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THESIS

INTRA-ASEAN IN-MIGRANT LABOUR AND IMPACT ON THAI ECONOMY

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A Thesis Submitted in Partial Fulfillment of
the Requirements of the Degree of
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This study aims to analyse the determinants of intra-ASEAN labour migration to Thailand and its impacts upon the Thai economy. The Hatton's migration model is applied to by employing panel data through fixed effect model estimations, reveal that the GDP gaps between Thailand and the migrant countries, migration stock reflecting the existence of immigrant networks, and Thailand's migration worker policy all play a crucial role in explaining migration behaviour.

The findings of impact of ASEAN labour migration to thailand on the Thai economy, via the CGE model, is divided into two scenarios. The first scenario is based upon Thai foreign worker policies for permit unskilled in-migrant labours, results in higher GDP, household incomes, exports, and imports, but lower wages for unskilled labour and lower income distributions. The second scenario is based upon an ASEAN MRA concerning the labour movement of eight occupations: doctors, dentists, nurses, engineers, architects, accountants, surveyors, and tourism professionals, shows the impacts upon higher GDP, household incomes, income distributions, exports, and imports but lower wages for skilled labour. However, such effects are relatively minimal than the first scenario since the ASEAN member states continue to have their own work permit regulations.

Therefore, it is essential to emphasis more coherent policies, specifically the movement of unskilled labour. In addition, more collaboration in common labour standards and development might cause the free flow of skilled labour between ASEAN member states to become more effective and, eventually, fulfill the main aims and purposes of the AEC.

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Student's signature Thesis Advisor's signature

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This thesis is dedicated to my older brother who passed away in April 2001. He was a great man, good human being and the best brother any child could ever have. I will always be grateful to you because whatever I am today is all because of you. I will always love you and wherever you are, you are being missed.

Last but not least to all my family, relatives, and friends for their faith in me and without all their love and support it would have been impossible to live at home away from home and achieve my goal.

Utis Sanglaoid

November, 2014

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LIST OF ABBREVIATION

ASEAN	Association of South East Asian Nations
EU	European Union
CIA	Central Intelligence Agency
CGE	Computable General Equilibrium
AEC	ASEAN Economic Community
SAM	Social Accounting Matrix
LES	Linear Expenditure System
CES	Constant Elasticity of Substitution
CET	Constant Elasticity of Transformation
LEO	Leontief Production Function
GDP	Gross Domestic Product
OLS	Ordinary Least Square
WWII	World War 2
MRA	Mutual Recognition Agreement
PPP	Purchasing Power Parity

CHAPTER I

INTRODUCTION

Statement of the Problem

Economic development is a crucial target for developing countries since it can move the economy forward as well as enhancing the well-being of the people; even though economic growth does not necessarily lead to economic development. However, as it is perceived to be the major part of economic development; most countries aim to achieve economic growth.

After WWII, through the framework of economic development, human capital has consistently played an important role in economic growth. An eminent pioneer in the role of human capital was Theodore W. Schultz (1961). He studied the impact of variables on economic development and found that the quality of human resources or human capital is a variable for inclusion as an important determinant of economic growth. It is commonly acknowledged that education, training, health care, and migration are forms of human capital investment. To migrate is to seek income, gain experiences, and to enhance one's capability both domestically and internationally. The latter case is more difficult to achieve owing to the rules and regulations governing emigration and immigration in each country. The world Trade Organization (WTO) therefore attempts to relax such barriers in order to promote more free trade among nations. This is thought to bring about the greatest benefits to consumers from free trade. ASEAN is currently seeking unity for the same purpose. That is, by 2015 ASEAN will become the ASEAN Economic Community (AEC) providing a single market and production base under an agreement between the member countries. In particular, the Mutual Recognition Agreement (MRA) exists in order to set qualifications and professional standards for the inter-ASEAN skilled labour mobility. In addition, immigration and working permit conditions remain in

effect as independently determined by each country. In 2012, ASEAN signed the Mutual Recognition Agreement to include eight professionals: doctors, dentists, nurses, engineers, architects, accountants, surveyors, and tourism professionals from 31 December 2015 and other professionals will gradually be granted free flow thereafter.

Despite the existence of global migration, Asian labour migration is quite distinctive. This is because Asians constitute a substantial portion of the world's population, although the combined income per capita of Asia is relatively low. Furthermore, income disparity among countries is noticeable. Such a pattern also occurs in the case of the Association of South East Asian Nations (ASEAN). ASEAN, which consists of 10 countries, has agreed to become a single economic unit by 2015. It is home to approximately 600 million people in total, but the GDP per capita of the 10 member countries is relatively marginal when compared to the rest of the world. In addition, there is a wide gap in income per capita. This ranges from US$1,254.52 for Myanmar to US$56,708.21 for Singapore, based upon the 1995 international constant dollars and purchasing parity power (World Bank, 2010). Without doubt, this means substantial income inequality between the two countries. This also holds true when such a comparison is made between Myanmar and Thailand. This is because in 1995 Thailand was ranked fourth in terms of per capita income amongst the member countries. The net migration rates to Thailand from Myanmar, Laos, Cambodia, and the Philippines are shown to be positive. This means that the number of labourers from those countries immigrating to Thailand is greater than the number of Thai labourers emigrating to the same countries. It is fair to say that economic differentials are plausibly the prime reason for labour migration. However, there are other significant factors pertaining to such movements as well. One salient factor concerns migration and immigration laws and regulations. As a matter of fact, they differ greatly among the ASEAN member countries. Other reasons worth identifying are: the levels of economic development, job opportunities, government cognizance, and political concerns. These are neither uniform nor dependent.

These factors, amongst others, largely account for intra-ASEAN migration, although they are subject to confirmation through empirical investigations. Before proceeding to that point, the following theoretical concepts of migration need clarification. Based upon country status, the patterns of international migration can be sorted into three groups. In the case of ASEAN, group one comprises the main source of migrants: Cambodia, Laos, the Philippines, Indonesia, Vietnam, and Myanmar. Group two comprises their main destination countries: Singapore and Brunei. Group three comprises countries with significant emigration and immigration rates: Malaysia and Thailand (Hugo, 2005). Thailand lies in a different situation to Malaysia, though classified in the same group; such is its unique underpinning position. As previously mentioned, Myanmar has the lowest income amongst all member states. As a result, its outflows are likely to far exceed its inflows. The further the distance a destination country lies intensifies the problem. Geographically, Thailand is adjacent to Myanmar, and they share a border more than 1,800 kilometres in length. This, together with the fact that Thailand is one of the destination countries, has led to an influx of Myanmar workers to Thailand. In addition, they are the poorest, almost all low-skilled, and have a low level of education, thereby increasing the chance of their being illegal or undocumented workers. This clearly intensifies the migration problem which Thailand constantly encounters. It has now become an urgent requirement to seriously examine the factors determining labour migration to Thailand, with an emphasis upon empirical evidence. This intra-ASEAN migration analysis also offers inspection into both the relative and crucial points.

In 2012, the Gross Domestic Product (GDP) of ASEAN countries was US$2,311 billion, its trading balance was US$602 billion and its GDP per capita was US$3,748. Singapore has the highest GDP per capita with US$42,445, while Myanmar has the lowest with 861 USD. The GDP per capita of Thailand is US$5,391, which is lower than those of Singapore, Brunei, and Malaysia. In 2011, according to immigration data, 147,626 Thai people emigrated to other countries and 22,575 to ASEAN countries, or an equivalent of 15.92% of the total. Singapore is the

destination of choice for Thai people, or the equivalent of 50.77%. In 2011, the majority of migrants from ASEAN countries to Thailand were unskilled workers. Most migrant workers were from Myanmar, numbering 607,879 or 75.28% of the total from ASEAN regions in Thailand. Migrant workers from Cambodia were ranked second, accounting for 118,516 or 14.64%, and those from Laos were third highest with 71,336 or 8.81%. During the studied period, Thailand established a policy enabling unskilled labour mobility from neighbouring countries to enter the country. That policy permitted migrant workers, especially Burmese, Lao, and Cambodians, with or without existing work permits, to register for work in Thailand in 2004 and 2009. This policy increased the number of migrant workers from 296,184 in 2003 to 858,719 in 2004; an increase of 189.93%. In 2008, the number of migrant workers was 529,629 and reached 1,435,398 in 2009; equivalent to an increase of 171.02%. If Thailand implements this policy again, possibly increasing the number of migrant workers, the impact on the Thai economic system remains questionable.

Due to the commencement of the AEC in 2015, there are concerns about the free flow of labour, as defined in the agreements. Based upon a theoretical hypothesis, the free flow of labour will enable more flexibility in the labour market. Skilled workers will have more career choice thereby maximising their potential and income. As a result, the target countries for skilled workers will gain benefit from these highly skilled workers. On the other hand, some industries may be affected by the flow of skilled labour due to competition in the local workforce. Furthermore, the flow of skilled labour between the associated countries can lead to a loss of skilled labour in the countries from which they originated. That is, the free flow of skilled labour will have an effect on the highly competitive labour market creating both advantages and disadvantages.

This research looks at the importance of the study of intra-ASEAN migration and its impact upon the Thai economy as a tool to help Thailand achieve maximum

benefit from negotiation and policy. Moreover, Thailand will possess the relevant information and potential tool in related policy decisions.

Objectives of the Study

This study has two main objectives:

I. To study and analyse the Determinant of intra-ASEAN labour migration to Thailand, and

II. To analyse impacts of ASEAN labour migration to Thailand upon the Thai economy

Expected Benefits

A model of net migration rates from countries in ASEAN to Thailand is used to study the Determinant of intra-ASEAN labour migration to Thailand. This includes the net migration rates with a model of the situation leading to impacts upon the Thai economy. This would enable policy makers to utilise this information in future well-planned policy making. In addition, the information could be used more pertinently to plan, develop, and implement labour policies both domestically and between ASEAN member countries.

Scope of the Study

This study is divided into two parts:

To answer the first objective, the model of Hatton (1995) is applied to analyse the factors determining intra-ASEAN migration. The panel data which consists of a

cross-section of nine member ASEAN countries and annual time-series data in 2002–2010 is utilised in the applied Hatton model.

The second objective aims to analyse the impacts of ASEAN labour migration to Thailand upon the Thai economy. A Computable General Equilibrium (CGE) model is employed to investigate six economic impacts, comprising: Gross Domestic Product (GDP), household incomes, income distributions, wages, exports, and imports.

Structure of the Thesis

This study consists of six chapters. Chapter I is an introduction. Chapter II provides a literature review. Chapter III details the characteristics of ASEAN countries. Chapter IV provides the research study methods and explains data collecting methods as well as analytical procedures. Chapter V presents the results of the study and discusses these in light of the main objectives. The last chapter addresses the conclusion of the study and provides further recommendations.

Explanatory Note and Operaton Definition

1. Net migration rate of Thailand refer to net migration rate(inflow minus outflow) from ASEAN country i to Thailand per 10,000 inhabitants.

2. GDP per capita refer to GDP per capita (constant 1995) based on purchasing power parity (PPP) .

3. Employment Rate refer to the percentage of the labor force that isemployed.

3. Unemployment rate refers to the share of the labour force that is without work but available for and seeking employment.

5. Migration workers policy of Thailand refer to the policy enabling unskilled labour mobility from neighbouring countries, especially those from Murmese, Lao, and Cambodians, with or without existing work permits, to register for work in Thailand in 2004 and 2009.

CHAPTER II

LITERATURE REVIEW

This chapter presents various theories and is used as a framework for this research and is divided into two parts. The first part involves the international migration theories that will be applied to analyse the determinant of intra-ASEAN labour migration to Thailand. The second part presents theories to evaluate the economic impact of labour migration for utilisation in Thailand and the effect on the Thai economy, especially the impact on Gross Domestic Product (GDP), household incomes, income distributions, labour wages, exports, and imports.

International Migration Theories

There has been a variety of theoretical proposals to explain why international migration begins, and although each ultimately seeks to explain the same thing, they employ radically different concepts, assumptions, and frames of reference. Massey et al (1993) has the following international migration theories:

I. Neoclassical economics explain the procedure of migration due to economic variable differences between origin and destination country. The difference might be wages, increased income, and better job opportunities. Furthermore, neoclassical economics is divided into macro and micro economics.

A. Macroeconomics explains migration development levels in each area. On the one hand, it involves a study of migration from rural areas to urban (Arthur W. Lewis, 1954). This type of migration framework focuses on an explanation of the relationship between labour migration and economic development based on the push and pull factor. Simply put, it occurs from an imbalance in the level of economic development between one area and another created by an imbalance of supply and

demand in the labour market and different levels of income. Labour migration carries on until it reaches a balance where no migration takes place. Migration therefore occurs temporarily as a mechanism for imbalance reduction at the economic development stage of each country.

B. Microeconomics explains a group of theories for decisions at an individual level. The important theorists Harris and Todaro (1970) introduced expected income and job opportunities to explain migration from rural areas to urban. They also believe that this idea could be applied to international migration. According to the theory of expected income, migration decisions occur due to the difference in income between rural areas and urban. Labourers could find jobs in an urban area because it was industrial, and different from a rural area where there are no factories. Migration to an urban area offers job opportunity and contacts for employment. Until employment is found, a person may have money previously saved, or friends in an urban area can help with financial support. If there is no employment available in the manufacturing sector, small organisations or service sectors may have jobs available. Although they may receive a rather low income, it is better than living in a rural area because labourers can wait for a chance to work for a higher income.

II. The new economics of migration was introduced by Stark (1991 as cited in Massey *et al*., 1993). He looked at migration decisions generally in each household. He explained that decisions are made based on higher income expectations thus reducing the risks as much as possible, especially on the collapse of a labour market in a country, leading to unemployment and less income. This factor leads to international migration rather than domestic migration. The migrants realise that their income might not be much different due to higher travel expenses but any knowledge gained could ultimately prove worthwhile financially. Moreover, working abroad is an investment for risk distribution because staying at home may result in poverty or starvation. Households therefore send family members to work both inside and outside the country. Unfortunately, if the domestic labour market cannot sustain its

entire workforce of labourers, those labourers take the risk of working abroad. Similarly, international governments intervene in migration by launching policies affecting labour, investment, and other markets; such as a reduction in travel expenses to work abroad and guaranteed employment to motivate labour migration. Lastly, a change in economy and economic policy by governments has impacted on income distribution and the trend of international migration.

III. The dual labour market theory focuses on certain types of labourers in general - unskilled, semi-skilled and skilled - rather than individuals or households. According to the new economics of migration, Piore (1979 as cited in Massey et al, 1993), international migration is created by pull factors. That is to say, a specific need for some certain types of labourers (especially unskilled) in a destination or developed country motivates those labourers to want to work there rather than the push factors of low income or a high rate of unemployment in a gateway country. This creates a dual labour market in which unskilled labourers earn lower income/wages and remain at a certain social status in a country. Separation of this type of labour market is created by the impact of economic dualism and labour supply.

IV. The migrant network theory explains the connection between old, new, and non-migrants including employers on both sides. This connection causes more international migration because it reduces capital and employment risk. Additionally, the connection makes labourers easy to reach and facilitates international travel. Labourers are then able to predict income stability. The connection can also be developed for organisations. If migration continues unabated, it is difficult for governments to control.

V. The world system theory looks at the impacts on the world of international migration. These impacts involve economic systems, politics, society, and culture, which forms and changes all the time. Globalisation leads to capital changes in terms of quantity and direction. Direct foreign investment

changes by global economies lead to fluctuations in international labour requirements, including domestic and international migration.

The above literature review confirms that international migration had no theory to support it other than integrated related theories. A study of labour migration from other ASEAN countries to Thailand and vice versa is in line with Hatton's (1993) work. It starts from different levels of development in ASEAN countries. Considering push and pull factors, it can be seen that development differences lead to migration from a more developed country to one less developed. Rules are a barrier to migration, and from 2015 ASEAN countries will assemble as the ASEAN Economic Community and lose or terminate some rules and limitations for freer movement. As a result, push and pull factors will affect labour migration. If migration is higher, there will be an increase in income differential. According to Neoclassical economic theory, differences between existing and new areas together with income variation causes people to migrate. These differences can be applied to income expectations. Expected income and rate of employment are representative factors of migration decision making at the micro level. Moreover, network systems are another factor. It can be seen that network systems help to reduce travel expenses and risk in the case of high levels of migration. In terms of other theories, these may explain world changes in migration including its impact on income distribution. The dual labour theory explains that improved or reduced income levels impact on migration.

Impact of Migration on Economic Theory

Theories concerning the impact of migration on economic systems study the creation of the ASEAN Economic Community in 2015, divided into the following categories:

I. Thoughts on the impact of international migration

The impact of international migration can be classified into three aspects as follows:

A. Impact on the labour market

The impact on the labour market of a destination country concerns competition and replacement of existing labourers, leading to a decline in levels of income and unemployment either for specific careers or in general. Conversely, the impact on the labour market in a gateway country offers the opportunity to reduce a labour overload. However, if they are skilled, the gateway country loses high-quality labour. When working generations migrate to a new country, they leave children and the elderly behind. This causes a problem for the government because they are not able to work to support themselves financially. Moreover, the government must consider the educational budget as well. Borjas (2006) studies the impact of migration on a destination labour market. He found it to be an advantage, meaning that foreign unskilled labourers migrating to America can help skilled labourers progress to better jobs and higher income. At the same time, if those migrant labourers are skilled, they may develop and spread their knowledge and technology to the unskilled to increase productivity.

B. Impact on income and development

International migration may increase the Gross National Product of a destination country because it occurs due to the expectation of migrants for higher economic welfare. Higher income for migrants is possibly responsible for economic changes in the destination country rather than the gateway, thus creating an increase in GDP. In general, it can be predicted that income in each career will also increase when economic activity is supported. Moreover, migration helps to increase

efficiency in larger manufacturing industries. This also leads to higher Gross National Product (GNP). However, it depends on whether the size of the existing population drops below a sustainable level, increasing returns of a destination country, migrants with skills, and those motivated by foreign investment. If the above factors are not complied with, the income levels and development of a destination country may fall. For example, Hubertus and Thomas (2001) studied the impact of expansion in European countries and found that Central and Eastern Europe had low GDP after migration.

C. Impact on balance of account

Migration is good for the balance of payments of a destination country. If migrants bring money with them, it is an advantage financially to the country. Conversely, it may be a disadvantage to a origin country. If migrants send money back home, it causes advantage to the financial balance of a origin country but is disadvantageous to a destination country. The World Bank (2011) found that Thai labourers working abroad in 2010, sent money back home via financial institutions totalling US$1,637,000 or 10% of net direct overseas capital. The country where labourers sent most money back home in 2010 was India in the amount of US$49,256,000 or 120% of net direct overseas capital. If migrants form part of increasing efficiency in manufacturing, especially exports, it is a distinct advantage in foreign market competition. It causes the balance of payments and trade of a destination country to be generally better. Additionally, it helps to increase manufacturing efficiency in general products and reduce imported products. It is also financially advantageous.

In contrast, Hubertus and Thomas (2001) explained that migration might cause disadvantages to the balance of payments of a destination country. If migrants send money back home for family support, a lot of funds leave that country in a year, causing financial disadvantage to a country. This factor may decrease if

migrants bring their family to join them after migration. If migrants are associated with their home country, they may buy products such as food and clothing in that country, for instance.

II. Model of Computable General Equilibrium to analyse the impact of migration

The model of Computable General Equilibrium is used to show the relationship between economies and is also called the Multisectoral model. This model is divided into three main types: Input-Output model; I-O model, Social Accounting Matrix model; SAM model, and Computable General Equilibrium model; CGE model. The Social Accounting Matrix model and Computable General Equilibrium model are based or developed from the Input-Output model. The difference between the Input-Output model and Social Accounting Matrix model is that the Social Accounting Matrix model takes into consideration the household sector. It presents details which are more geared to perfection. In contrast, the Computable General Equilibrium model was developed from the Input-Output model and Social Accounting Matrix model. Both use the Leontief Production Function for manufacturing. It is not able to reflect enough truth but could be developed to set up a function for other types of manufacturing. Apart from the Leontief Production Function, the Input-Output model and Social Accounting Matrix model are models of the relationship of variables in terms of values. Both models can analyse outcomes on variables in terms of values only. They cannot reveal a change in value if it arises from price or quantity. Conversely, the Computable General Equilibrium model can differentiate the relationship of variables in terms of price and quantity. Possible analysis may reveal a change in price and quantity.

The Computable General Equilibrium model applies a general balance calculation theory during a certain time and is balanced according to Warlas's Law. If a part of the economy changes due to external factors such as the number of labourers,

leading to an imbalance in the economic system, it will once again revert back to the Computable General Equilibrium. This hypothesis states that if the economic system comprises *n* market but n-1 market is at balance, with external factors leading to market balance, it can then be adapted until the balance level is reached. This causes all markets to be in balance and general balance.

From the above idea, adaptation of the economic system shows a link to impact and behaviour forming a new balance, and movement of balance affects manufacturing to a greater or lesser extent, depending on the economic system of each field. As a result, calculation of the general balance of the economic system measures changes in each economic field, depending on how much their occurrence is due to external factors. Calculation and evaluation of changes in the economic system also helps towards changes in size and quantity as well.

The level of impact on each economic field based on the calculation of general balance depends on two main factors. Firstly, the economic system forms part of any economic change. If there is a substantial change in the economic system, the impact is greater. In contrast, if the economic system changes only slightly, the impact is less too. Secondly, the behaviour of economic adaptation and its high flexibility leads to improved problem solving.

From the above, it can be concluded that a change in the number of labourers due to migration, calculated using different models, shows that the Computable General Equilibrium model (CGE) can analyse different changes in terms of price and quantity. Also, it can classify the impact on labour changes due to migration in and out of Thailand (from the ASEAN Economic Community which is an external factor influencing economic change). It can be compared using the impact of migration on the previous balance to explain the process of adaptation to the new balance including the size and direction of impact on each field.

Ideas and explanations on international labour migration lead to synthesis in this study. The study focuses on the impact of migration in ASEAN countries into Thailand and vice versa. It can be seen that migration affects Thailand as a destination country for labourers and also as a gateway country. The impact from international migration consists of different dimensions, including the effect of human resources investment on individuals. Its impact at national level focuses on higher productivity and income. This research study is at national level. When Thai labourers migrate to ASEAN countries, it leads to a reduction in the number of available labourers. As a result, the most difficult changes are to the labour market, including income distribution. The status of migrants needs to be carefully considered. If the migrants enjoy a better status, income distribution will be lower. When labourers migrate into Thailand, it creates an increase in the number of labourers. As a result, changes in income and employment ratio create difficulties. Changes to the labour market, such as in Thailand, include income and development based on changes in income and the effect of the higher number of migrants on the economic system. Consideration also needs to be given to changes in manufacturing and consumption. The impact on the balance of payments caused by an influx of money brought into the country by migrants can be monitored. Effective manufacturing efficiency leads to lower imports and higher exports. It also encourages investment into the country.

Related Research

This study reviews related research to explain international labour migration and its impact on the economy to form a framework to the study. The study is divided into two parts as follows:

I. Related research on the causes for international labour migration

Economists and sociologists have historically tried to analyse the reasons for voluntarily migration in their individual fields. Economists who believe in the

Neoclassical economics and politics try to explain international migration by reason of economics. As a result, migrants were regarded as economic labourers. The push factors of migration were higher income and better job opportunities, suggesting people migrated from a lower economically developed country to one higher. One such theorist is Borjas (2006). Apart from income levels, Castello-Freeman (1992) proposed that choice of migration depends on the difference between the Gross National Product (GNP) of a gateway country and the GNP of a destination country. Put another way, migration rates relate in a positive way to the GNP of a destination country and in a negative way to the GNP of a gateway country. Destination choice, therefore, depends on changes in GNP. Other variables leading to migration are travel expenses and job type (Cuthbert and Sterns, 1981 and Melendiz, 1994 as cited in Massey, 1994). Additionally, the Migrant Network Theory states that migrants might have connections with former migrants, non-migrants, and employers both in a gateway and a destination country. This connection creates more international migration.

Hatton (1995) created a model in his study to explain the reason for migration from the United Kingdom, later developed and applied to migration in Europe, especially migration from the expansion of the European Union. This model was derived from the Microeconomics Foundation. In deciding whether or not to migrate, utility and model creation explanations share important variables of difference in income between a gateway and a destination country, rate of employment on both sides, numbers of remaining migrants in both countries, and future balance level obtained by the number of migrants.

Next, there is the specification of free migration in European countries before and after the formation of the European Union. As stated by Bauer and Zimmermann (1999) in a study of migration in Greece, Spain, and Portugal between 1985 and 1997; the period during which these countries became part of European Union and some countries received the right to free migration. A model was created

to see the influence of variables in unemployment and real Gross National Product (GNP). Later, Orlowki (2000) studied migration to European countries from Central and Eastern Europe. Variables of migration from both areas were population size and distance. There then followed a study by Hubertus and Thomas (2001) on the impact of expansion of the European Union leading to migration of labourers from Central and Eastern Europe, and the effect on the economies of those related countries. They estimated the number of migrants by reason of migration. The study is similar to Hatton in terms of income differences in gateway and destination countries as being representative. The differences referred to rates of employment on both sides and number of remaining migrants. Boeri and Brucker (2001) later studied migration to Germany from 1967–1998. Reasons for migration were found to be: income per head, employment, and powerful migration organisation. Later on, Alvarez et al (2003) studied migration from Eastern Europe to the European Union. Factors of migration were shown as income, unemployment, and population. Finally, Pedersen and Mariola (2007) studied migration before and after Central and Eastern European countries joined the European Union between 1985 and 2006. They looked at income per head, employment, migration stock, and other model factors.

In terms of studies on job development, this started with Fertig (2001). He studied migration into Germany between 1960 and 1994. Fertig developed Hatton's model by adding the factor of free labour migration, using alphabetical order and panel data. The information retrieved has great observation value. Pytlikova (2006) studied migration from seven countries into the European Union in 2002. Data was retrieved from 1990–2000. His model was developed from Hatton by adding a distance variable, using alphabetical order and panel data. It was considered using three types: no difference in each country, difference of each country, and difference in each country. Ruyssen (2008) studied migration into Eastern Europe. He developed a model from Hatton by adding migrants' voting rights, duration of citizenship, level of responsibility by a target country, job vacancies, and ratio of skilled and unskilled

labourers. He used alphabetical order and panel data with three considerations: no difference in each country, difference of each country, and difference in each country.

Table 1 Conclusion of literature review on impact of international migration

Theorist	Article	Publisher	Theory and idea			Variable										
			Neoclassical Economics	Migrant Network Theory	Migrant-Supporting Institutional Theory	1	2	3	4	5	6	7	8	9	10	11
1. Hatton T.J.(1995)	A Model of U.K. Emigration, 1870-1913	The Review of Economics and Statistics	X	X		X	X	X	X							
2. Bauer and Zimmermann (1999)	Assessment of Possible Migration Pressure and its Labour Market Impact Following EU Enlargement to Central and Eastern Europe	I ZA Research Report	X				X				X					
3. Boeri, T. and Brucker, H.(2001)	Eastern Enlargement and EU-LabourMarkets:Perceptions, Challenges and Opportunities	World Economics Journal	X		X		X				X			X	X	X

Table 1 (Continued)

Theorist	Article	Publisher	Theory and idea			Variable*									
			Neoclassical Economics	Migrant Network Theory	Migrant-Supporting Institutional Theory	1	2	3	4	5	6	7	8	9	10	11
4. Michal Fertig(2001)	The economic impact of EU-enlarngement: assessing the migration potential	Empirical Economics	X			X	X	X	X							X
5. Alvarez-:lata et al.(2003)	Potential Migration from Central and Eastern Europe into the EU-15 – An Update	The European Commission, DG Employment and Social Affairs	X				X				X	X				
6. Pedersen P.J.and Mariola P.(2007)	EU Enlargement: Migration flows from Central and Eastern Europe into the Nordic countries	Working Papers, University of Aarhus	X	X			X	X	X		X					

Table 1 (Continued)

Theorist	Article	Publisher	Theory and idea			Variable*										
			Neoclassical Economics	Migrant Network Theory	Migrant-Supporting Institutional Theory	1	2	3	4	5	6	7	8	9	10	11
7. Mariolaa Pytlikova (2006)	Migration Flows from the Perspective of Sending and Receiving Countries	Phd Thesis, Department of Economics Aarhus School of Business	X	X		X	X	X	X				X			
8. Ilse Ruyssen (2008)	The determinants of immigration to Western Europe 1996-2005: a panel data analysis	Working Papers , Ghent University	X	X		X	X	X	X							

* 1 wage
2 employment
3 time trend
4 migration stock
5 emigration
6 real GDP per capita
7 population size
8 distance
9 institutional restriction to migration
10 migratory agreement
11 free movement of workers

II. Literature review on the impact of international migration on the economy

Theories involving evaluation of the impacts of international migration upon economic systems can be explained by the following hypotheses. Borjas (2006) states that immigration might increase the GDP of a destination country because it occurs due to the expectations of migrants for higher economic welfare. The movement of foreign workers might make the labour market in a destination country more competitive, and the replacement of existing workers may lead to declines in income and unemployment in specific careers, or greater unemployment in general. In addition, immigration might cause a surplus in the balance of payments for the destination country.

A Computable General Equilibrium model (CGE) is the main analytical tool used to deal with the impacts upon economic systems, income distributions, wages, and international trade.

Sarris and Zografakis (1999) explored the impacts of illegal migration upon economic systems. They quantitatively assessed the impact of illegal migration upon the Greek economy in the short term, by employing a CGE model. They found that an increase in GDP resulted from the immigration of unskilled workers. Similarly, Hubertus and Thomas (2001) studied the impact of expanding member nations on the European Union. They also investigated the impact on the participation of Central and Eastern European countries in the European Union and the impact of labour mobility upon the economies of related countries. A CGE created by Purdue University was adapted. They created two simulations, including one that applied economic liberalisation to every aspect and another that applied labour mobility. The findings revealed that economic liberalisation increased the GDP of destination countries, while it decreased the GDP of those countries of migrant origin. In the area of labour mobility, the GDP of countries of origin decreased, while the GDP of

destination countries increased. Moreover, Baas and Brucker (2008) studied the impact of international labour mobility upon economies. They found that in 2004, the European Union accepted nations from Central and Eastern Europe, so it was anticipated that there would be workers from Central and Eastern Europe who gained higher per capita incomes than those of Britain and Germany. Based upon this anticipation, they created a simulation to analyse the impacts upon those economies and found that both Britain and Germany were similar. Private sector and government consumption, tax income for governments, factors involving per capita incomes and employment all increased.

In studies involving income distribution, Sarris and Zografakis (1999) also pointed out that illegal immigration decreased the real incomes in household sectors of unskilled workers, at both low and middle income levels. In other groups, the household sectors had higher real incomes. It was revealed that more than 37% of the population of Greece lost many benefits through illegal immigration.

For impacts upon labour markets, Baas and Brucker (2008) utilised two simulations. The first one demonstrated that Germany did not accept the free flow of labour, while Britain permitted it, and yet there were higher employment rates found in both countries. However, wages in Britain were higher than the wages in Germany, and the unemployment rate in Britain was lower than that of Germany. The second simulation represented the free flow of labour within European Union member nations, whereby the impacts upon Germany and Britain were consistent in that the employment rates of both countries had risen. Nevertheless, the difference was that wages in Britain were higher than those in Germany, and the unemployment rate in Britain was lower than that of Germany. Therefore, the results of both simulations were consistent. Similarly, a study by Reed and Latorre (2009) explored the impact of immigration upon the United Kingdom, and showed that workers receive lower wages when there is greater immigration.

Sarris and Zografakis (1999), Hubertus and Thomas (2001), and Baas and Brucker (2008) all investigated the impacts of higher numbers of migrant workers upon international trading. Therefore, when there are more migrant workers, international trading in destination countries increases and this can be seen through higher net exports.

In this study, a CGE is employed to emphasise the analysis of the impact of ASEAN labour migration upon the Thai economy. The investigation involves the Thai economy as a whole, and can be measured using GDP, household income, income distribution measured using the GINI coefficient, wages, imports, and exports**.**

Table 2 Literature review on impact of international migration on economy

Theorist	Article	Index			Result
		Labour Market Effect	Income Distribution Effect	Trade Effect	
1. Sarris and Zografakis (1998)	A computable general equilibrium assessment of the impact of illegal immigration on the Greek economy	X	X	X	- Incoming illegal migration affected real income of households from unskilled labourers. Those were poor and earned an average income. In contrast, other groups earned higher real income, which caused reduced income distribution in Greece. Income of unskilled labourers also decreased but skilled labourers increased. Employment was lower but net exportation was higher.
2. Hubertus and Thomas (2001)	The impact of the EU-enlargement on migration movements and economic integration: results of recent studies	X		X	- Models of non-free migration and free migration revealed that free migration led to lower GDP and income of unskilled labourers of a target country whereas higher income for skilled labourers. If there was free migration, GDP and incomes of unskilled labourers in a target country were higher, while lower for skilled labourers.

Table 2 (Continued)

Theorist	Article	Index			Result
		Labour Market Effect	Income Distribution Effect	Trade Effect	
3. George J. Borjas (2006)	The impact of immigration on the labor market	X			- Impact of unskilled labourer migration to the US led to development of unskilled labourers into skilled labourers and earned them higher income. Conversely, migration of skilled labourers to the US led to the spread of knowledge and technology in manufacturing to help unskilled labourers.
4. Baas and Brucker(2007)	The macroeconomic consequences of migration diversion: evidence for Germany and the UK	X		X	- Comparison of impacts on the economies of Germany and the UK in both situations revealed that the UK had free migration but not in Germany in the first situation whereas free migration occurred in both countries in the second situation.

Table 2 (Continued)

Theorist	Article	Index			Result
		Labour Market Effect	Income Distribution Effect	Trade Effect	
					If Germany had free migration, it would lead to lower wages but real income and international trade would be better. In contrast, the impact on the UK showed higher wages but lower real income and better international trade.
5. Reed and Latorre(2009)	The economic impact of migration on the UK labour market	X			- International migration to the UK had very little effect on the labour market. If migration to the UK was 1%, income was only 0.3% lower.

CHAPTER III

GENERAL CHARACTERISTICS OF ASEAN COUNTRIES

The Association of Southeast Asian Nations was established by the Bangkok Declaration, signed on 8 August 1967 by Ministers of five countries: Singapore, Thailand, the Philippines, Indonesia, and Malaysia. Later, there were five more member countries: — Brunei, Vietnam, Laos, Myanmar, and Cambodia, thereby encompassing ten countries in total.

Total Population

In 2010, the population of ASEAN consisted of around 601 million, with a total area of approximately 4.5 million square kilometres. Indonesia had the highest population in that year of 239,870,937. Vietnam had the second highest population of 86,927,700. Brunei had the lowest population of only 398,920 (see Figure 1).

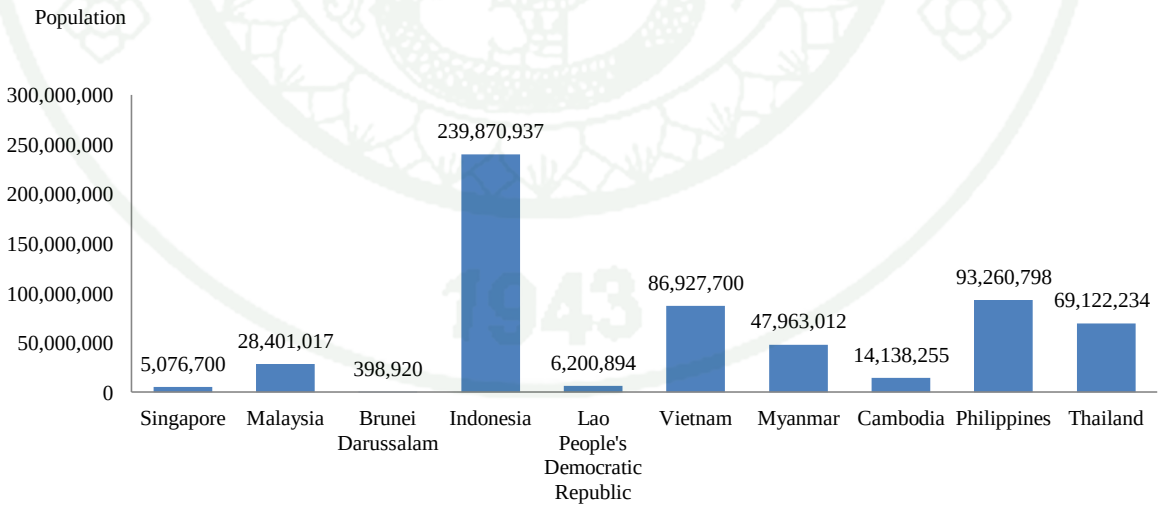

Figure 1 Total population of the ASEAN countries in 2010

Source: World Bank (2012)

GDP per capita

In 2010, ASEAN countries had similar per capita income as purchasing power parity or PPP, and this is an index of life quality comparison. Figure 2 shows that Singapore has the same income per head as purchasing power parity at US$56,708 followed by Brunei at US$48,621 and Myanmar, the least, at US$1,255 (see Figure 2).

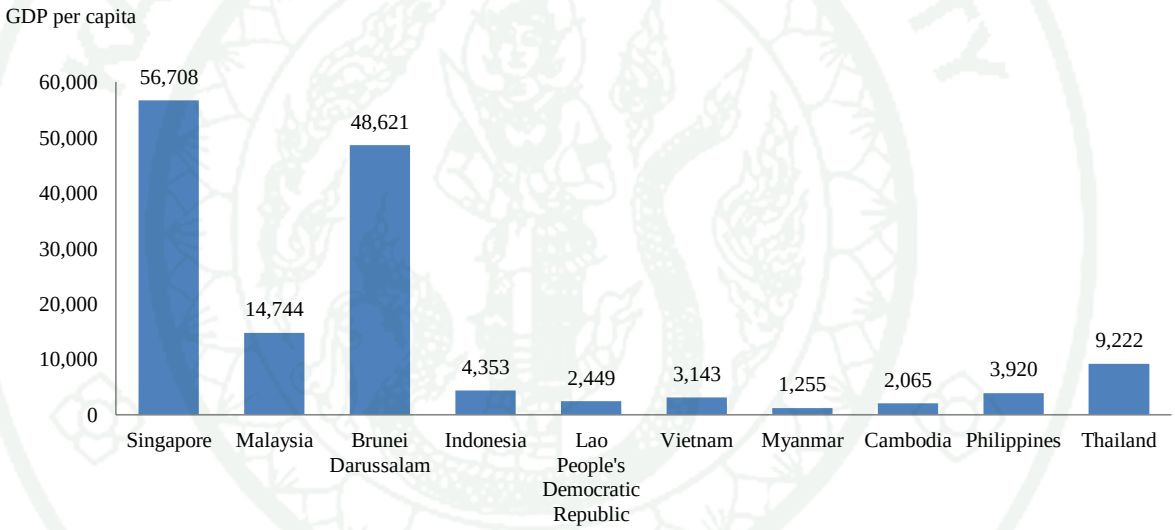

Figure 2 GDP per capita (constant 1995 international $) based on purchasing power parity (PPP) in 2010

Source: World Bank (2012)

Unemployment Rate

A country's unemployment rate is a factor of economic status. When the economy is lower, the rate of employment is higher. In contrast, the rate of employment decreases with improved economic status. In 2010, Thailand had the lowest rate of unemployment at 1. 04% followed by Singapore at 2.18%. The

countries where the rates of unemployment was highest were Brunei and the Philippines at 7.33% (see Figure 3).

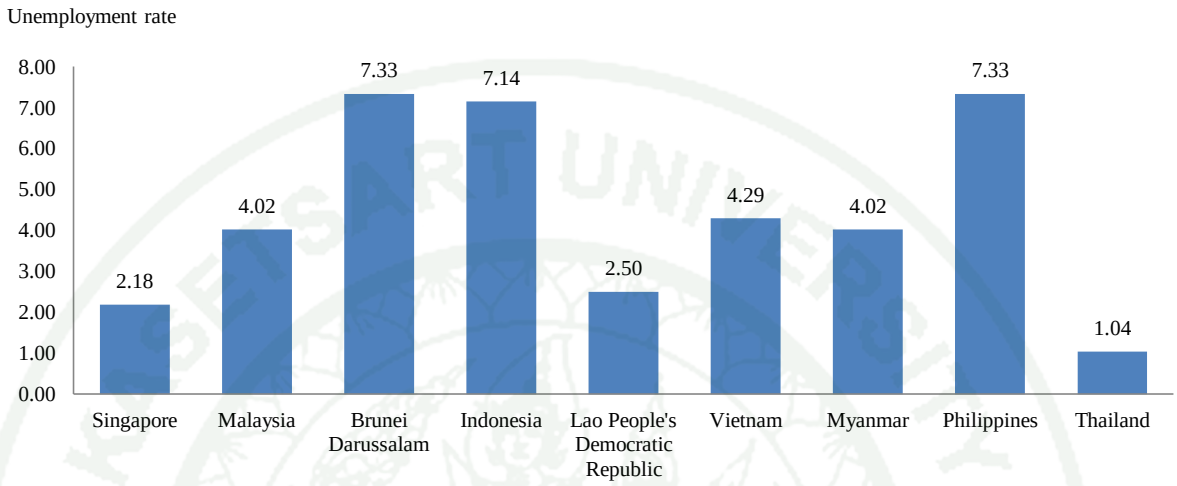

Figure 3 Unemployment rate in 2010

Source: Office of Workers Administration, Department of Employment, Ministry of Labour (2012)

Distance Between Thailand and ASEAN Countries

Thailand is connected to Myanmar in the north, Laos and Cambodia in the east, Myanmar in the west and Malaysia in the south. Thailand has the longest border with Myanmar at 2,400 kilometres followed by Laos 1,810 kilometres. The border between Thailand and Cambodia is 725 kilometres, and between Malaysia it is 647 kilometres. The distance from the capital city of Thailand and the closest capital city is in Laos at 470.89 kilometres, whereas the longest distance belongs to Indonesia at 2,333 85 kilometres (see Figure 4).

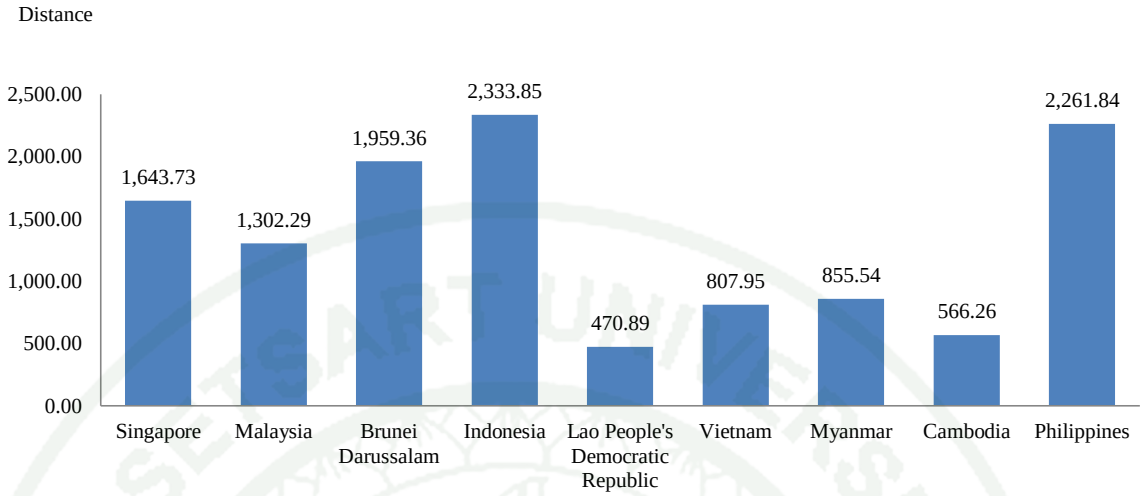

Figure 4 Distance between ASEAN country and Thailand (kilometres)
Source**:** MapInfo, distance from/to calculations (2012)

Thailand Migrant Workers Policy

The migrant workers policy affects the numbers of foreign labour migrants. There was an important policy from the Office of Foreign Workes Administration, Department of Employment, Ministry of Labour, that only Burmese, Cambodian, and Laotian could register for work in Thailand in 2004 and 2009 respectively. This caused a higher level of foreign labourers. In 2003, there were only 296,184 labourers, and 858,719 in 2004; 189.93% higher. In 2008, there were 529,629 labourers in Thailand and 1,435,398 in 2009. This was 171.02% higher. The number of immigrants remaining in Thailand from the first three ranks were from Myanmar, Laos, and Cambodia. These countries are also the first three choices for migration. This is in line with the distance between Thailand and other countries in the ASEAN. These countries share a border with Thailand (see Figure 5).

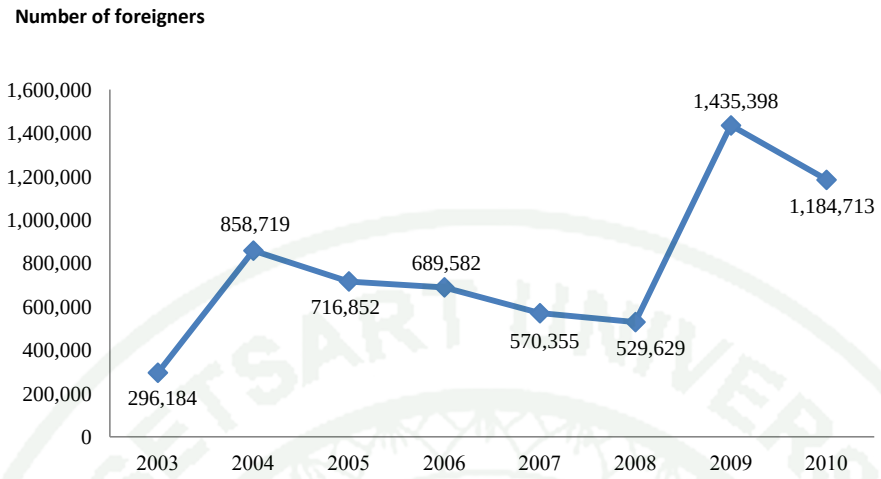

Figure 5 Stock of foreigners from ASEAN countries to Thailand in 2003–2010
Source: Office of Workers Administration, Department of Employment, Ministry of Labour (2012)

Number of Thai Labourers Emigrating to ASEAN Countries

The emigration of labourers from Thailand to other countries in the ASEAN in 2011 revealed that the highest level migrated to Singapore at 11,461 followed by Malaysia at 4,321 and Cambodia had the least (see Table 3).

Table 3 Numbers of Thai labourers emigrating to countries within the ASEAN in 2007–2011

Population	2007	2008	2009	2010	2011
Myanmar	54	75	226	208	140
Cambodia	206	52	50	56	65
Lao People's Democratic Republic	1,956	1,773	734	1,965	842
Philippines	156	187	145	146	135
Malaysia	3,432	3,476	3,882	3,630	4,321
Singapore	16,271	14,934	14,002	12,719	11,461
Indonesia	313	349	506	856	1,462
Vietnam	820	1,126	538	499	795
Brunei Darussalam	3,143	3,349	3,855	3,725	3,354

Source: Thailand Overseas Employment Admission, Department of Employment, Ministry of Labour (2011)

Stock of Foreigners from ASEAN Countries in Thailand

Thailand is a destination country for migration. In 2010, the highest number of Burmese labourers migrated to Thailand at 944,296 followed by Cambodia at 122,607. Brunei is the only country where there is no labourer migration to Thailand (see Table 4).

Table 4 Stock of ASEAN labourers migrating to Thailand from 2006–2010

Stock of foreign labour	2007	2008	2009	2010	2011
Singapore	1,799	1,999	2,294	1,617	1,530
Malaysia	2,743	3,156	3,749	2,251	2,230
Brunei Darussalam	0	0	0	0	0
Indonesia	693	845	1,069	586	606
Lao People's Democratic Republic	51,960	22,965	13,670	161,127	106,125
Vietnam	583	609	727	293	312
Myanmar	577,542	507,594	487,286	1,083,498	944,296
Cambodia	48,362	26,096	12,094	179,248	122,607
Philippines	5,900	7,091	8,740	6,778	7,007

Source: Office of Workers Administration, Department of Employment, Ministry of Labour (2012)

CHAPTER IV

STUDY METHODS

Conceptual Framework

The literature review is divided into two parts. The first part aims at analysing the determinants of intra-ASEAN labour migration to Thailand, for the period 2002–2010. Those migrants are classified as skilled and unskilled labourers. Social and economic factors are included in the study. The well-known Hatton's migration model is applied in the analysis, employing panel data through fixed-effect model estimations. Factors of policy on Thailand's foreign migrants are added and the scope of this study on international migration is shown in Figure 6.

The second part discusses various theories to evaluate the impact of migration on the general economy. The literature review on the Computable General Equilibrium to see the impact on migration is a prime example. The model is used to analyse the impact on the ASEAN Economic Community to show how it may lead to increased migration, affecting income, income distribution, labour wages, and international trade.

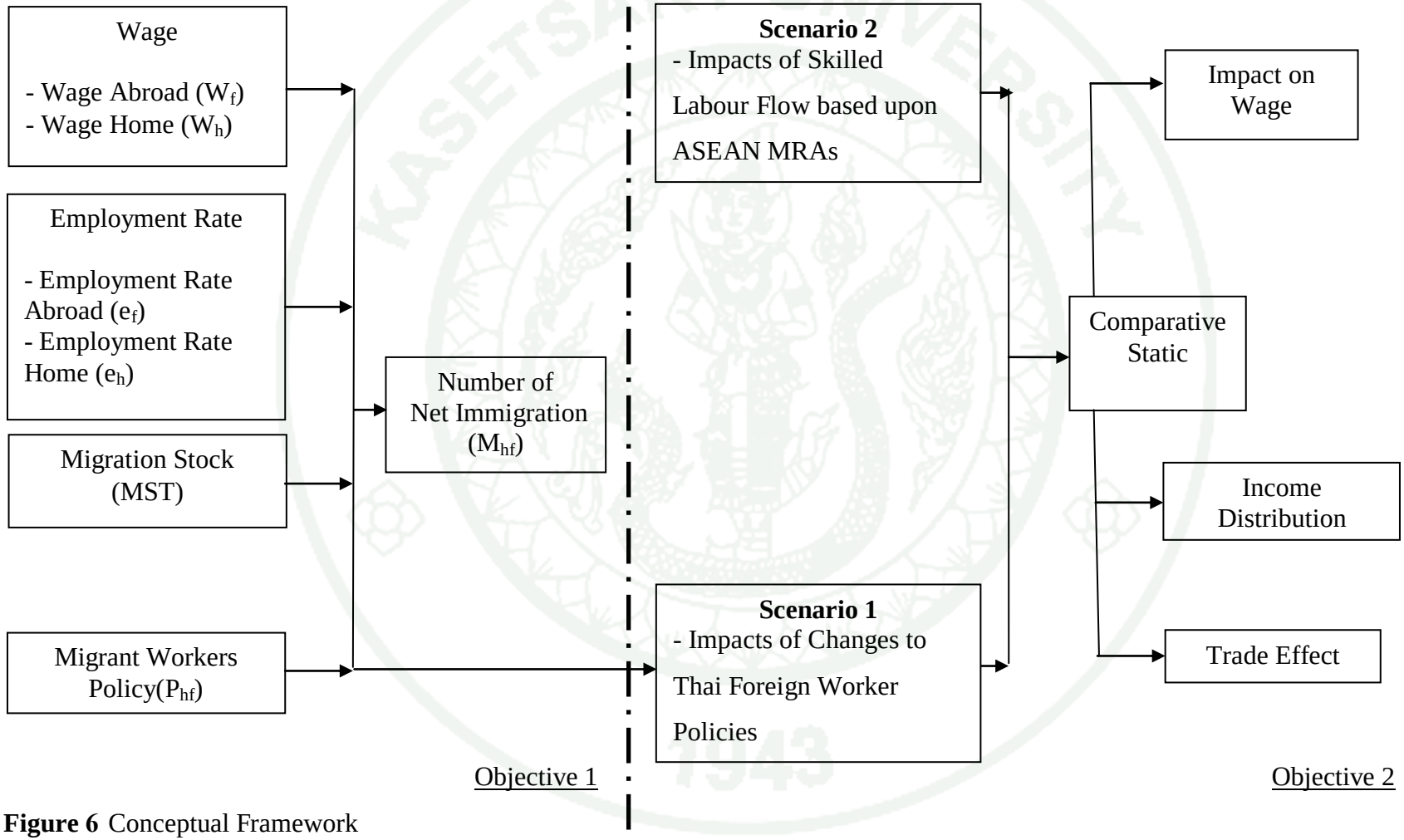

Figure 6 Conceptual Framework

Methodology

I. Data collection

Data collection is divided into two parts:

The first part applies the model of Hatton (1995) to analyse the factors determining intra-ASEAN migration. The panel data consists of a cross-section from nine member ASEAN countries and annual time-series data in 2002–2010, and secondary data from:

- Information on the amount of ASEAN labour from International Labour Organization;

- Information on ASEAN labour in Thailand from Department of Employment, Ministry of Labour;

- Information on Economic variables from the National Statistic Office, Fiscal Policy Office, Ministry of Finance, Department of Provincial Administration.

The second part analyses the impacts of ASEAN labour migration to Thailand upon the Thai economy, using secondary data from:

- Information on inter-ASEAN migration in Thailand from the Thailand Overseas Employment Admission and Office of Foreign Workers Administration, Ministry of Labour;

- Information on policy about labourers in Thailand from the Office of Foreign Workers Administration, Ministry of Labour;

- Information on the input-output table of 2005 containing 180 manufacturing fields but combined with sixteen from the gross national income table according to

the Thailand Standard Industrial Classification or TSIC (except part Q, international organisations, members and others. This creates a Social Accounting Matrix table using the same ratio of manufacturing and productivity in 2005 from the Office of the National Economic and Social Development Board.

- Information on tax collection from the revenue department and Office of the National Economics and Social Development Board;

- Information on import-export from Bank of Thailand;

- Information on labour surveys from the National Statistical office;

- Information on elasticity of substitution between inputs, as well as between domestic and imported goods from the Office of the National Economics and Social Development Board, Office of Industrial Economics;

- Information from socio-economic surveys on the flow of income from production to households, information on transfers from abroad to households from the National Statistical office and Office of the National Economics and Social Development Board.

II. The model for studying the determinant of intra-ASEAN labour migration to Thailand

Assuming that the probability of the migration of individuals (i) from their home country (h) to a foreign country (f) depends on the difference in expected utility streams in the two locations, minus the costs of migration (z_i); then this difference is denoted by d_i :

$$d_{ihft} = E\,u(y_{ft}) - E\,u(y_{ht}) - z_{it} \qquad (1)$$

With y_t being the income and z_{it} the cost of migration, the individual's utility is a concave function, and specifically given by U(y) = $\ln y$. Hence, the probability of migration can be written as:

$$d_{ihft} = E\ln(y_{ft}) - E\ln(y_{ht}) - z_{it} \quad (2)$$

Expanding $E \ln (y_{ft})$ in a Taylor series around $E(y_{ft})$ gives:

$$E\ln(y_{ft}) = \ln(Ey_{ft}) + \frac{1}{Ey_{ft}}E(y_{ft} - Ey_{ft}) - \frac{1}{2(Ey_{ft})^2}E(y_{ft} - Ey_{ft})^2$$

$$E\ln(y_{ft}) = \ln(Ey_{ft}) - \frac{var(y_{ft})}{2(Ey_{ft})^2} \quad (3)$$

Hatton (1995) follows Todaro (1969) in defining $Ey = we$ where w_t represents the wage and e_t the employment rate at time t. Hence, we can write:

$$\frac{var(y_{ft})}{2(Ey_{ft})^2} = \frac{Ey^2{}_{ft} + (Ey_{ft})^2}{2(Ey_{ft})^2} = \frac{1}{2}\frac{E(y_{ft}y_{ft}) + y_{ft}^2 e_{ft}^2}{w_{ft}^2 e_{ft}^2}$$

$$= -\frac{1}{2}\ln e_{ft} \quad (4)$$

Substituting equation (3) into equation (4) gives:

$$E\ln(y_{ft}) = \ln(Ey_{ft}) - \frac{var(y_{ft})}{2(Ey_{ft})^2}$$

$$E\ln(y_{ft}) = \ln(w_{ft}) + \frac{3}{2}\ln(e_{ft}) \quad (5)$$

This can be expressed in the expected utility of staying at home in country i

$$E\ln(w_{ft}) = \ln(w_{ft}) + \frac{3}{2}\ln(e_{ht}) \quad (6)$$

Substituting equation (5), (6) into equation (2) gives:

$$d_{ihft} = \ln (w_f)_t + \frac{3}{2}\ln (e_f)_t - \ln (w_f)_t - \frac{3}{2}\ln (e_h)_t - Z_{ihft} \quad (7)$$

Assuming an average probability of migration overall for individuals (i), the rate of migration (M_t) into a given destination country (j) is thus assumed to be a function of the net present value:

$$M_{hft} = \beta(d^*_{hft}) \quad (8)$$

Assuming the expectation of future utility streams is formed by a geometric series of past values of d, such that:

$$d^*_t = \lambda d_t + \lambda^2 d_{t-1} + \lambda^3 d_{t-2} + \lambda^4 d_{t-3} + \dots$$
$$d^*_t = \lambda d_t + \lambda d^*_{t-1} \quad (9)$$

Substituting equation (9) into equation (8)

$$M_{hft} = \beta(\lambda d_{hft} + \lambda d^*_{hft-1}) \quad (10)$$

Substituting equation (7) into equation (10) gives:

$$M_{hft} = \beta\lambda \ln (\frac{w_f}{w_h})_t + \beta\lambda\frac{3}{2}\ln (\frac{e_f}{e_h})_t - \beta\lambda Z_{it} + \lambda M_{hft-1} \quad (11)$$

Assuming that the costs of migration from (h) to (f) are (negatively) related to the stock of migrants to (f) from country (h) due to network effects (Hatton, 1995): therefore $\overline{Z}$ is the mean of z_i depending on migration stock at time (t) as expressed by equation (3):

$$\overline{Z}_t = \mu_0 - \mu_1 MST_{hft-1} \quad (12)$$

Replace equation (12) in equation (11) and rearrange, it becomes equation (13)

$$M_{hft} = \beta\lambda \ln \left(\frac{w_f}{w_h}\right)_t + \beta\lambda \frac{3}{2} \ln \left(\frac{e_f}{e_h}\right)_t - \beta\lambda\mu_0 + \beta\lambda\mu_1 MST_{hft-1} + \lambda M_{hft-1} \quad (13)$$

III. The CGE model for analysing impacts of ASEAN labour migration to Thailand upon the Thai economy

The Computable General Equilibrium model states that if an economic system has an *n* market and if n-1 is in equilibrium, although there are external factors affecting the market equilibrium, then there will be an adjustment to the rest in order to reach equilibrium again. As a result, all markets are accordingly in equilibrium. The model consists of three steps: the structure of a CGE model, data collection, and construction of a general equilibrium model as follows:

A. Structure of a CGE model

Four steps are used to determine the structure of a CGE model as follows:

1. Specification of a CGE model:

This step aims to determine the type of activity and institution:

(1) Type of activity

Setting up an activity type is created by SAM with 11 activities. This is to say, 180 activities from SAM in 2005 are divided into 11 activities. From the data collection, activities can be classified as in Table 5.

(2) Type of institutions

(a) Households and private non-profit institutions comprise individuals and entities: namely, residents of a country, non-profit, and private sector workers who are not juristic persons. Households can be grouped into ten. The initial group represents the first 10% of residents with Decile 1, and the final group represents the last 10% residents with Decile 10.

Table 5 The matching up of production activities as designated from studies, and the input-output table

Production Activities	**Input-Output Table**
1. Agriculture	001–029
2. Mining and Quarrying	030–041
3. Manufacturing	042–124, 128–134
4. Construction	138–144
5. Electricity, Gas, and Water Supply	135–137
6. Transport	149–159
7. Wholesale and Retail Trade	145–146
8. Financial Intermediation	160–162
9. Real Estate	163
10.Public Administration and Defence: Compulsory Social Security	165–166
11.Service	147–148,164,167–179

(b) Corporations include individuals and business organisations, namely, private companies, cooperatives, non-profit organisations, and state enterprises.

(c) General Government refers to government sectors providing service to people such as administration, defence, and public health but excluding state enterprises.

(d) The Rest of The World refers to household, juristic persons, and foreign governments.

2. Level and type of supply function

This step sets up supply functions consisting of two levels (Figure 7): Level 1 is the supply of Leontief (LEO) using two types: basic and immediate and level 2 consists of:

Part 1 refers to primary input. It is a supply function of Constant Elasticity Substitution (CES) using three types: skilled labourers, unskilled labourers, and capital.

Part 2 refers to intermediate input and uses the Production Function of Leontief (LEO) with eleven types of activities.

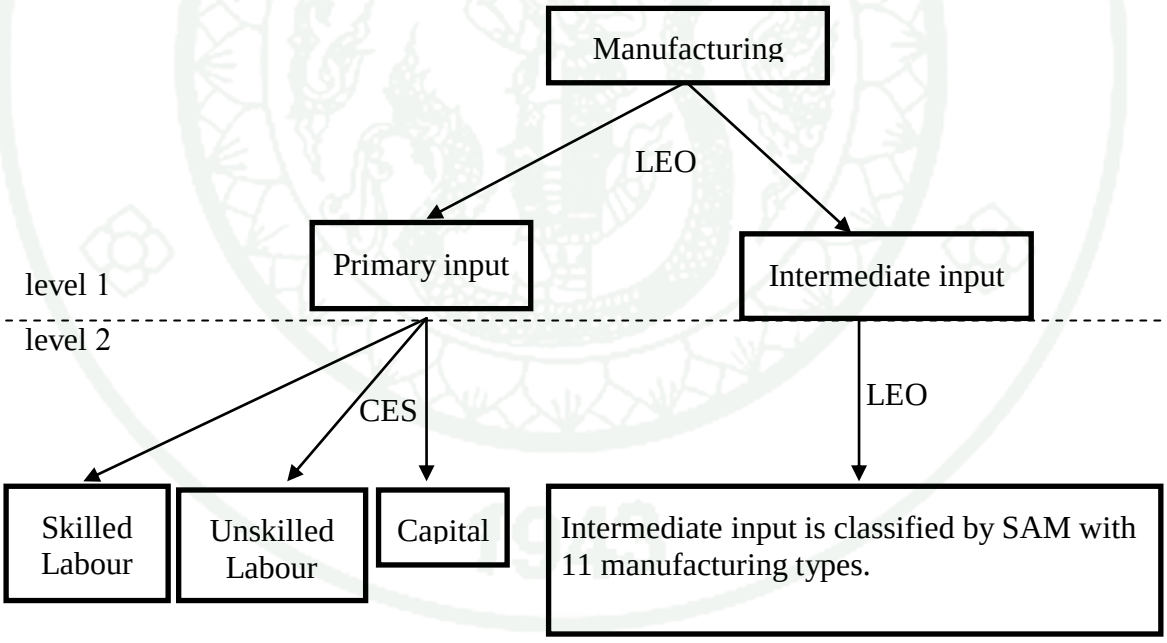

Figure 7 Level and type of supply function

3. Level and type of supply function

In terms of utility function, this is set up using only one level (Figure 9): namely, the Linear Expenditure System (LES). LES has sixteen chains of manufacturing activity.

4. Level and type of international trade function

In terms of international trade, this is set up using one level (Figures 9 and 10)

a) Export involves two types: consumption product and intermediate product known as the Constant Elasticity of Transformation (CET). CET has two parts: domestic sale and export.

b) Import involves two types: consumption product and intermediate function, known as the Constant Elasticity Substitution (CES) of Armington. CES has two parts: domestic manufacturing and import.

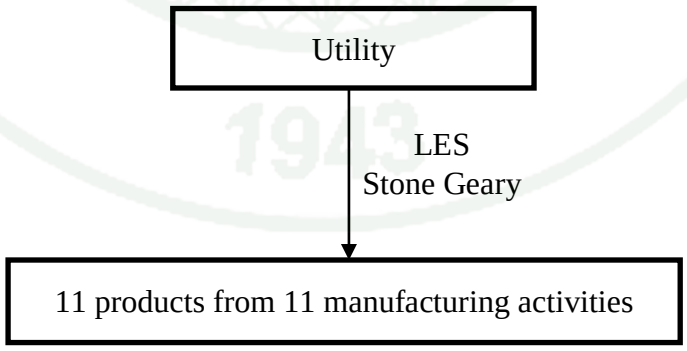

Figure 8 Level and type of household consumption function

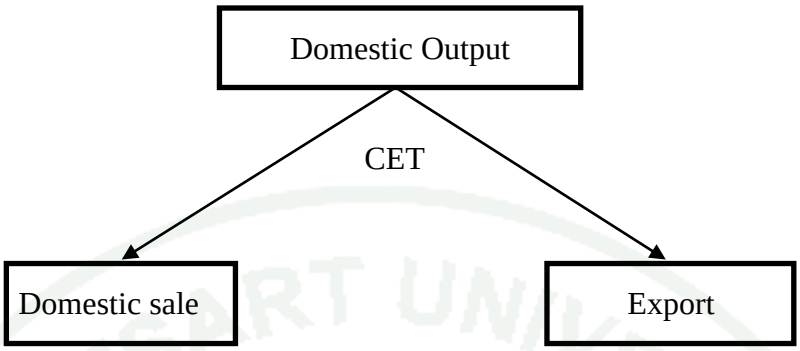

Figure 9 Level and type of function of all internally manufactured products

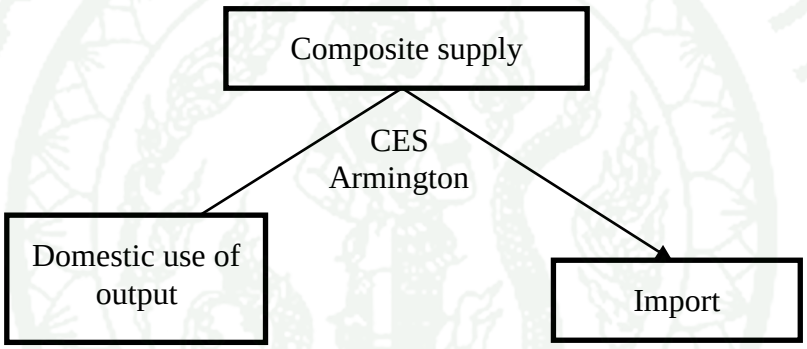

Figure 10 Level and type of function of composite supply

B. Data collection

This step collects data for Computable General Equilibrium model creation. There are two steps to formulate a SAM.

1. Social Accounting Matrix SAM of 2010

This matrix shows the circulation of income and expenses for the whole economic system (Table 7). Each cell and row-column in SAM represents the value of expense considered by vertical line, and income by horizontal line. The important principle is the balance of income and expenses list. The vertical line is

income and horizontal is expense. The Social Accounting Matrix is created from nine main accounts and 35 sub-accounts as follows:

a) Factors of Production are classified into three groups:

Skilled Labour: Ls is labour indicating work knowledge and ability in both theory and practice. Their educational background is higher than secondary school. Unskilled Labour: Lu is labour in the manufacturing and service field using labour as the main factor. Their educational background is lower than secondary school or equivalent. Operating Surplus: Cap is basic income in means of production and is not labour pay.

b) Household: HH is divided into ten groups (HH1-HH10)

c) Corporate: Cor

d) Production Activities in this study show 11 fields by population income account (Table 3)

e) Government Expenditure: GE

f) Private Investment: PI

g) Taxes: Tax

h) Government and transfer account (Gov)

i) Foreign account (F)

The Social Accounting Matrix shown at Table 7 explains briefly the relationship with the manufacturing account, consisting of 11 activities as per the details given. Each activity produces a different product making 11 products in total.

Manufacturing consideration is on vertical line 15–30, with each activity buying its own product, i.e. an “intermediate product”. The intermediate product can be divided into two types: intermediate internal product (P1_1, P1_2, . . . , P11_11) and intermediate imported product (M1, M2, . . . , M11). Apart from the intermediate product, there are further product means such as land, labour, capital, and entrepreneurship. Compensation of means from products in each activity is called value added. Value added comprises wages and salary, surplus, progress, and indirect tax. Outcomes from each activity equals Y1, Y2, . . . , Y35 respectively. Outcomes from each field are distributed to consumers and other manufacturing activities.

Income from each institute is believed to be created by the expenditure of another institute. Expenditure includes domestic consumption expenses, imported products, and the transfer of money to other institutes such as household expenditure, juristic persons, and abroad. The remaining income is from financial savings. Thus, the income and expenditure of each institute is the same.

The above statements show the relationship between each Social Accounting Matrix as follows:A Social Accounting Matrix presents manufacturing and distribution as a means of production table and products at consumer prices. It shows the circulation in means of production and products of each activity and between activities including those of manufacturers and final consumers. A Social Accounting Matrix shows the relationship in each institute such as the transfer of money between institutions. A Social Accounting Matrix shows the relationship between the economy and international trade in terms of imports and exports, and the transfer of money between institutions. A Social Accounting Matrix tells where sources of capital in a country come from and the capital collection system.

Table 6 Draft of social accouting matrix for study

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Ls	Lu	Cap	HH1	HH2	HH3	HH4	HH5	HH6	HH7	HH8	HH9	HH10	Cor	P1	P2	P3	P4
1	Ls														Ws1	Ws2	Ws3	Ws4
2	Lu														Wu1	Wu2	Wu3	Wu4
3	Cap														C_1	C_2	C_3	C_4
4	HH1	WHs1	WHu1	CH1										CH1				
5	HH2	WHs2	WHu2	CH2										CH2				
6	HH3	WHs3	WHu3	CH3										CH3				
7	HH4	WHs4	WHu4	CH4										CH4				
8	HH5	WHs5	WHu5	CH5										CH5				
9	HH6	WHs6	WHu6	CH6										CH6				
10	HH7	WHs7	WHu7	CH7										CH7				
11	HH8	WHs8	WHu8	CH8										CH8				
12	HH9	WHs9	WHu9	CH9										CH9				
13	HH10	WHs10	WHu10	CH10										CH10				
14	Cor			CC														
15	P1				HC1_1	HC2_1	HC3_1	HC4_1	HC5_1	HC6_1	HC7_1	HC8_1	HC9_1	HC10_1		P1_1	P1_2	P1_3	P1_4
16	P2				HC1_2	HC2_2	HC3_2	HC4_2	HC5_2	HC6_2	HC7_2	HC8_2	HC9_2	HC10_2		P2_1	P2_2	P2_3	P2_4
17	P3				HC1_3	HC2_3	HC3_3	HC4_3	HC5_3	HC6_3	HC7_3	HC8_3	HC9_3	HC10_3		P3_1	P3_2	P3_3	P3_4
18	P4				HC1_4	HC2_4	HC3_4	HC4_4	HC5_4	HC6_4	HC7_4	HC8_4	HC9_4	HC10_4		P4_1	P4_2	P4_3	P4_4
19	P5				HC1_5	HC2_5	HC3_5	HC4_5	HC5_5	HC6_5	HC7_5	HC8_5	HC9_5	HC10_5		P5_1	P5_2	P5_3	P5_4
20	P6				HC1_6	HC2_6	HC3_6	HC4_6	HC5_6	HC6_6	HC7_6	HC8_6	HC9_6	HC10_6		P6_1	P6_2	P6_3	P6_4
21	P7				HC1_7	HC2_7	HC3_7	HC4_7	HC5_7	HC6_7	HC7_7	HC8_7	HC9_7	HC10_7		P7_1	P7_2	P7_3	P7_4
22	P8				HC1_8	HC2_8	HC3_8	HC4_8	HC5_8	HC6_8	HC7_8	HC8_8	HC9_8	HC10_8		P8_1	P8_2	P8_3	P8_4
23	P9				HC1_9	HC2_9	HC3_9	HC4_9	HC5_9	HC6_9	HC7_9	HC8_9	HC9_9	HC10_9		P9_1	P9_2	P9_3	P9_4
24	P10				HC1_10	HC2_10	HC3_10	HC4_10	HC5_10	HC6_10	HC7_10	HC8_10	HC9_10	HC10_10		P10_1	P10_2	P10_3	P10_4
25	P11				HC1_11	HC2_11	HC3_11	HC4_11	HC5_11	HC6_11	HC7_11	HC8_11	HC9_11	HC10_11		P11_1	P11_2	P11_3	P11_4
26	P12				HC1_12	HC2_12	HC3_12	HC4_12	HC5_12	HC6_12	HC7_12	HC8_12	HC9_12	HC10_12		P12_1	P12_2	P12_3	P12_4
27	P13				HC1_13	HC2_13	HC3_13	HC4_13	HC5_13	HC6_13	HC7_13	HC8_13	HC9_13	HC10_13		P13_1	P13_2	P13_3	P13_4
28	P14				HC1_14	HC2_14	HC3_14	HC4_14	HC5_14	HC6_14	HC7_14	HC8_14	HC9_14	HC10_14		P14_1	P14_2	P14_3	P14_4
29	P15				HC1_15	HC2_15	HC3_15	HC4_15	HC5_15	HC6_15	HC7_15	HC8_15	HC9_15	HC10_15		P15_1	P15_2	P15_3	P15_4
30	P16				HC1_16	HC2_16	HC3_16	HC4_16	HC5_16	HC6_16	HC7_16	HC8_16	HC9_16	HC10_16		P16_1	P16_2	P16_3	P16_4
31	GE																	
32	PI				HS1	HS2	HS3	HS4	HS5	HS6	HS7	HS8	HS9	HS10	CS				
33	Gov				TranH1_G	TranH2_G	TranH3_G	TranH4_G	TranH5_G	TranH6_G	TranH7_G	TranH8_G	TranH9_G	TranH10_G	TranC_G				
34	Tax				HIT1	HIT2	HIT3	HIT4	HIT5	HIT6	HIT7	HIT8	HIT9	HIT10	CorT	IndT_1	IndT_2	IndT_3	IndT_4
35	F				HM1	HM2	HM3	HM4	HM5	HM6	HM7	HM8	HM9	HM10	IncC_F	M_1	M_2	M_3	M_4
36	Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18

Table 6 (continued)

	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	GE	PI	Gov	Tax	F	Tatal
1	Ws5	Ws6	Ws7	Ws8	Ws9	Ws10	Ws11	Ws12	Ws13	Ws14	Ws15	Ws16						Y1
2	Wu5	Wu6	Wu7	Wu8	Wu9	Wu10	Wu11	Wu12	Wu13	Wu14	Wu15	Wu16						Y2
3	C_5	C_6	C_7	C_8	C_9	C_10	C_11	C_12	C_13	C_14	C_15	C_16						Y3
4															TranG1_H		N1_R	Y4
5															TranG2_H		N2_R	Y5
6															TranG3_H		N3_R	Y6
7															TranG4_H		N4_R	Y7
8															TranG5_H		N5_R	Y8
9															TranG6_H		N6_R	Y9
10															TranG7_H		N7_R	Y10
11															TranG8_H		N8_R	Y11
12															TranG9_H		N9_R	Y12
13															TranG10_H		N10_R	Y13
14															TranG_C		I_F	Y14
15	P1_5	P1_6	P1_7	P1_8	P1_9	P1_10	P1_11	P1_12	P1_13	P1_14	P1_15	P1_16	CG_1	IP_1			X_1	Y15
16	P2_5	P2_6	P2_7	P2_8	P2_9	P2_10	P2_11	P2_12	P2_13	P2_14	P2_15	P2_16	CG_2	IP_2			X_2	Y16
17	P3_5	P3_6	P3_7	P3_8	P3_9	P3_10	P3_11	P3_12	P3_13	P3_14	P3_15	P3_16	CG_3	IP_3			X_3	Y17
18	P4_5	P4_6	P4_7	P4_8	P4_9	P4_10	P4_11	P4_12	P4_13	P4_14	P4_15	P4_16	CG_4	IP_4			X_4	Y18
19	P5_5	P5_6	P5_7	P5_8	P5_9	P5_10	P5_11	P5_12	P5_13	P5_14	P5_15	P5_16	CG_5	IP_5			X_5	Y19
20	P6_5	P6_6	P6_7	P6_8	P6_9	P6_10	P6_11	P6_12	P6_13	P6_14	P6_15	P6_16	CG_6	IP_6			X_6	Y20
21	P7_5	P7_6	P7_7	P7_8	P7_9	P7_10	P7_11	P7_12	P7_13	P7_14	P7_15	P7_16	CG_7	IP_7			X_7	Y21
22	P8_5	P8_6	P8_7	P8_8	P8_9	P8_10	P8_11	P8_12	P8_13	P8_14	P8_15	P8_16	CG_8	IP_8			X_8	Y22
23	P9_5	P9_6	P9_7	P9_8	P9_9	P9_10	P9_11	P9_12	P9_13	P9_14	P9_15	P9_16	CG_9	IP_9			X_9	Y23
24	P10_5	P10_6	P10_7	P10_8	P10_9	P10_10	P10_11	P10_12	P10_13	P10_14	P10_15	P10_16	CG_10	IP_10			X_10	Y24
25	P11_5	P11_6	P11_7	P11_8	P11_9	P11_10	P11_11	P11_12	P11_13	P11_14	P11_15	P11_16	CG_11	IP_11			X_11	Y25
26	P12_5	P12_6	P12_7	P12_8	P12_9	P12_10	P12_11	P12_12	P12_13	P12_14	P12_15	P12_16	CG_12	IP_12			X_12	Y26
27	P13_5	P13_6	P13_7	P13_8	P13_9	P13_10	P13_11	P13_12	P13_13	P13_14	P13_15	P13_16	CG_13	IP_13			X_13	Y27
28	P14_5	P14_6	P14_7	P14_8	P14_9	P14_10	P14_11	P14_12	P14_13	P14_14	P14_15	P14_16	CG_14	IP_14			X_14	Y28
29	P15_5	P15_6	P15_7	P15_8	P15_9	P15_10	P15_11	P15_12	P15_13	P15_14	P15_15	P15_16	CG_15	IP_15			X_15	Y29
30	P16_5	P16_6	P16_7	P16_8	P16_9	P16_10	P16_11	P16_12	P16_13	P16_14	P16_15	P16_16	CG_16	IP_16			X_16	Y30
31															CG			Y31
32															GS		NFB	Y32
33																Tax	TranF_G	Y33
34	IndT_5	IndT_6	IndT_7	IndT_8	IndT_9	IndT_10	IndT_11	IndT_12	IndT_13	IndT_14	IndT_15	IndT_16						Y34
35	M_5	M_6	M_7	M_8	M_9	M_10	M_11	M_12	M_13	M_14	M_15	M_16			TranG_F			Y35
36	Y19	Y20	Y21	Y22	Y23	Y24	Y25	Y26	Y27	Y28	Y29	Y30	Y31	Y32	Y33	Y34	Y35	

2. Construction of SAM

RAS is a widely used methodology to balance SAM. It is used when new information on the matrix row and column sums become available and the existing matrix needs to be updated.

C. Construction of the CGE model

The construction equation is a mathematical model of the relationship between microeconomics and macroeconomics systems. Groups of equations are as follows:

1. Production

Production is divided into two levels as follows:

Level 1

Manufacturing produces a product with two main factors - primary and intermediate within the manufacturing technique of Leontief (LEO) as follows:

$$QINA_i = INTA_i * QA_i \quad (1a)$$

$$QVA_i = IVA_i * QA_i \quad (2a)$$

Where

QA_i Quantity of activity i

QVA_i Quantity of value-added

$QINTA_i$ Quantity of aggregate intermediate input

$INTA_i$ Quantity of aggregate intermediate input per activity unit

IVA_i Quantity of value-added per activity unit

Level 2

Primary inputs

Manufacturers produce products with three factors: unskilled labour, skilled labour, and capital with Constant Elasticity Substitution (CES).

$$\text{Min Cost} = \sum_i WF_i * QF_{fi}$$

$$QVA_i = A_{ces\,i}(\sum \alpha_{fi}\ QF_{fi}^{-\rho\ ces\ i})^{-1/\rho\ ces\ i} \quad (3a)$$

Where

QF_{fi}	Quantity demand of primary input f from activity i
WF_f	Average price of primary input f
$-\rho_{ces\,i}$	CES production function exponent of activity i
α_{fi}	Share parameter for CES production function of activity i
$A_{ces\,i}$	Shift parameter for CES production function of activity i
PVA_i	Value–added price

Leading to the equation for maximising manufacturing profit, namely,

$$WF_i * WFDIST_{fi} = PVA_i * QVA_i\ (\sum \alpha_{fi} * QF_{fi}^{-\rho\ ces\ i})^{-1} * \alpha_{fi} * QF_{fi}^{-\rho\ ces\ i\ -1} \quad (4a)$$

Intermediate inputs

Manufacturing produces intermediate input using Leontief (LEO).

$$QINT_{ij} = A_{ij} QINTA_i \quad (5a)$$

Where

$QINT_{ij}$ Quantity of intermediate input j to activity i

A_{ij} Input-output coefficients

2. International trade

International trade consists of two parts:

a) Export

Market activity sells domestic output and export for maximising income; Constant Elasticity of Transformation (CET).

$$\text{MAX R} = \sum_i (\text{QD}_i * \text{PD}_i + \text{QE}_i * \text{PE}_i)$$

$$\text{St QA}_i = \text{A}_{\text{cet i}} (\alpha_{\text{cet i}} \text{QD}_i^{-\rho \text{ cet i}} + (1 - \alpha_{\text{cet i}}) \text{QE}_i^{-\rho \text{ cet i}})^{1/\rho \text{ cet i}} \quad (6a)$$

Where

QD_i Quantity sold domestically for domestic output

QE_i Quantity of exports for commodity i

PD_i Price for commodity produced and sold domestically

PE_i Export price

$\rho_{\text{cet i}}$ CET function exponent

$\alpha_{\text{cet i}}$ Share parameter for CET function

$A_{\text{cet i}}$ Shift parameter for CET function

Leading to supply of internal products, namely,

$$\text{QD}_i = \frac{\alpha_{\text{cet i}}^{1/(1-\rho \text{ cet i})} \text{PD}^{1/(\rho \text{ cet}-1)} \cdot \text{QA}_i}{\text{A}_{\text{cet i}} (\alpha_{\text{cet i}}^{1/(1-\rho \text{ cet i})} \text{PD}_i^{\rho \text{ cet i}/(1-\rho \text{ cet i})} + (1 - \alpha_{\text{cet i}})^{1/(1-\rho \text{ cet i})} \text{PD}_i^{\rho \text{ cet i}/(1-\rho \text{ cet i})})} \quad (7a)$$

and supply of exports

$$QE_i = \frac{\alpha_{cet\,i}^{1/(1-\rho\,cet\,i)} PE_i^{1/(\rho\,cet\,i-1)} QA_i}{A_{cet\,i}(\alpha_{cet\,i}^{1/(1-\rho\,cet\,i)} PD_i^{\rho\,cet\,i/(1-\rho\,cet\,i)} + (1-\alpha_{cet\,i})^{1/(1-\rho\,cet\,i)} PE_i^{\rho\,cet\,i/(1-\rho\,cet\,i)})} \quad (8a)$$

b) Import

Market activity buys products from domestic manufacturers and imports using the least capital. This equation assumes a Constant Elasticity Substitution (CES) or Armington function from the hypothesis of Paul Armington. He states that imported products and domestic products create imperfect substitutability.

$$MIN\ C = \sum_i (QD_i \bullet PD_i + QM_i \bullet PM_i)$$

$$QX_i = A_{am\,i}(\alpha_{am\,i} QAD_i^{-\rho\,am\,i} + (1-\alpha_{am\,i}) QM_i^{-\rho\,am\,i})^{-1/\rho\,am\,i} \quad (9a)$$

Where

QM_i Quantity of imports of commodity i

PM_i Import price

$-\rho_{am\,i}$ Armington function exponent of activity i

$\alpha_{am\,i}$ Share parameter for Armington function of activity i

$A_{am\,i}$ Shift parameter for Armington function of activity i

Leading to demand of domestic products and imported products, namely:

Domestic demands

$$QD_i = \frac{\alpha_{6i}^{-1/(1-\rho\,am\,i)} PD_{it}^{1/(\rho\,am\,i)} QX_I}{A_{am\,i}(\alpha_{am\,i}^{-1/(1-\rho\,am\,i)} PD_i^{\rho i/(1-\rho\,am\,i)} + (1-\alpha_{am\,i})^{-1/(1-\rho\,am\,i)} PM_i^{\rho\,am\,i/(1-\rho\,am\,i)})} \quad (10a)$$

Import demands

$$QM_i = \frac{\alpha_{am\,i}{}^{-1/(1-\rho\,am\,i)} PM_{it}{}^{1/(\rho\,am\,i)} QX_I}{A_{am\,i}(\alpha_{am\,i}{}^{-1/(1-\rho\,am\,i)} PD_i{}^{\rho i/(1-\rho\,am\,i)} + (1-\alpha_{am\,i})^{-1/(1-\rho\,am\,i)} PM_i{}^{\rho\,am\,i/(1-\rho\,am\,i)})} \quad (11a)$$

c) Institutions

Household and business income arises from compensation of labourers and capital, government transferables and international transferables. Government income comes from tax.

(1) Income of primary input

$$YF_f = \sum WF_{fi} \bullet QF_{fi} \quad (12a)$$

Where

YF_f Income of primary input f

(2) Income to households from primary input

$$YIF_{h\,f} = \theta_{h\,f} * YF_f \quad (13a)$$

Where

$YIF_{h\,f}$ Income to households from primary input f

$\theta_{h\,f}$ Proportion to the allocation of revenue from primary input f to household h

(3) Income to business from primary input

$$BI_{b\,f} = \theta_{b\,f} * YF_f \quad (14a)$$

Where

$BI_{b\,f}$ Income to business from primary input f

$\theta_{b\,f}$ Proportion for the allocation of revenue from primary input f to business

(4) Income of households

$$YI_h = \sum YIF_{h\,f} + Tr_{g\,h} * CPI + Tr_{f\,h} * EXR \quad (15a)$$

Where

YI_h Income of households h

$Tr_{g\,h}$ Transfer from government to households h

$Tf_{f\,h}$ Transfer from foreigners to households h

CPI Consumer price index

EXR Exchange rate (local currency unit per foreign currency unit)

(5) Income of business

$$BI = \sum BI_{b\,f} + Tf_b * EXR \quad (16a)$$

Where

BI Income of business

BI_{bf} Income to business from primary input f

Tf_b Transfer from foreigners to business

(6) Government income

$$GI = \sum Tin * YI + \sum QA_i * Ta_i + \sum QVA_i * Rva_i + \sum QM_i * Tm_i + \sum QE_t * Te_i \quad (17a)$$

Where

GI Government income

T_{ins} Direct tax of institution ins

Ta_i Indirect tax of commodity i

Tva_i Value-added tax of commodity i

Tm_i Import tariff of commodity i

Te_i Export tariff of commodity i

d) Final demands

Final demand comprises three parts as follows:

(1) Household demands

Households obtain the maximum utility from product consumption within budget availability.

$$\text{MAX } U_h = \sum \beta i \, \text{In}(CHQC_{hi} - CHQC_{li}) \quad (18a)$$
$$\text{St } BH_h = (1 - MPS_h) * YI_h * (1 - Tins_h))$$

Where

$CHQC_{l\,i}$ Minimum quantity consumed of commodity i by household h

$CHQC_{h\,i}$ Quantity consumed of commodity i by household h

BH_h Personal income minus personal taxes and savings

MPS_h Marginal propensity to save for household h

$Tins_h$ Direct tax of household h

Leading to customer demand for product

$$CHQC_{h\,i} = CHQCL_{h\,i} + \frac{\beta}{PC_i} * (BH_h - \sum PC_i * CHQCL_{h\,i}) \quad (19a)$$

Where

$\beta_{h\,i}$ Marginal share of consumer spending on marketed commodity i for household h

PC_i Average price for domestic sales

(2) Demand for investment

$$QINV_i = \theta inv_i * \overline{QINV_i} \quad (20a)$$

Where

$QINV_i$ Quantity of investment demand for commodity i

θinv_i Proportion of investment demand for commodity i

(3) Government demand

Government uses income for consumption, investment, and welfare of citizens.

$$EG = \sum PC_i * QG_i + Tr_{g\,h} * CPI \quad (21a)$$

Where

EG Government expenditure

QG_i Government consumption and demand for commodity i

Tr_{gh} Transfer from government to households h

Constraints of government for consumption and investment

$$OG_i = \overline{OG_i} \quad (22a)$$

e) Price

According to groups for structural manufacturing, consumption, international trade, and price mechanism is related as follows:

(1) Import price

$$PM_i = pwm_i(1 - T_{mi}) * EXR \quad (23a)$$

Where

PM_i Import price of commodity i

pwm_i Import price of commodity i (foreign currency)

tm_i Import tariff of commodity i

EXR Exchange rate (local currency unit per foreign currency unit)

(2) Export price

$$PE_i = pwe_i(1 - T_{ei}) * EXR \quad (24a)$$

Where

PE_i Export price of commodity i

pwe_i Export price of commodity i (foreign currency)

T_{ei} Export tariff of commodity i

(3) Average prices sold domestically

$$PC_i = (PD_i * QD_i + PE_i * QE_i)/(QD_i - QE_i) \quad (25a)$$

(4) Prices for commodity produced and sold domestically

$$PD_i = PA_i(1 - T_{ai}) \quad (26a)$$

Where

PA_i Producer price for commodity i

PD_i Price for commodity produced and sold domestically

T_{ai} Indirect tax of commodity i

(5) Value–added price

$$PVA_i = PA_i - PQINT_i \quad (27a)$$

Where

PVA_i Value–added price

$PQINT_i$ Average price of intermediate input

(6) Price of intermediate output

$$PQINT_i = \sum PC_i * A_{ij} \quad (28a)$$

Where

$PQINT_i$ Average price of intermediate input i

A_{ij} Input-output coefficients

(7) Customer index

$$CPI = \Sigma\, PC_i * cwts_i \quad (29a)$$

Where

CPI Consumer Prices Index.

$cwts_i$ Weight of commodity i in the CPI

f) Conditional equation

Conditional equations represent economic system balance.

(1) Primary input market

$$\sum QF_{fi} = \overline{TQF_f} \quad (30a)$$

Where

TQF_f Quantity supply of primary input f

(2) Product market

$$QC_i = PQINT_i + \sum CHQC_{h\,i} + GCQC_i + BINV_i + GINV_i \quad (31a)$$

Where

QC_i Quantity of commodity i sold domestically

$CHQC_{h\,i}$ Quantity consumed of commodity i by household h

$GCQC_i$ Quantity of government consumed of comodity i

$BINV_i$ Quantity of private investment of commodity i

$GINV_i$ Quantity of government investment of commodity i

(3) International trade balance

$$\sum PM \bullet QM_i = \sum PE \bullet QE_i + FS \quad (32a)$$

Where

FS Foreign savings

(4) Balance budget

$$GI = EG + GS \quad (33a)$$

Where

GS Government savings

EG Government expenditure

(5) Investment and Savings

$$\sum MPS \bullet \left(YI_h \bullet (1 + Tins_h)\right) + GS + BS + FS \bullet EXR = \sum QINV_i \bullet PC_i \quad (34a)$$

Where

BS Business savings

g) Closure rules

Closure rules determine a way of driving into a new balance of model after impact. This study determines the closure rules as follows: The stock of capital in each sector is assumed to be fixed. Hence, employment will simply be equal to labour demand. In product markets, variable prices allow for clearing of the markets. In the foreign exchange market, the exchange rate is exogenous. The model is homogenous for all prices. Hence, a numerair is chosen by fixing an aggregate price equal to one. Accordingly, wages and exchange rates can be interpreted as real wages and real exchange rates. The weights for this aggregate price are the initial values of domestic production.

h) Calculation of benchmark equilibrium

Equations are used to find the benchmark equilibrium and then compare it with Calibration in SAM. After that, information is adjusted to get the benchmark equilibrium.

i) Analyse results of change in number of net migrants into Thailand

To apply the CGE model to analyse the impact of labour flow, Phuwanich's model was used (Phuwanich, 2008). This model is based upon the behaviour of producers, consumers, and the government and demonstrates the relationships between them. The model shows how changes in the number of workers flowing from ASEAN countries affect the Thai economy. The model consists of three steps, including: conceptual framework development, data collection, and the development of a general equilibrium model and its analysis, respectively. The conceptual framework defines the elements of an economic system and identifies the

type of production activity, institution, and behaviour of economic units. Subsequently, data from each element is illustrated through social accounting matrices (SAM). The final stage compiles all the information and links it together, using SAM as the centre.

Figure 11 represents the conceptual framework development and starts with types of production activities derived from national income accounts, including eleven activities, four institutions, and ten households divided into ten levels, from juristic persons, government, and the foreign sector. Identification levels and type of supply functions are completed as follows: Level 1 is a Leontief (LEO) production function comprising two types; basic and intermediate. Level 2 comprises two parts: the first part is the basic factor; a Constant Elasticity Substitution (CES) function. This part contains three factors: unskilled labour, skilled labour, and capital. The second part is the intermediate factor of production, which is also a Leontief (LEO) function. This part includes eleven factors of production activities.

Demand functions identify a utility as a Linear Expenditure System (LES), including eleven production activities. Identification of the levels and types of international trading functions, in terms of export, is based upon Constant Elasticity of Transformation (CET). It covers national consumption and exports. Imports are based upon the Constant Elasticity Substitution (CES) invented by Armington and covers national production and imports. The aforementioned conceptual framework is set and then some major variables in structural equations are created and used to analyse the impact of labour flow upon the Thai economy, as illustrated in Figure 12. The model of this study divides variables into two groups: endogenous variables and exogenous variables. Exogenous variables determine a change of model including the number of migrants. Excel software with the Newton-Raphson method is the utilised program for the analysis of such impacts.

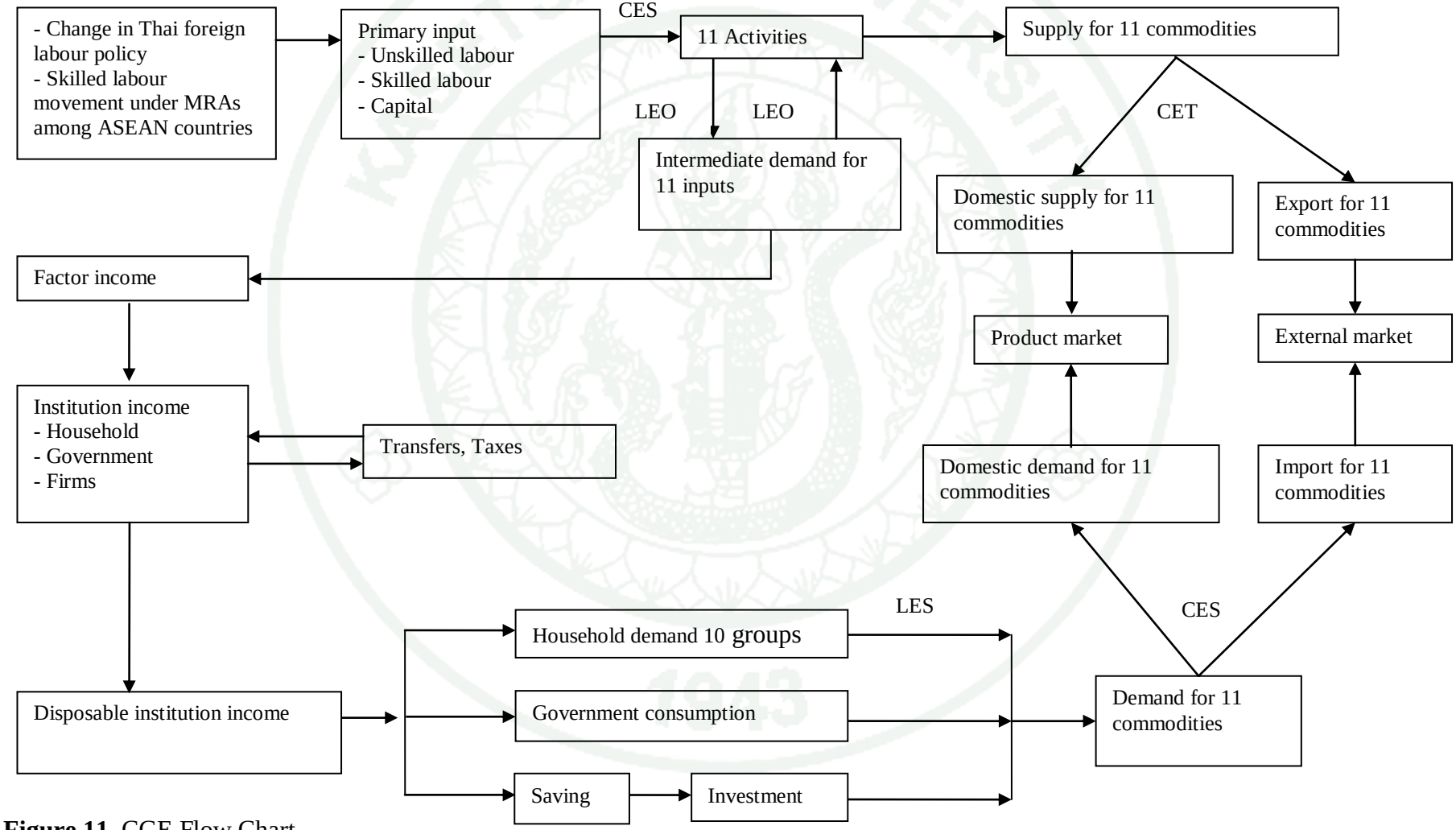

Figure 11 CGE Flow Chart

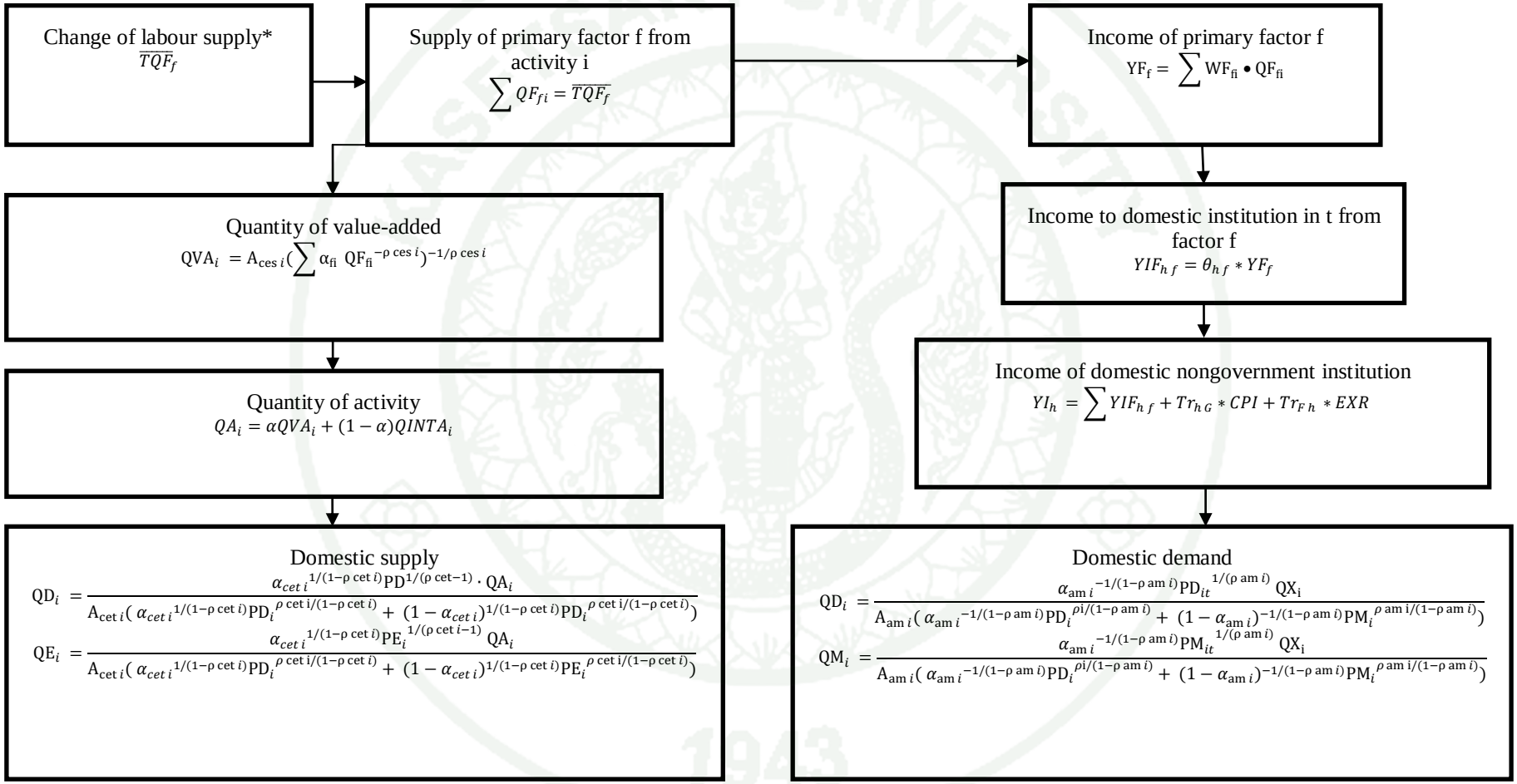

Figure 12 Diagram of relationship between main variables in structural equations

Note: * changes in number of labourers from Thai foreign labour policy and ASEAN MRA

CHAPTER V

RESULTS AND DISCUSSION

The Determinants of Intra-ASEAN Migration to Thailand

This study applies the model of Hatton (1995) to analyse the factors determining intra-ASEAN migration. One modification is the use of panel data, which consists of a cross-section of data from nine countries migrating to Thailand, and time-series data collected annually during the period 2002–2010; nine years in total. Thus, the number of observations employed in this present study is 81. The data is from the 'Office of Foreign Workers Administration', and the 'Thailand Overseas Employment Admission', the Department of Employment, Ministry of Labour, Thailand. The dependent variable is the net migration rate, resulting from dividing net migration (inflows minus outflows) from countries in the ASEAN (h) to Thailand, by the migration stock of countries in ASEAN (f) (Fertig, 2000; Hatton, 1995). Independent variables, real wages, w_h and w_f are approximated by the per capita income of the countries in the ASEAN and Thailand, respectively. Per capita income in power parities is provided by Fetig (2000) and Maddison (1995), and is used to account for the difference in living costs between Thailand and other ASEAN state members. Employment rates e_h and e_f are equal to $(1 - u_h)$ and $(1 - u_f)$, where u_h and u_f are the unemployment rates of respective countries, as published by the OECD. Furthermore, our model is extended by adding a dummy variable which concerns the migration worker policy of Thailand. This dummy variable equals one (=1) if the policy, concerning migration workers from Myanmar, Laos, and Cambodia, both with and without work permits, allowing work in Thailand, is implemented. Such a policy was in effect only in 2004 and 2009, so for the years other than these the dummy variable equals zero (=0). Thus, equation (13) can be rewritten as equation (14):

$$M_{h\,thai\,t} = \tau_0 + \tau_1 \ln\left(\frac{pgdp_{thai}}{pgdp_h}\right)_t + \tau_2 \ln\left(\frac{e_{thai}}{e_h}\right)_t + \tau_3 MST_{h\,thai\,t} + \tau_4 M_{h\,thai\,t-1} + \tau_5 P_{h\,thai\,t} + \varepsilon_{h\,thai\,t} \quad (14)$$

Assigned $\tau_0 = \beta\lambda\mu_0, \tau_1 = \beta\lambda, \tau_2 = \beta\lambda\frac{3}{2}, \tau_3 = \beta\lambda\mu_1, \tau_4 = \lambda$

$M_{h\,thai\,t}$ is the net migration rate from countries in the ASEAN (h) to Thailand at time (t); $pgdp_{thai\,t}$ is per capita GDP (PPP) in Thailand at time (t); $pgdp_{h\,t}$ is per capita GDP (PPP) in countries in the ASEAN (h) at time (t); $e_{thai\,t}$ is employment rate of Thailand at time t, $e_{h\,t}$ is the employment rate of countries in the ASEAN (h) at time (t); MST_{hft} is migration stock at time t, and $P_{h\,thai\,t}$ is the migration worker policy of Thailand at time (t).

According to the theory, we expect estimated coefficients to have the following signs: $\tau_1 > 0$, $\tau_2 > 0$, $\tau_3 > 0$, $\tau_4 > 0$ and $\tau_5 > 0$

The net migration of Thailand from countries in the ASEAN depends upon: the difference of incomes between Thailand and the other countries in the ASEAN, the remaining number of migrants in Thailand, and the distance between Thailand and the other countries in the ASEAN. This can be considered from the correlation coefficient presented in Table 7, showing that the three variables significantly correlate with the net migration rate of Thailand, from countries in the ASEAN, at a 1% significance level. They are per capita GDP PPP ratio, migration stocks, and distance between the two locations. However, consideration of these relationships cannot clearly describe which variables are the factors of change. The next inferential analysis will therefore explain such causes and effects.

Table 7 Descriptive statistics and correlation matrix of the studied variables

Variable	$M_{h\ thai\ t}$	$\ln(\frac{GDP_{thai}}{GDP_h})_t$	$\ln(\frac{e_{thai}}{e_h})_t$	$MST_{h\ thai\ t}$	Mean	S.D.
Net migration rate ($M_{h\ thai\ t}$)*10,000	1				9.881	91.245
Log of per capita GDP PPP ratio ($\ln(\frac{GDP_{thai}}{GDP_h})_t$)	0.744**	1			0.407	1.407
Log Employment rate ratio, $\ln(\frac{e_{thai}}{e_h})_t$	-0.084	0.173	1		0.032	0.029
Migration stocks/10,000 ($MST_{h\ thai\ t}$)	0.577**	0.454**	-0.139	1	7.997	19.853

Note: Number of observations: 81, Number of cross-sections: 9, Period: 2002–2010
** Significant at 1%

In terms of inferential statistics, panel data is applied to analyse factors that determine net migration rates from countries in the ASEAN to Thailand. The results in Table 8 show that both F-statistic and Breusch-Pagan LM statistic are statistically significant at the 1% level. This indicates that both fixed and random effect models are better than the pooled OLS model. Furthermore, the Hausman statistic is statistically significant at the 1% level, which indicates that the fixed effect model is more suitable than the random effect.

By employing 81 observations via the panel data with the fixed effect model, the results obviously show that there are three factors which are statistically significant at the 1% level. They are the per capita GDP ratio of Thailand to ASEAN countries, migration stock, and migration worker policy. All of them have a positive relationship with the net migration rate from countries in the ASEAN to Thailand. These results coincide with the aforementioned hypotheses.

Contrastly, there are two factors that are statistically insignificant: employment ratio and lag net migration. For employment ratio, the sign of the coefficient is as predicted, but its magnitude is not statistically significant. This might be due to the continuously low rate of unemployment in Thailand. For instance, the highest unemployment rate during the period of study is only 1.04% in 2010. Therefore, the employment rate is unlikely to correlate with the net migration rate. This result is similar to that found in the study by Hatton and Williamson (2002). The lag net migration rate is another factor which is not statistically significant. This lagged net migration rate indicates that the decision to migrate does not depend on that of the previous year. Perhaps it is owing to the migration worker policy not being regularly implemented. As a result, the lag net migration rate cannot be used to predict the current net migration rate.

Table 8 Determination of the net migration rate from countries in the ASEAN to Thailand during 2002–2010

Variable	Estimated Coefficient
Log Per-Capita-GDP Ratio, ln $(\frac{GDP_{thai}}{GDP_h})_t$	227.12 (3.78)**
Log Employment rate ratio, ln $(\frac{e_{thai}}{e_h})_t$	46.97 (0.13)
Migration Stock, $(mst_{h\ thai})_t$	0.21 (3.18)**
Lag Net Migration , $(M_{h\ thai})_{t-1}$	0.04 (0.45)
Migration Workers Policy, $(P_{h\ thai})_t$	68.17 (3.25)**
Constant Term	-108.87 (-3.64)**
No. of observations	81
R-squared	0.61
Adjusted R-squared	0.60
F-test	F(8,67)=8.28**
Breusch-Pagan test	Chi2(1)=8.73**
Hausman test	Chi2(6)=529.54**

note: t-statistics in parentheses

* sig. at 5 %, * * sig. at 1 %

The Impacts of Intra-ASEAN Migration on Thai Economy

Analyses of the impacts of ASEAN labour migration to Thailand upon the Thai economy by the CGE model provide two main scenarios: the impact of changes to Thai foreign worker policies and impact of skilled labour flow based upon ASEAN MRAs. The details are discussed as follows:

Scenario I: Impacts of Changes to Thai foreign Worker Policies

The impacts of foreign worker policies in Thailand upon the Thai economy are divided into two cases. The first case analyses the impact of ASEAN labour migration to Thailand upon the Thai economic system, based upon changes in the number of workers according to the coefficient of migrant worker policies from objective 1. The coefficient is 68.17 and is used to calculate the increasing rate of workers in Thailand, which is equivalent to 3.30%.

The second case is based upon data from the 'Ministry of Labour', Department of Employment, and the 'Office of Migrant Workers Administration'. In 2004 and 2009, there was a foreign worker policy affecting a number of migrant workers. This policy allowed migrant workers, especially those from Myanmar, Laos, and Cambodia with or without work permits, to register for work in Thailand. These migrant workers could remedy the lack of labour in Thailand. Furthermore, this policy could solve illegal immigrant labour problems. As a result, the numbers of migrant workers obviously increased. In 2004, the number of migrant workers was 189.99%, and measured 171.02% in 2009. Thus the average change in the number of migrant workers under this policy during the two periods reached 180.51%, and this was used to calculate the increasing rate of labour in Thailand, equivalent to 7.78%.

An analysis of the results of the two cases is shown in Table 9. These two cases indicate similar results excluding the size of the impacts. Therefore, when the numbers of migrant workers (mainly unskilled), increased due to migrant worker policy establishment, the impacts are in line with a theory stating that when the number of workers in a country increases, this results in higher available resources for

production. Thai economic systems were affected, although the increase in GDP included the value of eleven production activities. The construction sector was highly affected by a change in the amount of labour. In case 1, the change in GDP included the value of eleven production activities and was measured at 0.1123% compared with 0.1914% in case 2.

An increase in the number of unskilled workers in Thailand also resulted in higher income achievement at each level. On average, the change in household incomes was 0.2349% in case 1, and is lower at 0.4397% for case 2.

An increase in the number of migrant workers also resulted in a higher amount of unskilled labour in Thailand. Wages for unskilled workers decreased by 4.0169% in case 1 and 8.0122% in case 2, but wages for skilled labour increased by 0.0167% in case 1 and 0.0358% in case 2, respectively. Thus, income inequality increased due to the higher wages of skilled workers but lower wages for unskilled workers, which was reflected by an increase in percentage change to the Gini coefficient of 0.5346 in case 1 and 1.2476 in case 2, respectively.

Exports in 11 production activities tended to increase, except for the electricity and water supply sectors. These increases were 0.0265% in case 1 and 0.0905% in case 2, respectively. Exports in the construction sector tended to see drastic changes, as well as an increase in imports for 11 production activities. These increases were 0.1449% in case 1 and 0.1861% in case 2, respectively.

The findings from both cases were similar, but differed in impact size, indicating that impacts in case 1 were smaller than those of case 2, because for case 1 the increase in the number of unskilled workers was less than in case 2.

Table 9 The Impact of ASEAN Labour migration to Thailand upon the Thai economy in scenario 1

Variable	Case 1	Case 2
	Percentage Change	**Percentage Change**
Gross Domestic Product (Million Baht)	0.1123	0.1914
Household Income (Million Baht)	0.2349	0.4397
Wages	-4.0169	-8.0112
Income Distribution (Gini Coefficient)	0.5346	1.2476
Value of 11 production activities (Million Baht)		
1. Agriculture	0.1246	0.2817
2. Mining and Quarrying	0.1312	0.3121
3. Manufacturing	0.0537	0.1706
4. Construction	0.7043	0.5812
5. Electricity, Gas and Water Supply	0.2676	0.5497
6. Transport	0.1939	0.3481
7. Wholesale and Retail Trade	0.1764	0.2914
8. Financial Intermediation	0.1730	0.3475
9. Real Estate	0.1725	0.3371
10. Public Administration and Defence; Compulsory Social Security	0.0777	0.1724
11. Service	0.1788	0.3683
Export value of 11 production activities (Million Baht)		
1. Agriculture	0.0457	0.1402
2. Mining and Quarrying	0.0651	0.1931
3. Manufacturing	0.0487	0.1623
4. Construction	0.1211	0.4124
5. Electricity, Gas, and Water Supply	-0.0158	-0.0042
6. Transport	0	0
7. Wholesale and Retail Trade	0.0268	0.0912
8. Financial Intermediation	0	0
9. Real Estate	0	0
10. Public Administration and Defense; Compulsory Social Security	0	0
11. Service	0	0

Table 9 (continued)

Variable	Case 1 Percentage Change	Case 2 Percentage Change
Import value of 11 production activities (Million Baht)		
1. Agriculture	0.1140	0.2437
2. Mining and Quarrying	0.0963	0.1920
3. Manufacturing	0.2963	0.5074
4. Construction	0.6151	0.2718
5. Electricity, Gas, and Water Supply	0.2921	0.5776
6. Transport	0.0000	0.0000
7. Wholesale and Retail Trade	0.1802	0.2549
8. Financial Intermediation	0.0000	0.0000
9. Real Estate	0.0000	0.0000
10. Public Administration and Defence; Compulsory Social Security	0.0000	0.0000
11. Service	0.0000	0.0000

Scenario II. Impacts of Skilled Labour Flow Based Upon ASEAN MRAs

Since there is no data available regarding changes to the labour figures in the eight professions in Thailand, net migration rates were applied to the European Union (EU) in 2004, a period which accepted new member nations, whereby some member nations such as Germany allowed labour mobility within other EU member nations. As a result, data from the CIA World Fact Book 2010 indicates that the net migration rate of Germany changed from 2.35% in 2003 to 2.91% in 2004. Thus, the change in net migration was 23.28%, and this was used to calculate the increasing rate of skilled workers in Thailand, resulting in the eight professions of mobility based upon ASEAN MRAs being equivalent to 0.39%.

It is assumed that the eight professions mainly moved within the service sectors. Table 10 reveals that the increase in the number of skilled workers resulted in an increase in GDP at 0.0021%. However, this impact is lower than that of scenario 1. The construction sector was the most positively affected amongst all 11 production activities.

The higher number of skilled workers in Thailand, especially those in the service sector, resulted in the achievement of higher incomes at each level. On average, the increase in household income was 0.0042%.

For the higher number of skilled workers, lower skilled worker wages rose by 0.0047%, but unskilled worker wages increased by only 0.0001%. As a consequence, income inequality decreased and was reflected by a 0.0012% decrease in the Gini coefficient.

Exports in all 11 production activities tended to decrease by 0.0009%, whereas imports tended to increase by 0.0031%. Imports in the construction sector tended to see drastic changes, much more so than others.

Comparatively, the impacts of skilled labour migration, specifically in the eight professional occupations are simulated, rather than the minimal impacts on the Thai economy, as shown in case 3. This is because the numbers in such labour migration were still lower than those of unskilled workers. There are several obstacles for skilled labour movement amongst ASEAN countries, such as occupational qualifications and standards, language barriers and, last but not least, the work permit regulations of each member country, which have not yet been adjusted in line with the ASEAN MRA labour movement policy.

From the scenario 2, sensitivity can be analysed by designating the amount of skilled labour within the service sector to increase. By changing the scenario 2 to equal to 25, 50, 150, 200, and 500, the aim is to observe the consistency of the impacts. From Table 11, it appears that the size of change, once the skilled labour numbers in the service sector is increased, will result in an increase in the percentage value of the change in the economic variable; as well as the direction of change, similar to that in scenario 2.

The increased change caused by designating the amount of skilled labour in the service sector to increase, from the change within scenario 2 is equal to 25, 50, 100, 150, 200, and 500. The main conclusions are:

The impacts to the overall economic image of Thailand are initially illustrated by the overall amount of domestic products; actually, with a change in the nation's labour force, it appears that the percentage change in the impacts is equal to that of 0.0022%, 0.0019%, 0.0030%, 0.034%, 0.0068%, and 0.0396% respectively.

As for the impacts on the employment of unskilled labour, it appears that the wages of the unskilled have decreased in value by 0.0067%, 0.0086%, 0.0117%, 0.0135, and 0.0021 respectively.

The increase in labour numbers results in a positive change in household income by 0.0048%, 0.0051%, 0.0072%, 0.0088%, 0.0129%, and 0.0497%

respectively. The impact in terms of income distribution, in the 10 household categories within the study, contains no changes.

From the 11 production operations, the highest change in terms of percentage concerns construction, showing changes of 0.0154%, 0.0086%, 0.0174%, 0.0563%, and 0.4715% respectively.

The exportation in the 11 production operations has decreased in value; the operation with the highest change in terms of percentage is relates to construction. The changes show 0.0029%, 0.0024%, 0.0035%, 0.0037%, 0.0095, and 0.0590%. As for the increases in exportation value s, the operation with the highest change in terms of percentage relates to construction at 0.0175%, 0.0104%, 0.0201%, 0.0203%, 0.0637%, and 0.518%. The sectors which remain unchanged because they contain no products for exportation or importation are: the transportation sector, banking sector, insurance sector, land and assets sector, accommodation sector, governance and national security sector, and service sector.

Table 10 Impacts of skilled labour flow based upon ASEAN MRAs

Variable	Scenario 2
	Percentage Change
Gross Domestic Product (Million Baht)	0.0021
Household Income (Millions Baht)	0.0042
Wages	-0.0047
Income Distribution (Gini Coefficient)	-0.0012
Value of 11 production activities (Million Baht)	
1. Agriculture	0.0007
2. Mining and Quarrying	-0.0006
3. Manufacturing	-0.0006
4. Construction	0.0171
5. Electricity, Gas, and Water Supply	0.0027
6. Transport	0.0025
7. Wholesale and Retail Trade	0.0021
8. Financial Intermediation	0.0017
9. Real Estate	0.0018
10. Public Administration and Defence; Compulsory Social Security	0.0000
11. Service	0.0016
Export value of 11 production activities	
1. Agriculture	-0.0016
2. Mining and Quarrying	-0.0020
3. Manufacturing	-0.0007
4. Construction	-0.0029
5. Electricity, Gas, and Water Supply	-0.0014
6. Transport	0.0000
7. Wholesale and Retail Trade	-0.0010
8. Financial Intermediation	0.0000
9. Real Estate	0.0000
10. Public Administration and Defence; Compulsory Social Security	0.0000
11. Service	0.0000

Table 10 (continued**)**

Variable	Scenario 2
	Percentage Change
Import value of 11 production activities	
1. Agriculture	0.0014
2. Mining and Quarrying	0.0011
3. Manufacturing	0.0051
4. Construction	0.0194
5. Electricity, Gas, and Water Supply	0.0040
6. Transport	0.0000
7. Wholesale and Retail Trade	0.0034
8. Financial Intermediation	0.0000
9. Real Estate	0.0000
10. Public Administration and Defence; Compulsory Social Security	0.0000
11. Service	0.0000

Table 11 The sensitivity of impacts of Skilled Labour Flow based upon ASEAN MRAs

Variable	Scenario 2 (Percentage Change)	25% change (Percentage Change)	50% change (Percentage Change)	100% change (Percentage Change)
Gross Domestic Product	0.0021	0.0022	0.0019	0.0030
Household Income	0.0042	0.0048	0.0051	0.0072
Wage	-0.0047	-0.0067	-0.0086	-0.0117
Income Distribution (Gini Coefficient)	-0.0012	-0.0012	-0.0012	-0.0012
Value of 11 production activities				
1. Agriculture	0.0007	0.0009	0.0006	0.0014
2. Mining and Quarrying	-0.0006	-0.0008	-0.0017	-0.0012
3. Manufacturing	-0.0006	-0.0007	-0.0010	-0.0010
4. Construction	0.0171	0.0154	0.0086	0.0174
5. Electricity, Gas and Water Supply	0.0027	0.0032	0.0029	0.0048
6. Transport	0.0025	0.0026	0.0019	0.0035
7. Wholesale and Retail Trade	0.0021	0.0020	0.0010	0.0025
8. Financial Intermediation	0.0017	0.0018	0.0014	0.0026
9. Real Estate	0.0018	0.0020	0.0016	0.0029
10. Public Administration and Defense; Compulsory Social Security	0.0000	0.0000	-0.0004	0.0000
11. Service	0.0016	0.0019	0.0016	0.0029

Table 11 (continued)

Variable	Scenario 2 (Percentage Change)	25% change (Percentage Change)	50% change (Percentage Change)	100% change (Percentage Change)
Export value of 11 production activities				
1. Agriculture	-0.0016	-0.0018	-0.0024	-0.0025
2. Mining and Quarrying	-0.0020	-0.0021	-0.0028	-0.0029
3. Manufacturing	-0.0007	-0.0008	-0.0010	-0.0011
4. Construction	-0.0029	-0.0028	-0.0024	-0.0035
5. Electricity, Gas and Water Supply	-0.0014	-0.0016	-0.0019	-0.0023
6. Transport	0	0.0000	0.0000	0.0000
7. Wholesale and Retail Trade	-0.0010	-0.0011	-0.0013	-0.0015
8. Financial Intermediation	0	0.0000	0.0000	0.0000
9. Real Estate	0	0.0000	0.0000	0.0000
10. Public Administration and Defense; Compulsory Social Security	0	0.0000	0.0000	0.0000
11. Service	0	0.0000	0.0000	0.0000

Table 11 (continued)

Variable	Scenario 2 (Percentage Change)	25% change (Percentage Change)	50% change (Percentage Change)	100% change (Percentage Change)
Import value of 11 production activities				
1. Agriculture	0.0014	0.0016	0.0015	0.0024
2. Mining and Quarrying	0.0011	0.0011	0.0007	0.0014
3. Manufacturing	0.0051	0.0051	0.0037	0.0066
4. Construction	0.0194	0.0175	0.0104	0.0201
5. Electricity, Gas and Water Supply	0.0040	0.0046	0.0045	0.0068
6. Transport	0.0000	0.0000	0.0000	0.0000
7. Wholesale and Retail Trade	0.0034	0.0033	0.0023	0.0042
8. Financial Intermediation	0.0000	0.0000	0.0000	0.0000
9. Real Estate	0.0000	0.0000	0.0000	0.0000
10. Public Administration and Defense; Compulsory Social Security	0.0000	0.0000	0.0000	0.0000
11. Service	0.0000	0.0000	0.0000	0.0000

Table 11 (continued)

Variable	Scenario 2 (Percentage Change)	25% change (Percentage Change)	50% change (Percentage Change)	100% change (Percentage Change)
Gross Domestic Product	0.0021	0.0034	0.0068	0.0396
Household Income	0.0042	0.0088	0.0129	0.0497
Wage	-0.0047	-0.0155	-0.0135	-0.0021
Income Distribution (Gini Coefficient)	-0.0012	-0.0012	-0.0012	-0.0012
Value of 11 production activities				
1. Agriculture	0.0007	0.0017	0.0022	0.0149
2. Mining and Quarrying	-0.0006	-0.0015	-0.0019	0.0142
3. Manufacturing	-0.0006	-0.0011	-0.0019	-0.0021
4. Construction	0.0171	0.0174	0.0563	0.4715
5. Electricity, Gas and Water Supply	0.0027	0.0059	0.0084	0.0439
6. Transport	0.0025	0.0040	0.0078	0.0538
7. Wholesale and Retail Trade	0.0021	0.0027	0.0069	0.0605
8. Financial Intermediation	0.0017	0.0031	0.0053	0.0353
9. Real Estate	0.0018	0.0034	0.0057	0.0374
10. Public Administration and Defense; Compulsory Social Security	0.0000	0.0000	0.0000	0.0095
11. Service	0.0016	0.0036	0.0049	0.0272

Table 11 (continued)

Variable	Scenario 2 (Percentage Change)	25% change (Percentage Change)	50% change (Percentage Change)	100% change (Percentage Change)
Export value of 11 production activities				
1. Agriculture	-0.0016	-0.0030	-0.0052	-0.0111
2. Mining and Quarrying	-0.0020	-0.0034	-0.0061	-0.0125
3. Manufacturing	-0.0007	-0.0013	-0.0022	-0.0042
4. Construction	-0.0029	-0.0037	-0.0095	-0.0590
5. Electricity, Gas and Water Supply	-0.0014	-0.0027	-0.0044	-0.0131
6. Transport	0	0.0000	0.0000	0.0000
7. Wholesale and Retail Trade	-0.0010	-0.0017	-0.0032	-0.0106
8. Financial Intermediation	0	0.0000	0.0000	0.0000
9. Real Estate	0	0.0000	0.0000	0.0000
10. Public Administration and Defense; Compulsory Social Security	0	0.0000	0.0000	0.0000
11. Service	0	0.0000	0.0000	0.0000

Table 11 (continued)

Variable	Scenario 2 (Percentage Change)	25% change (Percentage Change)	50% change (Percentage Change)	100% change (Percentage Change)
Import value of 11 production activities				
1. Agriculture	0.0014	0.0029	0.0043	0.0199
2. Mining and Quarrying	0.0011	0.0015	0.0036	0.0292
3. Manufacturing	0.0051	0.0073	0.0165	0.1177
4. Construction	0.0194	0.0203	0.0637	0.5180
5. Electricity, Gas and Water Supply	0.0040	0.0083	0.0123	0.0563
6. Transport	0.0000	0.0000	0.0000	0.0000
7. Wholesale and Retail Trade	0.0034	0.0046	0.0110	0.0799
8. Financial Intermediation	0.0000	0.0000	0.0000	0.0000
9. Real Estate	0.0000	0.0000	0.0000	0.0000
10. Public Administration and Defense; Compulsory Social Security	0.0000	0.0000	0.0000	0.0000
11. Service	0.0000	0.0000	0.0000	0.0000

Examination of the Computable General Equilibrium Model

The Computable General Equilibrium model is incapable of testing reliability via statistical values, yet analysis for the general equilibrium with emphasis on the measurement of variables, change in terms of economics from the implementation of policies is a crucial point; thus, one can apply the examination reliability of the general equilibrium model by analysing its sensitivity.

Sensitivity analysis of the general balance affects the changes of elasticity values, which are of importance in this particular study. There would be changes to elasticity values in the compensation between capital and the workers (σ_{QF}). The objective of the study is to analyse the impact of workers to the different economic variables. As such, the elasticity value of the compensation between capital and workers becomes the main variable affecting the study.

In Table 12, an increase in the number of workers appears in simulations 1, 2, and 3 and is compared to a 50% increase in the original elasticity value; from 1.10 to 1.65. The elasticity value of the compensation between capital and workers from the 10 branches of production operations remains the same, with the exception of agriculture, which possesses different elasticity compared to other types of production operation. This means that a simultaneous change may lead to a false conclusion. Workers can pay back more capital. When there are more workers, this affects the economic variables as follows: the overall number of domestic products will increase, household income will increase, workers' wages will decrease, the Gini Coefficient will increase, and the production value of the 11 branches will increase Exports will increase as well as imports; the exception is in simulation 3, where importation will decrease. The study concludes that different changes in the elasticity values will give results of similar sizes in the same direction. This demonstrates that the designation of elasticity values in the compensation between capital and workers affects the size of change obtained from the study, illustrating the reliability of the simulation.

Information on the basic income of people formed a chain reaction in 2011, and unmodified by the Committee of Economic and Social Development National Office was tested with the CGE simulation in 2010. It was built upon the original formulae. From Table 12, case 1, scenario 1, the overall amount of GDP in 2010 changed by 0.2089%; in 2011, it changed by 0.00429%; in case 1, scenario 2, the overall amount of GDP in 2010 changed by 1.6102%; in 2011, the change was 1.1060%; In scenario 2, the overall amount of GDP in 2010 changed by 0.0021; whereas in 2011, it changes by 0.0061. Scenario 2 appears to have the same direction of changes concerning the overall amount of GDP; though the change is larger than that of 2010 B.E, except in scenario 1.

Comparison of economic impacts caused by the change in elasticity values in the compensation of workers and capital (σ_{QF}).

Table 12 The comparisons of economic impacts caused by the change in elasticity values from the compensations of workers and capitals (σ_{QF}).

Variable	Scenario 1				Scenario 2	
	Case 1		Case 2			
	σ_{QF}	$1.5\sigma_{QF}$	σ_{QF}	$1.5\sigma_{QF}$	σ_{QF}	$1.5\sigma_{QF}$
Gross Domestic Product (Millions of Baht)	0.1123	0.4254	0.1914	1.6374	0.0021	0.0023
Household Income (Millions of Baht)	0.2349	0.5101	0.4397	1.7497	0.0042	0.0047
Wage	-4.0169	-1.9834	-8.0112	-5.0313	-0.0047	-0.0037
Income Distribution (Gini Coefficient)	0.5346	0.5346	1.2476	1.2476	-0.0012	-0.0012
Value of 11 production activities (Millions of Baht)						
1. Agriculture	0.1246	0.2455	0.2817	0.8034	0.0007	0.0008
2. Mining and Quarrying	0.1312	0.3446	0.3121	1.2080	-0.0006	-0.0007
3. Manufacturing	0.0537	0.0694	0.1706	0.1912	-0.0006	-0.0007
4. Construction	0.7043	4.9301	0.5812	20.2283	0.0171	0.0183
5. Electricity, Gas and Water Supply	0.2676	0.5853	0.5497	1.9804	0.0027	0.0031
6. Transport	0.1939	0.6427	0.3481	2.4035	0.0025	0.0027
7. Wholesale and Retail Trade	0.1764	0.7301	0.2914	2.8251	0.0021	0.0024
8. Financial Intermediation	0.1730	0.4622	0.3475	1.6534	0.0017	0.0019
9. Real Estate	0.1725	0.4759	0.3371	1.7141	0.0018	0.0021
10. Public Administration and Defense; Compulsory Social Security	0.0777	0.1909	0.1724	0.6533	0.0000	0.0000
11. Service	0.1788	0.3828	0.3683	1.2794	0.0016	0.0019

Table 12 (Continued)

Variable	Scenario 1				Scenario 2	
	Case 1		Case 2			
	σ_{QF}	$1.5\sigma_{QF}$	σ_{QF}	$1.5\sigma_{QF}$	σ_{QF}	$1.5\sigma_{QF}$
Export value of 11 production activities (Millions of Baht)						
1. Agriculture	0.0457	0.0426	0.1402	0.0509	0.0007	-0.0018
2. Mining and Quarrying	0.0651	0.0718	0.1931	0.1305	-0.0006	-0.0021
3. Manufacturing	0.0487	0.0467	0.1623	0.1019	-0.0006	-0.0008
4. Construction	0.1211	-0.2083	0.4124	-1.0397	0.0171	-0.0025
5. Electricity, Gas and Water Supply	-0.0158	-0.0300	-0.0042	-0.1500	0.0027	-0.0014
6. Transport	0.0000	0.0000	0.0000	0.0000	0.0025	0.0000
7. Wholesale and Retail Trade	0.0268	-0.0030	0.0912	-0.0852	0.0021	-0.0010
8. Financial Intermediation	0.0000	0.0000	0.0000	0.0000	0.0017	0.0000
9. Real Estate	0.0000	0.0000	0.0000	0.0000	0.0018	0.0000
10. Public Administration and Defense; Compulsory Social Security	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11. Service	0.0000	0.0000	0.0000	0.0000	0.0016	0.0000

Table 12 (Continued)

Variable	Scenario 1				Scenario 2	
	Case 1		Case 2			
	σ_{QF}	$1.5\sigma_{QF}$	σ_{QF}	$1.5\sigma_{QF}$	σ_{QF}	$1.5\sigma_{QF}$
Import value of 11 production activities (Millions of Baht)						
1. Agriculture	0.1140	0.2426	0.2437	0.8276	0.0007	0.0016
2. Mining and Quarrying	0.0963	0.3478	0.1920	1.3350	-0.0006	0.0012
3. Manufacturing	0.2963	1.2932	0.5074	5.0535	-0.0006	0.0056
4. Construction	0.6151	5.1139	0.2718	21.2562	0.0171	0.0203
5. Electricity, Gas and Water Supply	0.2921	0.6353	0.5776	2.1903	0.0027	0.0044
6. Transport	0.0000	0.0000	0.0000	0.0000	0.0025	0.0000
7. Wholesale and Retail Trade	0.1802	0.8498	0.2549	3.3578	0.0021	0.0037
8. Financial Intermediation	0.0000	0.0000	0.0000	0.0000	0.0017	0.0000
9. Real Estate	0.0000	0.0000	0.0000	0.0000	0.0018	0.0000
10. Public Administration and Defense; Compulsory Social Security	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11. Service	0.0000	0.0000	0.0000	0.0000	0.0016	0.0000

Table 13 The comparisons of economic impacts used data in 2010 and 2011

Variable	Scenario 1				Scenario 2	
	Case 1		Case 2			
	2010	2011	2010	2011	2010	2011
Gross Domestic Product (Millions of Baht)	0.1123	0.2035	0.1914	0.3432	0.0021	0.0004
Household Income (Millions of Baht)	0.2349	0.3012	0.4397	0.5940	0.0042	0.0023
Wage	-4.0169	1.6958	-8.0112	3.7486	-0.0047	-0.0068
Income Distribution (Gini Coefficient)	0.5346	0.5346	1.2476	1.2476	-0.0012	-0.0012
Value of 11 production activities (Millions of Baht)						
1. Agriculture	0.1246	0.1816	0.2817	0.3315	0.0007	0.0005
2. Mining and Quarrying	0.1312	0.2678	0.3121	0.4225	-0.0006	-0.0005
3. Manufacturing	0.0537	0.0808	0.1706	0.1426	-0.0006	-0.0002
4. Construction	0.7043	1.6957	0.5812	2.3696	0.0171	-0.0043
5. Electricity, Gas and Water Supply	0.2676	0.3972	0.5497	0.7298	0.0027	0.0016
6. Transport	0.1939	0.3485	0.3481	0.5804	0.0025	0.0005
7. Wholesale and Retail Trade	0.1764	0.3667	0.2914	0.5701	0.0021	-0.0002
8. Financial Intermediation	0.1730	0.2879	0.3475	0.4990	0.0017	0.0006
9. Real Estate	0.1725	0.2871	0.3371	0.4972	0.0018	0.0007
10. Public Administration and Defense; Compulsory Social Security	0.0777	0.1304	0.1724	0.2139	0.0000	0.0000
11. Service	0.1788	0.2596	0.3683	0.4741	0.0016	0.0011

Table 13 (Continued)

Variable	Scenario 1				Scenario 2	
	Case 1		Case 2			
	2553	2554	2553	2554	2553	2554
Export value of 11 production activities (Millions of Baht)						
1. Agriculture	0.0457	0.0841	0.1402	0.1306	0.0007	0.0005
2. Mining and Quarrying	0.0651	0.1399	0.1931	0.2162	-0.0006	-0.0005
3. Manufacturing	0.0487	0.0768	0.1623	0.1364	-0.0006	-0.0002
4. Construction	0.1211	0.0493	0.4124	0.1997	0.0171	-0.0043
5. Electricity, Gas and Water Supply	-0.0158	-0.0174	-0.0042	-0.0501	0.0027	0.0016
6. Transport	0.0000	0.0000	0.0000	0.0000	0.0025	0.0005
7. Wholesale and Retail Trade	0.0268	0.0313	0.0912	0.0622	0.0021	-0.0002
8. Financial Intermediation	0.0000	0.0000	0.0000	0.0000	0.0017	0.0006
9. Real Estate	0.0000	0.0000	0.0000	0.0000	0.0018	0.0007
10. Public Administration and Defense; Compulsory Social Security	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11. Service	0.0000	0.0000	0.0000	0.0000	0.0016	0.0011

Table 13 (Continued)

Variable	Scenario 1				Scenario 2	
	Case 1		Case 2			
	2553	2554	2553	2554	2553	2554
Import value of 11 production activities (Millions of Baht)						
1. Agriculture	0.1140	0.1600	0.2437	0.3008	0.0007	0.0005
2. Mining and Quarrying	0.0963	0.1932	0.1920	0.3092	-0.0006	-0.0005
3. Manufacturing	0.2963	0.5408	0.5074	0.8482	-0.0006	-0.0002
4. Construction	0.6151	1.6634	0.2718	2.2235	0.0171	-0.0043
5. Electricity, Gas and Water Supply	0.2921	0.4312	0.5776	0.8070	0.0027	0.0016
6. Transport	0.0000	0.0000	0.0000	0.0000	0.0025	0.0005
7. Wholesale and Retail Trade	0.1802	0.4039	0.2549	0.6153	0.0021	-0.0002
8. Financial Intermediation	0.0000	0.0000	0.0000	0.0000	0.0017	0.0006
9. Real Estate	0.0000	0.0000	0.0000	0.0000	0.0018	0.0007
10. Public Administration and Defense; Compulsory Social Security	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11. Service	0.0000	0.0000	0.0000	0.0000	0.0016	0.0011

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study contain two objectives, firstly the determinants of intra-ASEAN labour migration to Thailand and secondly the impacts of ASEAN labour migration to Thailand upon the Thai economy. The first objective is to analyse the factors determining labour migration within the ASEAN member states, particularly into Thailand during the period 2002–2010. There are two main points on which this study differs from others. Firstly Hatton's (1995) time series model of migration determinants is extended by taking into consideration the immigration policies of the destination country. Secondly, a model of net migration rates from countries in the ASEAN to Thailand is used to estimate the number of worker migrants by employing 81 observations via the panel data with the fixed effect model. The results obviously show that there are three factors which are statistically significant at the 1% level. They are the per capita GDP ratio of Thailand to ASEAN countries, migration stock, and migration worker policy. All of them have a positive relationship with the net migration rate from countries in the ASEAN to Thailand. These results coincide with the hypotheses.

For the second objective, which aims at analysing the impacts of ASEAN labour migration on the Thai economy. A CGE model is employed to analyse the impacts of ASEAN labour migration upon the Thai economy as a whole. The investigated six economic impacts are those of GDP, household income, income distribution measured using the GINI coefficient, wages, imports, and exports**.** The findings reveal two cases in scenario 1, based on the establishment of a policy concerning hiring newly-registered migrant workers and registered unskilled migrant workers from Myanmar, Laos, and Cambodia; resulted in an increase the GDP,

household income, imports, and exports but decreased unskilled worker wages and reduced equality in income distribution. All of these impact sizes depend upon the numbers of unskilled migrants. For scenario 2, assuming the free flow of eight professions, based upon ASEAN MRAs, is expected to increase the number of skilled workers, which consequently results in an increase in GDP, household income, exports, and more equal income distribution but decrease in skilled worker wages and imports.

Recommendations

Policy Suggestions

For an analysis of the determination of intra-ASEAN labour migration to Thailand, we find one variable can explain the net migration rate to Thailand that is the migration worker policy. Thailand has a policy of open registration for new immigrant workers and the renewal of old immigrant workers but this is only applicable to workers from Myanmar, Lao PDR, and Cambodia. It appears that there were only two years; 2004 and 2009 when there was a rather significant increase in the number of immigrant workers. It is anticipated that there will be a rising number of ASEAN migrant workers to Thailand, searching for employment opportunities and human security. This is because the ASEAN will become the ASEAN Economic Community (AEC) in 2015, and a mutual recognition agreement (MRA) exists to monitor qualifications and standards of professionals for intra-ASEAN skilled labour mobility. Therefore, foreign worker policy implications for the Thai government should have more coherent.

For the findings of the impact of ASEAN labour migration to Thailand on the Thai economy. These can be separated into two important parts: the impacts caused by unskilled workers whose number has increased since the implementation of an open registration for new immigrant workers including the renewal of registration for current immigrant workers — especially workers from Myanmar, Lao PDR, and Cambodia, and by the free movement of skilled labour in eight branches of the service

sector. The similar results of the two cases are the increases in GDP, household income, imports, and exports. In summary, policies which increase the number of both unskilled and skilled workers in Thailand are likely to benefit the Thai economy. Therefore, it is essential to emphasise the implementation of more coherent policies: however, the impacts of skilled labour movement in eight professions are rather limited in the short-term. This is because the ASEAN member states continue to have their own work permit regulations. Nevertheless, the simulated economic benefit from professional movement in this study should lead to dramatic concerns regarding ASEAN skilled labour movement. More collaboration of common labour standards and development might cause the free flow of skilled labour between ASEAN member states to become more effective and, eventually, fulfill the main aims and purposes of the AEC.

Suggestions for Further Study

This study is restricted due to the limitation of data, which uses only time series data for nine years, and cross-sectional data of only nine countries. When complete data is available and more frequently changes in migration worker policy in Thailand, further study is, therefore, recommended for obvious determinants and impact of ASEAN labour migration into Thailand.

In addition, the limitation of this study is a determined arbitrary rate of 23.28 percent increase in net migration of skilled workers under the MRAs agreement in scenario 2, without reasonable ASEAN-related supports. Since the past of the net migration of such workers is very low. However, this study aims to quantitatively describe the expected effects of skilled workers net migration upon Thai economy, rather than to qualitatively describe which has generally been presented. This determined rate of net migration of skilled workers could be used as a baseline for further estimation, if there are reasonable ASEAN-related supports, the results will be more reliable and complete.

The analysis via a Computable General Equilibrium model should also expand its scope to connect countries. This is because the migration of workers between countries has inter-connecting impacts from the home countries to the host countries, as well as other trading partners. The multi-country CGE model is able to analyse the gains and losses from the movement of labour in each country, and among all countries concerned.

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APPENDICES

Appendix A

Dataset for analysis of the determinant of intra-ASEAN labour migration to Thailand

Appendix Table 1 Net migration rate from ASEAN country to Thailand per 10,000 inhabitants

Net migration rate	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Singapore	-47.9	-34.63	-24.88	-60.76	-23.72	-30.25	-31.1	-26.12	-24.83	-22.04
Malaysia	-0.32	-5.44	-1.7	-7.18	-0.94	-0.25	-0.1	0.1	-0.58	-0.49
Brunei Darussalam	-257.43	-209.46	-162.86	-360.59	-143.64	-138.83	-83.26	-87.06	-98.38	-93.38
Indonesia	0	0	0.01	0	0.01	0.02	0.02	0.03	0	-0.01
Lao People's Democratic Republic	109.58	59.07	34.04	181.62	154.07	88.15	35.42	19.76	262.42	167.98
Vietnam	0	-0.04	-0.08	-0.25	-0.07	-0.13	-0.03	-0.05	-0.03	-0.02
Myanmar	99.55	74.73	54.29	137.79	116.79	123.91	108.18	103.11	227.57	196.84
Cambodia	45.44	28.58	15.05	83.69	56.72	35.54	18.94	8.71	128.2	86.68
Philippines	0.15	0.26	0.32	0.37	0.52	0.65	0.78	0.95	0.72	0.74

Source: Thailand Overseas Employment Admission and Office of workers administration, Department of Employment, Ministry of Labour, own calculations.

Appendix Table 2 GDP per capita (constant 1995 international $) based on purchasing power parity (PPP)

GDP (PPP)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Brunei Darussalam	44,415.10	45,335.02	46,896.56	47,126.42	47,465.34	49,430.82	50,028.89	49,139.39	47,796.52	48,621.41
Cambodia	987.723	1,052.19	1,146.25	1,270.19	1,456.70	1,626.35	1,823.75	1,956.42	1,946.27	2,065.37
Indonesia	2,538.04	2,657.28	2,802.89	2,978.67	3,185.05	3,420.06	3,689.97	3,942.41	4,109.82	4,352.61
Lao People's Democratic Republic	1,239.20	1,323.12	1,411.89	1,525.68	1,647.39	1,815.83	1,979.00	2,140.66	2,285.09	2,449.25
Malaysia	9,139.92	9,505.86	10,027.16	10,717.86	11,379.96	12,270.45	13,269.38	14,032.76	13,771.43	14,744.34
Myanmar	522.339	571.49	651.06	739.58	859.211	983.193	1,110.71	1,153.03	1,200.99	1,254.52
Philippines	2,510.48	2,592.35	2,720.06	2,904.91	3,061.02	3,260.21	3,506.63	3,659.41	3,671.53	3,920.28
Singapore	32,313.69	34,725.59	36,617.96	40,330.02	43,975.70	47,360.74	50,301.97	50,738.46	49,880.44	56,708.21
Thailand	5,195.07	5,516.44	6,007.29	6,668.60	7,132.49	7,691.06	8,286.15	8,638.56	8,506.67	9,222.39
Vietnam	1,535.75	1,649.28	1,781.40	1,949.43	2,142.72	2,364.11	2,607.46	2,799.90	2,944.72	3,142.97

Source: World Bank

Appendix Table 3 Unemployment, total (% of total labour force)

Unemployment rate	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Brunei Darussalam	7.20	3.46	4.47	3.5	4.1	4	3.4	3.7	3.5	2.7
Cambodia	1.8	3.57*	3.57*	7.3	3.57*	3.57*	3.57*	1.68	3.57*	3.57*
Indonesia	8.1	9.1	9.5	9.86	11.24	10.28	9.11	8.39	7.87	7.14
Lao People's Democratic Republic	2.45*	2.45*	2.45*	2.4	2.45*	2.45*	2.45*	2.45*	2.5	2.45*
Malaysia	3.53	3.48	3.61	3.54	3.53	3.33	3.2	3.3	3.7	3.4
Myanmar	4.01	4.02	4.02	4.02	4.02	4.02	4.02	4.02	4.02	4.02
Philippines	11.13	11.4	11.4	11.83	11.35	7.95	7.33	7.4	7.48	7.33
Singapore	2.65	3.55	3.95	3.35	3.13	2.65	2.13	2.23	3.03	2.18
Thailand	3.34	2.41	2.17	2.08	1.85	1.52	1.38	1.39	1.5	1.04
Vietnam	6.28	6.01	5.78	5.6	5.31	4.82	4.64	4.65	4.6	4.29

Note: * own calculation

Source: World Bank: International Labour Organization

Appendix Table 4 Stock of foreigners from country i in Thailand (person)

Stock of foreigners	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Singapore	589	893	1,101	1,375	1,662	1,799	1,999	2,294	1,617	1,530
Malaysia	754	1,279	1,604	2,102	2,463	2,743	3,156	3,749	2,251	2,230
Brunei Darussalam	0	0	0	0	0	0	0	0	0	0
Indonesia	162	298	333	428	581	693	845	1,069	586	606
Lao People's Democratic Republic	59,358	32,492	21,314	105,259	90,073	51,960	22,965	13,670	161,127	106,125
Vietnam	314	390	367	408	458	583	609	727	293	312
Myanmar	451,446	340,993	248,971	635,046	541,108	577,542	507,594	487,286	1,083,498	944,296
Cambodia	57,556	36,818	19,675	110,601	75,804	48,362	26,096	12,094	179,248	122,607
Philippines	1,400	2,337	2,819	3,500	4,703	5,900	7,091	8,740	6,778	7,007

Source: Office of workers administration, Department of Employment, Ministry of Labour

Appendix Table 5 Total population (person)

Population	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Myanmar	45,323,903	45,609,292	45,843,675	46,070,248	46,321,162	46,605,278	46,915,826	47,250,315	47,601,374	47,963,012
Cambodia	12,653,684	12,845,222	13,024,171	13,193,961	13,357,574	13,515,884	13,669,857	13,822,644	13,977,903	14,138,255
Lao People's Democratic Republic	5,408,912	5,496,700	5,582,028	5,667,055	5,753,341	5,841,572	5,931,385	6,022,001	6,112,143	6,200,894
Philippines	78,964,389	80,630,416	82,293,990	83,936,698	85,546,427	87,116,275	88,652,631	90,173,139	91,703,090	93,260,798
Malaysia	45,323,903	24,515,323	25,060,184	25,590,453	26,100,241	26,586,287	27,051,142	27,502,008	27,949,395	28,401,017
Singapore	4,138,000	4,176,000	4,114,800	4,166,700	4,265,800	4,401,400	4,588,600	4,839,400	4,987,600	5,076,700
Indonesia	216,203,499	219,026,365	221,839,235	224,606,531	227,303,175	229,918,547	232,461,746	234,951,154	237,414,495	239,870,937
Vietnam	78,621,000	24,515,323	25,060,184	25,590,453	26,100,241	26,586,287	84,221,100	85,122,300	86,025,000	86,927,700
Brunei Darussalam	334,348	341,585	348,771	355,943	363,123	370,317	377,513	384,695	391,837	398,920
Thailand	60,933,752	64,642,931	65,370,277	66,060,383	66,698,483	67,276,383	67,796,451	68,267,982	68,706,122	69,122,234

Source: World Bank.

Appendix Table 6 Numbers of Thai labourers emigrated within ASEAN countries in 2005-2011 (person)

Population	2005	2006	2007	2008	2009	2010	2011
Myanmar	105	71	54	75	226	208	140
Cambodia	40	327	206	52	50	56	65
Lao People's Democratic Republic	1,429	466	1,956	1,773	734	1,965	842
Philippines	258	256	156	187	145	146	135
Malaysia	4,915	3,416	3,432	3,476	3,882	3,630	4,321
Singapore	11,780	15,115	16,271	14,934	14,002	12,719	11,461
Indonesia	309	242	313	349	506	856	1,462
Vietnam	629	923	820	1,126	538	499	795
Brunei Darussalam	5,216	5,141	3,143	3,349	3,855	3,725	3,354

Source: Thailand Overseas Employment Admission, Department of Employment, Ministry of Labour (2005-2011)

Appendix Table 7 Distance between country i to Thailand (kilometers)

Country	Distance
Myanmar	855.54
Cambodia	566.26
Lao People's Democratic Republic	470.89
Philippines	2,261.84
Malaysia	2,261.84
Singapore	1,643.73
Indonesia	2,333.85
Vietnam	807.95
Brunei Darussalam	1,959.36

Distance between countries: distance between capitals in km.

Source: MapInfo, distancefromto's calculations.

Appendix B

Data set, abbreviation, and notation for an analyzing of the impacts of ASEAN labour migration to Thailand upon the Thai economy

Appendix Table 8 Abridged Mathematical CGE model

Equation		number
(1a)	$QINTA_i = INTA_i * QA_i$	11
(2a)	$QVA_i = IVA_i * QA_i$	11
(3a)	$QVA_i = A_{ces\,i}(\sum \alpha_{fi}\ QF_{fi}^{-\rho\,ces\,i})^{-1/\rho\,ces\,i}$	11
(4a)	$WF_i * WFDIST_{fi} = PVA_i * QVA_i\,(\sum \alpha_{fi} * QF_{fi}^{-\rho\,ces\,i})^{-1} * \alpha_{fi} * QF_{fi}^{-\rho\,ces\,i-1}$	33
(5a)	$QINT_{ij} = A_{ij} * QINTA_i$	121
(6a)	$QA_i = A_{cet\,i}(\alpha_{cet\,i}\ QD_i^{-\rho\,cet\,i} + (1-\alpha_{cet\,i})\ QE_i^{-\rho\,cet\,i})^{1/\rho\,cet\,i}$	11
(7a)	$QD_i = \frac{\alpha_{cet\,i}^{1/(1-\rho\,cet\,i)} PD^{1/(\rho\,cet-1)} \cdot QA_i}{A_{cet\,i}(\alpha_{cet\,i}^{1/(1-\rho\,cet\,i)} PD_i^{\rho\,cet\,i/(1-\rho\,cet\,i)} + (1-\alpha_{cet\,i})^{1/(1-\rho\,cet\,i)} PD_i^{\rho\,cet\,i/(1-\rho\,cet\,i)})}$	11
(8a)	$QE_i = \frac{\alpha_{cet\,i}^{1/(1-\rho\,cet\,i)} PE_i^{1/(\rho\,cet\,i-1)} QA_i}{A_{cet\,i}(\alpha_{cet\,i}^{1/(1-\rho\,cet\,i)} PD_i^{\rho\,cet\,i/(1-\rho\,cet\,i)} + (1-\alpha_{cet\,i})^{1/(1-\rho\,cet\,i)} PE_i^{\rho\,cet\,i/(1-\rho\,cet\,i)})}$	11
(9a)	$QX_i = A_{am\,i}(\alpha_{am\,i}\ QAD_i^{-\rho\,am\,i} + (1-\alpha_{am\,i})\ QM_i^{-\rho\,am\,i})^{-1/\rho\,am\,i}$	11
(10a)	$QD_i = \frac{\alpha_{am\,i}^{-1/(1-\rho\,am\,i)} PD_{it}^{1/(\rho\,am\,i)} QX_I}{A_{am\,i}(\alpha_{am\,i}^{-1/(1-\rho\,am\,i)} PD_i^{\rho i/(1-\rho\,am\,i)} + (1-\alpha_{am\,i})^{-1/(1-\rho\,am\,i)} PM_i^{\rho\,am\,i/(1-\rho\,am\,i)})}$	11
(11a)	$QM_i = \frac{\alpha_{am\,i}^{-1/(1-\rho\,am\,i)} PM_{it}^{1/(\rho\,am\,i)} QX_I}{A_{am\,i}(\alpha_{am\,i}^{-1/(1-\rho\,am\,i)} PD_i^{\rho i/(1-\rho\,am\,i)} + (1-\alpha_{am\,i})^{-1/(1-\rho\,am\,i)} PM_i^{\rho\,am\,i/(1-\rho\,am\,i)})}$	11
(12a)	$YF_f = \sum WF_{fi} \bullet QF_{fi}$	3
(13a)	$YIF_{hf} = \theta_{hf} * YF_f$	30
(14a)	$BI_{bf} = \theta_{bf} * YF_f$	3
(15a)	$YI_h = \sum YIF_{hf} + Tr_{Gh} * CPI + Tr_{Fh} * EXR$	10
(16a)	$BI = \sum BI_{bf} + Tr_{Fb} * EXR$	1
(17a)	$GI = \sum Tin * YI + \sum QA_i * Ta_i + \sum QVA_i * Rva_i + \sum QM_i * Tm_i + \sum QE_t * Te_i$	1
(18a)	$U_h = \sum \beta i\ In(CHQC_{hi} - CHQC_{li})$	10
(19a)	$CHQC_{hi} = CHQCL_{hi} + \frac{\beta}{PC_i} * (BH_h - \sum PC_i * CHQCL_{hi})$	110
(20a)	$QINV_i = \theta inv_i * \overline{QINV_I}$	11
(21a)	$EG = \sum PC_i * QC_i + Tr_{Gh} * CPI$	1
(22a)	$OG_i = \overline{OG_i}$	11
(23a)	$PM_i = pwm_i(1-T_{mi}) * EXR$	11
(24a)	$PE_i = pwe_i(1-T_{ei}) * EXR$	11
(25a)	$PC_i = (PD_i * QD_i + PE_i * QE_i)/(QD_i - QE_i)$	11
(26a)	$PD_i = PA_i(1-T_{ai})$	11
(27a)	$PVA_i = PA_i - PQINT_i$	11
(28a)	$PQINT_i = \sum PC_i * A_{ij}$	11
(29a)	$CPI = \Sigma\ PC_i * cwts_i$	1
(30a)	$\sum QF_{fi} = \overline{TQF_f}$	33
(31a)	$QC_i = PQINT_i + \sum CHQCA_{hi} + GCQC_i + BINV_i + GINV_i$	11
(32a)	$\sum PM \bullet QM_i = \sum PE \bullet QE_i + FS$	1
(33a)	$GI = EG + GS$	1
(34a)	$\sum MPS \bullet (YI_h \bullet (1 + Tins_h)) + GS + BS + FS \bullet EXR = \sum QINV_i \bullet PC_i$	1

Definitions of Model Parameters/variables

Endogenous Variables

QA_i	quantity (level) of activity
QVA_i	quantity of (aggregate) value-added
$QINTA_i$	quantity of aggregate intermediate input
$QINT_{ij}$	quantity of intermediate input j to activity i
QF_{fi}	quantity demand of primary input f from activity i
QD_i	quantity sold domestically of domestic output
QE_i	quantity export commodity
QM_{it}	quantity import commodity
$CHQC_{hi}$	minimum quantity consumed of commodity i by household h
$CHQC_{hi}$	quantity consumed of commodity i by household h
BH_h	personal income minus personal taxes and savings
$QINV_i$	quantity of investment demand for commodity
QG_i	government consumption demand for commodity
GI	government income

Exogeneous Variable

TQF_f	quantity supply of primary input f
PVA_i	value-added price
PC_i	average price for sold domestically
PDi	price for commodity produced and sold domestically
PEi	export price
PM_i	import price
YF_f	income of primary input f
YIF_{hf}	income to households from primary input f
BI_{hf}	income to business from primary input f
YI_h	income of households h
BI	income to business
GI	government income

EG	government expenditure
EXR	exchange rate (local currency unit per foreign currency unit)
WF_f	average price of primary input
$GCQC_i$	quantity of government consumed of comodity i
$BINV_i$	quantity of private investment of commodity i
$GINV_i$	quantity of government investment of commodity i
$\overline{QINV_i}$	initial quantitative of investment demand for commodity i
$\overline{QG_i}$	initial government consumption demand for commodity i
pwm_i	import price of commodity i (foreign currency)
pwe_i	export price of commodity i (foreign currency)
MPS_h	marginal propensity to save for household h
$WFDIST_{fi}$	wage distortion factor for factor f in commodity i
CPI	consumer price index
T_{ins}	direct tax of institution ins
$T_{ins\ h}$	direct tax of household h
T_{vai}	value-added tax of commodity i
T_{mi}	import tariff of commodity i
T_{ei}	export tariff of commodity i
Tr_{Fb}	transfer from foreign to business
Tr_{gh}	transfer from government to households h
Tf_{Fh}	transfer from foreign to households h
Ta_i	indirect tax of commodity i

Parameters

α_{fi}	share parameter for CES activity production function of activity i
$-\rho_{ces\ i}$	CES activity production function exponent
$A_{ces\ i}$	shift parameter for CES activity production function of activity i
β_{hi}	marginal share of consumption spending on marketed commodity i for household h
A_{ij}	input output coefficient
$-\rho_{cet\ i}$	CET function exponent

$-\rho_{am\ i}$	armington function exponent
$\alpha_{cet\ i}$	share parameter for CET function
$A_{cet\ i}$	shift parameter for CET function
$\alpha_{am\ i}$	share parameter for Armington function
$A_{am\ i}$	shift parameter for Armington function
Θ_{hf}	proportion of income from primary input f to household h
Θ_{bf}	proportion of income from primary input f to business b
$INTA_i$	quantity of aggregate intermediate input per activity unit
IVA_i	quantity of value-added per activity unit
$cwts_i$	Weight of commodity i in the CPI

Analysis of the Initial Equilibrium Point

This study analyses the search for an unknown parameter value in the construction equation, in order to arrive at the initial equilibrium point.

Assumptions:

- The product market and production factors involve a completely competitive market;
- The production function is a constant return to scale;
- The labour numbers were set externally.

I. The construction of Social Accounting Matrix in 2553 B.E.

Since the most recent database available is the input-output table in 2005, in order to obtain an appropriate analysis, there must be a database adjustment. The SAM table in 2010 had adjustments as follows:

A. Adjusting the input-output table by using the one from 2005 to adjust the correlation between activities to become the input-output table of 2010. This was achieved using additional information from the National Account in 2010, and the Economic and Social Survey conducted by the National Statistical Office, then

adjusting the income and expenses for equality using RAS. RAS is a method using the Iterative adjustment procedure. The details are as follows:

Step 1:

$$a_i^1 = \frac{\hat{x}_i}{\sum_j x_{ij}^0} \Rightarrow x_{ij}^1 = a_i^1 x_{ij}^0 \Rightarrow b_j^1 = \frac{\hat{x}_j}{\sum_i x_{ij}^1} \Rightarrow x_{ij}^2 = b_i^1 x_{ij}^1$$

Step 2:

$$a_i^2 = \frac{\hat{x}_i}{\sum_j x_{ij}^2} \Rightarrow x_{ij}^3 = a_i^2 x_{ij}^2 \Rightarrow b_j^2 = \frac{\hat{x}_j}{\sum_i x_{ij}^3} \Rightarrow x_{ij}^4 = b_i^2 x_{ij}^3$$

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Step t:

$$a_i^t = \frac{\hat{x}_i}{\sum_j x_{ij}^{2t-1}} \Rightarrow x_{ij}^{2t-1} = a_i^t x_{ij}^{2t-2} \Rightarrow b_j^t = \frac{\hat{x}_j}{\sum_i x_{ij}^1} \Rightarrow x_{ij}^{2t} = b_i^t x_{ij}^{2t-1}$$

B. Expanding the input-output table to a SAM table in 2010. By applying the data on the distribution of production factors to the household sector, household consumption from the economic and social survey, as well as national income from the National Economic and Social Advisory Council (NESAC), and using the RAS method to readjust once again.

II. The calculation of parameter value

The data crucial to the construction of the model involves various parameter values in the Computable General Equilibrium model. As concluded in Appendix Table 10, and categorised into two major groups.

A. The equation group with the behaviour of economic activities. There are three equations in the function group possessing the behaviour of an economic unit: supply function, inter-trade function, and demand. Calculations for the parameter value of each function can achieved as follows:

1. Supply equation

$$QVA_i = A_{ces\ i} (\sum \alpha_{fi} QF_{fi}^{-\rho_{ces}})^{-1/\rho_{ces\ i}}$$

Where

QF_{fi} Quantity demand of primary input f from activity i

$-\rho_{ces\ i}$ CES activity production function exponent of activity i

α_{fi} Share parameter for CES activity production function of activity i

$A_{ces\ i}$ Shift parameter for CES activity production function of activity

The CES activity production function exponent can be obtained from elasticity of substitution $\rho^{ces} = (1 - \rho^{ces})/\rho^{ces}$ using a secoundary source according to Table 9

Appendix Table 9 Elasticity in the model

Equation	Elasticity	Parameter	Sources
Production	Elasticity of substitution	0.28–1.20	Office of the National Economic and Social Development Board
Import	Elasticity of substitution	0.50–2.80	The Office of Industrial Economics
Export	Elasticity of substitution	-2.00–1.20	The Office of Industrial Economics
Consumption	Income Elasticity	0.80–2.36	Thailand Development Research Institute
	Frisch parameter	4.00–4.50	Office of the national Economic and Social Development Board

Source: Phuwanich (2008)

Some supply equation operations use three fundamental factors.

$$\text{Min C} = W_{si} \bullet L_{si} + W_{ui} \bullet L_{ui} + R_i \bullet K_i$$

$$\text{St QA}_i = A_i(\alpha_{lsi} L_{si}^{-\rho_{ces\,i}} + \alpha_{lui} L_{ui}^{-\rho_{ces\,i}} + \alpha_{ki} K_i^{-\rho_{ces\,i}})^{-1/\rho_{ces\,i}}$$

where

L_{si}	Quantity of skilled labour from activity i
L_{ui}	Quantity of unskilled labour from activity i
K_i	Quantity of capital from activity i
W_{si}	Price of skilled labour from activity i
W_{ui}	Price of unskilled labour from activity i
R_i	Price of capital from activity i

The W and R data does not express its value using social metric information. As such, it becomes implausible to calculate α_{li}. However, the above-mentioned parameter value can be calculated from the calibration method, using the principle that the production equation has a zero-degree homogenous property. This achieves an adaptation to general equilibrium in accordance with comparable prices. Thus, one can normalise prices by designating the production price and fundamental factors to be equal to one, for production and fundamental factors to be in the form of quantity index and price index.

With the designation of W = R = 1, the Efficiency Parameter and Share Parameter can be calculated as follows:

$$\alpha_{li} = \frac{L^{1-\rho_{ces\,i}}}{L_{si}^{1-\rho_{ces\,i}} + K_i^{1-\rho_{ces\,i}} + L_{ui}^{1-\rho_{ces\,i}}}$$

$$\alpha_{ki} = \frac{K^{1-\rho_{ces\,i}}}{L_{si}^{1-\rho_{ces\,i}} + K_i^{1-\rho_{ces\,i}} + L_{ui}^{1-\rho_{ces\,i}}}$$

$$\alpha_{PWi} = \frac{PW^{1-\rho_{ces\,i}}}{L_{si}^{1-\rho_{ces\,i}} + K_i^{1-\rho_{ces\,i}} + L_{ui}^{1-\rho_{ces\,i}}}$$

$$A_i = \frac{QVA_i}{\left(\alpha_{lsi} L_{si}^{-\rho_{ces\,i}} + \alpha_{lui} L_{ui}^{-\rho_{ces\,i}} + \alpha_{ki} K_i^{-\rho_{ces\,i}}\right)^{-\frac{1}{\rho_{ces\,i}}}}$$

Using the aforementioned principle in the analysis, the leftover parameter value of the Supply Equation is as appears in Table 10.

Appendix Table 10 The value of income-expense circular flow in Social Accounting Matrix

Structural Equation	Parameter	Activity										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Production	Rho	0.16	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09
	Share											
	Unskilled Labour	0.15	0.23	0.25	0.33	0.35	0.17	0.24	0.26	0.14	0.69	0.41
	Skilled Labour	0.07	0.10	0.11	0.14	0.15	0.07	0.10	0.11	0.06	0.30	0.18
	Capital	0.78	0.67	0.65	0.53	0.49	0.76	0.65	0.62	0.79	0.01	0.42
	Alpha	3.50	3.50	6.54	10.01	3.97	2.02	2.45	3.52	11.82	3.62	6.18
Import	Rho	0.54	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Share											
	Domestic share	0.98	0.78	0.13	1.00	1.00	1.00	0.90	1.00	1.00	1.00	1.00
	Import share	0.02	0.22	0.87	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00
	Alpha	1.17	1.71	1.50	1.00	1.00	1.00	1.43	1.00	1.00	1.00	1.00
export	Rho	1.50	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83
	Share											
	Domestic share	1.00	0.93	0.60	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00
	Export share	0.00	0.07	0.40	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
	Alpha	1.10	1.60	1.99	1.00	1.09	1.00	1.39	1.00	1.00	1.00	1.00

2. Inter-trade equation

2.1 Export equation

$$\mathrm{QA}_i = \mathrm{A}_{ces\,i}(\alpha_{ces\,i}\mathrm{QD}_i^{\rho_{ces\,i}} + (1-\alpha_{ki})\mathrm{QE}_i^{\rho_{ces\,i}})^{1/\rho_{ces\,i}}$$

where

$-\rho_{ces\,i}$ CET function exponent

$\alpha_{ces\,i}$ Share parameter for CET function

$\mathrm{A}_{ces\,i}$ Shift parameter for CET function

For the calculation of parameter value, which forms part of the exportation equation, it also uses the same principle as the Supply Equation. With the calibration method, using the elasticity value obtained from the secondary source (Table 10), the parameter value of the exportation equation could be calculated as follows:

$$\rho^{\mathrm{cet}} = (\sigma^{cet}-1)/\sigma^{cet}$$

$$\alpha_{\mathrm{cet\,i}} = \frac{\mathrm{QD_i^{\rho\ ces\ I-1}}}{\mathrm{QD_i^{\rho\ ces\ I-1}} + \mathrm{QE_i^{\rho\ ces\ I-1}}}$$

$$\mathrm{A_i} = \frac{\mathrm{QA_i}}{(\alpha_{cet\,i}\mathrm{QD_i^{\rho\ cet\ i}} + (1-\alpha_{cet\,i})\mathrm{QE_i^{\rho\ cet\ i}})^{1/\rho cet\ I}}$$

For the analysis, the left over parameter values of the exportation equation are obtained using the previously mentioned principle as shown in Table 10.

2.2 Import equation

$$\mathrm{QC}_i = \mathrm{A}_{am\,i}(\alpha_{am\,i}\mathrm{QD}_i^{-\rho_{am\,i}} + (1-\alpha_{am\,i})\mathrm{QM}_i^{-\rho_{am\,i}})^{1/\rho_{am\,i}}$$

where

$-\rho_{am\,i}$ Armington function exponent

$\alpha_{am\,i}$ Share parameter for Armington function

$A_{ces\,i}$ Shift parameter for Armington function

Using the principle of calibration, and the elasticity data from the secondary source (Table 10), one can calculate the parameter value of the importation equation as follows:

$$\rho^{\mathrm{am}} = (1-\sigma^{am})/\sigma^{am}$$

$$\alpha_{\mathrm{am\,i}} = \frac{\mathrm{QD_i^{1-\rho\,am\,i}}}{\mathrm{QD_i^{1-\rho\,am\,i}} + \mathrm{QM_i^{1-\rho\,am\,i}}}$$

$$\mathrm{A_i} = \frac{\mathrm{QC_i}}{(\alpha_{am\,i}\mathrm{QD_i^{-\rho\,am\,i}} + (1-\alpha_{am\,i})\mathrm{QE_i^{-\rho\,am\,i}})^{-1/\rho_{am\,i}}}$$

The analysis of the above-mentioned principle allows one to obtain the leftover parameter value of the importation equation, as expressed in Table 11**.**

3. Demand equation

$$\mathrm{CHQC_{h\,i}} = \mathrm{CHQC_{h\,i}} + \frac{\beta}{\mathrm{PC_i}} * (\mathrm{BH_h} - \Sigma\,\mathrm{PC_i} \bullet \mathrm{CHQCL_{hi}})$$

where

β Marginal propensity to save

$\mathrm{CHQCL_{hi}}$ Minimum quantity consumed of commodity i by household h

Using the principle of calibration, and the elasticity value of income and Frisch Parameter from the secondary source (Table 11) enables the Parameter value of the Demand Equation to be calculated as follows:

$$CHQCL_{h\,i} = CHQC_{h\,i} * (1 + \eta/\varsigma)$$

where

η Income elasticity of demand

ς Frish parameter

$\beta = CHQC_{h\,i}/(\Sigma\ CHQC_{h\,i})$

Using the above-mentioned principle in the analysis, one can obtain the leftover parameter value of the Demand Equation as expressed in Table 12.

Appendix Table 11 Income elasticity and Frisch parameter

Income Elasticity	Household
Activity 1	0.81
Activity 2	2.09
Activity 3	0.91
Activity 4	1.01
Activity 5	2.28
Activity 6	0.80
Activity 7	1.06
Activity 8	1.33
Activity 9	0.81
Activity 10	0.81
Activity 11	1.22
Frisch Parameter	-4.25

Source: Phuwanich (2008)

Appendix Table 12 Household consumption and marginal propensity to consume

Activity	Household Consumption	Marginal Propensity to Consume
Activity 1	63,097.00	0.09
Activity 2	21.00	0.00
Activity 3	284,951.00	0.46
Activity 4	56.00	0.00
Activity 5	11,523.00	0.08
Activity 6	43,676.00	0.06
Activity 7	25,167.00	0.05
Activity 8	9,790.00	0.03
Activity 9	25,052.00	0.04
Activity 10	153.00	0.00
Activity 11	83,692.00	0.20
Total		1.00

B Equation group not using the behaviour of economic units.

As for parameter values in other equations, aside from those mentioned above, there are two equations which do not use the behaviour of economic: Supply Equation and Institutional Equation. Each equation can calculate the parameter values as follows:

1. Supply equation

$$QINTA_i = INTA_i * QA_i$$

$$QVA_i = IVA_i * QA_i$$

where

$INTA_i$ Quantity of aggregate intermediate input per activity unit

IVA_i Quantity of value-added per activity unit

Since the production price is set to be equal to 1, the parameter value becomes calculable.

$$INTA_i = QA_i / QINTA_i$$

$$IVA_i = QA_i / QVA_i$$

Thus, with QA_i and $QINTA_i$ this can be taken from the Social Accounting Matrix table directly.

The calculation of proportions to obtain the parameter value of the Supply Equation is expressed in Table 13.

Appendix Table 13 The value of Income-Expense circular flow in the Social Accounting Matrix

Activity	1	2	3	4	5	6	7	8	9	10	11
1	0.1185	0.0002	0.1029	0.0046	0.0005	0.0001	0.0000	0.0005	0.0026	0.0000	0.0530
2	0.0001	0.0046	0.0350	0.0287	0.0977	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.1929	0.0279	0.3030	0.3267	0.0596	0.0104	0.0057	0.0220	0.0095	0.0715	0.1178
4	0.0071	0.0023	0.0074	0.0064	0.0114	0.0003	0.0003	0.0121	0.1005	0.0583	0.0160
5	0.0018	0.0017	0.0170	0.0047	0.0880	0.0006	0.0007	0.0046	0.0335	0.0127	0.0224
6	0.0204	0.0197	0.0301	0.1760	0.0135	0.0282	0.0051	0.0774	0.0148	0.0212	0.0680
7	0.0871	0.1272	0.0379	0.0874	0.0199	0.0857	0.1090	0.0251	0.0204	0.3926	0.0404
8	0.0476	0.0037	0.0224	0.0237	0.0591	0.0033	0.0035	0.0681	0.1623	0.0069	0.0138
9	0.0196	0.0110	0.0288	0.0556	0.0089	0.0070	0.0040	0.0746	0.0929	0.0267	0.0769
10	0.0000	0.0004	0.0182	0.0207	0.0288	0.0024	0.0002	0.0286	0.2817	0.0107	0.0656
11	0.0101	0.0888	0.0318	0.0530	0.0167	0.0053	0.0039	0.0563	0.0746	0.1056	0.1640

2. The institutional equation

Institutional equations consist of the income distribution of fundamental factors to households and business, the transfer of income from businesses to households, and taxes from households and business. The analysis of this parameter part relies on the calculation of proportional value akin to the case of supply equation. This will result in a parameter value of institutional equation as shown in Appendix Table 16.

Once all parameter values are known, they can be used to replace a construction equation whose parameter values remain unknown, resulting in obtainment of a construction equation at the initial equilibrium.

Nonetheless, calibration could be achieved using Microsoft Excel. The data must be on a separate sheet, and consists of:

2.1 The Social Accounting Matrix Method used in 2004 represents real values.

2.2 The calculation of parameter values using the calibration method in each equation; four equations in total.

(1) The production equation;

(2) The inter-trade equation;

(3) The demand equation;

(4) Other equations.

Following the creation of the aforementioned basic data, the Social Accounting Matrix in 2004 should also be recreated The value obtained will come from the usage of inter-connecting equations according to the entire Construction Equation at the initial equilibrium point, until the economy comes to the general equilibrium at the same level as appears in the Social Accounting Matrix data from 2004, which was a real value.

BIOGRAPHICAL DATA

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