 20 percentage point of the budget share. Although the proportion appears to be much less in terms of the share number, food expenditure remains the biggest consumption category compared to expenditures spent on other aggregate commodity groups. Conversely, the consumers' private expenditure on nonfood consumptions were shown to be around 60 percent of the total expenditure in 1980 and increased to around 80 percent, on average, in 2014. This observation implies that there are certainly changes and improvements in the consumers' consumption patterns which occurred during the study period. Figure 1 illustrates the relationship between the allocations of expenditure shares on food and nonfood consumptions at different levels of incomes. The data shows that at the lower income levels, closer to the left axis, the shares of expenditure on food appear to be on the higher side and gradually decrease as consumers are faced with higher income levels. On the contrary, the expenditure shares generated on nonfood consumptions appear to be the opposite. Instead of decreasing with higher income, the budget share allocation on nonfood commodities suggests a positive relationship with the increase in the consumer's income.

Notice that even though when data are expressed in per capita value terms, both expenditures spent on food and nonfood may appear to have positive relationships with disposable incomes, however, when they are put instead in the form of the budget share, food expenditure appears to have exhibited a negative relationship with higher income. The ability of consumers to diverge themselves from spending almost half of their income on food consumption certainly signals some improvements and contributions toward better well-being. In addition, there are

Figure 1 The relationship between expenditure on particular commodities, food and non-food, and real per capita disposable income



Source: Created by Author using National Income Account, 1980–2014

other opinions expressing the importance of food consumption among consumers. Leibenstein (1957) pointed out a particular concern in his work regarding the reverse link of the nutritional status to productivity and income. He expressed concerns towards those who do not get enough food or calories intakes causing them to be unproductive and unemployed. As a result, this group of people are ones stuck in unemployment and the low-income trap.

Since the focus of the study now is mainly among the allocation of expenditures on food and nonfood consumptions, there are quite a limited number of empirical studies available relating particularly to this area. There are, however, some studies related to an analysis of sectoral private household consumption in Thailand and most cases found food expenditure to be less sensitive to income changes, especially when consumers are faced with lower income level, and when compared with other aggregate commodities (Karnjana Polchan and Suwannee Wattanachit, 1982; Pattamasiriwat, Punyasavasut and Santawesuk, 2000; Somprawin Manprasert, 2002; Isavilanonda, Somporn and Weerasak Kongrithi, 2006). Moreover, the expenditure data during the 1970s and 1980s suggest that apart from consumption on food, rent and utilities, other types of expenditures were found to be sensitive to changes in income and less responsive to changes in the prices while different income classes and the residing areas indicate different income elasticities of the demand for food as well. Their studies conclude that, in urban areas, the demand for food were found to be less elastic than those in the rural areas but, on average, the elasticities were all found to be positive, inelastic and close to zero, except for those with high-income households. Table 1 summarizes some of the previously mentioned relevant findings in Thailand.

Table 1 Reviews of Estimates of Food and Nonfood Expenditures in Thailand

Authors	Country	Study period	Categories	Intercept	Marginal Expenditure	Own-Price Effect	R ²	Income Elasticity	Own-Price Elasticity
Deaton, Angus and John Muellbauer	Britain	1954-1974	Food	1.221** (7.4)	-0.160** (-6.1)	0.186** (9.8)	0.99	0.21	0.07
			Housing	0.793** (6.3)	-0.104** (-5.1)	0.088** (7.2)	0.99	0.3	-0.31
			Transport and Communication	-0.061 (-0.9)	0.029** (2.6)	-0.023** (-2.2)	1.00	1.23	-1.21
Blanciforti, Laura and Richard Green	United States	1948-1978	Food	1.140** (4.4)	-0.127** (-4.1)	0.116** (2.7)	0.99	0.37	-0.32
			Housing	1.103** (10.6)	-0.131** (-9.5)	0.099** (6.7)	1.00	0.01	-0.15
			Utilities	0.143** (2.6)	-0.014** (-2.0)	0.011 (1.6)	0.97	0.62	-0.67
			Transportation	0.387** (6.3)	-0.042** (-5.6)	0.047** (5.6)	0.99	0.44	-0.34
			Medical care	0.390** (3.1)	-0.045** (-2.8)	0.041 (1.8)	1.00	0.31	-0.32
			Durables	-3.319** (-8.2)	0.428** (8.3)	0.111 (1.8)	0.84	4.42	-0.67
Klaus F. Zimmermann	Austria	1980	Food and drink	0.527** (6.8)	-0.063** (4.3)	0.095** (5.0)	0.99	—	—
			Other goods and services	0.437** (3.19)	-0.057** (2.18)	0.069** (2.07)	0.849	—	—
			Durables	-0.173 (1.2)	0.035 (1.3)	0.059 (1.0)	0.80	—	—
			Leisure	0.209 (1.4)	0.085** (2.9)	0.266** (8.6)	0.99	—	—

Table 2 Reviews of Estimates of Commodities Expenditures with AIDS in Britain, the United States, and Austria

Authors	Period	Food Expenditure	Intercept	Marginal Expenditure	R ²	Nonfood Expenditure	Intercept	Marginal Expenditure	R ²
Polchan, Kanjana and Suwannee Wattanaajitt	1975-1976	Whole Kingdom	1703.61 (0.58)	0.175 (0.48)	0.23	Whole Kingdom	18.327** (51)	0.0510 (0.0510)	0.19
		North	1645.46** (19.49)	0.132 (0.008)	0.09	North	8.85** (57.13)	0.0457 (0.0008)	0.57
		Northeast	1059.47** (56.47)	0.576 (0.002)	0.5	Northeast	4.82 (29.43)**	0.0677 (0.0023)	0.21
		Central	1763.15** (27.78)	0.297 (0.01)	0.26	Central	-8.28** (27.87)	0.0867 (0.0031)	0.27
		South	1812.52** (33.38)	0.168 (0.012)	0.13	South	60.30** (5.64)	0.0203 (0.0036)	0.0218
		Bangkok	1531.55 (41.69)**	0.529 (0.013)	0.43	Bangkok	-3.356** (18.66)	0.0541 (0.0029)	0.13
Isavilanonda, Somporn and Weerasak Kongrithi (2006) (Rice Consumption)	2002	Whole Kingdome	1.174** (61.3)	-0.106** (-53.2)	0.34	—	—	—	—
		Lower Income HH (25%)	1.025** (43.6)	-0.097** (-38.9)	0.28	—	—	—	—
		Middle Income HH (50%)	0.791 (67.74)**	-0.072** (-62.6)	0.33	—	—	—	—
		High Income HH (25%)	0.561** (55.77)	-0.049** (-50.91)	0.29	—	—	—	—
Chomtohsuan, Thoedsak	2002	Whole Kingdome	—	0.1013*** (122.79)	Prob. 0.00	Whole Kingdome	—	0.8948*** (1065.27)	Prob. 0.00
		Poor (0-299 Baht/month)	—	0.4639*** (21.08)	0.00	Poor (0-299 Baht/month)	—	0.5255	0.00
		Almost poor (923-4,000 Baht/month)	—	0.2792*** (106.45)	0.00	Almost poor (923-4,000 Baht/month)	—	0.7080*** (267.44)	0.00
		Moderate (4,001-12,500 Baht/month)	—	0.1182*** (36.57)	0.00	Moderate (4,001-12,500 Baht/month)	—	0.8770*** (267.76)	0.00
		Rich (>25,000 Baht/month)	—	0.027*** (7.57)	0.00	Rich (>25,000 Baht/month)	—	0.9720*** (268.34)	0.00

Source: Created by Author based on the results of the others' previous studies

Table 2, on the other hand, summarizes some of the relevant estimations of expenditures on different aggregate commodities in Britain, the United States and Austria respectively. The same functional form of AIDS is applied in all of the following three studies for the purpose of the empirical analysis. Despite the differences in the three countries' characteristics and demographics as well as the difference in the time periods of the data collection, the results indicate food consumptions to be necessities in all three cases whereas the results of consumption on nonfood commodities were found to have been varied across the countries. In the analysis of the postwar British data carried out by Deaton and Muellbauer (1980), the results categorized food and housing in Britain during the period to have been considered as necessity consumptions whereas the expenditures on transport and communication and the rest of the consumptions were found to be viewed as luxurious consumptions. Interestingly, the findings of the analysis of the expenditures data in the United States during 1948-1978 indicated consumptions on food, housing, utilities, transportation and medical care all appeared to be classified as necessities implying quite the better living quality compared to other countries while consumptions on durables were the only category found to be luxury with extremely high income elasticity (Blanciforti and Green, 1983). The findings suggest that the US consumers, in general, have accesses to good living conditions and health care. Whereas, the AIDS estimations on Austrian data indicated that besides consumption on durable goods and leisure, other consumptions such as consumptions on food, drinks as well as other goods and services were all considered to be necessity goods for consumers (Klaus F. Zimmermann, 1981).

3. Model Specifications and Theoretical Restrictions

Consumer theory in Microeconomic study explains how a consumer with a certain level of income allocates his or her budget among available goods and services during a specified period of time to satisfy their needs and desires. Many studies have been carried out over the course of the years in an attempt to bring light to the study of the consumer's behaviour; to find rational explanations as to why, indeed, consumers act the way they do or choose to consume some products over the others. For the sole purpose of making consumption analysis possible and to ensure the theoretical consistency, there are basic assumptions that must be laid out regarding the concept of utility functions and the demand functions, which will make the statistical data analysis on consumer behaviours possible.

The theory of consumer behaviour postulates that consumers behave rationally and choose among the consumption alternatives available to maximise their satisfaction. Taken into account that consumers are aware of the alternatives facing them and are able to evaluate their worth or utility given their specific level of income. Generally, the consumer's income, tastes, and market prices are assumed to be given. Each consumer is assumed to be spending his or her income on goods and services in such a way that maximises his or her total utility or, alternatively, minimises the amount of expenditure necessary to attain a specific level of utility at those given prices, provided that the marginal rate of substitution for each good diminishes as the purchased quantity of that particular good increases while other things remaining the same.

3.1 Almost Ideal Demand System (AIDS) and Linear Approximate Demand System (LA/AIDS)

The AIDS model has been applied extensively in many of the empirical demand analysis studies since its development in 1980 (Deaton and Muellbauer, 1980) largely due to its claims to give the arbitrary first-order approximation allowing the aggregation over consumers to be made such that the results derived from the model are the outcomes representing the rational decisions made by the representative consumers. The model is constructed based on a specific class of consumers' preference ordering known as the PIGLOG (price independence, generalized linear, and logarithmic) and can be represented through the consumers' cost function $c(u, p)$ defining the amount of minimum expenditure necessary to attain a specific level of utility u , given the market prices p (Muellbauer, 1975, 1966). The cost function is defined as

$$\log c(u, p) = (1-u)\log\{a(p)\} + u\log\{b(p)\} \quad (1)$$

where $a(p)$ and $b(p)$ are functions of prices and are positive linearly homogeneous functions. u lies between 0 and 1 representing expenditures' allocation between subsistence consumptions and bliss consumptions. Hence, the positive, linear and homogeneous function $a(p)$ and $b(p)$ can be regarded as the cost of subsistence and the cost of bliss respectively. By assigning the specific functional forms for $\log\{a(p)\}$ and $\log\{b(p)\}$, the empirical cost function of the AIDS can be derived. Following Deaton and Muellbauer's suggestion (1980), $\log\{a(p)\}$ and $\log\{b(p)\}$ functions defined as equation (2) and (3) respectively will allow the resulting cost function to be a flexible functional form.

$$\log a(p) = \alpha_0 + \sum_k \alpha_k \log p_k + \frac{1}{2} \sum_k \sum_j \gamma_{kj}^* \log p_k \log p_j \quad (2)$$

$$\log b(p) = \log a(p) + \beta_0 \prod_k p_k^{\beta_k} \quad (3)$$

By substituting (2) and (3) into (1), the AIDS cost function can be obtained.

$$\log c(u, p) = \alpha_0 + \sum_k \alpha_k \log p_k + \frac{1}{2} \sum_k \sum_j \gamma_{kj}^* \log p_k \log p_j + u\beta_0 \prod_k p_k^{\beta_k} \quad (4)$$

Equation (4) is *linearly homogeneous in prices* provided that the parameters satisfy the conditions;

$$\sum_{i=1}^n \alpha_i = 1, \quad \sum_j \gamma_{kj}^* = \sum_k \gamma_{kj}^* = \sum_j \beta_j = 0 \quad (5)$$

Given a cost function as shown in equation (4), the demand functions can be obtained through the application of the Shephard's Lemma (see Ronald Shephard, 1953). By differentiating the cost function with respect to the respective price $\frac{\partial c(u, p)}{\partial p_i}$, the quantity demanded q_i for that particular commodity can be derived as a function of prices and utility or Hicksian demand. To further observe the demand function in the form of the budget share of the commodity,

multiply the demand function by price over total expenditure $\frac{p_i}{c(u, p)}$, because the utility maximizing consumer always prefer more to less and will choose to spend income such that the income will equal expenditure $c(u, p) = x$ where x represents the total expenditure. Thus, the budget share of the i^{th} good can be obtained by

$$\frac{\partial \log c(u, p)}{\partial \log p_i} = \frac{p_i q_i}{c(u, p)} = w_i \quad (6)$$

where w_i represents the budget share of good i given that $i = 1, 2, \dots, n$. Alternatively, the logarithmic differentiation of equation (4) with respect to the price of good i also allows the budget share of good i to be derived directly from the cost function. The derived budget share, as shown below, is a function of utility and prices.

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i u \beta_0 \prod p_k^{\beta_k} \quad (7)$$

$$\gamma_{ij} = \frac{1}{2}(\gamma_{ij}^* + \gamma_{ji}^*) \quad (8)$$

As mentioned, the adding-up condition assumed under the consumer theory suggests that a utility-maximizing consumer will eventually spend up his entire income so that his total expenditure x will equate $c(u, p)$ implying that equation (4) must be equal to total expenditure as assumed in the demand theory. Note that in order for the budget demand function (7) to be applicable to the existing data, the money metric utility function has to be obtained. Such function can be obtained by setting the cost function, equation (4), equal to the total expenditure, then, reverse the function so that the indirect utility function $\varphi(x, p)$, a utility function as a function of total expenditure and prices, can be attained. Substituting the resulting indirect utility function into the budget share equation (7), then rearrange the equation so that the budget share of good i is written, instead, as a function of expenditure and prices;

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log\left(\frac{x}{P}\right) \quad (9)$$

$$\log P = \alpha_0 + \sum_k \alpha_k \log p_k + \frac{1}{2} \sum_k \sum_j \gamma_{kj}^* \log p_k \log p_j \quad (10)$$

where w_i is the budget share of good i , p_j is the price of good j , x is total expenditure, P is the price index function and $\alpha_i, \gamma_{ij}, \beta$ are the parameters to be estimated. Given the restrictions on the parameters of the cost function in equation (4) and the restrictions of equation (8), the restrictions on the parameters of equation (9) are also required. Firstly, adding-up condition is satisfied given that

$$\sum_{i=1}^n \alpha_i = 1 \quad \sum_{i=1}^n \gamma_{ij} = 0 \quad \sum_{i=1}^n \beta_i = 0 \quad (11)$$

Secondly, the homogeneity restriction requires that, for all j ,

$$\sum_j \gamma_{ij} = 0 \quad (12)$$

Lastly, the symmetry restriction is satisfied by

$$\gamma_{ij} = \gamma_{ji} \quad (13)$$

Nevertheless, the application of the price index suggested above by the Deaton and Muellbauer (1980) proven to be difficult in terms of estimation owing largely to non-linearity in the parameters. To handle such problem, Deaton and Muellbauer recommended the use of the Stone's price index.

$$\log P^* = w_i \log p_i \quad (14)$$

The studies later on suggest that the adaptation of the Stone's price index may not be advisable since doing so would mean that the budget share of the i^{th} good are treated as both the dependent and independent variables at the same time in the model, moreover, the index is also variant to changes in the unit of measurement of prices (Alston, Foster, and Green, 1994; Moschini, 1995; Eales and Unnevehr, 1988). Hence, an alternative Laspeyres price index was suggested instead. In the Laspeyres price index method, the budget share term is replaced by the average budget share, thus, the equation becomes a geometrically weighted average of prices;

$$\ln(P^L) = \sum_i \bar{w}_i \ln(p_i) \quad (15)$$

Substitute the Laspeyres price index (15) into the AIDS budget share (9) and rearrange the equation for the Linear-Approximate AIDS (LA/AIDS),

$$w_i = \alpha_i^* + \sum_j \gamma_{ij} \ln(p_j) + \beta_i (\ln(x) - \sum_j \bar{w}_j \ln(p_j)) + \mu_i \quad (16)$$

where

$$\alpha_i^* = \alpha_i - \beta_i (\alpha_i - \bar{w}_i \ln(\bar{p}_i))$$

and \bar{p}_i is the mean price of the i^{th} commodity. Again, the model requires the adding-up, homogeneity, and symmetry conditions to be satisfied in order to be consistent with the theory of the demand.

Suggestions on how to derive elasticities for the AIDS and LA/AIDS models are widely available. Following suggestions of Green and Alston (1990), Buse (1994), and Ackah and Appleton (2007), elasticities for LA/AIDS can be computed at the sample means. To derive the *expenditure elasticity* η_i , take the derivative of the LA/AIDS equation with respect to $\ln x$.

$$\eta_i = \frac{\partial \log q_i}{\partial \log x} = 1 + \left(\frac{1}{w_i} \right) \left(\frac{\partial w_i}{\partial \log x} \right) = 1 + \left(\frac{\beta_i}{w_i} \right) \quad (17)$$

On the other hand, taking derivative of the equation with respect to $\ln p_j$ would then give the Marshallian (uncompensated) own price elasticity (if $j = i$) or cross price elasticity (if $j \neq i$), e_{ij} .

$$e_{ij} = \frac{\partial \log q_i}{\partial \log p_j} = -\delta_{ij} + \left(\frac{1}{w_i} \right) \left(\frac{\partial w_i}{\partial \log p_j} \right) = -\delta_{ij} + \left(\frac{\gamma_{ij}}{\bar{w}_i} \right) - \left(\frac{\beta_i}{\bar{w}_i} \right) \bar{w}_j \quad (18)$$

where δ_{ij} is the Kronecker delta defined as $\delta_{ij} = 1$ for $j = i$ and $\delta_{ij} = 0$ for $j \neq i$.

From the Slutsky equation, by knowing the expenditure and uncompensated price elasticities, the Hicksian (compensated) price elasticity ε_{ij}^* can be derived by

$$\varepsilon_{ij}^* = e_{ij} + \eta_i w_j \quad (19)$$

3.2 Data and Estimation Method

The data adopted in this study is the data collected over the period of 1980–2014 from the national income account, published by the Office of the National Economic and Social Development Board (NESDB) of Thailand. The data is adjusted in real terms at 2002 constant price using the chain volume measures. During the observation period, not only had the real disposable income per capita of the country been increasing over time, the country had also moved up in rank from a low-income country to become a middle-income country. To signify the impacts of the improvements in per capita income on the consumption decisions, the data are firstly aggregated into two types of commodities, food and non-food consumptions and into two observation periods when the economy is classified as low-income and middle-income periods. By following the concept of the country's income level classifications announced by the World Bank in 2016, based on a country's Gross National Income (GNI) per capita, a country is classified to be a low-income economy if a country's GNI per capita is equal to or less than \$1,025. On the other hand, a country is considered to be a middle-income economy if the calculated GNI per capita appears to be higher than \$1,025. Using the World Bank Atlas calculation method, the GNI per capita in Thailand appeared to be at \$1,160 in the year 1988. Hence, by the definition, Thailand is found to have entered the rank of the middle-income economy starting in 1988. This finding helps to separate the observation period into different income class periods for the country. The country was considered a low-income economy during 1980–1987 while the economy was considered to have become the middle-income economy from 1988–2014 based on the existing data.

The LA/AIDS model, as explained in the previous section, is applied with the macro aggregate data of the collected national income account, 1980–2014, to observe the expenditure decisions made in the market. The OLS regression method is applied for the demand system estimations while the adding-up and the homogeneity conditions are imposed during the estimation to ensure the consistency with the demand theory. During the first two estimations, the dummy variables are introduced to see the impacts of the changes in income on the aggregate consumptions of food and non-food in the two subsequent periods in the first estimation. In the second estimation, the dummy variables for the two crisis, which took place in 1997 and 2008, are imposed to observe the effects they have on the consumption expenditures. Then, the Wald tests on the dummy variables are carried out for both estimations to test for any significant changes respectively.

In the latter estimation, the study follows the national income account approach of aggregate commodities, and the consumptions are categorized into 11 subsequent representative commodity groups; Food and Non-Alcoholic; Alcoholic Beverages, Tobacco and Narcotic; Clothing and Footwear; Housing, Water, Electricity, Gas and Other Fuels; Furnishings, Household Equipment and Routine Maintenance of the House; Health Expense; Transportation; Communication; Educa-

tion; Restaurants and Hotels; and Miscellaneous Goods and Services.

Furthermore, the prices applied in this study are the price deflators calculated from the growth in expenditures and consumptions for all consumption categories, including total expenditure as well as total food and total non-food expenditures to ensure the price consistency with the data. The price deflators are further applied in the calculations of the Laspeyres price index, which is necessary for the demand system analysis estimation.

Lastly, the results of the estimated parameters of the model imply different interpretations. The α_i is the intercept term representing the starting budget share, as shown in table 3 and 4, of commodity i . The β_i represents the marginal expenditure of that good where a negative value of the term indicates the good is considered a necessity at the given level of income and prices whereas a positive value suggests a good is being treated as a luxury. The γ represents the parameter of prices and μ_i is the calculated income elasticity of that particular commodity or, in this case, an expenditure elasticity since total expenditure is adopted in place of income.

Table 3 Estimates of LA/AIDS for Food and Non-food Commodities (Annual Data)

1980–2014	α_i	β_i	γ_{i1}	γ_{i2}	R^2	D. W.	\bar{w}_i	μ_i	Wald Test
Food	2.069*** (6.89)	-0.121*** (-6.10)	-0.010 (-0.58)	0.123*** (3.26)	0.988	1.369	0.278	0.566	—
Non-food	-1.069*** (-3.56)	0.121*** (6.10)	0.010 (0.58)	-0.123*** (-3.26)	0.988	1.369	0.722	1.167	—
1980–1987	α_i	β_i	γ_{i1}	γ_{i2}	R^2	D. W.	\bar{w}_i	μ_i	Wald Test
Food	2.085*** (6.28)	-0.242*** (-5.05)	-0.001 (-0.01)	-0.026 (-0.43)	0.989	1.735	0.346	0.651	0.000***
Non-food	-1.085*** (-3.27)	0.242*** (5.05)	0.001 (0.01)	0.026 (0.43)	0.989	1.735	0.654	1.184	—
1988–2014	α_i	β_i	γ_{i1}	γ_{i2}	R^2	D. W.	\bar{w}_i	μ_i	Wald Test
Food	2.085*** (6.28)	-0.114*** (3.44)	0.029 (0.42)	0.137 (2.32)	0.989	1.735	0.258	0.557	0.000***
Non-food	-1.085*** (-3.27)	0.114*** (-3.44)	-0.029 (-0.42)	-0.137 (-2.32)	0.989	1.735	0.742	1.154	—

Table 4 Estimates of LA/AIDS for Food and Non-food Commodities and Reactions to Crisis (Quarterly Data)

1993 Q1–2016 Q2	α_i	β_i	γ_{i1}	γ_{i2}	R^2	D. W.	\bar{w}_i	μ_i	Wald Test
Food	2.220*** (8.40)	-0.142*** (-7.68)	-0.041 (-1.81)	-0.115** (-2.51)	0.980	2.581	0.250	0.433	—
Non-food	-1.220*** (-4.62)	0.142*** (7.68)	0.041 (1.81)	0.115** (2.51)	0.980	2.581	0.750	1.189	—
1997 Crisis	α_i	β_i	γ_{i1}	γ_{i2}	R^2	D. W.	\bar{w}_i	μ_i	Wald Test
Food	2.209*** (8.32)	-0.142*** (0.79)	0.007 (0.05)	0.171 (0.70)	0.982	2.368	0.265	0.470	0.032
Non-food	-1.209*** (-4.55)	0.142*** (-0.79)	-0.007 (-0.05)	-0.171 (-0.70)	0.982	2.368	0.735	1.191	—
2008 Crisis	α_i	β_i	γ_{i1}	γ_{i2}	R^2	D. W.	\bar{w}_i	μ_i	Wald Test
Food	2.302*** (8.24)	-0.142*** (0.78)	-0.020 (-0.41)	-0.037 (-0.32)	0.981	2.612	0.253	0.418	0.476
Non-food	-1.302*** (-4.66)	0.142*** (-0.78)	0.020 (0.41)	0.037 (0.32)	0.981	2.612	0.747	1.197	—

4. Empirical Estimations

The empirical results in table 3 and table 4 show the estimation results of the LA/AIDS model of the expenditures on food and non-food commodities during different time periods using dummy variables. The results appear to be in accordance with the demand theory; the β parameters in both estimations indicate that food consumption is classified as a necessity whereas non-food consumption is seen as a luxury. As shown in table 3, the estimations indicate the fall in the budget share for food (\bar{w}_i) and the expenditure elasticity (μ_i) among the average consumers, of around eight and ten percentage point respectively, in the second period where per capita income is higher for the average consumers. This implies improvements in the well-being among the Thai consumers as consumers are able to switch up their consumption baskets toward more consumptions of the non-food commodities and, at the same time, the food consumption decision appears to have become less dependent on the changes in income. The parameters of the dummy variable introduced in the first analysis were tested and significantly rejected. The results indicate the difference in the consumption of food and non-food commodities after the country has moved up to the higher middle-income class or after real disposable income per capita increases over time. The γ of the non-food alone appears to have some significant influences on both consumptions of food and non-food whereas the price of food does not appear to have any impact on other consumptions. Therefore, as income increases consumers are changing their basket bundles of goods and services as well as the budget share with the rising income level as to enhance their well-beings. This finding is also found to be consistent with the results found by Subramanian and Deaton (1996) among the Indian household consumers as higher income allows consumers to substitute among more expensive food alternatives causing the elasticity to be higher. Moreover, due to the fact that this is mainly a general observation on average macro data and commodities are aggregated into merely two representative groups, it is important to note that not every good in the food basket possess the same property of being a necessity good; some of the goods in the basket may as well be considered a luxury good such as beverages and tobacco, fish, or food outside from home that may have expenditure elasticities of higher than one (see Seale et al., 2003). For the non-food commodity, although the income elasticity somewhat decreased in the second period, it is still considered to be a luxury product with the elasticity greater than one. On the contrary, the results of the dummy variables of the crisis imposed during the second estimation in table 4 could not be rejected suggesting that shocks from the crisis do not have any lasting impact on the consumption decisions unlike the changes in income. This result is in accordance with the Life-Cycle model (Laureate Milton Friedman, 1985) that the consumers tend to smooth out consumption over time and that the short-run fluctuations are temporary.

Table 5 shows the estimation results of LA/AIDS for 11 aggregate commodities. The results suggest that, during the observation period, consumptions on food and non-alcoholic; alcoholic beverages, tobacco and narcotic; clothing and footwear; housing, water, electricity, gas and other fuels are signified as necessities where the rest of the commodities appear to be classified as

Table 5 Estimates of LA/AIDS for 10 Aggregate Commodities

Commodities	α_i	β_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	γ_{i7}	γ_{i8}	γ_{i9}	γ_{i10}	γ_{i11}	R^2	D. W.	\bar{w}_i	μ_i
Food and non-alcoholic	1.697*** (7.93)	-0.098*** (-6.89)	-0.049*** (-4.11)	-0.000 (-0.01)	0.005 (0.16)	-0.203*** (-8.54)	0.089 (1.68)	0.035 (0.81)	0.015 (0.66)	0.039** (2.56)	0.013 (0.67)	-0.008 (-0.22)	0.063	0.988	1.300	0.228	0.568
Alcoholic beverages, tobacco and narcotic	0.523*** (2.45)	-0.031*** (-2.20)	-0.001 (-0.07)	-0.068*** (-3.63)	0.042 (1.45)	-0.033 (-1.40)	0.046 (0.88)	-0.001 (-0.03)	-0.016 (-0.70)	-0.012 (-0.4)	0.025 (1.25)	0.000 (0.00)	0.018	0.865	1.967	0.050	0.372
Clothing and footwear	0.750*** (3.51)	-0.045*** (-3.17)	-0.022 (-1.82)	-0.020 (-1.06)	-0.042 (-1.43)	0.042 (1.79)	-0.076 (-1.44)	0.086* (2.02)	0.018 (0.78)	0.003 (0.16)	-0.001 (-0.04)	0.027 (0.78)	-0.017	0.954	1.609	0.073	0.384
Housing, water, electricity, gas and other fuels	1.419*** (6.63)	-0.087*** (-6.08)	-0.034** (-2.82)	-0.001 (-0.49)	0.104*** (3.55)	-0.072*** (-3.01)	-0.053 (-1.00)	0.016 (0.37)	0.013 (0.55)	-0.002 (-0.11)	-0.039 (-1.94)	0.054 (1.55)	0.021	0.937	1.598	0.102	0.151
Furnishing household and routine maintenance	-0.095 (-0.45)	0.009 (0.66)	0.025* (2.05)	0.004 (0.23)	-0.046 (-1.58)	0.053 (2.21)	-0.053 (-1.00)	0.031 (0.72)	0.000 (0.02)	-0.002 (-0.15)	0.025 (1.25)	-0.018 (-0.52)	-0.018	0.939	1.805	0.050	1.189
Health	-0.038 (-0.18)	0.006 (0.41)	0.002 (0.18)	0.011 (0.56)	0.056 (1.92)	0.023 (0.97)	-0.0315 (-0.60)	-0.041 (-0.95)	0.014 (0.60)	-0.005 (-0.35)	0.003 (0.14)	-0.024 (-0.69)	-0.007	0.976	1.817	0.043	1.135
Transport	-1.005*** (-4.69)	0.076*** (5.31)	-0.006 (-0.47)	-0.029 (-1.55)	-0.054 (-1.85)	0.011 (0.48)	0.048 (0.91)	0.033 (0.77)	-0.034 (-1.45)	-0.004 (-0.27)	-0.017 (-0.87)	0.036 (1.03)	0.016	0.932	1.542	0.130	1.584
Communication	-0.294 (-1.37)	0.021 (1.49)	-0.007 (-0.60)	-0.012 (-0.64)	0.040 (1.38)	-0.046 (-1.94)	0.046 (0.87)	-0.028 (-0.65)	0.017 (0.75)	-0.021 (-1.33)	0.011 (0.58)	-0.039 (-1.11)	0.037	0.989	1.650	0.018	2.176
Education	-0.303 (-1.41)	0.025 (1.74)	-0.008 (-0.68)	-0.026 (-1.39)	0.057 (1.93)	-0.022 (-0.91)	0.026 (0.49)	-0.029 (-0.67)	0.012 (0.53)	0.001 (0.06)	-0.054** (-2.70)	0.038 (1.08)	0.006	0.965	1.871	0.065	1.382
Restaurants and hotels	-0.671*** (-3.14)	0.053*** (3.72)	0.066*** (5.52)	0.148*** (7.91)	-0.070** (-2.38)	0.142*** (5.95)	-0.083 (-1.58)	-0.060 (-1.39)	-0.024 (-1.02)	0.001 (0.07)	0.043* (2.17)	-0.131*** (-3.75)	-0.034	0.921	1.792	0.138	1.386
Miscellaneous goods and services	-0.983	0.072	0.034** (2.83)	0.001 (0.06)	-0.092*** (-3.15)	0.105*** (4.39)	0.042 (0.80)	-0.043 (-1.00)	-0.017 (-0.72)	0.002 (0.10)	-0.010 (-0.50)	0.064 (1.85)	-0.085	0.931	1.624	0.102	1.702

luxury items among the average Thai consumers while only few price parameters appear to have influences on consumptions. The estimated expenditure elasticities also imply the same results, which appears to be highly elastic consumptions on items such as communication, miscellaneous goods and services and transport respectively.

More importantly, the estimation results shown imply an important implication towards the well-being of the consumers on average. As pointed out by Deaton, consumption may be one of the ways to observe a person's well-being, nonetheless, there are other important determinants that should not be neglected when observing the well-being of the people, for instance, health and its connection to income and inequality (Deaton, 2003). Moreover, the human capital theory also points out the important significance of investment in health and education contributing toward a person's productivity and future income (Becker, 1964; Mincer, 1974), that will eventually lead to higher consumption and well-being. Thus, the results indicate that health and recreation and education in Thailand are still considered as luxurious consumptions with high income elasticities. This implies that the investments in these two categories are being made mainly by people who can afford to pay the prices or the high-income consumers.

5. Concluding Remarks

Based on the country's average expenditures over the period of 1980–2014, the study found

great significant differences in consumption expenditure patterns on food and nonfood commodities between the period when consumers were faced with low-income (1980–1987) and higher-income (1988–2014) as the economy progressed to a middle-income class as can be observed in table 3 and 4. However, random events such as crisis were proven to have no significant impacts toward changes in the consumption pattern among the Thai consumers. Moreover, the resulting estimation implies that consumers were able to switch up their consumption baskets of goods as more commodities become more affordable in the eyes of the consumers; particularly consumptions on food were found to have been significantly improved. As per capita income increased, the evidence suggested that consumers in Thailand chose to spend their bigger portion of the higher income on food commodity more than nonfood since the higher income elasticity of the demand for food indicates that more food alternatives have indeed become more affordable for most consumers. Nevertheless, the changes are still not enough to bring about the same significant improvement in the alternative consumptions among the nonfood commodities. The findings suggest that consumptions of aggregate commodities such as housing and utilities, health, transport, communication as well as recreation and education are still considered to be luxurious consumptions. Of particular concerns, however, are those lack of investment in health care and recreation and education since these particular groups are considered the main driven forces behind the greater productivity and the better well-being of the people. Taking into account the problems of aggregation among commodities and the consumer groups as well as the real situation of the income distribution problem, the estimation results of the average data indicate that access to important well-being enhancing factors such as health care and education are still limited and are currently affordable by the upper-income consumers.

In conclusion, the study found that even though higher income level for the country improves the situation of the consumption of food for most consumers, consumptions on important commodities such as health care, education and, in some cases, transport and communication as well, remain less affordable for the lower income consumers in the country. The results imply rooms for improvement in access to these types of consumption if the people's well-being is to be improved and be made better off. In addition, the results of the study call for the need of the further studies if better estimations of different income classes consumers' and different characteristics households' consumption situations are to be acquired. Moreover, the national income account data are in aggregate terms, hence, the resulting estimations generally reflect the overall situation of the country and for the average consumers. Therefore, the use of the data from the household socio-economic survey (SES) would further allow more precise observations of the different income classes and of different characteristic household consumers.

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