# A COMPUTABLE GENERAL EQUILIBRIUM MODELING OF THE ECONOMIC EFFECTS OF REDUCING NON-TARIFF MEASURES IN THE MALAYSIAN FOOD SECTOR



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## ABSTRACT

The Malaysian food processing sector is highly regulated with non-tariff measures (NTMs), and particularly with standard NTMs applied to imports. Though these measures are used for legitimate reasons such as health and safety, some appear to have been instituted for political reasons and serve as "hidden" barriers to trade, given this sector is highly import intensive. This sector is therefore considered to be over regulated and it is argued that a reduction of restrictive NTMs and non-tariff barriers (NTBs) is needed to facilitate trade. Since NTMs, in general, are opaque and less transparent relative to tariffs, they pose a significant challenge to assess their direct and indirect effects on the economy. There is an ongoing effort in contemporary economic literature to provide improved theoretical methodologies, and empirical studies to better measure the actual impact of NTMs.

This study contributes to the empirical literature in the following manner. First, it provides a quantitative assessment of the economic impacts of the reduction of NTMs in the food processing sector of Malaysia, by means of a disaggregated sectoral analysis. Such a methodology is used given that the Malaysian food industry is highly heterogeneous in terms of its trade intensity, labour usage and wage levels. Second, the indirect effects of a reduction in NTMs on employment are revealed when comparing local and foreign labour. In this context it is noted that the Malaysian food industry is labour intensive and dominated by small and medium-sized firms. The study estimates the production, trade, labour market (employment, wages and wage inequality) and welfare effects, which follow from a reduction of NTMs in 11 sub-sectors of the food processing industry. This empirical analysis uses the computable general equilibrium (CGE) model to simulate the impact of a reduction of NTMs based on three scenarios.

They include a baseline scenario with no changes in NTMs, a 10 percent and a 50 percent reduction in NTMs, which are introduced as exogenous shocks into the model. The calibration based on the data is generated from the Social Accounting Matrix (SAM) of Malaysia.

The core findings of the study are as follows. First, the change in production and trade following NTM cuts are substantial, especially in the long-run. The sub-sectors that are highly dependent on imported inputs in their production, benefit the most, as they are able to gain access to cheaper imported inputs since business compliance costs are reduced with reductions in NTMs. Second, NTM reductions incur positive indirect effects on employment, with employment gains most notable in the export oriented sub-sectors. Interestingly, the dependency on unskilled labour (both local and foreign) increases with the NTM cuts, but the wages for this group decreases. Third, the overall welfare in the economy increases, albeit minimally, with NTM cuts.

The study supports a reduction of NTMs in the food processing industry to enhance production, trade and welfare of the economy. This, in turn, underlines the presence of existing restrictive NTMs or NTBs in this industry. To reduce the incidence of restrictive measures, policymakers need to address the design and method of adoption of NTMs across the food industry's sub-sectors. Policymakers may also need to regulate unskilled foreign labour to ensure that an upgrading of the industry is not compromised following its expansion.

# ABSTRAK

Sektor pemprosesan makanan di Malaysia sangat dikawal selia dengan langkah-langkah bukan tariff (NTM) dan terutamanya dengan NTM berorientasikan standard yang digunakan untuk import. Walaupun langkah-langkah ini digunakan untuk sebab-sebab yang sah seperti kesihatan dan keselamatan, ia juga mungkin diwujudkan untuk tujuan politik dan berfungsi sebagai halangan "tersembunyi" kepada perdagangan memandangkan sektor ini adalah import intensif. Oleh itu, sektor ini dianggap terlalu terkawal, di mana pengurangan NTM terhad diperlukan untuk memudahkan perdagangan. Secara umumnya, NTM adalah legap dan kurang telus berbanding dengan tarif, hal ini menimbulkan cabaran penting untuk menilai kesan langsung dan tidak langsung NTM terhadap ekonomi. Terdapat usaha berterusan dalam kesusasteraan ekonomi kontemporari untuk memberikan kajian teori dan empirikal yang lebih baik untuk mengukur kesan sebenar NTM.

Oleh itu, kajian ini menyumbang kepada kesusasteraan empirikal dengan cara berikut. Pertama, ia memberikan penilaian kuantitatif mengenai impak ekonomi pengurangan NTM di sektor pemprosesan makanan Malaysia. Kajian ini juga menganalisis kesan terhadap sub-sektor kerana industri makanan adalah sangat heterogen dari segi intensiti perdagangan, penggunaan buruh dan upah purata. Kedua, kesan tidak langsung dari NTM yang dipotong pada pekerjaan dibezakan antara buruh tempatan dan asing, kerana industri makanan adalah intensif buruh dan ia juga dikuasai oleh firma kecil dan sederhana. Kajian itu menganggarkan pengeluaran, perdagangan, pasaran buruh (pekerjaan, upah dan ketidakadilan gaji) dan kesan kebajikan berikutan pengurangan NTM dalam 11 subsektor industri pemprosesan makanan. Analisis empirik ini menggunakan model *Computable General Equilibrium* (CGE) yang boleh dikira

untuk mensimulasikan kesan pengurangan NTM berdasarkan tiga senario, termasuk senario asas tanpa perubahan dalam NTM, 10 peratus dan 50 peratus pengurangan NTM yang diperkenalkan sebagai kejutan luar. Penentukuran berdasarkan data dihasilkan daripada Matriks Perakaunan Sosial (SAM) Malaysia.

Penemuan utama kajian ini adalah seperti berikut. Pertama, perubahan pengeluaran dan perdagangan berikutan pemotongan NTM adalah besar, terutamanya dalam jangka panjang. Subsektor yang sangat bergantung kepada input yang diimport dalam pengeluaran, mendapat manfaat yang paling banyak kerana ia dapat memperoleh akses kepada input yang diimport yang lebih murah kerana kos pematuhan perniagaan dikurangkan dengan penurunan NTMs. Kedua, pengurangan NTM menimbulkan kesan tidak langsung positif terhadap pekerjaan, dan pekerjaan di subsektor yang berorientasikan eksport dimanfaatkan secara ketara. Pergantungan kepada buruh tidak mahir (baik tempatan dan asing) meningkat dengan potongan NTM, tetapi upah untuk kumpulan ini menurun. Ketiga, kebajikan ekonomi secara keseluruhan bertambah, walaupun minimum, dengan pemotongan NTM.

Kajian ini menyokong pengurangan NTM dalam industri pemprosesan makanan untuk meningkatkan pengeluaran, perdagangan dan kebajikan ekonomi. Ini seterusnya menggariskan kesan-kesan NTM yang terhad pada industri ini. Untuk mengurangkan kejadian langkah-langkah yang ketat, pembuat dasar perlu menangani reka bentuk dan kaedah pengambilan NTM di seluruh subsektor industri makanan. Pembuat dasar juga perlu mengawal selia buruh asing yang tidak mahir untuk memastikan peningkatan industri tidak terjejas.

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| | | |
|---|---|---|
| AGE | : | Applied general equilibrium |
| AGL | : | Aggregate Grubel-Lloyd |
| AS | : | Ambitious scenario |
| ASEAN | : | Association of Southeast Asian Nations |
| AVE | : | Ad-valorem equivalent |
| BS | : | Baseline scenario |
| CCM | : | Capital composite matrix |
| CE | : | Cross Entropy |
| CES | : | Constant elasticity of substitution |
| CET | : | Constant elasticity of transformation |
| CGE | : | Computable general equilibrium |
| CTPM | : | Contingent trade-protective measures |
| D | : | Domestic markets |
| DCs | : | Developing countries |
| DCU | : | Domestic currency unit |
| DOS | : | Department of Statistics |
| DKM | : | Malaysian Skills Diploma |
| DLKM | : | Malaysian Skills Advanced Diploma |
| E | : | Export markets |
| ERIA | : | Economic Research Institute for ASEAN and East Asia |
| UNESCAP | : | United Nations Economic and Social Commission for Asia and the Pacific |
| EU | : | European Union |
| EV | : | Equivalent variation |

| | | |
|---|---|---|
| FCU | : | Foreign currency units |
| FLAB1 | : | Foreign skilled labour |
| FLAB2 | : | Foreign semi-skilled labour |
| FLAB3 | : | Foreign unskilled labour |
| FM | : | Finance measures |
| FTA | : | Free trade agreement |
| GAMS | : | General algebraic modeling system |
| GDP | : | Gross domestic product |
| GL | : | Grubel-Lloyd |
| GTAP | : | Global Trade Analysis Project |
| H-O | : | Hecksher-Ohlin |
| H-O-S | : | Heckscher-Ohlin-Samuelson |
| HS | : | Harmonised System |
| IIT | : | Intra-industry trade |
| ILO | : | International Labour Organization |
| IMP | : | Industrial Master Plan |
| I-O | : | Input-output |
| ISCO | : | International Standard Classification of Occupations |
| K | : | Capital |
| L | : | Labour |
| LDCs | : | Least developed countries |
| LLAB1 | : | Local skilled labour |
| LLAB2 | : | Local semi-skilled labour |
| LLAB3 | : | Local unskilled labour |
| M | : | Imports |

| | | |
|---|---|---|
| MASCO | : | Malaysia Standard Classification of Occupations |
| MAST | : | Multi agency support team |
| MIDA | : | Malaysian Investment Development Authority |
| MITI | : | Ministry of International Trade and Industry |
| MNCs | : | Multinational corporations |
| MPC | : | Malaysia Productivity Corporation |
| MRPT | : | Marginal rate of product transformation |
| MRS | : | Marginal rate of substitution |
| MRTS | : | Marginal rate of technical substitution |
| MS | : | Modest scenario |
| MSIC | : | Malaysia Standard Industrial Classifications |
| NAP | : | National Agricultural Policy |
| NNTT | : | New-new trade theories |
| NTBs | : | Non-tariff barriers |
| NTMs | : | Non-tariff measures |
| NTTs | : | New trade theories |
| NZIER | : | New Zealand Institute of Economic Research |
| OECD | : | Organization for Economic Cooperation and Development |
| PC | : | Price control |
| PPF | : | Production possibility frontier |
| PSI | : | Pre-shipment inspection and other formalities |
| PTAs | : | Preferential trade agreements |
| Q | : | Production/Output |
| QC | : | Quantity control |

| | | |
|---|---|---|
| R & D | : | Research and development |
| RGDP | : | Real gross domestic product |
| ROW | : | Rest of the world |
| S | : | Skilled labour |
| SAM | : | Social accounting matrix |
| SKM | : | Malaysian Skills Certificate |
| SMEs | : | Small and medium firms |
| SS | : | Semi-skilled labour |
| SPS | : | Sanitary and phytosanitary |
| TBT | : | Technical barrier to trade |
| TCE | : | Total cost equivalent |
| TP | : | Transfer payments |
| TPF | : | Total factor productivity |
| TRAINS | : | Trade Analysis Information System |
| UN Comtrade | : | United Nations Commodity Trade Statistics Database |
| UNCTAD | : | United Nations Conference on Trade and Development |
| U | : | Unskilled labour |
| US | : | United States |
| WITS | : | World Integrated Trade Solution |
| WTO | : | World Trade Organization |
| X | : | Exports |

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# CHAPTER 1: INTRODUCTION

## 1.1 Background of Study

Non-tariff measures (NTMs) have played an important role in international trade since tariff rates have been liberalised. The use of NTMs to regulate trade has been increasing since the 1990s (Gourdon, 2014). The World Trade Organization (WTO) (2012) reported that as many as 31,731 NTMs had been imposed by 2012. By 2018 this number had increased to 50,182 NTMs (WTO, 2019).

Governments have imposed NTMs for a variety of legitimate non-trade objectives. These include measures to protect human, animal and plant health, pursuing better national security, correct market failures such as asymmetric information or externalities. Although, the objectives of governments in implementing NTMs may not be related to international trade, NTMs can in fact restrict trade and serve protectionist purposes. Thus, tariff liberalisation may lead countries to use NTMs to protect domestic industries (Aisbett & Pearson, 2012; Fischer & Serra, 2000).

A nation's growth in international trade can be affected by NTMs (Beghin et al., 2012; Deardorff & Stern, 1997; Mohan et al., 2012). This is of particular concern for developing countries because of the requirement to comply with rules governing the use of various NTMs in order to access markets (United Nations Conference on Trade and Development [UNCTAD], 2013). NTMs can have both positive and negative effects (Disdier & Marette, 2010; Fugazza, 2013), which depends in part on the design of NTMs. Some NTMs may enhance trade. For instance, NTMs such as sanitary and phytosanitary (SPS) and technical barriers to trade (TBT)[1] measures are used to correct market failures such as information asymmetry. Typically, consumers increase demand for the product that is subject to these measures as their confidence in the product increases. On the other hand, NTMs can also distort and restrict international trade (UNCTAD, 2013). This is due to domestic and foreign producers having to face higher compliance costs. In addition, NTMs may induce negative trade impacts if countries protect domestic producers with NTMs. As is known, NTMs can generate positive and negative impacts, so that one product can be subject to more than a few NTMs, in which case the overall impact is a product of their combined impact.

As noted, countries have increasingly used NTMs to regulate trade. The global food sector is highly regulated by NTMs: 49 per cent of total NTMs notified to the WTO were found in this sector in 2016 (WTO, 2017). The imposition of NTMs in this sector is regarded as essential to provide confidence to consumers in the safety, quality and authenticity of what they eat. Thus, food regulations ensure the high quality of safe food in the market place in terms of cleanliness and sanitation. In this way, NTMs in this sector are designed to achieve public policy objectives. However, some countries for political reasons, may implement NTMs, which then act as barriers to trade (WTO, 2012). Such over regulation may create the need for loosening some of the NTM restrictions in order to enhance economic growth and welfare. This provides the motivation for this study, which focuses on the impact of NTMs in the food processing sector.

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[1]According to the WTO (2012), SPS measures are those which are designed to protect food safety and animal and plant health, while TBTs are all other regulations, standards, testing and certification procedures.

Through trade, NTMs can affect the labour market. According to the United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP] (2016), the implementation of NTMs will have a direct effect on trade and prices, and an indirect effect on the labour market. That is, the effect on labour markets – for example, on employment levels, wages and inequality – can be through changes in such mechanisms as prices, cost of production, and trade. Several studies have analysed the impact of NTMs on the labour market (Bustos, 2011; Francois, el. at., 2009; Haskel & Slaughter, 2003; Leonardi & Meschi, 2016; Stone & Cepeda, 2012; Verhoogen, 2008). They describe the way in which NTMs can affect the labour market positively or negatively.

However, the impact of NTMs can be ambiguous. Thus, there is a need to analyse the actual impact of NTMs in order to provide concrete theoretical and empirical conclusions. As mentioned above, the presence of NTMs dominate in the food sector and have an impact on the economy and the labour market. However, little research has been devoted to this issue as it affects the Malaysian economy. Thus, this study aims to analyse the economic effects of reducing NTMs in the Malaysian food processing sector with the hope that it contributes to the knowledge of the effects of streamlining NTMs.

## 1.2 Problem Statement

Malaysia has increasingly used NTMs to regulate international trade, as import tariffs have been progressively reduced over the years. The trade weighted average tariff rate in 2003 was relatively low at 4.57 per cent and reduced further to 4.02 per cent in 2016 (World Integrated Trade Solution [WITS], 2018). Despite the low tariff environment, the number of NTMs increased from 590 in 2003 to 713 in 2016 (ERIA-UNCTAD, 2017). Within ASEAN member countries, the country with the highest number of NTMs is Thailand with 1614 measures, followed by the Philippine (843 measures) and Malaysia (ERIA-UNCTAD, 2017). Under a regime of low tariff rates and an increasing number of NTMs, total Malaysia's trade increased by 27 per cent from RM1167.6 billion in 2003 to RM1484.6 billion in 2016 (Department of Statistics [DOS], 2016).

This study focuses on the food processing sector given the government's aims to promote this industry and given its strong linkages with other sectors. This sector also plays an increasing role in contributing to Malaysia's manufacturing output and employment. However, trade is highly regulated through the use of NTMs because of the pervasive issue of food safety. Some 57 per cent of the total number of Malaysia's NTMs are found in the food processing sector (ERIA-UNCTAD, 2017). Most are technical measures, which are SPS and TBT measures (ERIA-UNCTAD, 2017). Their use reflects consumer concern on health grounds and the need for high quality foodstuffs that are provided to the market.

NTMs in this sector are applied to the whole supply chain from the production process, to trade and to the handling of food. Although food standards are not trade measures *per se*, they can still affect trade levels. However, the effect of the presence of NTMs is often ambiguous. If countries use NTMs for reasons to do with the political economy, then they become unnecessary barriers to trade (WTO, 2012).For instance, some studies have shown that NTMs act as a barrier to trade given their implementation increases compliance costs to firms (Chen et al., 2008; Disdier & van Tongeren, 2010; Fontagne et al., 2005; Moenius, 2004; Otsuki et al., 2001; Peterson & Orden, 2008; Peterson et al., 2013). On the other hand, some argue that NTMs can enhance trade.

This is due to the fact that NTMs can reduce the problem arising from asymmetric information between buyers and sellers, and hence reduce the transaction costs (Athukorala & Jayasuriya, 2003; Schuster & Maertens, 2015). Furthermore, the presence of NTMs will affect employment, wages and inequality indirectly through trade (UNESCAP, 2016). There is however, a lack of studies in this area so that the linkage between them is still unclear.

The reduction of NTMs seems to be also beneficial for an economy if they are being used as a tool for protectionism. According to the WTO (2014), the elimination of NTMs could deliver a global increase in trade of up to USD 1 trillion (RM 3.65 trillion) per year and create 21 million jobs worldwide. Adriamananjara et al. (2004) found that global welfare increased by about USD 90 billion in 2001 due to the removal of certain NTMs. Wilson, et al. (2005) estimates that for developing countries, global trade in merchandise could increase by USD 377 billion between 2000-2001 when NTMs are removed. However, the extent to which these claims would apply to Malaysia's food processing sector, which is highly regulated, is unknown. This study therefore seeks to measure the impact of a reduction of NTMs in Malaysia's the food processing sector.

There are only few studies on NTMs in Malaysia. They focus on the effects of NTMs from an exporter's perspective. For instance, Kee at al. (2009) analysed the effects of NTMs on export behavior by simply measuring the ad valorem equivalent (AVE) of core non-tariff barriers (NTBs). The studies of Aini (2011), Hanif (2013) and Rabiul et al. (2010) reveal the specific NTBs at the sectoral level between Malaysia and her trading partners. Sithamparam et al. (2017) employed Malaysian exporters' firm-level surveys to assess the stringency of NTMs. This study focuses on the type of NTMs applied to Malaysian exporters' trading partners to examine how strict the NTMs are from Malaysian exporters' point of view. Hanif et al. (2011) studied the factors that affect the level of NTBs in Malaysia's agricultural sector. Normaz (2010) in a study focused only on the effects of language on Malaysia's trade and concluded that a common language shared by trading partners would improve trade.

There are a limited number of studies of the economic impacts of reducing NTMs from an importer's perspective as well as the impacts on labour market and welfare - especially for Malaysia. There is, therefore, no clear understanding on the linkages involved. Appropriate policies are therefore difficult to develop if the impact of NTMs is unclear. This study consequently seeks to further contribute to the debate on the impacts of a reduction of restrictive NTMs. This is by way of an investigation into how the food processing sector, as a whole and its sub-sectors, are affected by reductions in NTMs. The study also models the labour market impacts of reduction in NTMs. It is not only disaggregates employment by skills, but distinguishes local labour from foreign labour given the overwhelming presence of unskilled foreigners in the Malaysian manufacturing sector (World Bank, 2013; DOS, 2014).

**1.3 Research Questions**

This study aims to respond to the following questions:

1. How does a reduction of NTMs in the food processing sector impact food production and trade in Malaysia? Are the effects homogeneous across the food processing sub-sectors?

2. How does a reduction of NTMs in the food processing sector affect employment, wages and wage inequality this sector? Is the impact disproportionate across the food

processing sub-sectors? Does a reduction of NTMs influence the composition of labour in the food processing sector?

3. Does the local labour force benefit from the NTMs reduction policy compared to foreign labour in this sector?

4. What is the impact of a reduction of NTMs in the food processing sector on the overall welfare of the economy?

## 1.4 Research Objectives

The above research questions produce the following research objectives:

1. To estimate the food production and trade impacts of a reduction of NTMs in the food processing sector.

2. To simulate the employment, wages and wage inequality effects of a reduction of NTMs in the food processing sector.

3. To simulate the overall welfare effects of a reduction of NTMs in the food processing sector.

## 1.5 Scope and Significance of Study

This study analyses the potential impacts of a reduction of NTMs in the food processing sector. In doing so, it takes into account of the effect of lowering NTMs on the import side, given most food processing sub-sectors are import intensive.

The study estimates the impact of a reduction of NTMs on the food processing sector as well as its 11 sub-sectors[2] under various scenarios[3] using a computable general

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[2] The 11 food processing sub-sectors are meat and meat production, preservation of seafood, fruits and vegetables, dairy production, oils and fats, grains mills, bakery products, confectionery, other food processing, animal feeds and beverage.

equilibrium (CGE) model. The sub-sectors analysis provides a way of measuring the effect of an NTM reduction on each sub-sector. However, the impacts of a reduction of NTMs at the national level, including various economic sectors, are not included in the study. Some of the crucial variables identified are output, trade (exports and imports), employment (labour demand), wages, wage inequality and welfare.

The key contribution of this study is the estimation of the effects of a reduction of NTMs in the food processing sector on the Malaysian economy. Specifically, this study aims to produce the following:

1. Provide critical input for Malaysia on the overall impact of reducing trade costs from NTMs as the government is looking to reduce business compliance costs (MPC, 2018) to increase productivity and competitiveness of its manufacturing sector.
2. Examine the disaggregated impacts of a reduction of NTMs in Malaysia's food processing sector, a sector that is particularly important in the broader context of food security. The government is seeking to expand and diversify this sector in effort to become a regional food production and distribution hub.
3. Provide the contextual effects of reducing NTMs on the labour market by introducing foreign labour into the modeling exercise, as foreign labour characterizes the unskilled segments of most Asian labour markets.

[3]The detailed scenario development is discussed in Chapter 3.

## 1.6 Thesis Structure

This thesis consists of eight chapters. Chapter 1 provides the background of the study, as well as the problem statement, research questions and research objectives. The scope, significance and limitations of the study are also discussed in this chapter.

Chapter 2 reviews the literature in related fields, and provides definitions, and the classification of NTMs and labour. A review of trade theories, empirical findings and the methodologies used in measuring NTMs also form a part this chapter as is the identification of research gaps.

Chapter 3 presents the conceptual framework. It elaborates on the study's model and how the NTMs are incorporated in the CGE model. It also describes the data dimensions, construction and balancing mechanism of the social accounting matrix (SAM). Other measurements such as wage inequality, welfare, intra-industry trade and frequency index are presented in this chapter.

In the first part of Chapter 4 the food sector in Malaysia is described. Government policies, trade patterns, major import sources and NTMs in the food sector are discussed. The second part of Chapter 4 describes labour market patterns, trends in employment, wages and inequality. The link between import flows and labour market conditions is also described in the third part of this chapter. This chapter sets the background for the study.

Chapter 5, 6 and 7 present the analytical findings and discuss the results. Chapter 8 concludes the study with an outline of the main findings and policy recommendations.

Contributions and limitations of study are discussed in this chapter. Possible areas for future study are also described.

# CHAPTER 2: LITERATURE REVIEW

## 2.1. Introduction

The literature relating to the impact of NTMs on an economy and labour markets is reviewed in this chapter. This is set out in six sections. Section 2.2 provides a discussion on trade policy instruments with a specific focus on NTMs. Section 2.3 deals with the various classifications of labour based on skills. Section 2.4 reviews the theoretical links between NTMs and trade as well as the labour market. The empirical findings on the impacts of NTMs on production, trade, the labour market and welfare are discussed in Section 2.5.The methodological differences are reviewed in Section 2.6. The final section identifies the research gaps.

## 2.2. Instruments of Trade Policy

This section deals with the instruments of trade policy.

### 2.2.1 Tariffs

A tariff is a type of barrier to trade that the government imposes as a tax on the export or import of goods. The objectives of countries imposing tariffs are to protect local industries, to generate government revenue and to correct trade distortions.

### 2.2.2 Non-Tariff Measures (NTMs)

NTMs are policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both (UNCTAD/DITC/ TAB/2009/3). According to this definition, NTMs can involve a very wide range of regulations affecting traded products. UNCTAD defines NTMs as any government action with a potential effect on the value, volume, or direction of trade. These are all barriers to international trade: for example, quotas, licensing, voluntary export restraints.

Gourdon and Nicita (2013) define NTMs as policy related costs incurred in commercial activity starting from production to sale to the final consumer, excluding tariffs. Linkin and Arche (2002) define NTMs as policy measures other than a tariff that distorts trade. Some have defined NTMs as policy measures (private and government), other than normal tariffs, that can potentially have an economic effect on international trade in terms of goods, quantities traded and/or prices (Carrere & de Melo, 2011; Rytkonen, 2003). Bora et al. (2002) include export restraints and production and export subsidies – or measures with similar effect – not just restraints, to define NTMs.

NTMs are frequently and incorrectly referred to as NTBs. However, NTMs cover a much wider set of measures than NTBs. Another difference is that NTBs are subset of NTMs that have a protectionist element, either by intent or effect. Thus, although NTMs are viewed as instruments, which depress trade volumes by raising costs, they may in fact boost trade in certain circumstances (UNESCAP, 2013).

Baldwin (1970) developed the first classification of NTMs, which provides only a very general classification of policies that hamper the development of a single market without specifying the direct measures of the policy impact. Baldwin's classification has 13 categories. They are: quotas and restrictive state-trading policies, export subsidies and taxes, discriminatory government and private procurement policies, selective indirect taxes, selective domestic subsidies, restrictive customs procedure, anti-dumping regulations, restrictive administrative and technical regulations, restrictive business practices, controls over foreign investment, restrictive immigration policies, selective monetary controls and discriminatory exchange-rate policies.

Laird and Vossenaar (1991) classified NTMs in a simpler way than that of Baldwin. They aggregated NTMs into five categories: quantity control over imported goods, price control of imported goods, monitoring measures (including price and volume investigations and surveillance), production and export measures, and technical barriers. This classification is based on the objective or immediate impact of the measure. Deardorff and Stern (1997) on the other hand, developed a classification with six categories. The first two – quantity of imports reduction and the price effect of imports' rise, – are similar to that of Laird and Vossenaar's (1991). Their other categories are: change in the elasticity of demand for imports, variability of NTMs, uncertainty of NTMs, welfare costs of NTMs, and resource costs of NTMs.

Haveman et al. (2003) classified NTMs based on price effects, quantity reduction, quality restriction, and threat of retaliation. Price effects relate to minimum import pricing, trigger prices and variable levies. Quantity reduction is described as a product of quotas, seasonal prohibitions, and orderly marketing arrangements. Quality restrictions are described as those measures relating to health, safety or technical standards. Threat of retaliation is seen as flowing from anti-dumping and countervailing duty investigations. Staiger (2012) has classified NTMs on the basis of whether they are applied at the border, to exports (e.g. export taxes, quotas or bans) and imports (e.g. import quotas, import bans), or behind the border (this includes such measures as domestic legislation covering health, technical issues, product specifications, labour, environmental standards, internal taxes or charges and domestic subsidies). De Dios

(2004) classified NTMs based on para-tariff measures, price control measures, finance measures, automatic licensing measures, quantity control measures, monopolistic measures and technical measures. It is noted that all of above classifications have some similar categories – for example, quantity measures, quality measures and price control measures.

The Multi Agency Support Team (MAST) developed a comprehensive classification based on the UNCTAD coding system in 2008, which is in turn based on the characteristic of existing NTMs (UNCTAD, 2015). The legitimacy, adequacy, necessity or discrimination of any form of policy or measure used in international trade were not included in this classification. A detailed classification is important in order to identify NTMs and distinguish between their various forms. This classification of NTMs is necessary for three reasons:

i. Documentation of the NTMs that companies are required to comply with;
ii. Facilitation of harmonization of NTMs across different sectors and countries; and
iii. Analysis of NTMs' impact statistically.

UNCTAD revised the NTMs classification in 2012. This revision consisted of 16 chapters and covered a far wider range of measures compared to other classifications reviewed above. UNCTAD divided NTMs into two categories – import and export measures–in order to facilitate data collection and analysis. Import measures consist of those requirements that are implemented by importing countries. Export measures are all requirements that are imposed by exporting countries. UNCTAD (2012) notes that NTMs can be price, quantity or quality focused. A price measure (e.g. a subsidy) changes relative prices. A quantity measure (e.g. a quota) directly restricts the quantity of a good. Quality measures (e.g. a TBT measure or SPS measure) change in some way the nature of a product and/or the manufacturing process. By classifying NTMs their trade and welfare effects can be distinguished by using examples from each category rather than an exhaustive examination of all NTMs (UNCTAD, 2012).

**Table 2.1: NTMs Classification**

| | | |
|---|---|---|
| **Imports** | **Technical measures** | A. Sanitary and phytosanitary measures (SPS) |
| | | B. Technical barriers to trade (TBT) |
| | | C. Pre-shipment inspection and other formalities (PSI) |
| | **Non-technical measures** | D. Contingent trade-protective measures (CTPM) |
| | | E. Non-automatic licensing, quotas, prohibitions and quantity-control measures other than for SPS or TBT reasons (QC) |
| | | F. Price-control measures, including additional taxes and charges (PC) |
| | | G. Finance measures (FM) |
| | | H. Measures affecting competition |
| | | I. Trade-related investment measures |
| | | J. Distribution restrictions |
| | | K. Restrictions on post-sales services |
| | | L. Subsidies (excluding export subsidies under P7) |
| | | M. Government procurement restrictions |
| | | N. Intellectual property |
| | | O. Rules of origin |
| **Exports** | | P. Export-related measures |

Source: UNCTAD (2012).

Table 2.1 shows the UNCTAD (2012) NTM classification. Import measures are divided into two categories: technical and non-technical. Chapters A to C refer to technical measures. The objectives of technical measures are to ensure quality and food safety, environmental protection and national security and protect animal and plant health. These objectives require quality, quantity and price control of goods prior to shipment from the exporting country.

Chapters D to O refer to non-technical measures. Chapter D refers to contingent trade protective measures, which are aimed at ensuring that unfair or adverse trade practices are not introduced by exporters in importing countries. These anti-dumping, countervailing and safeguard measures are dealt in this chapter. Non-automatic licensing, quotas, prohibitions and quantity-control measures other than SPS or TBTs related (and which are implemented to restrict the quantity of goods that can be imported) are set out in Chapter E. The measures discussed in Chapter F relate to price control including additional taxes and charges, which aim to control the prices of imported goods which may be lower than the domestic price. Chapter G deals with financial measures and specifically measures restricting the payment of imports - for example, when the access and cost of foreign exchange is regulated. This chapter also includes restrictions on the terms of payment.

Chapter H concerns measures affecting competition. Monopolistic measures such as state trading, sole importing agencies or compulsory use of local services or transport are discussed. Chapter I refers to trade-related investment measures. These measures may restrict investment as investors must comply with the requirement of local content. Further, in order to balance imports, investors may need to invest in export related projects. The next chapter consists of a description of distribution restriction measures, which determine the internal distribution of imported goods. Chapter K includes a description of measures and a discussion of the effect of restricting post-sales services by exporters: for example, restriction in the provision of accessory services. Chapter L focuses on subsidies that affect trade, which may include grants, loans and price support.

Chapter M investigates government procurement restrictions. These restrictions are imposed on bidders when they are selling their products to a foreign government. Chapter N deals with intellectual property measures and intellectual property rights in trade. Examples include patents, trademarks, industrial designs, lay-out designs of integrated circuits, copyright, geographical indications and trade secrets. Chapter O describes the way in which rules of origin can affect trade by means of restricting the origin of products or its inputs. Laws, regulations and administrative determinations which are generally applied by governments of importing countries to determine the country of origin for goods, are discussed in this chapter. The final chapter in the classification framework is Chapter P, which is concerned with export related measures such as export taxes, export quotas, or export prohibitions.

## 2.3 Classification of Labour

Given skill is a multi-dimensional concept, direct measurement is difficult. In empirical studies, proxies for skills are often used. Two methods are frequently applied to disaggregate labour into skilled, semi-skilled and unskilled. First, job or occupation classifications are used to create proxies for skilled, semi-skilled and unskilled labour. The second method involves use of educational characteristics to measure skills (International Standard Classification of Occupation [ISCO], 2008). The Malaysian Standard Classification of Occupations (MASCO, 2008) classifies labour according to the ISCO, published by the International Labour Organisation (ILO). Table 2.2 shows the classification of labour based on MASCO and ISCO.

**Table 2.2: Classification of Labour**

| No | Skill classification | Skill level | Education level | | Major group occupation | |
|---|---|---|---|---|---|---|
| | | ISCO/ MASCO | ISCO | MASCO | ISCO | MASCO |
| 1. | Skilled | 4 | Obtained education at a higher educational institution for a period of 3-6 years leading to the award of a first degree or higher qualification | Tertiary education leading to a University or postgraduates university degree Malaysian Skills Advanced Diploma (DLKM) Level 5-8 | 1. Managers *and<br>2. Professionals | 2. Professionals |
| 2. | Skilled | 3 | Obtained education at a higher educational institution for a period of 1-3 years following completion of secondary education | Tertiary education leading to an award not equivalent to a first University Level; Malaysian Skills Diploma (DKM) Level 4 | 3. Technicians and associate professionals and; managers* | 3. Technicians and associate professionals |
| 3. | Semi-skilled | 2 | First stage of secondary education | Secondary or post-secondary education; Malaysia Skills Certificate (SKM) Level 1-3 | 4. Clerical support workers,<br>5. Services and sales workers,<br>6. Skilled agricultural, forestry and fishery workers,<br>7. Craft and related trades workers,<br>8. Plant and machine operators, and assemblers | 4. Clerical support workers,<br>5. Services and sales workers,<br>6. Skilled agricultural, forestry and fishery workers,<br>7. Craft and related trades workers,<br>8. Plant and machine operators, and assemblers |

(continued)

**Table 2.2, continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| 4. | Unskilled | 1 | Primary education or the first stage of basic education | Primary education | 9. Elementary occupations | 9. Elementary occupations |

Source: ISCO (2008) and MASCO (2008)

The ISCO (2008) disaggregates labour according to the profession of skills, distinguishing between skilled, semi-skilled and unskilled labour. Skill is then defined as the ability to carry out the tasks and duties of a given job. Two dimensions of skill are used for the purposes of the ISCO (2008) in order to arrange occupations into groups. These are skill level and skill specialisation. Skill level is defined as a function of the complexity and range of tasks and duties to be performed in an occupation and is measured operationally according to the nature of work performed in an occupation and the formal and informal education and training requirements.

However, skill specialisation relates to the knowledge required, the tools and machinery used, the materials worked on or with and the kind of goods and services produced (ISCO, 2008).

The ISCO divides ten major occupations into four skill levels. The first is defined as elementary occupations, which typically involve simple and routine physical or manual tasks (Skill Level 1). For some primary education or the first stage of basic education may be required. The elementary occupations are classified as unskilled occupations (ISCO, 2008).

According to the ISCO, occupations at Skill Level 2 are clerical support workers, services and sales workers, skilled agricultural, forestry and fishery workers, plant and machine operators, and assemblers. A capacity to read information, make written records and perform simple arithmetical calculations are required and are usually derived from education at the first stage of secondary education. The occupations at this level of skill are classified as semi-skilled (ISCO, 2008).

Technicians and associate professionals are at Skill Level 3 and professionals are at Skill Level 4. Managers can be either at Skill Level 3 or 4. Those occupations at Skill Level 3 and 4 are classified as skilled occupations. Occupations at Skill Level 3 generally require a high level of literacy and numeracy and good interpersonal communication skills. Labour at this skill level has usually obtained education from a higher educational institution for a period of 1-3 years following secondary education.

The ISCO (2008) defines occupations at Skill Level 4 as requiring extended levels of literacy and numeracy, as well as excellent interpersonal communication skills. Labour at this skill level usually has studied at a higher educational institution for a period of 3-6 years which leads to a first degree or higher qualification (ISCO, 2008).

The MASCO (2008) classifies labour in a similar way to the ISCO (2008). Nine major groups are categorised into to four skill levels. Elementary occupations involved simple and routine tasks largely effected by handheld tools and typically involve substantial physical effort. Most occupations in this major group require skills at the first level normally obtained through primary education and are classified as unskilled labour. Occupations at Skill Level 2 are required to have the ability to read information, to make written records of work completed, and to accurately perform simple arithmetical calculations. Such qualifications are generally obtained from secondary or post-secondary education (Malaysian Skills Certificate (SKM) Level 1-3). The occupations involved are clerical support, services and sales, skilled agricultural, forestry and fishery work, craft and related trades, plant and machine operators and assemblers. Labour at this skill level is defined as being semi-skilled.

According to MASCO (2008), the educational level requires to perform at Skill Level 3 is tertiary education leading to an award equivalent to a first university level or Malaysian Skills Certificate (SKM) level 4 or Malaysian Skills Diploma (DKM) level 4. Labour at this skill level must have a high level of literacy and numeracy and good interpersonal communication skills. Technicians and associate professionals categorized in this skill level are skilled labour.

Those who obtained tertiary education leading to a university or postgraduate university degree or Malaysian Skills Advanced Diploma (DLKM) level 5-8 and work as professionals, are at Skill Level 4. Labour in this category must have high levels of literacy and numeracy, as well as excellent interpersonal communication skills. According to MASCO (2008), the concept of skill level is not applicable to two major groups: managers and armed forces occupations. This is because the skill level concept does not allow them to be distinguished from other major groups.

Tan (2000) divides labour into production and non-production workers (professionals, managers, technicians, clerical staff and general workers). He identifies three types of production workers: skilled, semi-skilled and unskilled workers. He defines professional, technicians, manager and skilled production workers as skilled labour. Clerical, general workers and unskilled production workers are categorised as unskilled labour. For those who are neither skilled nor unskilled labour, the term semi-skilled labour is used. Sulaiman, et al. (2016) classifies labour according to the MASCO (2008) definition in order to allow data in the Industrial Manufacturing Survey to correspond with the labour force survey published by DOS. Sulaiman, et al. (2016) disaggregates labour into skilled, semi-skilled and low-skilled. Skilled labourers are those who work as managerial, professionals and executives. Semi-skilled labourers are made up of technicians, associate professionals and supervisors. Low-skilled labourers are made up of clerical workers, service, sales, craft and related trade workers, plant and machine operators, assemblers and elementary workers.

Berman et al. (1994) distinguish between skilled and unskilled labour based on matching job classifications associated with educational attainment. Ng (2013) however, classifies labour based on occupations (MASCO, 2008). In doing so, she disaggregates labour into three types: skilled (professional and managerial; and technicians and supervisory), semi-skilled (clerical) and unskilled (driver and general workers). Others have classified labour based on educational attainment without considering job classification. Thus, Bound and Johnson (1992) identify four skill groups based on educational attainment (high school dropouts, high school graduates, some college, and college graduates). In contrast, Baldwin and Cain (2000) disaggregate labour into skilled and unskilled based on the number of years of education. They classified labour with 1-12 years of education as unskilled labour and labour with 13 or more years of education as skilled.

Hall (1993) found that classifications based on educational attainment were superior as they could easily be extended to incorporate several types of labour. However, he notes that job classification procedures may misclassify some workers.

## 2.4. Theoretical Review

In economic theory, a tariff is effectively a tax that is levied on imports. There is therefore an expectation of a negative relationship between tariffs and imports in economic theory. This is based on the fact that tariffs by their nature will increase prices of imports. As Bowen et al. (2012) point out, as a consequence of the rise in import prices their volume will fall. However, such a straightforward relationship is not the case with NTMs, for which there is no necessary one to one relationship with trade volumes. This is important given their prominence in international trade (Ecorys, 2009; Fugazza, 2013). This significance reflects the multiple uses for which NTMs are used. These range from them being used simply as a protectionist measure for domestic producers where regular tariffs are permissible, to enforcement of quarantine requirements and other public health issues and to overcoming market failure (WTO, 2012).

Similar to the complexity of their use, the effect of NTMs can also vary widely: for example, they can both restrict and promote trade volumes. In the former case where NTMs involve the application of standards, this will usually place a cost imposes on producers and in turn a high price of this good when exported – and in turn a lower export volume. However, NTMs may produce a signaling effect as described by van den Bosse (2013): "NTMs can signal a higher quality of imports *via* information disclosure such as trademarks, labelling requirements, detailed description of certain attributes or restricted toxic residues." In these cases, the quality improvement can enhance rather than reduce demand. However, this clearly will depend on whether the increase in cost to suppliers is outweighed by the positive effect demand.

In the economic literature, a partial equilibrium model has typically been used to measure the impact of NTMs on trade. Using such a model, Disdier and Marette (2010) derive demand and supply from quadratic preferences and a quadratic cost function. According to the type of the NTM, there are two quantity effects –the first on the supply side and the second on the demand side. The first relates to quality control measures such as quotas and prohibitions. The effect of a quota (which is defined by the WTO (2012) as a limitation on the quantity of an imported good) is illustrated in Figure 2.1. Here, at the point where the maximum quantity ($Q_1$) falls below the equilibrium quantity of imports ($Q_0$), the quota can be termed as binding. In this case if imports are limited to the level shown at $Q_1$ and which then leads to a price $P_1$ (the domestic price of imports), this price will then be above the world price level $P_0$. This will have the flow-on effect of reducing the world price if the importing country is large.

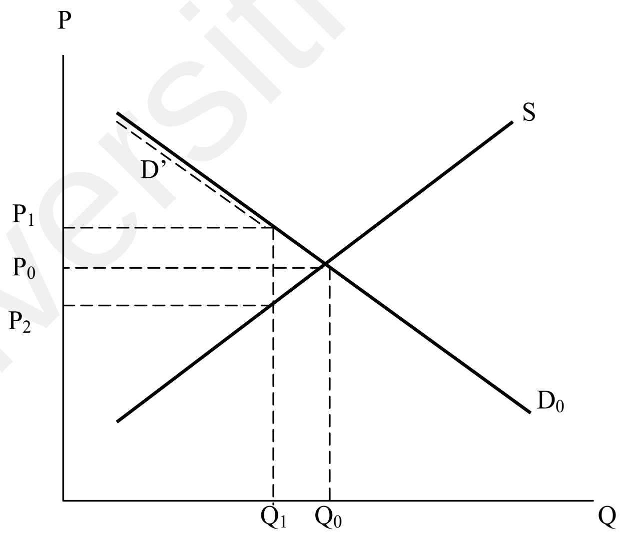


**Figure 2.1: Binding-Quantity Restricting NTMs**

Source: van den Bosse (2013).

Where there is a binding quantity restriction, limiting imports to $Q_1$ raises the domestic price of imports above the world price $P_0$ to $P_1$ (see Figure 2.1.). Again, if the importing country has a large economy, then the world price will fall. This creates a new demand curve, which has a kink at $Q_1$. The question of who benefits from the price wedge depends on how the licenses/rights are auctioned. As Fugazza (2013) points out, the distribution may influence the distribution of welfare although it does not have an effect on the equilibrium. Such an outcome applies to the range of other NTM quantitative restrictions. It is also possible for that the level of imports to be set above the level of free trade imports (see Figure 2.2). In such case, the quota is not binding.

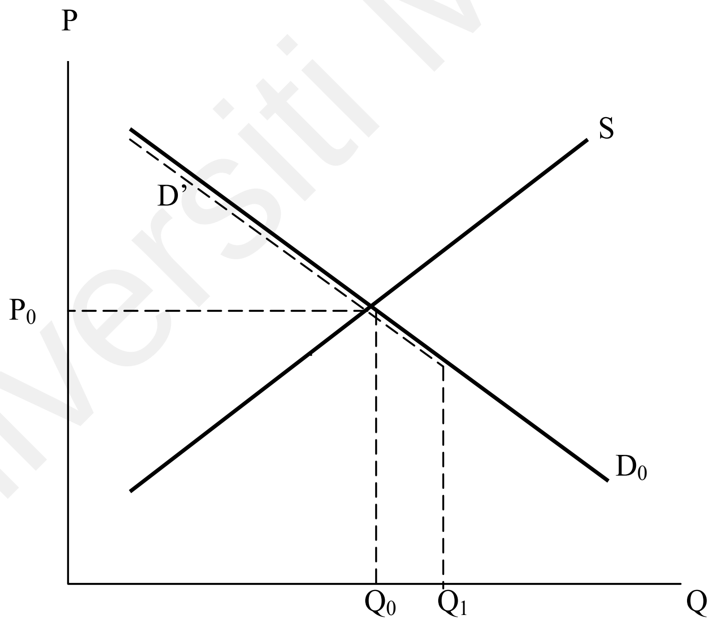


**Figure 2.2: Non-Binding Quantity Restricting NTMs**

Source: van den Bosse (2013).

The NTMs' effect on the supply-side is illustrated in Figure 2.3. Regulations relating to production processes (e.g. a new technology) and/or the attributes of the product (e.g. use by date restrictions) are liable to affect supply side production. In such cases, the supply-curve shifts from $S_0$ to $S_1$. In this way the effect of NTMs is to increase the price of imports from $P_0$ to $P_1$ and lower the quantity of imports from $Q_0$ to $Q_1$. Such regulation need not necessarily be designed to protect home markets. For example, regulations can incorporate externalities for products and processes, which are hazardous to health and to the environment. These relate to specific types of NTMs – for example, SPS, and TBTs–with technical regulations (Fugazza, 2013).

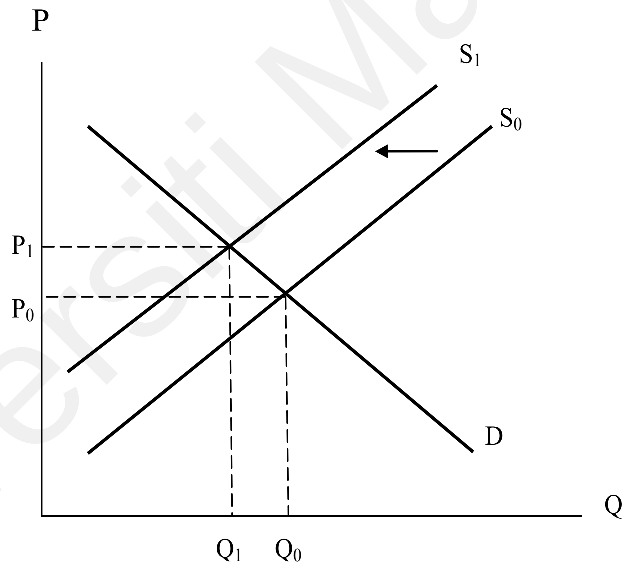


**Figure 2.3: Supply Reducing NTMs**

Source: van den Bosse (2013).

Signaling theory explains that NTMs provide information on product characteristics, quality and the risks of harming consumers. This information is important given consumers may not be aware of such risks (Frank, 2008). In other words, NTMs become a demand-shifting instrument used to correct this and other types of market failure. That is, where information is available about a product, demand is typically reduced. If consumers internalize the negative effect of a product, the demand-curve will shift to the left (see Figure 2.4). Equally, providing consumers information about a product's advantages/quality can be derived from NTMs. Here, consumers may be persuaded to pay more for a product, inducing a higher level of demand and a shift in the demand curve, $D_0$, to the right (see Figure 2.5). It is noted that technical measures can produce a shift in the demand curve (Fugazza, 2013).

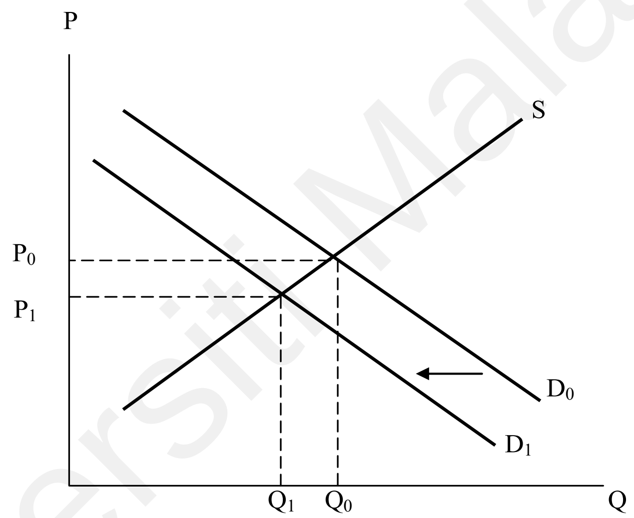


**Figure 2.4: Demand-Declining NTMs**

Source: van den Bosse (2013).

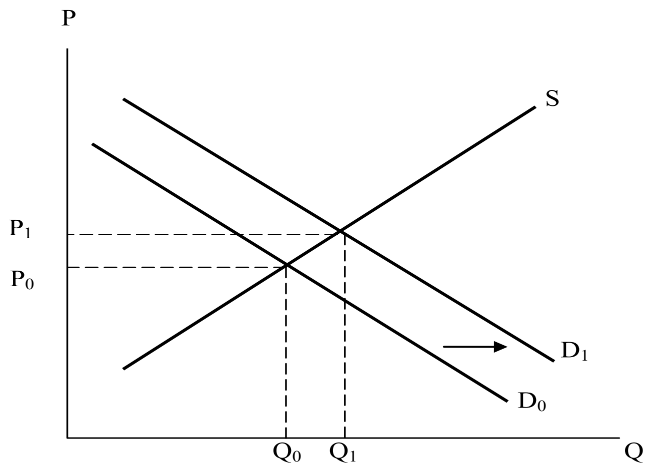


**Figure 2.5: Demand-Enhancing NTMs**

Source: van den Bosse (2013).

If there are multiple NTMs for the same product, their individual effects will be difficult to identify. Clearly, the overall impact will be related to the relative strength of the different NTMs in place. As Fugazza (2013) points out, where NTMs affect the supply-side, their effects are likely to be mixed together. Thus, to be able to identify individual effects of an NTM, knowledge of which category the NTM belongs is necessary.

Whether or not NTMs affect the quantity, the demand-side or import-side, in all cases there will be an impact on the prices and in turn, on the cost of production and on decisions of firms to produce. For instance, if the cost of production increases, this induces firm to demand less labour, to produce less output and so that employment will drop. Wages have to change in order to induce the movement of labour. In other words, NTMs will affect the labour market indirectly through the changes in the prices of goods. Moreover, trade theory shows that NTMs affect trade, and trade induces a reallocation of resources within industries or between industries (Melitz, 2003). More productive and larger firms and especially exporting firms, tend to employ relatively more skilled labour, and to pay higher wages. This in turn, affects wage inequality between skilled and unskilled labour (Bernard et al., 2007).

Furthermore, the implementation of NTMs may induce firms to change the composition of skill. For instance, firms may need to use a certain technology in their production, which requires more skilled labour to ensure the production process complies with the requirements set by the government. Hence, the demand for skilled labour increases, and in turn, increases their returns and wage inequality between skilled and unskilled labour.

Other theories - both classical and new-new trade – appear to explain the effect of the presence of NTMs. The Heckshler-Ohlin (H-O) theory which was developed in 1933 supports free trade. This theory differs from others based on the notion of absolute advantage and comparative advantage given they focus on productivity of labour in producing a particular good. In contrast the H-O theory argues that a country should adopt the theory of comparative advantage and specialize on those goods for export that use abundant factors of production. Conversely, they should import goods that are made from intensive use of factors that are domestically scarce. The H-O theory is also known as the factor proportions theory, which states that a factor of production (labour, land, or capital) will be more expensive if the demand for it is higher than its supply, and *vice versa*. Hence, according to the H-O theory, countries produce goods that require cheaper factors of production. The imposition of trade protection, for example through NTMs, may make cheaper factors of production, become more expensive due to compliance costs, adaption costs and other costs needed to comply with standards and requirements.

Economic theory indicates that when countries move to free trade, an increase in aggregate efficiency will be the result. That is, a change in prices will effect a change in production of both exported and imported goods. Each country will produce more of its exported goods and less of its imported goods. Consequently, there will be a change in the demand for labour and the returns to labour. In this way, production shifts will improve productive efficiency in each country. Consumers will experience an improvement in consumption efficiency as a result in the changes in prices. In other words, national welfare will increase when they move to free trade. Although the aggregate welfare has increased not everyone benefits from free trade as trade will create winners and losers.

Paul Samuelson refined the H-O theory by including the influence of differential factor abundance in explaining trade growth among countries. Thus, the Hecksher-Ohlin-Samuelson (H-O-S) theory emphasizes the influence of factor proportions in determining comparative advantage. Such countries – largely those in the early stages of economic development with a higher ratio of labour to capital – will have a comparative advantage in the manufacture of labour intensive goods. Similarly, developed countries will typically have a high capital to labour ratio and concentrate on the manufacture of capital intensive goods. Therefore, a developing country will export unskilled-intensive goods in exchange for skilled labour intensive goods with a developed country.

The H-O-S theory explains that trade leads to expansion in sectors where a country has a comparative advantage in producing it and equalizes the domestic prices of both goods. This implies that an increase in demand for unskilled labour intensive goods increases the demand for unskilled labour in the developing country. Unskilled labour in the exportable sector experiences an increase in wage. However, skilled labour in the import substitution sector experiences a reduction in wage. This theory implies that trade allows labour to shift from the import substitution sector to the export sector in a developing country as well as reducing the wage gap between skilled and unskilled labour. This theory predicts that trade leads to greater wage inequality in developed countries as demand for skilled labour increases leading to wage increases.

The H-O-S theory produces some clear predictions about how trade affects employment across economic sectors. When a country reduces its trade protection such as tariffs and NTMs, the import substitute sector contracts, while, the export sector expands. *Ceteris paribus*, employment in the former sector then declines and increases in the latter. The H-O-S theory thus conveys a simple message: trade results in a redistribution of employment away from the import substitute sector and towards the export sector.

The specific factors theory was developed by Jacob Viner (1892-1970) which is a variant of the Ricardian theory and sometimes referred to as the Ricardo-Viner theory. In effect it is a short run version of the H-O-S theory. The specific factors theory assumes trade will affect labour markets. As such, it appears to be more realistic as it assumes factors are not wholly mobile between sectors – at least in the short run or medium run. In developing his theory, it is assumed by Viner that all goods have a fixed factor of production (e.g., specific capital) and that the labour factor can move between products. If a good's price increases, this will generate an increase the real return to its specific factor. But there will be a corresponding fall in the real return of factors for other goods produced in the country. In the case of a mobile factor the effect on the return is ambiguous.

Viner points out that the specific factor theory demonstrates the effects of economic changes (e.g. a movement to free trade, the implementation of a tariff or NTMs, growth of the labour or capital endowment or technological changes) on labour allocation, output levels and factor returns. In the context of international trade, prices may change when a country imposed NTMs. If the price change is the result of the implementation of NTMs, then the demand for labour and production will change also. Wages then have to change in order to induce the movement of labour. In other words, NTMs will affect labour market indirectly through the changes in the prices of goods.

It is important to note that the movement of capital, and in particular direct investment, was not included in traditional trade theories. Failure of the HOS theory to take into account the realities of global capital flows (Sen, 2010) produced the development of new trade theories (NTTs) in the 1980s (Brander & Spencer, 1985; Ethier, 1982; Eaton & Grossman, 1986; Grossman & Horn, 1988; Krugman, 1986). NTTs incorporate three main factors that distinguishes them from traditional trade theories: increasing returns to scale, imperfect competition, and presence of a large domestic market (Krugman, 1996). Unlike traditional trade theories, NTTs do not depend on comparative advantage in explaining trade. The combination of increasing returns to scale and the 'love-of-variety' effect in consumers' preferences is the rationale for trade. The introduction of increasing returns to scale in this theory reflects that the economy has imperfect competition. The determinants of comparative advantage can be explained in this theory.

NTTs argue that in the contemporary world, determinants of comparative advantage are not solely dependent on natural (e.g., geographical or climatic) differences, but can be created. Importantly then, if as claimed, comparative advantage can be generated rather than inherited, then the rationale for free trade needs to re-examined.

In reality, a variety of influences such as government interventions and the actions of businesses typically work to discourage the operation of perfectly competitive markets. Equally, market imperfections will always work to deny the possibility of totally free trade. A second best option is for countries to exempt as much of their trade restrictions as possible although that will depend on a country's economy conditions and state of development. NTTs accept that government can have a role in promoting new industries and supporting the growth of key industries. The role of NTMs in this theoretical context is in the form of protectionism. NTMs are imposed to protect domestic firms so that they can eventually achieve competitiveness. It can be argued that NTMs make firms more innovative due to the need to produce products that are differentiated by higher quality and standards surpassing the NTM requirements in the importing countries. This study of NTMs and their impact on trade flows, employs this theory given consumers tend to have a variety of products that can be differentiated by brands and standards. This view has clear relevance to NTMs in the situation where consumers in importing countries can be expected to demand products of a specific brand and standard.

The role of NTMs requires exporters to comply with certain standard requirements if their products are to be accepted by the consumers in the export market. Leland (1979) and Mangelsdorf et al. (2012) view compliance with standards' requirements as helping to solve the problem arising from asymmetric information. The NTT assumes that large quantities of products can be produced at a lower cost due to economies of scale. The NTMs enable firms to achieve such economies of scale if NTMs act as a catalyst to trade. This is because NTMs lead to trade promotion and simultaneously increase firms' production of a specific product resulting in them achieving economies of scale. This in turn, will increase the labour demand and their return. NTMs can thus promote monopolistic competition.

In reality, the productivity of firms will not be same in a particular economy. Bernard et al. (2007), notes that in 2000, exporters in the United States (US) accounted for only 4 per cent of the 5.5 million firms. About 10 per cent of these firms produced 96 percent of the US's total exports by value. In general, then, it is found that exporters have higher productivity than non-exporters. But why exporters tend to be restricted to a few highly productive companies is not explained by neither former trade theories nor NTTs. This is because these theories assume homogeneous productivity across firms in the economy. Melitz (2003) developed a 'new' new trade theory (NNTT) to emphasis heterogeneous productivity across firms in the same industry of the same country.

The NNTT stresses that only highly productive firms are able to make sufficient profits to cover the large fixed costs required for export operations. This theory also indicates that trade leads to rising productivity based on higher trade levels, forcing the least efficient firms out of the market, and reallocates resources and production to the most efficient firms. In this way, trade reform can catalyse job creation and job destruction across economic sectors. This is because net-exporting and net-importing sectors are experiencing the growth of expanding high-productivity firms, while at the same time low-productivity firms are shrinking or closing down. The NNTT also underlines the greater difficulty for workers to move across sectors rather than changing firms within the same sector.

Melitz (2003) argues that a high level of protection of domestic industries can inhibit efficient resource allocation and therefore inhibit increases in productivity. He goes on to point out that where trade barriers are lowered, competition is stimulated on a global scale. In such an environment trade barrier protected low-productivity firms are forced out of the market and supplanted by high-productivity firms. Eventually, the labour market will be affected as the high-productivity firms stay and expand their market and low-productivity firms quit the market. Consequently, the average productivity of a country rises, which in turn delivers a rise in people's real income. That is, people become wealthier through the natural selection of firms on a global scale.

Melitz and Ottaviano (2008) show that NTMs change the conditions of competition and productivity of foreign firms given they generate a fixed cost to firms. Unlike tariffs, NTMs, such as licensing requirements, differentially affect foreign firm entry. These entry costs help explain the fact that trade is typically concentrated in a very few productive firms. Heterogeneity in productivity cause firms to have different preferences on trade policy. Osgood (2016) extends this analysis to motivate intra-industry differences in trade preferences, providing a theoretical underpinning for aggregate industry level preferences over NTMs. Similarly, Kox and Nordas (2007) observe that NTMs limit the access for small and medium sized enterprises (SMEs). Swann (2010) shows that product standards on imports change trade volume both positively and negatively. Gulotty (2012) demonstrates, being subject to NTMs can benefit a country's multinational firms. This is because the same firm-level characteristics that enable multinational corporations (MNCs), allow the firm's foreign affiliates to overcome NTMs more easily than unaffiliated foreign exporters.

The implementation of NTMs affects firms with different levels of productivity. High productivity firms such as MNCs expand their production as they have advantages in terms of their technology and management to cope with the NTMs than low-productivity firms. However, the implementation of NTMs may cause low-productivity firms to shrink and quit the market. This phenomenon will eventually affect the labour market in terms of the type of labour that the firms require.

As Mohan (n.d.) points out, to the extent that NTMs address market failures, simply removing them may not always be optimal, even if trade volumes are increased, given their intended benefits would be lost (e.g. SPS measures). Technical measures may act to restrict trade, but deliver an improvement in welfare through reducing negative externalities (e.g. lowering risks associated with the importation of pests). Similarly, overcoming information asymmetries may benefit consumers even though it raises costs. It is also argued that standards and regulations can act as a catalyst to upgrade developing countries' processing industries' production structures and thereby make them compatible with international standards (Henson, 2006). In some instances, NTMs can be shown to expand trade by enhancing demand for a good. That can come from better information about the good and enhancing its characteristics and attractiveness for the consumer (van Tongeren et al. 2009). Notably, NTM efficiency costs much less evident than the welfare losses associated with tariffs and trade restricting quantity measures. Analysis and policy must therefore seek to preserve these benefits and find alternative means to address market failures. In doing so, there is a need to assess NTMs on a case-by-case basis (van Tongeren et al. 2010; Winchester et al. 2012).

## 2.5 Empirical Evidence

The literature relates to this study are reviewed as follows:

### 2.5.1 Impact of NTMs on Trade and the Economy

The impact of NTMs on trade and the economy can be either positive or negative. Bao and Qiu (2010) argue that whether NTMs (in the form of TBTs) in general promote or restrict trade will depend on the type of country, the type of industry, and time periods. The introduction of NTMs such as minimum quality standards for instance, can act as a screening device to reduce informational asymmetries (Leland, 1979). This eventually will result in a reduction in transaction costs, enhance consumer trust and improve products quality. All of these can benefit trade (Anders & Caswell, 2009; Beghin et al., 2015; Crivelli & Gröschl, 2016; Disdier et al., 2008; Moenius, 2006; Maertens & Swinnen, 2009a; 2009b; Maur & Shepherd, 2011; Rial, 2014; Thilmany & Barret, 1997). In a recent study by Ronen (2017c), NTMs have a significant demand enhancing effect on trade in olive oil. Ghodsi et al. (2017) studied the effects of NTMs on trade by taking the average number of NTMs applied to imported Harmonised System (HS) 6-digit products in 124 countries. They found that trade-impeding effects of NTMs have accounted for nearly 60 per cent of all trade effects, particularly where quantitative restrictions and TBTs are involved. They also found that TBTs overall, appear to be trade-impeding. SPS measures were found to have both trade-enhancing and impeding effects depend on the country. Some researchers argue that NTMs have trade-impeding effects as their implementation can raise export compliance costs. Consequently, this can cause a reduction in trade (see for instance, Copenhagen, 2010; Ecorys, 2009; Gebrehiwet et al., 2007; Wilson et al., 2003).

A number of studies focus on the trade effects for specific products resulting from the imposition of NTMs for a group of countries. For instance, Fontagne et al. (2005) and Disdier et al. (2008) employ a frequency index based on notifications directly extracted from the TRAINS database. Fontagne et al.'s (2005) study indicated that NTMs, and in particular standards, had a negative effect on agri-food trade. Their study is similar to the findings of Moenius's (2004) work, which found that NTMs negatively impacted agri-food trade but had a generally neutral impact on manufactured products. These studies also find that NTMs have similar effects on the whole product range in least developed countries (LDCs), developing countries, and Organization for Economic Cooperation and Development (OECD) countries. It is nevertheless noted that OECD agri-food exporters tended to gain from NTMs at the expense of developing countries and LDC exporters.

The study of Disdier et al. (2008) covers 690 agri-food products (HS 6-digit level). Their data covers the bilateral trade between OECD importing countries and 114 exporting countries in 2004. Disdier et al. (2008) applies the ad-valorem equivalent (AVE) of NTMs (TBTs and SPS) to study the impact on trade. The findings suggest that NTMs have on the whole, a negative or insignificant impact on trade in agricultural products and food aggregate trade amongst OECD countries. However, they also claim that the implementation of NTMs causes a significant decrease in trade from developing countries towards OECD. Disdier et al. (2008) also discovered that the European Union (EU) SPS measures and TBTs are more trade restrictive than any other OECD standards, although they do not distinguish between the effects of SPS and TBT measures.

A similar study carried out by Kee et al. (2009) drew data from 78 developing and developed countries. Their results underpin the view that NTMs serve as tariff substitutes rather than tariff complements. In addition, they find greater import impeding effects for the agricultural sector than for the manufacturing sector. Yet, they restricted NTMs to a NTB role – i.e. to have a negative impact on trade– by imposing parameter restrictions. Their results are in line with those of Hoekman and Nicita (2011), who found that NTMs generally impede trade more than tariffs (i.e. the estimated AVEs are higher than the observed tariffs at the product line level). Bratt (2017) and Beghin et al. (2014) in a follow up study to that of Kee et al.'s (2009) describe a trade-promoting effect of NTMs, applied to 46 per cent and 39 per cent of the products affected, respectively. Equally, Fugazza and Maur (2008) find that NTMs can expand trade through raising demand for goods through better information about the good or by enhancing its characteristics. Further, Khouilid and Echaoui (2017) estimated the impact of NTMs on Moroccan foreign trade by employing import demand elasticities and estimating a gravitational equation. This study uses a sample of 28 countries at different levels of development. The results show that NTMs have a negative impact on Moroccan foreign trade, and that their exporting sectors suffered more from trade with developing countries than from trade with developed countries.

Nicita and Gourdon's (2013) study of the EU, Japan and 29 developing countries finds that the most common and widely accepted barriers to free trade are SPS and TBT based regulatory measures. TBTs and SPS affected around 30 per cent and 15 per cent of products, respectively. It is pointed out that often the SPS and TBT measures imposed quality and safety standards, which exceed multilaterally accepted standards. In this way the competitive labour cost advantage of developing countries and the benefits of preferential access are eroded.

Furthermore, some studies have found that a reduction of NTMs can benefit an economy (Andriamanajara et al., 2004; Francois, et al., 2009; 2011). Francois et al. (2011) investigate the impact of EU preferential trade agreements (PTAs) with its OECD and G20 trading partners by employing a global CGE model of the world economy. The CGE model in this study involves the elimination of tariff and a 50 percent reduction in estimated NTMs for industrial goods (excluding energy goods): processed foods, chemicals, metals and metal products, motor vehicles, machinery, other manufactures. They agree with other studies that the implementation of NTMs can reflect real increases in cost of production and delivery. Tariffs on the other hand, generate revenue and do not involve substantial increases in actual cost of production and delivery. With the elimination of tariff and reduction in NTMs, they discover that the impact of NTM reductions is larger (2 to 3 times) than tariff elimination.

In a study by Francois, et al. (2009) it is found that by removing all actionable NTMs, EU gross domestic product (GDP) is raised by €122 billion per year and exports increased by over 2 per cent. Such gains would largely be derived from motor vehicles, chemicals, pharmaceuticals, food and electrical machinery sectors. In the case of the US, removal of actionable NTMs are estimated to produce an annual increase in GDP of €41 billion and raise exports by over 6 per cent. The main beneficiaries would be the electrical machinery, chemicals, pharmaceuticals, financial services and insurance sectors. Francois et al. (2009) note that these outcomes are caused by many different factors in the EU and US economies. The US benefits more through increased exports, while the EU gains more in income. It is also noted that the initial volume of trade flows and the way in which there are changes in comparative advantages in specific sectors, are also important factors. They also find that the economy-wide NTM reductions produced cheaper imports, higher economic efficiency, increased incomes, stimulated investment and increased wages.

Unlike other studies, Grubler et al. (2016) assess the impact of NTMs for several types of NTMs (SPS measures, TBT and quantitative restrictions) on imports. They calculate the AVE for different types of NTMs at the 6-digit product level of the HS for 103 importing countries over the period 2002-2011.They note that SPS measures and TBTs are found to have both impeded as well as promoted trade, depending on the NTM imposing country and product under consideration. The analysis also suggests that quantitative restrictions have played an equally important role. The study also notes that richer countries tend to apply more NTMs than poorer countries, and that richer countries tend to suffer smaller effects from NTMs compared to poorer countries. Grubler et al. (2016) find that some agricultural products as well as manufactured products–especially intermediate products– experienced a boost in their imports as a result of SPS and TBTs. They cannot however confirm the findings of previous studies, which indicated that agricultural products in particular are negatively affected by NTMs (Bao & Qiu, 2010; Disdier et al., 2008; Fontagne, et al., 2005; Hoekman & Nicita, 2008; Kee et al., 2009). Grubler et al. (2016) also confirm that quantitative restrictions have strong import restricting effects.

Some studies examining the impact of NTMs focus on a single country (for instance, Bao & Qiu, 2010; Chemingui & Dessus, 2008). Chemingui and Dessus (2008) assess the impact of NTMs on the Syrian Arab Republic’s economy using a CGE model. The study uses the price-based approach to estimate the AVE of NTMs. It is noted that that Syrian trade is highly regulated by a combination of tariffs and NTBs. NTMs are estimated to increase the domestic price of imported goods by an average of 17 per cent based on a comparison of world and domestic prices of imports. The results also show that a complete removal of NTMs would result in reallocation gains. They conclude that Syria will derive only limited growth benefits if trade reform focuses only on tariff reduction. On the other hand, if the government abolishes the widespread application of NTMs to trade, including the elimination of quantitative trade restrictions, trade policy could be a key means to revive Syria's growth prospects. Likewise, Bao and Qiu (2010) analyse the impact of NTMs in China. Using frequency and coverage ratios, the effect of TBTs on China’s imports is found to be trade restricting in the case of agriculture goods, but trade promoting in the case of manufacturing goods.

Cadot and Gourdon (2016) employ a price-gap approach to estimating the AVEs of NTMs. They find NTMs raise trade unit values by 8 per cent for half of the HS6 products analysed – 3 per cent for SPS measures and 5 per cent for TBTs. But there is an offsetting factor in the form of deep integration clauses – a product of the mutual recognition of conformity assessment procedures. As a result, the price price-raising effect of NTMs is offset by round one quarter.

Some studies employ firm level data to study trade effects of NTMs (for instances, Chen et al., 2006; Fontagne et al., 2015). Fontagne et al. (2015) in a study of French industry analysed the trade effects of restrictive SPS measures on exports. SPS concerns were found to discourage exporters entering foreign markets. They also found SPS measures had a negative effect on the intensive margins of trade, which are attenuated in larger firms. Chen et al. (2006) also employed firm level data to study the effects of NTMs on exports in developing countries. This study also finds that firms in developing countries are negatively affected by standards. This is due a firm's production exhibiting diseconomies of scale, as a result of different standards imposed by importing countries, each requiring an added fixed cost.

Francois et al.' (2005) work on the impact of trade facilitation reform related to the WTO Doha round of negotiations is also referenced. They simulate the impact of improvements in trade logistics using a trade efficiency cost approach. From a baseline simulation scenario, trade logistics impediments account for 1.5 per cent of the value of trade. The simulation further indicates that income effects related to trade facilitation reform could account for 0.2 per cent of GDP and two fifths of the overall impact on reform.

### 2.5.2 Impact of NTMs on the Labour Market

The implementation of NTMs will affect trade and prices directly but only indirectly affect labour market (UNESCAP, 2015). The labour market will be affected by NTMs because they may produce a change in such factors as prices, cost of production and trade. Changes in these factors will then alter the labour market in terms of employment and wages. Haskel and Slaughter (2003) suggested that NTMs may be playing a large role in the trade-wages link. Likewise, Stone and Cepeda (2012) find a negative relationship between mandated wage changes and imports for the highly ranked NTM industries.

Francois et al. (2009) and the OCED (2011) yield the same conclusion: that a reduction in NTMs is beneficial for the labour market. Francois et al. (2009) employ a CGE model to simulate the impact of NTMs in both the EU and the US, finding that the implementation of NTMs raises the cost of trade in both economies. The study's outcome shows that the main stated objective of the implementation of NTMs is not to create compliance costs, but to generate benefits for consumers and producers, which should far exceed compliance costs. However, NTMs generate additional costs for firms when regulations differ between trading partners. This in turn will have an impact on trade and labour markets. In simulating the impact of NTM reductions on both economies, the study finds they produce benefits to both economies in terms of trade, real income and labour markets. While sectoral results indicate a decline in both output and exports in a number of sectors, the impact on labour markets is positive overall. Thus, labour markets in both EU and US are shown to benefit from an NTM reduction with wages increasing in both economies.

Similarly, the OECD (2011) agrees that NTMs reduction is beneficial for employment. Its study argues that a 50 per cent reduction in tariffs and NTMs by G20 countries would lead to a largely positive impact on employment in developing countries. However, labour markets in some countries such as Bangladesh, Egypt, and low income Asia are subject to a negative impact. For Spain and the US, NTMs are the primary source of gains, while for Italy, India, Canada and Germany tariff reductions are important. In Japan, tariffs and NTMs are equally important. However, Goldberg and Pavcnik (2004) find that because time series data are difficult to obtain, obtaining a good measure of the effects of trade policy especially, for NTBs is problematic. Therefore, they find no conclusive evidence of the effects of NTB reductions on employment and wages.

Furthermore, Fontagne et al.'s (2015) study shows that NTMs do act as effective trade barriers: for instance, restrictive SPS measures have a negative effect on the extensive margin of trade by discouraging the presence of exporters in SPS-imposing foreign markets, as well as on the intensive margin. Thus, changes in NTMs, for example those relating to safety/health-related issues, may affect both the level of demand for labour (as exports fall) and its composition (in terms of skills), because they may require exporting firms to change the labor mix to adapt the production process to the new rules. This composition effect is likely to be stronger in larger firms, which were found by Fontagne et al. (2015) to be less affected by NTMs, perhaps because of their greater ability to change the composition of their labour force and meet the new standards. The differential change in the demand for skills induced by NTMs may, in turn, also affect the returns to skills and ultimately affect income inequality. Additionally, in response to changes in NTMs that force firms to tilt the composition of the workforce towards a more expensive labour mix, firms (in the longer-run) may substitute expensive labour for relatively cheaper capital.

Other analyses, however, show that the implementation of NTMs can benefit the labour market. For instance, Verhoogen (2008) and Bustos (2011) argue that the implementation of NTMs would increase the demand for skilled labour, but thereby lead to an increase in wage inequality between skilled and unskilled labour. Furthermore, Leonardi and Meschi (2016) agree that the protection afforded by NTMs generates a positive impact on employment. Their results show that NTMs' protection mitigated the negative employment effects of import exposure. However, they conclude that NTM protection will have an impact not only on employment but also on wages. This is due to labour in the economy being mobile across local areas. This process will continue until wages are equalized.

Navarettia et al. (2017) find that NTMs have little impact on skill premiums, while affecting the skill composition of employment. In particular, they argue that TBTs raise the income share of managers at the expense of white collars and professionals, while SPS measures raise the income share of qualified blue collars and reduce the share of white collar workers.

### 2.5.3 Impact of NTMs on Welfare

Andriamanajara et al. (2004) estimate global AVEs for NTMs, using price data from Euromonitor and NTB coverage information from UNCTAD. They include 14 product groups and 18 regions in their study of the impact of NTMs through an applied general equilibrium (AGE) model. The price effects are found to be generally very large – up to 190 per cent for the wearing apparel sector in Japan and the bovine meat sector in China. The price effects in wearing apparel in the EU are less but still substantial at 60 per cent. The welfare effects of a removal of the selected NTMs are simulated using their AVEs. Global welfare gains are estimated at USD 90 billion largely a product of the removal of NTMs in Japan and Europe and in the textile and machinery sectors.

Vanzetti et al. (2018) suggest that the net welfare in the Association of Southeast Asian Nations (ASEAN) countries was raised in the order of USD 3 billion if harmonizing of technical NTMs and the elimination of non-technical NTMs were fully applied to intra-ASEAN trade only. Such gains are estimated to increase to USD 12 billion if technical measures on non-ASEAN imports were reformed. About USD 18 billion of gains would be achieved if ASEAN technical measures could be matched to international levels, allowing ASEAN exporters access to European, American and Japanese markets.

Fugazza and Maur (2008) provide a useful summary of the various means by which costs created by NTMs are modelled. They note that Hertel et al. (2001) first introduced an efficiency-shock variable, which simulated the impact of a lowering of non-tariff trade costs (e.g. customs clearances) in the Japan-Singapore free trade agreement (FTA). About USD 9 billion annual welfare gain was produced, largely derived through the trade facilitation component. Fox et al.'s (2003) modeling of both the direct and indirect transaction cost from a lack of trade facilitation at the US–Mexico border is also described. In this way the different nature of costs created by NTMs are accounted for. The modeling involves assuming direct transaction costs are an import tax, which produces a transfer of rent between importers and domestic agents. Indirect transaction costs are seen as representing efficiency losses. On this basis indirect costs are found to be the major source of welfare gains. Walkenhorst and Yasui (2005) are also referred to as an example of the same approach in order to measure gains from trade facilitation and liberalisation. Taxes are apportioned between those paid by importers and those paid by exporters. The results reveal substantial welfare gains in the order of around USD40 billion (80 per cent of which is derived from the efficiency gain effects).

Fugazza and Maur (2008) refer to other studies – Maertens et al. (2007) and Maertens and Swinnen (2009a) – which find that while many NTMs can restrict trade, they can also improve welfare in the presence of negative externalities or informational asymmetries. Another author cited – Beghin et al. (2012) – the impact of NTMs on both trade and welfare in an environment of market imperfections. This study focused on the standard measures such as TBT and SPS. They found that welfare tends to increase when NTMs are reduced, and trade expands with the absence of market imperfection.

## 2.6 Methodologies for Quantifying NTMs and Measuring Impact of NTMs

There are several approaches often used, some of which are more reliable in quantifying NTMs and measuring impact of NTMs. They are inventory approaches, price or quantity based approaches, survey based approach, gravity models, and CGE models.

### i. Inventory Approaches

Use of the inventory methodology involves employment of a frequency index and coverage ratio. A frequency index can be defined as the share in total tariff lines containing one or more NTM. This share can be measured according to the weights based on either imports or production. The frequency index is simply an accounting of the presence or absence of an NTM. This is expressed as the percentage of products that are subject to one or more NTM. Importantly, the frequency ratio is not a measure of the relative value of the affected products, and therefore gives no indication of the importance of NTMs on overall imports (Disdier et al., 2008; Fontagné et al., 2005; Kee et al., 2008). It also does not show the impact on prices, trade, welfare and markets. The advantage of using the frequency ratio is that it does not suffer from endogeneity of the weights in the import value.

The coverage ratio is the percentage of imports affected by one or more NTMs to total imports. This method measures the importance of NTMs on overall imports (Disdier & van Tongeren, 2010). Bao and Qui (2010) note that the coverage ratio is affected by the problem of endogeneity resulting from the weighting of import values. If more products are affected by NTMs, the coverage ratio tends to be higher. For instance, if a product category is totally affected by very restrictive NTMs and the country does not import this product, the weight will be zero and hence the coverage ratio will be downward biased. The use of the counterfactual free trade weights is to avoid the problem of endogeneity, however, they are not always available.

An UNCTAD study of the economics behind NTMs (UNCTAD, 2013) notes that these inventory measures provide a means of summarizing information on NTMs at a disaggregated level in a single indicator. This of course requires a country's detailed information to be collected at a disaggregated level for the computation of these measures. The UNCTAD study points out that the advantage of such instruments is the ease with which they can be collected, entailing not much more work than compiling tariff schedules. Inventories of NTMs are seen as representing valuable information, which can be used to trace the evolution of different types of NTMs on the trade flows of goods, and of the evolution of their incidence relative to tariffs.

The UNCTAD study points to another obvious advantage: information can be highly NTM type-specific and highly disaggregated at the product level. However, they do not provide direct information about a possible impact on price and quantities produced, consumed or traded. More often they are used to create indicators of trade restrictiveness, which in turn are used to estimate quantity and/or price effects. A number of studies can be cited, which employ these inventory measures to estimate the impact of NTMs (Liard & Yeats, 1990; Beghin & Bureau, 2001; Disdier, et al, 2008).

**ii. Price-and-Quantity Based Approaches**

Price-and-quantity based approaches are used to estimate the economic and trade effects of NTMs and can be converted into the AVEs of NTMs. For instance, Beghin and Bureau (2001), Bradford (2003, 2005), Chemingui and Dessus (2008), Cadot and Gourdon (2016), Deardoff and Stern (1997), Dean et al. (2009) and Ferrantino (2006) all employ a price based approach to estimating the effects of NTMs on the economy and trade. This approach is based on comparing the prices in the importing country with prices of comparable products in free markets, i.e. without distortions. As UNCTAD (2013) studies point out, detailed price data provides an important means for distinguishing between the impact of NTMs and of local distribution costs in raising the price of a commodity. An instrumental variable approach, which can incorporate the endogeneity of NTMs, can be used to estimate the magnitude of NTMs' effect. The 'price gap' (or AVE) is therefore the difference between the price of imports (which have risen because of the NTM) and the lower world price (in the absence of the NTM). It is pointed out in the UNCTAD study that the price based approach has several drawbacks. Imported products cannot be assumed to be perfect substitutes for domestic ones. As well, there is the challengeable assumption that the price gap is associated exclusively with the impact of NTMs, and is not influenced by such factors as market settings.

Many studies – for instance Baldwin (1975); Bhagwati and Srinivasan (1975): Leamer (1988); Trefler (1993); Kee et al. (2008, 2009); Ferrantino (2010); Berden et al. (2009); Fontagné et al. (2013); Francois et al. (2013) and Egger et al. (2015) – employ a quantity based approach to estimate the impacts of NTMs. They use gravity equations to estimate the extent to which an NTM leads to a reduction in trade flows compared to potential trade without NTMs. From this methodology an AVE or trade cost equivalent (TCE) can be calculated. This can be described as a 'fictitious' import tariff, which if actualized, would reduce imports by the same extent as that of an NTM.

Ferrantino (2006) argues that the price based approach is preferable to the quantity based approach. The price based approach measures the difference between two observed values. The first is a distorted price reflecting the effect of NTMs and the second a non-distorted price. Using a quantity based approach the difference between an observed (distorted) value and an estimated ('normal') value of trade is measured. Such measurements are therefore affected by the quality of the estimated value, which is in turn is influenced by the various uncertainties surrounding econometric specifications. Fontagné et al. (2013) on the other hand, argue that quantity-based approach proves more convenient for large-scale analyses.

**iii. Surveys**

Surveys (UNCTAD, 2013) or structured interviews are a frequently used means to obtain information on the incidence of NTMs. Survey investigations can be employed to collect data which reveals the frequency of NTMs and their trade restrictiveness or trade impact. However, surveys can be costly, time consuming and limit both the scale and scope of the issue to be investigated. Can, for instance, the researcher be confident that the data is sufficient to describe an economic sector or industry? Laird (1997) argued that surveys could give details that are more relevant by narrowing the scope. Deardorff and Stern (1997) claim that the estimates of NTM effects must be made at the most disaggregated level possible. A further issue is that surveys inherently tend to rely on perceptions of participants, rather than statistical data. Moreover, methodological differences can make comparisons between surveys difficult. Carrere and de Melo (2011) find that surveys conducted on different products and countries are not comparable with one another as the standard level used for comparison differs greatly.

**iv. Gravity Models**

The gravity model of trade is used to estimate the value impact of NTMs and in particular to quantify the impact of NTMs on international trade (Carrere & de Melo, 2011; Disdier et al., 2010; Essaji, 2008; Ghali et al., 2013; Ghodsi, 2015b; Rahman & Ara, 2010; Sun et al., 2014; Walsh, 2008; Xiaohua & Qiu, 2012; Yousefi & Liu, 2013). In a cross section, a value impact is comparable to a quantity impact taking into account some price normalization. However, as Fugazza (2013) points out when identifying the effect of an NTM, a panel structure is preferable notwithstanding the complications inherent in empirical decomposition of value variations into price and quantity variations.

The standard gravity estimation is implemented at the product level or at the industry level. Disdier and Marette (2010) note that if the estimation is implemented at the product level, it mostly focuses on product specifics and is often limited to a restricted sample of countries. Xiong and Beghin (2011) point out that the analysis could be exhaustive in terms of industry coverage in the case of implementation at the industry level. Therefore, samples are generally restricted to a limited number of countries.

The gravity model is widely used to quantify the effects of NTMs on trade as it benefits from simplicity. The model has the advantage of using a limited series of easily obtained data, enabling it to be applied to a large set of countries. On the other hand, there are drawbacks in the use of the gravity model to measure NTMs' impact. They include the quality of the data, the sample of countries, the level of sensitivity of the results from the model and its specification.

**v. Computable General Equilibrium (CGE) Models**

CGE models are simulations, which can be used to assess the effects of NTMs, or their removal, on such factors as trade flows, production, employment, GDP and welfare. Both price and quantity based approaches can be used as policy shocks in CGE models.

Gilbert et al. (2018),by estimating AVEs – the difference between world and domestic prices not explained by tariff measures – follows the most popular means for measuring the border effect of NTMs. With the aid of AVEs, NTMs can be introduced to the CGE models by two means. The first is as tariff equivalents (this equates to export tax equivalents if exports are involved). Non-revenue generating price wedges (iceberg costs) provide the second means (Andriamananjara et al., 2003; Gilbert et al., 2018). Gilbert et al. (2018) note there is a need to adjust tariff measures in the CGE in order to model the introduction of NTMs or their removal in NTMs as tariff equivalents. Given tariffs generate revenue, the value generated must be changed and accounted for in some way. Put another way, data of the equilibrium model must be appropriately adjusted.

Gilbert et al. (2018) identify three methods for adjusting the data of a general equilibrium model. The first involves counterfactual simulation, which is the simplest and employs a shock to the model to simulate a new equilibrium in which NTMs are included. Further simulations are then run, which involve partial or full removal of the NTMs. However, by using this methodology, the simulation distorts the equilibrium following the assumed theory – there is no longer simulations relative to observed data. A second approach requires the use of counterfactual simulations employing a closure or parameter specification, which minimizes the changes in the data. It should be noted that the CGE model results are very sensitive to the relative importance of various activities – such as consumption shares and value-added shares. If the introduction of NTMs is simulated with core elasticities adjusted, the equilibrium can be correspondingly adjusted while maintaining shares. The old parameters can then be recovered if further simulations are desired. In using this technique, a new SAM needs to be rewritten and recalibrated. A further option involves adjusting the flows in the SAM directly, which produces greater control. That is, it is possible to manipulate tariff revenues, provide precision about how the NTMs influence consumption of the various agents, and specify distribution of revenue. If new SAM cell entries are made, a new theory is needed to explain the flow. But by introducing new entries in a SAM cell, this will put the SAM out of balance. Therefore, the use of SAM balancing techniques such as RAS is required after the manipulations have been made.

A number of studies employ the CGE model to study the impact of NTMs. They estimate the AVE of NTMs and incorporate this into a CGE model (see for example: Andriamananjara et al., 2004; Ciuriak & Xiao, 2014; Cororaton & Orden, 2015; Chemingui & Dessus, 2008; Fugazza & Maur, 2008; Kee et al., 2009; Petri & Plummer, 2016). Fugazza and Maur (2008) provide a global assessment of NTMs employing a CGE model (the standard GTAP model). With the use of econometrics, they estimate the AVEs of NTMs as computed by Kee et al. (2009). The authors follow a similar methodology to Andriamananjara et al. (2004), by limiting their study to a subset of sectors. Cororaton and Orden (2015) implement AVEs of NTMs sourced from Kee et al. (2009) in the model. Kee et al. (2009) insert the AVEs of NTMs indirectly in a two-step approach to assess the impact of NTMs on the import values with a gravity model. The results are then converted to AVEs using import demand elasticities. They restricted their AVEs to those which are positive, which means that all NTMs have only import restricting effects and that are comparable to tariffs and quotas.

CGE models examine the economy as a complex system with interdependent components. This approach captures economy-wide changes due to the effects of a policy change, such as the introduction of NTMs or removal of NTMs. However, this approach has limitations. It may not be able to detect beyond border NTMs and may not be easy to implement. It is a highly complex process to assess the supply-and-demand shift effects in a CGE context.

### 2.7 Summary and Research Gaps

This chapter begins with the discussion on the definition and classification of NTMs and labour. It also reviews the trade theories that deal with trade protectionism.

Understanding the theoretical links between NTMs and the labour market is important to identifying how NTMs affect the labour market. Moreover, this chapter deals with empirical findings. The last section of this chapter elaborates the methodologies used to quantify NTMs and their impact.

In summary, the literature review identifies a number of issues. Studies on the impact of NTMs on trade mostly focus on the micro-level and use firm-level data to analyse the effect of NTMs on firm exports (see for example, Chen et al., 2006; Fontagne et al., 2015; Kee et al., 2009; Reyes, 2011). At the macro-level, a number of studies on the impact of NTMs on trade have been carried out for a group of countries (Andriamanajara et al. 2004; Berden, 2009; Bratt, 2017; Beghin et al., 2014; Deardorff, 1997; Disdier et al., 2008; Gasiorek et al., 1992). However, single country studies are few, notwithstanding they have greater policy relevance than cross-country studies that tend to reveal only average impacts.

The literature provides evidence that the effect of NTMs remains inconclusive at both micro-and-macro levels. They can be trade-enhancing or trade-impeding. This is important in understanding the impact of NTMs on the Malaysian economy and in providing appropriate policies governing international trade.

NTMs also impact other parts of the economy, for example labour markets. There is therefore a need to acknowledge that an understanding of this labour market's response to NTMs is important for the design of better regulations by governments. However, given most studies have ignored them. Limited evidence on NTM impacts on labour in

Asia, though the effects on employment, wages and inequality are contextual. Therefore, a proper analysis of this impact is still lacking in literature.

Finally, there is no study conducted on Malaysia that analyses the impact of reducing NTMs in the food processing sector on the economy and the labour market. The study found that limited evidence on disaggregated impacts of NTMs by sectors. Furthermore, the issue of foreign labour has not been considered in the literature. Many studies focused on the composition of labour (in terms of skills), but do not distinguish local labour from foreign labour. Thus, such a study is the key to developing a framework and creating policies to boost and enhance the Malaysian economy and labour market.

# CHAPTER 3: METHODOLOGY

## 3.1 Introduction

This study uses a quantitative method, employing a general equilibrium framework. Theoretical considerations and approaches that have been used to assess the impacts of NTMs on the Malaysian economy and labour market are set out in this chapter.

This chapter consists of four sections. The first deals with the justification for using the CGE model, the general equilibrium theory and conceptual framework of the study. The CGE mathematical model specification and parameter development are explained in the second section. The third section explains the development of a benchmark database and construction of a social accounting matrix (SAM). This includes how the highly disaggregated SAM is reconciled or integrated with a disaggregated input-output (I-O) table. It also explains SAM balancing procedures, SAM market closure conditions and calibration of the CGE model. The final section consists of the methodology used to quantify NTMs, and a description of the measurement of wage inequality and welfare.

## 3.2 Justification for the Use of a CGE Model

The general equilibrium framework is regarded as the best economic model to represent the wide impacts of various external shocks and policies on the entire economy, where many variables are endogenously determined (Döll, 2009). The CGE model enables the simulation of the impact of policy change on various endogenous variables – for example, effects on output, prices, employment, wages and welfare (Brocker, 2004). Furthermore, the CGE model is the best analytical tool and a robust means of measurement in assessing the impact of a policy change in the short- and long-run.

The CGE models represent the principles behind general equilibrium theories in their depiction of the whole economy and allow an exploration of the different interactions among economic agents making decentralised decisions (Khor, 1982). General equilibrium theory and modeling have been developed to deal with a series of theoretical questions, and policy and empirical issues that are related to international trade and macroeconomic and environmental issues.

CGE models are more theoretically comprehensive by unequivocally incorporating households' and firms' optimizing behaviour. Households supply their endowments in exchange for commodities in order to maximize their utility, while firms decide on the demand for inputs and the supply of outputs in their profit maximizing decisions. These optimizing behaviours can be used to highlight the role of commodity and factor prices, which influence the decisions made by firms and households, as well as to describe the behaviour of governments. In other words, they are ***general*** (Dixon, 2008). The level of output, incomes and prices are endogenously determined by these optimizing behaviours.

CGE models also describe how the prices of commodities and factors are determined by supply and demand. These models also show how total demand equals the total supply in the economy, and how this is achieved through the interaction of the economic agents. This shows that the economic agents utilize market ***equilibrium*** assumptions.

CGE models also produce ***computable*** results, where numerical databases are used to estimate parameters and coefficients in equations. This allows the simulation of changes in policy and responses to exogenous shocks in the economy, as well as the forecasting of macroeconomics variables (Chumacero & Hebbel, 2004). CGE models are suitable to simultaneously carry out policy experiments for many countries, as well as capturing inter-sectoral linkage effects. In addition, CGE models are able to address the issue of the offsetting effects of trade liberalization working through inter-sectoral shifts, factor price adjustments and exchange rate changes, which are not addressed by partial equilibrium models.

Another unique feature of CGE models is the data requirement, where basic national accounts for a single year are used. Generally, the estimation of econometric models requires time series data, which may be a problem when studies are carried out for developing counties that do not have long historical time series data. For this study, however, it is not possible to carry out policy analysis using an econometric approach. This is because of the limitations in the availability of occupational data for wages and employment in Malaysia. This section introduces the key features of CGE models and how they are used to address data limitations, as well as being used as a powerful tool for carrying out policy analysis. Thus, CGE models provide a key tool for carrying out empirical analysis when faced with such limitations.

## 3.3 General Equilibrium Theory

The CGE model is supported by the theory of general equilibrium, established by Walras in 1954. This theory is based on the concept of competitive market exchange. Here all markets are in equilibrium simultaneously. The total market demand for the output of all commodities together with the total of all factors, equates to total market supply. Given all commodities prices are fixed, the equilibrium profit for all firms is zero once payments are allocated to factors.

For a general equilibrium model, household expenditures must be equivalent to household income. As well, government transfer payments to consumers equal the government revenue from taxes. In other words, the Walrasian equilibrium for this model represents a set of prices that ensure the supply side of an economy is in equilibrium and therefore entails all firms maximizing profits. In the same way, by households maximising their utility subject to a budget constraint (represented by the value of their endowments) the demand side achieves equilibrium. Ultimately, excess demand for all commodities is zero in such an equilibrium.

As an example, assume that only two commodities X and Y are produced by an economy. These commodities are produced by only two types of factors of production, capital (K) and labour (L). All individuals have identical preferences in the economy. Every individual's choices/preferences are depicted by an indifference map. The production possibility frontier (PPF) shows the inter-linkages between inputs and outputs. Assuming a fixed volume of capital and labour, the PPF can be constructed.

Figure 3.1 depicts an Edgeworth box with different possible combinations of existing capital and labour needed to produce commodities X and Y. Each point in the Edgeworth box shows the allocation of the inputs between two commodities

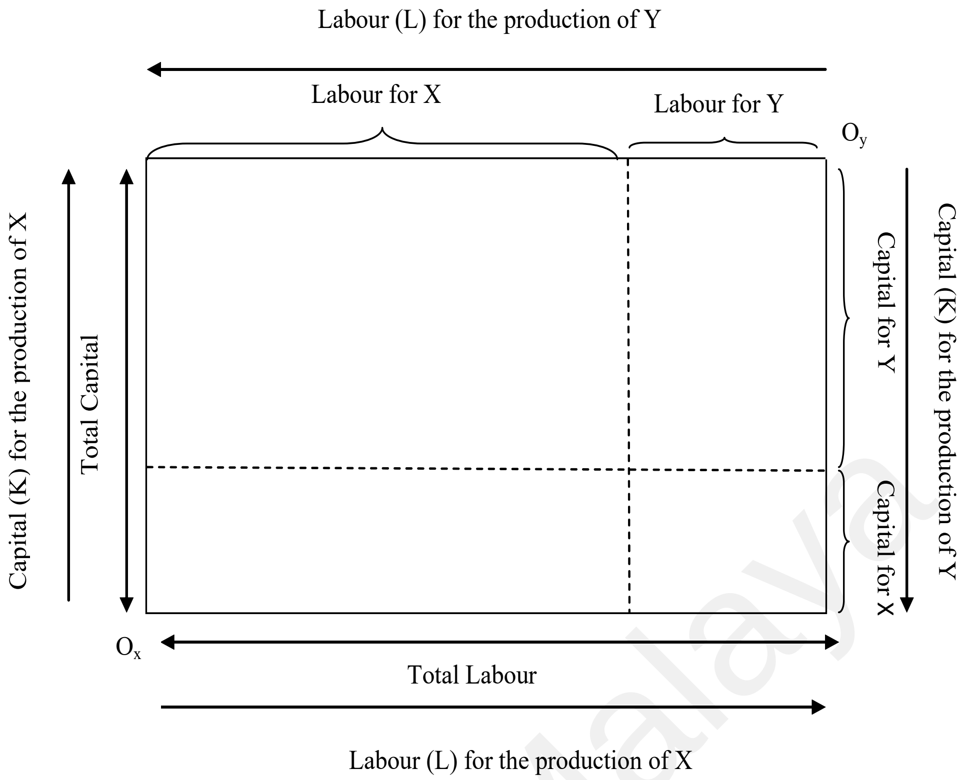


**Figure 3.1: Allocation of Available Resources to X and Y**

An allocation of the L and K as being production efficient if the only way to increase the output of one commodity is to decrease the output of another. Figure 3.1 indicates not all the allocations in the Edgeworth box are production efficient. This can be explained given that, by changing labour (L) and capital (K), production of either commodity can increase. In order to achieve efficient allocation, the model employs isoquant maps for commodities (see Figure 3.2). The isoquant map for commodity X uses $O_x$ as the commencement point, while the isoquant map for commodity Y uses $O_y$ as the commencement point.

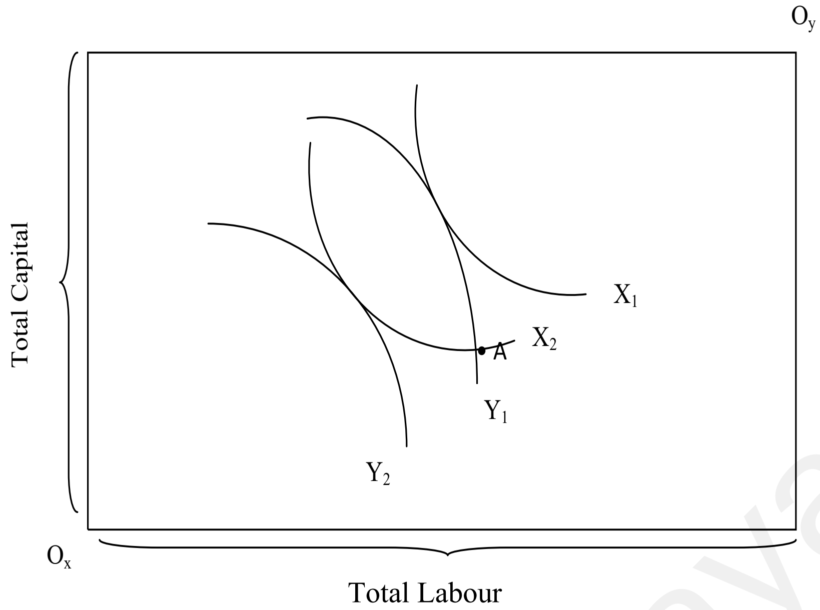


**Figure 3.2: Isoquants for Commodities**

When both isoquants are tangential to each other, production efficient allocations occur as shown in Figure 3.2. Thus point A is inefficient as by moving along $Y_1$, production of commodity X is raised from $X_2$ to $X_1$ while Y is held constant. Equally for production of commodity Y, by moving along $X_2$, Y is increased from $Y_1$ to $Y_2$ if X is held constant. At each efficient point the marginal rate of technical substitution (MRTS) of K for L is the same for production of X and Y. When the $\frac{p_x}{p_y}$ ratio is equal to the marginal rate of product transformation (MRPT), firms can maximise their profit. This equates to the slope of PPF. If utility is to be maximized, the marginal rate of substitution (MRS) of X and Y will be the $\frac{p_x}{p_y}$ ratio. Thus, when both individuals and firms have an identical price ratio, an equilibrium is achieved where there is neither excess supply or excess demand.

In Figure 3.3, the efficient points are depicted as the highest/maximum level of output for commodity Y, which is produced for an arbitrary level of output for commodity X. Therefore, all efficient points of production are located as a point on the PPF.

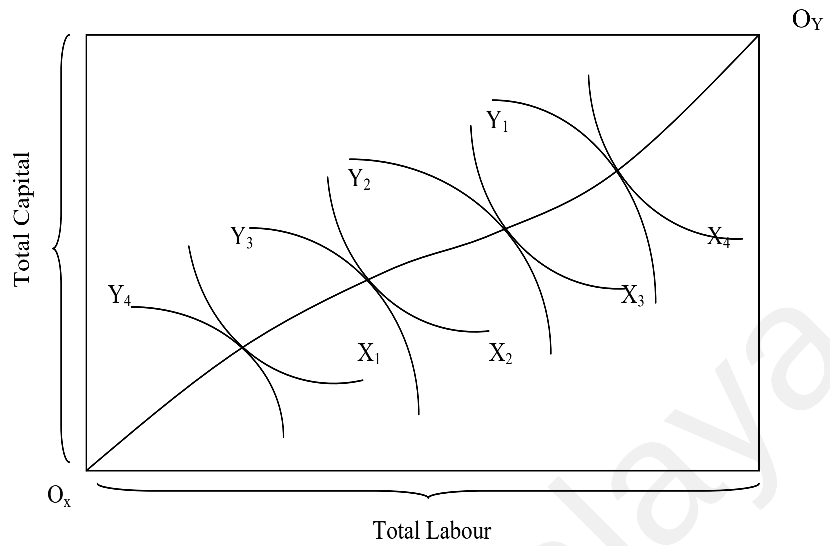


**Figure 3.3: Efficient Point Path of General Equilibrium**

### 3.4 Conceptual Framework

In Figure 3.4, this study's conceptual framework study is illustrated showing the presence of NTMs in the Malaysian food processing sector. A number of theories are used to explain the impact of a reduction of NTMs on the food processing sector. They are the theories of signaling, trade protectionism, factor specifics and the H-O-S. The factor specific theory explains the short run case, while the H-O-S theory explains the situation in the long run.

The framework variables, namely, production, trade, employment, wages, wage inequality and welfare, are used to assess the NTMs' impact. Numerous studies have examined these impacts, including by trade organisations such as the WTO and UNCTAD. However, the impact of NTMs is not just one dimensional - despite the predominant view that it invariably affects trade negatively. Some studies have found otherwise: that is, that NTMs enhance trade (Maskus et al., 2001; World Bank, 2005; van Tongeren et al., 2009; Neeliah et al., 2013; Rial, 2014).

The presence of NTMs in this sector can have either positive or negative impacts. According to the signaling theory, NTMs can enhance trade through better information about the quality of a good. Thus, the level of production will be affected. Welfare can be improved in the presence of NTMs as consumers can increase their confidence about the quality of a product and the variety of choice of goods that are offered in the market. However, NTMs can indeed act as trade protection, which in turn impact production and trade negatively. This is because the presence of NTMs results in higher cost of adaption that requires producers to comply with them. Given the problem of asymmetric of information, many NTMs can help solve this problem and enhance welfare although at the same time hampering trade.

The labour market outcome depends on whether the factors of production can be fully mobile. According to factor specific theory, price changes will eventually affect trade, production, welfare and labour market. NTMs would affect labour demand in relation to skills (skilled, semi-skilled and unskilled). The theory predicts that NTMs will affect the composition of employment (demand for skill). The reduction of NTMs causes the demand for unskilled labour to increase and a reduction of skilled labour in developing countries.

The theory of H-O-S assumes that all factors of production are fully mobile between sectors. The theory predicts that if a country imposes trade protection such as NTMs, they may cause cheaper factors of production to become more expensive due to compliance, adaption and other costs. When the reduction of NTMs takes place, the costs of trade and production become cheaper – which can then result in an increase in trade, production and welfare. The labour market in terms of employment, wages and inequality will be changed due to price effect of NTMs.

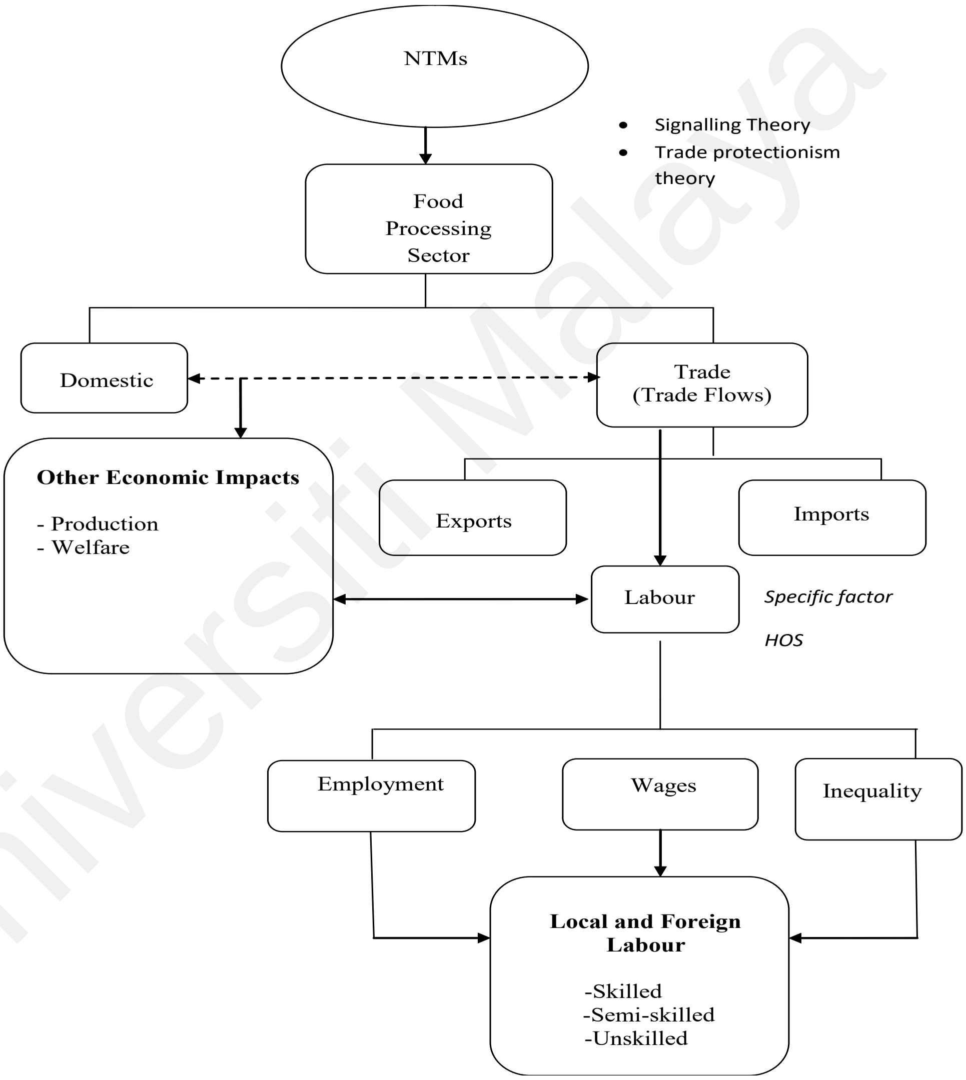


**Figure 3.4: Conceptual Framework**

Source: Author's design

### 3.5 Applied Computable General Equilibrium

This section describes the assumptions in the CGE model and the basic structure of the model.

#### 3.5.1 Assumptions in the CGE model

CGE modeling is based on an estimation of the SAM framework for the Malaysian economy in 2010. The following are the assumptions of the CGE model:

i. It consists of set of non-linear simultaneous equations, which have a varying order of degree.

ii. Subject to "constant returns to scale", producers will maximize profits which requires the same proportional change between outputs following to a proportional change in inputs.

iii. Given a production function, which provides producers with a choice of labour and capital ratios, they will minimize costs. The production function is governed by a constant elasticity of substitution (CES).

iv. Production technology is organized in a nested structure. This allows the elasticity of substitution to vary according to different levels of the nesting hierarchy (i.e. CES and Leontief fixed proportion) and be independent of each other.

v. Sectoral output is composed of a CET aggregation of goods and services, which is supplied to domestic (D) and export markets (E). The composite commodities Qi represent the Armington function, which differentiates between domestic goods sold on the domestic market (D) and sectoral imports (M),

vi. The underlying equations must fulfill certain restriction of general equilibrium theory. These include macroeconomic closure and market clearing conditions which are fed into the behavioural equations for demand and supply of commodities, factor markets, and macroeconomic balances (that is saving-investment balance and balance of payments), all of which contribute to simultaneous equilibrium quantities.

vii. Producers will maximize profit by taking as given on the supply side the equilibrium of prices of input and output. Consumers behave in a way which they maximise utility subject to their budgets, which are defined by their original factor endowments on the demand side.

### 3.5.2 Basic Structure of the Model

The basic structure of the model consists of prices, production and domestic demand. The structure and specification of the model follow Löfgren et al. (2001) and Robinson (1989) by aggregating industries into 15 sectors. All of these are described in this section.

#### 3.5.2.1 Prices

It can be assumed that Malaysia is a price taker in the world economy as the size of the country is small. Thus, the model treats import price as an exogenous variable. Malaysia has a downward sloping export demand function. Figure 3.5 shows the price structure of this economy. The world prices (*pwm* and *pwe*, respectively), the import tariff (*tm*) or export subsidy (*te*) and exchange rate (*EXR*) are the factors that determine the domestic prices of imports and exports. The model assumes that commodities from different origins and destinations (domestic outputs, exports, imports and that are used domestically) have different quality.

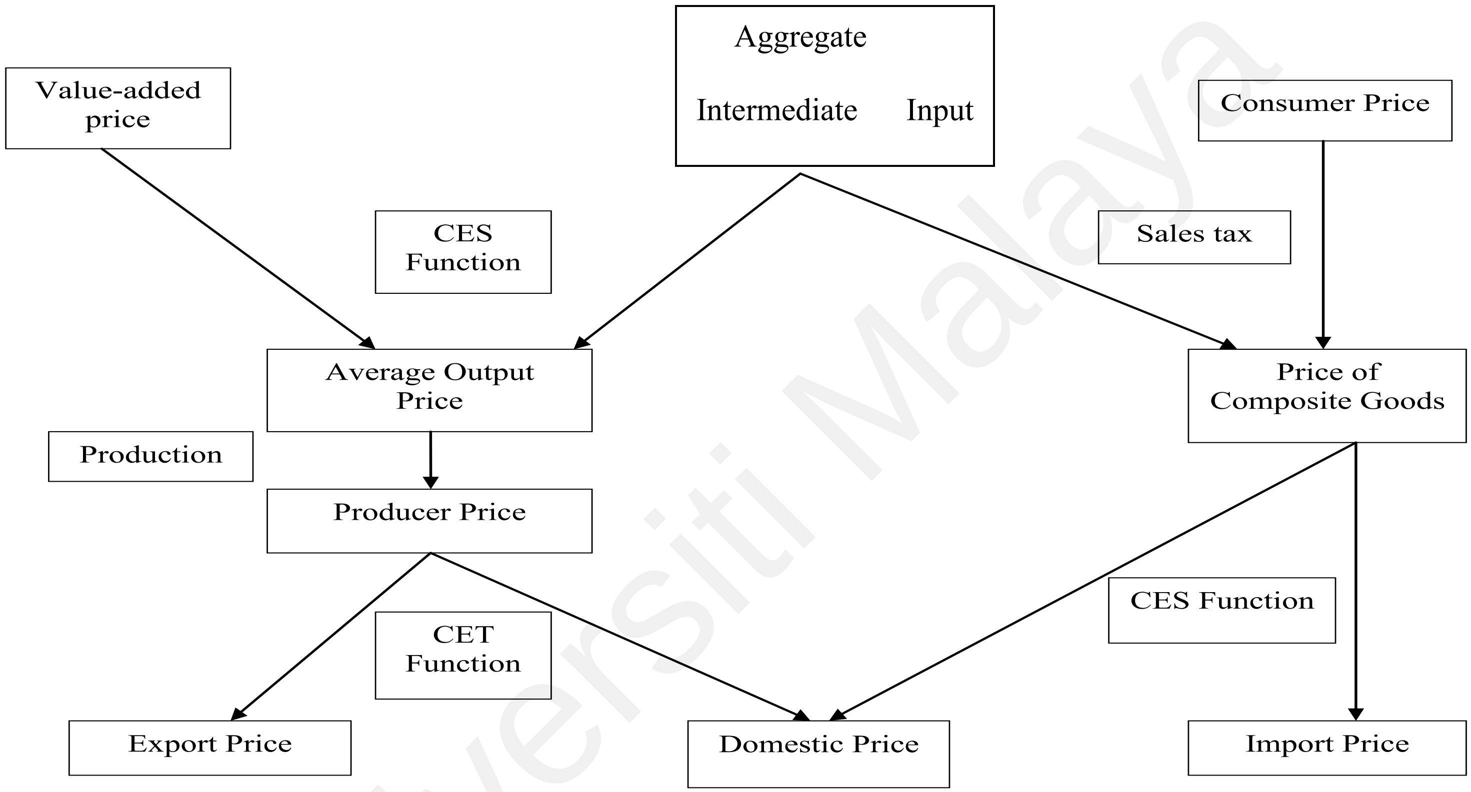


**Figure 3.5: The Price Structure of the Malaysian Economy**

#### 3.5.2.2 Production

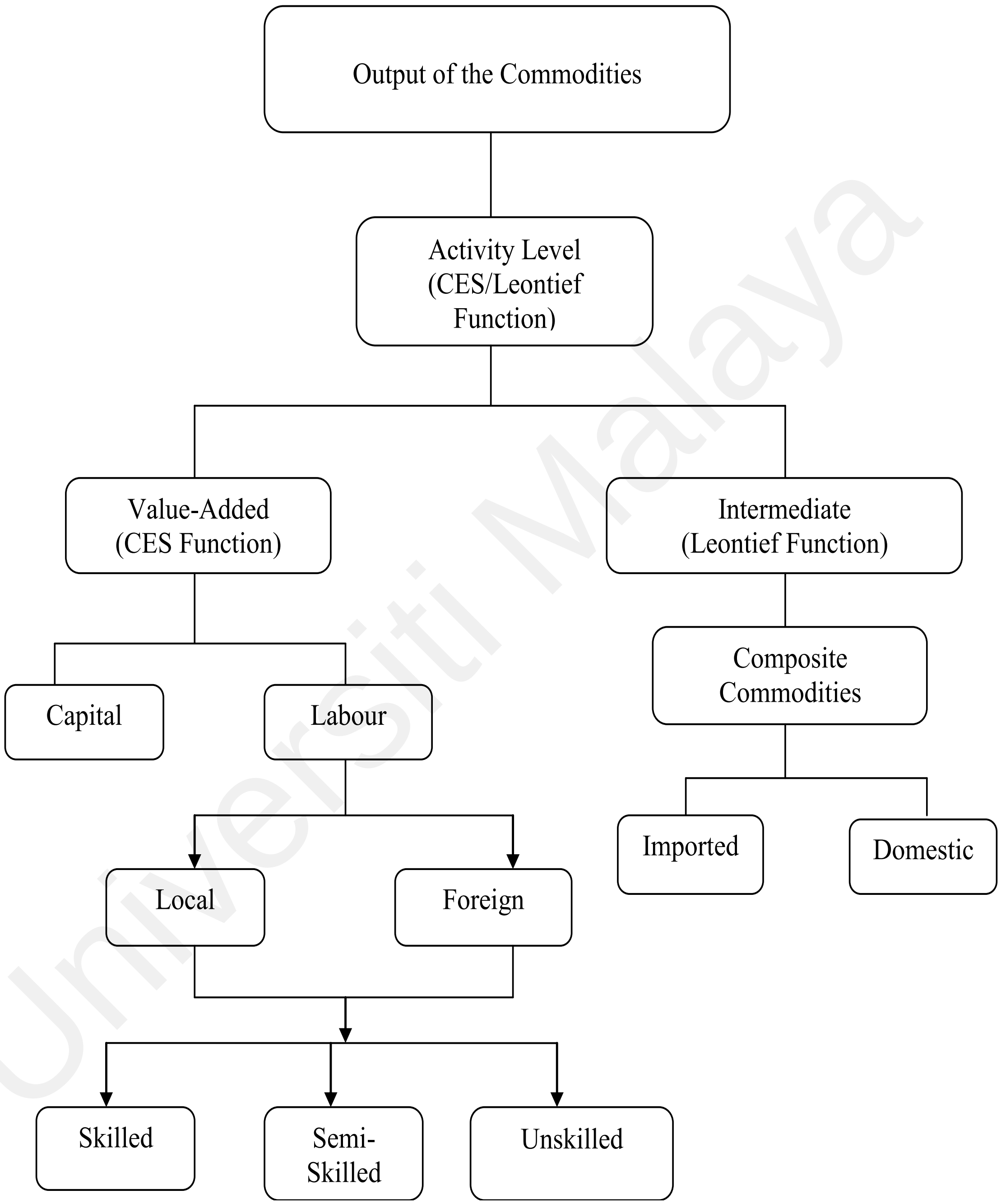


**Figure 3.6: Nested Structure of Production Activities**

The nested structure of production activities is illustrated in Figure 3.6. Income generation activities are captured in the production and net supply of commodities derived from domestic production activities[4]. Incomes from production activities are derived from the supply of different commodities, sourced from domestic and foreign resources/intermediate inputs (imports) as well as *via* the supply of intermediate commodities to other production activities. Income is generated in the process of all producers maximising profits. All producers are subject to the two-level nested *Leontief/CES* production function. Represented then, is total GDP produced locally from each production activity – derived in part *via* the purchase of either domestic or imported raw materials. Other production costs (i.e. value added factor payment) can be described as wages and rents, which are paid to factors of production[5]and to market factors (by way of enterprises), and include tax payment to governments.

**3.5.2.3 Domestic Demand**

Figure 3.7 indicates the structure of demand in the economy. At the level 1, the total composite demand comprises four components: household consumption, government spending, investment and demand for intermediate goods. There is a fixed share for these four components. For example, the government decides how much to demand, therefore government expenditure is exogenously fixed. Consumption demand is represented by a household's consumption expenditures in which the household's utility is maximised.

[4]This study aggregates 124 production activities/sectors into 15 production activities/sectors. Refer to Table 3.3 in Section 3.15 for the detailed industry classification.

[5]The study assumes that only two types of factors of production, labour (L) and capital (K). Local and foreign labour are both taken into account in this study. Local and foreign labour also disaggregates into skilled, semi-skilled and unskilled.

Intermediate demand is subject to fixed input-output coefficients. Demand for investment is derived from the capital composition matrix (CCM). At the level 2, the total composite demand is divided into total demand for domestic commodities and total demand for imported goods from the rest of the world (ROW). The substitution between domestic and import composite goods is based on the CES function. This implies the adoption of the so-called Armington assumption (Armington (1969)) for production differentiation.

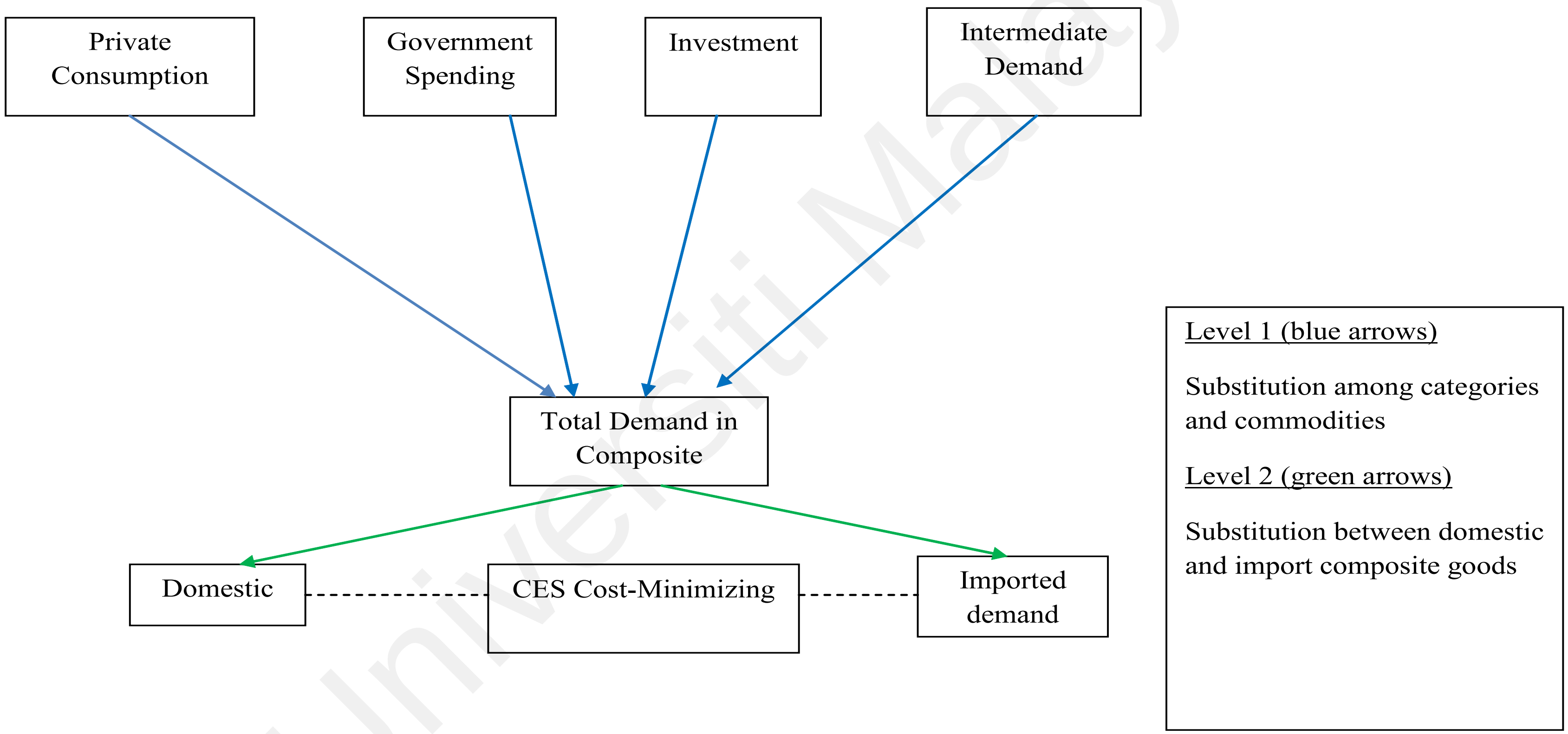


**Figure 3.7: The Demand Structure of the Economy**

### 3.6 Model's Equations

The equations of the model can be divided into four blocks. The first block describes the price system, and the second is the production and total payment to a factor of production. The third block is the relationship of the combination of factor payment to institutional actors and the demand system of the institutional actors and is represented by the institutional block. The final block is system constraints, represented by the equations of macro closure and market clearing.

The following section describes details of all the equations in all blocks. For notational convenience, all the parameters are presented in lower cases, while variables and indices are presented in upper case letters. All the variables and parameters for the model are presented in Appendices A and B, respectively.

### 3.7 Price Block

This section presents the sets of price equations, which are employed by the study. The corresponding equations are shown below:

#### 3.7.1 Import Price

Equation 3.1 shows that the import price here is the domestic price of imports paid by domestic consumers for imported goods (exclusive of sales tax). The domestic price of imports depends on the world price of import, import tariffs and AVE of tariffs[6]and exchange rates. The model uses one equation for each imported good. The distinction between variables and parameters is made by the notational principles. In this equation,

[6]The WTO (2012) stresses that an NTM would have same trade restricting effect as a traditional ad-valorem tariff.

the exchange rates and domestic prices are flexible while world price of imports[7] and tariff are fixed (small country assumption).

$$PM_c = (1 + tm_c + m_c).\ EXR\ .pwm_c \qquad (3.1)$$

where

$PM_c$ = import price in domestic currency units (DCU) including transaction costs

$pwm_c$ = import price in foreign currency units (FCU)

$tm_c$ = import tariff rate

$m_c$ = ad-valorem tariff equivalent of NTMs

$EXR$ = exchange rate (DCU per FCU)

NTMs generate a difference between the domestic and world prices as the imposition of NTMs directly affects the domestic price of the imported goods. Therefore, the most appropriate way to model NTMs is as a tariff equivalent[8] (Andriamananjara et al. 2003). In this study, a new parameter $m_c$ is added into equation 3.1 as the ad-valorem tariff equivalent based on existing studies[9].

[7] The share of Malaysia in world trade is so small, it faces an infinitely elastic supply schedule at the world price.

[8]When NTMs are expressed as a tariff equivalent, the impacts of NTMs on trade are the same as trade restrictiveness. Importing countries have to bear higher import prices when governments implement NTMs. When a liberalizing country removes NTMs, demand for imported goods will increase causing pre-tariff prices of imported good to increase. In this case, the term of trade is expected to deteriorate although allocation of resources will be improved.

[9] Refer to Appendix C for the estimation of simple average of AVEs of NTMs. The study is based on existing studies which include the World Bank's (Kee at al., 2009), "Estimating Trade Restrictiveness Indices"; and World Bank's (Kee at al., 2008), "Import Demand Elasticities and Trade Distortions".

### 3.7.2 Export Price

Equation 3.2 represents the export price in *DCU* received by domestic producers. The domestic price of exports is determined by the export tax rate, exchange rate and the world price of exports.

$$PE_c = (1 - te_c).\ EXR.pwe_c \tag{3.2}$$

where

$PE_c$ = export price in DCU

$pwe_c$ = export price in FCU

$te$ = export tax rate

$EXR$ = Exchange rate (DCU per FCU)

### 3.7.3 Absorption

Equation 3.3 is an equation representing absorption. It is expressed as the total spending on domestic output and imported goods at the prices, *PD* and *PM* respectively inclusive of the sale tax. The prices *PD* and *PM* exclude the commodity sales tax, but include the cost of trade inputs. The absorption equation applies to all domestic and imported commodities, while those commodities that are completely exported are not included in the absorption equation.

$$PQ_c\,.QQ_c = \ [(PD_c.QD_c) + (PM_c.QM_c)\ \ ].(1 + tq_c) \tag{3.3}$$

where

$PQ_c$ = price of composite commodity

$QQ_c$ = quantity of goods sold to domestic market (composite supply)

$QD_c$ = aggregate quantity of domestic output

$QM_c$ = quantity of imports

$PD_c$ = domestic sale price

$tq_c$ = sale tax rate (composite price share)

The right-hand side of equation 3.3 applies only to domestic demand and import respectively. Likewise, the price and quantity of those commodities that are not part of imports are fixed at zero. In essence, the absorption equation is transferred to the market or composite price by multiplying with by the sale tax adjustment[10].

### 3.7.4 Domestic Output Value

Equation 3.4 is the domestic output value at producer prices. This equation states the total values of domestic sales and exports at producer prices. It includes domestically produced commodities, while excluding the value of the output consumed at home. The price received by producers is used to value domestic sales and exports to account for the cost of trade inputs. Since the model includes the category of imported commodities, which are not used for domestic production, the domain of domestically produced commodities has to be stated explicitly. Moreover, non-exports commodities should be fixed at zero.

$$PX_c \, . \, QX_c = PD_c . QD_c + \, (PE_c . QE_c) \tag{3.4}$$

---

[10] Sale tax adjustment rate is (1+tq). It generates government revenue.

where

$PX_c$ = aggregated producer price for commodity

$QX_c$ = quantity of domestic output

$PD_c$ = domestic sale price

$PE_c$ = export price

$QE_c$ = quantity of export

### 3.7.5 Activity Price

The activity price is the gross revenue per activity unit. It can be defined as the yield per unit of activity multiplied by price of activity-specific commodity, which is further summed across all commodities. Equation 3.5 shows the activity price, which is given as follows:

$$PA_a = \sum_{c \in C} PX_c \,.\, \theta_{ac} \tag{3.5}$$

where

$PA_a$ = price of activity

$PX_c$ = producer price for commodity (aggregate)

$\Theta_{ac}$ = yield per unit of activity a

### 3.7.6 Value-Added Price

Equation 3.6 is the price of value added. The differential between an activity's revenue/cost and the price of intermediate goods is the price of value-adding.

$$PVA_a = PA_a - \sum_{c \in C} PQ_c \,.\, ica_c \tag{3.6}$$

where

$PVA_a$ = price of value added

$PA_a$ = activity price

$ica_c$ = non-exported commodities

### 3.7.7 Consumer Price Index

Equation 3.7 is the consumer price index. It acts as *numẽraire* in domestically marketed output. Thus, it is an exogenous variable. A *numẽraire* is necessary as the model is homogenous of the degree zero in prices: a doubling of prices leaves output unchanged. All changes in price and income in the simulation must be interpreted as a relative change.

$$\overline{CPI} = \sum_{c \in C} PQ_c \,.\, cwts_c \tag{3.7}$$

where

$CPI$ = consumer price index

$cwts_c$ = commodity weights in the consumer price index

### 3.8 Production Block

The model assumes that each sector minimises costs subject to the production function in order to produce a gross output ($x_i$) with a constant returns to scale. The production technology is represented by the constant elasticity of substitution (*CES*). It represents the nested structure of the production hierarchy (Shoven, 1992). This means that the elasticities of substitution may be different at a different level of the nesting hierarchy by maintaining independence of each other.

In this model a four-tier-nested CES production structure has been adopted, as shown in Figure 3.6. However, the functional form of the fundamental nested CES and Leontief's production function must satisfy the general equilibrium theory restrictions (Robinson, 1991).

#### 3.8.1 Activity Production Function

Production function is a CES function which shows the linkage between activity levels. Each activity uses the combination of value added and intermediate inputs to produce output. However, the optimal mixture of value added and intermediate input is a function of their relative prices. Equation 3.8 shows the production function used in the model to quantify the activity level.

$$QA_a = \sigma_a \prod_{f \in F} QF_{fa}^{\alpha_{fa}} \tag{3.8}$$

where

$QA_a$ = level of activity A

$\sigma_a$ = shift parameter (efficiency parameter)

$\alpha_{fa}$ = value-added share for factor *f* in activity *a*

$QF_{fa}$ = quantity demanded of factor *f* by activity *a*

### 3.8.2 Factor Demand

As mentioned above, each activity places a demand on factors of production in order to produce output. This factor of production value added is a basic CES function. The demand for factors is determined at the level where the marginal revenue equals marginal cost per factor. However, the marginal revenue product of the factor should be net of intermediate input cost. Equation 3.9 gives the factor demand:

$$WF_f * WFDIST_{fa} = \propto_{fa} * PVA_a(\frac{QA_a}{QF_{fa}}) \quad (3.9)$$

where

$WF_f$ = average wage of factor

$WFDIST_{fa}$ = factor market distortion parameter

$a_{fa}$ = shift parameter for factor in activity a

In the model, the wage-distortion factor is considered to bean exogenous variable, while the average factor price is an endogenous variable. This treatment of the factor market is important in generating factor market equilibrium (Löfgren et al., 2001).

### 3.8.3 Intermediate Demand

Intermediate demand for each activity is determined *via* a standard Leontief formulation. Equation 3.10 gives the framework of the intermediate input calculation. In this case, a fixed intermediate input coefficient is used along with the level of intermediate input which can be represented by:

$$QINT_{ca} = ica_{ca}.QA_a \tag{3.10}$$

where

$QINT_{ca}$ = quantity of commodity c as intermediate input to activity A

$ica_{ca}$ = quantity of c as intermediate input per unit of activity A

### 3.8.4 Commodity Function

Commodity production represents production of commodities with a certain level of activity as shown in equation 3.11. The equation on the right shows the sum of production quantities, while the equation on the left represents output produced domestically. This equation elaborates two important points: first, one or two activities can produce a single commodity. Second, one or more commodities can be produced by any activity.

$$QX_c = \sum_a \theta_{ac} \,.\, QA_a \tag{3.11}$$

where

$QX_c$ = level of output

$\theta_{ac}$ = yield of output c per unit of activity a

### 3.8.5 Composite Supply (Armington) Function

Composite supply is the combination of domestically produced and imported goods (entered as inputs in the production process). It is captured by a CES aggregation function as shown in equation 3.12. This function shows the substitutability between imported and domestically sold output to be imperfect. Imports and domestically produced commodities constitute the domain of the function: the lower limit of the elasticity of substitution is minus one, and is often called the Armington function.

$$QQ_c = \propto_c^q . \left(\delta_c^q . QM_c^{-\rho_c^q} + \left(1 - \delta_c^q\right) . QD_c^{-\rho_c^q}\right)^{\frac{1}{-\rho_c^q}} \qquad (3.12)$$

where

$QQ_c$ = composite supply

$\alpha q_c$ = shift parameter for composite supply (Armington) function

$\delta_c^q$ = share parameter for composite supply (Armington) function

$\rho_c^q$ = exponent of the Armington function

### 3.8.6 Import-Domestic Demand Ratio

As in the case of export and domestic sales, we created an optimal composite commodity mix, which is the optimal between domestic and imported output. The domain of this optimal mix is composed of imports and domestic production. A mathematical formulation of the function is given is as follows:

$$\frac{QM_c}{QD_c} = \left[\frac{PD_c}{PM_c} . \frac{\delta_c^q}{1-\delta_c^q}\right]^{\frac{1}{1+\rho_c^q}} \qquad (3.13)$$

### 3.8.7 Composite Supply for Non-Imported Commodities

Equation 3.14 gives the quantity of the commodity that is produced and sold domestically, where there are no imports involved at any stage of production or sale.

$$QQ_c = QD_c \tag{3.14}$$

### 3.8.8 Output Transformation (CET) Function

Domestically produced commodities are sold on domestic and international markets (exports). The output transformation function is used to split domestic production into two segments, which involves a transformability assumption between the destinations as shown in equation 3.15. Technically it is similar to CES, however, it has a negative substitution elasticity. The lower limit of the transformational elasticity is fixed at one. This restriction is made to ensure the concavity of the isoquant corresponding to the output transformation function. Mathematically, it is presented as follows:

$$QX_c = \alpha t_c\left[\delta_c . QE_c^{\rho c} + (1-\delta_c)QD_c^{\rho c}\right]^{\frac{1}{pc}} \tag{3.15}$$

where

$\alpha t_c$ = shift parameter: CET function

$\delta c$ = share parameter: CET function

$\rho_c$ = exponent of CET function

### 3.8.9 Export-Domestic Supply Ratio

In contrast with the output transformation function, the ratio of exports to domestic supply provides an optimal mix of commodity supply between two destinations, i.e. exports and domestic sales. The framework for this optimal mix is given in equation 3.16.

$$\frac{QE_c}{QD_c} = \left[\frac{PE_c}{PD_c} . \frac{1-\delta_c}{\delta_c}\right]^{\frac{1}{\rho_{c-1}}} \tag{3.16}$$

Given the two prices and the fixed quantity of domestic output are subjected to the CET function, equations 3.4, 3.1, and 3.16 constitute the first-order conditions for producer revenues maximization. It is also important to note that equation 3.16 illustrates the direct relationship between export-domestic supply and export-domestic price ratios.

### 3.8.10 Output Transformation for Non-Exported Commodities

In some cases, output is either used domestically or exported completely. Therefore, equation 3.17 provides the framework for non-exported commodities that are domestically consumed.

$$QX_c = QD_c \tag{3.17}$$

**3.9 Institution Block**

All equations discussed in this section represent net factor incomes inflows and outflows. That is, they represent value added factor income (capital and labour) flows from production activities and business activities (wages and salary), from government (transfers and subsidies) and from abroad (remittances). These in turn are distributed to households and redistributed back to producers and businesses (household consumption). The equations set out in 3.9 represent income and expenditure respectively. They capture all the income received by the government from other institutions in the economy such as tariffs, indirect taxes, income tax, firm tax, dividends, profits, net income from abroad as well as investment and savings activities of capital and financial institutions.

On the expenditure side, they capture all the expenditure and consumption that households, enterprises and government make either for domestic use or abroad, for own use or for investment and from local and overseas manufacturing. Importantly, the savings-investment balance, the government budget balance and market balance are also represented in these income equations.

**3.9.1 Factor Income**

Total income of each factor of production is defined in equation 3.18. The share parameter is used to show the share for households in factor income. This equation includes factor market distortion to capture all the income obtained from different markets. It also shows the sum of all factors of production income in the economy.

$$YF_f \quad = \quad shry_{\,hf} \sum_{\alpha \in A} WF_f \, . \, WFDIST_{fa} \, . \, QF_{fa} \qquad (3.18)$$

where

$YF_f$ = total factor income for each factor

$shry_{hf}$ = share for household h in the income of factor f

### 3.9.2 Household Income

Household is one of the subsets of domestic institutions. The total income received by households is the summation of the income received from a factor of production and the transfer payments by other institutions. Equation 3.19 sums up household income from all the sources.

$$YH_h = \sum_{f \in F} YF_{hf} + tr_{h,gov} + EXR.tr_{h,ROW} \qquad (3.19)$$

where

$YH_h$ = household income

$\sum_{f \in F} YF_{hf}$ = total of factor incomes

$tr_{h,gov}$ = transfer from government

$tr_{h,ROW}$ = transfer from the ROW

$EXR$ = exchange rate

### 3.9.3 Household Consumption Demand

The level of income determines the consumption of household. The right-hand side of the equations are divided by the composite commodity price, PQ, to make the demand function explicit. Equation 3.20 shows the consumption demand of households.

$$QH_{ch} = \frac{\beta_{ch}.(1 - mps_h).(1 - ty_h).YH_h}{PQ_c} \tag{3.20}$$

where

$QH_{ch}$ = household consumption demand

$\beta_{ch}$ = consumption spending share of household

$mps_h$ = marginal propensity to save

$ty_h$ = rate of household income tax

### 3.9.4 Investment Demand

Investment demand is the product of base year investment quantity and the adjustment factor. The investment quantity is exogenous because the adjustment factor is exogenous. In the SAM, we aggregated inventory with the saving-investment account and therefore, the separate treatment of stock is not required. Thus, equation 3.21 gives the investment demand framework in the model.

$$QINV_c = \overline{qinv}_c . IADJ \tag{3.21}$$

where

$QINV_c$ = investment demand for commodity

$\overline{qinv}_c$ = base year investment demand

$IADJ$ = investment adjustment factor (exogenous variable)

### 3.9.5 Government Revenue

The sum of income received by the government through various sources is government revenue. The domain of government revenue equation constitutes direct taxes on households, import tariffs on the commodities that enter the country, foreign aid or any other transfers to the government. As AVEs of NTMs are treated as tariff equivalents they therefore generate revenue for governments. Accordingly, the following equation constitutes the revenue from tariff equivalents. That is, equation 3.22 is the government revenue equation that sums up all the transactions into the modeling framework.

$$
\begin{aligned}
YG \quad = & \sum_{f} YH_{ht} * ty_{h} + EXR * tr_{Gov,Row} + \sum_{c \in CM} (tq_{c} * PQ_{c} * QD_{c}) + (PM_{c} * QM_{c}) \\
& + \sum_{c \epsilon CM} tm_{c} * EXR * pwm * QM_{c} + \sum_{c \epsilon CE} te_{c} * EXR * pwe_{c} * QE_{c} \\
& + \textstyle\sum_{c \epsilon CM} m_{c} * \; EXR * pwm_{c}
\end{aligned}
\qquad (3.22)
$$

where

$YG$ = government revenue

There are several other entries that can be included in the government revenue equation, for example activity tax. However, this study included only those entries that are part of the SAM.

### 3.9.6 Government Expenditure

Government expenditure is defined as the sum of total government spending and transfer payments, as shown in the equation 3.23.

$$EG \quad = \sum_c PQ_c \,.\, qg_c + \sum_h tr_{h,GOV} \tag{3.23}$$

where

$EG$ = government spending

$qg_c$ = government commodity demand

### 3.9.7 Real Gross Domestic Product (RGDP)

The RGDP equation comes last in institutional module equations. Equation 3.24 provides the framework for the calculation of RGDP.

$$RGDP \quad = \sum_c (\sum_h QH_{ch} + QG_c + QINV_c) + \sum_c QE_c - \sum_c QM_c \tag{3.24}$$

## 3.10 System Constraints Block

The final set of the equations in the model constitutes "equilibrium conditions" or "system constraints". In decision-making processes, the equilibrium must be satisfied without exogenous interference. The equilibrium in the competitive market is expressed as a set of prices at which excess demand/supply is zero. Therefore, market clearing is achieved in the economy through the price mechanism. The equilibrium and corresponding equations of all the relevant systems are presented in the following section.

### 3.10.1 Factor Markets Equilibrium

The sum of each primary input (labour and capital) employed across production sectors is equal to the quantity of supplied factors and is the necessary condition for equilibrium in factor market.

$$\sum_{a \in A} QF_{f\,a} = QFS_{\,f} \tag{3.25}$$

where

$QFS_{\,f}$ = quantity of supplied factors (exogenous variable)

### 3.10.2 Composite Commodity Market Equilibrium

The demand and supply equilibrium of composite commodities are given in equation 3.26. The demand side includes demand for intermediate goods, household consumption, firms' investment and government spending on final goods. The supply side is compiled from marketed output and imports.

$$QQ_c = \sum_{a \in A} QINT_{ca} + \sum_{h \in H} QH_{c\,h} + qg_c. + QINV_c \tag{3.26}$$

The variables qg and QINV are endogenous variables. They are fixed in the model where changes in stock are aggregated with fixed investment. In composite commodity markets, the import side of the variables for market-clearing are the quantity of imports supplied, and two interrelated domestic prices – prices of demand for and supply of the commodity produced and sold domestically.

### 3.10.3 Current-Account Balance

The current account balance represents the country earnings and spending balance. In the current-account balance, exchange rates are flexible as they act as an equilibrating variable in the current account balance, while foreign savings remain fixed.

$$\sum_{C \in CE} pwe_c . QE_c + \sum_i tr_{i,ROW} + \overline{FSAV} = \sum_{C \in CE} pwm_c . QM_c + irepat + yfrepat_{CAP} + yfrepat_{LLAB1} + yfrepat_{LLAB2} + yfrepat_{LLAB3} + yfrepat_{FLAB1} + yfrepat_{FLAB2} + yfrepat_{FLAB3} \quad (3.27)$$

where

$FSAV$ = foreign savings (FCU)(exogenous variable)

*yfrepat* = factor income to ROW

*LLAB1* = local skilled labour

*LLAB2* = local semi-skilled labour

*LLAB3* = local unskilled labour

*FLAB1* = foreign skilled labour

*FLAB2* = foreign semi-skilled labour

*FLAB3* = foreign unskilled labour

Equation 3.27 illustrates the fixed trade deficit. However, fixed exchange rates and flexible foreign savings may appear in cases of flexible trade deficits.

### 3.10.4 Savings-Investment Balance

The saving-investment balance is expressed in equation 3.28. This equation states there is equality of total saving and investment. Total savings constitute household savings, government savings and foreign savings. Foreign savings in this equation need to be changed into domestic currency. Additionally, total investment comprises of the sum of gross fixed capital formation and inventories.

$$\sum_{h} mps_h.\ (1 - ty_h) * YH_h + (YG - EG) + (EXR.\ \overline{FSAV}) = ygi + (EXR.irepat) + \sum_{c \in C} PQ_c\,.QINV_c + WALRAS_t \quad (3.28)$$

In the basic modeling framework, changes in the marginal propensity to save act as a market clearing variable, while keeping other variables fixed. Given these conditions, a balancing role is provided by the saving side of the equation. To make the model square we added WALRAS as an additional dummy variable, with a zero solution value. Following this adjustment, the model satisfies the Walras law. Finally, we added the objective function equation that equals to one.

OBJ=1 (3.29)

### 3.11 Model Closures

There are two factor-market closures to reflect the short and long cases.

#### 3.11.1 Short-Run Factor Market Closure

In macroeconomic theory, the term “short-run” or “long-run” does not inherently mean “time” (although in reality it is often linked to some form of time component) but rather refers to the mobility of the factor of production when there are changes in the economy. The term “short-run” refers to a situation where at least one of the factors of production can be varied when the economy changes. This study uses the specific factors model to explain the short run case. Capital is a specific factor and labour can be freely moved between sectors, so that unemployment does not occur.

The supply of factor ($QFS_f$) should be flexible while wages need to be fixed ($\overline{WFf}$) in order that the economy produces unemployment. Each activity is free to demand factors ($QF_{f\,a}$) at the given level of wages ($\overline{WF_f}$. $\overline{WFDIST}_{f\,a}$). The supply of factors ($QFS_f$) is flexible in order to achieve full employment.

In the case where factors specify the model, fixed factor demand($\overline{QF}_{fa}$) and wages ($\overline{WF}$) are used while the supply of factors ($QFS_f$) and wage distortions ($WFDIST_{fa}$) are flexible. To ensure the level of $\overline{QF}_{fa}$ is consistent with the condition of profit maximisation, $\overline{WF}_f$. $WFDIST_{fa}$ is allowed to fluctuate. In other words, the endogenous total supply of the factor simply records the level of total employment.

### 3.11.2 Long-Run Factor Market Closure

This study uses the H-O-S model to explain the long run case. Factors of production are fully mobile (both in overall value and between sectors). Thus, in the model $QF_{fa}$ and $WF_f$ are not fixed, while $OFS_f$ and $WFDIST_{fa}$ are fixed. $WF_f$ acts as an equilibrating variable that ensure an increase in $WF_f$ raises $WF_f.\overline{WFDIST}_{fa}$ is inversely related to $QF_{fa}$. This formulation ensures that all factors in the economy are freely mobile across all sectors.

## 3.12 Advantages and Disadvantages of the Basic CGE Model

CGE modeling has certain advantages over counterpart quantitative methods. These models have the potential to capture a much wider set of economic assessments. One of the particular advantages of CGE models is that they require detailed data for an economy for only one year, while other econometric models need time series data sets. This enhances the scope and range of CGE model utilization and makes it effective to use, where developing countries are concerned given their economic systems are more susceptible to drastic changes (Hosoe et al., 2010). Moreover, price changes in CGE models cause simultaneous reactions in other markets – a characteristic of all general equilibrium models. The CGE's formulation is based on two foundations of economics: the underlying principles of microeconomics[11] and the phenomenon of feedback[12]. Together they allow the CGE model to be used for long term analysis (Walz & Schleich, 2009). Additionally, these models can incorporate dozens of industries simultaneously, while in the case of other modeling techniques, very large data sets are

[11] The foundation of microeconomics comprises of three conditions: firms earn zero profits, balanced income of households and market clearing.

[12] Feedback process of economics is changes in quantity is due to the price changes.

required. Last but not the least, is the transparency and numerical solvability of CGE modeling which bridges the gap between planners, theorists and policy makers given its capacity to handle complex multi sector and regional issues.

Nevertheless, CGE models have some shortcomings. First, its estimation process or calibration is highly sensitive. It can give spurious results in the case of an economy with significant fluctuations. Secondly, only one year observations are used to estimate shift parameters in the CGE model. Thus, it can be theoretically inconsistent when a dynamic component of an economy such as savings and investment are also incorporated. The third disadvantage of the CGE model is that it cannot be used to capture economic reality. Consequently, in this study, the CGE model employs relative prices rather than absolute prices, and therefore does not incorporate financial/monetary aspects (Hosoe et al., 2010).

### 3.13 Input-Output (I-O) Tables

The I-O table is a set of data, which provides a static view of an economy. However, it does not serve the purpose of a model to analyse the working mechanism of an economy. The I-O table contains benchmark information for the formation of a credible model in the form of market resource allocation, which allows for the creation of a variety of general equilibrium models. Modern computerized economic techniques have improved the original I-O analysis as developed by Leontief (1936). I-O tables describe the flow of goods in the economy among various sectors, and also represent the value of economic transactions. They are further broken down into intermediate and final use for a given time period. I-O tables also provide detailed cost structures of production activities (Konovalchuk, 2006).

Table 3.1 shows the structure of a standard I-O table. This general structure can be used in the construction of any I-O table (Eurostat, 1986), which can be disaggregated into 10 different quadrants. Each quadrant possesses a distinguishable type of property. Generally, rows of the I-O table show the output of a particular sector, which is being consumed as an intermediate input by other sectors, while columns represent the inputs of a sector that are obtained from other sectors. When the column sum equals the row sum, the I-O table is balanced.

In the case of the Malaysian I-O table 2010, quadrant “A” is comprised of 124 sectors, of which 12 are agricultural, 4 belong to mining and quarrying, 76 belong to manufacturing and the remaining 32 constitute services. Similarly, quadrant “B” shows products from industries to final consumers and which is called "final demand" or "gross product consumed."The displayed column depicts the total spending on final goods and services. Correspondingly, quadrant “C” gives the total domestic production which is the sum of the production sector and final demand. Quadrants D, E and F show the imports of goods and services. Quadrant “G” shows the payments to factors of production and taxes. Quadrant “H” usually remains empty. The row summation of both G and H gives the quadrant “I”, which represents value-added information. Specifically, it captures the payment flows from each industry to their own primary factors, such as salary and wages for labour; indirect taxes; interest, dividends, and rents, capital (depreciation), profits and imports. Finally, the quadrant “J” provides information on inputs.

If the columns of quadrant J equal the rows of quadrant C, then total input will be the same as total output (Rutherford & Paltsev, 1999). This also implies that the I-O table is balanced. In terms of Table 3.1, the information relating to the 'H' matrix is available in the SAM, which facilitates the further explanation of the inter-linkages between all the accounts (Pyatt, 1988).

**Table 3.1: General Input-Output Table Structure**

| | | Intermediate consumption | Final Consumption | | | | Output |
|---|---|---|---|---|---|---|---|
| | | Production sectors | Private consumption | Government consumption | Investment | Exports | |
| | | n | | | | | |
| Domestic production | 1 | A | B | | | | C |
| | 2 | | | | | | |
| | i | | | | | | |
| | : | | | | | | |
| | n | | | | | | |
| Imports | 1 | D | E | | | | F |
| | 2 | | | | | | |
| | i | | | | | | |
| | : | | | | | | |
| | n | | | | | | |
| Value added | | G | H | | | | I |
| Labour | | | | | | | |
| Capital | | | | | | | |
| Indirect tax | | | | | | | |
| Input | | J | | | | | |

### 3.13.1 Advantages of the I-O Table

Advantages of I-O tables are explained below.

1. I-O tables are dependent on production technology.

2. They are based on computable quantities that are empirically workable and supportable.

3. The unique sectoral scheme with a matrix representation of an I-O table facilitates data collection and organization.

4. I-O tables apply Leontief multipliers to the potential impacts of a policy change, as well as a change in private-sector decision making (Richardson, 1985).

5. I-O tables are able to show the interaction from all inputs to production.

## 3.14 Social Accounting Matrix (SAM)

The SAM is an extension of the I-O table, thus, this section describes the construction of the 2010 SAM for the Malaysian economy. This SAM is used as the underlying data for the CGE model, which is described in the next section. Thus, it reflects sectors and institutions that are used in the CGE model.

A consolidated SAM is given to illustrate its main components, along with a description of the dataset used. The SAM offers a structural and empirical framework for the model. Thus, SAM is the starting point of any CGE model and is assembled before constructing the CGE model in order to determine the potential scope of the study and data availability. However, it is often revised according to the different issues, which arises during model construction. The SAM highlights basic accounting principles and ensures that the entire economic expenditure equals income to show that economy is at equilibrium. Furthermore, no agent can spend more than its corresponding earnings. Likewise, in an economy-wide model, the SAM defines all of the accounts that specify the circular flow of income on which core equations of the CGE model are determined.

A SAM captures the interaction between all agents in the economy and represents a system of socioeconomics within the micro and macroeconomic accounts (Pyatt & Round, 1985; Relnert & Roland-Holst, 1997). According to Lofgren et al. (2002), the SAM is constructed by using economy wide data that allows representation of the economy of a country. According to Round (2003), the SAM is a square matrix in which is recorded the receipts and payments for each account in a corresponding row and column of the matrix. It uses single year data to represent a static economy and identifies all monetary flows within a disaggregated national account. In other words, the SAM is used to represent a baseline economy in the CGE model, which describes all of the flows of payments and receipts.

The main data sets necessary to construct a standard SAM include I-O tables, a household expenditure survey, data relating to the government's budget, trade and balance of payments accounts and national accounts. However, the arranging of accounts in the SAM mostly depends on the researcher's objectives, preferences and tradition. Extensive literature on the SAM methodology and construction, and its linkages with disaggregated economy wide models also can be found in the works of Pyatt and Round (1985), and Relnert and Holst (1997).

The income circular flow of an economy best describes the data organization in the SAM (Richardson, 1985), which is shown in the Figure 3.8. It depicts all transactions and transfers between institutions and sectors. In the course of production, factors of productions – capital and labour – are hired from factor markets through rental/wages. To produce final goods and services, intermediate inputs derived from commodity markets are necessary. Typically, domestically produced commodities are supplemented by imported goods. The total volume of commodities is supplied to the agents in the economy's households, investment institutions, the government and foreigners in the goods market. Figure 3.8 depicts how, through a circular flow of economic activities, the income of an institution becomes the expenditure of another institution. Thus, the government and households in their purchase of commodities, transfer income to producers. In turn, producers use the income so derived to pursue further production activities. Overall, all expenditure and income flows labour – whether they are domestic or international transactions – do not produce overflows from the system.

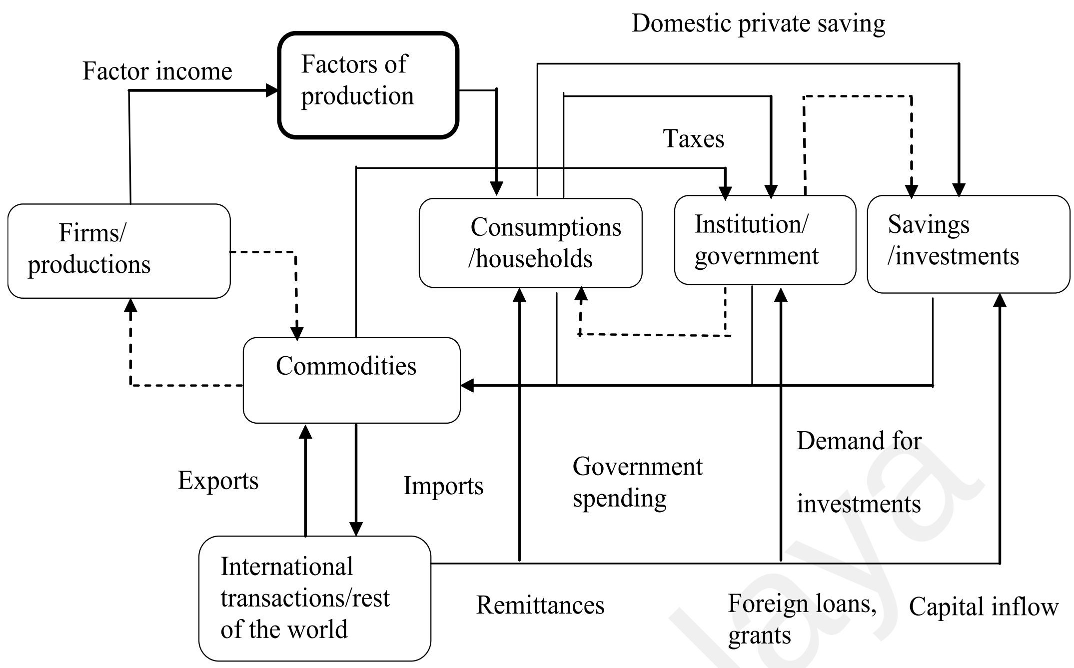


**Figure 3.8: Circular Flow Diagram of an Economy**

Table 3.2 shows an economy's SAM, which exhibits a circular income flow as depicted in Figure 3.8. All of the SAM's cells indicate a flow of money from a column to a row account. As an example, in the circular flow diagram, private consumption spending represents a flow of money from households into the goods markets. For all accounts, the total revenue is equal to total expenditure, for the SAM accommodates double-entry accounting systems. Thus, the total value of a row must be the same as the total value of columns for every account.

Table 3.2 shows the general components of the SAM, which are made up of activities and commodities. The production of commodities by firms represents economic activities, while goods and services produced by such activities are the commodities. That each activity can result in the production of more than one type of good (by-products) is illustrated by the SAM. Similarly, more than one activity can produce a similar type of commodity. For instance, large firms or small firms or both produce shoes. In the activity accounts, producer prices are used to calculate the monetary values. Activities employ factors of production (capital and labour) and intermediate inputs to produce commodities (goods and services). The generated value added is shown in the factors row, and the activity columns [Row 3-Column 1] as the factors of production receiving income (i.e., the rents, wages and profits) from activities during the production.

In the same way, activities pay the commodities for the demand for intermediate inputs [Row2-Column1]. To produce gross output, the accumulation of value-added and the demand for intermediate inputs are needed. Goods and services are either produced and supplied from domestic sources [Row 1-Column 2] or imported [Row 7-Column 2]. In the case of commodities produced domestically, indirect sales tax is paid while for imported commodities, the government is paid through import tariffs and tariff equivalents.

As mentioned, in the production process, the purchase of commodities become intermediate inputs [Row 2-Column 1]. A commodity's final demand is made up of households' expenditure for that commodity [Row 2-Column 4], the expenditure of government (recurrent) [Row 2-Column 5], investment or gross capital formation [Row 2-Column 6], and the demand through exports for the commodity [Row 2-Column 7]. While Table 3.2 includes only single commodity and activity rows and columns, a SAM is usually made up of a number of commodities and activities. For instance, this study disaggregates the SAM into 15 different activities and commodities according to the study's objectives.

Households supply factors of production in exchange for factor incomes in the production process [Row 4-Column 3]. Transfer payments (TP) from the government (for instance, pensions and social security) [Row 4-Column 5] and the ROW – including remittances from foreign workers – are received by households [Row 4-Column 7]. On the payments side, households are subject to government direct and indirect taxes [Row 5-Column 4], and they also engage in the purchase of commodities which they consume [Row 2-Column 4]. Any surplus income will be saved (or dissaved if expenditure is greater than income) [Row 6-Column 4]. The national accounts and household income and expenditure survey carried out by the Department of Statistics (DOS) are needed for household accounts in the SAM.

From the ROW, TPs received by government are made up of foreign grants and development assistance [Row 5-Column 7]. The total of taxes and TPs from the ROW makes up government revenues. An examination of expenditures shows that it is made up of government payments for recurrent consumption expenditure [Row 2-Column 5] and transfer payments received by households [Row 4-Column 5]. The overall fiscal surplus (or deficit) is shown in [Row 6-Column 5]. This information can be sourced from a country's Ministry of Finance.

From the definition of an economic equilibrium, investment or gross capital formation (which includes any change in inventories or stocks) is necessarily equal to total savings. The gap between investment and domestic savings represents total external capital inflow and is referred to as the current account balance or capital transfer [Row 6-Column 7]. Data for the current account are from balance of payments statistics. This set of data can be obtained from the central bank.

**Table 3.2: Fundamentals of a Standard SAM**

| Receipts | | Expenditures | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Institutions | | | | |
| | | **Activities** | **Commodities** | **Factors** | **Households** | **Government** | **Savings and investment** | **Rest of the world** | |
| **Activities** | | | Domestic supply | | | | | | **Activity income** |
| **Commodities** | | Intermediate demand | | | Private consumption | Government consumption | Investment | Exports | **Total demand** |
| **Factors** | | Value-added (wages/rent) | | | | | | Factor income from abroad | **Total factor income/GDP at factor cost** |
| **Institutions** | **Households** | | | Factors Income | | Transfer payment | | Foreign transfers | **Household income** |
| | **Government** | | Indirect taxes (tariff/Tariff equivalent/ sales taxes) | | Direct taxes | | | Foreign borrowing | **Government income** |
| | **Savings and investment** | | | | Private savings | Fiscal surplus | | Capital transfer | **Total savings** |
| | **Rest of the world** | | Import | Factor payment to abroad | | | | | **Foreign exchange outflow** |
| | **Total** | **Production at factor costs** | **Domestic Supply** | **Total factor income** | **Households expenditure** | **Government expenditure** | **Total investment** | **Foreign exchange inflow** | |

## 3.15 The Social Accounting Matrix (SAM) of Malaysia 2010

This section illustrates the data sources used to construct SAM of Malaysia 2010. This section also deals with the reconciliation and balancing of the SAM.

### 3.15.1 Data Sources

The SAM is a principle database for CGE modelling, as all economic agents in the economy can be specified in the SAM system. Generally, the essential data sources of the SAM are based on a standard I-O table. This study is utilised the I-O table for the year 2010 published by the DOS Malaysia in 2015.

Typically, SAMs requires additional data depending on the objectives of a study, such as total household income (by income category), total factor payments, institutional income distribution, total government expenditures and receipts (including intergovernmental transactions) and transfer payments (both to production sectors and to households). Specifically, the secondary data employed to build the SAM for 2010 are national account statistics and balance of payments for 2010, published by the DOS Malaysia, government expenditures and revenues data for the years 1990 to 2010, published by the Ministry of Finance, and the industrial manufacturing survey and labor force survey for the year 2010, published by the DOS Malaysia.A set of unpublished disaggregated labour data (employment and wages) by occupation for the years 2000 to 2014 is also collected from the DOS Malaysia. This data do not take into account illegal foreign workers who are without registration or documentation. Only labour data for the year 2010 are used to construct the SAM.

Furthermore, NTMs data are obtained from the UNCTAD Trade Analysis and Information System database (TRAINS). The HS 6-digit processed food product codes are obtained and aggregated in accordance with the processed food sub-sectors set out in the SAM. This study employs a dataset of AVE of NTMs developed by Kee et al. (2008, 2009). They provide estimates of the AVEs of NTMs for nearly 5000 products in 104 countries. A quantity-based approach, combined with import demand elasticity to estimate AVEs, is used. To obtain the AVE values, a gravity model is used to estimate non-linear least squares. This estimation allows an analysis of NTMs impact on each country's imports. The NTMs include both technical and non-technical measures. The dataset consists of the AVE of NTMs, which is specified at the tariff line based on HS 6-digit food product codes. Only those products in the concordance table (see Appendix D) are selected to obtain the AVE of NTMs for the benchmark dataset. [13]

All above data sets are formalized in a consistent framework following standard expenditures and saving patterns. The main reason for selecting the 2010 as base year to construct the SAM is that it is the published Malaysian I-O table and other supplementary data are available for 2010.

Typically, the SAM is constructed based on an I-O table and other sources. The original I-O table for 2010 consists of 124 sectors. Among these 12 sectors are, agriculture, 4 belong to mining and quarrying, 76 to manufacturing and the remaining 32 to the services sector. However, all sectors were further aggregated into 15 sectors in order to meet the research objectives, and to ensure activities classification was consistent. The final classification also helps interpretation of the results. This higher

[13] See Appendix C for AVEs of NTMs.

level of aggregation is based on the research objectives, which specifically focus on the food sub-sectors. Thus, the model in this study consists of 15 sectors, 3 institutional agents, 2 primary factors of production, and the ROW. All the food sub-sectors are maintained in the original form as per the I-O table in order to measure the impact of food sector NTMs on trade, the labour market, as well as welfare. The following Table 3.3 shows the sectors included in this study.

**Table 3.3: Sector Aggregation**

| Sectors | Sectors from IO 2010 |
|---|---|
| SEC1- Agricultural | 1-12 |
| SEC2-Mining and quarrying | 13-16 |
| SEC3-Meat and meat production | 17 |
| SEC4-Preservation of seafood | 18 |
| SEC5-Preservation of fruits and vegetables | 19 |
| SEC6-Dairy production | 20 |
| SEC7-Oils and fats | 21 |
| SEC8-Grains mills | 22 |
| SEC9-Bakery products | 23 |
| SEC10-Confectionery | 24 |
| SEC11-Other food processing | 25 |
| SEC12-Animal feeds | 26 |
| SEC13-Beverage | 27-28 |
| SEC14-Other manufacturing | 29-92 |
| SEC15-Services | 93-124 |

Source: Author’s aggregation

The Malaysian SAM for this study has 15 commodity/activity accounts. The activity account is valued at the prices of the producer. The commodity account is valued at market price. This study assumes only two types of factors of production: labour and capital. Labour has been divided into skilled, semi-skilled and unskilled. This study assumes that skilled labour represents those who work as managerial and professionals. Technicians, associate professionals, supervisory, clerical workers and other related occupations are classified as semi-skilled workers and production workers are represented as low-skilled labour. This assumption allows the data of the industrial manufacturing survey to match the labour force survey published by the DOS Malaysia. Furthermore, local and foreign labour are take into account in this study.

### 3.15.2 Reconciliation and Balancing of the SAM

Once a highly aggregated SAM has been developed, the next step is to balance all the entries of the micro-SAM which are accounted for by the expenditures and receipts accounts that accounts – that involves equating the total value of columns by rows respectively. As stated earlier, a SAM is built through a combination of fundamental economic ideas, the input-output framework and the national accounting framework. Therefore, it contains inconsistencies. The I-O framework captures the purchase of one industry's intermediate input as the sale of another industry's output.

In a national accounting framework, the SAM is a way of setting out an accounting framework in which the matrix's rows and columns shows inflows (i.e. receipts) and outlays (i.e. expenditures). For all accounts, total receipts (in the rows) and total expenditures (in the columns) balances following the principles of double-entry book keeping. The transactions between accounts are shown in the cells. In order to get a macro balance, each of these accounts must be balanced. The balance here means the total columns side equal to the total rows side. In other words, the outlays are equal to receipts.

This study adopts the Cross-Entropy (CE) approach for balancing the SAM. This approach applies Shannon's (1949) theory, which is deployed in economics by Theil (1967). The CE approach employs all available data, which includes past parameter estimates and supports estimation even in a "data sparse" environment. The estimation process is designed to minimise the gap between the new and the previous estimated probabilities (the Kullback-Leibler (1951) CE measures). In other words, this process is used to minimise the new set of data brought into $X^1$ relatively to the prior set $X^0$.

This can be written in term of probabilities as:

$$\min H = \sum_i \sum_i t_{ij}^1 \, ln \frac{t_{ij}^1}{t_{ij}^0} = \sum_i \sum_j t_{ij}^1 - \sum_i \sum_j t_{ij}^1 \, ln t_{ij}^0 \tag{3.30}$$

Subject to:

$$\sum_j t_{ij}^1 X_j = X_i \tag{3.31}$$

$$\sum_j t_{ij}^1 = 1 \tag{3.32}$$

Once the problem has been solved, $t_{ij}^1$ is a new value of cell ij and $0 \leq t_{ij}^1 \leq 1$.

The CE approach is commonly used for balancing a SAM as it is efficient when minimum information is available. The CE approach has an added advantage of minor manual adjustment, which makes it user-friendly (Löfgren et al., 2001). This approach is also able to provide a more accurate estimate or update as it is able to pick up the changes in the flows across the matrix by incorporating more data. A highly aggregated and balanced SAM for Malaysia is built following the above mentioned procedure and which is presented in Appendix E.

### 3.16 SAM Market Closure

The standard SAM must satisfy three conditions of market closure where the CGE model is concerned.

#### 3.16.1 Market Clearance Condition

The market clearance conditions involve commodity market balance and factor market balance**.**

1. *Commodity market balance* can be represented by the quantity of each commodity $X_i$, produced by producer *I,* being equal to the volume of commodities demanded by producer $j$ in $n$ industries. Thus, producer $j$ in $n$ industries creates a demand $X_i$ for intermediate inputs ($Z_{ij}$) from producer *I,* which are used to produce outputs to meet final demand, $F_j$.

$$X_i = \sum_{i=1}^{n} \sum_{j=1}^{n} Z_{ij} + \sum_{j=1}^{n} F_j \qquad (3.33)$$

2 *Factor Market Balance* occurs when all industries are fully employed by factor of endowment that are available in the market. That is, the demand for primary factor inputs utilised by producers, equals the factor endowment supply by the representatives agent,:

$$V_i = \sum_{j=1}^{n} V_j \tag{3.34}$$

### 3.16.2 Normal Profit Conditions

The second condition is normal profit. In this case it is assumed that all industries have zero profit. Thus, total revenue (price multiplied by output quantity) generated by producers equals total costs, which are a product of the use of intermediate inputs and primary factors. This equates to the value added from production. Consequently, if price of output, *P,* is multiplied by the quantity of output, $X_i$, the value of total revenue is obtained. Total cost is represented by multiplying the price of intermediate input, $P_i$ by quantity of intermediate input and adding the value-added cost $W_f$.

Rental and profit are equivalent to labour's average wage and total revenue is identical to the price, $P_i$, multiplied by output $X_i$.

*Total revenue=total cost*

*Total revenue = cost intermediate inputs + value-added cost*

*Total revenue* $(P_iX_i) = \sum_{j=1,i=1}^{n} P_i . Z_{ij} + \sum_{j=1}^{n} W_f . V_j$ (3.35)

### 3.16.3 Factor Market Balance

For the factor market to be balanced, the supply of primary factors received factor income (*m*) must equal total payments of value added ($V_j$) that employ primary factors. This factor income (*m*) also must equal the factor's total final demand, $F_j$.

$$m = \sum_{j=1}^{n} V_j \; = \sum_{j=1}^{n} F_j \tag{3.36}$$

These are the three basic macro balances that are used to achieve the general equilibrium condition.

### 3.17 Calibrating the CGE Model

In applied general equilibrium models, calibration is a process to re-generate base year data as a model solution. However, if data are insufficient, the main model parameters must be augmented from the literature in the process of calibration. In practice, due to models applying the CES/CET function extensively, the key model parameters are considered to have identical elasticities. Calibration technique estimates the related coefficient parameters from benchmark data in order to standardize the parameter used in the calibration technique. Demand and cost functions are derived from the Stone-Geary Cobb-Douglas and CES (single stage or nested) production functions, which are used to express consumers' and producers' behaviour. In some cases, a more complex variant such as the Leontief function also can be considered. However, they demand more execution time for equilibrium calculations. In such cases, the standard SAM procedure requires further parameter values in order to use the CGE model for estimation and simulation. An evaluation of an equation's parameters is needed once operators are identified, and through the use of algebraic equations, their optimization behavior is identified. In doing so, exogenous and endogenous variable data for a particular point of time are used. For the development of a CGE model, two types of parameter estimates have been used. The first is the econometric approach introduced by Berndt and Christensen (1973) to generate base year equilibrium observation. The second calibration approach was developed by Jorgenson and Wilcoxen (1991).

As noted, benchmark (base year) data sets represent the economy's equilibrium, and therefore the parameter values are solved from this equilibrium data. Shoven (1992) systematically compiled a SAM, which represented the base year dataset. The results approximate base year data when the parameters are estimated correctly. If the results are not close to the base year data, the model needs to be modified until it can reproduce the base-year observation. However, the calibration approach has been criticized for the following reasons: (i) the parameters estimated are deterministic, and therefore, the realism of the coefficients is not established; (ii) the estimation of the parameter is a function of the benchmark year selected. The model has to be modified if the results are not close to base year data. In case there is an error in parameter estimations the results using the initial data will not match that of the base year equilibrium data. Therefore, it is necessary to modify the model until it can replicate base year observations. Despite the issues associated with the calibration approach, it remains the first choice for many researchers (Sánchez & Vos, 2007). This is because, firstly, in the case of scarce data (especially in developing countries), the simultaneous stochastic estimation of all these parameters would be unrealistic. Therefore, calibration is needed to avoid severe restrictions (Gunning & Keyzer, 1995). Secondly, the calibration method is fruitful because of the small data set needed for parameter estimation. Finally, CGE modeling is more applicable to LDCs, and therefore widely used due to the non-feasibility of full-fledged econometric estimations. The model and equation are set out in the general algebraic modeling system (GAMS) language which is used to solve parameters. The GAMS is a software specifically designed to solve linear, nonlinear, and mixed-integer problems. It is also used to make the process of constructing economy-wide complex mathematical models easier. The main advantage of GAMS is that it allows modelers to use an almost standard notation (Al Amin et al., 2008).

The objective of this study is to analyse the impact of NTMs change in the short-and long-run. Therefore, a neoclassical comparative static model is preferred over a dynamic CGE model, which requires identification of the length of adjustment period. The benefit of using a comparative-static model is that it requires benchmark year data only. On the other hand, a dynamic CGE requires more information - for example data on changes in exogenous variables are required.

## 3.18 Measurement of Wage Inequality

This study adopts a wage inequality ratio to determine wage inequality in the food sector and the economy as a whole.

$$wage\ inequality\ ratio = \frac{average\ wage\ of\ skilled\ labour}{average\ wage\ of\ unskilled\ labour} \quad (3.37)$$

## 3.19 Welfare Measurement

In the model, the prices of all commodities are fixed at unity. Therefore, the Hicksian equivalent variation (EV) measures a welfare change as a result of a change in the total utility.

$$EV_h = \frac{U_h^1 - U_h^0}{U_h^0} . I_h \quad (3.38)$$

where

$EV_h$ = the Hicksian equivalent variation

$U_h$ = the utility level for household

$I_h$ = the income level for household

Following Xie (1995), the utility function is also added to investigate the welfare level of households in the model. The utility function measures the welfare of consumers as a function of consumption.

$$Utility_h = \sum_i hhcles_{i,h} . \log (THCON_h) \tag{3.39}$$

where

$Utility_h$ = utility function for households

$THCON_h$ = total household consumption

$hhcless_{i,h}$ = household consumption shares

### 3.20 Measurement of Intra-Industry Trade

Grubel-Lloyd (GL) (1975) developed a method for determining the extent of intra-industry trade (IIT). This method is known as the GL index. It is calculated as:

$$GL = 1 - \frac{|X_i - M_i|}{(X_i + M_i)} \tag{3.40}$$

where Xi and Mi refer to a country's exports and imports of industry *i*, during a time period of usually one year. The GL index is a standard indicator for measuring the share of IIT. This is calculated from the share of IIT in total trade due to product differentiation with scale economies. The GL index ranges between zero (pure *inter*-industry trade) and one (pure IIT).

## 3.21 Frequency Index

The frequency index illustrates the percentage of import transactions covered by NTMs for an exporting country. The formula is:

$$F_{jt} = \left[\frac{\sum(D_{it} \cdot M_{it}}{(\sum M_{it})}\right] \cdot 100 \qquad (3.41)$$

where $D_i$ is the presence of an NTM at the tariff line item, Mi is imports from the exporting country *j* of good *i* (also a dummy variable) and *t* is the year of measurement of the NTM.

## 3.22 Summary

The first section of the chapter justified the used of the CGE model in this study. This is followed by a discussion on the general equilibrium theory and conceptual framework of the study.

The CGE mathematical model specification and parameter development are discussed in the second section. This section also presents the NTMs parameters as a form of AVEs in the equations. The third section covers the data dimensions of the study. It explains the formulation of SAM, which is comprised of benchmark databases. It also explains the SAM balancing procedures, SAM market closure conditions and calibration of the CGE model. The methodology used to quantify NTMs, measurement of wage inequality, welfare, the GL index, the frequency index and simulation scenario development are discussed in the final section.

# CHAPTER 4: FOOD PROCESSING SECTOR AND LABOUR MARKET IN MALAYSIA

## 4.1 Introduction

This chapter profiles the food processing industry and labour market in Malaysia and is divided into three sections. The first section provides an overview of the food processing sector, the government policies employed to help the growth of this sector and details the trade patterns. As well, the regulations in the form of NTMs are discussed. The second section deals with the labour market in Malaysia, in particular wage and employment trends. The third section analyses the link between import flows and the labour market in the food sector.

## 4.2 Food Processing Sector in Malaysia

This section provides an overview of the Malaysian food processing sector. This section also deals with the government policies, trade patterns and the regulations of NTMs in this sector.

### 4.2.1 Overview

Generally, changes in the world economy will not significantly impact the food sector. Changes to food markets is more usually driven by changes in consumer tastes, technology, food policies and the business environment. In recent times, the food processing sector has become increasingly important involving the transformation and processing of agricultural products and livestock into products for intermediate or final demand. Thus, the food processing sector now plays an increasingly important role in building a bridge between industry and agriculture.

The food processing sector forms a significant part of the overall industrial sector of the Malaysian economy. There are 11 sub-sectors identified, which include meat, seafood, vegetables and fruits, dairy products, oils and fats, grains mills, bakery products, confectionery, other food processing, animal feeds and beverages. Overall the contribution of the food processing sector to domestic manufacturing output was 7 per cent in 2003, rising to 13 per cent in 2016 (DOS, 2014, 2017). This sector also contributes to growing employment opportunities, value added to primary agricultural products and foreign exchange saving.

The food processing sector in Malaysia is dominated by SMEs - more than 80 per cent SMEs and are largely labour-intensive. The problems facing SMEs are low levels of production technology and capitalisation, ineffective management, difficulty in access to credit, marketing, supply of raw materials as well as labour (Malaysian Investment Development Authority [MIDA], 2018). Furthermore, this sector is also populated by MNCs including Nestle Berhad, Heineken Malaysia Berhad and Campbell Malaysia. They are involved in sectors such as fishery products, grain mills products, processed fruits and vegetables, food ingredients, confectionery, herbs and spices, beverages and others (MIDA, 2018).

Several government policies were developed to support the growth of the food manufacturing sector. Those policies are presented in Table 4.1 and include the National Agricultural Policy (NAP) and National Agro-Food Policy, which are focused on promoting the growth of the agricultural sector and agro-based industry. The First Industrial Master Plan (IMP1) focused on the development of this sector as this sector has a strong connection with other sectors, such as agricultural and services sectors

(MIDA, 2018). This sector also provides investment opportunities given food is a basic necessity. These opportunities have led the government to acknowledge that this sector is one of the most important sectors through which to promote and develop the economy.

During the period IMP2, the contribution of the food processing sector to total manufacturing output increased from 6.1 per cent in 1996 to 9.9 per cent in 2005. During the IMP3 period, the food processing sector (including halal foods) was one of the most important sectors being promoted. The growth of this sector is making Malaysia a regional food production and distribution center.

The government offers many ways to increase the growth of total factor productivity (TPF) in order to enhance the competitiveness of this sector. They include upgrading technology and human resources, engaging in research and development (R&D), and implementing food quality standards. For the period of IMP3, the government's target was an annual investment of RM24.6 billion or RM1.6 billion per annum in this sector. The government also projected exports of this sector to increase by an average annual rate of 7.8 per cent to reach RM24.2 billion by 2020.

In the $11^{th}$ Malaysia Plan, the government focused on the agro-food sub-sector to ensure the targeted self-sufficiency level of food commodities were met by 2020. These targets included a self-sufficiency level for rice of 100 per cent, vegetables 95.1 per cent and beef 50 per cent. This sector will therefore be given support in the form of greater R&D in order to increase its productivity. Therefore, the output of the agriculture sector is projected to increase by 3.5 per cent per year. Thus, the focus on the food processing sector during IMP3 became an important part of promoting the agro-based industry (Ministry of International Trade and Industry [MITI], 2006).

The goal of the government is to make Malaysia a recognized international centre for all processed foods as well as halal food. To help achieve this goal, the Malaysian government offers various types of assistance, such as training, technical services, financial assistance, facilities to industry and consultancy services. To realise this goal, not only should the government continue to provide the necessary support but also assistance from private sector is also essential (MITI, 2018).

**Table 4.1: Malaysian Government Food Sector Policies**

| Policy | Period | Objectives |
|---|---|---|
| NAP 1 | 1984-1991 | Develop agricultural sector to be an export-oriented. |
| NAP 2 | 1992-2010 | a. Increase productivity, efficiency and competitiveness.<br>b. Develop an agro-based industry. |
| NAP 3 | 1998-2010 | a. Increase the competitiveness of the agricultural sector.<br>b. Maximize income.<br>c. Deepen linkages with other sectors.<br>c. Further develop the agro-food sub-sector and agro-based industries.<br>d. Enhance food security. |
| National Agro-Food Policy | 2011-2020 | Expand food production to ensure food supplies are sufficient, are of better quality, edible, safe and nutritious and are affordable. |
| IMP 1 | 1986-1995 | Give top priority for industrial development given its strong linkage with other sectors. |
| IMP 2 | 1996-2005 | Build a manufacturing “plus plus” economy to help propel Malaysia to realize Vision 2020. |
| IMP 3 | 2006-2020 | Expand and diversify the sector to become a regional food production and distribution hub, with particular emphasis on halal foods. |

Sources: Compiled from Ministry of International Trade and Industry, Ministry of Agricultural Malaysia and Ministry of Agricultural and Agro-based Industry.

Malaysia has enjoyed a steady increased in its living standard and its purchasing power (per capita income exceeded USD10,020 in 2016). The demand for health and convenience foods has increased along with the changes in lifestyle. Therefore, the key growth areas of this sector are health food, functional food, food ingredients, convenience food and halal food. This sector is regulated by the Food Act 1983, which was designed to ensure the safety of foods provided to the market.

### 4.2.2 Trade Patterns in Food Processing

The contribution of the food processing sector is around 13 per cent of manufacturing output in Malaysia in 2016. Malaysian exports processed foods to more than 200 countries, which was valued at USD 7.3 billion in 2003 and increased to USD 13.3 billion in 2016 (Table 4.2) – an 83 per cent rise. Although exports from this sector have increased rapidly, most of the sub-sectors are still import intensive. For instance, Malaysia is a net importer of some processed food products. It can be seen from Table 4.2, Malaysia is a net importer of meat, grains mills, dairy products, vegetables and fruits, animal feeds and a net exporter of bakery products, other food processed, confectionery, beverages and oils and fats.

Malaysia is a net importer of meat products although it is a net exporter of poultry meat. Poultry meat is a major intermediate input used for further processing. It constitutes 60 per cent of the meat processing sector (MIDA, 2018). This is because Malaysia imports about 80 per cent of its beef and mutton from other countries. The major import sources were India, Australia, Republic of China, New Zealand and Thailand (UN Comtrade, 2016).

Malaysia's dairy production sector is highly import-oriented as the supply of dairy product is insufficient to meet the local demand. The dairy products produced are ice cream, sweetened condensed milk, milk powder, yoghurt and other fermented milk products. It can be seen from Table 4.2, this sector generated a trade deficit of USD 220 million in 2003. Malaysia's increasing dependency on imports of dairy products has generated increasingly large trade deficits, which amounted to USD 326 million in 2016. The major import sources were New Zealand, the US, Australia, France and Germany (UN Comtrade, 2016). In the past, manufacturing of seafood was an export oriented sector with a trade surplus of USD 129 million in 2003. But this decreased to USD 89 million in 2006. Due to the continued high demand for seafood products, Malaysia has became a net importer for manufactured seafood, creating a trade deficit of USD 1 million in 2009 and USD 93 million in 2016. Most seafood imports have come from the Republic of China, Indonesia, Thailand, Vietnam and India (UN Comtrade, 2016).

Malaysia depended on the imports of fruits and vegetables over the period cover by this study, with the net imports amounting USD 8 million in 2003 and subsequently increasing to USD 148 million in 2016. Fruits and vegetables are being processed into juice, jam, pickles, sauces, canning of fruits and vegetables. This sector is able to encourage investors as it is seen to have major opportunities for exports and import substitution. The key countries from which Malaysia imported fruits and vegetables were the Republic of China, US, Thailand, India and South Africa. The major export destinations were Singapore, China, Thailand, Hong Kong and Indonesia (UN Comtrade, 2016).

Manufacture of confectionery includes the production of chocolate, cocoa, cane or beet sugar and sugar confectionery. This sector is export oriented due to the fact that Malaysia is the 8$^{th}$ largest cocoa producer in the world, and the largest cocoa producer in Asia. The net export of this sector was USD 115 million in 2003 but decreased to USD 33 million in 2016. Major import partners were Brazil, Thailand, Australia, India and Republic of China and main export destinations were Singapore, Republic of Korea, Hong Kong, Indonesia and Australia in 2016 (UN Comtrade, 2016).

The manufactures of bakery products, beverages and other food processing are well established in Malaysia. Although most of raw materials are imported, Malaysia is a net exporter of bakery products, beverages and other processed food with a net export of USD 390 million, USD 69 million, and USD 137 million respectively in 2016. Bakery products include bread, pre-mixes, snack foods, biscuits, frozen cakes vegetarian food and frozen pastries. The manufacture of other food processing includes inter alia noodles, macaroni, similar farinaceous products and couscous.

Malaysia is not only the world's largest exporter of palm oil but also the second world's largest producer. Thus, this makes Malaysia a net exporter of oils and fats. This sector includes manufacture of crude palm oil, crude palm kernel oils, refined palm oils, crude and refined vegetable oils, coconut oils, compound cooking fats and animal oils and fats. Exports of oils and fats increased by 59.75 per cent between 2003 and 2016. Major export markets for oils and fats are India, People's Republic of China, Netherlands, the US and Pakistan (UN Comtrade, 2016).

Table 4.2 shows that a positive growth of exports of processed food over the period of the study. It indicates that Malaysia's food products have been increasingly accepted in the international market. The government has implemented a number of policies to promote the growth of this sector and adapt advanced technology in processing. This effort has widened the usage of local raw materials, increased the range of processed foods and also increased investment in the food industry. Such efforts have made Malaysia's exporters of processed food more competitive in international markets.

**Table 4.2: Trade Flows of Processed Food in Malaysia, 2003-2016 (USD million)**

| Sector | 2003 | | 2006 | | 2009 | | 2012 | | 2014 | | 2016 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Imports | Exports | Imports | Exports | Imports | Exports | Imports | Exports | Imports | Exports | Imports | Exports |
| **Meat &meat production** | 207 | 35 | 238 | 22 | 357 | 55 | 547 | 83 | 669 | 96 | 608 | 106 |
| **Preservation of seafood** | 195 | 324 | 348 | 437 | 391 | 390 | 584 | 522 | 429 | 263 | 516 | 423 |
| **Preservation of vegetables & fruits** | 64 | 56 | 82 | 60 | 150 | 84 | 232 | 129 | 249 | 112 | 336 | 188 |
| **Oils &fats** | 427 | 5678 | 793 | 6028 | 1462 | 9685 | 2669 | 14835 | 1581 | 11671 | 1275 | 9071 |
| **Dairy products** | 298 | 78 | 403 | 114 | 361 | 134 | 669 | 232 | 895 | 297 | 539 | 213 |
| **Grain mills** | 217 | 71 | 375 | 82 | 670 | 90 | 849 | 128 | 706 | 167 | 573 | 173 |
| **Animal feed** | 104 | 31 | 121 | 43 | 159 | 40 | 220 | 105 | 218 | 86 | 198 | 99 |
| **Bakery products** | 17 | 114 | 20 | 167 | 32 | 242 | 60 | 336 | 74 | 390 | 80 | 470 |
| **Confectionery** | 281 | 396 | 412 | 576 | 599 | 805 | 1039 | 985 | 1052 | 1014 | 903 | 936 |
| **Other food processing** | 298 | 314 | 464 | 413 | 617 | 715 | 1051 | 1300 | 1144 | 1526 | 906 | 1043 |
| **Beverages** | 113 | 154 | 167 | 245 | 255 | 334 | 529 | 525 | 533 | 630 | 513 | 582 |
| **Total** | 2221 | 7252 | 3422 | 8187 | 5054 | 12575 | 8450 | 19179 | 7550 | 16254 | 6447 | 13304 |

Notes: 1. Exports and imports values are deflated by the US consumer price index (CPI) at base year 2000.
2. Exports and imports are calculated at the HS 6-digit prior to aggregation.
Source: Calculated from UN Comtrade.

Given that Malaysia's food processing sector is engaged in two-way trade flows, it is important to find out the extent of trade overlap. Based on the aggregate Grubel-Lloyd (AGL) index (Grubel & Lloyd, 1975), the trade overlap with the ROW is presented in Table 4.3.

**Table 4.3: AGL Indices for Trade in Food Sub-Sectors, 2003-2016**

| Product Category | 2003 | 2006 | 2009 | 2012 | 2014 | 2016 |
|---|---|---|---|---|---|---|
| **Meat & meat production** | 0.08 | 0.05 | 0.10 | 0.08 | 0.09 | 0.10 |
| **Preservation of seafood** | 0.38 | 0.50 | 0.55 | 0.60 | 0.61 | 0.55 |
| **Preservation of fruits & vegetables** | 0.39 | 0.41 | 0.43 | 0.40 | 0.42 | 0.41 |
| **Oils & fat** | 0.08 | 0.13 | 0.15 | 0.22 | 0.12 | 0.13 |
| **Dairy product** | 0.40 | 0.43 | 0.44 | 0.30 | 0.35 | 0.41 |
| **Grains mills** | 0.26 | 0.22 | 0.21 | 0.24 | 0.29 | 0.32 |
| **Animal feed** | 0.46 | 0.53 | 0.41 | 0.65 | 0.57 | 0.67 |
| **Bakery products** | 0.26 | 0.21 | 0.23 | 0.30 | 0.32 | 0.29 |
| **Confectionery** | 0.16 | 0.13 | 0.14 | 0.28 | 0.32 | 0.31 |
| **Other processed food** | 0.75 | 0.68 | 0.71 | 0.72 | 0.80 | 0.76 |
| **Beverages** | 0.54 | 0.62 | 0.69 | 0.61 | 0.63 | 0.68 |
| **Total** | **0.34** | **0.36** | **0.37** | **0.40** | **0.38** | **0.39** |

Note: The AGL index is calculated at the HS6-digit level prior to aggregation.
Source: Calculated from the UN Comtrade.

Table 4.3 shows that IIT is not important for the food processing sector as the AGL indices are below 50 per cent over the period of the study. Differences in gross GDP and GDP per capita between trading partners gives lower IIT. Furthermore, distance between trading partners is also one of the contributors to the low IIT. Of the 11 food sub-sectors, only four – other processed food, beverages, animal feed and seafood – have a higher share of IIT over the period covered by the study. The high share of IIT can indicate that these sectors achieved economies of scale and also wider consumer choices. However, the AGL indices for the remaining food sub-sectors are below 50 per cent over the period covered by the study. This indicates that IIT is not as important for these sectors. This is due to fact that Malaysia usually imports these products as raw materials for further processing (MIDA, 2018).

### 4.2.3 NTMs in the Food Processing Sector

In Malaysia, the food sector is highly regulated by the Food Regulations 1985 and of the Food Act 1983. The Food Act 1983 applies a range of standards on products, production, processing, labelling and distribution. Standards are compulsory for all local produced or imported food, beverage, and edible agricultural products in order to meet the guidelines set out in the Food Regulations 1985. Malaysia's food processing industry is subject to several types of NTMs. Most of the NTMs' regulations are found in the area of manufacture of food and are issued by Ministry of Health under the Food Regulation 1985 of the Food Act 1983 (ERIA-UNCTAD, 2017). Malaysia has 713 NTMs, which affect around 54 percent of the total tariff lines (ERIA-UNCTAD 2017). Import measures contribute about 90 per cent (641 import measures), while export NTMs cover 10 per cent (70 export measures) of the total recorded NTMs. NTMs can have impacts on trade and either affect quantities traded or their price, or a combination of both. Prices of imports or exports can become more expensive as a result of the increase in compliance costs or transaction costs (New Zealand Institute of Economic Research [NZIER], 2016).

Malaysia's import measures are mostly technical. A total of 407 out of 641 import measures are found in the food processing sector. Within import measures, technical measures – which consist of SPS, TBT and pre-shipment inspections and other formalities (PSI) – predominate, accounting for 98 percent of total import measures, while non-technical measures comprise the remaining 2 per cent. Of the technical measures, 206 are in the form of TBTs and 191 are SPS. Only 2 measures are pre-shipment inspection (Table 4.4). Technically, SPS measures aim to protect the health of human, animals and plants, while TBTs ensure product quality and safety.

**Table 4.4: Total NTMs in Food Processing**

| Types of NTMs | Total measures |
|---|---|
| SPS | 191 |
| TBT | 206 |
| PSI | 2 |
| PC | 3 |
| QC | 5 |
| **Total measures** | **407** |

Source: Author's calculations based on ERIA-UNCTAD database (2017).

In the food processing sector, most of the SPS measures are used for controlling the use of some ingredients in foods and feed and their contact materials (A22), followed by labelling requirements (A31). Similarly, most of the TBTs found in this sector are for quality of product or performance requirements (B7), followed by requirements of labelling and packaging (B31) (Table 4.5).

Being an Islamic country, labelling requirements are important for Malaysia to distinguish the halal from non-halal food. Furthermore, nutrition labelling is mandatory in Malaysia for content of protein, energy, fat, carbohydrate and total sugars for foods that are widely consumed (milk, bread, canned fish, meat, fruit and fruit juices, vegetable, mayonnaise and salad dressing) and for beverages (Pettman, 2013; Kasapila & Sharifudin, 2011). Recently, demand for safe foods has increased as consumers increase health awareness. In order to maintain its reputation and global market shares, firms now have to provide safe food to meet the market demand (Devadason, et al., 2016).

**Table 4.5: SPS and TBT Chapters in Food Processing**

| A | SPS | No. | % |
|---|---|---|---|
| A14 | Special authorization requirement for SPS reasons | 6 | 0.03 |
| A19 | Prohibitions/restrictions of imports for SPS reasons n.e.s. | 2 | 0.01 |
| A21 | Tolerance limits for residues of, or contamination by, certain (non-microbiological) substances | 1 | 0.005 |
| A22 | Restricted use of certain substances in foods and feeds and their contact materials | 89 | 0.47 |
| A31 | Labelling requirements | 55 | 0.29 |
| A33 | Packaging requirements | 9 | 0.05 |
| A41 | Microbiological criteria of the final product | 1 | 0.005 |
| A42 | Hygienic practices during production | 6 | 0.03 |
| A51 | Cold/heat treatment | 5 | 0.02 |
| A63 | Food and feed processing | 2 | 0.01 |
| A64 | Storage and transport conditions | 6 | 0.03 |
| A82 | Testing requirement | 4 | 0.02 |
| A83 | Certification requirement | 3 | 0.02 |
| A84 | Inspection requirement | 1 | 0.005 |
| A86 | Quarantine requirement | 1 | 0.005 |
| | **Total SPS** | **191** | **100** |
| **B** | **TBT** | | |
| B6 | Product identity requirement | 31 | 0.15 |
| B7 | Product quality or performance requirement | 107 | 0.52 |
| B9 | TBT measures, n.e.s. | 1 | 0.005 |
| B14 | Authorization requirement for TBT reasons | 7 | 0.03 |
| B19 | Prohibitions/restrictions of imports for objectives set out in the TBT agreement, n.e.s. | 1 | 0.005 |
| B21 | Tolerance limits for residues of or contamination by certain substances | 1 | 0.005 |
| B31 | Labelling requirements | 54 | 0.27 |
| B33 | Packaging requirements | 1 | 0.005 |
| B41 | TBT regulations on production processes | 1 | 0.005 |
| B42 | TBT regulations on transport and storage | 1 | 0.005 |
| B49 | Production or post-production requirements, n.e.s. | 1 | 0.005 |
| | **Total TBT** | **206** | **100** |

Source: Author's calculation based on ERIA-UNCTAD database (2017).

**Table 4.6: Frequency Counts and AVEs of NTMs in Food Processing, by Sub-Sectors**

| Sector | Types of NTMs (number) | | | | | Simple Average of AVEs (%) |
|---|---|---|---|---|---|---|
| | Technical measures | | | Non-technical measures | | |
| | SPS | TBT | PSI | PC | QC | |
| **Meat & meat production** | 26 | 24 | 1 | 1 | 0 | 53 |
| **Preservation of seafood** | 19 | 19 | 0 | 1 | 0 | 42 |
| **Preservation of vegetables & fruits** | 39 | 30 | 1 | 0 | 1 | 52 |
| **Dairy product** | 10 | 2 | 0 | 0 | 0 | 80 |
| **Oils &fats** | 24 | 27 | 0 | 1 | 2 | 52 |
| **Grain mills** | 29 | 19 | 0 | 1 | 2 | 50 |
| **Bakery products** | 12 | 10 | 0 | 0 | 0 | 120 |
| **Confectionery** | 23 | 17 | 0 | 0 | 0 | 40 |
| **Other processed food** | 70 | 68 | 1 | 2 | 2 | 70 |
| **Animal feeds** | 3 | 1 | 0 | 1 | 0 | 100 |
| **Beverage** | 37 | 39 | 0 | 1 | 0 | 32 |

Source: NTMs are calculated from ERIA-UNCTAD database (2017) and AVEs are computed from Kee et al. (2009).

All foods are subject to SPS and TBT measures. SPS and TBT measures dominate in the 'other processed food' category, followed by beverages and vegetables and fruits. Only these three categories have pre-shipment inspection measures. Malaysia does control the price and quantity of dairy products, confectionery and bakery products. Worth noting here is that the AVE for bakery product is the highest across the food processing sector. While beverages has the smallest AVE across the food processing sector (Table 4.6).

The implementation of NTMs in the food processing sector can reduce asymmetric information, which can boost the confidence level of consumers in the safety, quality and authenticity of what they eat. Hence, demand for processed food is increasing. However, NTMs are not necessary to generate a positive impact on an economy. Although the purposes of NTMs are not to serve as protectionist devices, they may restrict trade by driving up the trade cost as NTMs will increase compliance cost. The implementation of NTMs also hurts consumers who can no longer access formerly cheaper imported products.

## 4.3 Labour Markets of Food Processing

This section discusses the labour markets in the food processing sector in Malaysia. Employment, wages and wage inequality in this sector are described in this section.

### 4.3.1 Overview

The manufacturing sector in Malaysia plays an important role in providing employment. This sector contributed about 7 per cent to the total employment in 2003 and increased to 16 per cent in 2014 (Labour Force Survey; 2004, 2015). The Manufacturing Survey (2014) shows that about 70 per cent of the total labour in the sector was unskilled, many of which were foreign labourers. Malaysia employs more than 25 per cent of all foreign labour in South-East Asia, representing about 9 per cent of its population and more than 30 per cent of its labour force in the manufacturing sector (World Bank, 2013). Notably around 90 per cent of the total foreign labour consists of unskilled labour (World Bank, 2013; DOS, 2014).

As mentioned earlier, the Malaysian government is highly focused on the development of the food processing sector as this sector provides added value to agricultural products. It also supports Malaysia’s agro-based industries, which accounted for 13 per cent of total employment in manufacturing in 2014 (DOS, 2014).

### 4.3.2 Employment in Food Processing

This section highlights some trends and salient facts on employment in the food processing sector in Malaysia over the period of 2009 to 2014. Skilled, semi-skilled and unskilled workers are classified based on occupations (MASCO, 2008)[14]. A set of unpublished labour data (employment and wages) was collected from the DOS for the period 2009 to 2014. Unlike the data before 2009, this set disaggregates the 11 food processing sub-sectors and distinguishes the employment of local labour from foreign labour. The employment trends by skill in the 11 sub-sectors from 2009 to 2014are shown in Table 4.7.

The growth in the number of labourers in the food processing industry sector grew from 176,170 in 2009 to 267,935 in 2014 (Table 4.7) reflecting the expansion of this sector. About 70 per cent of the total labour in this sector is recorded as being unskilled, 16 per cent and 7 per cent being semi-skilled and unskilled respectively in 2014. Unskilled labour dominates in this sector given 80 per cent of the firms are SMEs, which mostly depend on low-level of technology. Less than 10 per cent of the firms are MNCs, which are better able to invest in human capital. They also use a high level of

[14]Refer to Chapter 3.

technology in processing that requires skilled and semi-skilled labour to operate (MIDA, 2018).

Malaysia has a long history of using unskilled foreign labour in manufacturing industries and the food processing sector is no exception. Foreign labour consists of around 20 per cent of the total labour force in this sector. The Malaysian government has introduced policies to restrict the employment of foreign labour – for example, the implementation of the “foreign workers first out” policy in the 2000s and policies designed to make the use of locals more preferable to that of foreign labour (Oostendorp et. al, 2014). From Table 4.8, it can be seen that the food processing sector has used more local than foreign labour, and that the number of foreign labourers in this sector dropped by 13.5 per cent in 2014 compared to 2012.

However, foreign labour remains important infilling structural gaps in the labour market. In this way, the use of foreign labour is able to increase productivity and enhance the competitiveness of major manufacturing industries in international markets. All of these effects relating to the use of foreign labour are important for Malaysia given the main source of Malaysian economic growth comes from international trade (World Bank, 2014). Chin (2002) notes that some limitations were found in policies that limit the use of foreign labour. This is because unskilled local labour has not been interested in low wage jobs.

Within the 11 food processing sub-sectors, the oils and fats sector contributed the most to the employment – 27 per cent in 2014. This is because this sector is the most export oriented, which requires a high labour content in its production. This sector also employed more foreign labour relative to other sub-sectors over the period of the study.

The meat, meat production and dairy product sectors are the most import intensive sectors. These sectors heavily depend on imports: therefore the sectors' labour usage is low as a proportion of total labour employed due to the low level of production. It accounted for 5.2 per cent and 6.4 per cent of the total employment in the food processing sector respectively in 2009, and dropped to 4 per cent and 4.7 percent, respectively in 2014. The use of foreign labour in the meat and meat production sector was 27 per cent of total employment in this sector in 2009 and increased to 32 per cent in 2014. The use of foreign labour in dairy production was 19 per cent of the total employment in this sector in 2009 and 2014.

**Table 4.7: Total Employment in Food Processing, by Category of Local and Foreign Labour, 2009-2014**

| Sector | 2009 | | | | | | 2012 | | | | | | 2014 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Local | | | Foreign | | | Local | | | Foreign | | | Local | | | Foreign | | |
| | S | SS | U | S | SS | U | S | SS | U | S | SS | U | S | SS | U | S | SS | U |
| Meat & meat production | 418 | 1445 | 4754 | 13 | 20 | 2476 | 716 | 1156 | 3175 | 5 | 48 | 2570 | 545 | 1148 | 5713 | 11 | 56 | 3402 |
| Preservation of seafood | 489 | 992 | 5981 | 22 | 67 | 3712 | 824 | 1385 | 8612 | 27 | 62 | 5668 | 909 | 1977 | 9864 | 15 | 84 | 1455 |
| Preservation of fruits & vegetables | 274 | 435 | 1646 | - | 2 | 665 | 533 | 1058 | 3263 | 6 | 17 | 2280 | 455 | 861 | 2578 | 16 | 7 | 1324 |
| Dairy production | 1330 | 2637 | 5170 | 114 | 409 | 1561 | 1137 | 2522 | 8072 | 27 | 5 | 2774 | 1104 | 2243 | 6863 | 20 | 9 | 2289 |
| Oils & fats | 2998 | 11294 | 26779 | 52 | 438 | 13043 | 4997 | 14514 | 37260 | 52 | 451 | 27029 | 3605 | 12549 | 35572 | 44 | 533 | 20340 |
| Grains mills | 667 | 1626 | 3707 | 7 | 9 | 1110 | 776 | 1765 | 6888 | 11 | - | 4582 | 1237 | 3017 | 9728 | 8 | 5 | 2016 |
| Bakery products | 2046 | 5007 | 19425 | 33 | 191 | 6180 | 2409 | 5231 | 22705 | 31 | 99 | 10019 | 3053 | 7264 | 32332 | 17 | 108 | 13609 |
| Confectionery | 859 | 1965 | 4807 | 13 | 3 | 2505 | 913 | 2196 | 5205 | 15 | 13 | 3537 | 1231 | 2783 | 7033 | 49 | 18 | 4670 |
| Other food processing | 2127 | 3912 | 13087 | 46 | 19 | 3611 | 2929 | 5535 | 17222 | 75 | 75 | 7778 | 3822 | 6434 | 22038 | 110 | 114 | 8216 |
| Animal feeds | 398 | 1014 | 1736 | 34 | 52 | 1653 | 522 | 1072 | 2475 | 8 | 3 | 2363 | 479 | 1113 | 2542 | 8 | 4 | 2279 |
| Beverage | 1046 | 1911 | 5287 | 24 | 3 | 814 | 1198 | 2148 | 8010 | 21 | 2 | 2800 | 1222 | 2129 | 8143 | 16 | 1 | 1819 |
| **Total** | 12652 | 32238 | 92379 | 358 | 1213 | 37330 | 16954 | 38582 | 122887 | 278 | 775 | 71400 | 17662 | 41518 | 142406 | 314 | 939 | 61419 |

Note: S : Skilled-labour
SS: Semi-skilled labour
U : Unskilled labour
Source: Calculated from Department of Statistics (DOS), Malaysia.

### 4.3.3 Wages in Food Processing

This section reports the wages by skill in the 11 food processed sub-sectors. The average weekly wage is obtained by dividing the annual wages by the total number of labourers employed in each occupation and then dividing it by the number of weeks in a year. Unfortunately, this set of data does not disclose the wages for foreign labour. Average weekly wages by skill in the 11 food sub-sectors are shown in Table 4.8.

The oils and fats sector is the most export oriented and largest contributor to employment among 11 sub-sectors. However, the returns (wages) of labour in this sector were not the highest. In fact, the meat and meat and dairy production sectors were heavily dependent on imports, and the demand for labour was correspondingly low. However, labour returns were higher compared to the wages in the oils and fats sector. The average weekly wage for labour in meat and meat and dairy production sectors was RM800 and RM1192 respectively in 2009, increasing to RM1446 and RM1288 respectively in 2014. The average weekly wage for labour in the oils and fats sector was RM 826 in 2009 increasing to RM1042 in 2014.

The average weekly wages for all types of labour in the 11 sub-sectors experienced an increasing trend, except for average weekly skilled wages in the grains mills sector and unskilled average weekly wages in the dairy production sector (Table 4.8). The demand for skilled and unskilled labour in the grain mills and dairy production sectors respectively experienced positive growth, although the average weekly wages for skilled labour decreased by 7.6 per cent and 4.3 per cent respectively in 2014, compared to 2009. These labour market conditions showed that the demand for labour is not the sole factor in the determination of wages. Such factors as knowledge requirements, technological differences were also contributors.

**Table 4.8: Average Weekly Wages (RM) in Food Processing, by Category of Skills, 2009-2014**

| **Sector** | **2009** | | | **2012** | | | **2014** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **S** | **SS** | **U** | **S** | **SS** | **U** | **S** | **SS** | **U** |
| Meat & meat production | 1582 | 531 | 288 | 1588 | 550 | 324 | 2480 | 1442 | 417 |
| Preservation of seafood | 1171 | 395 | 184 | 1133 | 440 | 232 | 1590 | 543 | 364 |
| Preservation of fruits & vegetables | 1042 | 473 | 225 | 1164 | 453 | 238 | 1306 | 559 | 320 |
| Dairy production | 2159 | 866 | 552 | 2170 | 914 | 418 | 2391 | 945 | 528 |
| Oils & fats | 1723 | 494 | 262 | 1866 | 640 | 292 | 2096 | 683 | 349 |
| Grains mills | 1494 | 543 | 268 | 1534 | 536 | 229 | 1380 | 637 | 294 |
| Bakery products | 1140 | 437 | 229 | 1435 | 508 | 263 | 1557 | 535 | 305 |
| Confectionery | 1845 | 582 | 306 | 2108 | 770 | 391 | 2265 | 728 | 433 |
| Other food processing | 1216 | 494 | 228 | 1341 | 499 | 250 | 1503 | 580 | 306 |
| Animal feeds | 1656 | 535 | 253 | 1764 | 592 | 284 | 2282 | 742 | 372 |
| Beverage | 1524 | 530 | 270 | 1989 | 736 | 319 | 2040 | 755 | 390 |

Note: Average weekly wages are deflated at base year price 2000.
Source: Calculated from Department of Statistics (DOS), Malaysia.

### 4.3.4 Wage Inequality in Food Processing

Table 4.9 shows the wage inequality in the food processing sector. The study employs wage inequality ratio, obtained by dividing average weekly wage for skilled by average weekly wage for unskilled. If the wage inequality ratio between skilled and unskilled labour is 3, it means average weekly wage for skilled is three times higher than average weekly wage for unskilled.

Relevant to these statistics is that Malaysia experienced significant trade liberalization (tariff reductions) and various government policies targeting the food sector (refer to Table 4.1) were launched in the period covered by the study. The average weekly wages experienced a positive growth for almost all food processing sub-sectors and all types of labour. Although, average weekly wages have increased, wage inequality still remains especially between skilled wages with unskilled wages. According to trade theory, liberalization of trade can help to increase wage equality in developing countries. This study found that government policies and trade liberalization have not contributed to a significant change in wage inequality. This can be attributed to the fact that Malaysia is a middle-income country.

For the meat and the meat production sector (the most import intensive sector), the average weekly wages for all types of labour increased throughout the period of the study. However, wage equality between skilled and unskilled labour and also semi-skilled and unskilled labour, decreased in this sector.

Average weekly wages experienced positive growth in the other food processing sectors. The study found that wage inequality between skilled and unskilled and also semi-skilled and unskilled wages reduced in this sector. The positive growth in average weekly wages may be a contributor to the increase in wage equality in this sector. Furthermore, the number of NTMs implemented in this sector is the highest of all other sub-sectors. According to Navaretti et al. (2017), NTMs have an impact on wage inequality. Therefore, the higher number of NTMs in this sector may contribute to an increase in wage inequality.

**Table 4.9: Wage Inequality in Food Processing, by Skill Category, 2009-2014**

| Sector | 2009 | | | 2012 | | | 2014 | | |
|---|---|---|---|---|---|---|---|---|---|
| | S/SS | S/U | SS/U | S/SS | S/U | SS/U | S/SS | S/U | SS/U |
| Meat & meat production | 3.0 | 5.5 | 1.8 | 2.9 | 4.9 | 1.7 | 1.7 | 5.9 | 3.5 |
| Preservation of seafood | 3.0 | 6.4 | 2.1 | 2.6 | 4.9 | 1.9 | 2.9 | 4.4 | 1.5 |
| Preservation of fruits & vegetables | 2.2 | 4.6 | 2.1 | 2.6 | 4.9 | 1.9 | 2.3 | 4.1 | 1.8 |
| Dairy production | 2.5 | 3.9 | 1.6 | 2.4 | 5.2 | 2.2 | 2.5 | 4.5 | 1.8 |
| Oils & fats | 3.5 | 6.6 | 1.9 | 2.9 | 6.2 | 2.2 | 3.1 | 6.0 | 2.0 |
| Grains mills | 2.8 | 5.6 | 2.0 | 2.9 | 6.7 | 2.3 | 2.2 | 4.7 | 2.2 |
| Bakery products | 2.6 | 5.0 | 1.9 | 2.8 | 5.5 | 1.9 | 2.9 | 5.1 | 1.8 |
| Confectionery | 3.2 | 6.0 | 1.9 | 2.7 | 5.4 | 2.0 | 3.1 | 5.2 | 1.7 |
| Other food processing | 2.5 | 5.3 | 2.2 | 2.7 | 5.4 | 2.0 | 2.6 | 4.9 | 1.9 |
| Animal feeds | 3.1 | 6.5 | 2.1 | 3.0 | 6.2 | 2.1 | 3.1 | 6.1 | 2.0 |
| Beverage | 2.9 | 5.6 | 2.0 | 2.7 | 6.2 | 2.3 | 2.7 | 5.2 | 2.0 |

Note: Wages are deflated at base year price 2000.
Source: Author's calculation from Department of Statistics (DOS), Malaysia.

### 4.4 Link between Import Flows and Labour Market Conditions

This section shows the link between import flows and labour markets (employment, wages and inequality). The detailed information is shown in Tables 4.10, 4.11 and 4.12 respectively.

The import of dairy products increased the most – by 148 per cent over the years 2009 to 2014. Employment in this sector has had positive growth, which means labour is not negatively affected by the increased in imports in this sector. Both the local and foreign labour rates rose by around 11 per cent over the period of the study (Table 4.10). It could be assumed that, given the demand for labour increased, average weekly wages should have increased. However, the study found that average weekly wages for labour in this sector decreased by 9.2 per cent over the years 2009 to 2014 (Table 4.11).

It is clear from Table 4.10, that imports in all sub-sectors experienced an increasing trend from 2009 to 2012. Imports of beverage increased the most, recording a 107 per cent gain while, imports of grains mills increased the least – by 26.7 per cent. The employment in all sub-sectors increased, followed by the increase in imports. This shows there was a positive impact on employment from trade. Average weekly wages increased in almost all sub-sectors, except for vegetables and fruits, dairy production and grain mill sectors, as a result of increases in employment (Table 4.11).

The study also shows that the imports in all sub-sectors increased through out the period of the study. However, an increase in imports does not help to reduce wage inequality between skilled and unskilled in some sub-sectors (meat and meat production, dairy product and bakery product).

**Table 4.10: Imports (USD million) and Employment in Food Processing, 2009-2014**

| Sector | 2009 | | | | | | | 2012 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Imports (USD million) | Local | | | Foreign | | | Imports (USD million) | Local | | | Foreign | | |
| | | S | SS | U | S | SS | U | | S | SS | U | S | SS | U |
| Meat & meat production | 357 | 418 | 1445 | 4754 | 13 | 20 | 2476 | 547 | 716 | 1156 | 3175 | 5 | 48 | 2570 |
| Preservation of seafood | 391 | 489 | 992 | 5981 | 22 | 67 | 3712 | 584 | 824 | 1385 | 8612 | 27 | 62 | 5668 |
| Preservation of fruits & vegetables | 150 | 274 | 435 | 1646 | - | 2 | 665 | 232 | 533 | 1058 | 3263 | 6 | 17 | 2280 |
| Dairy production | 361 | 1330 | 2637 | 5170 | 114 | 409 | 1561 | 669 | 1137 | 2522 | 8072 | 27 | 5 | 2774 |
| Oils & fats | 1462 | 2998 | 11294 | 26779 | 52 | 438 | 13043 | 2669 | 4997 | 14514 | 37260 | 52 | 451 | 27029 |
| Grains mills | 670 | 667 | 1626 | 3707 | 7 | 9 | 1110 | 849 | 776 | 1765 | 6888 | 11 | - | 4582 |
| Bakery products | 32 | 2046 | 5007 | 19425 | 33 | 191 | 6180 | 60 | 2409 | 5231 | 22705 | 31 | 99 | 10019 |
| Confectionery | 599 | 859 | 1965 | 4807 | 13 | 3 | 2505 | 1039 | 913 | 2196 | 5205 | 15 | 13 | 3537 |
| Other food processing | 617 | 2127 | 3912 | 13087 | 46 | 19 | 3611 | 1051 | 2929 | 5535 | 17222 | 75 | 75 | 7778 |
| Animal feeds | 159 | 398 | 1014 | 1736 | 34 | 52 | 1653 | 220 | 522 | 1072 | 2475 | 8 | 3 | 2363 |
| Beverage | 255 | 1046 | 1911 | 5287 | 24 | 3 | 814 | 529 | 1198 | 2148 | 8010 | 21 | 2 | 2800 |
| **Total** | **5053** | **12652** | **32238** | **92379** | **358** | **1213** | **37330** | **8449** | **16954** | **38582** | **122887** | **278** | **775** | **71400** |

(continued)

**Table 4.10, continued**

| Sector | 2014 | | | | | | |
|---|---|---|---|---|---|---|---|
| | Imports (USD million) | Local | | | Foreign | | |
| | | S | SS | U | S | SS | U |
| Meat & meat production | 669 | 545 | 1148 | 5713 | 11 | 56 | 3402 |
| Preservation of seafood | 429 | 909 | 1977 | 9864 | 15 | 84 | 1455 |
| Preservation of fruits & vegetables | 249 | 455 | 861 | 2578 | 16 | 7 | 1324 |
| Dairy production | 895 | 1104 | 2243 | 6863 | 20 | 9 | 2289 |
| Oils & fats | 1581 | 3605 | 12549 | 35572 | 44 | 533 | 20340 |
| Grains mills | 706 | 1237 | 3017 | 9728 | 8 | 5 | 2016 |
| Bakery products | 74 | 3053 | 7264 | 32332 | 17 | 108 | 13609 |
| Confectionery | 1052 | 1231 | 2783 | 7033 | 49 | 18 | 4670 |
| Other food processing | 1144 | 3822 | 6434 | 22038 | 110 | 114 | 8216 |
| Animal feeds | 218 | 479 | 1113 | 2542 | 8 | 4 | 2279 |
| Beverage | 533 | 1222 | 2129 | 8143 | 16 | 1 | 1819 |
| **Total** | **7550** | **17662** | **41518** | **142406** | **314** | **939** | **61419** |

Source: Author's calculation from UN Comtrade and Department of Statistics (DOS), Malaysia.

**Table 4.11: Imports (USD million) and Average Weekly Wages (RM) in Food Processing, 2009-2014**

| Sector | 2009 | | | | 2012 | | | | 2014 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Imports (USD million) | Average weekly wages (RM) | | | Imports (USD million) | Average weekly wages (RM) | | | Imports (USD million) | Average weekly wages (RM) | | |
| | | S | SS | U | | S | SS | U | | S | SS | U |
| Meat & meat production | 357 | 1582 | 531 | 288 | 547 | 1588 | 550 | 324 | 669 | 2480 | 1442 | 417 |
| Preservation of seafood | 391 | 1171 | 395 | 184 | 584 | 1133 | 440 | 232 | 429 | 1590 | 543 | 364 |
| Preservation of fruits & vegetables | 150 | 1042 | 473 | 225 | 232 | 1164 | 453 | 238 | 249 | 1306 | 559 | 320 |
| Dairy production | 361 | 2159 | 866 | 552 | 669 | 2170 | 914 | 418 | 895 | 2391 | 945 | 528 |
| Oils & fats | 1462 | 1723 | 494 | 262 | 2669 | 1866 | 640 | 292 | 1581 | 2096 | 683 | 349 |
| Grains mills | 670 | 1494 | 543 | 268 | 849 | 1534 | 536 | 229 | 706 | 1380 | 637 | 294 |
| Bakery products | 32 | 1140 | 437 | 229 | 60 | 1435 | 508 | 263 | 74 | 1557 | 535 | 305 |
| Confectionery | 599 | 1845 | 582 | 306 | 1039 | 2108 | 770 | 391 | 1052 | 2265 | 728 | 433 |
| Other food processing | 617 | 1216 | 494 | 228 | 1051 | 1341 | 499 | 250 | 1144 | 1503 | 580 | 306 |
| Animal feeds | 159 | 1656 | 535 | 253 | 220 | 1764 | 592 | 284 | 218 | 2282 | 742 | 372 |
| Beverage | 255 | 1524 | 530 | 270 | 529 | 1989 | 736 | 319 | 533 | 2040 | 755 | 390 |
| **Total** | **5053** | **16552** | **5880** | **3065** | **8449** | **18092** | **6638** | **3240** | **7550** | **20890** | **8149** | **4078** |

Note: Wages are deflated at base year price 2000.
Source: Author's calculation from UN Comtrade and Department of Statistics (DOS), Malaysia.

**Table 4.12: Imports (USD million) and Wage Inequality Ratio in Food Processing, 2009-2014**

| Sector | 2009 | | | | 2012 | | | | 2014 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Imports (USD million) | S/SS | S/U | SS/U | Imports (USD million) | S/SS | S/U | SS/U | Imports (USD million) | S/SS | S/U | SS/U |
| Meat & meat production | 357 | 3.0 | 5.5 | 1.8 | 547 | 2.9 | 4.9 | 1.7 | 669 | 1.7 | 5.9 | 3.5 |
| Preservation of seafood | 391 | 3.0 | 6.4 | 2.1 | 584 | 2.6 | 4.9 | 1.9 | 429 | 2.9 | 4.4 | 1.5 |
| Preservation of fruits & vegetables | 150 | 2.2 | 4.6 | 2.1 | 232 | 2.6 | 4.9 | 1.9 | 249 | 2.3 | 4.1 | 1.8 |
| Dairy production | 361 | 2.5 | 3.9 | 1.6 | 669 | 2.4 | 5.2 | 2.2 | 895 | 2.5 | 4.5 | 1.8 |
| Oils & fats | 1462 | 3.5 | 6.6 | 1.9 | 2669 | 2.9 | 6.2 | 2.2 | 1581 | 3.1 | 6.0 | 2.0 |
| Grains mills | 670 | 2.8 | 5.6 | 2.0 | 849 | 2.9 | 6.7 | 2.3 | 706 | 2.2 | 4.7 | 2.2 |
| Bakery products | 32 | 2.6 | 5.0 | 1.9 | 60 | 2.8 | 5.5 | 1.9 | 74 | 2.9 | 5.1 | 1.8 |
| Confectionery | 599 | 3.2 | 6.0 | 1.9 | 1039 | 2.7 | 5.4 | 2.0 | 1052 | 3.1 | 5.2 | 1.7 |
| Other food processing | 617 | 2.5 | 5.3 | 2.2 | 1051 | 2.7 | 5.4 | 2.0 | 1144 | 2.6 | 4.9 | 1.9 |
| Animal feeds | 159 | 3.1 | 6.5 | 2.1 | 220 | 3.0 | 6.2 | 2.1 | 218 | 3.1 | 6.1 | 2.0 |
| Beverage | 255 | 2.9 | 5.6 | 2.0 | 529 | 2.7 | 6.2 | 2.3 | 533 | 2.7 | 5.2 | 2.0 |

Note: Wages are deflated at base year price 2000.
Source: Author's calculation from Department of Statistics (DOS), Malaysia.

## 4.5 Summary

This chapter commences with a description of government policies employed to support the growth of the food processing sector in Malaysia. Trade patterns and the use of NTMs in this sector are identified. The labour market in terms of employment, wages and wages inequality are discussed. The links between import flows and labour market conditions are also highlighted.

The study found that NTMs are dominated in the food processing sector: 57 per cent of total NTMs are found in this sector. Most of the measures are SPS and TBTs and the implementations of these measures are generally to ensure quality and safe food can be provided to markets. However, the implementation of these measures may overshoot the requirements of consumer health and safety and be used to protect domestic producers from fair competition. The government may use NTMs as a protectionist tool, and by doing so, can hamper trade and also affect the welfare of consumers by limiting the choices of goods available to them.

A positive growth in processed food trade is revealed over the period of study. Various reasons may contribute to this trend such as the help provided by government policies in the development of this sector, low tariff rates (less than 1 per cent), stimulation of demand due to lower prices and the adoption of NTMs to correct externalities. Raw materials are mostly imported for further processing due to the domestic supply from agricultural products being insufficient to cover local consumption (MIDA, 2018). The food processing sector in international trade has become increasingly important in the growth of imports of raw material. The government is therefore faced with the challenge of reducing the dependence on imported raw materials. This in part can be addressed by the government through continued support for the agricultural sector. Assistance could include funding R&D and education in order to ensure domestically produced primary products can competitively meet the demand for raw materials used by the food processing sector.

It is found that total employment in the food processing sector has grown significantly over the period of the study. This is clearly due to the expansion of this sector, and the requirement for more labour. In accordance with trade theory that states that trade can boost domestic industries and create employment opportunities, the link suggest that trade does generate more employment opportunities. However, it is appeared that trade induced a greater use of foreign labour than local labour. The total number of foreign labourers rose by 61 per cent, from 38,901 people in 2009 to 62,672 people in 2014. On the other hand, the number of local labourers increased by 47 per cent, from 137,269 people in 2009 to 201,586 people in 2014. Trade plausibly generates some losers and winners in terms of wages, and in this study, as noted below, the losers are most likely to be foreign skilled and semi-skilled labour, while the remaining labour are the winners.

The labour market link suggests that increases in employment contribute to an increase in average weekly wages in this sector. However, it is accepted that returns to labour are not necessarily positive for all labour in all sub-sectors. For instance, the average weekly wage for unskilled labour in the dairy production sector and skilled labour in the grains mill sector decreased over the period of the study. Another important finding is that an increase in trade does not reduce wage inequality. In fact, wage inequality remains high at a time when trade is growing strongly.

The employment profile shows that labour usage is low in most import intensive sectors – the meat and meat production and dairy production sectors. However, the returns for labour are higher relative to the most export oriented sector: oils and fats, which also has the highest labour intensity relative to other sectors. This indicates that a higher demand for labour does not necessarily generate the highest returns to labour. That is, the demand for labour is not the only factor to determine the average weekly wage of labour.

The discussion in this chapter only captures the concentration of NTMs in the food processing sector and the potential impact on food trade and labour. The magnitude and the direction of the impact that NTMs have on processed food production, trade, labour market and welfare are investigated in the following chapters.

# CHAPTER 5: ECONOMIC IMPACT OF A REDUCTION OF NTMs ON FOOD PROCESSING SECTOR

## 5.1 Introduction

This chapter presents the impacts of a reduction of NTMs on the food processing sector in Malaysia. It begins with describing the policy scenarios that are taken into account for the analysis and elaborates on the simulation process. It highlights the impact of reductions in NTMs on the food processing sector as a whole, as well as on its 11 sub-sectors in both the short- and long-run. The final section of this chapter discusses the results of the various scenarios in both the short- and long-run.

This chapter covers the impact of reductions in NTMs in the food processing sector on production (Q), and trade (exports (X) and imports (M)). The study analyses a modest scenario (MS), and an ambitious scenario (AS) to identify what happens to food production and food trade. The policy simulation in this study aims to demonstrate the impact of a proposed NTM cut on the import side. However, NTMs do not discriminate between foreign and local producers. Therefore, their reduction will affect both import and domestic prices. The results are calculated as the percentage change from the baseline: that is, what otherwise would have happened had the NTMs remained unchanged.

## 5.2 Simulation Scenario Development

A CGE model is able to simulate different types of shocks on exogenous variables and the impact of these shocks on different endogenous variables (BrÖcker, 2004). Therefore, the MS and AS scenarios are introduced as exogenous shocks to measure the effects on the economy. The reduction of NTMs does not necessarily mean that the number of NTMs is reduced. But instead it can mean reducing the trade restrictiveness of NTMs or reducing compliance costs. Obviously, it is unrealistic to assume that NTMs can be completely eliminated as countries typically maintain a set of NTMs for economic and social reasons. Thus, this study estimates the impact of elimination of part of the trade costs related with NTMs. This study assumes that AVEs of NTMs are cut by 10 per cent or 50 per cent in all food processing sub-sectors. This is in line with the Malaysian government's efforts to reduce compliance costs (Malaysia Productivity Corporation [MPC], 2018). Three scenarios[15] are introduced in this study to analyse NTMs' impact.

**i. Baseline scenario (BS)**

This scenario considers that there are no policy changes and the economy will continue following the existing trends.

**ii. Modest scenario (MS)**

The study examines a modest scenario that assumes a 10 per cent[16] reduction of NTMs in the food processing sector.

**iii. Ambitious scenario (AS)**

The study also applies an ambitious scenario with a 50 per cent reduction of NTMs in the food processing sector.

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[15] The simulation results should not be viewed as a prediction, but only as an estimate of the strength and direction of the change in the situation *ceteris paribus*.

[16] The 10 per cent reduction in NTMs is realistic in that it reflects ASEAN's targeted 10 per cent reduction in trade transaction costs by 2020 (Damodaran, 2017)

The difference between the baseline and counterfactual simulations (MS or AS) reveals the impact of NTMs.

### 5.3 Baseline Simulation Results

The summary of the baseline simulation results in the food processing sub-sectors is reported in Table 5.1 and represent a situation where there is no reduction of NTMs. Results from the MS and AS scenarios are compared with this baseline simulation and expressed in terms of percentage change from the baseline, which are shown in Figure 5.1 to Figure 5.6.

**Table 5.1: Baseline Simulation (RM million)**

| Sector | Q | X | M |
|---|---|---|---|
| Meat & meat production | 2077 | 80 | 342 |
| Preservation of seafood | 3323 | 923 | 305 |
| Preservation of fruits & vegetables | 400 | 242 | 226 |
| Dairy production | 4714 | 404 | 1790 |
| Oils & fats | 113207 | 29901 | 6298 |
| Grains mills | 3991 | 302 | 703 |
| Bakery products | 4290 | 629 | 1205 |
| Confectionery | 5953 | 3251 | 3575 |
| Other food processing | 4709 | 2648 | 1809 |
| Animal feeds | 2835 | 385 | 1637 |
| Beverages | 4505 | 425 | 1405 |

Source: Author's simulation results.



Table 5.1 shows that without reducing NTMs in the food processing sub-sectors, seven sub-sectors – namely meat and meat production, grain mills, dairy production, bakery products, confectionery, animal feeds and beverages – experienced trade deficits. In the baseline scenario, the dairy production sector experienced the highest trade deficit. This is mainly caused by its productivity and resource disadvantages. As a result, the domestic supply was unable to keep up with increasing demand. Malaysia heavily depends on imported milk and milk products: more than 90 per cent of these products are imported. Another reason is that Malaysia imports dairy products for use as intermediate inputs. These products will be processed for human consumption and animal feeds (MIDA, 2018). Despite its consumption exceeding production, Malaysia still exports a small amount of dairy products.

As mentioned in the previous chapter, Malaysia is the largest exporter and second largest producer of palm oil in the world, and is a large net exporter of oils and fats products (90 per cent of its production is exported). Oils and fats exports grew by 60 per cent between 2003 and 2016 (UNCTAD, 2004; 2017). Therefore, this sector recorded the highest trade surplus among the sub-sectors (MIDA, 2017).

## 5.4 Short Run versus Long Run Impacts of a Reduction in NTMs

This section analyses the short-run versus long-run impacts of a reduction of processed food NTMs on food production and trade. The term 'short-run' does not inherently mean 'time' (although in reality it is often linked to a time component) but rather refers to the relative immobility of factors of production at the onset of economic change. For instance, in the short-run, wages are not re-negotiated and firms do not optimally reinvest capital. Therefore, this study assumes that capital is fixed in the short-run while labour can be freely moved between sectors. In the long-run, all factors of production are fully mobile and the economy returns to its full employment level.

### 5.4.1 Impact on Production of Processed Food

The simulation results on the impact of a reduction of NTMs in the food processing sector on the production in the short- and long-run are presented in the Figure 5.1 and Figure 5.2 respectively. Both for total and disaggregation by food sub-sectors under MS and AS scenarios are shown in these two figures.

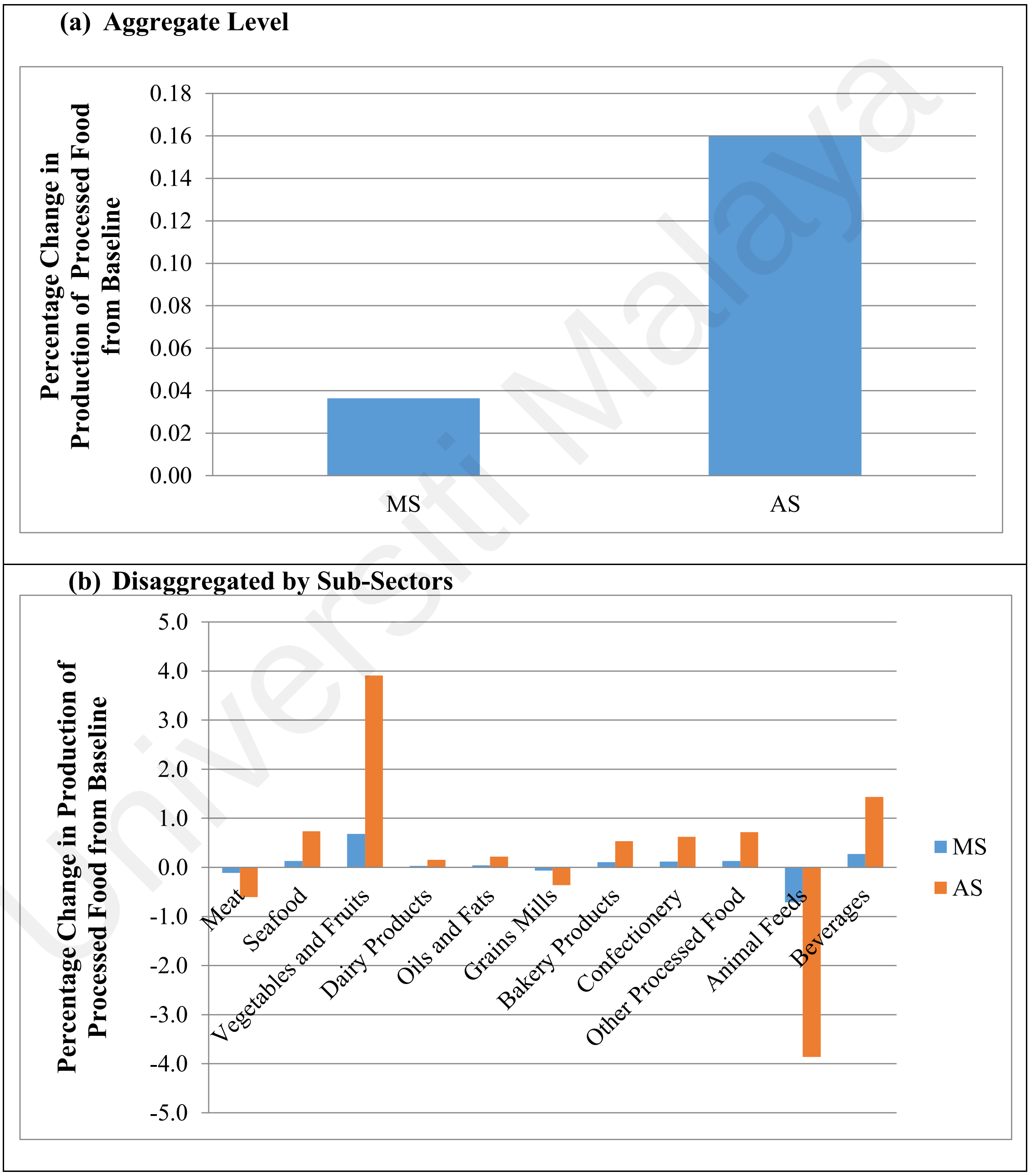



**Figure 5.1: Short-Run Impact of Reductions in NTMs on Production of Processed Food**

Source: Computed by author.

In line with the reduction of NTMs in the food processing sector, there are noticeable upturns in total processed food production under both the MS and AS scenarios in the short-and long-run (see Figure 5.1 (a) and 5.2 (a)). It is also clear that overall, processed food production improves more in the long-run than in the short-run: processed food production increases by more than 14 per cent in the long-run under both scenarios, but by less than 1 per cent in the short-run under both scenarios. The simulation results confirm the effectiveness of a reduction of NTMs to stimulate overall growth in the food processing sector.

Although in general processed food production tends to increase, there are positive and negative changes in production across sub-sectors. Indeed, the relative impact differs across all food processing sub-sectors (see Figure 5.1 (b) and 5.2 (b)). This is demonstrated by comparing changes in output (reflecting reallocation of factors) across the food processing sub-sectors. In the short-run, most of the sub-sectors benefit from a reduction of NTMs. Others, such as meat and meat, grain mills and animal feeds sectors, do suffer, although their outputs reduce by less than 5 per cent.

Importantly, with the reduction of NTMs, the production of all subsectors improves simultaneously in the long-run, except for the beverages sector. It is noted that the production of dairy products increases the most among all sub-sectors in the long-run, recording a rise of 33 per cent and 37 percent under MS and AS scenarios respectively. The simulation results confirm the theory relating to NTMs that not all sectors will be the winners. Thus, the policy change regarding NTMs will result in some losers in the market as they are less competitive relative to other competitors. The results also show that the impact of a reduction in NTMs is disproportionate across the various sub-sectors.

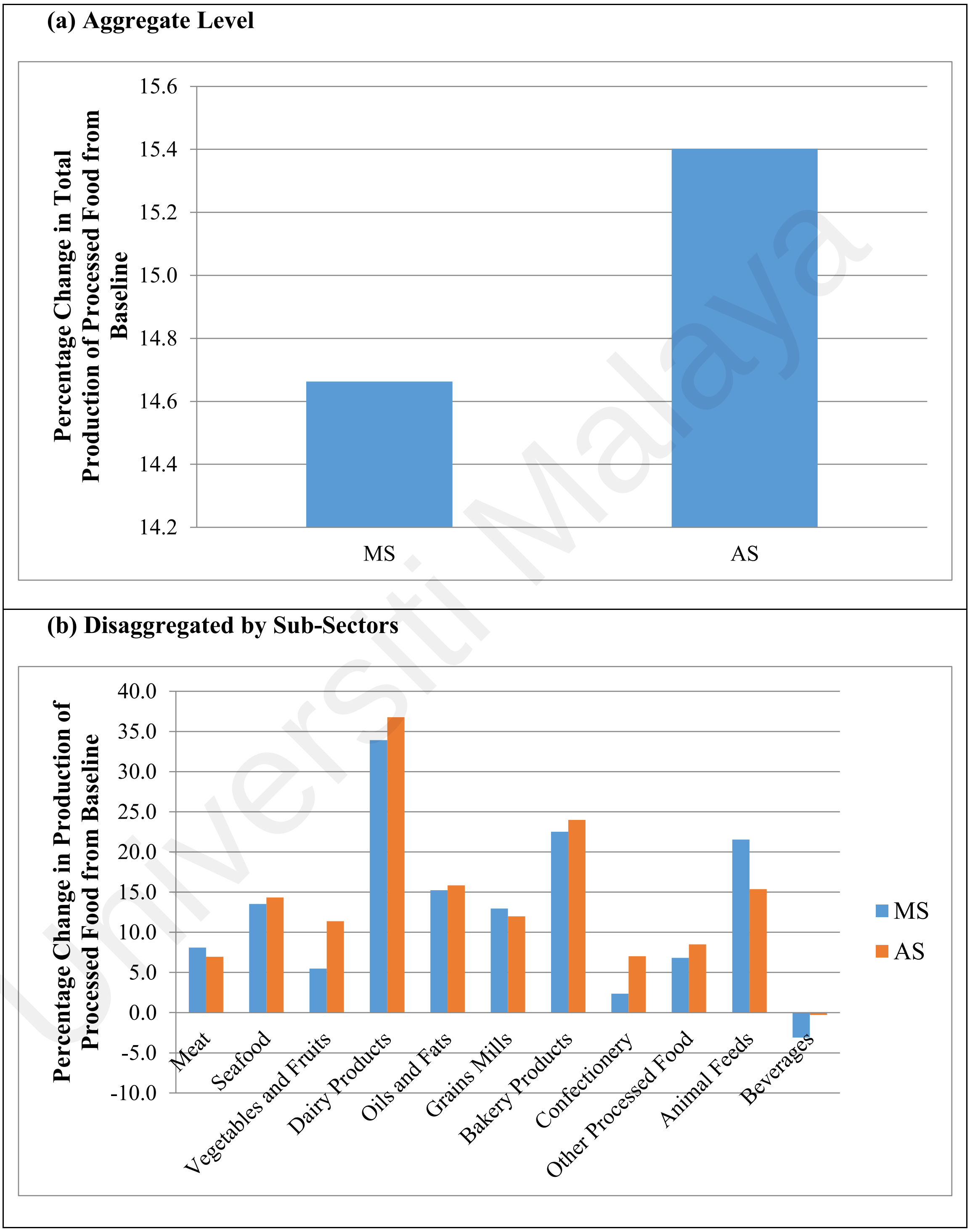



**Figure 5.2: Long-Run Impact of Reductions in NTMs on Production of Processed Food**

Source: Computed by author.

### 5.4.2 Impact on Trade in Processed Food

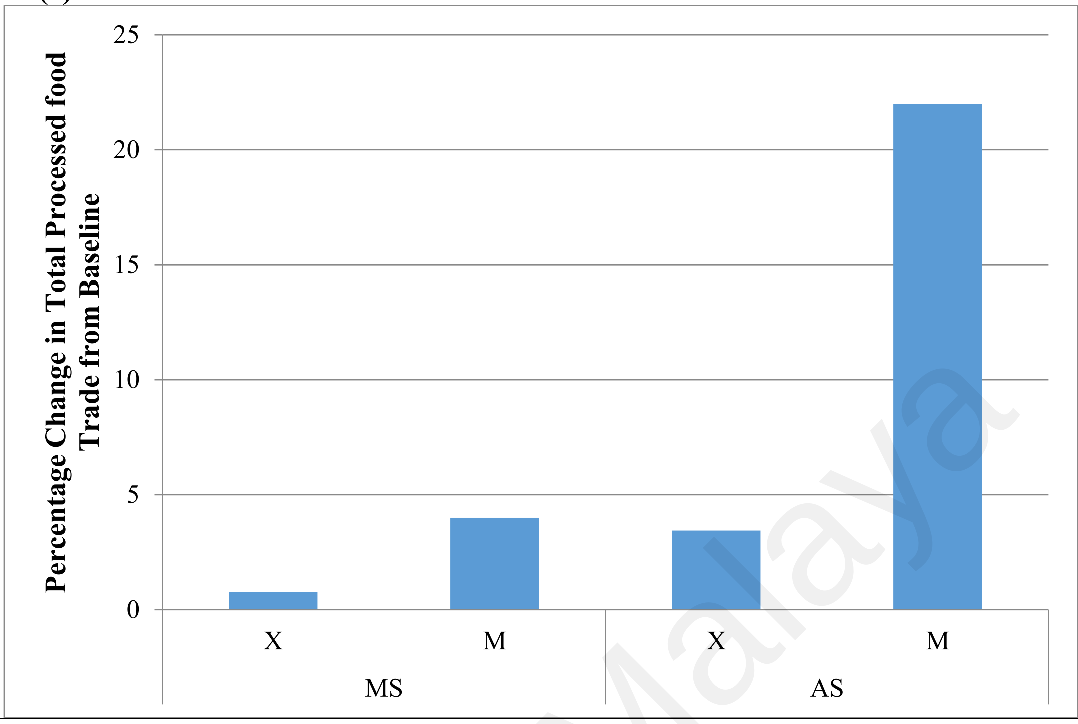
The impact of a reduction of food processing sector NTMs on the trade is analysed in this section – both the short- and long-run (see Figure 5.3).

The results from the simulation show that the reduction of NTMs in the food processing sector fosters exports and imports, in both the short- and long-run under both scenarios. The increase in imports is relatively greater than the increase in exports in the short-run under both scenarios. But clearly, NTMs in this sector can have a greater restrictive effect on processed food imports trade in the long-run. Overall then, trade in processed food increases in the long-run by relaxing NTMs in this sector. That is, the increase in exports more than offsets the increase in imports in the long-run under both scenarios. The results affirm the argument that the policy of reducing NTMs is able to increase the competitiveness of this sector in the international market.

Additionally, the impact under the AS scenario is approximately 5 times larger than the impact under the MS scenario in the short-run (see Figure 5.3 (a)). However, this is not the case in the long-run. Exports deviate from the baseline by about 40 per cent and 46 per cent under MS and AS scenarios respectively (see Figure 5.3 (b)). On the other hand, imports increase from the baseline by about 6 per cent and 25 per cent under the MS and AS scenarios respectively.

**Aggregate Level**

**(a) Short Run**




**(b) Long Run**

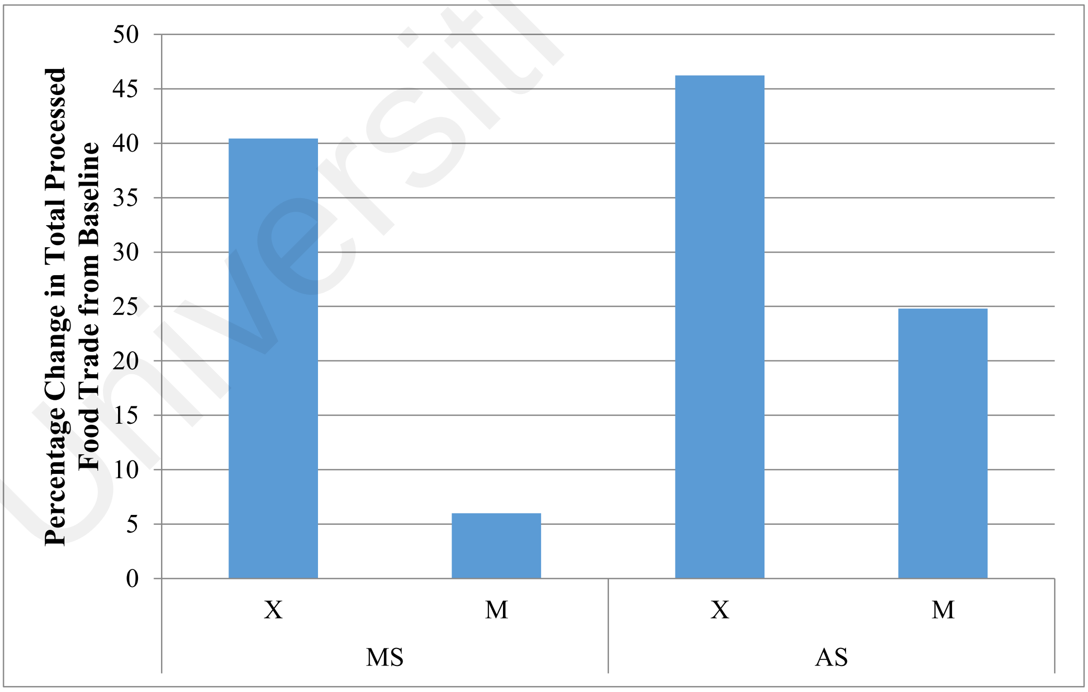



**Figure 5.3: Short-Run and Long-Run Impact of Reductions in NTMs on Processed Food Trade.**

Source: Computed by author.

We next report on the impact on specific sub-sectors from relaxing NTMs on the processed food trade. Figures 5.4 and 5.5 show trade at the sectoral level under two scenarios in both the short- and long-run respectively. Exports and imports of processed food in all sub-sectors increase under both scenarios in the short-and long-run. However, the gains are not evenly shared by all sub-sectors. This proves that the policy change does not affect trade across all sub-sectors equally.

In the short-run, the most affected sector is vegetables and fruits, for which exports increased by less than 2 per cent under the MS scenario. The impact under the AS scenario is greater, registering a 10 per cent increase from the baseline. Exports for the rest of sub-sectors increased by less than 10 per cent. As noted, the impact of a reduction of NTMs increases imports more than exports in the short-run. The most affected sector is bakery products, followed by dairy products.

In the long-run, exports of all subsectors increase more than in the short-run. The most affected sector is dairy products. The results appear counterintuitive, as there is an extremely large increase in this sector's exports in the long-run – up 180 per cent and 210 percent from the baseline under the MS and AS scenarios respectively. The increase in imports of dairy products – which record increases of 5 per cent and 26 per cent under the MS and AS scenarios respectively – is less than the increase in exports. Thus, although exports of these products increased substantially, the sector is nevertheless import intensive. The least affected are the exports of beverages in the long-run: increases of 10 per cent under the AS scenario, and no changes under the MS scenario. For imports, the most affected sector is bakery products, which increased by 4 per cent and 39 per cent under the MS and AS scenarios respectively. The impact of the reduction in NTMs on exports under the AS scenario is not greatly different from the impact under the MS scenario in the long-run. Conversely, this is not the case for imports.

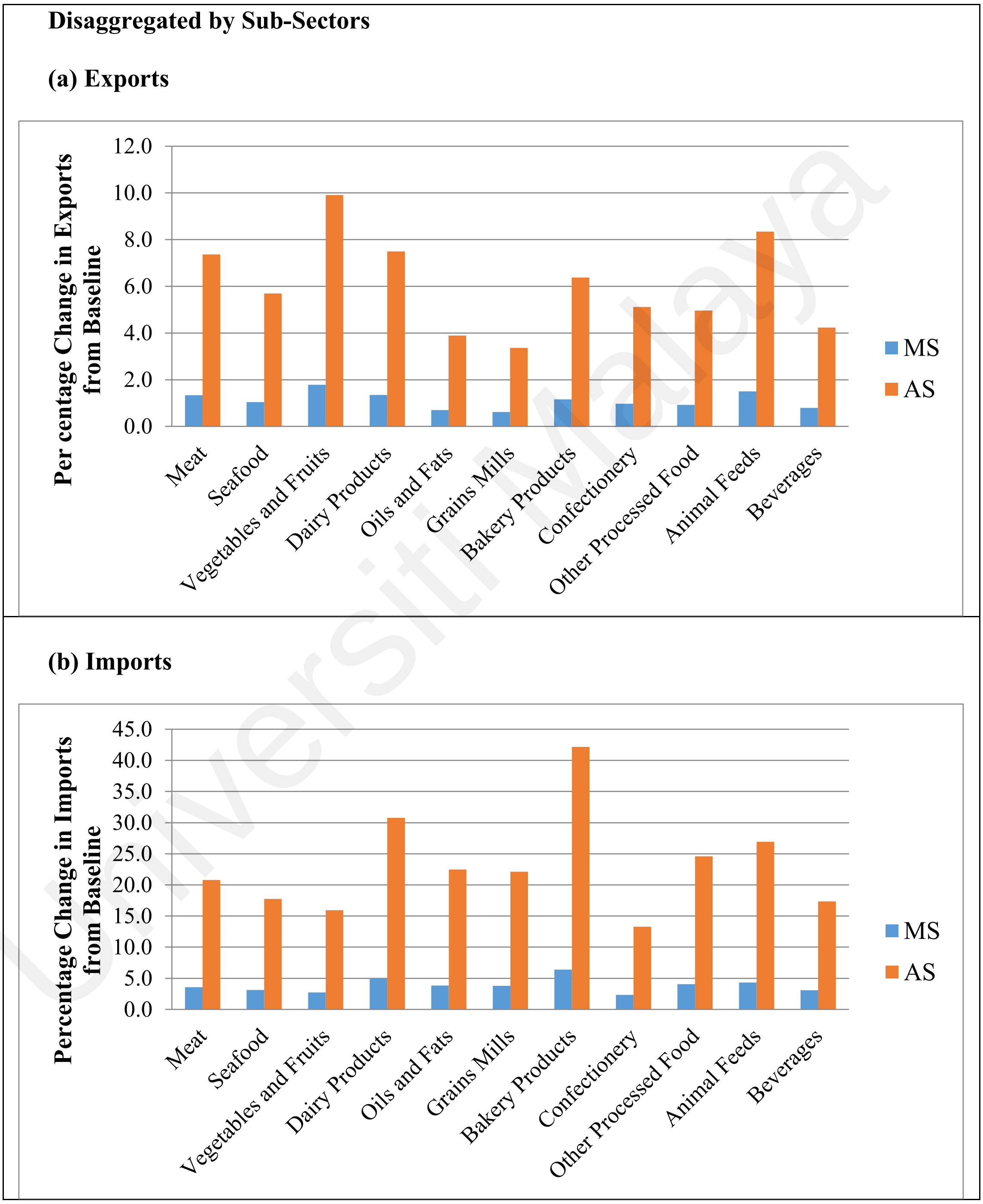
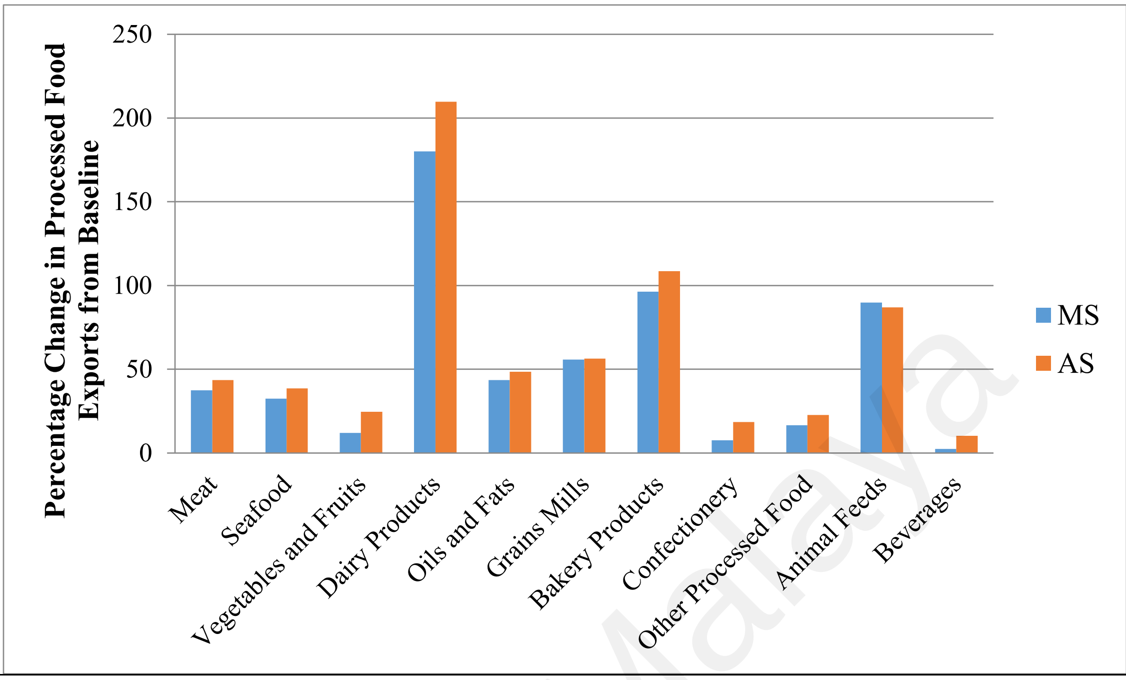



**Figure 5.4: Short-Run Impact of Reductions in NTMs on Processed Food Trade**

Source: Computed by author.

**Disaggregated by Sub-Sectors**

**(a) Exports**




**(b) Imports**

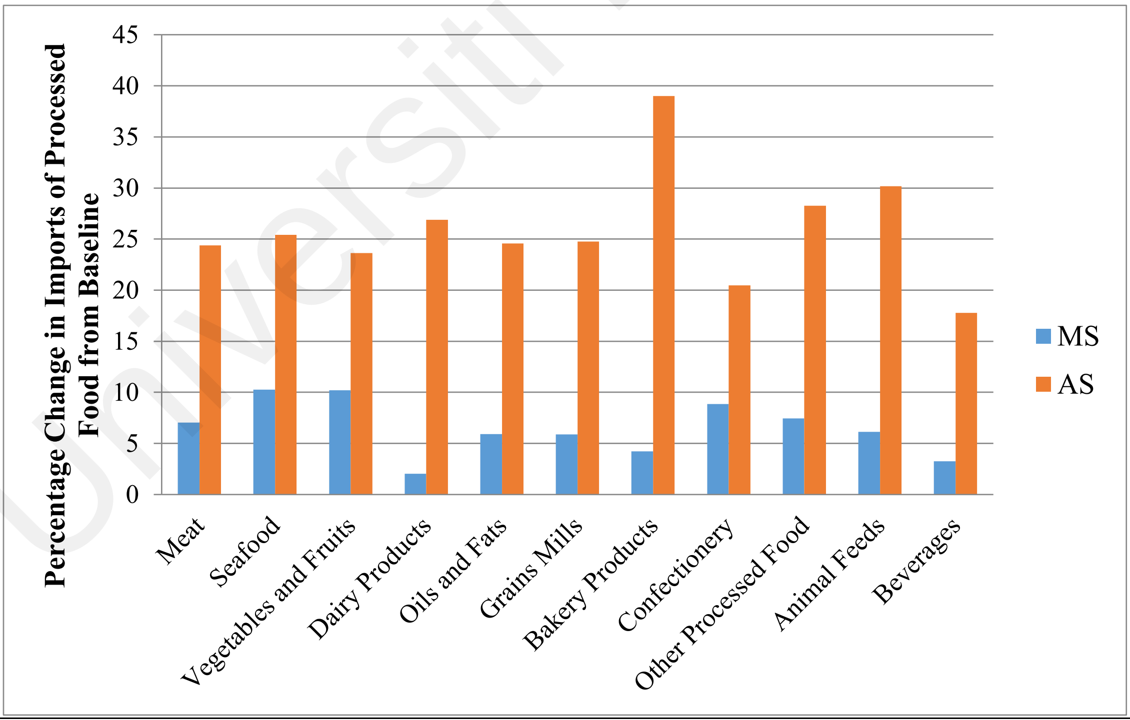



**Figure 5.5: Long-Run Impact of Reductions in NTMs on Processed Food Trade**

Source: Computed by author.

## 5.5 Discussion of Findings

As mentioned in the previous chapter, NTMs in the food processing sector consist of technical and non-technical measures. The majority of NTMs in this sector are technical measures, namely SPS and TBT measures[17]. The sub-sector with the highest number of NTMs is the other processed food sector, and the lowest is the animal feed sector followed by dairy products. The stated reason for applying NTMs in the food processing sector are to achieve the objectives of product quality and safety, health and environmental protection. They may equally apply to domestic producers. SPS measures are largely applied in order to restrict the use of certain ingredients in food and feeds and their contact materials (A22), followed by labelling requirements (A31). Similarly, TBTs mostly relate to product quality or performance (B7), followed by requirements of labelling and packaging (B31)[18]. Although they are NTMs, they can be used for protectionist purposes that can substantially escalate costs of trade and hence affect trade. This is because the imposition of NTMs, especially SPS and TBTs, are likely to generate extra costs (fixed and variable costs) for producers (Baldwin et al., 2000). This in turn, affects the production and competitiveness of the trade in goods. Moreover, the application of NTMs can be used to protect the domestic industry from import competition (UNCTAD, 2013).

Some people argue that this sector tends to be overregulated as exporters have difficulty in accessing the Malaysian market. It is also costly for producers to meet requirements set by the government. Consequently, relaxing NTMs in this sector could help to increase its competitiveness, as it needs to compete with foreign products. The

[17]Refer to Table 4.4 in Chapter 4.
[18] Refer to Table 4.5 in Chapter 4.

results from previous sections of this thesis show that NTMs in this sector are quite restrictive. The magnitude of their impact on production is evident - total food production and exports increased by more than 14 per cent and 40 per cent respectively under both scenarios in the long-run.

Simulation results of the reduction of NTMs in this sector show that it is beneficial to both domestic processed food production and trade (exports and imports). As mentioned previously, NTM reduction is able to reduce the price of imports, so that ultimately, imports of processed food increase in both the short- and long-run under both the MS and AS scenarios. There are two reasons why the domestic processed food production and exports increase in line with the policy change. First, this sector is heavily dependent on imported intermediate goods. This is because the supply of raw materials from domestically produced foodstuffs is unable to meet domestic demand (MIDA, 2014). The second reason is that NTMs reduce the prices of imports. Domestic producers are therefore able to get cheaper imported raw materials. This in turn increases the competitiveness of this sector. Hence, exports increase in both the short- and long-run under both the MS and AS scenarios. This corresponds with the findings of Chemingui et al. (2008) for Syria. They found that the removal of NTMs could actually increase the relative competitiveness of some sectors in Syria where domestic production is highly dependent on imported intermediate inputs.

Second, the compliance costs of meeting the NTMs' requirements are normally trade-restrictive, and it also increases the trade barrier effect for some products. This is in line with Moise and Le Bris's (2013) findings. NTMs in this sector impose various health and safety standards, which can increase production and delivery costs, especially for those SMEs with limited production capacity, less advanced production technology and weaker infrastructure. These limitations cause SMEs to face relatively higher costs than large firms that are better able to meet the requirements set by government (Francois et al., 2011). Given the majority of the firms in this sector in Malaysia are SMEs (MIDA, 2018), they are particularly affected by the limitations stressed by Francois et al. (2011). That is, SMEs have smaller scale of production and therefore are subject to relatively higher costs as a result of the imposition of NTMs. But they correspondingly benefit more, relatively, when there is a reduction of NTMs through the decrease in administrative and regulatory costs. The results also correspond with the theory, which states that reducing these barriers increases both production and exports.

The simulation findings also show that the impact in the long-run is larger than in the short-run. The OECD (2011) found similar results. Ng (2016) on the other hand found that tariff reductions had a very small impact on production and trade in both the short- and the long-run in Malaysia. This study shows that the impact of a NTM cut is different to that of a tariff cut. The study suggests that slow responses to a NTM cut, as NTMs present themselves as a package rather than a single instrument such as tariffs. NTMs involve certification, testing, and inspection by official and analytical bodies. Although some producers cannot initially meet the requirements to access the market, they may eventually be able to do so. However, to do so takes time for firms to change their facilities or production processes in order to meet the new requirements. Some producers may still lack of the capacity in terms of the soft or hard infrastructure, to take advantage of production and export opportunities in the short run – even when NTMs on processed food are reduced. Those existing suppliers who have complied with the old regulations would benefit from the reduction of NTMs given the decreased compliance costs. However, they may not be able to adjust their production and trade substantially in the short-run as they have pre-signed contracts. Therefore, the results reveal that the reduction of NTMs does not have a substantial impact on production and trade in the short-run. Another reason is that the model assumes that capital cannot be changed while labour is a variable input in the short-run, although both inputs can be varied in the long-run. According to trade theory, since both inputs can freely move across the sectors in the long-run, the reduction of NTMs induces a more efficient reallocation of resources in the long-run than in the short-run. Hence, the impact on production and exports is higher in the long-run.

The study corroborates trade theory in that exports of processed food will increase more in the long-run relative to imports. This is mainly due to the expectations that NTM reductions can worsen the terms of trade (i.e., pre-tariff prices of the imported good increase as demand for it increases), but lead to better resource allocation in the liberalising country.

Kee et al. (2009) have stressed that NTMs do not have a significant impact on an imported necessity good in an importing country. However, this is not the case in Malaysia. The simulation findings suggested that the NTM policy change has a substantial impact on imported processed food especially under the AS scenario with imports increasing by more than 20 per cent in both the short- and long-run.

This study has also found that the impact of NTM reduction is uneven across food sub-sectors. In the long-run, the dairy products sub-sector gains the most in terms of production and exports, followed by bakery products and animal feeds. This is mainly because these sub-sectors have lower numbers of NTMs relative to other food sub-sectors (see Table 4.6). However, the NTMs in these sectors are very restrictive (see Appendix C) and therefore experience a greater impact from the reduction of NTMs. Furthermore, these sub-sectors are highly dependent on imported inputs for their production processes (MIDA, 2018). The reduction of NTMs makes the prices of imported goods cheaper and therefore also increases the competitiveness of sub-sectors that are highly dependent on imported inputs.

The simulation results indicated that the dairy products sub-sector benefits the most with output and exports increasing more than 30 percent and 150 percent respectively in the long-run. In line with these findings, Tao, et al., (2016) claims that the implementation of NTMs in the Chinese dairy market caused unnecessary distortion of this market, and therefore recommended less regulation of dairy imports into China. He argues that NTMs applied to China's dairy imports may result in lower competitiveness of China's dairy producers and lower efficiency of resource reallocation in domestic dairy production. These conclusions are based on this study's findings – NTM reduction is beneficial to the food processing sector not only because it can increase imports of dairy products to meet local demand, but it can also benefit domestic producers through lower import prices of intermediate goods used in production.

**5.6 Summary**

The food processing sector in Malaysia is an import intensive sector. It is therefore not surprising that the government continues to introduce policies to promote the domestic food industry and to encourage the growth of food exports. Similar to most other countries, Malaysia is concerned over the quality of food from other countries, and continues to prevent imports of unsafe items. It is for this reason that NTMs dominate in this sector. However, the system of food safety is complex as it covers the whole supply chain. It starts with inputs (e.g., pesticides and fertilizers), to fisheries and farms, to primary (i.e., dairies, grain mills, and abattoirs), secondary processors (i.e., freezing, brewing, canning, drying), to distributors and to food caterers and retailers. Meeting the requirements of NTMs is labour and resource intensive and therefore costly. Such high compliance costs to producers in turn affect their production cost and competitiveness. The Malaysian government is therefore looking to reduce compliance costs (MPC, 2018) in order the foster the growth of this sector. This study's analyses of the impact of a reduction of NTMs on this sector is therefore highly relevant.

This chapter provides answers to the first research question as to how a reduction in NTMs in the food processing sector impacts food production and trade in Malaysia. A subsidiary question is, are the effects homogeneous across the food processing sub-sectors? This chapter begins with a development of policy scenarios that are used to answer the research questions. Three scenarios are developed, namely, baseline, MS and AS. The next section discusses the findings pertaining to the short- and the long-run impacts of reductions in NTMs on production and trade of the food processing sector. The third section discusses the results.

The simulations were conducted to cover both the whole food processing sector and its sub-sectors. Overall, it is found that reductions in NTMs increase food production and trade in both the short- and long-run under both the MS and AS scenarios. The results suggest that NTMs in the food processing sector in Malaysia are highly restrictive so that the magnitude of the change in production and trade after the NTM cuts is substantial. Furthermore, the results of the sub-sector analyses clearly show that there are uneven effects from the reduction in NTMs on production and trade for processed food. For instance, dairy products, bakery products and animal feed sectors gain more relative to other sub-sectors. Given that these sectors that are highly dependent on imported inputs in their production, they obviously benefit the most because they can gain access to cheaper imported inputs to increase their competitiveness in the international market.

The study supports a reduction of NTMs in the food processing sector to enhance production and trade. However, it is clearly not an option to completely do away with NTMs, as some of them are necessary and legitimate instruments that ensure food safety and quality of food. The positive gains in trade reflects that the plausibility of existing restrictive (high trade costs) or protectionist NTMs (that have not been identified) in this sector.

# CHAPTER 6: IMPACT OF NTMs REDUCTION ON THE LABOUR MARKET

## 6.1 Introduction

The objective of this chapter is to present the results of a policy simulation showing the effects of the reduction of NTMs in the food processing sector on labour. Three variables – employment (labour demand), wages and wage inequality –are measured in order to determine the impact of NTMs reduction. Ng (2013) assumed that all labour is Malaysian in her study of the impact of tariff liberalisation on the labour market in Malaysia using CGE modelling. But this study takes local (Malaysian) and foreign labour into consideration. Furthermore, this study divides labour into 3 types, namely, skilled, semi-skilled and unskilled labour.

The chapter begins with a review of the impact of the reduction of NTMs on employment in the food processing sector. The impact of NTMs cut is described in terms of its effect on overall employment, and disaggregated by composition of employment in this sector, as well as its effect on its sub-sectors. The second section presents the impact of NTMs cut on wages. The third section describes the impact on wage inequality in the food processing sector. The final section discusses the impact of NTMs reduction on the labour market. The policy simulation carried out in the study has already been discussed in Chapter 5.

## 6.2 Impact on Employment in Food Processing

The baseline simulation for employment in the food processing sector is presented in Table 6.1. Total employment in the food processing sector before the reduction of NTMs was 198,540. The baseline simulation reveals that this sector has relatively less skilled and semi-skilled labour compared to unskilled labour. The data show that about 7 per cent and 17 per cent of the total employment in this sector are skilled and semi-skilled labour respectively, while 76 per cent of the total employment in this sector are unskilled labour. The baseline data also confirm that this sector's productive activities are heavily dependent on unskilled labour. There is therefore low productivity, a lack of administration and managerial skills, and low levels of creativity and innovation needed to compete internationally.

Labour in this sector comprises both local and foreign workers. The supply of local labour is insufficient to meet overall demand, requiring the use of guest workers from overseas, almost all of which is unskilled making up 99 per cent of the total foreign labour force in this sector. The employment of such workers in this sector is distributed unevenly across all sub-sectors. For instance, the oils and fats sector has the largest share of foreign workers – 26 per cent of total employed in this sector. On the other hand, the lowest share of foreigners is in the preservation of the vegetables and fruits sector – 2 per cent of total employed.

In the general equilibrium model, all markets will change simultaneously due to a policy change. In this study, NTMs cut will not only affect the demand for imported final goods, but also for imported inputs. Consequently, this affects the supply of domestically produced goods, and the demand for factors in all activities. In this way, this analysis is able to identify who benefits and who loses from the NTMs policy change. This study also analyses the impact of reducing NTMs on local and foreign labour. It allows us to identify whether the local labour benefit from a NTM reduction policy change compared to foreign labour.

**Table 6.1: Baseline Simulation for Employment in Food Processing Sub-Sectors**

| Sector | Skill groups | | | | | |
|---|---|---|---|---|---|---|
| | LLAB1 | LLAB2 | LLAB3 | FLAB1 | FLAB2 | FLAB3 |
| **Meat & meat production** | 479 | 1378 | 4146 | 9 | 17 | 2138 |
| **Preservation of seafood** | 681 | 1287 | 7903 | 15 | 82 | 4962 |
| **Preservation of fruits & vegetables** | 380 | 566 | 1906 | 4 | 8 | 1023 |
| **Dairy production** | 1094 | 2702 | 6042 | 314 | 547 | 2705 |
| **Oils & fats** | 3209 | 10467 | 24387 | 52 | 344 | 14069 |
| **Grains mills** | 682 | 1510 | 5640 | 7 | 3 | 3968 |
| **Bakery products** | 2239 | 4920 | 19876 | 38 | 136 | 7642 |
| **Confectionery** | 729 | 1698 | 5184 | 9 | 6 | 2631 |
| **Other food processing** | 2693 | 4974 | 17487 | 41 | 61 | 6033 |
| **Animal feeds** | 457 | 1151 | 2270 | 32 | 57 | 1659 |
| **Beverage** | 1152 | 2153 | 6509 | 18 | 1 | 1958 |

Note: LLAB1 = Local skilled labour
LLAB2 = Local semi-skilled labour
LLAB3 = Local unskilled labour
FLAB1 = Foreign skilled labour
FLAB2 = Foreign semi-skilled labour
FLAB3 = Foreign unskilled labour

Source: Computed by author.

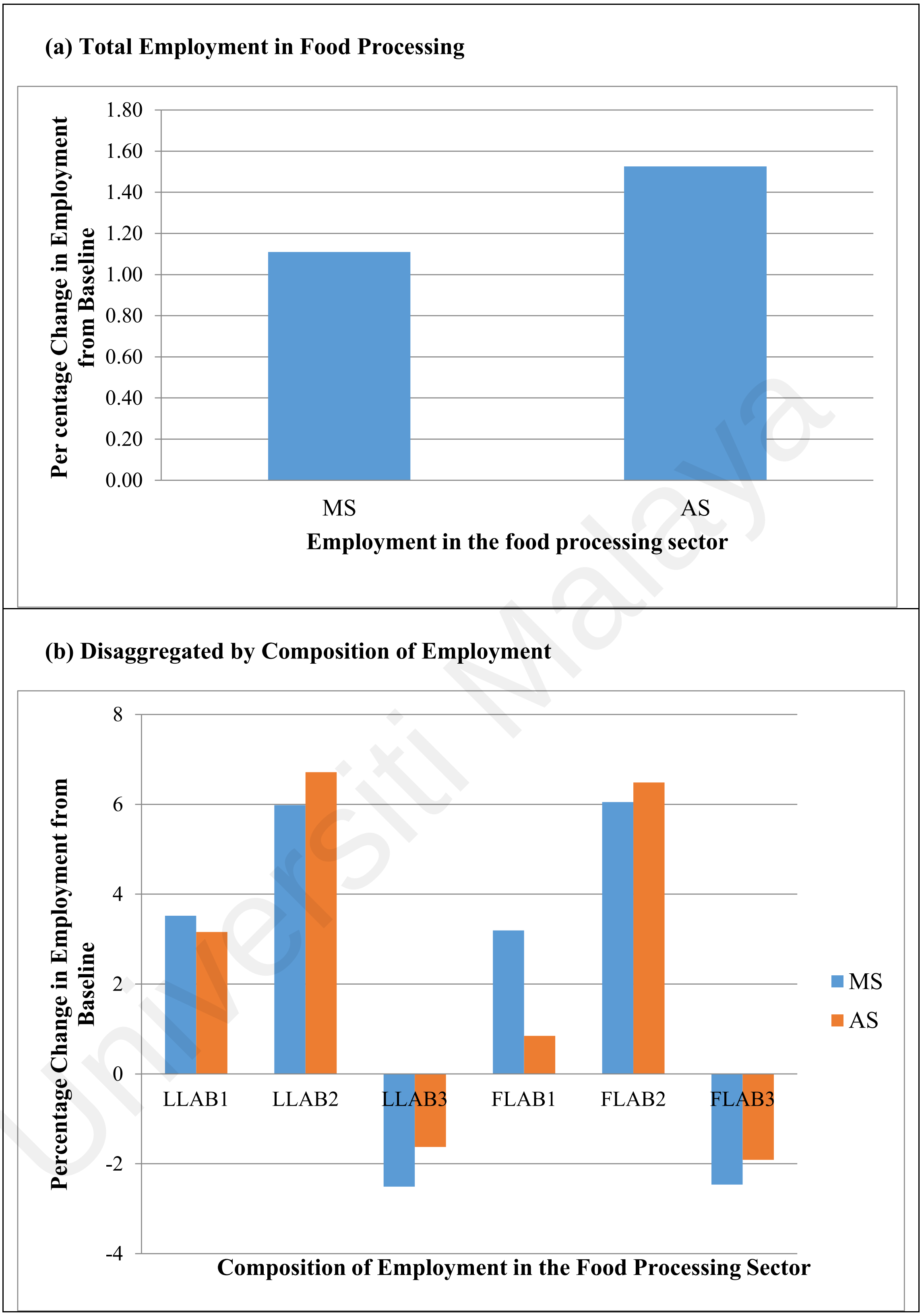



**Figure 6.1: Short-Run Impact of Reductions in NTMs on Employment in Food Processing**

Source: Computed by author.

The study shows that a reduction of NTMs in the food processing sector raises its total employment by 1.1 per cent and 1.5 per cent under the MS and AS scenarios respectively, in the short-run (see Figure 6.1(a)). In the long-run total employment rises considerably – at a rate more than 14 per cent greater than the baseline under both MS and AS scenarios (see Figure 6.2 (a)).

Although total employment in this sector increased under both the MS and AS scenarios in the short-run and the long-run, not all types of labour benefit from this policy change. We can see from Figure 6.1 (b), local and foreign semi-skilled labour benefit the most from this policy change in the short-run. Employment rises by 6 per cent and 6.5 per cent under both the MS and AS scenarios, respectively. But both local and foreign unskilled labour do not benefit from NTMs reduction. Employment of local and foreign unskilled labour dropped by about 2.5 per cent and 1.6 per cent under the MS and AS scenarios respectively.

In the long-run, the effect of NTMs reduction generates employment gains for all skill groups, except for foreign skilled labour (see Figure 6.2 (b)). The employment for local semi-skilled labour increased the most (17 per cent and 18 per cent under the MS and AS scenarios respectively). It is followed by foreign unskilled labour (which increases by more than 16 per cent for both scenarios).

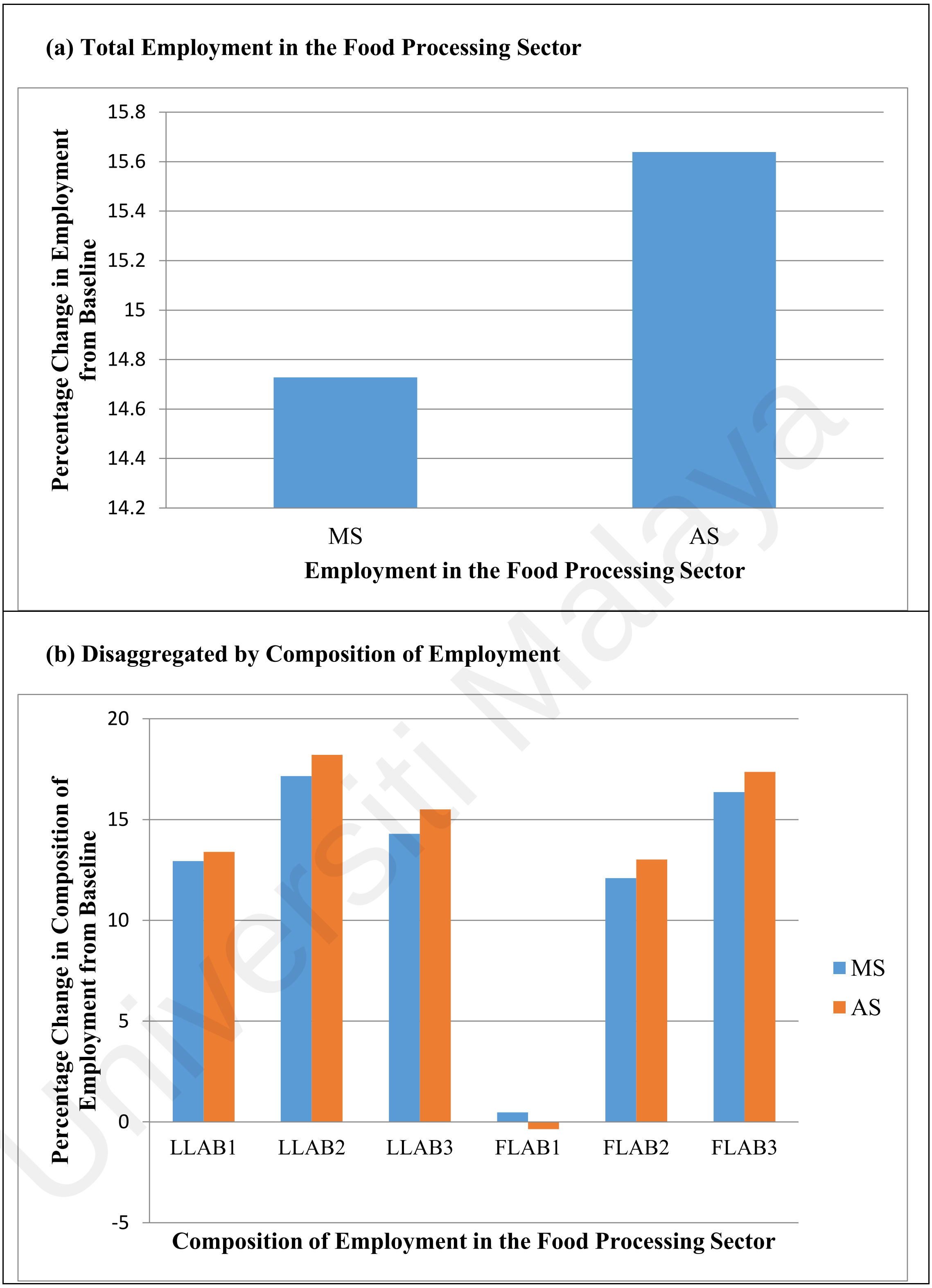



**Figure 6.2: Long-Run Impact of Reductions in NTMs on Employment in Food Processing**

Source: Computed by author

Tables 6.2 and 6.3 summarise the impact on employment in food processing sub-sectors as a result of the reduction of NTMs. Sectoral specific analysis is important as it can provide a clear picture that shows whether labour in specific sub-sectors gain or are adversely affected by the policy change. With such information, better and more effective policies at the sub-sectors specific can be recommended.

Table 6.2 reports the results under the MS scenarios. The simulation illustrates that the impact of the reduction of NTMs on employment varies across all sub-sectors in both the short- and long-run. The demand for local and foreign skilled and semi-skilled labour has a positive response to NTMs reduction across all food processing sub-sectors in the short-run. Conversely, the demand for unskilled labour decreases across all sub-sectors. In the short-run, the highest increase in employment for local and foreign skilled labour – amounting to 5.7 per cent and 6.1 per cent respectively – takes place in the oils and fats sector. At the same time, local and foreign semi-skilled labour supply increases by 7.6 per cent and 7.7 per cent respectively. The simulation results also show that employment for local and foreign unskilled labour is least affected by NTMs reduction with a 0.8 per cent and 0.9 per cent decrease in employment in the oils and fats sector respectively.

In the long-run, the impact on employment is considerably larger in most sub-sectors. Employment increases for all skill groups, ranging between 0.6 per cent and 39.4 per cent across almost all sub-sectors. The highest increase in employment was found in the oils and fats sector – around 38 per cent. Skilled labour in this sector benefits the most from the NTMs policy change. Employment for all skill groups in the dairy, bakery products and animal feeds sub-sectors are adversely affected in the long-run. Employment decreases in these sectors by 3.1 per cent to 22.4 per cent. It was expected that employment in the dairy product sector would experience a positive gain, as this sector had the highest rise in production and exports in the long-run. Surprisingly, the simulation results show the opposite – employment in the dairy product sector experienced the greatest negative impact – decreasing between 21.7 per cent and 22.4 per cent. In this case, the demand for semi-skilled labour decreased the most, followed by the unskilled and skilled labour.

Results under the AS scenario are summarised in Table 6.3. Although this study repeated the simulation experiment by scaling up the NTMs cut to 50 per cent, the results indicate that the impact was proportionately less than that of the 10 per cent cut in both the short- and long-run. Generally, the impact under the AS scenario is roughly similar to the impact under the MS scenario, with the exception for employment in the animal feeds sector in the short-run. Employment for all skills groups in this sector experienced a negative impact in the short-run as a result of NTMs reduction. The fall in employment ranged from 5.5 per cent to 13.8 per cent in the short-run.

In the long-run, the impact on employment was found to be greater than in the short-run. As under the AS scenario, employment across all sub-sectors increases except in the dairy products, bakery products and animal feeds sub-sectors. Employment in the oil and fats sector experienced the greatest gains, while the most adversely affected by the NTMs cut is the dairy product sector. Foreign labour gained slightly more than local labour under both the MS and AS scenarios, in both the short-run and the long-run.

**Table 6.2: Impact of NTMs Reduction (MS Scenario) on Employment in Food Processing Sub-Sectors (% deviation from baseline)**

| Sector | MS scenario | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Short run** | | | | | | Long run | | | | | |
| | LLAB1 | **LLAB2** | **LLAB3** | **FLAB1** | **FLAB2** | **FLAB3** | LLAB1 | **LLAB2** | **LLAB3** | **FLAB1** | **FLAB2** | **FLAB3** |
| **Meat & meat production** | 3.4 | 5.3 | -3.0 | 3.8 | 5.4 | -3.0 | 2.0 | 1.3 | 1.4 | 2.3 | 1.3 | 1.5 |
| **Preservation of seafood** | 4.5 | 6.5 | -1.9 | 4.9 | 6.5 | -2.0 | 26.8 | 25.9 | 26.0 | 27.1 | 25.9 | 26.1 |
| **Preservation of fruits & vegetables** | 4.9 | 6.8 | -1.5 | 5.3 | 6.9 | -1.6 | 27.2 | 26.3 | 26.4 | 27.5 | 26.3 | 26.5 |
| **Dairy production** | 3.2 | 5.1 | -3.1 | 3.6 | 5.2 | -3.2 | -21.9 | -22.4 | -22.3 | -21.7 | -22.4 | -22.3 |
| **Oils & fats** | 5.7 | 7.6 | -0.8 | 6.1 | 7.7 | -0.9 | 39.1 | 38.1 | 38.2 | 39.4 | 38.1 | 38.4 |
| **Grains mills** | 2.5 | 4.4 | -3.8 | 2.9 | 4.5 | -3.9 | 1.3 | 0.6 | 0.7 | 1.5 | 0.6 | 0.8 |
| **Bakery products** | 3.1 | 5.0 | -3.2 | 3.5 | 5.1 | -3.3 | 3.4 | -4.0 | -4.0 | -3.1 | -4.1 | -3.9 |
| **Confectionery** | 3.3 | 5.2 | -3.0 | 3.7 | 5.3 | -3.1 | 11.9 | 11.2 | 11.3 | 12.2 | 11.1 | 11.4 |
| **Other food processing** | 3.2 | 5.1 | -3.2 | 3.6 | 5.2 | -3.2 | 15.0 | 14.2 | 14.3 | 15.3 | 14.2 | 14.4 |
| **Animal feeds** | 1.0 | 2.9 | -5.2 | 1.4 | 3.0 | -5.3 | -9.2 | -9.8 | -9.7 | -8.9 | -9.8 | -9.6 |
| **Beverages** | 2.7 | 4.7 | -3.5 | 3.2 | 4.7 | -3.6 | 2.5 | 1.8 | 1.9 | 2.8 | 1.8 | 2.0 |

Source: Computed by author

**Table 6.3: Impact of NTMs Reduction (AS Scenario) on Employment in Food Processing Sub-Sectors (% deviation from baseline)**

| Sector | AS scenario | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Short run | | | | | | Long run | | | | | |
| | LLAB1 | LLAB2 | LLAB3 | FLAB1 | FLAB2 | FLAB3 | LLAB1 | LLAB2 | LLAB3 | FLAB1 | FLAB2 | FLAB3 |
| **Meat & meat production** | 2.5 | 4.4 | -3.8 | 2.9 | 4.5 | -3.9 | 1.0 | 0.3 | 0.4 | 1.3 | 0.2 | 0.5 |
| **Preservation of seafood** | 5.9 | 7.9 | -0.6 | 6.4 | 8.0 | -0.6 | 27.7 | 26.8 | 26.9 | 28.1 | 26.8 | 27.1 |
| **Preservation of fruits & vegetables** | 10.9 | 12.9 | 4.1 | 11.3 | 13.0 | 4.0 | 34.3 | 33.3 | 33.5 | 34.7 | 33.3 | 33.6 |
| **Dairy production** | 4.8 | 6.8 | -1.6 | 5.3 | 6.9 | -1.7 | -20.2 | -20.7 | -20.7 | -19.9 | -20.8 | -20.6 |
| **Oils & fats** | 6.2 | 8.2 | -0.3 | 6.6 | 8.3 | -0.4 | 39.8 | 38.8 | 38.9 | 40.2 | 38.8 | 39.1 |
| **Grains mills** | 1.2 | 3.1 | -5.0 | 1.6 | 3.2 | -5.1 | 0.4 | -0.3 | -0.2 | 0.7 | -0.3 | -0.1 |
| **Bakery products** | 4.3 | 6.2 | -2.1 | 4.7 | 6.3 | -2.2 | -2.2 | -2.9 | -2.8 | -1.9 | -2.9 | -2.7 |
| **Confectionery** | 6.0 | 8.0 | -0.5 | 6.4 | 8.1 | -0.6 | 17.1 | 16.2 | 16.3 | 17.4 | 16.2 | 16.5 |
| **Other food processing** | 5.0 | 7.0 | -1.4 | 5.5 | 7.1 | -1.5 | 16.9 | 16.0 | 16.1 | 17.2 | 16.0 | 16.2 |
| **Animal feeds** | -7.3 | -5.6 | -13.0 | -6.9 | -5.5 | -13.0 | -13.8 | -14.4 | -14.3 | -13.5 | -14.4 | -14.2 |
| **Beverages** | 6.9 | 8.9 | 0.4 | 7.4 | 9.0 | 0.3 | 5.5 | 4.7 | 4.8 | 5.8 | 4.7 | 5.0 |

Source: Computed by author

### 6.3 Impact on Wages

The model in this study assumes that in the short-run, firms and workers will not negotiate for higher wages, hence the wages remain constant in the short-run.

**Table 6.4: Impact of a Reduction in NTMs on Wages (% deviation from baseline)**

| Types of labour | MS | AS |
|---|---|---|
| **LLAB1** | 2.05 | 2.06 |
| **LLAB2** | 5.28 | 5.29 |
| **LLAB3** | -6.18 | -6.16 |
| **FLAB1** | 2.15 | 2.17 |
| **FLAB2** | 5.29 | 5.31 |
| **FLAB3** | -6.13 | -6.13 |

Source: Computed by author.

Table 6.4 reports the impact of a reduction of NTMs on wages in the food processing sector in the long-run. It can be seen that there is only marginal increases in wages by about 0.4 per cent (average increased in total wages) under both the MS and AS scenarios in the long-run. In terms of composition of labour, it was envisaged that wages for both local and foreign skilled and semi-skilled labour would gain from increased employment. This was borne out by the simulations: wages for both local and foreign semi-skilled labour increased by more than 5 per cent under both the MS and AS scenarios. It was also expected that there would be an increase in wages for unskilled labour as a result of an increase in employment of this type of labour. Surprisingly, the simulation indicates that wages for both local and foreign unskilled labour decreased under both the MS and AS scenarios. This appears to reflect that the three skill groups have different bargaining power.

## 6.4 Wage Inequality in Food Processing

According to H-O-S theory, trade liberalization reduces wage inequality between skilled and unskilled labour in developing countries. Thus, this section aims to evaluate the impact of reduction of NTMs on wage inequality in the food processing sector. The baseline wage inequality ratio for local labour and foreign labour under the MS and AS scenarios are presented in Figure 6.3. In terms of local labor wage inequality, the reduction of NTMs in the food processing sector contributes to a widening of the wage disparity between the skilled and unskilled, and also between the semi-skilled and unskilled labour (see Figure 6.3 (a)). The greatest increase in wage inequality was experienced by skilled and unskilled labour, followed by that between semi-skilled and unskilled labor. In this case the wage inequality ratio increased from 7.09 to 7.57 and from 2.09 to 2.30 respectively. However, the reduction of NTMs in the food processing sector helped to enhance wage equality between the skilled and semi-skilled labour: the ratio fell slightly from 3.40 to 3.31. It is noted that both the MS and AS scenarios yielded the same results.

Unlike wages for local labour, the highest wage inequality ratio for foreign labour is between semi-skilled and unskilled labour at 10.6 under the baseline scenario. The lowest wage disparity ratio was between the skilled and semi-skilled labour, which was 0.71 under the baseline scenario (see Figure 6.3 (b)). The reduction of NTMs only benefits wages for skilled and semi-skilled labour. It can be seen from Figure 6.3 (b) that the difference between the skilled and semi-skilled wages was 0.71 compared to 0.68. Wage gaps between semi-skilled and unskilled labour, and also skilled and unskilled labour, increased after the reduction of NTMs. The MS and AS scenarios yielded similar impacts.

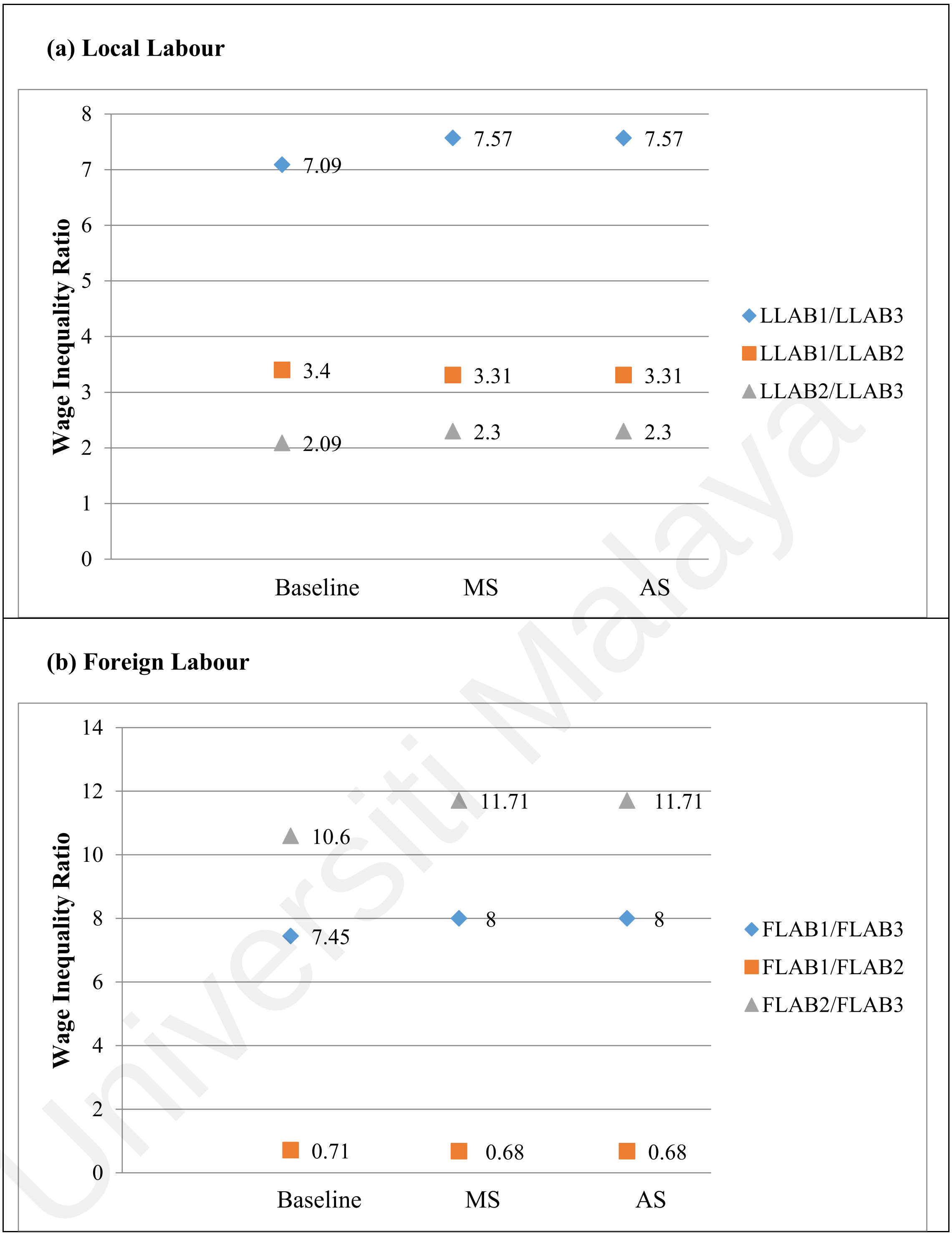



**Figure 6.3: Impact of Reductions in NTMs on Wage Inequality in Food Processing**

Source: Computed by author

## 6.5 Discussion of Findings

This section draws together the results obtained from the previous sections. The reduction of NTMs in the food processing sector is beneficial for overall employment in this sector in the short- and long-run. This is due to two factors. Firstly, trade costs reduce as a result of NTMs cut. Firms are thus able to gain access to cheaper imported inputs, so that their cost of production decreases. Lower cost of production encourages firms to employ more labour to produce more. Secondly, the reduction in NTMs encourages trade (exports and imports) in both the short- and long-run. In turn, employment growth flows from growth in trade. Firms are able to achieve larger market shares through improved competitiveness of firms, which leads to employment increases. The findings are in line with a number of previous studies (Francois, el at., 2009; OECD, 2011). The long-run impact on employment is greater than that in the short-run. This is mainly due to the fact that the impact on production and exports is greater in the long-run than that in the short-run.

It could be expected that wages would increase as employment in the food processing sector increases. However, the model assumes that wages remain constant in the short-run as firms and labour are assumed not to have time to negotiate for higher wages. Leonardi and Meschi (2016) found that labour is able to move across local areas. This process will continue until wages are equalized. Therefore, NTMs will have an impact on employment, but no effect on wages in the short-run.

The impact of NTMs on employment is greater than wages in the long-run. Labour earns the same market returns regardless of where they are employed, as the model assumed that labour can freely move between sectors. These results are similar to the findings of Barba Navaretti et al. (2017). Furthermore, the findings indicate there is little impact on wages, which increase by about 0.4 per cent in the long-run. The marginal increase in wages following the cuts in NTMs reflect the problem of wage stagnation (Nambiar, 2017) that has long characterized the Malaysian manufacturing labour market. Another contributor to this is the import intensive of the Malaysian food processing sector.

Trade does not significantly impact factor prices in import-intensive industries. This study observes that a reduction in NTMs increases trade and eventually raises wages. This is similar to the findings from a number of other studies (Haskel & Slaughter, 2003; Stone & Cepeda, 2012), which show that NTMs play a significant role in the trade-wages link. They found a negative relationship between wage changes and imports for those industries that were subject to a large number of NTMs. Conversely, this study found that the relationship between wage change and imports is positive, reflecting, it seems, the large number of NTMs that have been applied to Malaysia's food processing sector.

Trade theory also predicts that trade liberalization encourages the reallocation of resources across sectors. That is, the relative demand for different types of labour will be changed as will their relative returns. This study affirms the predictions of trade theory in this respect. The reduction of NTMs induces firms to change the composition of labour towards more skilled and semi-skilled in the short-run. However, it adversely affects the employment of unskilled labour in the short-run. This is due to firms changing the labour mix to adapt the production process to new NTMs requirements. Similar results were found by Fontagné et al. (2015), who showed that firms are forced to change the composition of labour in response to changes in NTMs. In the long-run, demand for unskilled labour (abundant labour) increases more, followed by semi-skilled and skilled labour. This may be due to the nature of the industry, which utilises a low level of technology. The reduction in NTMs also triggers greater local labour gains relative to foreign labour.

Although total employment in the food processing sector increases, not all sub-sectors gain. NTM cuts cause dairy products, bakery products and animal feeds sub-sectors to increase production and raise export growth at a rate greater than import growth. However, in the long-run, employment shrinks. Two reasons can be cited to explain this outcome. Firstly, all factors of production can freely move across all sectors and therefore a NTM reduction triggers reallocation of resources across sectors. This may induce these sectors to achieve optimal input mix by reducing labour demand and increasing the demand for capital in order to support higher production and exports. Fontagné et al. (2015) argue that firms may substitute away from expensive labour using relatively cheaper capital in the long-run as a result of the change in NTMs. Secondly, trade theory predicts that an increase in trade would have a greater adverse effect on employment in import intensive sectors relative to employment in export-oriented sectors. These findings therefore follow trade theory in that the food processing sector is highly import intensive and has attracted highly restrictive NTMs.

Additionally, this study observes a disparity in the way wages change for skilled labor. An upward trend in wage growth for skilled labor could have been expected as the employment of skilled labor increased. Surprisingly, the simulation results show that skilled and semi-skilled wages increase while unskilled wages decline. This is plausible since the NTM cut increases employment for unskilled labour the most, it leads to a decline in their returns. In terms of factor returns, unskilled labour appears to be the loser in this case, while the winners are the skilled and semi-skilled labour in relative terms. This finding runs counter to the prediction of the H-O-S theory in that trade liberalization for a developing country will cause unskilled labour (abundant labour) to be winners, while the losers should be the skilled and semi-skilled labour. This study's findings could be explained in terms of unskilled labour having a weaker bargaining power relative to the skilled and semi-skilled labour (Raza, et al., 2016). Further, Malaysia is a semi-skilled country. Of course employment is also not the only factor to determine wages. Other factors such as price levels, productivity of labour and import share may contribute to the change in wages.

As mentioned previously, the reduction in NTMs increases skilled and semi-skilled wages, but decreases unskilled wages. This in turn reduces wage equality between skilled and unskilled labour, although the impact is minimal. This is inconsistent with the prediction of the H-O-S theory. The estimated results agree with some other studies (Barba Navaretti et al., 2017; Baghdadi et al., 2016). Baghdadi et al. (2016) for example, stresses that price changes induced by NTMs raise wage inequality. Barba Navaretti et al. (2017) also find that wage distribution is affected by NTMs. They argue that NTMs have little impact on skill premiums, which in turn have a limited impact on wage inequality. These results are inconsistent with the studies of Verhoogen (2008) and Bustos (2011), who argue that the implementation of NTMs increases the demand for skilled labour. Thus, wage equality between skilled and unskilled labour reduces.

### 6.6 Summary

This chapter offers answers to the second set of research questions. They are: how does a reduction in food processing sector NTMs affect employment, wages and inequality? Is the impact disproportionate across the food processing sub-sectors? Does a reduction of NTMs influence the composition of labour in the food processing sector? Does local labour benefit from the NTMs policy change compared to foreign labour in this sector? This chapter begins with outlining the short-and the long-run impacts of a reduction in NTMs on employment, wages and wages inequality in the food processing sector under baseline, MS and AS scenarios. The second section of the chapter discussed the results. Highlighted are the impacts of a reduction in NTMs on overall employment in the food processing sector, as well as on the employment in its sub-sectors. Furthermore, the impact on employment and wages in all labour skill groups is described. As well, the impact on local and foreign labour is discussed in this chapter.

The study concludes that the reduction of NTMs in the food processing sector is beneficial to overall employment, in both the short- and long-run. However, the impact on employment is less equitably spread across all the sub-sectors. Importantly, the study finds that all types of labour are able to reap benefits from the reduction in NTMs. In particular, unskilled labour gains more relative to other skills in the long-run. The effects of a reduction of NTMs can also play a role in developing long term trade policy as the impacts are more substantial in the long run.

The simulations indicate that market mechanisms do not prevent increased wage inequality, even though wages overall have increased. This is due to the fact that the impact on wages is unevenly distributed. NTMs reduction favours employment of local labour over foreign labour. However, the changes in their returns are almost the same. But due to a lack of supply of local labour, foreign labour is used to fill such structural gaps in the labour market. They generate positive productivity effects and enhance the competitiveness of key manufacturing industries in the international market (World Bank, 2014). This policy outcome is thus contrary to the government's objective of restricting the use of foreign labour.

This study repeated the simulation experiment by scaling up the NTMs cut to 50 per cent. However, the degree of the impact on employment and wages is not greatly different to that of a 10 per cent cut in NTMs. It is also found that the changes in NTMs should be implemented at the sectoral level rather than by the same rate in all sub-sectors simultaneously. The policy implications of these findings will be discussed in detailed in the final chapter of this thesis.

# CHAPTER 7: WELFARE IMPACT OF A REDUCTION IN NTMs

## 7.1 Introduction

This chapter assesses the impact of the reduction of NTMs on welfare. Welfare is a measure of benefit that includes social well-being factors, as well as economic and monetary factors. In this study, the Hicksian EV is used to measure a change in welfare in the short- and long-run following a reduction of NTMs in the food processing sector.

The EV estimates the amount of income that would have to be taken away from (or given to) the economy to leave it as well off as before the policy change. In other words, it determines how much of the income has to compensate a consumer in order to forgo the policy change. Similar simulation exercises (baseline, MS and AS) are conducted as in previous analysis.

## 7.2 Impact on Welfare

This section discusses the impact of a reduction of NTMs in the food processing sector on welfare. The changes in welfare in the short- and the long-run under both the MS and AS scenarios are illustrated in Figure 7.1.

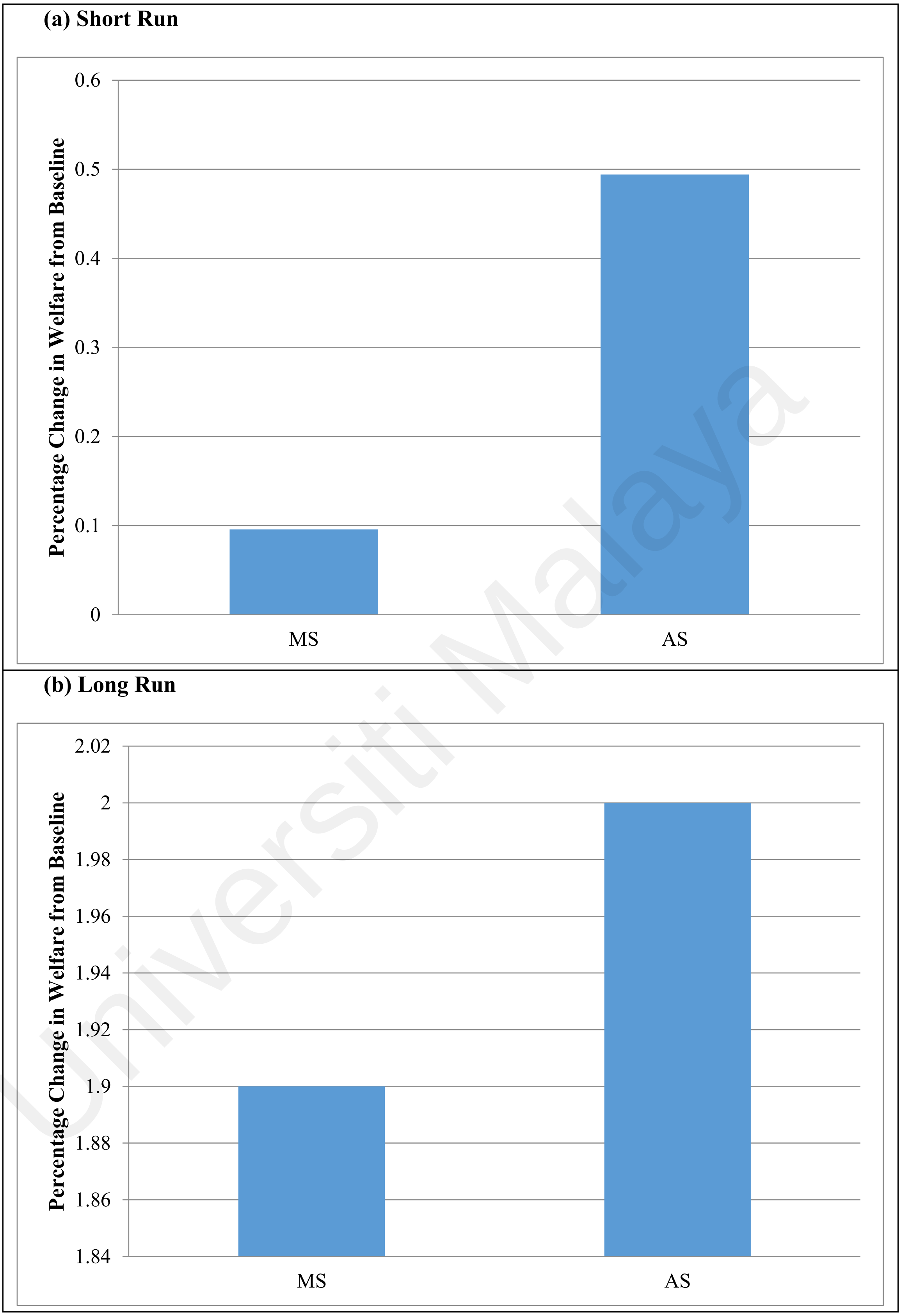



**Figure 7.1 Impact of Reductions in NTMs on Welfare**

Source: Computed by author

It is clear that the simulation results confirm that a reduction of NTMs in the food processing sector leads to positive changes in welfare in both the short-run and the long-run under the MS and AS scenarios. The results show that long-run effect (about 2 per cent) is greater than short-run (less than 1 per cent). The impacts in the short- and long-run are minimal, being in a range of 0.1 per cent to 2 per cent. The results thus confirm that welfare growth is almost the same under both the MS and AS scenarios.

## 7.3 Discussion of Findings

According to economic theory, the effect of NTMs on welfare is ambiguous. In the case of informational asymmetries or negative externalities, some NTMs can improve welfare, but they may restrict trade (Disdier & Marette, 2010; WTO, 2012). However, some NTMs may cause welfare losses (Ganslandt & Markusen, 2001; Treichel et al., 2012). A positive or negative welfare effect will depend on how NTMs address market failure, the types of NTM employed and other market-specific conditions.

Some NTMs increase trade costs as the importing country requires exporters to comply with the measures. On the other hand, they enhance consumer confidence, which helps to enhance the demand for the products and trade if compliance with the NTMs resolves uncertainty about the imported products' quality or safety. Thus, NTMs contribute to an increase in trade and welfare (Maertens et al., 2007; Maertens & Swinnen, 2009a). Similarly, Pienaar (2005) found that NTMs in the form of labeling requirements imposed on imported goods are able to improve welfare of the importing country as they provide all the necessary information to consumers. In other words, the benefits of trade and welfare effects of NTMs depend on whether they address market failures. Those NTMs that are mainly designed to defend domestic producers will bring a negative impact on trade and welfare in the importing country. On the other hand, if the NTMs are able to correct market failure, welfare can be expected to increase, although with uncertain effects on trade.

This study finds that the reduction of NTMs in the food processing sector contributes to welfare gains in both the short-and long-run. In the model, the impact of reducing NTMs on welfare is distributed through several channels. Firstly, consumption increases because of cheaper imported goods. Thus, the result implies that welfare has increased. Cheaper imports contribute to an increase in domestic production, especially for those sectors dependent on imported inputs. Additionally, competition in the domestic market increases as a result of the rising import volume. This contributes to a fall in domestic consumer prices. Thus, purchasing power and real incomes of consumers increase. According to Treichel et al. (2012), NTMs contribute to an increase in price, and thus may reduce consumers' welfare if those affected products are important to consumers' spending basket. As food products are necessities and they are important to consumers' spending baskets, a reduction of NTMs resulting in prices reductions, will correspondingly improves consumers' welfare.

Second, welfare gains resulting from lower compliance costs will in turn contribute to increases in exports and domestic production. This phenomenon, in turn, increases the factor price and encourages the reallocation of factors of production among sectors. As can be seen from previous chapters, the reduction of NTMs improves production, trade, employment and wages. Firms demand more labour to produce more products, resulting in the prospect of higher wage levels. The purchasing power of labour increases as a result of higher wages and lower prices, thus welfare is increased. The gains contributed by increased allocative efficiency reduce economic distortions. This result corresponds to the findings of Andriamananjara et al. (2004), Beghin et al. (2012) and Ando and Fujii (2001) that a reduction of NTMs contributes to welfare gains. Andriamananjara et al. (2004) stressed that the welfare gains imply that the allocative efficiency impact of a reduction of NTMs offsets any unfavorable terms of trade impact.

Third, given Malaysia is a small developing country, the reduction of NTMs is beneficial to the economy, as well as to welfare. This is consistent with the study of Ganslandt and Markusen's (2001), who find that the implementation of NTMs, particularly affects a small country, where both producers and consumers may lose. Thus, reducing NTMs can contribute to a strong increase in welfare.



## 7.4 Summary

This chapter answers the third research question: What is the impact of a reduction of food processing sector NTMs' on welfare? The study employs the EV to measure the change in welfare in the short-and the long-run resulting from the reduction of NTMs in the food processing sector.

The study finds that the reduction of NTMs improves welfare in the economy in both short- and long-run. However, the impact on welfare is minimal – 0.1 per cent to 2 per cent. The study also finds that the welfare gains are mainly due to cheaper prices, higher trade volumes, increased employment and higher wages.

# CHAPTER 8: CONCLUSION

## 8.1 Overview of Study

This study simulated the impacts of a reduction of NTMs on the food processing sector. The study has three objectives. First, it estimates the production and trade impacts of the reduction of NTMs on the food processing sector. Second, it simulates the employment, wages and inequality effects of NTMs reduction. Third, it simulates the welfare effects of a reduction in NTMs.

The empirical strategies involve several steps. First, this study employs the latest available 2010 I-O table, national accounts data and other supplementary data to construct the SAM for Malaysia. The study adopts the CGE model given its applicability to modeling the food processing sector in Malaysia. Second, three scenarios are constructed in order to run the simulations: baseline, MS and AS. Third, the baseline parameters and coefficients required for the implementation are based on the constructed database.

## 8.2 Major Findings

The core findings of the study are:

i. The reduction of NTMs in the food processing sector raises food production and trade in both the short- and long-run. Unlike the impact of tariffs, NTMs have a larger impact in the long-run, but a minimal impact in the short-run. This can be due variable lags. Further, the increase in exports of processed food is greater than the increase in imports of processed food. This is mainly due to the increase in competitiveness of Malaysia's domestic sector in the long-run, given producers can access cheaper imported inputs and also that real devaluation occurs in the long-run. Although the overall processed food production and trade has increased, the impact of a reduction of NTMs are found to be unevenly distributed across its sub-sectors. Those sectors, such as dairy and bakery products, with very restrictive NTMs and high dependence on imported inputs, benefit the most relative to other sectors.

ii. Overall employment in this sector improved as a result of a reduction in NTMs, which also contributes to an increase in wages. It is noted that the impact on employment is unevenly distributed across all sub-sectors, and also among skill groups. For instance, labour in most sectors are winners as employment increases. While some sectors – dairy products, bakery products, and animal feeds sub-sectors- have reduced their dependency on labour. The oils and fats sector generated more job opportunities relative to other sectors, while labour in the dairy product sector experienced the most negative impact. Overall, the results show that the food processing sector increased its dependency on unskilled labour relative to other skills. The reduction of NTMs not only provides more job opportunities to local labour, but also for foreign labour. Although wages increased, the impact was minimal and wage inequality had not reduced. This is mainly due to the fact that the skilled and semi-skilled wages increased, while unskilled wages fell. It can therefore be concluded that the reduction of NTMs generates some winners and losers.

iii. The reduction of NTMs encouraged resource reallocation between sectors, as the model assumed full employment in the long-run. That is, there is no job creation in the economy as a whole. Thus, it is important to study the impact on overall welfare. In the case of a reduction of NTMs in the food processing sector, the welfare of the economy as a whole improved. This result suggests that some measures may still be pervasive. The impact on welfare was minimal in both the short-run and long-run. This can be due to the dominance of "quality" focused (TBTs and SPS) import measures relative to price (subsidy) or quantity (quota) based regulations in the food processing sector.

## 8.3 Policy Implications

This study has a number of findings which will be of interest to policy-makers, and particularly those involved in the food processing sector. Several of these are discussed below.

The NTMs in the food processing sector are mainly designed to protect the environmental provide product safety. However, they do affect trade costs and market access as NTMs are widespread, varied and complex. Producers need information about the requirements they must comply with. It is costly to adhere to the requirements. The cost of NTMs can be also due to misapplication of a regulation. These costs are in addition to the cost of compliance, all of which drive up the prices of products in international trade (Cadot et al., 2014). The general findings show that NTMs in the food processing sector are highly restrictive so that their reduction can be correspondingly highly beneficial to food production, trade, labour markets and consumer welfare. In this regard, understanding the costs associated with NTMs is important, as it can help firms comply with NTMs on a more cost-efficient basis. To do so, policy makers need to enhance the transparency of NTMs, and in so doing, contribute to equality of access and fairness in trade. For their part, policy makers require structured information on NTMs for policy design and regulatory cooperation at the national, multilateral as well as regional levels. This study provides such information.

This study also shows that a reduction of NTMs in the Malaysian food processing sector would make this sector more competitive in world markets and increase import competition leading to a reallocation of resources, an enhancement of firms' productivity and of growth rates. Yet, there is a risk that this sector may not be able to realize the benefits associated with the reduction of NTMs. As mentioned previously, a majority of the firms in this sector are SMEs. As such, they are facing production capacity constraints, have less advanced production technology and weaker infrastructure. Thus, policy makers should focus on improvement of the food processing sector's infrastructure. Further, there is a need for stronger incentives for producers to improve technology through education and training and use of R&D to generate innovations that will enhance their production competitiveness. In this way, the sector can better reap the benefits from a reduction in NTMs.

The food processing sector is heavily dependent on unskilled labour and as this study indicates, will continue to rely on unskilled labour after a reduction in NTMs. Up-skilling programs should therefore be provided in order to support efforts to expand market share and increase the quality of goods produced. Thus, the government can continue to improve and expand employment through education and training programs to ensure labour can meet the requirements of the growing food industry. The government should also look at policies that attract more foreign skilled labour instead of foreign unskilled labour. This would allow the industry to further develop their production capability and produce high value-added goods.

Another suggestion relates to the unevenly distributed impact of an NTM reduction across sub-sectors of the food processing sector. Policy makers clearly need to have a detailed understanding of the sub-sector impact of NTMs in order to design targeted policies for each sub-sector. This means that the government should focus on designing policies at a sectoral level, instead of reducing the NTMs by the same rate for all sub-sectors simultaneously.

## 8.4 Contributions of Study

To analyse the impact of a reduction of NTMs, the latest publication of NTM data obtained from the UNCTAD TRAINS is utilised. This set of data is matched with the AVEs of NTMs developed by Kee, et al., (2009). Further, this set of data forms a benchmark dataset incorporated into the CGE model.

The study contributes to the empirical literature by validating the impact of the reduction of NTMs in the food processing sector using the CGE modeling framework. Intrinsically, most of the existing studies have investigated this impact on an aggregate level; this study examines the impact on both the food processing sector, as a whole and its sub-sectors. The sectoral study of food processing is most relevant when considering the impact of streamlining NTMs, as it is the sector that is dominated by the highest number of NTMs in Malaysia. The quantitative inclusion of the impact on food processing sub-sectors *per se* also contributes to an enhanced knowledge for designing policy at the sub-sectoral level. The impacts in the short-run and long-run are analysed, so that long term policy can be designed to enhance the economy.

The study also contributes to the existing literature by introducing foreign labour into the modeling exercise. As a result, the impact of the reduction of NTMs on local and foreign labour is individually investigated. Relevant labour policy can be introduced in order to enhance the labour market's quality, growth and welfare. The study also provides guidelines to policy makers for the formulation of better policies in order to enhance general economic growth. This research is also likely to benefit organizations/firms in the food processing sector in devising growth strategies.

## 8.5 Limitations of Study

A CGE modeling is employed in this study given that it is able to simulate the effects of future policy changes that cannot be effected by other econometric estimation techniques. However, the model does have its weaknesses. Most importantly, the calibration is heavily based on the assumptions of the model. Thus, unlike other econometric models, the CGE model can be only used for simulation purposes, not for the forecasting. A further drawback is that while it can simulate what will happen if certain policy changes have been implemented, they do not produce real world results. Thus, the results need to be treated as econometric predictions rather than economic axioms.

Another limitation of this study is quantifying NTMs. They are all defined as non-price and non-quantity restrictions on the trade in goods, services, and investment. However, it is hard to quantify NTMs by definition, so that in order to incorporate them into the CGE model they are estimated in AVE terms. Due to data limitations, there are difficulties in estimating AVEs for econometric purposes for all processed foods at the six-digit tariff line level. Therefore, this study employed the data on the AVEs of NTMs developed by Kee at al. (2009), which do not disaggregate into individual NTMs. Thus, the effects of an individual NTM cannot be identified through the use of these AVEs.

### 8.6 Future Research

A useful further research step would be to generate AVEs for all goods in all 11 sub-sectors at the six-digit tariff line level based on the new estimated import demand elasticities. This would enable researchers to obtain considerably greater detail on the effects for each NTM type by splitting the overall effect of NTMs into individual effects. However, this is subject to availability of data relevant to the AVEs of NTMs. Researchers could also include skill-bias technology into the model. Such a modification would provide a useful point of comparison with this current study.

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