

REGIONAL INTEGRATION  
AND  
PRODUCTION DIVISIONS IN MALAYSIA

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# ABSTRACT

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Globalization is the increasing world-wide integration of markets for goods, services, labor, and capital. It seems to increasingly dominate discussions on the direction of social change and representations of the world. This study is of no exception; it provides an overview on the economic aspects of globalization. It mainly focuses on economic integration, trade patterns of multinational firms and international labor movement. As part of the analysis, international labor movement is centered on the inflow of unskilled labor into host country and the effects they bring along to the welfare of local populations. Particular attention is also given to the construction sector.

International trade grows rapidly along with the progress of globalization. The massive development of new communication and transportation technology has made possible for heterogeneous firms to look for optimum production allocation worldwide. There have however been massive debates among researchers on the conditions that firms decided upon when choosing the production allocation, i.e; whether to locate in one country and export to another or to locate in both countries at the same time. The study proposes a general equilibrium model in order to understand the mechanism of decision behavior of heterogeneous firms on production allocation.

Apart from that, international labor movement is an important dimension of globalization and has become increasingly embedded in changes in global economic and social structures. Like the rest of the world, Malaysia is affected by globalization. The wide economic and demographic

differences between Malaysia and its immediate neighbors triggered the cross-border movement of labor. The country began to rely on foreign labor, particularly unskilled labor, due to the structural changes and labor market segmentation that first emerged in the early 1970s. The unprecedented influx of these labors, following unabated high growth since the mid-1980s, raised several social, political and economic concerns. The popular perception was that foreign labors were affecting local unskilled labors, both in terms of wages and living standards.

It is important to note that the vast majority of preceding discussions on the subject are from the social and political point of view. There is however lack of discussions from economic and quantitative perspective. This study endeavors to fill in these gaps and contribute to the body of knowledge. Consequently, empirical analysis is accomplished using CGE modeling on international labor movement in Malaysia. And this is the first attempt such approach is carried out thus far.

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# LIST OF ABBREVIATIONS

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AGE	Applied General Equilibrium
APEC	Asia Pacific Economic Cooperation
CDE	Constant Difference Elasticity
CES	Constant Elasticity of Substitution
CET	Constant Elasticity of Transformation
CGE	Computable General Equilibrium
CIDB	Construction Industry Development Board
Cif	Cost, insurance and freight
EU	European Union
EV	Equivalent Variations
FC	Footloose Capital
FDI	Foreign Direct Investment
Fob	Free on board
GDP	Gross Domestic Product
GEMPACK	General Equilibrium Modeling PACKage
GMig	Global Migration Model
GMig2	Global Migration Model Version 2
GTAP	Global Trade Analysis Project
GTAP7Agg	GTAP 7 Aggregation
I/O	Input Output



IA	Integrated Assessment
IBS	Industrialized Building System
ICT	Information Communication Technology
IEA	International Energy Agency
ILO	International Labor Organization
MFA	Multifibre Arrangement
MIDA	Malaysian Industrial Development Authority
NEAC	National Economic Action Council
NEG	New Economic Geography
NST	News Straits Times
OIEs	Older Industrialized Economies
R&D	Research and Development
RDEs	Rapidly Developing Economies
ROW	Rest of the World
USA	United States of America
USD	United States Dollar
WTO	World Trade Organization

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

The subject of globalization, economic integration, production divisions and international labor movement are all the main areas of discussion in this study. Every topic is interconnected and complements each other in a way that one cannot be described properly without mentioning the other.

Globalization has, over the past decade become a major feature of commentaries on contemporary social life. Global issues, institutions, and events seem increasingly to dominate discussion on the direction of social change and representations of the world. Globalization is the increasing world-wide integration of markets for goods, services, labor, and capital. It creates many impacts on the world business and industry. From the deluge of books, journal

articles and etc., in which the word 'global' has been so readily appended to the subject matter, it would seem that we are now living in an era of globalization (Abdul Rashid, 1993).

Economic integration promotes countries all around the world to coordinate their economic activities for mutual benefits. Among the activities is international trade which grows rapidly along with the progress of globalization. International trade has made it possible for consumers to taste tradable and differentiated goods produced from other countries. It consequently encourages international movement of resources such as capital and labor.

Heterogeneous and multinational firms have become very important parts of the subjects in international trade. The firms arrange for their allocation of production worldwide due to the various conditions of factor endowment such as the difference in labor productivity and wage rate between countries. The massive development of new communication and transportation technology has made possible for heterogeneous firms to look for optimum production allocation worldwide. The improvement of international infrastructures such as harbors and airports influences the production condition in each country, and therefore brings the difference arrangement of the production allocation of the firms. The scenario eventually causes industrial relocation and capital flow from one country to another.

In the long run, the movement of capital would offer employment opportunities to the native residents and consequently improve their welfares. The new arrangement would create agglomeration of economic activities and the residents will experience changes in socioeconomic environment. This alone would induce people from lower income economy to move to countries with higher income economy. The situation is being described in the

framework of new economic geography as the generation of agglomeration forces.

There have been however massive debates among researchers (Melitz, 2003, Helpman, Melitz and Yeaple, 2004, Baldwin, 2005 and Melitz and Ottaviano, 2005) on the conditions that firms decided upon when choosing the production allocation, i.e; whether to locate in one country and export to another or to locate in both countries at the same time. Chapter 4 aims to propose a general equilibrium model in order to understand the mechanism of decision behavior of heterogeneous firms on production allocation.

Apart from that, international labor movement is an important dimension of globalization and has become increasingly embedded in changes in global economic and social structures (Koser, 2007). It happens when people move from one country to another in search of work and for some, better living condition. Like the rest of the world, Malaysia is affected by globalization. The country's economy has consistently recorded impressive and sustained economic growth. This robust growth has led to substantial job creation, with employment expanding faster than labor force growth.

The wide economic and demographic differences between Malaysia and its immediate neighbors triggered the cross-border movement of labor. The country began to rely on foreign labor, particularly unskilled labor, due to the structural changes and labor market segmentation that first emerged in the early 1970s. The unprecedented influx of these labors, following unabated high growth since the mid-1980s, raised several social, political and economic concerns. The popular perception was that foreign labors were affecting local unskilled labors, both in terms of wages and living standards.

Integration of world economy creates demand for quantitative analysis of policy issues on a global basis. In relation to that, there has been a development of great interest in estimating the impact of international agreements on individual countries, international trade, and worldwide welfare (Hertel, 1997). The needs for empirical evidence have inspired the development of Computable general equilibrium (CGE) models which are among the most influential tools in applied economics. The models provide a comprehensive macro-economic framework to describe market-oriented economies. It is designed to produce conditional projections of the 'what if' type of policy analysis. Consequently the approach is employed to examine the international labor movement effects on the welfare in Malaysia.

Note that the simulation results are not intended to incorporate all of the economic impacts of international labor movement since they also capture important social and political implications. The goal is not to forecast the overall impact of increased or decreased labor movement, but rather to give insights into the economic gains that might be expected from changes in policy or circumstances, as well as insights into the channels through which international labor movement affects welfare.

### **1.3 Aims and objectives**

The main aim of this study is to discuss economic integration, production divisions and international labor movement as parts of globalization. The study also aims to evaluate and examine international labor movement and provide empirical analysis using CGE modeling approach on labor movement policy in Malaysia.

The objectives of the study are:

- To investigate the effect of foreign labors on the relative price, the wage rate, and the welfare of native inhabitants in the host country.
- To discuss the trade pattern of heterogeneous firms by examining the allocation production behavior of multinational firms using general equilibrium approach.
- To describe the Computable General Equilibrium (CGE) modeling approach on international labor movement issues by adopting GTAP model and data base.
- To conduct empirical analysis on the effect of international labor movement policy, Malaysia as a case study.

### **1.3 Methodology**

The study mainly adopts general equilibrium theory approach in investigating the subject matter. The methodology used for Chapter 3 and Chapter 4 is theoretical general equilibrium modeling in investigating the welfare effects of international labor movement and the issue of international trade pattern by multinational firms. Meanwhile, Chapter 5 and Chapter 6 employ the global comparative static general equilibrium modeling approach which is commonly applied in policy analysis.

CGE (Computable General Equilibrium) modeling is introduced in order to appreciate the basic framework of CGE model. CGE models provide theoretical general equilibrium framework for simulating answers to 'what if' questions that are the heart of the most policy analysis. The most distinctive feature of CGE models is data requirements. We usually need a large amount of time series data to estimate a model econometrically. On the contrary, CGE models require

input-output (I/O) tables and basic national accounts for a single year. Therefore it is indeed a suitable solution to be utilized as a tool in empirical analyses in the situations where data are scarce.

The model and data in Chapter 6 necessarily make a number of simplifying assumptions, which should be noted at the outset. Although every effort was made to collect data on the flows of unskilled foreign labor, data are scarce and of questionable quality and assumptions had to be made to fill in the gaps. The additional data complements the data aggregation generated from GTAP 7 data base.

#### **1.4 Scope of study**

The study provides an overview on the economic aspects of globalization. It mainly focuses on economic integration, trade patterns of multinational firms and international labor movement. As part of the analysis, international labor movement is centered on the inflow of unskilled labor into host country and the effects they bring along to the welfare of local populations. It is undeniably true that international labor movement which is the gist of the discussion herein has social and political implications that may be just as important as the economic implications that are provided in this study. Despite their importance, internal labor movement, skilled labor movement, and the political and social impacts of international labor movement are beyond the scope of this work.

## **1.5 Significant contributions**

Chapter 3 and Chapter 4 present theoretical frameworks for investigating the labor movement impacts on host country and for examining firm's production allocation in order to seek better ways to minimize production cost, at the same time maximize profit revenues, respectively. The frameworks are developed in attempts to fill in the gaps between previous literatures. On the other hand, Chapter 5 signifies the computable general equilibrium modeling approach in performing empirical analysis on international labor movement which is the main focus of the study.

It is important to note that the vast majority of preceding discussions on the subject are from the social and political point of view. There is however lack of discussions from economic and quantitative perspective. This study endeavors to fill in these gaps and contribute to the body of knowledge. Consequently, empirical analysis in Chapter 6 is accomplished using CGE modeling on international labor movement in Malaysia. And this is the first attempt such approach is carried out thus far.

## **1.6 Summary of chapters**

This dissertation is structured into 7 chapters. Chapter 1 starts with introduction, Chapter 2 continues with literature reviews on related subjects understudy. Afterwards, Chapter 3 follows with discussion on international labor movement and the effects on social welfare in host country. Chapter 4 focuses on economic integration and multinational firms' behavior. Then Chapter 5 provides basic understanding on computable general equilibrium (CGE) modeling



related to international labor movement. Chapter 6 continues with empirical analysis on international labor movement, Malaysia as a case study, using CGE modeling. The dissertation is ended with conclusion and recommendation in Chapter 7. The summary of the aforementioned chapters are as follows:

### **1.6.1 Chapter 1**

This chapter serves as introductory part of the whole study. It provides basic framework and overview of the dissertation.

### **1.6.2 Chapter 2**

Chapter 2 provides reviews of past literatures on the subject of globalization, economic integration, production divisions and international labor movement. Basic understanding of the study is started through the contents discussed in this chapter. It offers general knowledge of the subject understudy and represents better acknowledgement of the ensuing chapters.

### **1.6.3 Chapter 3**

Many issues are related to the impact of globalization, i.e. international trade, labor movement, technology transfer, the exchange of knowledge, environmental concerns, service industries, etc. This chapter however, focuses on how globalization is related to international labor movement.

The chapter discusses the effect of foreign labor on the host country from an economic point of view. A theoretical model was developed taking into consideration that foreign labors are employed only in the non-tradable sector and that labor endowments (both native and foreign labors) are immobile between sectors. Subsequently, comparative static analysis was conducted to draw the results.

#### **1.6.4 Chapter 4**

In contrast with the previous chapter as well as the next chapters, the discussions here are focusing on economic integration and international capital movement. It emphasizes on firms' behavior when producing heterogeneous goods under monopolistic competition market. This chapter explains how international trade is being directed towards firms' production allocation in order to seek better ways to minimize production cost and at the same time maximize profit revenues.

In this chapter, a general equilibrium model of trade pattern of heterogeneous firms is formulated. The model has two assumptions; i.e, labor productivity and wage rate are different between the two countries, and the difference in production technology between the firms. Based upon these assumptions, the production allocation of the firms and trade structure between the two countries are endogenous. It is hoped that the model will offer new insights and contribute to the body of knowledge.

This chapter does not directly discuss international labor movement. However, it is important to note that the situations mentioned in the chapter would eventually, in the long run create

employment opportunities to native residents in the respective countries. It is interesting to note that the movement of capital discussed in this chapter does have effects on labor market.

### **1.6.5 Chapter 5**

Chapter 5 starts with the introduction of the global comparative static general equilibrium modeling approach which is commonly adopted in policy analysis. Consequently, a static CGE (Computable General Equilibrium) model is discussed in order to appreciate the basic framework of CGE model. CGE models provide theoretical general equilibrium framework for simulating answers to 'what if' questions that are the heart of the most policy analysis.

A brief description of GTAP model and Data Base and the development of Global Migration models (GMig and GMig2) are also presented herein to provide basic understanding on the structure of the CGE model used in the study. Furthermore, this chapter provides an overview on the theoretical framework of GTAP and GMig2 including the assumptions and structures of the models. The chapter ends with description on the necessary steps carried out to simulate data based on GMig2 model. It includes brief introduction of the GEMPACK software and associated files required for the simulation process. This chapter provides basic framework for case study analysis to be deliberated in Chapter 6.

### **1.6.6 Chapter 6**

This chapter discusses empirical analysis through computable general equilibrium (CGE) modeling to measure the quantitative effects of unskilled foreign labors on host country,

Malaysia as case study. The model presented in this chapter is based on GMig2 model developed using GTAP 7 data base. In addition, international labor movement scenario in Malaysia is discussed as the main focus of the study.

Two-country, five-sectors and five-factors model is formulated to theoretically signify international labor movement scenario in Malaysia. Assumptions are made for simplification of analysis. Considering Malaysian high reliance on unskilled foreign labor, the model assumed that inflows of foreign labor only involve this type of labor and therefore international movement of skilled labor and issue of brain drain are ignored.

The chapter explains the model in detail with a list the equations and data sources. The assumptions together with the equations represent basic framework for simulation process using GEMPACK software described herein. Data aggregation for empirical analysis is generated from GTAP 7 Data Base.

Results of the simulation are discussed in two parts. Part 1 looks at the effects of increasing inflow of unskilled foreign labor into Malaysia from year 2005 till 2010. Part 2 discusses the policy implementation of reducing the number of unskilled foreign labor to 1.5 million by 2010. The discussion also gives particular attention to the construction sector. The results are tabulated and deliberated in the end of the chapter.

#### **1.6.7 Chapter 7**

The dissertation is ended with concluding remarks in Chapter 7. The chapter summarizes all

the results in preceding chapters and notes the limitations of the study. In the end, the chapter highlights potential ideas for future research on the same area of study.

# **CHAPTER 2**

## **LITERATURES ON ECONOMIC INTEGRATION**

### **2.1 Introduction**

Globalization has, over the past decade become a major feature of commentaries on contemporary social life. Global issues, institutions, and events seem increasingly to dominate discussion on the direction of social change and representations of the world. Globalization creates many impacts on the world business and industry. It is not simply an economic phenomenon.

This chapter describes the literature search on the subject of globalization, economic integration, production divisions and international labor movement. These are all the main area of discussion in this study. Every topic is interconnected and complements each other in a way

that one cannot be described adequately without mentioning the other. The chapter serves as basic overview of the above subjects, offering an outline degree of understanding towards better appreciation of the subsequent chapters.

## **2.2 Globalization**

Globalization means differently to different people. Many definitions have been created by previous researchers on the infamous term. Among others, Slaughter & Swagel (1997), defined globalization as the international integration of goods, technology, labor, and capital. The definition of globalization, provided by Mirza (1998) is the growing economic interdependencies of countries worldwide through the increasing volume and variety of cross border transactions in goods and services and of international capital flows, and also through rapid and widespread diffusion technology.

Frenkel & Peetz (1998) referred globalization as the processes that reduce barriers between countries, thereby encouraging closer integration of economic, political, and social activity. They added that economic aspects are the most important. These include rapidly expanding international trade and financial flows and foreign direct investment (FDI) by multinational corporations.

Steger (2003) summarized four distinct qualities or characteristics lie at the core of the globalization phenomenon. First, globalization involves the creation of new and the multiplication of existing social networks and activities that increasingly overcame traditional political, economic, cultural, and geographical boundaries. Second, globalization is reflected in

the expansion and the stretching of social relations, activities, and interdependencies. Third, globalization involves the intensification and acceleration of social exchanges and activities. Finally, the fourth, the creation, expansion, and intensification of social interconnection and interdependencies do not occur merely on an objective, material level but also human consciousness. With all the qualities, he then defined globalization as a multidimensional set of social processes that create, multiply, stretch, and intensify worldwide social interdependencies and exchanges while at the same time fostering in people a growing awareness of deepening connections between the local and the distant.

Globalization is the increasing world-wide integration of markets for goods, services, labor, and capital. From the deluge of books, journal articles and etc., in which the word 'global' has been so readily appended to the subject matter, it would seem that we are now living in an era of globalization (Abdul Rashid, 1993). It can be summarized that globalization is about cross border relationship and economic activities all around the world. It involves international integration of economics, politics, social and technology. It deems to create change as the world is treated as one operating platform. And by looking at the world around us and our daily activities, indeed, we are living in the era of globalization.

The history of globalization is nothing new. It began roughly five hundred years ago with the so-called voyages of discovery, which coincided with the emergence of capitalist world economy (Broad, 1995). People have been traveling around the world in pursuit of new wealth in the form of valuables and tradeable commodities. According to Slaughter & Swagel (1997), world trade in relation to output grew from the mid-1800s. Only in the 1970s, however did trade flows reach the same proportion output as at the turn of the century, a result of easing tariffs



and quotas, more efficient communications and falling transportation costs. In the developing countries, exposure to international trade picked up again in the late 1980s, coinciding with their movement toward trade liberalization.

The earliest globalizer in the Asian region was clearly Japan whose post-War emergence as the “classic” export-oriented fast-growth economy dates back to around the mid-1960s. Japan’s lead was followed rapidly by South Korea, Hong Kong and Taiwan, and in the 1970s, by Singapore, Malaysia, Thailand and Indonesia (Sen, 1999).

The world is shrinking and continues to shrink metaphorically as communication and transportation systems become more advanced, rapid and cheaper to utilize (Abdul Rashid, 1993). Over the past two decades, foreign trade and the cross border movement of technology, labor and capital have been massive and irresistible. Goods produced in one country can be seen traded in other country’s market. Japanese cars ply the streets of any large cities in the world. People can get connected to each other from half a world away through a telephone call, etc.

The globalization process has been driven by the interaction of a number of factors: declining man-made barriers; steep falls in the costs of transportation and communication; fragmentation of production processes; and economic growth (Greenaway & Nelson 2000).

Globalization brings along opportunities as well as threats. One can take it in particular, in the economic point of view, as an opportunity as it generally establishes that the world is the market to do business. It can create a win-win situation between parties. For instance, one

could gain profit from low production cost in the exchange of technology transfer. On the other hand, one can also take it as a threat for when the former happens, it also means that the home market is equally accessed by others. Therefore, it could be more competitive and if not careful, conquered by others.

It is reasonable to say that most economists would agree that increasing openness globalization brings all round benefits (Raftery, et.al, 2000). They claimed that benefits to the exporters include employment and additions to GNP counter-intuitively, there are probably more benefits following to the importing country which manages to get access to technology or products which would not be produced locally with efficiency. In addition, the country with comparative advantage can produce goods or service to the mutual advantage of exporter and importer, thus leading towards enhanced overall standard of living.

### **2.3 Economic Integration**

For a variety of reasons it often makes sense for nations to coordinate their economic policies. Coordination can generate benefits that are not possible otherwise. Benefits may also accrue to countries that liberalize labor and capital movements across borders, who coordinate fiscal policies and resource allocation towards agriculture and other sectors and who coordinate their monetary policies. Any type of arrangement in which countries agree to coordinate their trade, fiscal, and/or monetary policies is referred to as economic integration (Suranovic, 2007).

Mussa (2000) suggested three fundamental factors that he considered to have affected the process of economic globalization and are likely to continue driving it in the future. First,

improvements in the technology of transportation and communication have reduced the costs of transporting goods, services, and factors of production and of communicating economically useful knowledge and technology. Second, the tastes of individuals and societies have generally, but not universally, favored taking advantage of the opportunities provided by declining costs of transportation and communication through increasing economic integration. Third, public policies have significantly influenced the character and pace of economic integration, although not always in the direction of increasing economic integration.

He added that these three fundamental factors have influenced the pattern and pace of economic integration in all of its important dimensions. In particular, his paper discussed three important dimensions of economic integration: (1) through human migration; (2) through trade in goods and services; and (3) through movements of capital and integration of financial markets.

Suranovic (2007) argued that there are many different degrees of integration. Many countries used economic integration methods to achieve trade liberalization includes the formation of preferential trade arrangements, free trade areas, customs unions and common markets. Since many of these agreements involve geographically contiguous countries, these methods are sometimes referred to as a regional approach to trade liberalization.

## **2.4 New Economic Geography**

With the rapid development towards the borderless global economy over the past two decades, it has become increasingly clear that none of the traditional theories of urban economics,

regional economics or international trade would prove adequate or appropriate for the study of the dynamics of the spatial economies taking place recently in almost all parts of the world (Fujita, 2007). He added that the defining issue of the new economic geography (NEG) is how to explain the formation of a large variety of economic agglomeration (or concentration) in geographical space.

Fujita and Mori, (2005) present an overview of the recent development in the NEG, and discusses direction of its future development. In the paper, the authors stated that new economic geography (thereafter NEG) represents a new branch of spatial economics, which aims to explain the formation of various forms of economic agglomeration in geographical space, using general equilibrium framework. They added that it is an analytical framework initiated by Paul Krugman in the early 1990s in order to explain the formation of a large variety of such economic agglomerations in geographical space, and has grown into one of the major branches of spatial economics today.

There are four key terms for (first generation) NEG (Fujita & Mori, 2005). The first is the general equilibrium modeling of an entire spatial economy which sets apart this approach from that of traditional location theory and economic geography. The second is increasing or indivisibilities at the level of individual producers or plants, which is essential for the economy not to degenerate into 'backyard capitalism' (in which household or small group produces most items for itself). Increasing returns in turn lead to the market structure characterized by imperfect competition. The third is transport costs (broadly defined), which makes location matter. Finally, the fourth, the locational movement of productive factors and consumers is a prerequisite for agglomeration. In addition, there are three classes of models in NEG:

core-periphery models, regional and urban system models, and international models.

Under the presence of sufficient heterogeneity of goods or labors, the three-way interaction among increasing returns, transport costs, and movement of labors creates a circular causation leading to agglomeration of both consumers and suppliers of these goods or services (Fujita, 2007).

## **2.5 Production Divisions**

Fujita (2007) argued that the main engine for the current new phase of globalization is the steady reduction of transport costs. He added that the impact of decreasing transport costs is non-monotonic. This theoretically means that only with sufficient reduction in transport costs, will agglomeration economies start dominating the dispersion force of transport costs, leading the formation of economic concentrations. Too much concentration of economic activities in core regions however will increase wage rates and land cost, which consequently tend to push away some of activities having high labor (or land) intensity to peripheral regions and in the really long run, major metropolises eventually disappear.

He also acknowledged that the reality shows almost the contrary thus far. Due to the progress of IT revolution over the past three decades, many major metropolises are becoming more dominant than before. It is therefore important to realize that the recent reduction in transport costs has been accompanied by a broad range of fundamental technological innovations, which contributed to the advancement of transport technologies, innovation in production, information processing, communications and new products. These have contributed to the

rapid growth of multinational firms, leading to the major reorganization of global production system and division of labor.

An essential part of international capital movement takes the form of foreign direct investment (FDI). It initiates international capital flows and allows the formation of multinational organizations in which a firm in one country creates or expands a subsidiary in another. This spatial division of production aims at taking advantage of differences in technologies, factor endowments or factor prices, and market sizes across countries. It is regarded as one of the main ingredients of the process of economic globalization. Multinational firms have been playing a dominant role in the economic growth and integration of East Asia. For instance, in 2003, 57 percent of both exports and imports in China were conducted by these firms (Fujita, 2007).

## **2.6 International labor movement**

### **2.6.1 General**

International labor movement is an important dimension of globalization and has become increasingly embedded in changes in global economic and social structures. It happens when people move from one country to another in search of work and for some, better living condition. The term 'foreign workers' encompasses a group of foreign national who have legal right to work in a country where they have been officially recruited (Zehadul et al., 1999)

The ILO Convention on Migration for Employment 1949, (No. 97) in its Article 11, states:

“migrant for employment means a person who migrates from one country to another with a view to being employed otherwise than on his own account and includes any person regularly admitted as a migrant for employment.” It exempts frontier workers, short-term entry of members of the liberal professions and artists, and seamen, from its application. The 1990 UN Convention on the Protection of all Migrant Workers and their Families uses a more comprehensive definition which reads as: " a person who is to be engaged, is engaged or has been engaged in remunerated activity in a State of which he or she is not a national". The UN definition specifically includes those foreign workers who may currently be out of work, but had been working earlier (Wickramasekera, 2002).

Foreign labors are mainly categorized either as illegal or legal foreign labors (Koser, 2007). The term ‘irregular’ is possibly more accurate for the latter and probably less derogatory than ‘illegal’ when talking about foreign labors. The concept of ‘irregular’ foreign labors covers a wide range of people, principally those who enter a country which they are not a national either without valid documents or with forged documents, or those who enter legally but then stay after their visa or work permit has expired (Koser, 2007). In some countries like Malaysia, it is illegal to work in the sector other than the one that is approved for in their application of work permit. It is next to impossible to enumerate accurately the irregular foreign labors either on country basis or worldwide and therefore there is no exact data on this type of foreign labors.

Another related distinction that is often made between people who move for political reasons and those who move for economic reasons (Koser, 2007). The former are usually refugees – people who have been obliged to leave because of political persecution or conflict. The latter are usually described as foreign labors – people who move to find work, or better job

opportunities and working conditions. They are often further classified as unskilled and skilled foreign labors. Somewhere in between economic and political foreign labors, there are also people who move primarily for social reasons. Most commonly these are women and children who join their husbands who have found work abroad through the process of family reunion. It is certainly useful to distinguish between mass migrations which have continued to occur in response to wars and political and social turmoil, and migrations of individuals and families undertaken primarily for economic reasons. Of course, the two categories are not completely distinct; individual and family decisions about migration are often affected by both economic and non-economic factors (Mussa, 2000).

High-income economies are increasingly becoming characterized by the segmentation of labor markets. This occurs where sectors of the labor market are eschewed by native labors because the low-paying, have little security, and are low status, and thus have become dominated by foreign labors. These are often described as '3D jobs' – entailing work that is dirty, dangerous, or difficult, and often a combination. They are concentrated in sectors such as agriculture, plantation, heavy industry, construction and domestic service. Even in times of economic downturn, native are reluctant to work in these jobs, and so demand for foreign labors continues to some extent irrespective of economic trends. More often than not, the foreign labors who work in these sectors are undocumented or have irregular status, for they more than others are willing to work for very low wages and in insecure conditions.

International labor movement is attributed both to 'pull' factors (attractive features of destination) and 'push' conditions (negative evaluations of a present origin). Kondoh (1999) classified foreign labors into three types, namely; permanent migrants, temporary migrants,



and cross-border migrants.

The movement of an individual to another country is regarded as permanent if the foreign labor has no intention of moving back to the source country during his or her life time. The source country loses not only labor services originally provided by the foreign labors, but also all these people and their offsprings. Consumption is done in host country, and probably all their income is spent in the host country (including any possible remittance).

Temporary labor movement refers to labors who move voluntarily to another country and work there with a belief that there is a positive probability that they will go back to the source country in the future. Basically divided into two types: voluntary and involuntary:

- Voluntary: if after staying in the host country for a period of time the foreign labor chooses to return to the source country.
- Involuntary: exists when the foreign labor is allowed by the host government to stay for a limited amount of time and after that the foreign labor is forced to return to the source country. They normally aware of the departure constraint when making the decision of whether to move. Involuntariness refers to the departure, not the arrival.

Another crucial issue in international labor movement is the effects of brain drain. It is however not part of this study. Nonetheless, it is a fraction of international labor movement and deserves acknowledgement. Brain drain refers to the outflow of skilled labors. Typically, residents in a source country who spend their earlier years on receiving education and training and then decided to move to another country as skilled labors, the simultaneous outflow of labors and human capital. In some cases they are those who receive basic education in

source country but higher education in host country and they continue to stay and work in host country. Generally has adverse effects on those left behind; same case as unskilled foreign labors.

Foreign labors have made an important contribution to the economies of the host countries, and through their remittances, to their home countries. They also generally benefited from the opportunity of working overseas. There are however negative effect of this labor movement. ILO (1995) reported that there seems to have developed, for both legal and illegal foreign labors, a 'buyers' market' for labor, with attendant downward pressures on wages and conditions of work.

International labor movement has always been associated with the welfare effects on host country's local population and those who are left behind in the home country. It is indisputable that international labor movement has social and political implications that may be just as important as the economic implications that are provided in this study. Nevertheless, despite their importance, internal labor movement, skilled labor movement, and the political and social impacts of international labor movement are beyond the scope of this work.

### **2.6.2 Construction sector**

Construction industry is a labor intensive industry. In the process of industrialization and urbanization, construction work provides a traditional point of entry into the labor market for labors from the countryside. Construction is often the only significant alternative to farm labor for those who do not have any particular skill, and it has special importance for the landless

(ILO, 2001).

It is now mainly in developing countries that construction provides employment for rural-urban migrants. But within living memory the industry has also played this role in developed countries, drawing on reservoirs of rural labor during the process of urbanization and agricultural intensification. When the pool of labors from the rural areas dries up, the industry attracts and absorbs foreigners from other countries with labor surplus and lower wages (ILO, 2001).

While manufacturing can handle labor shortages to some extent by means of investing in the automation and latest technology or relocation, these do not seem to apply appropriately in the case of construction. An important feature of the construction industry is its labor intensiveness that makes it prone to the use of foreign labor. There is a limit to the process of mechanization in the sector and it remains essentially a labor-intensive activity (ILO, 1995). Construction projects are also geographically tied to a particular site. Although many multinational firms with labor-intensive manufacturing can decide their production allocation and relocated to countries with cheaper labor cost, this does not apply in the case of construction.

In the past decade it has become a significant phenomenon in East Asia, where huge differentials in demographic characteristics and wages have led to a “siphoning” of foreign labors from low to high wage economies (ILO, 2001). There is evidence from various parts of the world to indicate that construction labors do not view their employment in a very favorable light. Construction is regarded almost everywhere as a low status job (ILO, 2001).

In the case of Malaysia, particularly the construction sector, legal and illegal foreign labors

dominate the share of its workforce. A combination of factors contributed, including the unattractiveness of manual construction work to local youths, an expanding manufacturing sector that offered better employment conditions, labor attrition, increasing opportunities for tertiary education, a lower birth rate, out migration of Malaysian labors to high wage countries such as Singapore and Japan (Abdul Aziz, 2001).

Local labors tend to shy away from construction works as there are many opportunities in other sectors offering more prestigious and congenial work compared to the 'dirty, demanding and dangerous' work in the sector. Employers choose to utilize foreign labors not because they have construction-related skills but because they represent a ready source of labor willing to be trained under less than ideal condition (NEAC, 2003).

Nevertheless, during the 1980s, the widespread use of foreign labors was cited as a factor in the lower growth of wages in the sector, relative to the non-plantation sector. The willingness of foreign labors to accept low wages and poor working conditions has apparently depressed wages and had an adverse impact on locals in the sector as well. Skilled Malaysians at the time found themselves jobless even when they were willing to accept less in 1987. The demand price declines not only due to recession but also because of the availability of foreign labor substitutes (Narayanan & Lai, 2005).

However, the New policy announced in 1991 allowed the use of foreign labors on condition that same treatment and benefits accrued to the local under labor laws, applied to foreign labors (same wage, contribution to social security scheme, etc.). In addition, employment levy are made mandatory to employers recruiting foreign labors. Hence, legal foreign labors are no

longer cheap substitute to locals. Nonetheless, the heavy reliance on foreign labors in the industry still holds because they are used not as a cost-cutting strategy, but simply because labors are not available in sufficient numbers.

In this complex scenario, many (Abdul Aziz, 2001, NEAC, 2003, Narayanan & Lai, 2005, etc.) have suggested that labor-saving methods to be adopted widely. Among others, the Malaysian Government has been encouraging the use of Industrial Building System (IBS) – a modular, prefabricated system to improve the working conditions in the sector. It offers great promise in reducing the number of on-site workers and time. Besides, it could contribute positively to making work in the sector more attractive.

## **2.7 Conclusion**

The discussion in this chapter centered upon literature search on background subjects of globalization, economic integration, production divisions and international labor movement. Basic understanding of the study is started through the contents discussed in this chapter. It offers general knowledge of the subject under study and represents better acknowledgement of the ensuing chapters.

Various definitions and arguments have been offered by previous researches on globalization, economic integration, production divisions and international labor movement. These are all related area of study that complements each other to the extent that one cannot be described adequately without mentioning the other. It is hoped that the chapter achieves its aim at providing a starting point to better appreciate other chapters to come.

# **CHAPTER 3**

## **LABOR MOVEMENT AND SOCIAL WELFARE**

### **3.1 Introduction**

Globalization is inevitable. It creates many impacts on world business and industry. Over the past two decades, foreign trade and the cross-border movement of technology, labor and capital have been massive and irresistible. Many issues are related to the impact of globalization i.e; international trade, labor movement, technology transfer, the exchange of knowledge, environmental concerns, service industries, etc. This chapter will, however, focus on how globalization is related to international labor movement.

Millions of people have moved to other countries in search of work, higher pay, or a good working environment. This scenario is widespread, existing all over the world. Labor movement began during the time of colonialism, though at the time it was accomplished by

force, through the slave trade. When the slave trade was abolished, indentured labor took its place. During the industrial revolution in Europe, many people began to move voluntarily (for details, see Wells, 1996). Nevertheless people do not automatically migrate when incomes are higher in one place than another, but their desire to migrate depends on factors such as the following: (i) comparative wage levels, actual and expected; (ii) comparative unemployment rates and unemployment benefits; (iii) the availability of housing; and (iv) the cost of migration: travel costs (including availability of foreign exchange), information costs, and the psychic cost of leaving one's culture, friends, and relations (for detail discussions, see Layard, *et al.*, 1994).

Like the rest of the world, Malaysia is affected by globalization. The country's economy has consistently recorded impressive and sustained economic growth. This robust growth has led to substantial job creation, with employment expanding faster than labor force growth. The wide economic and demographic differences between Malaysia and its immediate neighbors triggered the cross-border movement of labor. The country began to rely on foreign labor, particularly unskilled labor, due to the structural changes and labor market segmentation that first emerged in the early 1970s. The unprecedented influx of these labors, following unabated high growth since the mid-1980s, raised several social, political and economic concerns. The popular perception was that foreign labors were affecting local unskilled labors, both in terms of wages and living standards.

This chapter aims to discuss the effect of foreign labors on the host country. The objective of the study is to investigate the effect of foreign labors on (i) the relative price and the wage rate, and (ii) the welfare of the native inhabitants in the host country. The methodology for the study involves a two-factors and two-sectors model developed to measure the effects. It is based

on previous research conducted by Kondoh (1999). The current model, however, has been expanded and further improved to suit the nature of this study.

In addition, this chapter provides a theoretical framework for investigating the labor movement impacts on host country. This framework will be used as a basis for empirical analysis in chapter 6 where it is expanded to suit the scenario in Malaysia. It is hoped that for the purpose of the following chapters, the model will provide a suitable methodology for the basis in measuring the effects of labor movement on the Malaysian economy.

### **3.2 International Labor Movement**

Every year millions of people move to other countries in pursuit of better opportunities. Nowadays they can be seen in various parts of the world and they are commonly known as foreign labors.

The term foreign labor refers to a person who enters a country (of which he or she is not a national) with or without valid entry and work permits to be gainfully employed in various economic sectors. Skilled foreign labors are commonly referred to as 'expatriates', while semi-skilled and unskilled are popularly known as 'foreign labors' or 'migrant workers'. Kondoh (1999) classified them into three types of migrants: permanent migrants, temporary migrants, and cross-border migrants. This chapter focuses on cross-border unskilled labor.

The major pull factor in international labor movement is a demand for labor far beyond that which can be met from local resources. Labor shortages exist in many countries including in



the fast growing economies of Asia (ILO, 1995).

### **3.3 Basic Idea**

Many studies have been done to address the issues related to foreign labors (i.e., Ethier, 1985, 1986; Kondoh, 1999; Chao et al, 2002; Carter, 2005; Kanapathy, 2004, 2006a, 2006b, etc.). In addition, there have been a growing number of studies on the welfare effects of foreign labors on the native inhabitants of the host country. The main debate focuses on the question of whether foreign labors were displacing local labors and suppressing wages and living standards.

These studies, for example Kondoh (1999), concluded that in an environment of perfect competition, permanent, temporary, and cross-border labor movement have very different effects on the host country. He found that immigration is beneficial to the host country. On the other hand, Chao, et al (2002) introduces imperfect competition for the non-traded sector and his paper suggested that if the non-traded sector is relatively skilled-labor intensive, the immigration of skilled labors is welfare enhancing while the entry of unskilled labors can be welfare reducing. Carter (2005) analyzed illegal immigration and the effects of immigration enforcement policies. He concluded that an increase in migration depth lowers foreign labors' wages and raises the income of host-country capital and labor, but when the foreign labors move into what had been host-country jobs, native labor may suffer. Kanapathy (2006b) studied the impact of foreign labors on the Malaysian economy. According to her, cross-country empirical evidence suggests that international labor movement has not caused any net increase in the unemployment rate in the host country, and any negative impact of

international labor movement on wages is small.

Rivera-Batiz (1982) examined the economic effects of emigration in a source country by proposing a theoretical framework of two factors, two goods; tradable and non-tradable goods and two countries model. The study suggested that emigration can affect the welfare of the non-migrants, and the direction of the effect in this context will always be negative. However, the study did not consider the inflow of remittances. Djajic (1986) later contradicted the result in Rivera-Batiz (1982) by suggesting that such payments (remittances) improve the welfare of direct recipients, and the non-migrants who are unrelated to migrants may also benefit from emigration of their countrymen if the flow of remittances is sufficiently large. Djajic (1986, 1988, 1989) expanded two factors, two goods and two countries models and discussed about the economic and social welfare effect of three different types of immigration; permanent, temporary and cross border migrant. He analyzed the optimum behavior of the different types of immigration.

Borjas (1994) proposed empirical overview about the effect of wage change for labor market in host country by controlling the number of immigration. Borjas (1995) provides an economic framework to show how natives benefit from immigration. He suggested that natives would gain more if immigration policy could attract more skilled foreign labors.

This chapter will further investigate the effects of foreign labors on (i) the relative price and the wage rate, and (ii) the welfare of the native inhabitants in the host country under a perfect competition environment. Kondoh's (1999) model adopting two-commodity (tradable and non-tradable goods), two-factor (labor and capital) is analyzed and used as the basis for the

study. It is observed that in his model, he assumed that labors are moveable between the two commodities under the same wage rate. However, in this chapter the immobility factor labor is assumed to represent an extreme short run scenario. In the very short run it is difficult for any factor to be moved and be productive in another industry. Thus we consider the difference in wage rate between the two commodities.

It is certainly worthwhile to study the model by including the above scenarios. This point is addressed in the model which is presented in the next section. The new model, theoretical in nature, shows another perspective on the same area of study.

### **3.4 The Model**

#### **3.4.1 Assumptions**

The model is developed considering a country with a small open economy. There are two goods,--tradable and non-tradable--and two factors--labor and capital. The study focuses on cross-border labor, employed only in non-tradable goods. Therefore, it is assumed that labor is immobile between the two goods while capital is internationally immobile.

The production function for tradable goods is  $T = T(L_T, K_T)$  and that for non-tradable goods is  $N = N(L_N, K_N)$ .  $L_T$  and  $L_N$  are inputs of labor, while  $K_T$  and  $K_N$  are inputs of capital for the production of tradable and non-tradable goods, respectively. Both functions are assumed to be linearly homogeneous and strictly quasi-concave. It is further assumed that the economy is in a condition of perfect competition and full employment. By taking the tradable

goods as numeraire, the following equations are derived from the aforementioned assumptions:

$$p_N \frac{\partial N}{\partial L_N} = w_N \quad (1a) \qquad \frac{\partial T}{\partial L_T} = w_T \quad (1b)$$

$$p_N \frac{\partial N}{\partial K_N} = \frac{\partial T}{\partial K_T} = r \quad (1c)$$

$$L_T = \bar{L}_T \quad (1d) \qquad L_N = \bar{L}_N + L_B \quad (1e)$$

$$K_T + K_N = \bar{K} \quad (1f).$$

In the model, the different wage levels are highlighted by equations (1a) and (1b) while  $p_N$  represents the price,  $w_N$  is the wage for labor in non-tradable,  $w_T$  is the wage for labor in tradable goods and  $r$  is the rental price. In addition,  $L_B$  is the inflow of cross-border labor employed only in non-tradable goods and thus  $L_T$  being constant.  $\bar{L}$  and  $\bar{K}$  are the endowment of labor and capital in the host country of which both are assumed to be given and constant. Here,  $\bar{L} = \bar{L}_T + \bar{L}_N$ . Cross-border labors remit their earnings mainly to their families in their home country. For simplification, it is assumed that all of their income is spent in their home country. The total income of factor endowments in the country is denoted as

$$Y = rK + w_N \bar{L}_N + w_T \bar{L}_T.$$

$Y$  is the total income, a sum of  $rK$ ; rental of capital,  $w_N \bar{L}_N$ ; total wage of local labors in non-tradable goods and  $w_T \bar{L}_T$ ; total wage of labors in tradable goods. The supply function of the two goods relies on the relative price and the inflow of labor whereas the demand function

depends on the relative price and the total income spent in the country. Under the equilibrium condition for both goods markets, therefore,

$$D_N(p_N, Y) = S_N(p_N, L_B) \quad (2)$$

Here, the Walrasian Law is adopted whereby one equilibrium condition is omitted and the condition of the non-traded goods market is shown. In this general equilibrium system, equations (1a), (1b), (1c), (1d), (1e), (1f) and (2) determine nine endogenous variables  $p_N, w_N, w_T, r, L_T, L_N, K_T, K_N$  and  $Y$ , if  $L, K$  and  $L_B$  are given exogenously.

### 3.5 Analysis of Prices Responses

This section investigates the effects of an increase in the inflow of cross-border labor on prices in the host country. Differentiation of equation (2) with respect to  $p_N$  and  $L_B$  derives

$$\frac{dp_N}{dL_B} \equiv p_N^B = \frac{S_N^L}{D_N^P - S_N^P + D_N^Y \left( \frac{\partial Y}{\partial p_N} \right)} \quad (3)$$

where  $S_N^L \equiv \frac{\partial S_N}{\partial L_B}$ ,  $D_N^P \equiv \frac{\partial D_N}{\partial p_N}$  and  $D_N^Y \equiv \frac{\partial D_N}{\partial Y}$ .

According to the Walrasian price-adjustment process,

$$\dot{p}_N = D_N(p_N, Y) - S_N(p_N, L_B).$$

The equilibrium must be stable and the stability condition  $d\dot{p}_N / dp_N < 0$  ensures that the denominator of Equation (3) is negative. From Equation (3),  $dp_N / dL_B > 0$  if the non-tradable good is capital intensive. In addition,  $Y = rK + w_N \bar{L}_N + w_T \bar{L}_T$  and due to the

factor-price-equalization theorem, when  $p_N$  is unchanged,  $w_N$ ,  $w_T$ , and  $r$  are also unchanged. According to the Rybczynski theorem,  $S_N^L > 0$  if the non-tradable good is labor intensive, and  $S_N^L < 0$  if it is capital intensive. It can therefore be concluded that  $dp_N/dL_B > 0$  if the non-tradable good is capital intensive and  $dp_N/dL_B < 0$  if it is labor intensive.

From the above, the effect of an increase in the inflow of cross-border labor on factor prices is further analyzed:

$$\begin{aligned} \frac{dw_N}{dL_B} &= \frac{\partial w_N}{\partial L_B} + \frac{\partial w_N}{\partial p_N} \frac{dp_N}{dL_B} = \frac{\partial w_N}{\partial p_N} \frac{dp_N}{dL_B} = \left( N^{LL} \frac{dL_N}{dp_N} + N^{LK} \frac{dK_N}{dp_N} \right) \frac{dp_N}{dL_B} \\ &= \left( N^{LK} \left( \frac{-T^{LK} N^L k_N + p_N N^{LK} (1 + N^L) k_T}{p_N N^{LK} T^{LK} k_N} \right) \right) \frac{dp_N}{dL_B} \quad (4) \end{aligned}$$

$$\begin{aligned} \frac{dr}{dL_B} &= \frac{\partial r}{\partial L_B} + \frac{\partial r}{\partial p_N} \frac{dp_N}{dL_B} = \frac{\partial r}{\partial p_N} \frac{dp_N}{dL_B} = \left( N^{KK} \frac{dK_N}{dp_N} + N^{KL} \frac{dL_N}{dp_N} \right) \frac{dp_N}{dL_B} \\ &= \left( N^{LK} \left( \frac{T^{LK} N^L k_N + p_N N^{LK} (1 + N^L) k_T}{p_N N^{LK} T^{LK} (k_N)^2} \right) \right) \frac{dp_N}{dL_B}. \quad (5) \end{aligned}$$

$k_N \equiv K_N/L_N$ ,  $N^{LL} \equiv \partial N^L / \partial L^N$  and  $N^{LK}$ ,  $N^{KK}$ ,  $N^{KL}$  are defined in a similar manner. (Detailed calculations are presented in the Appendix). Adopting the result from  $dp_N/dL_B$ , hence equation (4)  $dw_N/dL_B$  is negative and equation (5)  $dr/dL_B$  is positive if the non-tradable good is capital intensive and the opposite results occur if it is labor intensive.

### 3.6 Analysis of Welfare

This section concerns an analysis of welfare in the host country. The aggregate utility function, which signifies the welfare of natives (both capital and labor), is  $U = U(D_N, D_T)$ .  $D_N$  and  $D_T$  refer to the demand for non-tradable and tradable goods by native laborers, accordingly.

Total differentiation of the utility function above would derive equation (6) below:

$$dU = \frac{\partial U}{\partial D_N} dD_N + \frac{\partial U}{\partial D_T} dD_T \quad (6)$$

Following the Kondoh's model (1999),  $\frac{\partial U}{\partial D_N} \frac{\partial D_T}{\partial U} = p_N$ , equation (6) can therefore be

rewritten as:

$$\frac{dU}{(\partial U / \partial D_T)} = p_N dD_N + dD_T \quad (7)$$

$U$  is maximized subject to the budget constraint given by equation (8) below:

$$p_N D_N + D_T = pN + T \quad (8)$$

where  $N$  and  $T$  indicate the output of the nontradable and tradable good that a competitive economy consisting only native labors (working with the capital they own) would produce given a price of  $p_N$ .

Differentiating Equation (8) would resulting

$$p_N dD_N + D_N dp_N + dD_T = p_N dN + N dp_N + dT \quad (9)$$

and substituting Equation (9) into Equation (7), enable us to determine the factors that give rise to a change in  $U$

$$\frac{dU}{(\partial U / \partial D_T)} = (N - D_N)dp_N + p_N dN + dT \quad (10)$$

$N$  and  $T$  are output combinations on the natives production possibility frontier chosen when price is and  $dT / dN = -p_N$  so that  $p_N dN + dT = 0$ . The only factor that changes  $U$  is a change in the price ratio. Therefore we derive the conclusion:

$$\frac{1}{\partial U / \partial D_T} \frac{dU}{dL_B} = (N - D_N) \frac{dp_N}{dL_B} \quad (11)$$

Since the nontradable goods is labor intensive, and based on section 3.5 on the analysis of price responses, the inflow of foreign labors lowers the relative price of the nontradable good. Hence the result in equation (11), ie; the natives decrease their production of the nontradable good and start extend trading with the immigrants even though the aggregate production of the nontradable good increases and vice versa. Therefore  $N < D_N$  and  $dp_N / dL_B < 0$  (Equation (3)), thus  $dU / dL_B > 0$ .

### 3.7 Conclusion

This chapter discusses the effect of foreign labor on the host country from an economic point of view. A theoretical model was developed taking into consideration that foreign labors are employed only in the non-tradable sector and that labor endowments (both native and foreign labors) are immobile between sectors. Subsequently, comparative static analysis was conducted to draw the results.



The study theoretically concurs with the theorems of Kondoh (1999) that if the non-tradable good is capital intensive, (i) an increase in the inflow of cross-border labor raises the relative price of non-tradable goods; (ii) an increase in the inflow of foreign labors lowers wage rate and raises rental prices (the opposite result occurs if the non-tradable good is labor intensive). A marginal increase in the inflow of cross-border labor gives rise to an aggregate welfare gain of natives in the host country.

It is interesting to note that even though the model in this study has differing wage rates between labors in tradable and non-tradable goods (instead of having the same wage rate as in the previous study), the analysis in both studies draws the same results. Nevertheless, the author is of the opinion that the quantitative effect of the inflow of foreign labors would be different. This is due to the disparity in labor market size between the models. These circumstances will be addressed in the subsequent study.

In addition, this chapter provides a brief overview of the international labor movement scenario in the Malaysian economy. This chapter provides a basis for detail discussion in Chapter 6 where, the model will be expanded to suit the Malaysian economy and it will be used to analyze the effects of foreign labor on the country.

The study, preliminary in nature, is not without its limitations, particularly the methodology used. The author adopted the methodology established by the previous researcher with some modifications. The model should be tested and calibrated before proper conclusions can be made. Consequently, further in-depth studies are required.

### 3.8 Appendix

$L_B$  being constant, total differentiation of Equations (1a) – (1f) with respect to  $L_N, L_T, K_N, K_T$  and  $p_N$

(A1)

$$N^L dp_N + N^{LL} dL_N + p_N N^{LK} NdK_N = 0 \quad (i)$$

$$T^{LL} dL_T + T^{LK} dK_T = 0$$

(ii)

$$N^K dp_N + p_N N^{LK} dL_N + p_N N^{KK} dK_N - T^{LK} dL_T - T^{KK} dK_T = 0 \quad (iii)$$

$$dL_T = 0 \quad (iv)$$

$$dL_N = 0 \quad (v)$$

$$dK_N + dK_T = 0 \quad (vi)$$

Because  $N(L_N, K_N)$  and  $T(L_T, K_T)$  are linearly homogeneous, we apply Euler's Theorem and obtain

(A2)

$$N^{LL} L_N + N^{LK} K_N = 0$$

$$N^{KL} L_N + N^{KK} K_N = 0$$

$$T^{LL} L_T + T^{LK} K_T = 0$$

$$T^{KL} L_T + T^{KK} K_T = 0$$

Equation (i) and (iii) of (A1) can be expressed, by substituting the other two equations of (A1)

and (A2), as

$$\begin{bmatrix} -k_N p_N N^{LK} & p_N N^{LK} \\ -p_N N^{LK} & \frac{1}{k_N} p_N N^{LK} + \frac{1}{k_T} T^{LK} \end{bmatrix} \begin{bmatrix} dL_N \\ dK_N \end{bmatrix} = \begin{bmatrix} -N^L \\ N^K \end{bmatrix} dp_N$$

$$\Delta = -\frac{k_N}{k_T} p_N N^{LK} T^{LK}$$

and

$$\begin{aligned} \frac{dL_N}{dp_N} &= \frac{1}{\Delta} \left( \frac{1}{k_N} p_N N^{LK} + \frac{1}{k_T} T^{LK} (-N^L) + (-p_N N^{LK} (N^K)) \right) \\ &= \frac{-p_N N^{LK} k_T + k_N (T^{LK} N^L + p_N N^{LK} N^K k_T)}{p_N N^{LK} T^{LK} (k_N)^2} \end{aligned}$$

$$\begin{aligned} \frac{dK_N}{dp_N} &= \frac{1}{\Delta} \left( p_N N^{LK} (-N^L) + (-k_N p_N N^{LK} (N^K)) \right) \\ &= \frac{(N^L + N^K k_N) k_T}{T^{LK} k_N} \end{aligned}$$

$$\begin{aligned} \frac{dw_N}{dL_B} &= \left( N^{LL} \frac{dL_N}{dp_N} + N^{LK} \frac{dK_N}{dp_N} \right) \frac{dp_N}{dL_B} \\ &= \left( -N^{LK} \left( \frac{T^{LK} N^L k_N - p_N N^{LK} (1 - N^L) k_T}{p_N N^{LK} T^{LK} k_N} \right) \right) \frac{dp_N}{dL_B} \end{aligned}$$

$$\begin{aligned}
\frac{dr}{dL_B} &= \left( N^{KK} \frac{dK_N}{dp_N} + N^{KL} \frac{dL_N}{dp_N} \right) \frac{dp_N}{dL_B} \\
&= \left( N^{LK} \left( \frac{T^{LK} N^L k_N + p_N N^{LK} (1 + N^L) k_T}{p_N N^{LK} T^{LK} (k_N)^2} \right) \right) \frac{dp_N}{dL_B}
\end{aligned}$$



# **CHAPTER 4**

## **ECONOMIC INTEGRATION WITH MULTINATIONAL FIRMS**

### **4.1 Introduction**

International trade established through economic integration between nations grows rapidly along with the progress of globalization. Heterogeneous and multinational firms have become very important parts of the subjects in international trade. The firms arrange for the allocation of production worldwide due to the various conditions of factor endowment such as the difference in labor productivity and wage rate between countries. This chapter explains how international trade is being directed towards firms' production allocation in order to seek better ways to minimize production cost and at the same time maximize profit revenues.

Nowadays, it has become possible for heterogeneous firms to look for optimum production

allocation worldwide through the massive development of new communication and transportation technology. The improvement of international infrastructures such as harbors and airports influences the production condition in each country, and therefore brings the difference arrangement of the production allocation of the firms. The scenario eventually causes industrial relocation and capital flow from one country to another.

In the long run, the movement of capital would offer employment opportunities to the native residents and consequently improve their welfares. The new arrangement would create agglomeration of economic activities and the residents will experience changes in socioeconomic environment. This alone would induce people from lower income economy to move to countries with higher income economy. The situation is being described in the framework of new economic geography as the generation of agglomeration forces. This chapter is however focuses on the best location for firms to operate and produce heterogeneous goods under monopolistic competition market.

In the global monopolistic competition market, a lot of heterogeneous firms produce and sell their goods manufactured through heterogeneous productivity. More and more firms with heterogeneous productivity tend to change their location of production through foreign direct investment (FDI), fragmentation and outsourcing. The firms take into consideration the decision of production allocation in the world market.

In this chapter, a general equilibrium model of trade pattern of heterogeneous firms is formulated. The model has two assumptions; i.e, labor productivity and wage rate are different between the two countries, and the difference in production technology between the firms.

Based upon these assumptions, the production allocation of the firms and trade structure between the two countries are endogenous. It is hoped that the model will offer new insights and contribute to the body of knowledge. In the end, the chapter points out the effects of technology improvement (level of firms' productivity), changes of market size, the reduction of transportation cost and the R&D capital investment on the heterogeneous firms' production allocation.

## **4.2 Multinational Firms**

Many studies have been conducted to address the issues related to production activities and production organization of heterogeneous firm. The firms can decide, either to produce in one country and sell for domestic and foreign market through export or they can use foreign direct investment (FDI) to cater both markets respectively. In the event that the firms choose to allocate their production activities in more than one country through FDI, they will be recognized as multinational firms.

This chapter is also partly based on the international trade theory of multinational firm behavior. In the theory, multinational firm acts to achieve profit maximization of total production process and internally controls any risk occurs in its supply chain. The risk could generate from the firm's vertically integrated processes, i.e; production, processing, and marketing/sales of various and relative goods. With the improvement of traffic and information communication technologies, a lot of multinational firms are achieving vertical integration of the production processes and the efficiency of international production allocation in the global market. Due to the international production allocation of the firms, capital accumulation and increase of labor



wage rate will occur in the country with capital inflow. Conversely, it will cause hollow out industry and decrease of labor wage rate in the country with capital outflow.

The model in this chapter is developed based on the Melitz model (2003) and Ricardian comparative advantage, by considering the world economic model with two countries. In the model, a lot of heterogeneous firms produce and sell heterogeneous goods in global monopolistic competition market. It is assumed that the two countries in the model have different labor productivity and wage rate. In addition, the production technology between firms also differs. The firms are also free to choose their production allocation and therefore have to act in line with profit maximization behavior.

In the Helpman, Melitz and Yeaple (2004) model, they focused on the different productivity and also the different fixed cost of the heterogeneous firms. The different fixed cost of the firms is depending upon the firms' decision whether to produce for local consumption only or to include both local and foreign i.e; export and FDI. In addition, their model assumed same wage rate in both countries and the firms can trade freely between the countries. The model presented here however, focuses on the productivity of heterogeneous firms. Based upon the assumptions and analysis in this model, different results from Helpman, Melitz and Yeaple (2004) model were derived. In particular, if the firms are with high difference of productivity between two countries, it will produce all goods in one country and sell the goods to domestic market as well as exporting it to another country. However, if the firms are with low difference of productivity between two countries, it will choose horizontally FDI forms and respectively located in two countries.

The improvement of international infrastructure changes trade cost between two countries. The cost change therefore affects the firm's decision on global production allocation and influences the international capital flow. In view of the aforementioned, this chapter formulates a general equilibrium model of trade between two countries, taking into consideration the heterogeneous firm's decision of production allocation. Next section discusses basic idea for the chapter.

### **4.3 Basic Idea**

There have been a growing number of researches on production allocation and production organization of heterogeneous firm carried out thus far. In the earlier studies, the Internalization theory (Rugman, 2006) and the Flying Geese Paradigm model (Akamatsu, 1935, Kojima, 2003, 2005 and 2006 in Ozawa, 2007) were proposed. In the Internalization theory, the development of heterogeneous firm is formulated to control the risk of production processes and supply chain, which occurred in integration progress of production and sales.

Meanwhile, in the Flying Geese Paradigm model, the dynamic process of international industry movement is described. Afterwards, the new trade theory (Krugman, 1979; Helpman and Krugman 1985; Helpman, 1987; in Kikuchi et al., 2008) emerged. Then, the new economic geography theory on the economies of scale in monopolistic competition market by Fujita et al. (1999, 2006) was introduced. These studies discussed the change of production allocation by management motivation such as the effects of reduction on production cost and transport cost. They also examined the change of wage rate and labor productivity in two countries which industries moved in or out, according to the heterogeneous firms allocation activities.

In addition, some theoretical findings have been mounting up in the field of the new trade theory for the development progress of intra-industry trade, FDI, international outsourcing, and the fragmentation of multinational firm under the increasing return to scales in the monopolistic competition market. Among the new trade theory, Grossman and Helpman (2002) proposed a two countries outsourcing model for multinational firm's decision on which intermediate goods input to outsource and where to outsource. That is, the intermediate goods input required by the firm's production process. And the firm has to select whether to outsource or to produce the intermediate goods.

Shortly afterwards, Grossman and Helpman (2005) developed a general equilibrium model for production allocation and explained why it causes intra-industry trade in which firms in industry must outsource a particular activity. Hubler (2007) proposed a Cournot competition model for firm's outsourcing. He analyzed the EU countries expanding process of multinational firm's production allocation from high wage rate area to low wage rate area. He obtained a theoretical finding that the production allocation of multinational firm is more affected by the effect of substitution between high wage labor and low wage labor in the same area rather than substitution effect of low wage labor in different areas.

In the field of the new economic geography, general equilibrium model is used to analyze effects of transportation cost on global production and trade structures by adopting the idea of the new trade theory. Fujita et al. (2006) analyzed FDI mechanism that firms implement to invest directly in two countries. When traffic and communications costs increase, the production allocation of firms is arranged in the home country. On the other hand, when the traffic and communications costs decrease, the production allocation of the firms is relocated

from home country to another country where the production cost is lower.

Moreover, Dornbusch, Fischer, and Samuelson (1977), (Hereafter, it is called the DFS model) discussed the Ricardian model to determine which country have comparative advantage concerning the continuum of goods distributed under constant return technique in the economies of scale. In the model, the goods produced between two countries are endogenously decided in accordance to constant change of labor input required to produce one unit of heterogeneous goods distributed continuously. Matsuyama (2007) proposed a model, wherein the price of production factors is endogenously decided due to constant continuum of goods. His model was constructed based upon the DHS model. Production technology of goods is different between industries and tradable goods depend upon the comparative advantage and destination. These factors are essential in determining the location to supply the goods to consumers.

There are many literatures sought to incorporate the model of heterogeneous firm behavior for analyzing the above trade phenomenon. In response, 'new' trade theory incorporated imperfect competition and increasing returns to account for intra-industry trade. The modeling approaches adopted by the 'new' trade theory assumed the heterogeneity among firms with same production behavior for simplification. Recent empirical evidence, however, shows that behavior differences among firms are crucial to understand the world trade.

Firms heterogeneity within sector may be more pronounced than differences between sectors and most firms – even in traded-goods sectors – do not export at all. In view of that, what might be called the 'new new' trade theory emerged; incorporating firm-level heterogeneity to

account for the many of the new firm-level facts. The main theoretical papers in this rapidly expanding literatures are Melitz (2003), Helpman, Melitz and Yeaple (2004), Baldwin (2005) and Melitz and Ottaviano (2005).

In the Melitz model, depending on productivity and production fixed cost, the heterogeneous firms within sector will have different production behavior. This is because the Melitz model focused on the different productivity between firms. It ignored the wage difference among the countries. Heterogeneous firms will have to pay more and more fixed cost if the firms sell goods in domestic, export or FDI in foreign country. In other words, the productivity and level of fixed cost will influence the firms' production behavior.

These studies, however, are insufficient in the sense that international capital flow was not included in those models. They were simplified in order to reduce complexities and to suit the convenience of analysis. The models considered only labor as production input factors and discussed briefly the production allocation decision of firm with the wage rate change.

In contrast to the aforementioned literatures, Martin and Rogers (1995), Baldwin et al. (2003) and Zeng (2008) integrated both labor and capital as production input factors in their models. Martin and Rogers (1995) particularly established a model to study the trade in which domestic and international transport infrastructures are asymmetric between countries. Their models (thereafter called footloose capital (FC) model in the subsequent literatures), i.e; Baldwin et al. (2003) and Zeng (2008) assumed that capital is mobile and labor is immobile.

These literatures emphasized FC model in their studies. And capital is considered as fixed

cost, for example; R&D investment at firms' level. The firms are assumed to operate with same production technology, produce same level of output and use same mill price within the same industry. They seemed to ignore the different production technology between firms in the same industry.

In all of the above studies, the traffic of trade is only in one way. They explained the situation whereby there are only two countries, home and foreign and firm's relocation is only from home to foreign country. That was how the effects of multinational firm production allocation were analyzed. Thus, it is believed that the studies failed to explain the global level of heterogeneous firm behavior.

Consequently, the two countries, two factors and two goods model in this chapter is developed by incorporating the production technology difference at firms' level and it is used to analyze the behavior of its production allocation. The chapter particularly focuses on the conditions that firms decided upon when choosing the production allocation, i.e; whether to locate in one country and export to another or to locate in both countries at the same time. In a nutshell, this chapter aims to propose a general equilibrium model in order to understand the mechanism of decision behavior of heterogeneous firms on production allocation.

## **4.4 General equilibrium model**

### **4.4.1 Assumptions**

The model assumes the world economic with two countries,  $N$  and  $S$ . As shown in Figure 4.1,

there are two sectors producing heterogeneous goods and homogenous goods respectively. The heterogeneous goods are horizontally differentiated with  $i \in [0, n]$  as its continuous variables. However, there is only one type of homogenous goods in the world economic. The total number of menu for heterogeneous goods is normalized as 1. Consumers in the two countries can buy both types of goods.

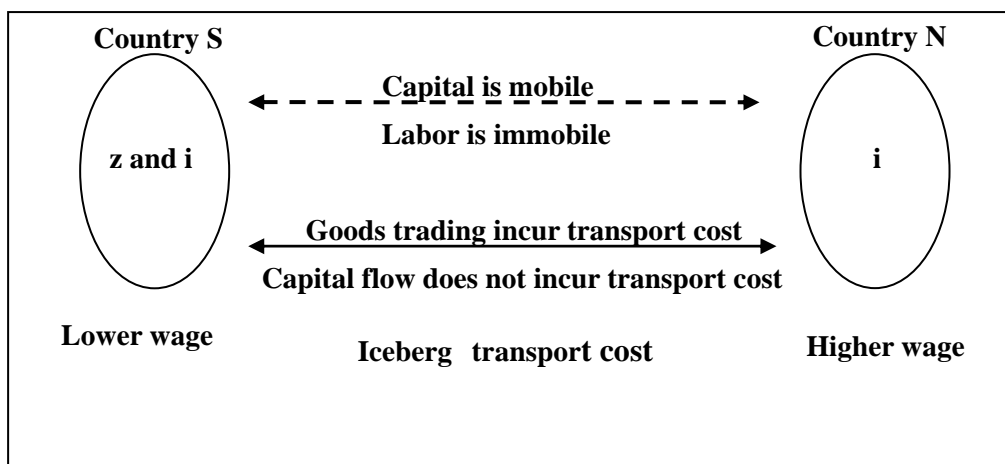


Figure 4.1: The assumptions for the model

Heterogeneous goods are produced by heterogeneous firms and sold in global monopolistic competition market and one heterogeneous goods  $i \in [0, n]$  is produced by only one firm,  $i \in [0, n]$  in the world. A heterogeneous firm  $i \in [0, n]$  produces the heterogeneous goods  $i \in [0, n]$  but labor productivity of the goods and wage rate are different between the two countries. The heterogeneous firms act based on the principle of profit maximization and can freely choose their optimum production allocation whether to be in only one country or both. Hence, from the model it is possible to get both tradable and non-tradable heterogeneous goods, endogenously.

However, homogenous goods  $z$  are produced under perfectly competitive market. To

produce one unit of homogenous good, the firm only needs one unit of labor input. This is because it is further assumed that the wage rate of  $N$  country is higher enough than the wage rate of  $S$  country. Even though transportation cost exists, all homogenous goods  $z$  are produced in  $S$  country. But, the heterogeneous firm produces goods using both labor as marginal cost and R&D capital as fixed cost inputs for firm's production. This is because every heterogeneous firm has different labor productivity in both countries. Prior to penetrating and producing goods in the monopolistic competition market, the heterogeneous firms must pay  $K_D$  capital investment and afterward it will get the labor productivity  $\mu_N, \mu_S$  that are generated from a density function  $G[\mu]$ . The firms depend on the labor productivity  $\mu_N, \mu_S$  and  $K_D$  and can freely decide whether to enter the world market or exit and therefore loss their  $K_D$  capital as sunk cost. Nevertheless, once firms pay the R&D investment  $K_D$  unit capital and decided to enter the market to produce goods, they only need labor as marginal cost in the production process.

The income of consumers in each country is gained from wage and rental of capital. Consumers' capitals are given in both countries. All incomes are consumed to buy goods, and consequently, no savings. The capital in both countries is mobile and the international interest rate is endogenous. Furthermore, the population in the two countries  $L_j (j = N, S)$  is exogenous and fully employed. Labor is immobile and the wage rate of labor in each country is determined by the full employment level. It is assumed that the wage rate is different in the two countries;  $w_N > w_S$ . Consumers earn their income from wage and rental of capital and buy heterogeneous goods and homogenous goods according to utility maximization behavior. Here the Icebergs type transportation cost of goods between two countries is applied, particularly if  $t(> 1)$  unit goods transported; only 1 unit goods will arrive. No transportation cost



of capital exists.

#### 4.4.2 Consumer behavior

Preference of consumer described by the Dixit and Stiglitz (1977) utility function is as follows:

$$U(z_j, x_j(i)) = z_j^{(1-\alpha)} \left[ \int_0^n x_j(i)^\rho di \right]^{\frac{\alpha}{\rho}} \quad (1)$$

$z_j$  is consumption of homogenous goods of consumers in  $j(j = N, S)$  country, while  $x_j(i)$  is consumption of heterogeneous goods in  $j$  country.  $\alpha, \rho$  are parameters, denote  $0 < \rho < 1, 0 < \alpha < 1$ , respectively. Income condition of consumer in  $j$  country is defined as below:

$$q_j z_j + \int_0^n p_j(i) x_j(i) di = e_j \quad (2)$$

$$e_j = w_j + r k_j$$

$q_j, p_j(i)$  denote the price of homogenous goods and heterogeneous goods, respectively.  $e_j$  denotes income of consumer whereas  $w_j$  is the wage rate in  $j$  country.  $k_j$  denotes capital owned by consumer and it is exogenous, whilst  $r$  denotes rental of capital.

Consumer's utility maximization is defined by the following equations:

$$\max_{z_j, x_j(i)} U(z_j, x_j(i)) \quad (3)$$

$$\text{subject to } q_j z_j + \int_0^n p_j(i) x_j(i) di = e_j \quad (4)$$

Consumption of homogenous goods and heterogeneous goods by each consumer in  $j$  country is formulated below:

$$Z_j = (1-\alpha)e_j / q_j \quad (5a)$$

$$x_j(i) = \alpha e_j \{p_j(i)\}^{-\sigma} \{P_{mj}\}^{\sigma-1} \quad (j = N, S) \quad (5b)$$

here,  $P_{mj}$  denotes price index of heterogeneous goods in  $j$  country. It can be represented as follows:

$$P_{mj} = \left[ \int_0^n \{p_j(i)\}^{1-\sigma} di \right]^{\frac{-1}{1-\sigma}} \quad (j = N, S) \quad (6)$$

$\sigma = 1/(1-\rho)$  refers to the elasticity of substitution of heterogeneous goods. In addition, indirect utility of consumer is derived by combining equation (1) with equations (5a) and (5b) as shown in equation (7):

$$V_j = (1-\alpha)^{1-\alpha} \alpha^\alpha e_j (q_j)^{-(1-\alpha)} (P_{mj})^{-\alpha} \quad (7)$$

Total consumption of homogenous goods and heterogeneous goods in both markets is derived as:

$$Z_S = (1-\alpha)E_S / q_S \quad (8a)$$

$$Z_N = (1-\alpha)E_N / tq_S \quad (8b)$$

$$Z = Z_S + Z_N \quad (8c)$$

$$Y(i) = x_N(i)L_N + x_S(i)L_S = y_N(i) + y_S(i) \quad (8d)$$

$$y_j(i) = \alpha E_j \{p_j(i)\}^{-\sigma} \{P_{mj}\}^{\sigma-1} \quad (j = N, S) \quad (8e)$$

where,  $Z$  is the total consumption of [homogenous](#) goods in the two countries.  $y_j(i)$  means consumption of goods  $i$  in  $j$  country. Meanwhile,  $Y(i)$  is the total demand of  $i$  goods in the two countries. And  $E_j$  is total income in  $j$  country as shown by the following function:

$$E_j = (w_j + rk_j)L_j \quad (j = N, S) \quad (9)$$

#### 4.4.3 Firm behavior

First, the section discusses homogenous firm behavior where the behavior of firm producing homogenous goods is described here. It is assumed that in order to produce one unit of homogenous goods  $z$ , the firm needs one unit of labor input.  $W_S$  is the number of labor invested to produce homogenous goods  $z$  in country  $S$  as formulated below:

$$W_S = (1 - \alpha) \left( \frac{E_N}{tw_S} + \frac{E_S}{w_S} \right) \quad (10)$$

However, it should be noted that the wage rate between two countries must be:

$$w_N > tw_S \quad (11)$$

This is because homogenous goods are produced only in  $S$  country.

On the other hand, for heterogeneous firms, when the firms pay R&D investment as sunk cost in their production, thereafter they will get the labor productivity  $\mu_N, \mu_S$  by density function  $G[\mu]$ . Subsequently, the firms face into market and produce goods if the productivity index is low. Conversely, it will exit the market and lose the sunk cost  $K_D$ , if the productivity index is very high. Once the heterogeneous firms decided to enter the market, they can freely choose to allocate their production in one country and export to another or in both countries at the same time. In practical, the firms could produce all goods in one country and export to another, or the firms can choose horizontally FDI in both countries and sell goods for local consumption in the countries, respectively. It should be noted that the effect of the price change of specific goods to price index in each country is indifferent because it is assumed that there are innumerable types of heterogeneous goods.

Now let's consider that firms decide to enter the market. Under the monopolistic competition market, the firms' profit can be described as follows:

$$\pi_j(i) = (p_j(i) - \mu_j(i)w_j)y_j(i) - rK_D = p_j(i)^{1-\sigma} \frac{\alpha E_j}{\sigma P_{mj}^{1-\sigma}} - rK_D \quad (12)$$

In equation (12),  $p_j(i)$  is equilibrium mill price of heterogeneous goods  $i$ ,  $y_j(i)$  represents the consumptions of  $i$  which are produced in  $j$  country. In equation (12), it shows that

firm's profit depends on the equilibrium mill price  $p_j(i)^{1-\sigma}$  if  $\frac{\alpha E_j}{\sigma P_{mj}^{1-\sigma}} - rK_D$  is same in the

sector. That is, the lower the mill price, the more profitable the firms. So, there must exists a cut-off level mill price just to cover the fixed cost and generate zero profit. If a firm's mill price is lower than the cut-off level, the firm will earn positive profit, but if a firm's mill price is higher

than the cut-off level, the firm will exit the market and lose its R&D investment  $K_D$ . Hence, the heterogeneous firm must search for the lowest mill price for its production.

The cut-off condition for a heterogeneous firm is zero profit in all the production possibility, as shown below:

$$\pi_{cutoff} = \max \left\{ \pi_{cutoff}^N, \pi_{cutoff}^S, \pi_{cutoff}^{FDI} \right\} \quad (13)$$

It should be noted that in the long-run equilibrium, under monopolistic competition market, equilibrium mill price of heterogeneous goods  $i$  in two countries is respectively described as:

$$p_S(i) = w_S \frac{\mu_S(i)}{\rho} \quad \text{and} \quad p_N(i) = w_N \frac{\mu_N(i)}{\rho} \quad (14)$$

In equation (14), the mill price depends on the labor wage rate and firm's productivity. By comparing the above mill prices, let's now consider how to find the lowest mill price in the two countries.

The heterogeneous firms that produce heterogeneous goods  $i$  are free to choose their production allocation. Consequently, firms' behavior summarizes the options of the equilibrium price as follows:

$$\begin{aligned} p_N(i)/p_S(i) > t & \text{ located in } S \text{ country} \\ p_N(i)/p_S(i) < \frac{1}{t} & \text{ located in } N \text{ country} \\ t \geq p_N(i)/p_S(i) \geq \frac{1}{t} & \text{ located in both countries} \end{aligned} \quad (15)$$

A firm produces heterogeneous goods distributed continuously in  $(0, n)$ ,  $n$  refers to the

number of heterogeneous firms survive in the market. These firms decide their production allocation by considering the wage rate and transportation cost between the two countries.

Next, the chapter renews the range of firms by their rate of technical productivity, and introduce function  $A(i) = \mu_N(i) / \mu_S(i)$ , which means the rate of technical productivity, in here. As shown in Figure 4.2, function  $A(i)$  are considered as decreasing function of  $i$ . By bringing equations (14), firms producing heterogeneous goods  $i$  ( $i \in [0, n]$ ) are located in the countries according to the following production allocation patterns; firms producing all goods  $i$  ( $i \in [0, m_S]$ ) are located in  $S$  country and export to  $N$  country, while  $i$  firms producing all goods ( $i \in [m_N, n]$ ) are located in  $N$  country and export to  $S$  country, and  $i$  firms producing ( $i \in [m_S, m_N]$ ) are located in both countries as horizontally FDI.

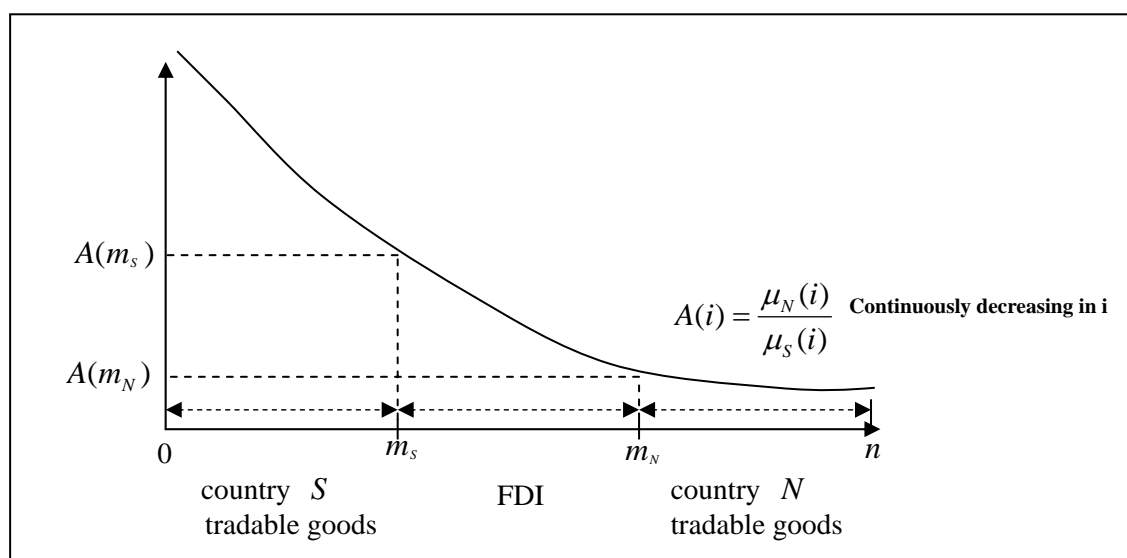


Figure 4.2: Pattern of trades (based on Matsuyama, 2007)

Refer to marginal firms, the threshold  $m_S, m_N$  is derived below:

$$A(m_S) = \frac{\mu_N(m_S)}{\mu_S(m_S)} = \frac{tw_S}{w_N} \quad (16a)$$

$$A(m_N) = \frac{\mu_N(m_N)}{\mu_S(m_N)} = \frac{w_S}{tw_N} \quad (16b)$$

Accordingly, the profit of company  $i$  ( $i \in [0, m_S]$ ) located in  $S$  country and the profit of company  $i$  ( $i \in [m_S, n]$ ) located in  $N$  country are similarly described below:

$$\pi_j(i) = p_j(i)^{1-\sigma} \frac{\alpha E_j}{\sigma P_{mj}^{1-\sigma}} + t^{1-\sigma} p_j(i)^{1-\sigma} \frac{\alpha E_{j^*}}{\sigma P_{mj^*}^{1-\sigma}} - rK_D \quad (17)$$

Where,  $j, j^* = N, S; j \neq j^*$ . It means that firm will produce all goods in one country and export to another.

Similarly, the profit of company  $i \in [m_S, m_N]$  located in two countries is described as follows

$$\pi(i) = p_N(i)^{1-\sigma} \frac{\alpha E_N}{\sigma P_{mN}^{1-\sigma}} + t^{1-\sigma} p_S(i)^{1-\sigma} \frac{\alpha E_S}{\sigma P_{mS}^{1-\sigma}} - rK_D \quad (18)$$

It means that the firm will choose horizontally FDI in both countries and sell goods to the domestic market, respectively. These firms will become multinational firms.

Finally, all potential firms can freely enter the monopolistic competition market. However, before the firms decide to join the market, they must compare the expected average operation profit of a new entrant and R&D investment  $K_D$ . According to the cut-off condition, the expected average operation profit should match the R&D investment  $K_D$ . In the market, the total  $n$  firms should earn  $\alpha(E_N + E_S)/\sigma$  income in the two countries. Therefore, for all potential firms that can freely enter the market, their expected average profit should match the R&D investment  $K_D$ . The expected average profit for all potential firms is zero, as shown

below:

$$rK_D \frac{1}{G(\mu_1)} = \frac{\alpha(E_N + E_S)}{\sigma n} \quad (19)$$

where,  $G(\mu_1)$  is the probability of total potential firms can successfully enter the market.

#### 4.4.4 Equilibrium

Labor is immobile and fully employed by firms located in each country. The number of population is given exogenously. The equilibrium of labor market in  $S$  country is defined as:

$$L_S = W_S + \int_0^{m_S} \mu_S(i)(ty_{SN}(i) + y_S(i))di + \int_{m_N}^{m_S} \mu_S(i)y_S(i)di \quad (20)$$

$W_S$  means labor input in producing homogenous goods, the second R.H.S refers to labor employed by the company  $i$  ( $i \in [0, m_S]$ ) in  $S$  country and the third R.H.S refers to labor employed by the company  $i$  ( $i \in [m_N, m_S]$ ) in  $S$  country.

Similarly, the equation of labor market equilibrium in  $N$  country is defined as:

$$L_N = \int_{m_N}^n \mu_N(i)(ty_{NS}(i) + y_N(i))di + \int_{m_S}^{m_N} \mu_N(i)y_N(i)di \quad (21)$$

It is also assumed that capital market is open. The equilibrium of the capital endowment in two countries which is invested for firms' production is described below:

$$(n + \bar{n})k_D = L_S K_S + L_N K_N \quad (22)$$

It is important to note that R.H.S. is total capital owned by the consumers in both countries.



The L.H.S means capital invested by successful entrant firm and failure firm. Where  $n$  means the number of successful entrant firm,  $\bar{n}$  means the number of failure firm.

The rental of capital is same in both countries. And the international balance of payments can be described by equation (23). To simplify the analysis, it is assumed that the firms which decide horizontally FDI in two countries should get equal capital from the two countries. It is also assumed that trade cost for tradable goods is paid by consumers in each country, and the balanced international trade condition of  $S$  country therefore derives:

$$\begin{aligned} tq_S Z_N + \int_0^{m_S} tp_S(i) y_{SN}(i) di - \int_{m_N}^n tp_N(i) y_{NS}(i) di \\ = r \left( \int_0^{m_S} K_D di + \int_{m_S}^{m_N} \frac{K_D}{2} di - k_S L_S \right) \end{aligned} \quad (23)$$

The first L.H.S refers to export volume of homogeneous goods produced in  $S$  country. The second L.H.S is export volume of heterogeneous goods produced in  $S$  country. Last term of L.H.S is import goods produced in  $N$  country, while R.H.S is the capital flow from  $S$  country.

When the condition of international balance of payments in  $S$  country is satisfied, then the condition of international balance of payments in  $N$  country will automatically be satisfied.

The equilibrium solution is realized by solving the above equations. In the general equilibrium model discussed earlier, the equations derived 16 endogenous variables;

$P_{mj}, W_S, E_j, w_j, m_j, r, n, \bar{n}, y_j(i), y_{j\nu}(i)$  where  $(j, \nu = N, S, j \neq \nu)$  if

$k_j, K_D, L_j, t, G(\mu), G(\mu_1)$  ( $j = N, S$ ) are given exogenously. And  $\rho, \alpha, \sigma$  are the

parameters. Additionally, it is assumed that wage rate of  $S$  country is numeraire, and

thus,  $w_S = 1$ .

## 4.5 Comparative statics analysis

Based on the analysis, it is possible to get the general equilibrium model of firms' production allocation between two countries. Comparative statics analysis was formulated to analyze the change in the aspects of transport cost, market size, technology improvement and R&D capital. In particular, most firms' allocation change depends on the threshold  $m_N, m_S$  by changing the facts in the aforementioned aspects.

### 4.5.1 The impact of decreasing transport cost between two countries

From the assumptions in the model, the transport cost not only means real transport cost, but also includes trade barriers between two countries. Transport cost is a very important fact that influences firms' decision on production allocation in the monopolistic competition market.

Here the transport cost decreasing proportionally in two countries is being considered.

According to equations (16a) and (16b), new equations are derived as follows:

$$\frac{\partial m_S}{\partial t} = \frac{\partial m_S}{\partial A(m_S)} \frac{\partial A(m_S)}{\partial t} = \frac{\partial m_S}{\partial A(m_S)} \frac{w_S}{w_N} \quad (24)$$

$$\frac{\partial m_N}{\partial t} = \frac{\partial m_N}{\partial A(m_N)} \frac{\partial A(m_N)}{\partial t} = \frac{\partial m_N}{\partial A(m_N)} \frac{w_S}{w_N} \left(-\frac{1}{t^2}\right) \quad (25)$$

Function  $A(i)$  is decreasing function in  $i$ . Hence,  $\frac{\partial m_S}{\partial t} < 0$  and  $\frac{\partial m_N}{\partial t} > 0$ . Consequently,

$m_S', m_N'$  which are the new thresholds by change in  $t$ . It is shown in Figure 4.3 below:

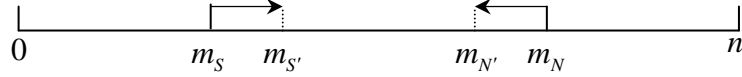


Figure 4 3: Decreasing in transport cost

Thereby,  $m_S$  increases, but  $m_N$  decreases. In other words, some firms change their horizontally FDI to export trade pattern, and other firms are likely to relocate in one country and export to another. It is also known that decreasing transport cost would make trade pattern clearer through comparative advantage theory.

If firms can trade freely between two countries,  $t' = 0$ . Therefore, no firms will choose horizontally FDI trade pattern and thus, all firms have to locate in one country and export to another. The firms' allocation pattern is fully determined by comparative advantage between two countries.

Next, the effect of decreasing transport cost on the welfare of consumers in two countries is discussed. The wage and income of consumers is fixed but the price index of heterogeneous goods in the market will decline due to the price falling in import of heterogeneous goods through the decreasing transport cost.

$$\frac{\partial V_j}{\partial t} = \frac{\partial V_j}{\partial P_{mj}} \frac{\partial P_{mj}}{\partial t} = -\alpha(1-\alpha)^{1-\alpha} \alpha^\alpha e_j (q_j)^{-(1-\alpha)} (P_{mj})^{-\alpha-1} \frac{\partial P_{mj}}{\partial t} < 0 \quad (26)$$

Thus, from to the indirect utility function of consumers (equation (7)), equation (26) is derived.

In equation (26), it shows that the welfare of consumers in two countries will obviously become better by decreasing transport cost.

#### 4.5.2 The impact of technical progress

This section considers the impact of technical improvement. Equations (16a) and (16b) show that labor productivity also has influence on the trade pattern of firms in two countries. If the technical progress happens in a country, firms can cut down the number of input labor to produce unit goods. As a result, the firms can lower the mill price and generate more profits. Eventually, it will attract firms from the other country to move to the country with technical progress.

The model presented in this chapter assumes the Harrod-Neutral technical progress; the technical progress which increases the efficiency of labor, so that the labor force in efficiency units increases faster than the number of workers available. However, this technical progress ignores the capital input progress and this form is known as labour –saving technical progress.

If the Harrod-Neutral technical progress happened proportionally in two countries, the technical productivity will become lower due to technical improvement. In this situation, according to equations (16a) and (16b), there will be no effect on the threshold change in trade pattern.

In addition, if the Harrod-Neutral technical progress is imbalance in two countries, for convenient of analysis, it is assumed that technical progress only happened in  $S$  country and so the technical progress in  $N$  country will remain unchanged.

$$\frac{\partial m_s}{\partial \mu_s} = \frac{\partial m_s}{\partial A(m_s)} \frac{\partial A(m_s)}{\partial \mu_s} \quad (27)$$

$$\frac{\partial m_N}{\partial \mu_S} = \frac{\partial m_N}{\partial A(m_N)} \frac{\partial A(m_N)}{\partial \mu_S} \quad (28)$$

According to firm's mill price, equation (14) and definition of  $A(i)$ , the  $\frac{\partial m_S}{\partial \mu_S} < 0$  and

$\frac{\partial m_N}{\partial \mu_S} < 0$ . In Figure 4.4, the lower mill price will cause some firms to relocate their horizontally

FDI production from  $N$  country and change their location and produce all goods in  $S$  country. On the other hand, some firms that produce all goods in  $N$  country will change to horizontally FDI and will locate in both countries. Finally, technical progress in  $S$  country will cause the firms in  $N$  country to take place the firm in  $S$  country, and therefore increasing the number of firms in  $S$  country.

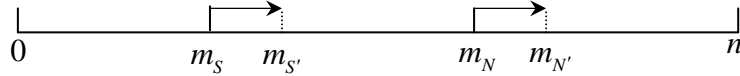


Figure 4.4: Harrod-Neutral technical progress in  $S$  country

### 4.5.3 The impact of market size

This section describes the effect of the changing nation population and market size on the firms' production allocation. The market size can influence the firms' production allocation by the so called Home Market Effect which has been introduced in several new trade theory studies. The model provides evidence on the effect of changing nation population on firms' decision on production allocation.

It is assumed that the increasing population in  $S$  country (for example, by urbanization in the

developing countries) will consequently make the total population to become  $\theta L_S$  ( $\theta > 1$ ). Total income in the country is fixed and the average income of a consumer is  $e_{S'} = e_S / \theta$ . Therefore, the average wage of a labor is  $w_{S'} = w_S / \theta$ . The income and wage of consumers will proportionally decrease from the rising number of population.

From equations (16a) (16b), new equations are formulated as follow:

$$\frac{\partial m_S}{\partial w_S} = \frac{\partial m_S}{\partial A(m_S)} \frac{\partial A(m_S)}{\partial w_S} = \frac{\partial m_S}{\partial A(m_S)} \frac{t}{w_N} \quad (29)$$

$$\frac{\partial m_N}{\partial w_S} = \frac{\partial m_N}{\partial A(m_N)} \frac{\partial A(m_N)}{\partial w_S} = \frac{\partial m_N}{\partial A(m_N)} \frac{1}{t w_N} \quad (30)$$

In the above equations (29) and (30), the  $\frac{\partial m_S}{\partial w_S} < 0$  and  $\frac{\partial m_N}{\partial w_S} < 0$ . The new thresholds become larger than the original thresholds. The  $A(i)$  decreasing in  $i$ , hence  $m_{S'} > m_S, m_{N'} > m_N$  as shown in Figure 4.5 below. It is the same result with technical progress in  $S$  country. In particular, it will cause some firms to relocate their horizontally FDI production from  $N$  country to change their location and produce all goods in  $S$  country. On the other hand, some firms produce all goods in  $N$  country will change to horizontally FDI and relocate the firms in both countries. Finally, market size will be increasing in  $S$  country due to the firm relocation from  $N$  to  $S$  country, and therefore increasing the number of firms in  $S$  country.

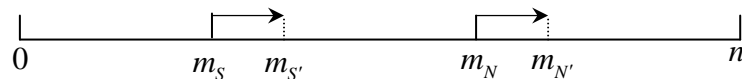


Figure 4.5: Market size increasing in  $S$  country

From to the above analysis, some firms will relocate from  $N$  country to  $S$  country. Furthermore, it will cause the relative wage imbalance between the two countries. That is, some firms with horizontally FDI originally in  $N$  country will change their production pattern and relocate to  $S$  country and export goods to satisfy the consumption in  $N$  country. While some firms that originally produce all goods in  $N$  country and export to  $S$  country will now change their production pattern to horizontally FDI and relocate in both countries. In the end, this will cause the relative wage rise in  $S$  country and wage decline in  $N$  country.

#### **4.5.4 The impact of decreasing R&D capital**

In the model, the R&D capital such as sunk cost and fixed investment will influence the average expected profit of new entrants in the market. It determines firms with what kind of productivity are qualified to enter the market. In other words, lower R&D capital sunk cost can make it easier for firms with lower productivity, therefore increase the number of survival firms in the market.

The model assumes that there must be some firms with lowest productivity which will loss their R&D capital as sunk cost before entering the market. The R&D capital is also considered as venture capital. If R&D capital is decreased for each potential firm, it will eventually attract more potential firms to enter the market. The capital investor can disperse the risk in the global capital market. In due course, it will increase the number of potential firms to enter the market and increase the welfare of consumers in the two countries.

The R&D capital cannot affect the firms' production allocation, but according to the analysis in

the comparative statics, it will cause capital flow and increase the rental of capital in the country with capital inflow. To explain this phenomenon, this section provides an example of international trade between Japan and China.

In the past decade, the problem of hollowing out industry in Japan and the foreign exchange increasing rapidly in China and it has become a very important issue in the regional economics development. Many Japanese firms changed their production allocation from Japan to China due to the lower wage rate and improving labor productivity in the country. This situation causes capital flow in the two countries. However, because there are only a few capital hold in China, the firms' production allocation had increased the capital rental in the country and as a result, it attracted more potential firms to enter the market. Finally, the equilibrium capital rental increased due to capital flow between the two countries.

#### **4.6 Conclusions**

This chapter discussed the current issue in globalization, economic integration and optimum production allocation of heterogeneous firm. To analyze the above, a general equilibrium model that integrates the comparative advantage theory and new economic geography theory which have been widely applied to diverse fields such as international trade and macroeconomics was proposed. In this two countries model, the heterogeneous firms use mobile R&D capital as fixed cost and immobile labors as marginal cost under monopolistic competition and economies of scales. And it is assumed that labors productivity and wage rate are different in the two countries.



R&D capital is assumed as fixed cost and only has effect on new potential entrants. The R&D capital is independent upon the pattern of firms' allocation production. Different result was derived from Helpman, Melitz and Yeaple (2004) model. In particular, if the firms are with high difference of productivity between two countries, it will produce all goods in one country and sell the goods to domestic market as well as exporting it to another country. However, if the firms are with low difference of productivity between two countries, it will choose horizontally FDI forms and respectively located in two countries.

The model is mainly applied in heterogeneous firms that consider the costs associated with the different production technologies between firms and transportation cost between two countries. And the mechanisms used by the firms in determining their production allocation of whether to operate in any one country or both countries at the same time were also analyzed. The model was then expanded to analyze the effects of technology improvement (level of firms' productivity), changes of market size, the reduction of transportation cost and the R&D capital investment on the heterogeneous firms' production allocation and promote trade liberalization between two countries.

This chapter did not directly discuss international labor movement. However, it is important to note that the situations mentioned in the chapter would eventually, in the long run create employment opportunities to native residents in the respective countries. It is interesting to note that the movement of capital discussed in this chapter does have effect on labor market.

# CHAPTER 5

## CGE MODELING WITH INTERNATIONAL LABOR MOVEMENT

### 5.1 Introduction

Integration of world economy creates demand for quantitative analysis of policy issues on a global basis. In relation to that, there has been a development of great interest in estimating the impact of international agreements on individual countries, international trade, and worldwide welfare. This chapter aims to discuss the global comparative static general equilibrium modeling approach which is commonly adopted in policy analysis. Consequently, a static CGE (Computable General Equilibrium) model is introduced in order to appreciate the basic framework of CGE model. CGE models provide theoretical general equilibrium framework for simulating answers to 'what if' questions that are the heart of the most policy analysis.

A brief description of GTAP model and Data Base and the development of Global Migration models (GMig and GMig2) are also presented herein to provide basic understanding on the structure of the CGE model used in the study. Furthermore, this chapter provides an overview on the theoretical framework of GTAP and GMig2 including the assumptions and structures of the models. The structure of the model is the framework adopted for simulation process using GEMPACK software as to be described in Chapter 6.

## **5.2 Computable General Equilibrium (CGE)**

Computable general equilibrium (CGE) models provide a comprehensive macro-economic framework to describe market-oriented economies. It consists of three major components; consumer, producers (firms) and markets. Consumers comprise private household and government household while producers are firms producing output in the market. Consumers decide demand of commodities and supply of their endowments. Producers decide demand of inputs and supply of outputs.

The model is designed to produce conditional projections of the 'what if' type of policy analysis. An example of policy change is if there is a 20 percent cut in the import of foreign labors, the model would be able to simulate the effects of this change on output, export, imports, wages, and other economic values. In addition, the model assumes cost minimization and profit maximization behavior for producers and utility maximization for consumers. The different economic agents in the model adjust their behavior in response to changes in market prices.

Quantity and price of consumption, output, import, exports, and etc. in each sector and

commodity can be computed to show economic activities in detail. Depending upon the availability and quality of data, it often enable users to analyze sector-specific as well as economy wide issues in detail by initially distinguishing several economic sectors such as agriculture, manufacturing, construction, services and so on. Trade liberalization analyses are one of the most frequently discussed issues for CGE analyses. However, due to its importance, many other policy analysis researches has been developed using the models.

The most distinctive feature of CGE models is data requirements. We usually need a large amount of time series data to estimate a model econometrically. On the contrary, CGE models require input-output (I/O) tables and basic national accounts for a single year. Therefore it is indeed a suitable solution to be utilized as a tool in empirical analyses in the situations where data are scarce.

CGE models are among the most influential tools in applied economics. However, some serious questions have been raised about the empirical validity of these models. One such critique is McKittrick (1998). According to him, the core of the critique is that the parameter selection criteria are unsound and the use of first-order (CES class) functional forms imposes influential restrictions in the model's structure. Through a series of comparative simulations conducted, he found out that the functional structure appears to strongly influence the results from a policy simulation at both the industry-specific and macroeconomic levels, for large and small policy shocks.

Meanwhile, Rauscher (1999) in his review of Hertel's *Global Trade Analysis*, observed that to many economists, computable general equilibrium (CGE) models are a bit dubious. They are

huge, they are complex, and they appear to be large black boxes that produce results that cannot be traced to an accessibly small set of simple assumptions or axioms. He also mentioned on the positive side that the book is an introduction into the structure of this GGE model. Accordingly, the authors provide an overview of the basic model features which is instructive and accessible in spite of the model's complexity. He concluded that the GTAP research group has developed a global CGE modeling framework in a way which substantially reduces the initial investment to be undertaken by first-time users of such models.

In response to the above review, Meagher, Adams and Horridge (2000) in their paper describes the application of the MONASH CGE model to labor market forecasting in Australia, an application which they expressed, 'supports a commercially viable briefing service for policy analysts and for which Rausher's cautionary observation is both particularly relevant and specifically addressed'.

The requirement of reliability is fundamental for the purpose of policy analysis. However, given the present state of economic knowledge, it is clear that any attempt at disaggregated medium-term economic forecasting will result in mixed success. Whatever measure of accuracy is chosen, the forecast for some variables will turn out to be 'highly' accurate while those of others might not.

At the end of the paper, Meagher, Adams and Horridge (2000) stated that the forecasting system has been designed to address labor market analyst's requirements for detail, accessibility and transparency, and has achieved a reasonable measure of success in those regards. It is therefore can be concluded that while true reliability remains a more elusive goal,

almost all economic decision making is subject to similar uncertainty because it is forward looking. Hence, the accuracy of any particular forecasting methodology should properly be compared with the accuracy of the best available alternative, and not of some non-operational ideal.

### **5.3 Global Trade Analysis Project (GTAP)**

GTAP or The Global Trade Analysis Project is an alternative data source established in 1992, with the objective of lowering cost of entry for those seeking to conduct quantitative analyses of international economic issues in an economy wide framework. GTAP is coordinated by the Center for Global Trade Analysis, which is housed in the Department of Agricultural Economics at Purdue University. Its mission is to provide leadership in economic policy analysis through better data, fostering collaboration and research. The project consist of several components, among others include; (i) a fully documented, publicly available, global database, (ii) a standard modeling framework, and (iii) software for manipulating the data and implementing the standard model (Hertel, 1997).

World Wide Web site for GTAP is another important source of information regarding the project. It is a comprehensive and frequently updated website accessible through internet connection. The website is created for distributing software, data, and other project-related items of interest. The information is available at <https://www.gtap.agecon.purdue.edu/default.asp>.

The GTAP model, developed by Hertel (1997), is a standard applied general equilibrium model. It assumes perfect competition and hence there is no scale or clustering effects, which often

figure in the literature of skilled labor movement. In each region, a single regional household allocates income across private and government consumption, and saving according to a Cobb Douglas utility function, firms supply commodities to both the domestic and export markets, while minimizing costs of production. Notable features of the GTAP model include:

- i) the use of the Constant Difference Elasticity (CDE) system for allocating private consumption across commodities;
- ii) trade flows by commodity, source and destination based on Armington assumptions;  
and
- iii) international transportation margins.

The GTAP Data Base is the global data base representing the world economy for a given reference year – 2004 for the GTAP 7 Data Base. It covers the concordances for the 57 sectors and 113 regions. Details about sources and construction of the individual components such as domestic data bases (or I-O tables), international data sets, and parameters, are provided in the GTAP documentation (Narayanan and Walmsley, 2008).

The main data file includes arrays summarizing the value of revenue generated from protection measures and the subsidy expenditures related to support measures. These values are all in millions of 2004 U.S dollars. The most recent GTAP Data Base is version 7 (2008) and this latest version is used in the simulation for empirical analysis in the next chapter.

Among the applications of the standard model are on the issues of economic growth and trade, trade policy, resources, technology and the environment. McDougall and Tyers focused on the effects of economic growth on factor markets. In particular, they examined the impact that

factor accumulation and increased openness in the rapidly developing economies (RDEs) of East Asia has had on factor markets in the older industrialized economies (OIEs).

Other applications address various dimensions of trade policy liberalization, more familiar turf for AGE modelers. MacLaren for example, provided an ex post analysis of the Cairns Group strategies for negotiation in the Uruguay Round. He estimated the benefits, to selected member countries, from alternative unilateral agricultural liberalization scenarios. Meanwhile, Young-Huff examined the impact of multiregion, across-the-board cuts in protection. They compared two alternative approaches to free trade in Asia Pacific region: preferential versus nonpreferential (MFN). Young and Huff shed some light on the issue with a carefully constructed set of experiments that highlight the importance of reciprocity on the part of non-APEC members, when liberalization on an MFN basis. Another trade policy liberalization application is that of Yongzheng, Martin, and Yanagishima. These authors exploited the addition of the GTAP data base of bilateral quota rents associated with the Multifibre Arrangement (MFA). Details of the applications are being discussed in Hertel (1997).

On top of the applications mentioned above, a lot of information on GTAP applications is made available on the website. GTAP has successfully integrated global energy data sets – in particular, extended energy balances and energy prices and taxes, compiled by the International Energy Agency (IEA) – into the GTAP input-output tables and bilateral trade data (first implementation). With its data base now covering inputs/outputs and bilateral trade of 57 commodities (and producing industries) and 113 countries/regions, GTAP is able to capture broad sectoral interactions within domestic economies and international trade effects as well. Recently, growing research demands for integrated assessment (IA) of climate change issues



and bio-fuels have motivated construction of data bases and models related to GHG emissions, Land use, and Biofuels which can be used with CGE models.

Furthermore, as the result of continuing research aimed at extending GTAP's standard modeling framework to incorporate dynamic behavior, *GDyn* was developed. It includes all the special features of the standard GTAP model, such as the sophisticated consumer demands and inter-sectoral factor mobility, as well as incorporating a new treatment of investment behavior and additional accounting relations to keep track of foreign ownership of capital.

Thomas Hertel and Roman Keeney have developed a poverty module for the GTAP model. The breakdown of the WTO negotiations under the Doha Development Agenda has inspired critics to highlight the lack of effort on the part of rich countries to reform their agricultural policies. The authors focused on the poverty impacts of developing country tariff cuts – particularly those in agriculture.

Apart from the above applications of GTAP model and Data Base, another important application of the model and data base is on the labor movement issue, of which the focus of this study. Detail discussion is provided in the next section.

## **5.4 Bilateral Global Migration Model (GMig2)**

### **5.4.1 Development**

A number of significant changes had to be made to the standard GTAP model and database to

incorporate the movement of labors. Based on this, Walmsley and Winters (2005) demonstrated using a Global Migration model (GMig) that lifting restrictions on the movement of natural persons would significantly increase global welfare with the majority of benefits accruing to developing countries. However, the lack of bilateral migration data requires them to make approximations in important areas that naturally precluded their tracking bilateral migration agreements (Walmsley, Ahmed and Parsons, 2005).

Later, Parsons, Skeldon, Walmsley and Winters (2005) came up with new development to construct a bilateral matrix of foreign population. This has then enabled Walmsley, Ahmed and Parsons (2005) to produce a model and Data base of labor, remittances and wages; and hence significantly enhance the ability to examine the issue. The new development is referred to as the GMig2 Model and Data Base.

In that model, the authors had to hypothesize a global pool of labor to intermediate the lack of bilateral data on migration between individual countries. As a result of Parsons, Skeldon, Walmsley and Winters (2007), however, data base for the bilateral stocks of migrants (defined as foreign born) were realized, which GMig2 model exploits to enable user to track labor movements between particular countries.

The data base used with the GMig2 model was based on the GTAP 6 Data Base and was augmented with the bilateral data base developed by Parsons et al (2007) and remittance data from the World Bank. The GMig2 data base construction process is documented in Walmsley et al (2007).

The GMig2 model tracks both the home and host region of each person and labor. The home region is defined as the permanent residence of the person/labor; in the data base this is their place of birth. The host region is the region in which the person resides/works. In the model, changes in the number of foreign labors can occur in two ways, i.e;

- (i) exogenous shocks to the labor supply where shocks can be made to:
  - the number of foreign labors from home region to host region directly to simulate a bilateral movement of labor,
  - the total labor supply in the host region to simulate quotas of the host region, or
  - the total supply of labor in the home region to simulate an exodus of foreign labors or the return of foreign labors
- (ii) Endogenous movements
  - In this case movement in foreign labors is endogenous. Foreign labors are assumed to respond to differences in the real wages between the home and host region. A parameter reflecting the extent to which foreign labors respond to differences in real wages is created. This parameter might also reflect extent to which foreign labors can move in response to real wages given restrictions, such as quotas. The parameter can also be shocked, reflecting a change in policy or ability of people to move in response to wages.

In the standard GTAP model the measure of welfare change used is the Equivalent Variation (EV), which is obtained from the income and utility function of each regional household. In GMig, however, the EV of host region has to be divided into two components, as with income: the EVs for local and foreign labors.

The welfare of local labors is a function of the utility derived from their income. Meanwhile, the utility of these labors is a function of their income, numbers and the prices of goods they purchase with this income. Given this utility, their EV can be calculated.

The welfare for foreign labor is similarly assumed. Their welfare is a function of utility derived from their income, from which remittances paid have already been subtracted. Their utility is a function of their income, number and the price level in the host region, and thereby the EVs can be calculated. Consequently, the welfare change for a host region can therefore be found by summing the parts for local and foreign labor.

The main exercise of GMig2 as reported by Walmsley, et al (2007), quotas on the number of temporary workers permitted into developed economies are increased by 3% of the developed economies' labor forces. The real income of permanent residents in the developed economies increases significantly; with most of those gains arising from the lifting of quotas on unskilled labors. The permanent residents of developing countries also gain in terms of real incomes from sending unskilled labor and skilled labor, although the gains from skilled are lower. While results differ across developing economies, most gain as a result of the higher remittances sent home.

#### **5.4.2 The Model**

In this model, it is assumed that there exists an aggregation stage in order to treat imports and domestic goods as different goods. The model applied Armington assumption to explain that imports and domestically supplied goods are aggregated to be composite goods. These

composite goods are used for intermediate inputs and domestic final demand whereby imports are imperfectly substitutable with domestic goods. This would mean that one unit of imported inputs can be substituted with more than one unit of domestic good inputs.

### *Regional Household*

At the top of the model structure is the regional household. Expenditures by this household are governed by an aggregate utility function that allocates expenditure across three broad categories: private, government and savings expenditures. The regional household's Cobb-Douglas utility function assures constant budget shares are devoted to each category. For simplicity, it is assumed that total income is equal to total expenditure. It should be noted that all income earned within a country accrues to household in that same country.

### *Sources of household purchases*

Private household purchases represent the sum of expenditures on domestically produced goods and composite imports. Their income consists of earnings from endowments of labor, capital, land and natural resources, all of which are inelastically supplied to firms for production. In the GMig2 model, Armington Constant Elasticity of Substitution (CES) type function for utility is assumed for the consumption of these two different goods (domestically produced and composite imports).

As described above for private household, government household is similarly assumed. The government household spends its revenues to purchase domestic and imported goods which

are represented by Armington CES type utility function.

#### *Sources of firms' purchases and household factor income*

Firms maximize its profit subjects to its production technology. All production technologies are constant return to scale, the functions are homogeneous to degree one. For simplicity, firms are assumed to utilize its revenues to purchase inputs for production and therefore in zero pure profit condition. This means that revenues must be exhausted on expenditures, once accounting for all tradeables (i.e; intermediate) inputs and endowment (i.e; primary) factors of production. This assumption is based on the character of perfectly competitive market in the model. The production technology for this stage is expressed by CES production function.

Composite intermediate inputs may be broken into the domestic and imported components. The domestic intermediate goods are purchased from other sectors and also sourced from the same sector in the country. Furthermore, the model assumes an aggregation stage in order to treat imports and domestic goods as different goods. Here, it is assumed that imports and domestically supplied goods are aggregated to be Armington's composite goods. This means that imports are considered to be imperfectly substitutable with domestic goods. Therefore, the production technology in this stage is represented by Armington CES.

Firms also purchase services of nontradeable commodities, which are termed endowment commodities. These include labor, capital, land and natural resources. The production technology at this stage is assumed to be CES production function. These purchases are the flow of income from the firms employing the factors of production back to the household

supplying them. In other words, it is the sources of household factor income. It is important to distinguish between perfectly mobile and sluggish endowments. Mobile endowments are labor and capital while sluggish endowments are land and natural resources. Capital is mobile between sectors in the country but internationally immobile whereas land and natural resources are completely immobile.

Labor market is separated between skilled and unskilled. In GMig2, both labor markets employ local and foreign labors. The model assumed that local and foreign labors are composite function linearly substitutable with the difference level of productivity. Input foreign labor is exogenous. It is assumed that foreign labors have lower level of productivities than those of locals. This productivity is used to determine the equivalent, productivity weighted, quantity of migrant labor which enters the labor force of labor importing country. The equivalent quantity of foreign labors is given by the actual quantity multiplied by their productivity. This implicitly expressed the difference wage rate between the labors; local and foreign.

### *Exports*

Domestic productions by firms in certain sector are consumed as final goods by regional household, intermediate goods within the sector and other sectors and to be transformed into exports. The export goods are consumed either as final imported goods or intermediate imports by consumers in foreign country.

The model assumes that firms transform gross outputs into exports for foreign consumption and domestic goods for domestic consumption. It is also assumed that exports are imperfectly

transformable with domestic goods. Hence at this stage, firms are considered to have constant elasticity of transformation (CET) production technology.

*Global sectors*

The model is incomplete without two global sectors namely; global transportation sector and global banking sector. The first sector provides services that account for the difference between fob and cif values in the model, for a particular commodity shipped along a specific route. Total demand for the services is given by summing over all routes and commodities whilst supply is provided by individual country economies that transporting them to the global transport sector.

In the meantime, the other global sector acts as intermediates between global savings and investment. It is a composite investment good based on net regional investment which is offered to regional household in efforts to satisfy their savings demand. The global sector invests in capital market. The value of the beginning of period capital stock,  $VKB$ , is updated by regional investment, and less depreciation. This yields the value of ending capital stocks,  $VKE$  as shown in Figure 5.1. This relationship is being discussed in detail by Hertel (1997).

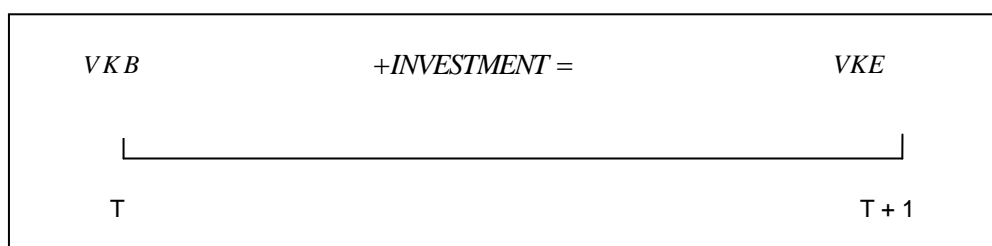


Figure 5.1: Composite investment goods



### *Market Clearing Condition*

By the virtue of Walras' Law, all markets are in equilibrium whereby the country's current account is balanced. Even though the model considers immobility of international capital market and yet there exist the flow of remittance, it is still possible to reflect general equilibrium of this economy. To ensure that income equals spending in the model, one of the spending components was altered. Saving is reduced by the value of the net remittances paid (Walmsley and Winters, 2002).

## **5.5 Simulation**

This section is dedicated to describe the necessary steps carried out to simulate data based on GMig2 model. It includes brief introduction of the GEMPACK software and associated files required for the simulation process. The information below is abstracted from GEMPACK documentation GPD-1 (Harrison & Pearson, 2002).

### **5.5.1 GEMPACK**

GEMPACK (General Equilibrium Modeling PACKage) is a suite of general-purpose economic modeling especially suitable for general and partial equilibrium models. It can handle a wide range of economic behavior and also contains powerful capabilities for solving intertemporal models. It provides software for calculating accurate solutions of an economic model, starting from an algebraic representation of the equations of the model. These equations can be written as levels equations, linearized equations or a mixture of these two. The software

provides a range of utility programs for handling the economic data base and the results of simulations.

GEMPACK provides:

- a simple language in which to describe and document the equations of economic model;
- a program which converts the equations of model to a form ready for running simulations with the model;
- options for varying the choice of exogenous and endogenous variables and the variables shocked; and
- utility programs to assist in managing the database on which the model is based. The data can be inspected, modified, converted to spreadsheets or moved to different computers.

There are three main steps involved in carrying out a simulation using GEMPACK:

- Step 1            Implement the model
- Step 2            Solve the equations of the model
- Step 3            View the results

A model is implemented in GEMPACK when:

- the equations describing its economic behavior are written down in an algebraic form, following a syntax described in the document, and
- data describing one solution of the model are assembled, to be used as a starting point for simulations.

In the early versions of GEMPACK, the equations had to be written down in a linearized form, usually expressed in terms of percentage changes in the variables. Now user can choose to base his implementation on the original (usually nonlinear) equations or on a linearized representation of these. In either case the user needs to write them down in a text file which is called a TABLO Input file (since TABLO is the name of the GEMPACK program which processes this information).

Once a model is implemented, the model can be used to carry out simulations. Many simulations are the answer to "What if" questions. From the original solution supplied as the starting point, a simulation calculates a new solution to the equations of the model. Within GEMPACK, the results of a simulation are usually reported as percentage changes from the original solution.

Solving models within GEMPACK is always done in the context of a simulation. The user specifies the values of certain of the variables (the exogenous ones) and the software calculates the values of the remaining variables (the endogenous ones). The new values of the exogenous variables are usually given by specifying the percentage changes (increases or decreases) from their values in the original solution given as part of the implementation.

The data for a model often consists of input-output data (giving dollar values) and parameters (including elasticities). The data given are usually sufficient to read off an initial solution to the levels equations. (Usually all basic prices are taken as 1 in the initial solution.) In this case GTAP data is used and aggregated according to purpose of study. Depending upon the purpose of simulation, the main data files required are sets.har, basedata.har and default.prm.

### 5.5.2 File sets for simulation

WinGEM, the Windows interface to GEMPACK, is aimed at improving the efficiency and productivity of modelers by providing tools in the familiar Windows environment. It is a user friendly program that is used for simulation process. For this purpose, the most important files used, namely; TABLO Input files, data files, Command files and Solution files and Stored Input files.

#### *TABLO Input files.*

These contain the theory (equations etc) for a model. Alternatively they may be for data manipulation. These files have suffix .TAB . These files are inputs to the program TABLO. The program TABmate can be used to create and or modify these files.

#### *Data files.*

These may be Header Array files or text files. The suffix is not prescribed by the software, though suffixes .HAR and .DAT are commonly used. Data files can be inputs to a simulation (the data sets - Sets.har, original input-output data - Basedata.har, the parameters - Default.prm) and updated versions are output from a simulation. Updated data files are often given the suffix .UPD

#### *Command files.*

These contain the details of a simulation, including closure, shocks, starting data and solution method. The suffix is not prescribed by the software, though .CMF is very commonly used.

*Solution files.*

These are the main outputs from a simulation. They contain the change or percentage change results for all the linearized variables. They may also contain levels results. These files have suffix .SL4 .

*Stored-input files*

If the user has a lot of input to a program, or if he needs to run the program several times with the same, or similar input, he can put all the input into a Stored-input file. The suffix for Stored-input files is not prescribed by the software, though suffix .STI is commonly used.

## **5.6 Conclusion**

This chapter discusses the global comparative static general equilibrium modeling approach which is commonly adopted in policy analysis. Brief overview of CGE modeling is provided in the beginning of the chapter. Thereafter GTAP model and Data Base and its application in various CGE researches are presented. Among the applications of the standard model are on the issues of economic growth and trade, trade policy, resources, technology and the environment.

Apart from the above, another important application of the model and data base is on the labor movement issue, of which the focus of this study. The development of Global Migration models (GMig and GMig2) is discussed herein to provide basic understanding on the structure of the CGE model used in the study.

The chapter ended with description on the necessary steps carried out to simulate data based on GMig2 model. It includes brief introduction of the GEMPACK software and associated files required for the simulation process. This chapter provides basic framework for case study analysis to be deliberated in Chapter 6.



# **CHAPTER 6**

## **CASE STUDY IN MALAYSIA**

### **6.1 Introduction**

This chapter focuses on international labor movement scenario in Malaysia. The study aims to discuss the inward movement of unskilled foreign labor due to the country's high reliance on this type of labor. There have been many studies conducted on the impact of these labors on the social and political aspect of the country. This chapter will offer another view by looking at the economic perspective of the same topic.

The objective of this chapter is to investigate the quantitative effects of unskilled foreign labors on host country, Malaysia as case study. Computable general equilibrium (CGE) modeling framework based on GTAP 7 data base and GMig2 model is used to measure the effect particularly on the welfare of populations in the host country.



It is important to keep in mind three basic principles (World Bank, 2006). First, international labor movement is a diverse phenomenon, and its economic impact in one location or another depends heavily on the particular circumstances involved. Second, basic data on international labor movement and remittances are lacking, so predicting the impact of policy changes can be problematic. This underlines the need for better data and more research. Third, international labor movement has social and political implications that may be just as important as the economic implications that are provided in this study. Despite their importance, internal labor movement, skilled labor movement, and the political and social impacts of international labor movement are beyond the scope of this work.

## **6.2 International Labor Movement in Malaysia**

### **6.2.1 Malaysian labor market**

The Malaysian economy has been dominated by 5 main sectors: services, manufacturing, agriculture, mining, and construction. Each sector's contribution to the country's GDP in 2008 was 54.3%, 29.8%, 7.5%, 8.2%, and 3.0%, respectively (Malaysian Economic Report 2008/2009).

Total employment for 2008 was estimated to be almost 12 million (2007: 11.8 million). The labor market was expected to remain favorable in line with strong domestic economic activity. All sectors were expected to generate additional employment opportunities, with total employment expanding 1.7% (2006: 2.2%). Due to the increase application of new technology, ICT and the improvement of work process, new employment was however estimated to

decrease to 196,200 jobs in 2008 (250,600; 2007). Meanwhile, the unemployment rate was envisaged to remain low at 3.2% of the labor force (2007: 371,500; 3.2%). Table 1 shows the country's labor market indicators. The statistic shows the situation whereby the country's economy is yet to be hit by the global economic crisis which started in USA in September 2008.

	('000)		Change (%)	
	2007	2008 <sup>1</sup>	2007	2008 <sup>1</sup>
Labor force	11,781.0	11,985.8	2.0	1.7
Employment	11,409.6	11,605.9	2.2	1.7
Unemployment	371.5	379.9	3.2 <sup>2</sup>	3.2 <sup>2</sup>

<sup>1</sup> Estimate

<sup>2</sup> Percentage of labor force

Source: Malaysian Economic Report 2008/2009

*Table 6.1: The Malaysian Labor Market Indicators*

Malaysia is an exporter as well as an importer of labor. The country started to rely on foreign labor due to the structural changes and labor market segmentation that first emerged in the early 1970s, during which the industry faced severe labor and skill shortages (NEAC, 2003). Local labors started emigrating to the rapidly growing Newly Industrializing Economies where wages were much higher.

According to NEAC (2003), the first upsurge of foreign labor inflow into Peninsular Malaysia took place in the early 1970s and coincided with structural changes arising from the implementation of the New Economic Policy aimed at reducing poverty and equity imbalances. It involved Indonesian labors engaged mainly in the plantation and construction sectors. Based

upon the rapid industrialization and growth in the late 1980s, the employment of foreign labor became a complimenting factor to support production activity amidst a tight labor market. These workers were generally allowed as an interim measure to meet the excess demand for unskilled labors in selected sectors. The reliance on these cheap labors however, appeared to have risen rather than diminished, as originally planned.

The emergence of large pool of foreign labor caused by (Tan, 2000):

- Pull factor – the tolerance of the Malaysian government to allow skilled and unskilled to work in Malaysia, attract foreigners to seek employment.
- Push factor – excess labor supply and low wages in home country
- Willingness to tolerate poorer working condition in labor receiving country, even among the educated
- As foreign labor do not benefit from social protection in terms of the pension saving scheme, this has effectively lowered the cost

As a result of the above and strong demand for foreign labor in the environment of robust economic growth thus large influx of these labors. Also, due to its sustained economic growth, geographical closeness and similarities in culture and language, the country continues to attract foreign labors, particularly Indonesians.

In Malaysia, foreign labors are divided into (NEAC, 2003):

- Foreign labors – engaged in lowly job categories like general workers, agriculture workers and production workers, mostly unskilled with low educational attainment; employed under the visit pass for temporary employment issued for the duration of a year.

- Expatriates – foreign labors in higher rank jobs at the top end of the distribution and are employed either during a visit pass for professional employment (for labors on short term contract with professional qualifications) or using an employment pass (for contracts of at least two years' duration and a minimum monthly salary exceeding RM2,500).

Kanapathy (2004, 2006a, 2006b) discussed in detail international labor movement in Malaysia. She mentioned that, in contrast with the situation in many advanced countries, where international labor movement is concerned with those who migrate for work and permanent settlement, the focus on international labor movement in Malaysia primarily centers on contract foreign labors. They are unskilled labors who are imported for a short duration on a contract basis to alleviate labor shortages in specific sectors. Table 6.2 summarizes the types of foreign labors in Malaysia.

Skilled	Unskilled
● Expatriates	● Foreign labors
● Professional and specialist and skilled workers	● Lower end of the skills spectrum
● RM2,500 and above (per month)	● Less than RM2,500/ month
● 2 years – employment passes	● Visit passes for temporary employment, renewable every year up to a maximum of 5 years
● Less than 1 year – visit passes or professional employment	

*Table 6.2.: Types of foreign labors in Malaysia*

According to the Malaysian Economic Report 2008/2009, at the end of March 2008, the number of registered foreign labors totaled 2.1 million (including expatriates) in Malaysia, accounting for 18% of total employment. Foreign labors are mainly engaged in semi and low-skilled jobs in the manufacturing sector (36%), agriculture (16.1%) and construction

(14.9%). In 2007, Indonesians comprise 75.6% of total foreign labor, followed by Nepalese, 14.5% and Indians, 9.1% (Economic Report, 2007/2008).

Year	2001	2002	2003	2004	2005	2006	2007	2008
Foreign Labors ('000)	849.8	1067.5	1336.9	1359.5	1620.0	1840.0	1910.0	2100.0
% of Total Employment	9	11	13	13	15	16	17	18

Source: Immigration Department, Malaysia (2008) and Economic Report, Ministry of Finance, Malaysia (various publications, 2004/2005 – 2008/2009)

Table 6.3.: Statistic of foreign labors in Malaysia (Percentage of total employment)

Year	TOTAL		Foreign <sup>1</sup>		Local	
	skilled	unskilled	skilled	unskilled	Skilled <sup>3</sup>	Unskilled <sup>3</sup>
	25% <sup>2</sup>	75% <sup>2</sup>				
2004	2,636,400	7,909,200	34,519	1,324,981	2,601,881	6,584,219
2005	2,723,225	8,169,675	33,448	1,586,552	2,689,777	6,583,123
2006	2,789,775	8,369,325	35,052	1,804,948	2,754,723	6,564,377
2007	2,852,400	8,557,200	38,090	1,871,910	2,814,310	6,685,290
2008	2,901,475	8,704,425	33,062	2,066,938	2,868,413	6,637,487
2009 <sup>4</sup>	2,950,800	8,852,400	n.a	2,124,576 <sup>5</sup>	n.a	6,727,824
2010 <sup>4</sup>	3,000,964	9,002,891	n.a	2,160,694 <sup>5</sup>	n.a	6,842,197

Sources:

<sup>1</sup> Data are gained from Economic Report (various issues - 2005/2006-2008/2009), Ministry of Finance, Malaysia

<sup>2</sup> The 25/75% proportion of skilled and unskilled labor (total) are derived from the 4 years trend of employment (Labor report survey 2006 and 2007, Department of Statistics, Malaysia)

<sup>3</sup> The 30/70% proportion of skilled and unskilled local labor are based upon the 5 years trend of employment (balance of skilled and unskilled labor after deduction of number of foreign labors from the total employment)

<sup>4</sup> Estimates – based on 1.7% labor force growth

<sup>5</sup> Estimates – based on data in 2008 (24% of total unskilled labor is foreign labor)

n.a Not available

Table 6.4.: Statistic of foreign labors in Malaysia (Proportion of skilled and unskilled labor)

Table 6.3 shows the statistic of foreign labors in Malaysia as percentage of total employment

and table 6.4 shows the statistic of foreign labors in Malaysia, according to skills proportion. The high figure of unskilled migrant labors illustrates the country's high reliance on this type of labor.

Malaysian construction sector is highly dependent on foreign labor. The construction sector in Malaysia includes construction activities related to private residences, commercial and industrial buildings, and civil engineering projects such as the building of ports, airports, highways, dams, and other infrastructure. The residential construction, dominated by smaller building companies, tends to be more labor intensive (Narayanan & Lai, 2005).

Foreign labor has become a vital component of the construction workforce in Malaysia. An estimated 60% of all manual labors in the construction sector were foreign nationals, a figure which was revised upwards to 70% in 1991, and then 80% in 1995 (cited in Abdul Aziz, 2001). Legal and illegal foreign labors dominated the sector's employment and according to Narayanan & Lai (2005), they account for nearly 70 percent of its workforce. Table 6.5 shows the number (in thousand) of legal unskilled foreign labors in the Malaysian construction sector. The figures were gained from Economic Report (various issues), Ministry of Finance, Malaysia. Contrary to this estimate, the unrecorded number of illegal foreign labor is much higher. International Labor Organization in its Tripartite Meeting in Social and Labor Issues Concerning Migrant Workers in the Construction Industry, Geneva (1995) reported that at least two-thirds of all foreign labors in Malaysia are illegal.

Year	Total Employment in The Construction Sector	Unskilled Foreign Labor	Percentage
------	---	-------------------------	------------

2004	798,200	269,100	34%
2005	759,600	245,916	32%
2006	755,200	272,547	36%
2007	757,300	280,787	37%
2008	760,000	307,974	41%

Source: Economic Reports (various issues, 2005/2006 to 2008/2009)

*Table 6.5: Number (in thousand) of legal unskilled migrant labors in the Malaysian construction sector*

In Malaysia, local youth would rather be unemployed than work in the construction industry. This is attributed to the archaic employment practices, outdoor work and prevalence of temporary and casual labor. The industry has been forced to rely on foreign labor, mostly from neighboring Indonesia, for the past two decades. Official estimates put foreign labor at 80 per cent of the entire construction workforce in 1992 (Abdul-Aziz, 2001). There is consensus among employers in the industry that it will continue to depend on imported labor (regularized or otherwise) in the foreseeable future. As work in construction has come to be associated with foreign labors (many of them illegal) its status has deteriorated further. A similar situation is found in some developed countries where construction work has for many years been undertaken largely by foreigners, or by their children (ILO, 1995). Also, recently the local population in many more countries has begun to shun construction work.

The substantial rise in the foreign labors population, both legal and illegal, therefore calls for the need of a better development strategy and policy. In efforts to sustain rapid economic growth in a tight labor situation, effective labor management poses an immense challenge to the authorities. Various problems such as illegal entry, overstaying and abscondments require persistent attention by the government.

There are plans to reduce the number of foreign labors to about 1.5 million by 2010, in particular unskilled labors. To reduce reliance on unskilled foreign labors, employers are encouraged to move up the value chain by adopting new technology, introducing mechanization and automation in the production process. In the process to slowly achieve the target, the Government has implemented various measures including introducing and encouraged the usage of Industrialized Building System (IBS), especially in government projects and increase the automation and mechanization in manufacturing and agriculture sectors. Other measures considered are improving the skills of local workers. The Government had allocated RM100 million under the Ninth Malaysia Plan's Mid-Term Review to train 15,000 local labors in various fields (NST, 2008).

### **6.2.2 Government's stand point towards regulating foreign labor**

The Malaysian government has introduced and imposed various management policies in permitting employment of foreign labors under certain management conditions to cope with the severe labor shortage in the main economic sectors. Table 6.6 lists the countries and sectors allowed to recruit foreign labors.

The purpose of the foreign labor management policy lies in preventing excessive reliance on 'cheap labor' that foreign labors offer while serving as a measure for adjusting the labor market in response to economic trends (Watanabe, 2003). On the one hand, the government is trying to make sure that there are not too many of them in the country but at the same time they do not want to have the industries suffer because there are no sufficient labors to cater the needs



of the economy.

<b>Sector</b>	<b>Country</b>
Construction	Philippines (male), Indonesia, Cambodia, Kazakhstan, Laos, Myanmar, Nepal, Thailand, Turkmenistan, Uzbekistan and Vietnam, Bangladesh (effective 1 August 2006)
Manufacturing	Philippines (male), Indonesia (female), Cambodia, Kazakhstan, Laos, Myanmar, Nepal, Thailand, Turkmenistan, Uzbekistan and Vietnam, Bangladesh (effective 1 August 2006)
Plantation/Agriculture	Philippines (male), Indonesia, India, Cambodia, Kazakhstan, Laos, Myanmar, Nepal, Thailand, Turkmenistan, Uzbekistan and Vietnam, Bangladesh (effective 1 August 2006)
Services	
● Restaurants	All source countries for general worker posts (except India-cooks only). Restaurants in major towns in Peninsular Malaysia.
● Laundry	All source countries except India
● Cleaning/Sanitation	All source countries except India
● Caddy	All source countries except India
● Resort Islands	All source countries except India
● Welfare Homes	All source countries except India
● Cargo	All source countries except India
● High Tension Cables	India only
● Domestic Maids	Sri Lanka, Indonesia, Thailand, Philippines and Cambodia Albania, India, Bangladesh, Philippines, Pakistan,
● Foreign Nurses	Indonesia and Myanmar

Source: Ministry of Human Resources at [www.moha.gov.my](http://www.moha.gov.my)

*Table 6.6.: The countries and sectors allowed recruiting foreign labors*

The policies include controlling and regulation the inflow of foreign labors, the elimination of

irregular labor movement and the protection of the labor's rights. Malaysia is obligated to ensure employers give equal treatment to foreign labors. Accordingly, Malaysian employment and labor laws on rights and benefits that accrued to a local labor are equally applied to foreign labors. This however does not always hold water in reality. Evidently, in practice not all employers comply with the requirement of these benefits (Narayanan & Lai, 2005).

A study done by Abdul Rashid (2001) suggested that there exist a wage hierarchy especially in the construction sector, with the Malaysians occupying the apex. Nonetheless, the abundant job opportunities, not high wages, provided the main stimulus for migrating to Malaysia. Furthermore, in order to control the inflow of foreign labors, application approval is based on the merits of each case and subject to conditions that will be determined from time to time. Applications to employ foreign labors will only be considered when efforts to find qualified local citizens and permanent residents have failed (MIDA, 2009).

Although their contributions to the country's economic growth are undeniable, the unprecedented influx of unskilled foreign labors, following unabated high growth since mid-1980s, had raised several social, political and economic concerns. The popular perception was that foreign labors could potentially affecting local unskilled labors; both in wages and living standard. Table 6.7 summarizes policy objectives and measures for managing foreign labors in Malaysia.

Objectives	Policy Measures and Instrument
Control and Regulate the Inflow of	● Establishment of recruitment agencies

Foreign Workers	<ul style="list-style-type: none"> <li>● Bilateral agreements</li> <li>● Work permit</li> <li>● Levy</li> <li>● Freeze/ban on the intake of contract foreign workers</li> <li>● Employment of 'Malaysian First' Policy</li> </ul>
Reduce Clandestine or Irregular Foreign Labors	<ul style="list-style-type: none"> <li>● Registration and regularization Programs for Irregular foreign labors</li> <li>● Amnesty</li> <li>● Security Operations code-named OPS Nyah I (Get Rid Operation) and Ops Nyah II</li> <li>● Enhanced legal penalties for irregular foreign labors and those hiring or harboring irregular foreign labors</li> <li>● Biometric Identity Cards</li> </ul>
Protect the Rights of Foreign Labors	<ul style="list-style-type: none"> <li>● Ratification of ILO Convention 97 (Migration for Employment Convention (Revised), 1949 by Sabah in March 1964).</li> <li>● Foreign Worker Recruitment Policy – Requirement for Contract of Employment, Provision of Similar wages and benefits as local workers.</li> <li>● Compulsory Induction Course on Local Laws and Customs</li> </ul>

Source: Kanapathy (2006)

*Table 6.7: Policy objectives and measures for managing foreign labors*

### **6.2.3 Remittance**

Remittances have become an increasingly prominent source of income to many labor exporting countries. Foreign labors with family or dependants back home would usually send a certain share of their monthly income to them. Remittances are either sent through formal

channels such as banks or registered agents and money changers or informally by asking favors from friends or relatives traveling home.

Remittances refer to the portion of a foreign labor's income that is sent back to his or her family in the labor's country of origin (Abubakar, 2002). She added that, according to official sources, the annual outflow of remittances by foreign labors amounted to RM1 billion. If there were indeed about 2 million foreign labors in the country, this would mean that on average, each worker remitted approximately RM500 a month. However, a study by Ariff, Wong and Abubakar in 1998 (cited in Abubakar, 2002) asserted that foreign labors saved "about RM100 per month" to be remitted back to their families in their home countries. This was supported by the survey by Zehadul et al. (1999). From the survey done by Zehadul et al., it was found that the amount of remittances varied directly with their level of income. The size of the remittance ranged from RM200 and below to RM601 and above, although the majority of workers (52.1% of total response) fell within the lowest category of RM200 and below.

Kanapathy (2004) reported that relevant data on repatriation of income by foreign labors are not readily available, and therefore in her study, an estimate was made based on a field survey of foreign labors (a survey of about 600 migrant labors was carried out between July and September 2003 to gather information on foreign labors in Malaysia). Based on the survey findings, the average income of foreign labor is around RM835. The survey also showed that foreign labors in the different sectors send varying proportion of their income home. Those in plantation sector and domestic maids repatriated about 93% of their income since food and lodging are provided by their employers. Assuming that foreign labors repatriate about 50% of their income, the documented foreign labors were estimated to repatriate about RM7 billion

annually. The survey also showed that three out of every four workers used telegraphic transfer or bank draft, while the remainder 25% used informal channels such as agents and money changers, or friends and relatives.

This source of income may be intended for consumption (by recipient household) and it also might be for the purpose of investment. Foreign labors may increase remittances in times of economic hardship, especially in low-income countries where their families may depend significantly on remittances as a source of income and may live close to subsistence level. Economic downturns may also encourage labors and increase the pressure for them to migrate abroad where the illusions of employment are way better than home (with increasing retrenchments and scarcity of jobs) – and to begin transferring funds to families left behind.

### **6.3 Application of GMig2 Model and Data Base for Malaysia**

The model and data necessarily make a number of simplifying assumptions, which should be noted at the outset. Although every effort was made to collect data on the flows of unskilled foreign labor, data are scarce and of questionable quality and assumptions had to be made to fill in the gaps.

The model structure in this study is similar to the GMig2 model described in the previous chapter. The relationship of the variables is similarly assumed with some modifications on the data aggregation as to be presented below.

#### **6.3.1 Assumptions**

The model assumes a two country model; Malaysia as labor importing country and Rest of World (ROW) as labor exporting country with only one way labor movement between the countries in the model. The focus of the study is the impact of legal unskilled foreign labors on the host country. Malaysia is only importing unskilled foreign labors and therefore unskilled foreign labors are internationally mobile from ROW. The model does not consider the movement of skilled labor or the effects of brain drain. Thus in this case, skilled labor is immobile.

Neither does the model consider illegal foreign labors. It is undeniably true that illegal immigration also have its impact on the labor importing countries, however, due to scarcity of data, they are not included in the study. 5 sectors aggregation (Agriculture, Manufacturing, Construction, Services and Transportation) are generated for both countries using GTAP7Agg. The GMig2 model is used and most of the same assumptions are applied here.

There are 5 factors of production (skilled labor, unskilled labor, capital, land and natural resources) and 5 sectors (agriculture, manufacturing, construction, services and transportation). Labors are divided into 3 categories, unskilled local labor, skilled local labor and unskilled foreign labor. The wage rate between the two countries differs and unskilled foreign labors are assumed to be of different level of productivity, with unskilled local labor possessing higher level of productivity. This is used to measure the number of unskilled labor inflows into host country. The nominal number of unskilled foreign labor is adjusted into real number by multiplying them with the productivity level.

Further assumptions are made on the labor market in the labor importing country. Different

labor market is based on types of labor; skilled and unskilled. Foreign labor is only employed in the unskilled labor market. Capital is internationally immobile. It is however mobile within individual country. Meanwhile other factors such as land and natural resources are immobile.

The model considers situation whereby remittance is allowed into the home country. In the GMig2 Model and Data Base, remittances flowing out of the host country back to the home country are assumed to be a constant portion of income. Consequently, as the number of foreign labors or their wages increase, so do remittances. Remittances then flow back to the permanent residents of the home country. It therefore reduces the income of the foreign labors in host country but increases the incomes of permanent residents back home. It also affects a country's balance of payments. Foreign labors spend the rest of their earnings for consumptions in the host country. Other factors of production, land and natural resources are immobile and their income are assumed to accrue to permanent residents of the respective countries. Malaysia is assumed to be a small open economy which is in full employment condition and the market is under perfect competition environment.

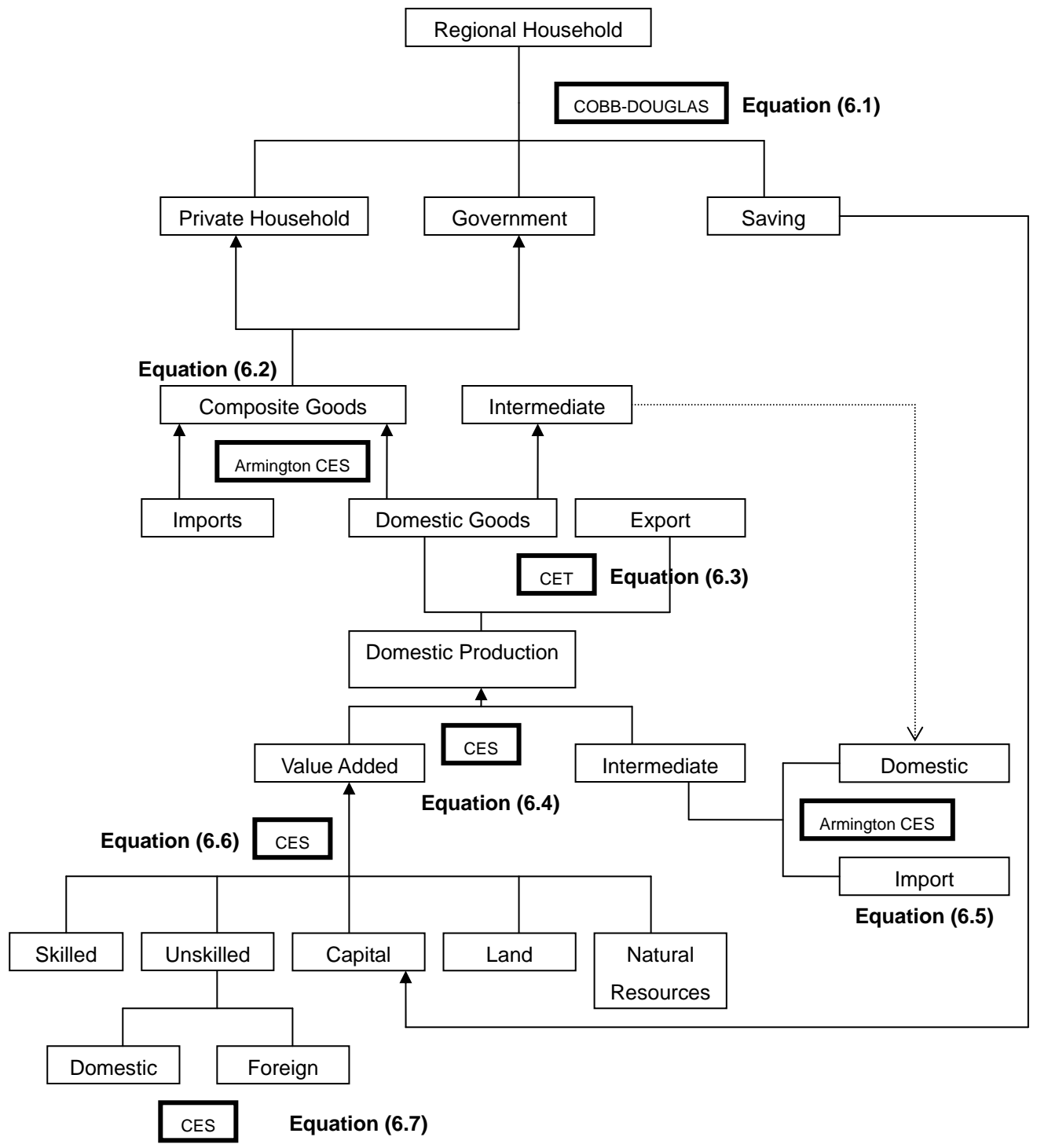


Figure 6.1: Structure of the model to show the flow of variables



### 6.3.2 The Equations

The equations listed in this section describe the model in this chapter. Refer to Figure 6.1 above for the relationship of the variables presented here.

#### Equation 6.1

Utility maximization of regional household

$$\text{Max}_{QP_i, QG_i, QCGDS_i} UU = QP_i^\alpha, QG_i^\beta, QCGDS_i^\gamma$$

$$\text{Subject to: } Y = (PP_i * QP_i) + (PG_i * QG_i) + (PCGDS_i * QCGDS_i)$$

$$QP_i = Y \frac{\alpha}{\alpha + \beta + \gamma}$$

$$QG_i = Y \frac{\beta}{\alpha + \beta + \gamma}$$

$$QCGDS_i = Y \frac{\gamma}{\alpha + \beta + \gamma}$$

Notation:

$QP_i$  Quantity of composite tradable commodity i demanded by Private Household

$QG_i$  Quantity of composite tradable commodity i demanded by Government Household

$QCGDS_i$  Quantity of capital goods sector supplied

$\alpha, \beta, \gamma$  Share parameter,  $\alpha + \beta + \gamma = 1$

$Y$  Total income of the regional household

$PP_i$	Demand price of composite tradable commodity i for Private Household
$PG_i$	Demand price of composite tradable commodity i for Government Household
$PCGDS_i$	Price of investment goods

*Equation 6.2*

Composite goods for domestic consumption by Private and Government Household

$$\left[ (PIM_i * QIM_i)^\alpha + (PM_i * QDC_i)^\alpha \right]^{\frac{1}{\alpha}} = (PP_i * QP_i) + (PG_i * QG_i)$$

Notation:

$PIM_i$	Market price of aggregate imports of tradable commodity i demanded by Private and Government Household
$QIM_i$	Quantity of demanded aggregate imports of commodity I demanded by Private and Government Household
$QDC_i$	Quantity of composite tradable commodity i demanded by Private and Government Household
$PM_i$	Market price of composite tradable commodity i demanded by Private and Government Household

Equation 6.3

Distribution of domestic production for domestic consumption and exports

$$\underset{QO_i, QXS_i, QD_i}{Max} \pi = (PFOB_i * QXS_i + PM_i * QD_i) - (\tau + PS_i) QO_i$$

Subject to:  $QO_i = \theta (QXS_i^\sigma + QD_i^\sigma)^{\frac{1}{\sigma}}$

$$QXS_i = \left( \frac{\theta^\sigma (\tau_i + PS_i)}{PFOB_i} \right)^{\frac{1}{1-\sigma}} QO_i$$

$$QD_i = \left( \frac{\theta^\sigma (\tau_i + PS_i)}{PM_i} \right)^{\frac{1}{1-\sigma}} QO_i$$

Notation:

$PS_i$	Supply price of nonsavings commodity i
$QO_i$	Quantity of nonsaving commodity i output or supplied
$PFOB_i$	World (fob) price of tradable commodity i exported
$PM_i$	Market price of composite tradable commodity i demanded by Regional Household
$QXS_i$	Quantity of exports of tradable commodity i
$QD_i$	Quantity of composite tradable commodity i demanded by Regional Household
$\tau$	Tax rate on production of commodity i per unit
$\pi$	Profit of firm
$\theta$	Output augmenting technical change
$\sigma$	Parameter

Equation 6.4

Domestic production

$$QO_i = \left[ QVA_j^\alpha + \sum_j QF_{i,j}^\alpha \right]^{\frac{1}{\alpha}}$$

Notation

$QVA_j$  Quantity of value added (composite endowments) in firms of sector j

$QF_{i,j}$  Quantity of intermediate input i demanded by firms in sector j

Equation 6.5

Composite intermediate goods

$$VFA_{i,j} = \left[ (PFM_{i,j} * QFM_{i,j})^\alpha + (PFD_{i,j} * QFD_{i,j})^\alpha \right]^{\frac{1}{\alpha}}$$

Notation:

$VFA_{i,j}$  Value of composite intermediate goods i demanded by firms in sector j

$PFM_{i,j}$  Demand price of imported intermediate goods i for firms in sector j

$QFM_{i,j}$  Quantity of imported intermediate goods i demanded by firms in sector j

$PFD_{i,j}$  Demand price of domestically produced intermediate goods i for firms in sector j

$QFD_{i,j}$  Quantity of demanded domestically produced intermediate goods  $i$  by firms  
in sector  $j$

*Equation 6.6*

Behavior of value added

$$QVA_j = \delta \left( S_j^\alpha + U_j^\alpha + K_j^\alpha + LD_j^\alpha + NR_j^\alpha \right)^{\frac{1}{\alpha}}$$

Notation:

$QVA_j$  Quantity of value added in sector  $j$

$\delta$  Primary factor augmenting technical change in sector  $j$

$S_j$  Quantity of skilled labor demanded by firms in sector  $j$

$U_j$  Quantity of unskilled labor demanded by firms in sector  $j$

$K_j$  Quantity of capital endowment demanded by firms in sector  $j$

$LD_j$  Quantity of land endowment demanded by firms in sector  $j$

$NR_j$  Quantity of natural resources endowment demanded by firms in sector  $j$

*Equation 6.7*

Market clearing of endowments

$$S_j = \sum_j S_j$$

$$U_j = D_U + M_U \frac{PR_M}{PR_D} = \sum_j U_j$$

$$K_j = \sum_j K_j$$

$$LD_j = \sum_j LD_j$$

$$NR_j = \sum_j NR_j$$

Notation:

$\sum_j S_j$  Total skilled labor in all sectors

$\sum_j U_j$  Total unskilled labor demanded by firms in sector j

$D_U$  Number of unskilled local labor demanded by firms in sector j

$M_U$  Number of unskilled migrant labor demanded by firms in sector j

$PR_M$  Productivity of unskilled migrant labor demanded by firms in sector j

$PR_D$  Productivity rate of unskilled local labor demanded by firms in sector j

$\sum_j K_j$  Total of Capital endowment demanded by firms in sector j

$\sum_j LD_j$  Total of Land endowment demanded by firms in sector j

$\sum_j NR_j$  Total of Natural resources demanded by firms in sector j

*Equation 6.8*

Market closure

$$EX - IM - REM = SAVE$$

$$VKB = \sum_j K_j$$

Notations:

<i>EX</i>	Value of Export
<i>SAVE</i>	Value of Saving
<i>REM</i>	Remittance
<i>IM</i>	Value of Imports
<i>VKB</i>	Value of capital stock

The equilibrium solution is realized by solving the above equations. In the general equilibrium model discussed earlier, the equations derived 22 endogenous variables; *PP, PG, PCGDS, PIM, PM, PS, PFOB, PFM, PFD, Y, QP, QG, QCGDS, QIM, QDC, QO, QXS, QD, QVA, QF, QFM* and *VFA* if  $\tau, \theta, \delta, S, U, K, LD, NR, PR_M$  and  $PR_D$  are given exogenously. And  $\alpha, \beta, \gamma, \sigma$  are the parameters.

### 6.3.3 Data sets for analysis

Data aggregation for empirical analysis is generated from GTAP 7 Data Base. However, the model necessitates further data to complement GTAP 7 Data Base in order to simulate GMig2 model. In addition, downloadable data base for GMig2 model is not sufficient for Malaysia-ROW model. Additional ad hoc data was formulated based on various sources, mainly the Malaysian Economic Report (various issues) and Malaysian Labor Force Survey Report and other publications by the Department of Statistics Malaysia.

The additional data includes:

- Population, Labor force and Number of foreign labors from Rest of World (ROW) in Malaysia.

Since the model focuses on unskilled foreign labors, data on this type of labor is used. To suit other data provided by GTAP 7, data of foreign labor's inflow in year 2004 is initially gathered for the purpose of the study. Thereafter, similar data for subsequent years are accumulated (refer Table 6.4).

Productivity level is formulated based on published data on average wage rates of construction worker (daily), July 2007 by Construction Industry Development Board (CIDB), Malaysia. The data indicates that productivity rate of unskilled foreign labor is at 0.8 with unskilled local labor at 1. This figure is used to determine real number of unskilled foreign labor in Malaysia. The formulas are presented below:

$$\text{Productivity}^* = \text{Wage unskilled foreign labor} / \text{Wage unskilled local}$$

$$\text{Nominal number of foreign labor} \times \text{Productivity} = \text{Real number}$$

Notation: \* Productivity of unskilled local labor = 1

- Wages

It is assumed that once the real number of foreign labor is calculated based on level of productivity, the wages of foreign labors are same with those of locals. The productivity difference however, shows the implicit wage difference between these two types of labors.

Total wages are formulated using data from Value of Firms Purchases of Endowment at Market Prices, Value of Firms Purchases of Endowment at Agents Prices and Value of



Output at Agents' Prices.

$$\text{Total Wage} / \text{Total Unskilled labors}^* = \text{Wage per unit labor}$$

$$\text{Wage per unit labor} \times \text{Total Unskilled Foreign labor} = \text{Total Wage for Foreign labor}$$

Notation: \* Both local and foreign unskilled labors

- Remittance

It is assumed that foreign labors remit 50 percent of their monthly income to home country.

This assumption is in line with the proportion of income described in literatures.

$$\text{Total Remittances} = \text{Total Wage for Foreign labor} \times 50\%$$

- Savings

To create balance of account, remittance is deducted from total savings. This is conducted by using the original data on savings aggregated from GTAP 7 and less total remittances as described above.

$$\text{Original Savings} - \text{Total Remittances} = \text{Net Savings}$$

Table 6.8 lists the additional data formulated as described above. A total of eight variables are derived for simulation purposes.

GMig2 Data Base is used as the main reference in formulating the aforementioned additional data. Consequently, all the data are compiled in Base Data.har file for simulation purposes.

Header	Name
POP	Total Regional Population
Q	Total Labor Force Participation Rate
MGLF	Total Foreign Labor from r in s
VOMS	Wage of Foreign Labor from r in s – Value of Firm Purchase at Market Price
VFAS	Wage of Foreign Labor from r in s – Value of Firm Purchase at Agents' Price
VOAS	Wage of Foreign Labor from r in s – Value of Output at Agents' Price
REME	Value of Remittances sent from s to r
SAVE	Savings – Net Expenditure at Agents' Price

*Table 6.8: List of additional data in the Data Base*

## **6.4 Policy analysis**

According to economic report (2006/2007), there are plans to reduce the number of foreign labors to 1.5 million by 2010. This policy is tested to evaluate its effect on the economy. Based on table 6.4, as end of March 2008, there are about 2.1 million of legal unskilled foreign labors in the country. However, it is important to note that this number does not illustrate the current economic condition where many labors have been retrenched and lost their job due to global economic crisis that hit the world economy since the end of 2008. Given the unavailability of current data on the number of unskilled foreign labors in the country, data from year 2004 till 2008 are used in the simulation.

Based on Table 6.9, it is obvious that the inflow of unskilled foreign labor is increasing every year. Therefore the study is aimed to investigate the quantitative effects of inflow of unskilled

foreign labor in Malaysia, particularly the effects on wages and welfare of local labors in the country.

<b>Year</b>	<b>Actual Number (Nominal)</b>	<b>Real Number (Nominal x 0.8)</b>
2004	1,324,981	1,059,985
2005	1,586,552	1,269,242
2006	1,804,948	1,443,958
2007	1,871,910	1,497,528
2008	2,066,938	1,653,550
2009*	2,124,576	1,699,661
2010* (w/o policy)	2,160,694	1,728,555
2010 (with policy)	1,500,000	1,200,000

Note:

\* Estimates

*Table 6.9: Data on nominal and real number of unskilled foreign labors*

The simulation of the above data is used to complement data aggregated from GTAP 7 data base to produce the result.

Changes in the labor movement are modeled by 'shocking' the allocation of unskilled foreign labors in the model. This shock is in accordance to data presented in Table 6.8. The software used for this study is the current Source-code version (Release 8.0, October 2002) of GEMPACK. For simulation purposes, WinGem, the Windows interface of GEMPACK is

utilized.

Data for simulation is compiled according to the required format in .HAR file. This includes the basedata.har, sets.har and default.prm. Other files namely; the TABLO input file for the model (in this case GMig2 model is adopted), command file and stored input file.

## **6.5 The results**

The outcomes of the experiments are being discussed in two sections. The first section investigates the 5 years effects of increased inflow of unskilled foreign labor (2005 till 2010). Meanwhile the second section examines the effects of policy intervention should it being implemented.

### **6.5.1 The effects of increasing inflow of foreign labor**

The increase in inflow of unskilled foreign labor from labor exporting country (ROW) is found to have an overall positive impact on the welfare of labor force (local and foreign) in the host country (Malaysia). Details of the effects are presented in the following tables and figures.

Table 6.10 and Figure 6.2 depict some of the outcomes from the increased inflow of unskilled foreign labor. Percentage change shown in Table 6.10 and Figure 6.2 are relative to base year 2004. Malaysia experiences increases in real GDP as a consequence of increased supply of labor which is utilized by firms to be used in production. Due to the country's high reliance on unskilled labor, the increased supply of this labor causes an increase in output.

	Real GDP (%)	Real wages of unskilled (%)	Real return to capital (%)	Household income (%)	Household income of local population (%)	Household income of foreign labor in Malaysia (%)	Remittances (%)	EV (USD Millions)	Change in Current Account Balance (USD Millions)
2005	0.73	-1.64	0.59	0.36	-0.08	17.65	17.65	463.28	-150.01
2006	1.33	-2.96	1.08	0.66	-0.13	31.93	31.93	850.09	-267.62
2007	1.51	-3.36	1.23	0.75	-0.14	36.23	36.23	968.65	-302.36
2008	2.03	-4.48	1.65	1.03	-0.18	48.56	48.56	1313.82	-400.15
2009	2.18	-4.81	1.78	1.11	-0.19	52.15	52.15	1415.78	-428.11
2010	2.28	-5.01	1.86	1.16	-0.19	54.38	54.38	1479.65	-445.42

Table 6.10: Results of the simulation (Percentage change is relative to base year 2004)

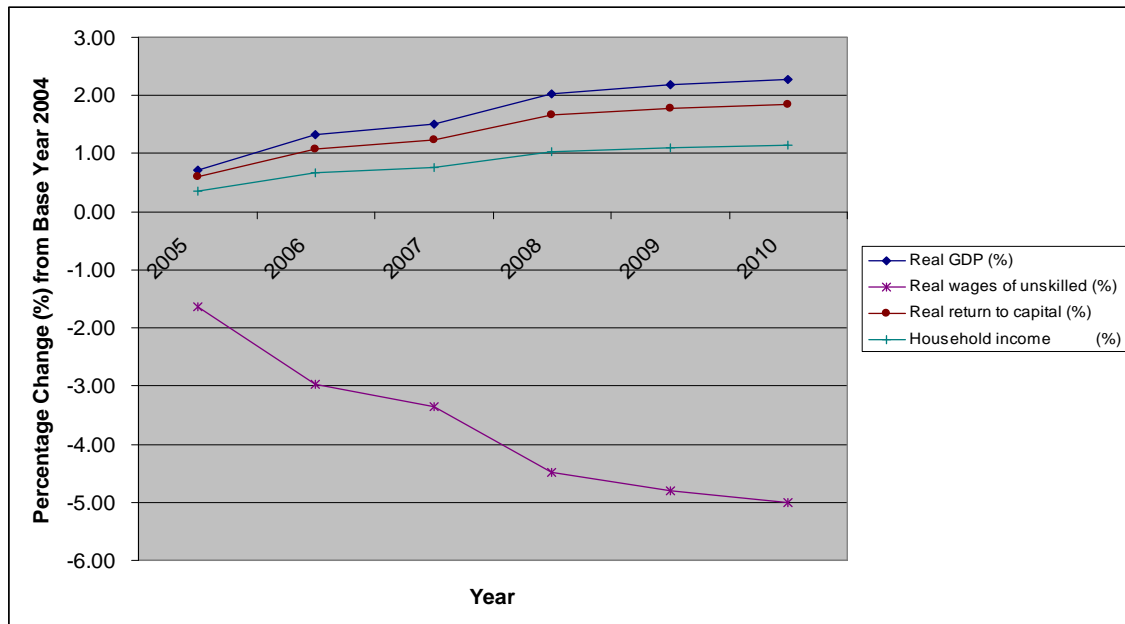


Figure 6.2: Results of the simulation (Percentage change is relative to base year 2004)

The wage of unskilled labors falls with the increase in supply due to the inflow of foreign labors

while the wage of local skilled labor increases. With the assumption that unskilled local and foreign labors are composite function linearly substitutable with the difference level of productivity, the wages of existing foreign labors are affected in the same way as those of local labors. However, they do not get the benefits of increased returns to capital; which are assumed to be owned by permanent/local residents. Returns to capital increase as greater labor supply and demand for goods increase the demand for capital. The rise of the returns to capital will in the long run lead to increase level of investment that would result in higher capital stocks and production (not within the scope of the model).

With the increase of unskilled foreign labor in Malaysia, total income in the country rises. However, if incomes of local labor force and foreign labor are to be considered separately, the result shows that total income of local decreases although rental of capital increases (the percentage is very small since the increase rental of capital are lower than the decrease in real wage). On the other hand, total income of unskilled foreign labor increases as their number increases.

The decrease in prices of goods consequently increases the demand by regional household and exports. Even though the prices for imports increase, imports also rise in Malaysia due to the increase in total income and number of consumers. The demand for imports moves in the same direction with the inflow of unskilled foreign labors. Figure 6.3 illustrates the trade balance condition with the rising number of unskilled foreign labor. The current account which takes into account remittance flows tends to decline as more remittances leave the country (Figure 6.4)

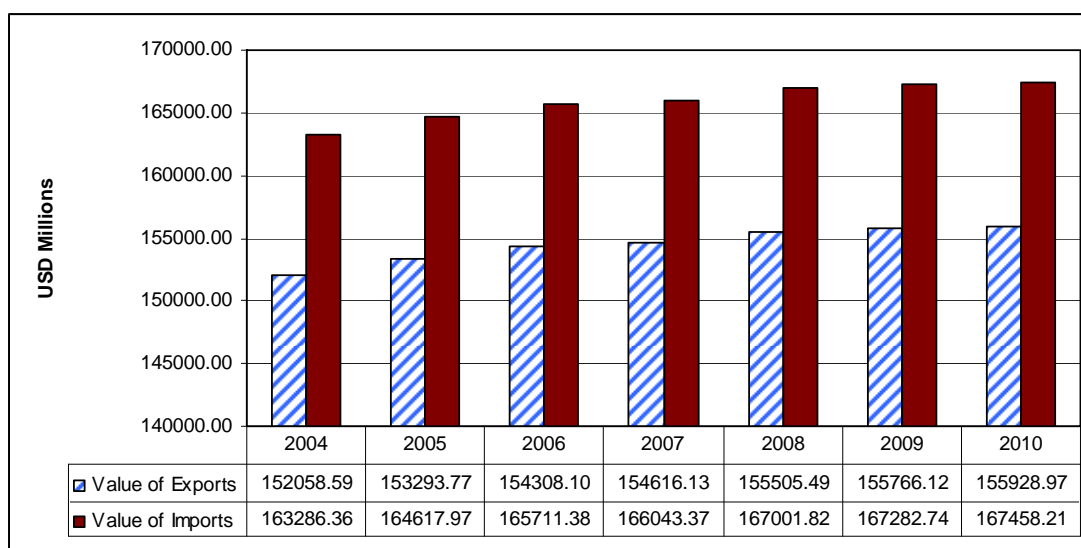


Figure 6.3: Trade balance condition

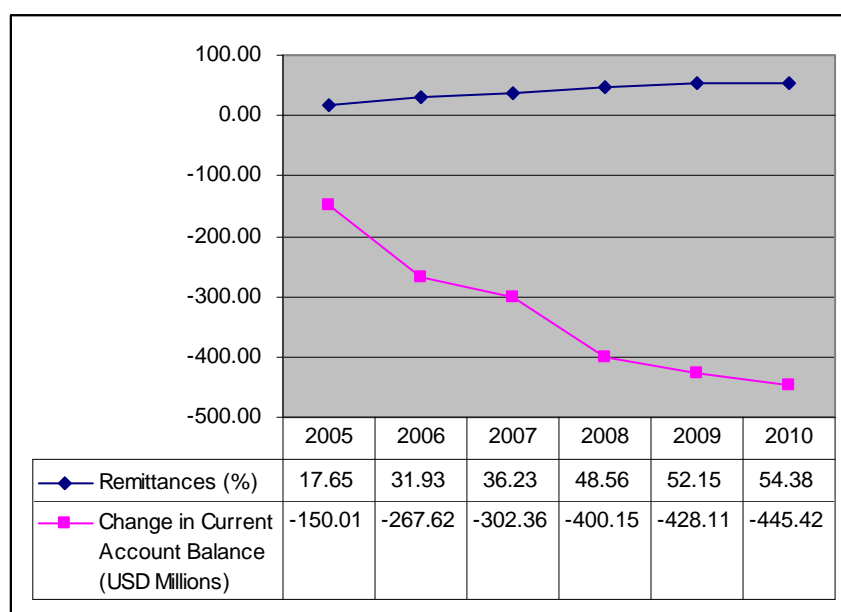


Figure 6.4: Remittances and Current Account Balance.

As discussed in Chapter 5 for GMig2 model, similar approach is adopted in this study to evaluate welfare, i.e; using equivalent variation (USD million). Figure 6.5 indicates that the increase inflow of unskilled foreign labor resulting in increase of total welfare in Malaysia.

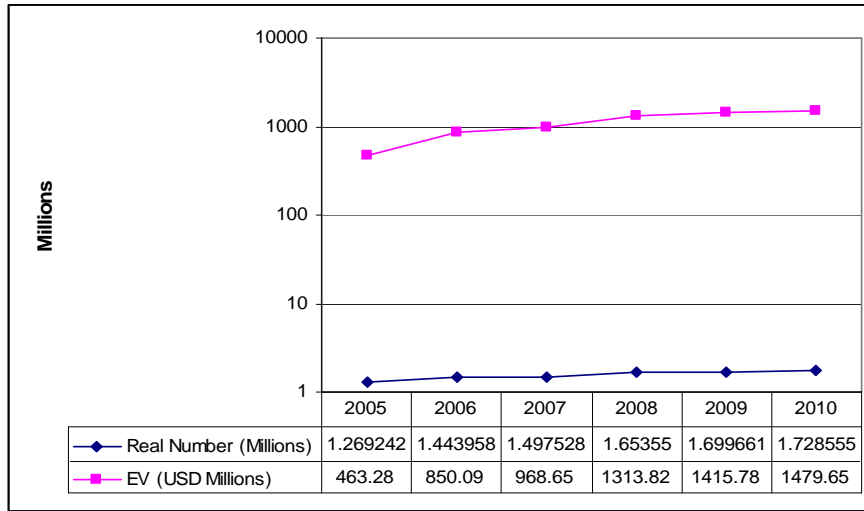


Figure 6.5: The effect of inflow unskilled foreign labor to welfare of Malaysian population

All residents in Malaysia and ROW gain in terms of real incomes as a result of increased foreign labor in Malaysia. Malaysian economies gain from increases returns to capital and increased tax incomes while ROW economies gain from the increased remittances and wages.

When particular attention is given to the construction sector, the result shows that firm price of unskilled labor in the sector decreases with the increase inflow of unskilled foreign labor into the sector. Hence, the firms increase their demands of the labors in the sector. The decrease in price of labor reduces the cost of production and therefore reduces the price of output. This situation consequently increases the demand for construction output in Malaysia. Table 6.11 below illustrates the aforementioned situations.



	Firm price for unskilled labor in construction (%)	Demand for unskilled labor in construction (%)	Change of construction output (%)
2005	-1.75	2.82	1.48
2006	-3.15	5.16	2.69
2007	-3.57	5.88	3.05
2008	-4.77	7.95	4.11
2009	-5.11	8.56	4.42
2010	-5.33	8.95	4.61

*Table 6.11: Results for construction sector*

### **6.5.2 The effects of policy implementation**

However, experiment on the policy intervention whereby the number of inflow of unskilled foreign labor to be reduced to 1.5 million by 2010 shows the following results:

Table 6.12 illustrates the outcome should the policy being implemented. The difference between 2010 without policy and 2010 with policy suggested reverse outcomes. On contrary to those discussed in previous subsection (6.5.1), the reduction of unskilled foreign labor would cause real GDP to fall due to the reduction in output.

The wage of unskilled labor still decreases albeit lower with the lower supply of unskilled foreign labors into the country. With policy implementation however, the real wage of unskilled labor increases by 3.90%. Returns to capital would be lower by 1.46% and consequently reduce the total income. Nonetheless, total income of local population would eventually increase by 0.14%.

	2010 (without policy)	2010 (with policy)	Difference
Real GDP (%)	2.28	0.49	-1.79
Terms of Trade (%)	-0.45	-0.10	0.35
Change in Trade Balance (% of GDP)	1071.19	229.62	-841.57
Change in Current Account Balance (USD Millions)	-445.42	-101.51	343.91
Real wages of unskilled (%)	-5.01	-1.11	3.90
Real return to capital (%)	1.86	0.40	-1.46
Household income (%)	1.16	0.24	-0.91
Household income of local population (%)	-0.19	-0.05	0.14
Household income of foreign labor in Malaysia (%)	54.38	11.87	-42.51
Remittances (%)	54.38	11.87	-42.51
EV (USD Millions)	1479.65	309.97	-1169.67
Firm price for unskilled labor in construction (%)	-5.33	-1.18	4.15
Demand for unskilled labor in construction (%)	8.95	1.89	-7.06
Change of construction output (%)	4.61	0.99	-3.62

*Table 6.12: Results of the simulation (with and without policy implementation)*

Figure 6.6 depicts trade balance condition whereby the decrease number of unskilled foreign labor would resulting in decrease in exports and imports. Current account balance will be faring better with lower remittances leave the country. Total welfare will nevertheless reduce by 79 percent (refer Table 6.12).

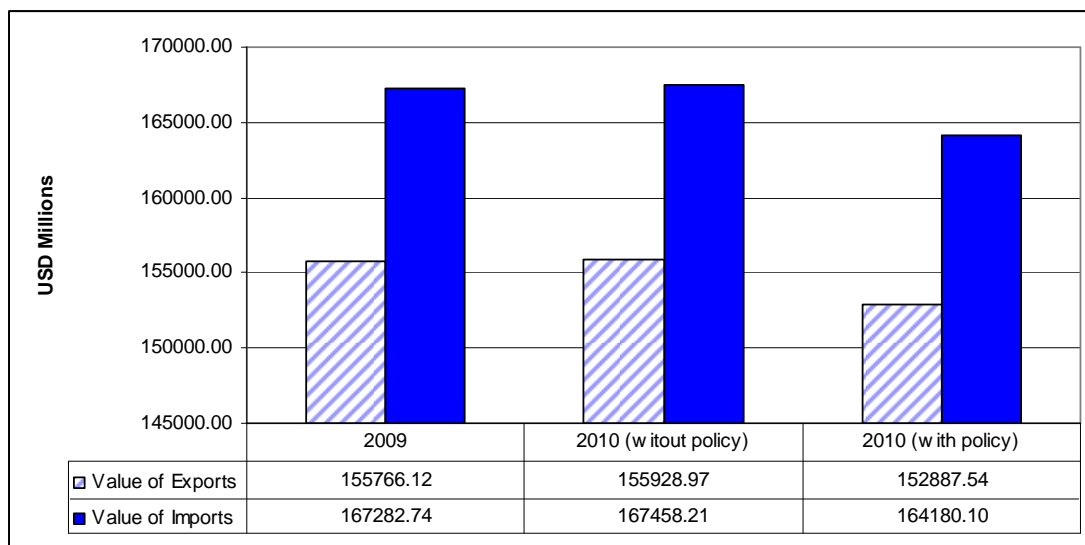


Figure 6.6: Trade balance condition (difference between simulation results)

In construction sector, firm price of unskilled local labor still decrease by -1.88 percent with policy implementation as compared to -5.33 percent in its estimated condition. The decrease in price ultimately instigates the demand for more unskilled labors in the sector. However, the difference between the two scenarios is obvious, i.e; 8.95 percent without policy and 1.89 percent with policy. The lower decreases in the price thus creating lower construction output.

Assuming that the number of unskilled foreign labor to be reduced to 1.5million by 2010, Malaysian economies would loss from decrease returns to capital and decrease tax incomes while ROW economies loss from the decrease in remittances and wages.

## 6.6 Conclusion

This chapter discusses general equilibrium modeling to measure the quantitative effects of unskilled migrant labors on host country, Malaysia as case study. The model presented in this

chapter is based on GMig2 model developed using GTAP 7 data base. In addition, international labor movement scenario in Malaysia is discussed as the main focus of the study.

Two-country, five-sectors and five-factors model is formulated to theoretically signify international labor movement scenario into Malaysia. Assumptions are made for simplification of analysis. Considering Malaysian high reliance on unskilled migrant labor, the model assumed that inflows of foreign labor only involve this type of labor and therefore international movement of skilled labor and issue of brain drain is ignored.

The chapter explains the model in detail with a list the equations and data sources. The assumptions together with the equations represent basic framework for simulation process using GEMPACK software described herein. Data aggregation for empirical analysis is generated from GTAP 7 Data Base. However, the model necessitates further data to complement GTAP 7 Data Base in order to simulate GMig2 model. In addition, downloadable data base for GMig2 model is not sufficient for Malaysia-ROW model. Additional ad hoc data was formulated before proceeding with simulation process.

Results of the simulation are discussed in two parts. Part 1 looks at the effects of increasing inflow of unskilled foreign labor into Malaysia from year 2005 till 2010. The result indicates that with the rising numbers of this labor, Malaysian economy gains in term of increasing returns to capital and tax incomes. Although unskilled local labor is experiencing decreasing real wage, total welfare of Malaysian population eventually increases. This could be due to the fact that permanent residents would start trading with foreign labors and increase the aggregate welfare.

On the other hand, Part 2 of the results which discussing the policy implementation of reducing the number of unskilled foreign labor to 1.5 million by 2010 shows reverse effects. This would cause GDP to fall and reduction in total income, thus decreasing total welfare of the country's population.

Construction sector being the sector that is labor-intensive, is inevitably affected by the inflow of foreign labors. The sector highly dependent upon foreign labor due to its nature of work that is generally tends to shun locals. Results show that the firm price of unskilled labor decreases with the increase supply of labor, hence creating more demand for the labor. With policy implementation however, the lower decreases in firm price eventually reduce construction output.

Assuming that the number of unskilled foreign labor to be reduced to 1.5million by 2010, Malaysian economies would loss from decrease returns to capital and decrease tax incomes while ROW economies loss from the decrease in remittances and wages.

# **CHAPTER 7**

## **CONCLUSION AND RECOMMENDATION**

### **7.1 Concluding remarks**

This chapter concludes and summarizes the entire chapters in the dissertation. Each chapter has been thoroughly discussed and deliberated within the scope of works aimed for the study.

The conclusions of the chapters are as follows:

#### **7.1.1 Chapter 1**

This chapter introduced the work done in the study. It highlighted the background, aims and objectives, methodology, scope, significant contributions and summary of chapters as brief overview of the dissertation.

### **7.1.2 Chapter 2**

The discussion in this chapter centered upon literature search on background subjects of globalization, economic integration, production divisions and international labor movement. Basic understanding of the study is started through the contents discussed in this chapter. It offers general knowledge of the subject under study and represents better acknowledgement of the ensuing chapters.

Various definitions and discussions have been offered by previous researches on globalization, economic integration, production divisions and international labor movement. These are all related areas of study that complements each other to the extent that one cannot be described adequately without mentioning the other. It is hoped that the chapter achieved its aim in initiating towards a better appreciation of the next chapters.

### **7.1.3 Chapter 3**

Chapter 3 provided a theoretical framework for investigating the labor movement impacts on host country. The chapter concluded that if the non-tradable good is capital intensive, (i) an increase in the inflow of cross-border labor raises the relative price of non-tradable goods; (ii) an increase in the inflow of foreign labors lowers wage rate and raises rental prices (the opposite result occurs if the non-tradable good is labor intensive). A marginal increase in the inflow of cross-border labor gives rise to an aggregate welfare gain of natives in the host country.

It is interesting to note that even though the model in the chapter has differing wage rates between labors in tradable and non-tradable goods (instead of having the same wage rate as in the previous study), the analysis in both studies draws the same results. Nevertheless, the author is of the opinion that the quantitative effect of the inflow of foreign labors would be different. This is due to the disparity in labor market size between the models.

#### **7.1.4 Chapter 4**

This chapter explained how international trade is being directed towards firms' production allocation in order to seek better ways to minimize production cost and at the same time maximize profit revenues.

R&D capital was assumed as fixed cost and only has effect on new potential entrants. The R&D capital is independent upon the pattern of firms' allocation production. Different result was derived from Helpman, Melitz and Yeaple (2004) model. In particular, if the firms are with high difference of productivity between two countries, it will be produce all goods in one country and sell the goods to domestic market as well as exporting it to another country. However, if the firms are with low difference of productivity between two countries, it will choose horizontally FDI forms and respectively located in two countries.

The model was mainly applied in heterogeneous firms that consider the costs associated with the different production technologies between firms and transportation cost between two countries. And the mechanisms used by the firms in determining their production allocation of whether to operate in any one country or both countries at the same time were also analyzed.



The model was then expanded to analyze the effects of technology improvement (level of firms' productivity), changes of market size, the reduction of transportation cost and the R&D capital investment on the heterogeneous firms' production allocation and promote trade liberalization between two countries.

This chapter did not directly discuss international labor movement. However, it is important to note that the situations mentioned in the chapter would eventually, in the long run create employment opportunities to native residents in the respective countries. It is interesting to note that the movement of capital discussed in this chapter does have effects on labor market.

#### **7.1.5 Chapter 5**

Chapter 5 discussed the global comparative static general equilibrium modeling approach which is commonly adopted in policy analysis. Brief overview of CGE modeling was provided at the beginning of the chapter. Thereafter GTAP model and Data Base and its application in various CGE researches were presented. The standard model has been applied in studying the issues of economic growth and trade, trade policy, resources, technology and the environment.

Apart from the above, another important application of the model and data base is on the labor movement issue, of which the focus of this study. The development of Global Migration models (GMig and GMig2) was discussed to provide basic understanding on the structure of the CGE model used in the study.

The chapter ended with description on the necessary steps carried out to simulate data based on GMig2 model. It includes brief introduction of the GEMPACK software and associated files required for the simulation process. This chapter served as basic framework for case study analysis deliberated in Chapter 6.

#### **7.1.6 Chapter 6**

Results of the simulation in Chapter 6 were discussed in two parts. Part 1 looked at the effects of increasing inflow of unskilled foreign labor into Malaysia from year 2005 till 2010. The result indicated that with the rising numbers of this labor, Malaysian economy gains in term of increasing returns to capital and tax incomes. Although unskilled local labor is experiencing decreasing real wage, total welfare of Malaysian population eventually increases. This could be due to the fact that permanent residents would start trading with foreign labors and increase the aggregate welfare.

On the other hand, Part 2 of the results which discussing the policy implementation of reducing the number of unskilled foreign labor to 1.5 million by 2010 showed reverse effects. This would cause GDP to fall and reduction in total income, thus decreasing total welfare of the country's population. Assuming that the number of unskilled foreign labor to be reduced to 1.5million by 2010, Malaysian economies would loss from decrease returns to capital and decrease tax incomes while ROW economies loss from the decrease in remittances and wages.

Construction sector in particular, being the sector that is labor-intensive, is inevitably affected by the inflow of foreign labors. The sector highly dependent upon foreign labor due to its nature

of work that is generally tends to shun locals. Results showed that the firm price of unskilled labor decreases with the increase supply of labor, hence creating more demand for the labor. With policy implementation however, the lower decreases in firm price eventually reduce construction output. It is hoped that the results from this study could contribute toward better policy formation by the policy makers in respect to the management of international labor movement in Malaysia.

With respect to welfare effects, the results in chapter 6 supported the result in chapter 3: A marginal increase in the inflow of foreign labor gives rise to an aggregate welfare gain of population in the host country.

## **7.2 Recommendation for future research**

The dissertation is not without limitations and constraints. The focus of the study is to investigate the economic effects of globalization. The other aspects such as social and political effects are therefore not within the scope of the study. In addition, it does not consider the movement of skilled labor and neither does it consider the effects of labor movement on the home country. Although illegal foreign labors also contributed to the Malaysian economy, they are nevertheless excluded in the analysis due to unavailability of reliable data.

The followings are among the area that could provide potential ideas for future research:

- The effects of skilled and unskilled international labor movement to labor importing (Malaysia) and labor exporting (ROW) countries' economies.

- Computable General Equilibrium (CGE) modeling on sectoral effects of international labor movement in Malaysia.
- Empirical analysis of multinational firms' behavior using CGE modeling.



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