Trade Liberalization and Manufacturing Performance: The Case of Vietnam

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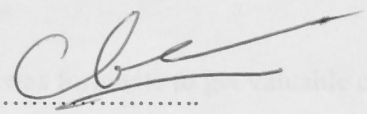
A thesis submitted for the degree of Doctor of Philosophy of
the Australian National University

October 2011

Declaration

I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institute of tertiary education. Any material previously published or written by another person is duly acknowledged in the text with appropriate referencing when being used.



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Son Ngoc Chu

October 2011

Acknowledgements

The writing of a PhD thesis has been a long, exciting and trying journey in my life. The completion of this work has been made possible with the professional and spiritual support and guidance from many people to whom I am indebted.

I am especially grateful to Associate Professor Ligang Song, my principle supervisor, for his helpful guidance, encouragement and support throughout the course of this study. His expertise and experience helped me to improve my research skills and shape the research topic. He was also always positive and encouraging in my difficult times and provided me with prompt feedback on my draft chapters. I am profoundly indebted to Professor Kaliappa Kalirajan, my panel supervisor, for his generous assistance, support and useful comments on my work. He was willing to meet and talk with me whenever I had a problem with my study. My discussions with him helped me to find suitable solutions for my research issues. My special thanks go to Professor Tom Kompas, my panel advisor, for his encouragement, inspiration and invaluable support during my research journey. His timely assistance was critical to the completion of my research.

I was fortunate to get valuable contributions from other academics to my work. I would like to express my sincere thanks to Professor Prema-Chandra Athukorala for his constructive and insightful discussions and help to find reference materials. I am grateful to Dr. Shiro Armstrong, as an academic and my friend, for his comments on my work and for spending time to discuss with me about the issues of the study. I wish to express my gratitude to academics and my fellow PhD scholars in the Crawford School of Economics and Government, ANU College of the Asia and Pacific for their valuable comments on my presentations in PhD seminars.

I was also fortunate to receive generous assistance from other staff members during my candidature. I wish to give my special thanks to Ms Robyn Walter for her continuous help, encouragement and crucial support. She very kindly gave a lot of her time to listen to my research and everyday problems and gave me good advice and sympathy. I am grateful to

Dr. Wendy Noble for her great help with writing skills. Her writing class is a memorable time for me. I would also like to thank Ms Maxine McArthur for her thorough copy editing of this thesis.

My work on the thesis would not be possible without the generous help from those who assisted in the process of data collection. In particular, I would like to thank Professor Nguyen Khac Minh at Hanoi National Economics University, Dr. Nguyen Thang and Mr. Nguyen Van Tien at Centre for Analysis and Forecasting (CAF), the Vietnamese Academy of Social Sciences (VASS), Mr. Nguyen Anh Duong at Central Institute of Economic Management (CIEM), Mr. Nguyen Dinh Thuy at the General Statistical Office (GSO) in Vietnam.

I wish to express appreciation to my friends, including among others Dr. Vu Quoc Ngu, Ms Le Ngan, Dr. Tran Thi Bich, Dr. Tran Quang Tien, Nguyen Thi Minh Hoa and Dinh Thu Huong. Their help and support in both academic and everyday life gave me strength and encouragement while writing this thesis.

I am indebted to the Ministry of Training and Education (MOET), the Vietnamese Government, for the scholarship to undertake my PhD research at the ANU.

Finally, but not least, thanks go to my whole family. My wife, Le Thi Thao has given me constant support and understanding. My wife and my daughter Chu Mai Phuong suffered through my stressful times, but their companionship and love encouraged me to pursue this study. My parents, brother and sister also have been an important source of moral support throughout the course of my doctoral research.

Abstract

Trade liberalization is often expected to play a key role in promoting the manufacturing performance of many developing countries, where industrialization is central to economic growth. In fact, a large and growing body of empirical literature exists on the contribution of trade opening to industrial growth and transformation. However, it is recognized that the impacts of trade liberalization are country-specific and the question of how manufacturing evolves under trade opening remains an issue of concern among policy makers in developing countries. This thesis aims to contribute to the empirical trade and growth literature by examining whether trade liberalization has improved manufacturing performance in Vietnam, an Asian transitional economy where extensive trade reforms have been conducted since 2000.

The thesis examines the relationship between trade liberalization and manufacturing performance in two aspects: output growth and structural transformation, and productivity performance. After undertaking a theoretical review of the main links underlying the relationship, the extent of trade liberalization is examined with a detailed review of trade reforms and estimation of measures of trade openness. The thesis investigates output growth and structural transformation by analyzing the growth and structural patterns of output, capital and employment in different phases of the trade regime. The impact of trade liberalization on productivity performance is examined at two levels with different approaches. At the four-digit industry level, the study adopts a two-step approach to evaluate the effects of trade liberalization on manufacturing productivity growth. The first step estimates total factor productivity (TFP) growth using the Tornqvist productivity index. In the second step, a panel data regression framework is used to examine the links between the TFP growth rates and trade policy variables and controlling for other key determinants of TFP growth. As a way of checking the robustness of trade liberalization impact, the firm-level analysis employs the stochastic production frontier framework to explore whether trade opening has increased the productive efficiency of existing firms. In addition, at both industry and firm levels, the role of institutional reforms in Vietnam is considered with different proxies.

The findings suggest that, under trade opening, manufacturing growth has been higher, more labor-intensive and export-oriented with a greater contribution to TFP growth. Importantly, the regression results indicate that reduction in trade protection and increased trade openness have stimulated manufacturing TFP growth, supporting the positive view in the trade and growth literature. Another key finding is that the impact of trade opening is significantly dependent on domestic market-oriented reforms, which appear to be a central feature of Vietnam's transitional economy. In addition, in response to increased pressure from foreign competition, manufacturing firms and industries appear to have managed to improve their productivity by exploiting Vietnam's comparative advantage, that is, using more unskilled labor and less capital. This would indicate that in the early years of trade liberalization, the efficiency gains rather than technological progress contributed more to manufacturing TFP growth. Overall, the analysis suggests the importance of relying on comparative advantages and the need to promote the accumulation of dynamic factor endowments for the long-term sustained growth of manufacturing productivity and output.

Table of Contents

List of Tables

List of Figures

List of Acronyms

ACAFTA	ASEAN-China Free Trade Agreement
AFTA	ASEAN Free Trade Area
APEC	Asia-Pacific Economic Cooperation Forum
APO	Asian Productivity Organization
BEC	Broad Economic Classification
CEPT	Common Effective Preferential Tariffs
CIE	Centre for International Economics
CIEM	Central Institute for Economic Management
CMEA	Council for Mutual Economic Assistance
CO	Certificate of Origin
CV	Coefficient of Variation
DAF	Development Assistance Fund
DAI	Development Associates, Inc.
EO	Export Orientation
EPZ	Export Processing Zone
FDI	Foreign Direct Investment
FE	Fixed Effects
FIE	Foreign-invested Enterprise
GSO	General Statistical Office
HCMSO	Hochiminh City's Statistical Office
HO	Heckscher-Ohlin

HS	Harmonized System
IE	Institute of Economics
IMF	International Monetary Fund
IO	Input-Output
IRS	Increasing Returns to Scale
IS	Import Substitution
ISIC	International Standard Industrial Classification
JICA	Japan International Cooperation Agency
MFN	Most Favored Nation
MOF	Ministry of Finance
MPI	Ministry of Planning and Investment
NEU	National Economics University
OECD	Organization for Economic Co-operation and Development
PE	Private Enterprise
RE	Random Effects
SITC	Standard International Trade Classification
SOE	State-owned Enterprise
SPF	Stochastic Production Frontier
TFP	Total Factor Productivity
TFPG	Total Factor Productivity Growth
UNCTAD	United Nations Conference on Trade and Development
USAID	The United States Agency for International Development
USD	The United States Dollar

USVBTA	The United States-Vietnam Bilateral Trade Agreement
VND	Vietnamese Dong (Currency)
VSIC	Vietnamese Standard Industrial Classifications
WTO	World Trade Organization
XTGLS	Panel Data Feasible Generalized Least Squares

Chapter 1

Introduction

1.1 Context of the issue and the aim of thesis

In the last three decades, many developing countries in Latin America, Africa and Asia have implemented economic reforms, made structural adjustments and implemented trade liberalization. In addition, there has been an increasing trend of globalization driven by trade and investment liberalization with the proliferation of multilateral and bilateral trade agreements among both developing and developed countries. Trade openness has been much anticipated as a means to foster a country's economic performance in terms of productivity growth, income improvement and poverty reduction.

For a developing country in the throes of industrialization, a main driving force of economic and productivity growth is the manufacturing sector. This sector also plays a leading role in providing wage employment for a large pool of agricultural labor, which is abundant in developing countries with a large share of the poor. In the context of trade liberalization, the performance of the manufacturing sector in terms of output, productivity growth and employment has a very significant impact on per capita income growth and poverty reduction. The question arising here is how the manufacturing sector responds to trade liberalization in developing countries.

The links between trade, growth and productivity have been discussed at length in the vast theoretical literature on trade. In sum, this literature predicts that trade opening has many beneficial effects on a country's growth rate while not excluding the possibility of negative effects of trade liberalization. Neoclassical theoretical reasoning as well as other arguments in the new trade theory and endogenous growth models tend to support the beneficial impacts of trade liberalization on growth and productivity. Various possible links have been proposed, such as import disciplines, domestic competition, capacity utilization, economies of scale and innovation and diffusion of technologies. However, the skeptical view of free trade, based on empirical grounds, is concerned with the destructive effects of foreign competition on domestic firms and industries in terms of shrinking market size. The loss of

output and subsequent reduced productivity growth may outweigh the efficiency gains from effort-induced competition and resource reallocation. In addition, the new trade theory and endogenous growth models suggest the long-term possibility of a lower productivity growth path for developing countries due to the pattern of trade specialization and resource reallocation in industries with a low income elasticity of demand and limited technological base after trade opening.

From a theoretical perspective, trade liberalization is also argued to have an important efficiency effect in terms of resource reallocation. This effect has been extensively discussed in trade theories (Kirkpatrick and Weiss 1992; Rodrik 1995; Winters 2004). The orthodox approach makes a plausible and convincing prediction that in any country, trade opening will induce resources to move into production activities whose output is intensive in the use of production factors abundant in that country (Djikista 2000; Guerrieri 2002). While recognizing this orthodox proposition, the new trade and endogenous growth theory considers this effect basically as a short-term effect of trade liberalization, and is more concerned with the long-term implication of specialization patterns induced by trade opening on productivity and output growth. Nevertheless, given the short-term effect of trade opening on resource allocation, for developing countries with an abundance of less-skilled labor force, it is predicted that trade liberalization has a positive impact on employment growth through the development of labor-intensive industries. The trade-induced employment expansion subsequently implies the favorable impact of trade opening on poverty reduction.

To date, the empirical literature examining the links between trade openness, growth and productivity has been increasingly accumulated to a large scale. Most empirical studies at country level have found significant evidence for the positive link/relationship between trade openness and economic and productivity growth (Havrylyshyn 1990; Edwards 1998; Harrison and Hanson 1999; López 2005). However, suffering from aggregate data problems (measurement errors) and shortcomings of econometric application (Edwards 1993; Rodrik 1995; Harrison and Hanson 1999; Winters 2004), they are limited in obtaining the robust results of this relationship. At the same time, many micro-level studies based on industry and firm-level data in the manufacturing sector appear to be more helpful

in examining the specific mechanisms of trade liberalization impact (Berg and Krueger 2003; López 2005).

While the results of many empirical studies tend to lend support to theoretical arguments, the ways and the extent of the impacts of trade liberalization depend significantly on a country's specific circumstances, particularly on a country's specific stage of development and institutional settings (Rodrik 2000; Chang et al. 2009). What emerges from empirical literature is that the impact of trade opening is country-specific and the positive effects of trade liberalization in one country could not be presumed in other countries (Michaely et al. 1989). Moreover, as Salinas and Askoy (2006: 3) claim: "the question of what happened to countries after their trade reforms continues to be an important issue in the policy discussions of many developing countries". Hence, more empirical studies are needed, not only to contribute to empirical literature on trade and growth, but also to provide inputs for policy makers in developing countries on the path of industrialization.

In context of the accumulation of the empirical literature on trade and growth and the reality of the rapid globalization process and latecomers to industrialization, this thesis aims to make an additional contribution by examining the performance of the Vietnamese manufacturing sector in the face of trade liberalization and market-oriented transition reforms.

Vietnam has undergone more than two decades of renovation (*Doi Moi*) since 1986 from a centrally planned economy to a market-based economy. In line with numerous policy and institutional reforms, industrialization has been considered as a central objective to move the economy from low income status to achieve rapid economic growth. In 1996, the goal of becoming an industrialized country in the year 2020 was officially initiated by the 8th Party Congress. This goal was reinstated by the 9th Party Congress and adopted in Vietnam's Socio-economic Development Strategy 2001-2010. Recognizing the position of a developing country and the transition process, Vietnam has pursued the 'open door' policy and international economic integration as a central part of its renovation policy to promote industrialization and economic growth. Therefore, Vietnam has made continuous efforts in trade policy reforms and engaged in various bilateral and multilateral trade agreements. In 1992, Vietnam signed a bilateral trade agreement with the European Union

(EU). In 1995, Vietnam became a member of ASEAN and at the same time committed to ASEAN Free Trade Area (AFTA). In 1998, Vietnam joined APEC. In 2000, Vietnam signed a bilateral trade agreement with the US (the USVBTA), making a crucial step to join the global trading system. Following this in 2003, Vietnam participated in the ASEAN-China Free Trade Agreement (ACFTA). The year 2007 was a landmark for Vietnam's international economic integration and trade opening, with the accession to the WTO. At the same time, international economic integration and trade opening took place in line with the attraction of foreign direct investment into the economy as a driving force of industrialization and growth.

In such a context of economic reforms and economic integration, the manufacturing sector experienced rapid changes in the trade policy regime. In the 1990s, following the introduction of the government's industrialization goal, there was a clear bias toward import-substitution industrialization with a highly restrictive trade regime, despite the government's several initiatives in economic integration. In contrast, as Vietnam's commitments under the AFTA, the USVBTA and WTO became effective, the period 2000-07 witnessed a clear reverse trend with many substantial trade reforms moving toward a liberal trade regime. As a result, the Vietnamese manufacturing sector underwent a marked policy shift from the import-substitution biased regime to a more neutral trade regime.

A specific feature of Vietnamese manufacturing emerges from the fact that trade reforms were associated with substantial institutional reforms, presented by the ownership diversification in entrepreneurial development. Transition to a market-based economy entailed restructuring the state-owned enterprises (SOEs), which were dominant in the centrally planned economy, and promoting the development of private sector enterprises (PEs). At the same time, the foreign direct investment (FDI) policy led to the emergence and expansion of the FDI businesses in manufacturing activities. As a result, the increase in domestic competition in manufacturing was associated with the ownership diversification of manufacturing businesses. Moreover, there was a close association between the pace of institutional reforms and resulting expansion of non-state enterprises, and the progress of trade reforms and international economic integration in Vietnam. The extensive trade reforms in the period 2000-07 period took place in line with the significant reduction of the

SOEs, accelerated expansion of the private sector and the increased inflows of FDI into the economy. These changes imply that increased import competition in the domestic markets was accompanied by improvement in the degree of competition among domestic producers under the impact of institutional reforms in the transition process.

It follows from the above overview that Vietnam's manufacturing sector appears to be a valuable experiment for examining the impacts of trade liberalization on the evolution of manufacturing. The case of Vietnamese manufacturing also allows us to test the role of institutional reforms which have accompanied trade liberalization in determining manufacturing performance in a transitional economy. Significant institutional reforms in Vietnamese manufacturing distinguish this research from other empirical studies on trade liberalization and manufacturing performance in developing countries. The distinct feature of this study also comes from the fact there are very few studies on the impact of trade opening on manufacturing performance in transitional economies, as most studies are concerned with the performance impact of ownership forms and other institutional factors during the transition process. In the particular case of Vietnam, there seems to be no comprehensive and systematic study on the relationships between trade liberalization and manufacturing performance. Available studies either focus on the firm and industry-specific determinants of manufacturing performance or examine the impact of trade reforms on manufacturing protection and manufactured trade. In addition, the availability of national enterprise survey data in Vietnam since 2000 made it possible to examine the specific channels of the impacts of trade liberalization on manufacturing performance.

The thesis will empirically investigate the links and the extent to which significant trade liberalization in Vietnam affected the performance of the manufacturing sector in terms of its output and productivity growth, structural change and employment creation based on firm-level production data as well as disaggregate trade data. The specific questions the thesis aims to address are as follows:

- Has trade liberalization significantly affected the patterns of output growth and structural changes of manufacturing?

- Did resource allocations take place in response to trade opening as predicted by the theoretical literature?

- How did the sources of manufacturing output growth change under trade liberalization? Did TFP growth contribute more to output growth? Are there any differences in productivity growth between firms of different ownership?

- Has trade liberalization led to higher manufacturing TFP growth? What were the specific channels of the impacts?

- Were the impacts of trade liberalization on manufacturing TFP growth significantly influenced by institutional reforms and domestic market conditions?

1.2 Structure and preview

The thesis is organized in seven chapters. Following the introductory chapter, Chapter 2 sets up a theoretical framework to examine the impact of trade liberalization on manufacturing industries, with an emphasis on the productivity effects. The chapter begins with a conceptual discussion on the measurement of trade liberalization. This is followed by a detailed review of theoretical literature to discern the main links through which trade opening may affect the productivity performance of domestic producers. An important distinction between the efficiency improvement aspect and the technological progress aspect of the productivity change is highlighted among the identified links between trade and productivity growth. This distinction appears as an underlying thread of a further theoretical survey of the structural transformation effects of trade opening. This additional survey draws two key effects of trade liberalization: the short-term static efficiency effect, which is resource reallocation as suggested by the traditional trade theory, and the long-term dynamic effect of resource reallocation, which is the possibility of obtaining technological progress due to trade-induced specialization as implied by the new trade and endogenous growth theory. The empirical review then focuses on the evidence of the impact of trade reforms on productivity performance with a separate examination of the empirical studies focusing on technical efficiency and those focusing on TFP. Finally, a review of empirical studies on the relationships between trade liberalization and the

Vietnamese manufacturing sector is undertaken to explore the gaps in the empirical literature.

Chapter 3 provides two important sections which sketch the whole process of trade liberalization in manufacturing as a start of the empirical analysis. The policy review part investigates and discusses the process of trade policy reforms in Vietnam from 1990 to 2007. This part begins with a review of the process of Vietnam's international economic integration, which indicates the important points in the timeline of changes in Vietnam's trade policy regime. The following is a discussion of how the reforms have taken place in the trade policy regime, covering the trade policy instruments, which include the tariffs and non-tariff measures. A key theme running through this discussion is the changing policy balance between import substitution and export promotion, which is the central aspect of the progress of reforms in the trade regime and the underlying perspective of Vietnam's industrialization policy. Consequently, the analytical part of the chapter examines how trade policy reforms led to the reduction of manufacturing protection by estimating the nominal rates of protection (NRPs) and effective rates of protection (ERPs) with the distinction of import-substituting, export-oriented and other activities. Compared with other available studies, this empirical analysis of the NRPs and ERPs is the most comprehensive examination of manufacturing protection in Vietnam in two areas: (i) all tariff schedules used in the trade regime are taken into account with all regulation-updated changes in every year from 2000 to 2007; and (ii) the weights to estimate average NRPs and NRPs are the imports of trading partner groups with corresponding applied tariff schedules. Therefore, the final estimates of the NRPs and ERPs more strongly reflect the true levels and changes of manufacturing protection. Lastly, the levels of Vietnamese manufacturing protection are compared with those of other ASEAN countries to have clearer insight into the extent of trade liberalization in Vietnam.

Chapter 4 examines the patterns of manufacturing growth and structural changes to reveal the manufacturing responses to trade liberalization in terms of resource allocation. Based on the different phases of changing trade policy regimes identified in Chapter 3, the chapter begins with a review of the macroeconomic context to discern how the economy performed and the contribution of manufacturing to the economy compared with other sectors, as well

as to identify macroeconomic shocks affecting manufacturing performance. Consequently, the growth and structural changes of manufacturing under trade liberalization are investigated in two dimensions and three facets. The two dimensions of manufacturing evolution are: (i) the growth and change in the relative importance of manufacturing industries at two-digit VSIC level and of trade-orientation groups (export-oriented, import-competing and less-traded); and (ii) the growth and change in the relative importance of ownership groups (SOEs, PEs and FDI). The three facets are gross output, employment and capital. Moreover and importantly, the growth and structure of manufactured trade, in particular manufactured exports, are examined to detect the changes in Vietnam's trade specialization pattern in line with trade opening.

Chapter 5 examines the most important aspect of the relationship, i.e. productivity performance, between trade policy reforms and the production outcomes of manufacturing industries at two-digit VSIC level in two steps. The first step undertakes the decomposition of output growth and estimation of TFP growth and its contribution to output growth. Subject to data availability, the period 2000-05 is chosen for the analysis and the VA-based measure of output is used after a substantial discussion of the advantages and disadvantages of the measures of manufacturing output based on GO and VA. Then the trends of output and TFP growth are investigated to see if their patterns are consistent with the general patterns of structural changes found in Chapter 4. The second step quantitatively evaluates the relationship between trade liberalization and manufacturing TFP growth in a regression framework. To test the robustness and consistency of the impact of trade liberalization on productivity performance, all possible measures of trade liberalization are taken into account, including NRPs, ERPs and import and export share ratios. The industry-specific characteristics are controlled for with the emphasis put on the features of manufacturing in a transitional economy, represented by the shares of SOEs and FDI and industry competition index (as the outcome of institutional reforms). Additionally, the interactions between the measures of trade liberalization and the industry competition index to test for the conditionality of trade opening effects on institutional reforms are also taken into account. It should be noted that the econometric analysis of this step differs from available studies in two important respects: (i) all variables are measured in the growth rate or change forms, making a consistent measurement of the relationship between dependent and

explanatory variables; and (ii) the generalized least squares method for panel data is used to account for both heteroskedasticity and serial-correlation problems in the data. Therefore, the estimation results of the impact of trade liberalization could be more consistent. At the same time, the estimation results are compared with the findings of similar studies on other developing countries.

Chapter 6 further investigates the impact of trade reforms on manufacturing performance at the firm level. Based on the premise of X-efficiency as one of the most important effects suggested in theoretical literature, the analysis adopts the stochastic production frontier framework to measure the technical efficiency level of manufacturing firms and examines whether the reform and opening of the trade regime had significant and consistent effects on the technical efficiency of manufacturing firms. As in Chapter 5, three alternative measures of trade liberalization, including the NRPs, ERPs and import shares are employed in different model specifications to test the robustness of the trade impact. In addition, both firm and industry-specific characteristics, particularly firm ownership, are taken into account in the inefficiency model of the stochastic production frontier framework. Due to limited data availability on the surveyed firms with production cost information, the analysis is carried out using a panel data of manufacturing firms in the period 2000-03. The estimation results obtained in this chapter are useful to check the findings in Chapters 4 and 5 in order to obtain consistent conclusions on the impact of trade liberalization on manufacturing performance. At the same time, the estimation results are compared with the findings of available studies on other developing countries. It is notable that this empirical analysis is the first ever study to examine the impact of trade reforms on Vietnamese manufacturing firms based on the panel data.

Chapter 7 provides a summary of key findings and presents policy implications for Vietnam's industrialization strategy and industrial transformation to achieve long-term productivity and output growth in the context of trade opening. Finally, several important areas for further research on the relationship between trade opening and industrial performance will be suggested.

Chapter 2

Trade Liberalization and Manufacturing Performance: A Review of the Literature

2.1 Introduction

Since one of the central objectives of trade liberalization is improving economic welfare, there is a vast literature on whether and how trade liberalization can promote economic growth. As trade liberalization has become a main policy option in many developing countries in their pursuit of industrialization since the second half of the last century, a significant part of the literature has been focused on the impact of trade reforms on industrial development. Given the focus of the study on the impact of trade liberalization on manufacturing performance, this chapter will survey relevant literature to draw on the key links or the main mechanisms of transmission of the impact in terms of both theory and empirical evidence.

The main objectives of this chapter are: (i) to examine the literature to draw on the theoretical links between trade liberalization and the performance of the manufacturing sector; (ii) to review the empirical studies for their findings on these links and to discuss possible factors shaping the impact of trade liberalization on industrial performance; (iii) to review the available studies on this issue for the case of Vietnam; and (iv) to provide rationales for the methodology and approaches followed in this thesis to examine the effects of trade liberalization on the manufacturing sector in Vietnam.

Conceptually, there is a distinction between the manufacturing sector and the industrial sector as the latter is defined to include not only the former, but also the construction and energy sub-sectors. However, in practice, many studies adopt the narrow meaning to equate the industrial sector with the manufacturing sector in discussing the issues related to industrialization strategy and industrial development. As trade liberalization is always discussed in the context of the industrialization process, it is more convenient to follow this practice in the literature review and then in the empirical work of this thesis. Another important issue is the concept of manufacturing performance, which is considered here as the growth of the manufacturing sector. Output growth can result from input expansion and

productivity improvement. As in many other studies, the emphasis here is on productivity growth, which is the key for long-run sustained growth. In addition, the dynamics of manufacturing growth at the aggregate (sectoral) level can be significantly affected by the structural transformation process, in which there is a continuous change in the relative importance of the sub-sectors (manufacturing industries) with different scope of productivity and output growth.

The chapter starts with a discussion of alternative measures of trade liberalization to address the question of why there are different terms used to refer to trade liberalization in Section 2.2. Based on this background, Section 2.3 draws the key links between trade liberalization and manufacturing performance by reviewing the theoretical debates over the possible effects of trade liberalization on growth in terms of productivity and structural transformation. Then Section 2.4 surveys empirical evidence on the relationships between trade liberalization and economic performance, given the focus on the manufacturing sector. Section 2.5 focuses on reviewing empirical studies on the performance of the Vietnamese manufacturing sector and their implications for the role of trade liberalization to reveal the possible gaps in the empirical literature in the case of Vietnam, which are to be filled by the thesis. In the final section, key conclusions will be drawn to make the background for the following empirical chapters.

2.2 Measures of trade liberalization

In studying the effects of trade liberalization, the foremost important issue is how to get reasonable measures or proxies of trade liberalization. The export bias index or Krueger-Bhagwati index may be constructed to determine a country's trade orientation. An increase in this index can be seen as a country's tendency to follow the export promotion strategy and trade liberalization (Greenaway et al. 1998). However, trade liberalization has been increasingly perceived as reducing government restrictions on trade, toward more openness and liberality.[1] Therefore, gauging the extent of trade liberalization is equivalent with determining the level of openness at different time points. As Winters (2004: F5) notes: "conceptually it is important to distinguish openness to trade, a levels or state variable,

[1] Also, outward orientation has been interpreted as more openness and liberality (Prichett 1996).

from trade liberalization, which refers to its change: in practice, however, they can be difficult to separate. Both should strictly be measured by policy stances but, since that is so complex, outcome measures are often used instead". In this study, following McCulloch et al. (2002), we adopt two main approaches to measuring openness: (i) openness in policy and (ii) openness in practice.

Policy openness is concerned with the existence and extent of policy measures, which are used to control or restrict trade flows, particularly imports. The conceptual measures of policy openness are basically similar to those of the trade policy stance suggested by Baldwin (1989) and Pritchett (1996). According to Pritchett (1996), the measures of trade policy can be classified into two categories: incidence and outcome. The incidence-based measures are actually statistical accounts of the policy instruments in existence. For example, the nominal rates of tariff protection (NRPs) is one of the common measures of import protection, which are usually constructed by computing the level (and dispersion) of tariffs. The NRPs indicate how much the prices of imported goods would increase under the imposition of tariffs. The frequency and coverage of the non-tariff barriers (NTBs), particularly quota, trading licenses is another common measure of trade policy incidence, which is simply obtained by counting or observing the NTBs applied on import items. Despite their simple calculation, the incidence-based measures, particularly those of NTBs, are limited in showing the extent of distortions in prices and levels of trade. For example, it is practically difficult to estimate a fall in the amount, and an increase in the prices of imports of the goods subject to foreign exchange allocations. It is even more difficult to do so when there is a combination of trade barriers and some NTBs are not easily to observe. Moreover, while being a good indicator of the price changes, the NRPs do not show the net possible gains accrued to the producers of the imported goods subject to tariffs and do not take into account other factors of goods price changes such as income (GDP) and demand elasticity.

The outcome-based measures of policy openness are concerned with the overall impacts of trade policy instruments on the level of prices and trade flows. The main idea underlying these measures is to evaluate the changes in prices and trade flows before and after the policy instruments are imposed (actual vs. counterfactual situations). An example of the

policy outcome measures based on price is the effective rates of protection (ERPs). The ERPs is the one of the most popular measures of trade protection and more meaningful than the NRPs in indicating the net average incentive of trade policy for domestic production (Greenaway and Miller 2003). This measure presents the net change in the value added for the producers of goods which results from the difference between the changes in the prices of goods and the prices of imported inputs due to trade barriers. The outcome measures based on trade flows are aimed at examining the level and patterns of trade (this can be imports, exports or net exports). Examples of these trade flow-based outcome measures are structure-adjusted trade intensity or Balassa's index, and Leamer's openness index. Balassa's index is actually the trade orientation index, defined by the residuals of the regression of trade intensity on the structural variables of an economy such as population, GDP and transport costs. A positive (negative) value of the residuals indicates that a country follows an outward (inward) orientation strategy. The Leamer's openness index is the sum of the differences between the actual levels and the predicted levels of net exports based on the estimation of a modified Heckscher-Ohlin-Vanek (HOV) model of trade flows. The higher positive deviation of net export implies a greater openness level of a country's trade regime (Pritchett 1996 and Santos-Paulino 2005). Another possible way of measuring openness could be the measurement of trade potential compared with the actual trade volumes between countries using the gravity equation framework as adopted in Drysdale et al. (1997). It should be noted, however, that these indices are estimated and applied at the country level.

The openness in practice can be measured by trade intensity (with regard to imports, exports or total trade) or the actual price distortions (e.g. the black market premium). It appears that openness in practice is not merely the outcome of pure trade policies, but also other factors beyond the government's control such as the country's size, endowments and preferences.

Since the prices and flows of internationally traded goods are not only affected by trade policy instruments, but many non-policy factors, there seem to be no satisfactory measures of openness and trade liberalization. Difficulties in collecting data and methodological problems could produce less accurate measures of openness. Another important factor is

the broadness of trade liberalization definition. Therefore, it is possible that the openness measures are inconsistent with each other. For example, small countries can be more open than large countries in terms of trade share in GDP while the former may have more trade distortionary policies than the later. Moreover, in many cases, there is a little relationship between various measures of openness (Harrison 1996; Pritchett 1996). As Edwards notes:

> The literature on the subject [trade and growth] has not always been successful in dealing with precise definitions of trade regimes, nor has it been able to handle successfully the difficult issue of measuring the type of trade orientation followed by a particular country. (1993: 1365)

As a result, the practice of using measures of trade liberalization varies from study to study. Depending on the aggregation level of study, the extent of trade liberalization can be measured at country, sectoral or sub-sectoral levels.

Given the imperfect nature of measures of trade liberalization and the focus on the manufacturing sector, the thesis will use three key measures of openness, that is, the NRPs, ERPs and trade intensity, in evaluating the progress of trade liberalization in Vietnam. Apart from their very common use in studies on trade liberalization and growth, these measures can be estimated at more disaggregate levels, i.e. sub-sectoral level. This allows the detailed examination of how the levels of trade restrictiveness have been reduced and the importance of trade in manufacturing industries.

2.3 Trade liberalization and manufacturing performance: Theoretical perspectives

As a policy reform process, trade liberalization is expected to promote better economic performance. In the context of industrialization, better performance is seen in the output growth, which could result from better factor input utilization, productivity growth and structural transformation toward more productive industrial activities.

2.3.1 Productivity effects

As a cornerstone of the relationship between trade and growth, the question of how trade liberalization exerts its influence on productivity of firms, industries, sectors and the whole economy has been widely discussed in the literature. Theoretical arguments, which have been established from neoclassical models and new trade and growth models, suggest that productivity gains stem from trade liberalization through three main channels: X-efficiency, economies of scale and technological progress.

Trade liberalization and increasing X-efficiency

A number of early arguments on the relationship between trade regimes and productivity have concentrated on the effects of trade regimes on X-efficiency. In essence, X-efficiency[2] is similar to the concept of technical efficiency or productive efficiency,[3] implying the success of a firm or an industry in achieving the maximum possible output with a given set of inputs and a given available production technology. As indicated by Leibenstein (1966), the increase in X-efficiency is a part of the 'unexplained residuals' in the output growth, which is defined as the total factor productivity in the economic growth literature.

In the import substitution regime, trade protection creates the high relative prices of import-competing goods, making it profitable for domestic producers. In addition, the empirical evidence suggests that the firms in many import-competing industries operate in a monopolistic environment with significant entry and exit barriers (Bhagwati 1988). As a result, an overall net incentive is created for home market production in terms of monopoly returns. Under such circumstances, firms are not motivated to act optimally for survival because there are few threats from both foreign and domestic competition (Rodrik 1988). Importantly, as Bergsman (1974) indicates, trade restrictions allow inefficient domestic producers to stay in the market and live 'a quiet life'. Moreover, while it is possible that there are some efficient firms in the protected sectors, these firms appear to be reluctant to expand their market shares due to the lack of competitive pressures and thus accept to take supernormal profits and leave room for inefficient competitors. Overall, there exists a lack

[2] These two terms were first used by Leibenstein (1966).
[3] This term was used by Farrell (1957).

of motivation among protected firms and resulting X-inefficiency. Tybout et al. (1991) claim that the absence of foreign competition makes domestic firms fail to produce at the highest possible efficiency level due to monopoly power.

The negative impact of the restricted trade regime on X-efficiency provides a ground for the arguments for trade liberalization. A well-known reasoning, initially suggested by Corden (1974), is that trade liberalization promotes X-efficiency by provoking the motivation of entrepreneurs through increasing competition. Reduced trade restrictions are usually expected to have the effects of reducing the prices and increasing the flows of imported goods. As a result, domestic producers of import-competing goods face stronger foreign competition and less profit due to lower prices. They have no choice but increasing entrepreneurial efforts to reduce production costs by becoming more efficient. In this sense, trade opening can be considered as a driving force of 'external motivational efficiency'.[4] Consequently, one of the most feasible responses predicted for firms, at least in the short-term, is to use available inputs more efficiently and adopt better practice for the available technology. It has been proved that the benefit of trade liberalization, or the cost of protection, in terms of X-efficiency is significantly larger than the gain due to allocative efficiency (Bergsman 1974).

While the arguments based on X-efficiency are plausible, there are some important caveats underlying the search for empirical evidence. The first is the preference of firm managers or entrepreneurs for more managerial leisure over working efforts when their income is higher due to trade protection. This requires an assumption that the labor supply curve of the managers/entrepreneurs is backward bending and the income effect is greater than the substitution effect. Given that the technical efficiency of the import-competing firms was positively associated with the manager's efforts, then the firms would become less efficient under trade protection (Corden 1997). Then trade liberalization would work by eliminating the bias toward import-competing producers. In this regard, it should be noted that the same reasoning could arguably be applied to export producers when trade liberalization is

[4] This is one of three elements determining X-efficiency suggested by Leibenstein (1966), which are (i) Intra-plant motivational efficiency; (ii) external motivational efficiency; and (iii) non-market input efficiency. Also, Leibenstein (1966) stresses the importance of motivation and its association with degree of effort in determining X-efficiency.

expected to increase their profits through higher output prices and lower input costs (Rodrik 1988). However, this mechanism is not likely to work because the exporters from developing countries usually face more competitive and high-demanding international markets. In addition, when trade liberalization takes place, there are fewer entry and exit barriers in export-oriented industries. This means exporting industries are relatively more competitive under trade liberalization.

The second aspect is the domestic market structure, which is usually assumed to be monopolistic or oligopolistic under trade protection (Dijkstra 2000 and Dornbusch 1992). As already mentioned, this characteristic of domestic market competition is common in protected economies. Therefore, domestic producers enjoy high income both from trade protection and restricted competition without worrying about competition threats. That is why trade liberalization is often seen to be accompanied by increased competition. Moreover, trade reforms in developing countries have been usually undertaken with other domestic policy reforms such as macroeconomic stabilization, structural adjustments, labor regulation reform and institutional reforms (Thomas and Nash 1991, Krueger 1998, Rodrik 2000 and Winters 2004). These domestic reforms have significant effects on domestic market competition and consequently X-efficiency through their influence on managerial slacks. Finally, as Dijkstra (2000) argues, the impact of trade liberalization on efficiency would be severely limited if the tariff reduction was not passed on to the prices of imported goods due to the monopolistic nature of the trading sector in developing countries. Therefore, it appears that trade liberalization also involves the elimination of entry barriers in trading activities in developing countries (for example the elimination of trading permits or import licenses).

The final aspect is the static vs. dynamic nature of X-efficiency gains. Conventionally, X-efficiency gain is considered to be static because of the underlying assumption of once-for-all change in tariff (Corden 1997). However, in the practice of many countries, trade liberalization takes place gradually over a course of at least several years and over different episodes (Michaely et al. 1989). Further, in the 1990s and 2000s, many developing countries still continued gradually liberalizing their trade regime by tariff reduction within the WTO framework. This means that the X-efficiency gains could be continued under the

process of trade liberalization, implying the dynamic nature of the impact. Rodrik (1988) argues such once-for-all gains of trade liberalization can accumulate over time. Therefore, the impact of trade reforms on efficiency could be better examined over time or in the dynamic perspective. The review of empirical evidence below will show that many studies at industry and firm levels for a particular country examine the effects of trade liberalization over time.

Economies of scale

In the production theory, economies of scale is an important concept meaning that a firm's unit production cost will decrease when its output expands to a certain level and therefore it is equivalent to the improvement of the firm factor productivity, particularly labor productivity. Economies of scale is a main account for Verdoorn's Law, which is a well-known and empirically proven hypothesis on the positive relationship between the growth of labor productivity and output growth (Boulier 1984; Nishimizu and Robinson 1984). Further, the production frontier approach, popularized by Aigner et al. (1977), considers economies of scale as a contributing factor to the overall productivity when the firm makes an improvement in scale efficiency, which is a component of technical efficiency (Coelli et al. 2005).

It is argued that trade liberalization provides domestic firms with better access to international markets for exports, which makes it possible for them to achieve economies of scale through expanding outputs (Nishimizu and Page 1991). At the aggregate level (i.e. industry, sectoral or economy levels), trade opening allows a country to exploit economies of scale by widening the markets for the goods in which that country has comparative advantages. As Rodrik (1988: 7) notes, "small, open economies are likely to specialize in a narrow range of products which they can produce and export at sufficient scale to be competitive". Therefore, there has been a common hypothesis related to the 'demand side' effect of trade liberalization on productivity growth, which essentially states that there is a positive relationship between export growth and output and productivity growth (Greenaway and Sapsford 1994).

There are some qualifications regarding the applicability of the economies of scale argument. Firstly, despite their appeal, the exploitation of economies of scale through widening export markets is subject to a condition that manufacturing firms and industries exhibit increasing returns to scale (IRS). While IRS is generally specific to the manufacturing sector compared with the primary sector (Rodrik 1988), the degree of IRS varies across manufacturing industries. For example, labor-intensive and raw material processing manufacturing industries seem to have less scope of IRS compared with capital-intensive industries and developing countries tend to have comparative advantages in the former (Dijkstra 2000). In this regard, economies of scale is an important aspect of the long-term growth potential of manufacturing sector and trade opening can have significant effects on a country's patterns of specialization.[5] Secondly, it has been recognized that the rule of economies of scale can reasonably be applied to the case of import-competing industries under trade liberalization (Tybout 1992). It is possible that increased foreign competition reduces the market shares, leading to the fall in the output and efficiency of the import-competing firms (Pavnick 2002). However, as Tybout (1992) argues, what is more important is the net impact on the average industry productivity, which depends on the demand shifts, market structure and ease of entry or exit barriers of each industry. With the assumption of free entry and exit, which appears more relevant to the reality of developing countries under trade liberalization, it is argued that foreign competition will increase the average productivity by forcing some inefficient firms to leave the industry and the incumbent firms to expand to become more efficient (Rodrik 1988 and Tybout 1992).[6] In addition, new firms with the average cost equal to or lower than the industry average cost will enter the market. The expansion of average firm output is possible due to the increase in the demand for the industry output.

Trade and technological progress

Until the late 1980s, the academic attention of neoclassical trade supporters had been on the role of international trade in promoting technological change by creating better access to a

[5] This will be discussed in more detail below.

[6] It should be noted that Rodrik (1988) applies the assumption of free entry and exit to the protected trade regime to prove the role of economies of scale. However, this assumption is quite at odds with the common wisdom and less relevant to the reality of developing countries in protected import-competing industries.

greater variety of intermediate inputs and capital goods through increasing imports. Nishimizu and Robinson (1984) claim that the increased availability of imported inputs with embodied technologies which are new to domestic producers will help to boost productivity performance. However, there was a lack of theoretical reasoning in terms of formal models linking trade and technological progress, which has been considered a key determinant of long-term growth in the growth literature. Rodrik (1988) argues that while there are many arguments on the possible link between trade policy and domestic productivity, there appear to be no theoretical explanations on the effects of trade liberalization on the growth rate of productivity or output. The commonly perceived benefits of trade liberalization are of the one-shot nature and do not lead to technological development. He further notes that only the arguments based on X-efficiency and economies of scale deserve attention because of their coherence and close relation to trade policy. In reviewing the existing literature on trade policy and productivity gains in developing countries, Havrylyshyn (1990) suggests that the most important difficulty for empirical studies on the link between trade policy and productivity growth is the lack of a cohesive, unifying theory. Moreover, a majority of empirical studies appear to concentrate on the relationship between trade policy and efficiency based on hypotheses on economies of scale, capacity utilization and effort-induced efficiency (Havrylyshyn 1990).

The emergence of endogenous growth theory in the 1980s provided a substantial basis for the development of new theoretical models focusing on the role of trade in promoting sustained productivity and output growth through its effects on technological progress. Theoretical developments are centered on modeling the role of trade in the endogenous growth process via its effects on industrial innovation and technological diffusion.

One considerable strand of new endogenous growth literature emphasizes the impact of international trade on industrial R&D activities and diffusion of their outputs. The most significant contributions were made by Grossman and Helpman (1991)[7], Rivera-Batiz and Romer (1991), and Aghion and Howitt (1992), among others. Grossman and Helpman (1991) start with a key assumption that technological progress is endogenously determined

[7] Grossman and Helpman (1991) present various models on trade and endogenous growth introduced in their previous papers such as Grossman and Helpman (1988, 1990a, 1990b).

by private R&D activities, which are in turn driven by profit-seeking motives. The R&D activities are considered as an economic sector with its products being industrial know-how or blueprints, which contain technical information (consisting of product-specific and more general technical information). Industrial invention is assumed to be aimed at reducing production costs (called process innovation), designing new products or improving the quality of existing products (called product innovation). By buying or investing in industrial know-how, entrepreneurs are able to produce new or better quality products, which help them to reap monopoly profits or higher economic rents. Higher expected profits induce businessmen to invest more in further innovations. In addition, technology as the output of industrial R&D has properties of a public good, but incomplete, characterized by the partial non-excludability. On the one hand, technology is an appropriable good for the owners as it embodies specific technical information, which can be kept secret or protected by patent laws. On the other hand, technology is a non-excludable good as it contains more general technical information with wider applicability and the owners cannot have any effective measures to prevent it from being copied or acquired by others. This crucial aspect of technology creates technological spillovers, which provide free inputs for other innovative activities to produce new knowledge. Technological spillovers help to reduce the costs of new invention and make it profitable for investment in industrial research. Therefore, the innovation is endogenously maintained by technological spillovers and expected higher returns for investors.

Based on the above fundamental characteristics of the commercial R&D sector and its products, Grossman and Helpman (1991) establish how the evolution of this sector, measured by the rate of innovation, leads to the growth of manufacturing productivity and output. The industrial R&D sector generates inputs (technical know-how) to manufacture new differentiated products with the rate of growth in their variety being a measure of technological progress. Due to technological spillovers, differentiated products, either in the form of intermediate goods or final goods, are manufactured with less unit input (labor or composite input) requirement. This means that a greater variety of differentiated products are associated with a higher level of output per unit of labor if they are final goods, or per unit of the aggregate input if they are intermediate goods. Consequently, the growth rates of manufacturing output are determined to be proportional to the growth rate in the

variety of the differentiated products, i.e. the rate of innovation. In the long-run equilibrium, the economy achieves a constant rate of innovation and hence a constant rate of output growth.

Given that the development of the R&D sector is the driving force of technological progress and output growth, Grossman and Helpman suggest that trade opening can affect a country's rate of innovation by changing the costs of innovative activities through different mechanisms. The most important mechanism is international knowledge spillovers, which can take place with international trade in three different ways: (i) general technical information is transmitted through the information exchange in commercial transactions; (ii) innovative firms can obtain general technical information from imported differentiated intermediated goods, which are not locally available; and (iii) local exporters can learn from foreign buyers by meeting their requirements of product standards and information on product designs, following their advice on production process or adopting their ideas for new intermediate inputs. This is basically the idea of learning-by-exporting hypothesis. Generally, the principal hypothesis is that the international knowledge flows increase with the volume of international trade of a country with the rest of the world. The knowledge flows contribute to increasing the country's stock of knowledge capital. Access to the larger base of knowledge capital helps the R&D sector to reduce the amount of human capital and hence the average cost needed to develop new differentiated products. Lower costs associated with higher returns induce entrepreneurs to take ventures in new product development. This process results in the expansion of innovative activities and a higher rate of innovation in the long run for all economies engaged in international trade. Furthermore, international trade exposes firms in each country to more intensive competition in the integrated world market and induces them to develop new and distinctive technologies to obtain monopolistic profits. Therefore, trade helps innovative firms to avoid replication of research efforts and then the world economy is able to achieve a higher rate of innovation and growth with knowledge spillovers compared with the case of technological knowledge diffusion without international trade.

There are two important assumptions worth being noted on the presence of the same positive effects of trade opening on the long-run technological progress in Grossman and

Helpman's endogenous growth models. Firstly, knowledge diffusion needs to be international in scope to create the world common stock of knowledge capital that is equally accessible to all countries. Secondly, researchers in trading countries have comparable skills or comparable research capability to exploit the benefits of international knowledge flows. In other words, integrated economies are similar in their technological capability to utilize new added knowledge capital in order to develop new differentiated products and contribute further to the world's knowledge stock. This framework of knowledge spillovers is similar to the knowledge-driven model suggested by Rivera-Batiz and Romer (1991), in which the free transmission of non-excludable technical ideas makes the world stock of knowledge available to researchers in symmetric countries and increases the productivity of the research sector, which consequently raises the productivity of the manufacturing sector. In practice, this could be true for the group of developed countries (for example, the OECD countries). However, if only general knowledge spillovers are assumed, international trade appears to play a limited role in promoting technological progress among trading countries, particularly developing countries. Even when the international exchange of technical information is allowed, trade is predicted to have no effects on the long-run rate of innovation among trading countries in the knowledge spillover models of Grossman and Helpman (1991) and the knowledge-driven model of Rivera-Batiz and Romer (1991). A relevant question arising here is what else can account for the role of trade as a channel of technology diffusion?

Another important mechanism of technology diffusion underlying the role of trade is embodied technological knowledge. Being often characterized as excludable or appropriable, this type of technological knowledge can be diffused only when there is trade in goods, particularly intermediate and capital goods. In one specification of the R&D sector, called the lab equipment model, Rivera-Batiz and Romer (1991) assume that all outputs of the R&D sector (new designs) are embodied in the new types of differentiated capital goods without inheriting any benefits from know-how or ideas presented in the previous designs. The producers or investors in making new product designs are provided with patent protection, giving them monopolistic profits. The economy consists of two sectors, i.e. the research and manufacturing sectors, which have the same production function, using the same inputs, including human capital, unskilled labor and capital goods.

The capital goods are produced by the manufacturing sector using the designs from the R&D sector. The pace of technological progress is determined by an increase in the number of new differentiated capital goods, which in turn contribute to the output growth of both sectors and the whole economy. Given that there are two similar countries (having the same resource endowments and preferences, but different types of capital goods), trade opening between these two countries with the flows of differentiated capital goods has two key effects resulting from embodied technological knowledge. Firstly, since each country has a distinct set of capital goods, trade increases twice the number of the varieties of differentiated capital goods used in the manufacturing sector, which, by the construction of its production function, leads to the increase of labor productivity and hence output. Secondly, with the same production function and double the available capital goods, the R&D sector also obtains a higher productivity of labor and higher output of designs, resulting in a higher rate of innovation and more new differentiated capital goods. Therefore, trade in differentiated capital goods with embodied technical know-how has both level and growth effects through directly improving the productivity of the manufacturing and research sectors on the long-run equilibrium path of both economies.

It is, however, much more common that countries differ significantly in their technological capabilities, particularly the case of developing countries engaging in trade with advanced countries. As a matter of fact, developing countries, especially low-income countries, have a significantly lower level of technological development, or in other words they lack a comparable technological capacity compared with industrial countries, in terms of the size of their R&D sector and innovative outputs (Lumenga-Neso et al. 2005). This would imply that it is more difficult for developing countries to develop their own new differentiated products by only benefiting from the general technological knowledge when it is internationally transmitted. Therefore, it is more relevant and important for developing countries to acquire new technical knowledge in order to upgrade their technological capability (Bell and Pavitt 1993). The question arising here is whether and how developing countries can still achieve this goal from engaging in international trade.

Grossman and Helpman (1991) provide another explanation for the role of trade in transmitting embodied technological knowledge from advanced countries to developing

countries. In their model of imitation, the product-specific technical information (product designs and processes) can be learnt and copied by domestic firms when differentiated products are traded. Industrial countries are assumed to be innovators because they have both abundant human capital and a developed R&D sector and developing countries are followers for having limited research capacity and a comparative advantage in manufacturing with a larger labor endowment. While developing countries have some capabilities of invention, it is still more costly for them to develop new products compared with their counterparts with more research experience. Therefore, it is more feasible for developing countries to devote their resources on learning and adapting new technologies from abroad. In addition, imitation is considered an innovative activity because it involves the efforts to master the existing technology to produce a variety developed in the North, but new to the South. Then the diffusion of specific technological knowledge takes place when innovating countries export new differentiated products to developing countries. After a certain period, Southern firms become able to master the technology to produce similar products developed by Northern firms and dominate the markets. At first, it appears that imitation may reduce the incentives to entrepreneurs in the innovating countries to invest in R&D. However, the destructive effect of imitation on some Northern brands allows other Northern firms of the existing brands to expand markets and obtain a higher profit rate with their monopolist position. Increased profit motivates the Northern firms to invest more in R&D and hence leads to a higher rate of innovation in innovating countries. For Southern firms, imitation helps to acquire new technologies at lower costs. As a result, developing countries can achieve a faster rate of technological progress and output growth.

In the case of developing countries, the import of new capital goods/intermediate goods may have only temporary effects on factor productivity and output unless they have a capable R&D sector to exploit the advantages of new foreign knowledge embodied in the imported capital goods. Similarly, a country with less research experience and small R&D sector would benefit less from knowledge spillovers. Grossman and Helpman (1991) also indicate the importance of a country's technological capability in exploiting the benefits of technological diffusion. However, the technological capability depends on its factor endowments (particularly human capital) and history (research experience). These are two key factors having significant influence on a country's patterns of specialization and the

pace of technological progress and long-term output growth when the country is engaged in international trade.

2.3.2 Resource reallocation and structural transformation

The previous discussion focused on the likely direct impact of trade liberalization on manufacturing productivity. At a higher aggregate level, the overall growth of the manufacturing sector also depends on the performance and contribution of each industry (sub-sector). Naturally, each manufacturing industry has a different rate of productivity and output growth due to industry-specific characteristics. In general, it is often perceived that traditional manufacturing industries have high unskilled labor intensity and low technology content with lower productivity level while the modern ones have high technology content and skilled labor intensity with a greater scope of productivity growth. In addition, the development of high-tech industries is expected to create dynamic externalities in terms of learning effects, which can enhance the productivity and output growth of the whole manufacturing sector. Therefore, in addition to direct productivity effects, theoretical literature also discusses extensively the possible indirect effects of trade liberalization on changing the relative importance of economic sectors and sub-sectors through its effects on resource allocation.

Resource reallocation and structural transformation: Static aspects

Reallocation of resources according to comparative advantages

One of the key arguments in favor of trade openness is resource reallocation efficiency (Kirkpatrick and Weiss 1992, Rodrik 1995). According to this argument, since a developing country does not have comparative advantage in production of importable goods in terms of costs due to their high requirements for scarce input factors, the restricted trade regime encourages the production of importable goods by making the prices and returns to production of these goods much higher through tariffs and other barriers. As a result, productive resources are attracted to import-competing industries while reducing the quantity of exportable goods, given the country's unchanged production frontier and domestic resource supply. Furthermore, Bhagwati (1988) adds that not only domestic

resources, but also foreign resources attracted by the developing countries under the IS regime are allocated in the same manner. This is evident in the so-called tariff-jumping foreign investment flows into the protected and capital-intensive sectors. An outcome of the IS-biased production structure is consumer welfare reduction due to the higher prices of importable goods and lower income due to the loss of export production. In addition, production inefficiency is expected due to the higher opportunity cost of the scarce factor (capital) and less use of the abundant factor (unskilled labor) in the import-competing industries. This situation means factor inputs are not efficiently employed. Consequently, the country's production pattern departs from its comparative advantage.

Given these resource use distortions, the movement to outward-orientation under trade liberalization will reduce import-substitution bias in the incentive system to bring the opportunity costs of factor inputs closer to the international level, inducing the changes in domestic resource allocation according to the country's comparative advantage. Trade openness supporters further argue that opening to trade helps the economy to achieve the better utilization of its abundant and underemployed domestic resources by attracting and exploiting relatively scarce resources from abroad (Srinivasan and Bhagwati 2001). For developing countries, this resource reallocation effect would be expected to manifest in the process of shifting unskilled labor from the agricultural sector to manufacturing sector, as well as the growth and increasing shares of resource and unskilled labor-intensive goods in their manufacturing production and export structure (Djikista 2000).

Despite its popularity in the literature and its solid ground in economic theory, the argument for the expected efficiency gains from the resource reallocation of trade opening is less significant in terms of the magnitude of the gains (Rodrik 1995). The very early evidence documented in Leibenstein (1966) and Bergsman (1974) indicated that the misallocation costs of trade restrictions under the neoclassical assumptions, which are represented by Harberger triangles, are considerably small, equivalent to less than two percent of GNP in several developing countries examined. Both Leibenstein (1966) and Bergsman (1974) also claim that the inefficiency costs due to managerial slacks (X-inefficiency) and monopoly under import-substitution trade regime are much more significant.

Increasing capacity utilization

Another kind of output possibly lost in the trade protection regime claimed by the pro-trade scholars is capital underutilization, which is related to the misallocation of resources. In line with the concentration of resources in the capital-intensive and import-substituting activities, underutilization of the capital stock becomes a phenomenon as a result of a number of related causes. At first, the overvalued exchange rate and the foreign exchange rationing based on installed capacity make incentives for firms to import more capital goods and expand their production scale. This process usually leads to excessive capacity (Bruton 1998). In addition, the domestic markets of many developing countries are small in terms of purchasing capacity due to their low per capita income at the early stages of development. The small market size could prevent firms from achieving the minimum efficient scale (Krueger 1998). Furthermore, the trade and foreign exchange restrictions limit the availability of better and cheaper imported inputs (intermediate goods), resulting in the ineffective exploitation of technological possibilities and the waste of resources (Dornbusch 1992). Therefore, it is implied that underexploited capacity, combined with resource misallocation, heightens the problem of resource underutilization, particularly the underemployment of unskilled labor, which is a main comparative advantage of developing countries. In light of the capacity underutilization problem, trade liberalization is argued to be effective in addressing its underlying causes, making it a more efficient use of the country's available resources.

The above arguments suggest that trade opening leads to a more efficient use and allocation of resources through the main mechanisms of changing relative output prices and expected returns, and specialization according to comparative advantages. It is clear that these mechanisms are implied by the underlying neoclassical approach, or the received trade theory, with the suggestions of minimal government intervention and getting prices right[8] (Guerrieri 2002). However, not only it is claimed by the skeptical and pessimistic views of trade openness (e.g. Rodrik 1999; Rodriguez and Rodrik 1999), but also acknowledged by the trade openness proponents like Srinivasan and Bhagwati (2001), and Winters (2004),

[8] This is the key approach of the Washington Consensus, which was originally suggested in 1989 to formulate a policy reform agenda for Latin American countries to overcome indebtedness and macroeconomic instability and achieve high economic growth (Williamson 2004).

that these efficiency gains are static in the sense that output growth results from the once-off increases in the amount of resources used due to the reallocation and rationalization process. In the neoclassical growth framework, the increase in the factor inputs (specifically capital) does not lead to the long-term growth rate of the economy in the steady-state due to the effects of diminishing returns. When more available resources are employed in the production process, a higher growth rate results to allow the economy to achieve the higher levels of output and income. However, this higher level of output growth rate is only transitional because it is not driven by increasing returns to scale and technological progress. Therefore, the effects on resource allocation on the aggregate growth of the economy and economic sectors are only considered as the level effect, not growth effect (Winters 2004). Notably, it is argued that while the resource allocation effects (including also resource use inefficiency eliminating effects) are transitional growth effects, they seem to be substantial in the early years of trade liberalization. In addition, they appear to last for a certain period of time, which can range from at least one to three decades due to the fact that trade liberalization in many countries takes time to complete (Winters 2004; Salinas and Aksoy 2006).

Another important implication of the above arguments is that the country will specialize in the production of goods, which use extensively the input factors abundant in that country. It follows that, under trade opening, a developing country is expected to increase the exports of resource and unskilled labor intensive products. However, this prediction is claimed to be limited in two aspects: (i) since the prediction is based on the neoclassical view, it neglects the role of technology in determining the changing pattern of trade specialization and the dynamic comparative advantages of developing countries. As mentioned above, while recognizing the role of trade opening in technological progress through imports of machinery and intermediate inputs, the neoclassical approach fails to model how trade can boost technological change and productivity; (ii) despite suggesting a higher growth rate due to resource allocation effects, the neoclassical approach does not indicate the possible worse outcome for a developing country of slowing down growth due to specialization in the traditional and stagnant industries, induced by trade opening through market forces. Therefore, in empirical perspective, the neoclassical approach is less effective to explain why some East and South East Asian countries have been very successful in promoting the

growth of manufactured exports and moving up in the sophistication level of their exports overtime.

Resource reallocation and structural transformation: Dynamic aspects

Various theoretical developments embodied in a number of new trade and endogenous growth models have suggested important additional predictions on the long-term and dynamic aspects of resource reallocation effects of trade opening. On the one hand, the new trade and growth theory recognizes the resource allocation effects of trade opening and the patterns of specialization based on static comparative advantages implied by the neoclassical approach. On the other hand, by focusing on the mechanisms of trade and the endogenous growth process, including increasing returns, innovation, technology diffusion and learning-by-doing, this theory gives a rise to the proposition that an integrated developing country may not experience the long-run growth due to its trade-induced specialization patterns that present very limited technological progress, despite the likely positive effects of trade opening on productivity. The followers of new growth and trade theory also indicate that the neoclassical view has failed to account for these new mechanisms induced by trade opening, which can explain better the dynamic patterns of industrial performance and manufactured exports of developing countries which have undergone substantial trade liberalization in the last two decades (Lall 2000).

In addition to explaining the alternative situations in which international trade promotes technological progress and productivity through technology diffusion, Grossman and Helpman (1991) provide the models of trade-induced specialization, dynamic comparative advantage and long-run growth. Grossman and Helpman argue that, at the outset of trade opening, each country follows the specialization patterns in production and exports of goods according to its static comparative advantages, which is determined by relative factor/resource endowments as predicted by traditional trade theory (HO effects). However, of the resource endowments, the initial stocks of human capital and R&D experience (knowledge capital) play a key role in endogenously determining a country's technological capability, which is the key for its long-run productivity and output growth. Therefore, in the case of trade opening between two dissimilar countries, one country having a larger endowment of human capital and knowledge capital will specialize in producing high-tech

goods with a wider boundary for technological advances while the other, which is rich in labor (low skill), will concentrate on manufacturing traditional goods. As a result, the country with the initial technological advantages is expected to grow faster in the long-run despite the predicted better welfare outcome for both countries with the same rate of real consumption growth in the long-run equilibrium. When technological spillovers caused by trade opening are allowed with two different countries having the same access to the worlds' common stock of knowledge, the predicted patterns of specialization and long-run growth appear to remain unchanged because of the endogenous nature of technological capability: the country with a larger initial stock of knowledge capital will accumulate knowledge and develop technological capability faster, and consequently lead the productivity growth and achieve higher output growth rates. In other words, technological advantage tends to be reinforced over time. Moreover, the shortage of human capital and research capacity prevents the technologically disadvantaged country efficiently exploiting the knowledge flows driven by international trade. This situation implies the strong influence of the initial conditions on a country's trade pattern and the rate of output growth in the long-run, being described by Grossman and Helpman as 'once behind, always behind'.

Despite asserting the critical role of relative resource endowments, Grossman and Helpman argue that by not taking into account the role of human capital and research experience, traditional trade models fail to explain changes in the pattern of a country's specialization and why some countries have obtained different levels of technological mastery in producing goods. They suggest that exploitation of the dynamic comparative advantage would help a technologically backward country improve its technological level, leading to the changes in the pattern of specialization toward sophisticated goods and higher growth. Whereas the improvement of technological capability is driven by the private profit-seeking investments of entrepreneurs, the high costs of these investments due to the lack of human capital and small knowledge base as the key inputs create disincentives for firms to involve in innovative activities. Therefore, the intervention of the government is needed in the form of a large subsidy to R&D activities to overcome the technological disadvantages. The necessary subsidy does not need to be a permanent one, because the subsidy policy has long-lasting effects when the country has overcome the initial gap in the knowledge stock.

In another branch of new trade and endogenous growth literature, which focuses on learning-by-doing as the source of endogenous growth, trade is also predicted to lead to the changes in a country's resource allocation and pattern of specialization in goods with different levels of learning-by-doing potential, which have a significant impact on the country's technical progress and growth rate. Important models of this branch include Krugman (1987), Stokey (1988, 1991), Young (1991), Lucas (1993) and Redding (1999), among others. Generally, these models are based on the Ricardian framework, in which a country's comparative advantage is determined by the relative wage and the difference in labor productivity, which, in turn, results from the difference in knowledge stock (technological level), accumulated from the learning processes. A notable early model which deals with the dynamics of trade-induced specialization based on the learning-by-doing potential of goods is Young (1991). Young emphasizes learning-by-doing as the process of exploiting the productive potential of developed technologies with an implicit assumption that it takes time to actualize the full productive potential of a technology. With more advanced technologies being introduced and associated with greater productive potential, learning-by-doing is continued, leading to sustained productivity and output growth over time.

Young's model assumes two countries, a less-developed one (LDC) and a developed one (DC). The key difference between the LDC and the DC is the initial gap in their current levels of knowledge (technological level). This technological gap leads to an absolute advantage of the DC in labor productivity over the LDC. However, the comparative advantage of each country is determined by its labor productivity and relative wage, i.e. the labor cost. Therefore, the combination of the technological gap and wage difference creates an overlapping range of goods, which can be produced in both countries. In the overlapping goods, there still continues learning-by-doing for the LDC (the most advanced LDC goods), while the DC has exhausted learning-by-doing (the least advanced DC goods). In addition, the DC is not able to produce the goods in which learning-by-doing has ended in LDC due to their higher relative wage. Similarly, the LDC is considered not to be able to produce those advanced goods in which learning-by-doing continues in the DC due to its absolute disadvantage in labor productivity. When trade integration (free trade) between two countries is allowed without cross-country technological spillovers, this creates the

increased demand for the goods in which each country has a comparative advantage. Therefore, in the competitive environment, the greater world demand for the goods of the LDC's comparative advantage induces labor movement from the industries in which the LDC is still experiencing learning-by-doing to the industries that have exhausted learning-by-doing, while the reverse labor reallocation process in the DC due to the increase demand for the goods of its comparative advantage leads to the expansion of the industries in which learning-by-doing is continuing. As a result, the LDC is predicted to experience slower technical progress and output growth while the DC obtains the higher rates of technical progress and output growth. Thus, dynamically, free trade appears to have a negative effect on the growth of the LDC by inducing it to specialization in technologically stagnant industries. Once again, as in the models of Grossman and Helpman (1991), initial conditions are considered to have a significant role in the impact of trade opening on the aggregate growth through resource allocation and specialization.

While suggesting the case of possible negative outcomes of trade opening for the developing countries, Young's model is limited for the purpose of deriving the implications on policy response (Navaretti and Tarr 2000). Regarding the question of whether the LDC would be able to catch up with the DC, the model's results indicate one possibility when the LDC has a working population much larger than that of the DC and the initial technical gap between the two countries is small enough. This implies the importance of the scale (the size of the labor force), but without indicating the links with the skills (human capital) to be required to use new technologies. If the LDC has a population that is equal or less than that of the DC and the initial difference is large, the gap between two countries will be ever-increasing. Young claims that the model would be suitable to depict the situation of trade between the East Asian NICs and their follower LDCs, in which the NICs specialize in commodities with learning-by-doing potential while the LDCs concentrate and wait in industries where the NICs have already exhausted learning-by-doing. While this appears as a gradual process, allowing for the LDCs to move up in the technological ladder, the initial technological gap still remains.

Lall (2000) stresses the role of human capital accumulation in the learning process and focuses on the role of technological capability in the adoption of technology in developing

countries. He makes a strong case for the role of government as going beyond intervention in building technological capability through human capital accumulation, but also through FDI policy, which is based on the fact that FDI play an important role in building a technological base, as well as the performance and sophistication level of exports of developing countries.

2.4 Empirical evidence on trade liberalization and industrial performance

Given the importance of international trade on economic growth and structural change, among its multi-dimensional welfare effects many empirical studies have examined the relationship between trade openness and productivity using different approaches. Based on the aggregation level of data used, there are two categories of empirical studies: macro-level and micro-level.

Motivated by the debate on the pros and cons of outward-oriented and inward-oriented development strategies in the 1960s and 1970s, most macro-level studies, including country case studies and cross-country studies, have focused on examining the relationship between trade openness and output growth based on aggregate (country level) data. However, few macro-level studies examined direct correlation between trade openness and the economy's total factor productivity (TFP) growth (López 2005). Until 1990, several cross-country studies found some, albeit not strong, empirical support for the hypothesis on the positive impact of outward-oriented (export-led) growth strategy on productivity growth. However, a number of country case studies of output and TFP growth over time did not find unambiguous evidence of positive links between trade and productivity growth (Havrylyshyn 1990; Edward 1993). Since the early 1990s, a number of cross-country studies have found a positive relationship between trade openness and economic growth (López 2005). Among them, only two studies, e.g. Edwards (1998) and Alcalá and Ciccone (2004) established direct links between trade openness and TFP growth across countries. Despite optimistic findings, macro-level studies have been frequently criticized as suffering from the serious problems of measurement errors (both in measuring productivity and openness due to data problems) and econometric shortcomings, including endogeneity and misspecification (Harrison and Hanson 1999; Winters 2004). More importantly, cross-

country studies are limited in identifying the mechanisms by which trade openness affects growth and productivity (López 2005). It has been suggested that the limitations could result from several causes, including the nature of aggregate data, the lack of good data on trade policies which leads to measurement errors of trade policy variables (Harrison and Hanson 1999), and some methodological problems in econometric models with irrelevant specifications and estimation methods. The measurement errors appear to be more serious with cross-country studies based on highly aggregated data. In reviewing early studies on growth and openness among developing countries, Havrylyshyn (1990) concludes that country-specific studies seem to be more conclusive than cross-country studies. López (2005) also points out that studies based on plant-level data have helped to find out more important and new stylized facts about the relationship between trade and growth and productivity. Detailed case studies of each country based on micro-level data appear to have provided more specific empirical evidence on the links between trade liberalization and productivity.

Micro-level empirical studies are based on industry and firm-level data. The standard procedure of examining the impact of trade liberalization on productivity includes two main steps: (i) estimating industry/firm productivity (with cross-section, panel or time-series data); (ii) relating productivity estimates with various measures of openness or trade liberalization and other influent variables in regression equations with different specifications and estimation methods. It can be said that the foremost issue for productivity-related studies is how to get good estimates of productivity level or index for firm or industry. This depends on many factors such as estimation and measurement methods, the nature of observations, and data quality. Starting from traditional Solow residual-based measures of productivity, many modifications have been applied with different assumptions to obtain more realistic estimates of productivity. There are two main approaches among empirical studies at mirco-level: (i) studies in which firms are assumed to operate on their production frontiers with full technical efficiency may be called the TFP-based studies; and (ii) studies adopting the approach with the assumption that firms may not produce at their production frontiers with technical inefficiency could be named

technical efficiency-based studies. Given the diverse features of their underlying hypotheses, the main findings of these studies are presented below[9].

It is surprising that, until 1990, stronger evidence of the positive impact of trade liberalization was found in efficiency-based studies than TFP-based studies. Based on the technical efficiency concept proposed by Farell (1957) and using sector/firm level data, several studies such as Pitt and Lee (1981), Nishimizu and Page (1982), Condon et al. (1985) and Page (1984) found strong positive effects of trade liberalization on efficiency. Meanwhile, only Krueger and Tuncer (1982) found evidence of higher TFP level following trade liberalization in Turkey (Havrylyshyn 1990).

Since 1990, with the development of econometric techniques and increasing availability of firm level data, there have been many more empirical studies in both directions. In addition, the increased number of empirical studies has been fostered by the trend of globalization and the substantial trade liberalization episodes of many developing countries and transitional economies in Asia and Eastern Europe.

2.4.1 Findings of TFP-based empirical studies

Despite significantly different econometric approaches and assumptions, most empirical studies based on TFP have found statistically significant and positive impacts of trade liberalization in developing countries. The majority of these studies tried to examine competition effects of trade liberalization through reductions of tariffs, import penetration, effective rates of protection and market share reallocation taking into account firm- and industry-specific effects.

By removing the assumption of perfect competition in the traditional growth accounting approach to correct for bias in TFP estimates and constant returns to scale, Harrison (1994) examines the impact of 1985 trade reform on the performance of manufacturing firms in Cote d'Ivoire. Using panel data estimation techniques and measures of tariffs and import penetration, the study finds that trade reform had a strong positive effect on firm

[9] Empirical studies are also diverse in their approaches to measures of trade liberalization or trade openness and underlying theoretical assumptions. Different aspects of their empirical results will be mentioned in the review.

productivity growth (productivity growth tripled after reform) and resulted in some reduction of market power in terms of price-marginal cost markups. With the same methodology applied to the firm-level data, Krishna and Mitra (1998) find a strong competition effect (reduction in price-cost margin) and some positive productivity effect of the dramatic 1991 trade liberalization in India.

Kim (2000) also follows the same methodology, but uses the different functional form, i.e. the Translog production function for industry-level data to examine the impact of trade liberalization over a long period of 1966-1988 on Korea's manufacturing industries. His findings are similar to the above mentioned studies in two aspects: (i) the negative correlation between quota protection and nominal protection and TFP growth; and (ii) a drop of markup in line with trade liberalization. However, his study also finds a surprising result that TFP growth contributed a very small share to Korean's manufacturing output growth (about 3 percent of output growth, or 0.5 percent compared with 17.9 percent/year), which is at odds with the 'conventional' wisdom. This may be due to the fact that his study uses industry-level data, which could miss the share reallocation effect at firm level. Another study of Chand and Sen (2002), based on panel data of 30 manufacturing industries in the period of 1973-88 in India, employs a 'price wedge' between the domestic and international prices of each industry as a measure of protection and an index of intra-industry trade as a measure of access to foreign intermediate inputs to investigate the impact of trade liberalization on Indian manufacturing TFP. Their results show a significant impact of trade liberalization on Indian manufacturing TFP growth, particularly the liberalization of intermediate goods sector. Using industry-level data in the period 1985-97, Ferreira and Rossi (2003) estimated the labor and TFP growth of 16 Brazilian manufacturing industries before and after the dramatic trade liberalization in 1988-90 by the instrumental variable (IV) method and then linked the estimated TFP growth with nominal tariff, effective rate of protection and imports in a panel data regression framework . Their regression results reveal a quite strong impact of trade liberalization on the TFP growth of Brazil's manufacturing industries.

As reviewed by Epifani (2003), the two main problems facing empirical studies based on firm-level data in estimating productivity are simultaneity bias and self-selection bias.

Simultaneity bias is caused by an unobserved plant-specific efficiency level, which is positively correlated with a firm's decision on the amount and combination of inputs used. Self-selection bias results from a firm's decision on whether to stay or exit the market due to its productivity level, which is unobservable to econometrician (Schor 2004). Several studies such as Pavcnik (2002), Levisohn and Petrin (2003), Schor (2004), Fernades (2007), Topalova (2007), and Wong (2009) have tried to overcome these problems by applying the instrumental variables method initially proposed by Olley and Pakes (1996) to obtain better estimates of plant TFP measures. Then bias-corrected TFP measures are regressed on trade policy measures and firms' lagged productivity, taking into account firm characteristics and industry effects (Fernades 2007). It has been found from these studies that trade liberalization still had significantly positive effects on firm- and industry-level productivity growth through various channels such as foreign competition (import penetration, output tariff reduction), better access to intermediate inputs[10] (reduction of input tariffs) and market share reallocation.[11]

2.4.2 Findings of technical efficiency-based empirical studies

In evaluating firm performance, it is commonly agreed that the assumption of full technical efficiency in neoclassical production theory is unrealistic (Kalarajan and Shand 1999). Recognizing this, a number of empirical studies consider whether trade liberalization could improve firm or industry technical efficiency levels. In addition, by assuming that factors are not fully utilized, TFP growth perceived as the changes of residuals is decomposed into technological changes and efficiency changes (Bartelsman and Doms, 2000).

As mentioned above, before 1990, several technical efficiency-based studies found a positive impact of trade liberalization. Similarly, using two measures of scale and technical efficiency in the concept of productive efficiency and firm-level data, Tybout et al. (1991) examine how performance of manufacturing industries in Chile changed in the period 1967-1979, in which trade liberalization took place in the sub-period of 1974-79. Their study finds a significantly positive correlation between the protection level and the technical inefficiency level of Chilean industries although there was little improvement of

[10] Examples are Schor (2004), Amiti and Konings (2004) and Tapalova (2007).
[11] Examples are Pavcnik (2002) and Fernandes (2007).

overall productive efficiency, which was attributed to the impact of other macroeconomic shocks in the same period.

With the concept of technical efficiency and the accompanying production frontier, there have been three main methodologies of estimating technical efficiency: (i) the data envelopment analysis approach (DEA); (ii) the stochastic frontier production function approach (SFA); and (iii) the stochastic varying coefficients frontier approach (SVFA) (Kalirajan and Shand 1999). The available studies have followed one of these approaches to measure firm and industry technical efficiency over time and link technical efficiency with various measures of openness.

Mahadevan (2002) would be one of few studies taking the decomposition of TFP growth into technical efficiency change and technological progress. Interestingly, this study makes a direct association between each of the TFP components, as well as whole TFP growth and the measures of trade policy reform and other industrial policies in Australia from 1968-69 to 1994-95. This study finds a positive and significant effect of trade liberalization on technological progress, but not the same result with technical efficiency. In contrast, with the same approach, Alam and Morrison (2000) reveal that the improvement of plan-level technical efficiency between 1988 and 1990 in Peru is substantially attributable to the 1990 trade reform, which is seen in the negative relation between protection rate and technical efficiency level.

It is notable that there are a significant number of empirical studies focusing on the case of India as reviewed by Das (2002). This could be due to two facts: (i) extensive economic reforms, including trade reform were carried out in the early 1990s, making an appealing natural experiment for examining the impacts of these reforms on firm performance; (ii) the slowdown of manufacturing growth after several years of economic reforms, which is 6.0 percent in the 1990s compared with 6.98 percent in the 1980s (Kalirajan and Bhide 2005). Examples of technical efficiency-based studies on the case of India include Parameswaran (2002), Kambhampati and Driffield (2003), Kalirajan and Bhide (2005) and Vencappa et al. (2007). It is found in Parameswaran (2002), and Kalirajan and Bhide (2005) that trade liberalization (measured by export intensity, imported intermediate inputs and machinery) had favorable impacts both on technological progress and firm technical efficiency.

However, technical efficiency was shown to reduce in the post-reform period (in the 1990s) in the decomposition analysis. Nevertheless, technological progress was speeded up at higher level, resulting in overall TFP growth improvement.

2.5 Empirical studies on the case of Vietnam

In the last two decades, Vietnam has achieved substantial progress in trade policy reforms and moving toward a liberal trade regime in line with transforming its centrally planned economy to a market-based economy. While the reforms of the trade regime were significantly implemented in the 1990s, substantial trade liberalization started in 2000 and reached a turning point in 2007 when Vietnam joined the WTO.[12] In this context, there have been a large number of studies on the effects of trade policy reforms on the country's economic welfare, particularly several notable general equilibrium model studies focusing on the prediction of the economy-wide effects on production, income and consumption.[13] Several significant sectoral studies have concentrated on what the changes of the trade policy regime imply for resource allocation and the performance of the Vietnamese manufacturing sector. It is also worth noting a group of studies examining the performance of the manufacturing sector at sub-sectoral and firm levels. However, only a very limited number of studies have directly investigated the links between trade liberalization and the growth and productivity of the manufacturing sector in Vietnam.

Studies including Centre for International Economics-CIE (1998; 1999), Institute of Economics-IE (2001), Trinh and Thanh (2005), and Athukorala (2006) examined the level and structure of trade protection with a focus on the manufacturing sector in the context of trade policy reforms. All studies are based on the IO table, trade data and tariff schedules to measure the nominal and effective rates of protection (NRPs and ERPs). It was found that while Vietnam's trade regime underwent significant changes from the old system of the centrally planned economy, the protection of import-substituting production increased in the late 1990s. Notable consequences were static resource misallocation, underutilization of comparative advantage of unskilled labor, inefficient domestic production and high costs to

[12] The trade liberalization process in Vietnam will be discussed in detail in the next chapter.
[13] See Abbott et al. (2009) for a review of modeling works on the impact of bilateral trade agreements such as the United States – Vietnam Bilateral Trade Agreement and the WTO accession.

consumers. For example, CIE (1998) reported that, by 1998, around 65 percent of foreign direct investment (FDI) flowed into sectors with ERPs above 60 percent while some 14 percent of FDI was in sectors having ERPs of less than or equal to zero. In an influential study, Athukorala (2006) observed that, in 1998, the price cost margin appears to be higher in highly protected industries, where the state owned and foreign invested enterprises dominate, indicating the high costs to domestic consumers. Importantly, manufacturing growth in the 1990s was capital intensive and capital intensity was higher in manufacturing industries with high levels of protection. This was in contradiction with the employment generation objective of the government. Athukorala (2006) also provided the estimates of NRPs and ERPs, which show the most significant reduction in the protection of the manufacturing sector compared with agriculture and mining between 1997 and 2003. In addition, there was a clear decline in the anti-export bias index between 2001 and 2003, implying the move to a more balanced trade regime with export orientation. Despite the above valuable findings, these studies did not make any statistical analysis on the links between trade protection and its change on the performance of manufacturing firms and industries. Moreover, their estimation of NRPs and ERPs was conducted for one year, preventing the consistent and continuous investigation of how the level and structure of manufacturing protection has changed over time and its relations with the production outcomes of manufacturing industries.

A significant number of empirical studies have focused on the growth and productivity of the manufacturing sector and its determinants, partly as a result of the availability of the enterprise dataset annually collected from the General Statistical Office (GSO) enterprise census. Many studies utilize the measurement of firm and industry performance in terms of technical efficiency. Examples include various and detailed analyses of industrial firms such as Thang et al. (2002), Ngu (2003), Minh (2005), Minh and Long (2005), Minh et al. (2005), Minh et al. (2007), Carlin et al. (2008) and Bich (2008). Other studies adopt the total factor productivity or labor productivity of manufacturing firms as a performance measure such as Anh et al. (2005), Tien (2007), and Hoi and Pomfret (2008). The former studies pay particular attention to the impact of ownership on firm performance, apart from considering common factors such as firm size, firm age, capital intensity, location and industry-specific characteristics. This trend could be explained by the fact that Vietnam is a

transitional economy in which ownership reform is a key one among institutional reforms and hence the performance of firms of different ownership types has important policy implications.[14] For example, the findings of some studies such as Minh and Long (2005), among others, support the arguments about the disadvantages and poorer performance of the private enterprises compared with state-owned and foreign invested enterprises as well as for fairer treatment in government policies, as put forward by Hakkala and Kokko (2007) and Perkins and Anh (2010).

The latter group of studies focuses on the technological spillover effects of the FDI on the productivity of manufacturing firms with the findings of positive effects. In addition, among the studies of both groups, domestic competition, measured by the industry competition index (Herfindalh index), was found to have statistically significant and positive effects on firm performance whenever it is taken into account. This finding implies significant competition effects from domestic reforms, particularly ownership transformation and other institutional reforms in a transitional economy, which have reduced the entry barriers to private firms. However, given the competition effects of import liberalization and the important role of trade in technological diffusion as well as the close association between trade liberalization and domestic reforms,[15] it seems that little research has been done on the links between trade liberalization and the productivity performance of the manufacturing sector, particularly technical efficiency. The only exception would be a very recent study of Hung et al. (2010), which is discussed in more detail below.

The incentive-induced technical efficiency effects of trade and market reforms in the agricultural sector were documented and examined in the stochastic production frontier framework by Tuong Nhu et al. (2002) and Kompas (2004). A similar approach was used by Hung et al. (2010) to examine the determinants of technical efficiency in the Vietnamese manufacturing sector at firm level, with particular attention paid to trade openness and

[14] This trend is also observed among empirical studies on firm and industry performance in China, see, for examples, Zheng et al (1998), Jeferson and Zheng (2000), Movshuk (2004), and Garnaut et al. (2005).
[15] In many developing countries, particularly Latin American and African countries, trade liberalization has been associated with substantial domestic reforms in the form of structural adjustment programs as proposed in the Washington Consensus. In some transitional economies like Vietnam, it has been closely accompanied by extensive institutional reforms. This feature of Vietnam will be discussed in the later chapters.

export orientation for the year 2002. In this study, trade openness is measured by nominal tariff rates, import penetration and export ratios at manufacturing sub-sectoral level, while the export orientation is based on whether the manufacturing firm is engaged in exporting or not. Other firm-specific variables are controlled for and examined including ownership type, age of firm, female labor share, and enterprise location. Interestingly, the study found that manufacturing firms in industries with higher average tariff rates, and lower export or import penetration ratios are less efficient. While the study's findings are theoretically expected and robust among the measures of openness, the estimated coefficients of the interested variables could be biased due to two-stage estimation process in the stochastic frontier framework.[16] Moreover, the industry average tariff rates at three-digit levels appear not to be consistent with the import penetration and export ratios measured at two-digit levels. The role of domestic competition is also not taken into account. More importantly, the use of the cross-section data of firms in 2002 seems to prevent the study from proving the effort-induced efficiency hypothesis on the dynamic impact of the trade liberalization process on the firm's behavior.

The above discussion clearly suggests that there appears to be a critical gap in the current literature on the impact of trade liberalization in Vietnam on the performance of the manufacturing sector, apart from the role of FDI and domestic reforms. Moreover, the theoretical discussion section implies the importance of examining the structural transformation of the manufacturing sector in the context of trade liberalization, which has critical implications in terms of technological progress potential for the future growth of manufacturing productivity and output. This issue has been examined by some trade-focused studies such as Trinh and Thanh (2005), Athukolara (2006), and Athukorala (2009), but needs to be investigated more systematically in conjunction with the trend and pattern of manufacturing output and productivity growth.

2.6 Conclusions

The theoretical literature suggests that there are three main channels through which trade opening can affect firm productivity: technical (X) efficiency, economies of scale and

[16] This estimation issue will be explained in Chapter 6.

technological progress. At the aggregate level, trade liberalization could have significant impacts on manufacturing productivity and output growth through promoting the efficiency gains in static resource reallocation and shaping the potential of technological progress by inducing a country to follow a certain pattern of specialization.

The first important point is that the benefits in terms of efficiency gains in various forms, particularly X-efficiency, brought about by trade liberalization appear to be widely recognized in the theoretical literature. Therefore, an important prediction is that efficiency gains with the transitional growth rate and resulting higher income level are more likely to be attained for developing countries in their movement from a restricted trade regime for import substitution to a liberal trade regime with outward orientation. Moreover, it is suggested that, in the early years of trade liberalization, the efficiency gains appear to be more apparent and more important, making it possible for developing countries to achieve higher income levels for physical and human capital accumulation, and invest in building technological capability.

It is important to note the dynamic nature of X-efficiency. Because of its close link with motivation and efforts, enhanced X-efficiency is likely to result in in the short term under trade liberalization due to its competition promoting effect. Trade opening is also expected to create opportunities of technological diffusion. In combination with increased competition pressures, this effect could promote the technological adoption of manufacturing firms. Therefore, the continuous improvement in X-efficiency is a crucial and concurrent issue for manufacturing firms in the long-term. This aspect of X-efficiency appears to be closely related to the learning-by-doing arguments of the new trade and endogenous growth theory, which has a cautious view of the benefits of trade opening on long-term growth and stresses the role of technological capability in achieving technological progress.

While it is widely agreed that the long-term dynamic benefit of trade liberalization is technological progress, not all countries are able to reap these benefits due to technological capability constraints as argued by the new trade and endogenous growth theorists. Specifically, they suggest alternative situations in which a developing country with a lack of technological capability may be worse off in terms of the long run growth due to trade-

induced specialization in the stagnant industries. They make the case for government intervention to upgrade the technological capability. Therefore, in terms of the long-term productivity and output growth, the theoretical literature does not give a definite answer for the effects of trade liberalization.

It appears that most empirical studies of the different approaches have found supporting evidence for theoretical arguments in favor of trade liberalization in promoting productivity and economic growth. Cross-country studies at the country level have found the evidence of positive relationship between trade liberalization and growth among countries. However, few cross-country studies can find the evidence of the specific links between trade openness and productivity growth. In contrast, studies at the industry and firm levels could provide empirical possibilities to test alternative hypotheses on the specific links between trade opening and productivity performance. Moreover, they help to identify and control for the influences of other important factors on productivity growth such as industrial structure by ownership types, firm size, other industry-specific characteristics and domestic institutional reforms.

Despite the focus on developing countries, it is notable that most studies have concentrated on Latin American countries, India and some Asian countries. There seem to be very few studies on transitional economies, including Vietnam, China and other former socialist countries in Eastern Europe. Some transitional countries like Vietnam and China have undergone a very extensive process of trade liberalization in the last two decades. Trade liberalization in these countries has been aligned closely with substantial other economic and institutional reforms, particularly the changing economic structure of ownership, with the rapid development of foreign invested and private sectors. Also, because of the economic structure of ownership, trade liberalization seems to have taken place at a different pace in different manufacturing industries in these transitional economies. This feature has a significant influence on the impact of trade liberalization on manufacturing growth and productivity. Finally, there is still a significant gap in the empirical literature on the impact of trade reforms on manufacturing performance in Vietnam. One of the main objectives of this thesis is to fill this gap in the empirical literature. In particular, the thesis

provides empirical investigation of the impact of trade liberalization on Vietnam's manufacturing sector, on which there are no systematic and comprehensive studies to date.

Chapter 3

Trade Liberalization and Manufacturing Protection

3.1 Introduction

In the context of a transitional economy, the trade policy regime in Vietnam has undergone significant changes to become more liberal. These changes are driven by various reform measures and fast-paced international economic integration initiated by the government. Following the introduction of the *Doi Moi* (Renovation) policy in the mid-1980s, the trade policy regime was transformed by dismantling the state monopoly in trading activities and developing a set of instruments for the market-based economy's trade regime such as tariffs, quotas and licenses (Aufret 2003). In the 1990s, in line with the initial steps of integrating into the world economy by signing various bilateral trade agreements and joining multilateral organizations such as ASEAN with ASEAN Free Trade Area framework (AFTA) and Asia-Pacific Economic Cooperation (APEC), Vietnam made further important changes, which included introducing the new tariff system, giving more trading rights to the private sector, reducing import and export license requirements, and step-by-step relaxation of foreign exchange control. However, due to the transformation process of the trade regime and the influence of the import substitution view in the industrial policy, there was an increasing trend of protection, particularly in the manufacturing sector, in terms of tariffs and quantitative restrictions (Kazi et al. 2003). Since 2000, trade liberalization has taken place extensively with the implementation of Vietnam's commitments under AFTA framework, the United States-Vietnam Bilateral Trade Agreement (USVBTA), and the ASEAN – China Free Trade Agreement (ACFTA). In particular, thanks to continuous and intensive efforts, Vietnam became the 150th member of the World Trade Organization (WTO) on 11 January 2007. As a result, there has been a substantial reduction of tariff levels and the removal of many non-tariff barriers in the trade policy regime, and Vietnam's economy has become much more open.

A key feature of the liberalizing trade policy regime in Vietnam's manufacturing sector is an emerging dualistic structure. Like many other developing countries, Vietnam initially

tended to follow the import substitution industrialization strategy, which leads to a very high level of protection to import-competing activities by various tariff and non-tariff barriers. High protection was also aimed at providing assistance to the state-owned enterprises, which, as a legacy of the centrally planned economy, dominated in many import-competing industries. Since the late 1990s, in parallel with protecting import-competing industries, many attempts have been made to promote export-oriented industries with the aim of exploiting Vietnam's comparative advantages for industrialization and higher economic growth. A number of measures have been implemented to reduce bias against export in the trade policy regime such as duty drawbacks, export processing zones and tax preferences (Athukorala 2006). As a result, a dualistic structure of the manufacturing sector and the policy regime has been created. In one dimension, the trade policy regime both maintains the protection barriers for a number of import-competing industries and a number of counter-balancing measures to assist export-oriented activities. In the other dimension, it has been observed that the manufacturing sector consists of two quite distinct groups of industries: one group of protected and low-efficiency import substitution industries and one group of competitive and export-oriented industries (National Economics University-NEU/Japan International Cooperation Agency-JICA 2003). Therefore, while a general trend is a reduction in the protection level, an important question is how the protection level has changed with respect to these groups of manufacturing industries as well as other manufacturing industries in line with the trend of trade liberalization.

This chapter aims to examine how trade liberalization has taken place in Vietnam's manufacturing sector in the context of fast-paced international economic integration. The focus is on the changes of the level and structure of protection to examine the progress of trade liberalization as suggested in the literature on trade protection.

The chapter is organized as follows. Section 3.2 makes an overview of the trade liberalization process in Vietnam. Section 3.3 provides a detailed review of trade reforms in Vietnam, including import liberalization and export promotion. Section 3.4 gives an overview of other important policy reforms related to manufacturing growth. Section 3.5 starts the empirical analysis of manufacturing protection changes by discussing the

methodology of estimating manufacturing protection. Section 3.6 presents the estimation results of nominal rates of protection. Section 3.7 discusses the estimation results of effective rates of protection. Section 3.8 makes the comparison of manufacturing protection in Vietnam with other countries in the East Asian region. Finally, Section 3.9 gives conclusions.

3.2 Trade liberalization and international economic integration

Trade liberalization accompanied by international economic integration in Vietnam has been a continuous and fast process. It took less than two decades for Vietnam to transform from a planned trade regime to being a WTO member in the beginning of 2007; from having almost barter trade relations with former socialist countries to having normal trade relations with other countries based on the international trade system.[17] As a transitional economy, Vietnam's trade liberalization involved both transformation and reform of the trade regime[18] in line with engaging in more and more agreements with trade partners. From the perspective of major changes in trade policy and major trade agreements, it may be possible to view trade liberalization as taking place in two main periods: (i) the 1988-99 period: initial trade reforms and transformation of the trade regime; (ii) the 2000-07 period: extensive trade reforms and accession to the WTO.

3.2.1 The period 1988-99: transformation of the trade regime and initial trade reforms

Following the introduction of *Doi Moi* in the 6th Party Congress in 1986 with a formal acceptance of the 'multi-ownership and multi-element' economy, market-oriented reforms started with domestic trade and price liberalization in 1989, which included the removal of local trade barriers between provinces to make integrated markets in the whole country and the abolition of dual price system, i.e. state and market prices (Auffret 2003). With foreign trade, the state monopoly in foreign trade was eliminated and import tariffs were for the first time introduced as a trade policy instrument to prepare for Vietnam to enter trading relationships with other countries of the regional and international trading system outside

[17] Before Vietnam became a WTO member in 2007, World Bank (2002) commented that Vietnam's trade reform was implemented on the fast pace.
[18] This feature will be mentioned in the discussion of tariff system and other trade policy instruments.

the Council for Mutual Economic Assistance (Centre for International Economics-CIE 1998).

In the early 1990s, a number of additional changes in various measures of import tariffs, import and export control, and foreign exchange management were introduced. More important was the introduction of harmonized system of tariff nomenclature (HS) in 1992, which provides a basis for Vietnam to formulate and manage the import and export tax system, as well as to develop bilateral and multilateral trading relationships with other countries.

Also in the 1990s, Vietnam started a number of important steps to promote international economic integration and trade liberalization. In 1992, Vietnam signed the preferential trade agreement with the European Union (EU). Two years later, it was accepted as an observer to the General Agreement on Tariffs and Trade (GATT), a previous organization of WTO (CIE 1998). In 1995, Vietnam joined the Association of South East Asian Nations (ASEAN) and became a member of ASEAN Free Trade Area (AFTA). In the same year, Vietnam officially started WTO accession process by submitting application for membership (Abott et al. 2007). In 1998, Vietnam became a member of the Asia-Pacific Economic Co-operation (APEC), which is aimed at facilitating trade and investment among its country members through reducing various barriers to trade and investments. Although individual countries' commitments within the APEC framework are not binding, the commitments are considered to add pressure to the domestic reform process (CIE 1998). Apart from participating in multilateral frameworks of economic cooperation, Vietnam had also made a significant number of negotiations on bilateral trade agreements. By 2000, some 57 trade agreements and 72 most favoured nation (MFN) tariff agreements had been signed between Vietnam and its trade partners (Yoko et al. 2003). Of importance are the MFN tariff agreements, which give a better access for Vietnam's export goods to the new markets of its trading partners, but at the same time, open domestic markets to their goods.

While the Vietnam-EU trade agreement signed in 1992 was the first major trade agreement with MFN status being granted to both sides, the AFTA agreement in 1995 was the start of Vietnam's trade liberalization on the multilateral basis with a systematic and scheduled plan to reduce trade barriers. Trade liberalization under the AFTA framework not only

includes tariff reduction (under the Common Effective Preferential Tariffs or CEPT scheme), but also more extensive commitments in reducing and eliminating non-tariff barriers (NTBs), the harmonization of tariff nomenclature and product standards, custom valuation, the removal of restrictions on foreign exchange transactions for goods covered by the CEPT scheme and the elimination of barriers to FDI (Thang 2004).

The central part of the AFTA is the tariff reduction on intra-regional trade under the CEPT scheme. The CEPT scheme consists of four lists: (i) Inclusion List (IL), which includes products subjected to tariff reduction; (ii) Temporary Exclusion List (TEL), which is used for products to be temporarily excluded from tariff reduction, but then transferred to the IL in equal yearly instalments; (iii) Sensitive List (SL), including mostly unprocessed agricultural products, which are kept out the IL in the longer period of time than those in the TEL before being included in the IL; (iv) General Exclusion List (GEL), containing products not subjected to tariff reduction in CEPT scheme for reasons of national security, protection of human, animal and plant health, etc. One key feature of the CEPT scheme is its 'reciprocity' rule, which means that tariff concessions are granted on a reciprocal, product by product basis. The CEPT scheme was initially started in 1994 by the ASEAN-6[19] with an implementation period of 15 years for all tariffs in the IL to be reduced to 0-5 percent. After two amendments in 1996 and 1998, the implementation period was reduced to ten years for old country members (ASEAN-6) and extended to three years for Vietnam. Generally, the all tariffs in the IL of the CEPT scheme are reduced to the range of 0-5 percent by January 2003 for ASEAN-6 and by January 2006 for Vietnam (Trung 2002; Thang 2004).

In fact, Vietnam commenced its implementation of the CEPT in 1996, immediately after joining AFTA. In the beginning of each year, the Government of Vietnam issued a CEPT list (the IL) to be implemented during that year. However, in the 1996-99 period, the was no actual reduction in tariff in the CEPT scheme because most tariff rates in the IL are very low, ranging between 0 to 5 percent, and more tariff lines of higher rates were subsequently transferred to the IL, making the average tariff of the IL increase from 0.94 percent in 1996 to 7.06 percent in 1999 (Trung 2002). Therefore, trade liberalization in the AFTA

[19] ASEAN-6 comprises Singapore, Thailand, Malaysia, Indonesia, Brunei and the Philippines.

framework had not really taken place in that period. In addition, the slowdown of the overall economic reform process happened at the same time as the Asian financial crisis in 1997, which seemed to have certain effects of limiting the progress of trade liberalization in the late 1990s.

3.2.2 The period 2000-07: accelerated economic integration, extensive trade reforms and completed WTO accession

The year 2000 began the period of Vietnam's deep economic integration and accelerated trade liberalization with a number of landmark changes and events to the trade policy regime: (i) the implementation of the CEPT scheme with massive tariff reduction between 2000 and 2006; (ii) the United States – Vietnam Bilateral Trade Agreement (USVBTA) was signed in 2000 and became effective from January, 2002; (iii) the ASEAN – China Free Trade agreement (ACFTA) was signed in 2004 and became effective from January 2006; and (iv) Vietnam joined WTO in January 2007 as the 150th member. Each of these events had its own important effects on the trade liberalization and the overall reform process toward a market-based economy. However, the USVBTA and WTO have been considered as landmark events leading to deeper international integration and more extensive trade liberalization.

Within the AFTA framework, Vietnam had step by step opened the domestic markets for ASEAN's goods by reducing tariffs and other non-tariff barriers as negotiated with ASEAN members. The main action was phasing out and detailing the CEPT scheme. In December 2000, the government at the first time announced the official roadmap of the CEPT scheme for the 2001-06 period as a guidance for implementation (Thanh 2005). [20] Then in 2003, an updated list of CEPT for the 2003-06 period based on new HS tariff nomenclature was issued by the government. Actually, as mentioned above, each year there was a detailed and updated list of CEPT tariffs to be implemented. Generally, as scheduled, an increasing number of tariff lines were gradually lifted to the IL from the TEL, resulting in the longer CEPT list, from 4,321 tariff lines (66.1 percent of total tariff lines)[21] in 2000 to about

[20] Before 2000 there was an unofficial roadmap of the CEPT scheme (CIE 1998).
[21] The total number of tariff lines is based on the HS 1996.

10,342 tariff lines (almost 97 percent of total tariff lines)[22] in 2006. The average CEPT tariff rate decreased significantly from 7.26 percent in 2000 to as low as 2.49 percent in 2006 and further to 2.45 percent in 2007. It should be noted here that the period 2000-03 saw a small fall in the average CEPT rate (from 7.26 percent to 6.97 percent) while the period 2003-06 experienced a sharp drop in this rate (from 6.97 percent to 2.49 percent). The tariff reduction under the CEPT scheme has resulted in a more liberalized trade regime in Vietnam for ASEAN imports.

While the CEPT implementation was getting underway, the USVBTA was signed between Vietnam and the United States in July, 2000 after a number of negotiations. The agreement was then ratified by both countries' legislative bodies in 2001 and became effective in 2002. The USVBTA is significant in its own right, not only in opening the market for Vietnam's exports to the US or the US's exports to Vietnam, but also in its wide coverage of trade-related issues based on WTO principles and regulations. In the agreement, the main commitments are concentrated in three key areas: (i) opening trade in goods; (ii) opening trade in services and (iii) intellectual property rights. In addition, the agreement extends the commitments of both sides, particularly Vietnam, to the other areas that require Vietnam to make more changes in its existing institutions and regulations to be more compliant with WTO rules, including: national treatment, trading rights, custom valuation, transparency and rights to appeal, development of investment relations and business facilitation (Auffret 2003; Thang 2004). On the one hand, the USVBTA was expected to facilitate trade between Vietnam and the US through tariff reduction, market access and quota removal. On the other hand, its implementation was expected to make pressure on further reforms of existing trade-related policies and regulations as well as other domestic reforms. Therefore, the USVBTA is considered as a stepping stone toward Vietnam's WTO accession (DAI 2008).

When the USVBTA entered into force in 2002, Vietnam had started to accelerate its WTO accession process by conducting a series of bilateral negotiations with interested parties[23]. At the 8th meeting of the Working Party in June 2004, Vietnam had put a lot of efforts in

[22] The total number of tariff lines is based on the HS 2002.
[23] Vietnam had finished the transparency period of WTO accession after four formal meetings of the Working Party and submitted its initial offer in 2001.

revising and updating its offer with the ambitious goal of WTO accession by 2005. In this offer, Vietnam had made many concessions on almost trade and trade-related issues, including tariff barriers, tariff rate quotas, agricultural products, services, custom valuation, sanitary and phytosanitary measures (SPS), TRIMs and TRIPs (Thanh 2005). However, the bilateral negotiations with interested parties, especially big trading partners such as the US, EU and the Cairns Group, were much more difficult than initially expected, resulting in the delayed accession of Vietnam to the WTO. The difficulties came from the demanding requirements of interested WTO members in market access (domestic supports, export subsidies, import quotas, anti-dumping), trade in services, SPS, TRIPs and especially regulations and policies. What made Vietnam's trading partners more concerned was how Vietnam was prepared for the implementation of its commitments. In response to these requirements, on the one hand, Vietnam made a great effort in conducting more bilateral negotiations with interested parties and adjusting its commitments. On the other hand, Vietnam speeded up various reforms in legal and institutional frameworks and public administration.[24] The implementation of the USVBTA provided Vietnam with some experience and credibility to move the accession process forward, both in bilateral negotiations and the legal reform process (DAI 2008). Consequently, Vietnam's intense efforts in both bilateral negotiations and improving policies and regulations have led to its success in becoming the 150th member of WTO since 2007. Joining WTO is the culmination of Vietnam's continuous efforts in international economic integration (Abott et al. 2007). With WTO accession, trade liberalization has taken place at the widest scope ever with much more reduction of trade barriers. The actual nominal tariff rates in 2007 have reduced by a large amount compared with previous years.[25]

Apart from putting efforts into joining WTO, Vietnam also actively took steps in the regional integration with East Asian countries. The ASEAN– China Free Trade Area (ACFTA) agreement became effective in 2006 as a result of China and ASEAN countries' efforts to promote regional trade for the greater benefits of each country (Tho 2006). As a

[24] During 2002-06, a greater number of laws than ever before had been revised or newly issued such as the Civil Code, Commercial Law, Investment and Enterprise Law, Law on Intellectual Property, Ordinance on National Treatment and MFN, Competition Law, Ordinance on Antidumping, Ordinance on Countervailing Duties, Law on Customs and Export-Import Duties (DAI 2008).
[25] This will be shown in a later section.

result, Vietnam committed to another regional preferential trade area, which contributed to further trade openness.

Vietnam's success in international economic integration means that trade protection would have been reduced considerably for the economy as a whole and the manufacturing sector in particular. A crucial question is whether the structure of protection has been changed between and within sectors of the economy. To answer this question, a number of the main trade policy instruments need to be examined, which can be grouped into two main categories: tariff and non-tariff barriers.

3.3 Reforms of trade regime

3.3.1 Import control liberalization

To some extent, the import control reforms in Vietnam appear to follow the standard process of trade liberalization in transitional economies as described by McKinnon (1993). The changes in the import control regime were started by gradually replacing central planning instruments of import control combined with strict control of foreign exchange to keep the current account balanced, followed by the wide-scale application of both tariff and non-tariff instruments, accompanied by the tarification process with removing non-tariff barriers and then the reduction of general tariff levels. To see how the import controls have been relaxed, we discuss at various reforms taken with respect to two main groups of instruments used to protect domestic production: tariff and non-tariff instruments.

Reduction of import tariffs

The introduction of a trade tax system in the late 1980s started fundamental reforms of Vietnam's former trade regime, which was based on targets and quotas to manage trade flows (Auffret 2003). Initially, the tariff system was simple with its coverage of 130 commodity categories and rates ranging from 0 to 60 percent (Thanh 2005). Since then, there have been several major changes in the import duty system to meet the standards of the international trade system and Vietnam's rapidly expanding trade relationships with other countries. In 1992, the harmonized system (HS) of tariff nomenclature was adopted as a benchmark for the new tariff system. Substantial changes in the tariff system took place in

1999 with the introduction of the HS 1996 (eight-digit commodity code) and in 2003 with the application of the HS 2002 (ten-digit commodity code). As a result of the changes, there has been a large increase in the number of tariff lines.

Another important dimension of change in the tariff system structure is the application of different types of tariffs on imports from different trading partners depending on whether Vietnam has signed or negotiated preferential trade agreements. As shown in Appendix Table A3.1, Vietnam has applied four different tariff schedules: (i) The preferential most favoured nation (MFN) tariffs, having been introduced since 1992, applied on imports from countries having the MFN agreement with Vietnam and currently from WTO members; (ii) the Common Effective Preferential Tariff (CEPT/AFTA) tariff rates applicable to imports from ASEAN countries having been in effect since 1996; (iii) the ASEAN-China (ACFTA) tariff rates mainly applicable to imports from China, having become effective since 2006; and (iv) the normal tariff rates (equal to 150 percent of the MFN rates), applied to imports from other countries. Of these four tariff schedules, the MFN and CEPT/AFTA schedules account for the overwhelming share of the tariff system in terms of import volume (98.8 percent in 2004 and 82 percent in 2006 as shown in Appendix Table A3.2). Therefore, the changes in the MFN and CEPT/AFTA rates determine the level of Vietnam's import protection. In addition, the MFN schedule is the basis of the tariff system in terms of its tariff rate structure because the CEPT/AFTA tariff schedule basically has a similar structure despite its lower average rate compared with the MFN schedule.

Tariff reductions did not happen in the 1990s, reflecting the early transition feature of the trade regime. The early transition commenced with the use of low tariff rates together with the widespread application of non-tariff barriers[26] and then followed by higher tariff rates. The simple average MFN rate increased from 12.8 percent in 1995 to 16.1 percent in 2000. Similarly, the simple average CEPT and AFTA rates rose from 0.9 and 8.8 percent in 1996 to about 7.1 and 14.6 percent in 2000 respectively.[27] Between 2000 and 2003, protection started to fall with the CEPT and AFTA mean rates, which reduced from about 7.3 and 13.7

[26] Non-tariff barriers will be discussed below.

[27] The CEPT rate here is the simple average of tariff items in the Inclusion List (IL) under the AFTA framework. The AFTA rate is the simple average of the whole tariff schedule for the ASEAN imports. The share of CEPT rates in the tariff schedule applied on imports from ASEAN is shown in Appendix Table A3.3.

percent to 6.9 and 9.4 percent, respectively. On the contrary, the MFN mean rate actually increased to 18.7 percent in 2003. A possible explanation for this increase is the tarification process of the quantitative restrictions. The period 2003-06 saw a sharp reduction of the CEPT and AFTA mean rates from 6.9 and 9.4 percent to 2.5 and 4.4 percent respectively, as Vietnam's commitments under the AFTA framework were fully implemented. There was a modest reduction of the MFN average rate from 18.7 percent to 17.2 percent in the same period. From 2006 to 2007, when Vietnam acceded to the WTO, there was a dramatic fall in the MFN rate from 17.2 percent to 13.9 percent while the CEPT and AFTA rates continued to fall slightly, but to a very low level of 2.45 percent and 4.1 percent, respectively. Therefore, it is clear that protection levels have been significantly reduced in line with Vietnam's accelerated international economic integration.

In terms of tariff structure, little progress toward simplification and uniformity has been seen over the more than ten-year period 1995-2007. Because the MFN tariff schedule dominates the tariff system, it can be used to investigate further the structure of the tariff system. As shown in Appendix Table A3.4, the tariff range reduced from 200 percent in 1995 and 1997 to 100 percent in 2000 and then went up again to 150 percent in 2003 and remained the same until 2007. Consequently, the dispersion of tariff rates (measured by the coefficient of variation) reduced from 1.31 in 1995, to 1.28 in 1997 and to 1.17 in 2000. However, it then increased to 1.21 in 2003 and 1.33 in 2007. With a nearly similar trend, the number of tariff bands initially reduced from 35 in 1997 to only 15 in 2003, but then went up to 26 in 2007. The main cause of this trend is the remaining (albeit decreasing) selective protection by the government of some consumer and import-competing products such as beverages and alcohol (HS22), tobacco and cigarettes (HS24), apparel (HS62-63) and motor vehicles and motorcycles (HS87).

Despite a small change in the complex structure of tariff rates as a whole, there was still a real reduction in the protection level in the manufacturing sector due to changes in the tariff structure of goods classified by their main end use. This will be presented in more detail in the next section.

Removing non-tariff barriers

Non-tariff barriers were extensively used before 2000 when import substitution was still dominantly used to protect SOEs and import-competing industries. After 2000, with the implementation of the AFTA, USVBTA and reform efforts toward accession to the WTO, the non-tariff instruments that are not allowed in bilateral and multi-lateral trade agreements were quickly phased out. Important non-tariff instruments which had significant effects on import flows in Vietnam include import-licensing, quantitative restrictions, foreign exchange controls and customs procedures.

Vietnam's import licensing system consists of issuing trading rights and special authority regulation. Before 1998, trading licenses (import/export) were almost limited to SOEs under the view of maintaining the role of the SOEs in foreign trade and effectively controlling consumer goods imports. The entry to foreign trade activity was restricted by a list of demanding conditions requiring a firm to have a foreign trade contract, shipment license, sufficient working capital, business license and trade experience, which are a difficult set of criteria to meet for non-state enterprises (Thanh 2005). Import licenses were also issued to a number of production enterprises, mostly SOEs and joint-ventures between SOEs and foreign partners, to import only capital and intermediate goods for their own business (CIE 1998). Decree 57/1998/ND-CP promulgated in July 1998 made a significant relaxation of the entry to international trading activities for businesses, particularly private firms, by abolishing the requirement of import-export licenses (Thai 2005). Provided that enterprises had a business license and a reference trading code in the customs offices, they were allowed and encouraged to trade their goods registered in their business licences, except the goods in the groups of specialized regulation.[28] More liberal changes were made in 2001 by Decision 46/2001/QD-TTg when all enterprises were allowed to trade freely in the goods not under special regulations (Thanh 2005). As a result, the number of enterprises registered in foreign trading activities has been seen to increase rapidly from 30 in 1988, to 1,200 in 1994, to 2,400 in 1998, to 10,000 in 2000, 16,200 in 2001 and to about 18,000 in

[28] These groups, which will be discussed below, include prohibited goods and quota-restricted goods and goods under specialized management.

early 2004 (CIE 1998; Thang 2004; Thanh 2005). This shows that entry conditions of importation as well as exportation have been greatly relieved.

Another part of the import licensing system is a specialized authority regulation. A significant number of the imported goods such as pharmaceuticals, some chemicals, fertilizers, and broadcasting and recording equipment, were subject to specialized management by the respective government agencies (line ministries). This tool of import control has usually been used with quantitative restrictions. The specialized regulation may have acted as a measure of protection for SOEs under the management of the responsible specialized agencies (CIE 1998). However, the scope of this import specialized management had a decreasing trend, reducing from over 13 percent of the total import value in 1998 (CIE 1999) to 10 percent in 2000 (Athukorala 2005). Moreover, there was an increasing participation by non-state enterprises in trading these goods. While the access to import licensing under specialized authorization has been more open to all enterprises in general, the importation of goods subject to specialized management is still applied for security, human health and environmental reasons, which are permitted and regulated under WTO rules (Son et al. 2007). Therefore, the import regulation based on the specialized agencies could be a potential technical barrier to trade, as trading agents need to have import licenses from the specialized agencies before importation of the goods under regulation.

After being introduced in 1994, quantitative restrictions (QRs) were used on a considerable scale in the late 1990s. Except for petroleum[29], the number of goods subject to import quotas increased from four in 1996, to eight in 1998 and seventeen in 1999 (Appendix Table A3.5). These goods are import-competing products mostly produced by SOEs or foreign-invested enterprises, the majority are joint-ventures between SOEs and foreign partners. For example, in 1998, the list of goods under import quotas included fertilizer, steel, cement/clinker, construction glass, motorcycles, cars, paper, sugar and liquor. The scope of quantitative restrictions was quite considerable as these products accounted for nearly 40 percent of total imports (CIE 1999). In 1999, the list of quota-restricted goods

[29] This is considered as a strategic imported product of an economy-wide scale effect, for which there is no domestic production. Therefore, it is under the strict control of the government.

nearly doubled as a response to the pressure on the country's current account deficit due to the Asian financial crisis (Athukorala 2006). Therefore, combined with official tariffs, the control of import quantity created a significantly high level of protection for the manufacturing industries producing these products.[30] From 2000 to 2003, the use of import quotas was quickly reduced from eight products to one product (sugar). Consequently, the protection of the QRs for several manufacturing industries had been nearly eliminated. It should be noted that tariff quotas, a legitimate instrument under the WTO, were introduced in 2003 to replace the QRs. However, the tariff quotas are only applied to agricultural products.

Import prohibition has been applied in Vietnam as in many other countries for public security, and cultural, safety, health and environmental reasons. The common list of prohibited items includes military equipment, toxic chemicals, narcotics, poisonous toys, firecrackers, antiques, and depraved and reactionary cultural products (Thang 2004). The import prohibition of these products is not considered to make a significant distortion to trade flows (Athukorala 2006). However, it is worth noting that, before 2000, there used to be a number of manufactured products in the prohibition list, including cigarettes, used consumer goods and used vehicles, and sometimes paper, cement and some consumer goods. Particularly, the bans on importation of items such as cigarettes, used consumer goods and used vehicles appeared to make considerable support for the protection of domestic production (CIE 1998). But the import prohibition led to widespread smuggling as an unintended consequence, which seems to be unavoidable in the context of high protection of domestic markets. It is notable that, after 2000, the ad hoc prohibition of cigarettes, used motorcycles and used vehicles was removed in line with the application of tariffs. However, the tariff rates appear to be very high as these products are produced by import-competing industries. In the case of cigarettes, for instance, the tariff rates on final products have always been 100 percent in the MFN tariff schedule and 150 percent in the NORMAL tariff schedule between 2000 and 2007, while the rates on raw materials and

[30] It is desirable to take into account the QRs to obtain the true levels of nominal and effective protection. However, the limited data availability constrains the estimation. Two studies of CIE(1998) and Institute of Economics (2001) attempted to convert the quotas to equivalent tariff levels for two products and estimate the nominal and effective rates of protection (NRPs and ERPs) in 1997. Their estimation results show the NRPs and ERPs to be significantly higher.

inputs were at around 30 percent. Given that the protection is legitimate on public health ground, continuous high protection would have significant implications on the growth trend of the tobacco industry[31].

Vietnam has also used foreign exchange management as another significant instrument to regulate import flows in accordance with the government's priorities: supporting certain import-competing industries, big infrastructure projects, controlling the current account balance, and regulating imported consumer goods. A general trend is that the access to foreign exchange for import payments has become significantly easier, especially since 2000 for foreign-invested enterprises (FIEs) and private enterprises (PEs), in line with a more liberal trade regime. This trend can be observed in the changes of using two important measures of foreign exchange control: a firm-level requirement for balancing foreign exchange and the foreign exchange surrender requirement. The 'balancing' requirement was set out in 1997[32] for foreign-invested enterprises (CIE 1998), stating that the value amount of goods imported by these enterprises should be equivalent to the actual amount of foreign exchange they have brought into the country in the year. Also, an advanced payment is required for importing consumer goods (Thang 2004). Since 2000, this requirement has been relaxed, making it possible for FIEs to buy foreign currency from domestic banks for debt and import payments to offshore banks. The relaxation of this requirement also helped the PEs have formal rights to access domestic banks for their import payment needs. In practice, however, only large firms, mostly SOEs, have been favored to get foreign exchange from state-owned commercial banks (Athukorala 2006). The surrender requirement was imposed in 1998 as a response to the Asian financial crisis in order to gain current account stability.[33] Under this regulation, all firms were required to sell to local banks 80 percent of their foreign exchange earnings within 15 days after the fund in foreign currency was transferred to their account. Subsequently, this requirement was reduced to 50 percent in 1999, to 40 percent in 2001, 30 percent in 2002 and finally 0 percent in 2003 (Thanh 2005).

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[31] This will be discussed later regarding the output, capital and labor growth of this industry in Chapter 4. The tobacco industry has the two-digit code number 16 in Vietnam's Standard Industrial Classification (VSIC16).
[32] Circular 02/TT-NH7 promulgated by the State Bank of Vietnam on 28 June 1997 (CIE 1998).
[33] Decree 63/1998/ND-CP promulgated by the Government on 17 August 1998 (CIE 1998).

3.3.2 Export Promotion

In common with many other developing countries, Vietnam has adopted an export promotion strategy while still maintaining a restrictive trade regime (World Bank 2003a). While the significance of export promotion is commonly justified on the grounds of exploiting comparative advantages and foreign exchange earnings for industrialization, protection has created significant biases against the export-oriented industries in terms of lower profitability due to the tariff-induced high costs of imported inputs compared with the domestic market-oriented industries (Athukorala 2006). It appears that the foremost role of export promotion is to reduce the extent of biases against exports. Therefore, the question arising here is how and to what extent export promotion has been implemented in the context of considerable trade protection. In addition, the question arises as whether export promotion has increased or decreased in the more liberal trade regime. In order to answer these questions, it is important to see what measures of export promotion have been adopted[34].

Recognizing that high protection by tariff and non-tariff barriers would make potential costs to export production, Vietnam has applied the import duty exemption for exporters as a central measure in the policy regime to promote exports. The duty drawback scheme was set up by the law on export and import duties in 1991, soon after introduction of the Doi Moi program (CIE 1998). Initially, under this scheme, direct exporters[35] were eligible to be reimbursed with import duties on raw materials and intermediate inputs that are used for export processing. Under additional amendments to the law on export and import duties in 1993 and 1998, indirect exporters[36] were also eligible to get refunds of duties they paid for imported goods used for export production, provided that they had acceptable evidence (World Bank 2003a). In 1993, a duty suspension system was supplemented to the scheme, allowing export producers to suspend their import duty payments for a maximum period of 90 days to execute the export production contracts. The duty payment period was extended to 275 days in 1998 (Athukorala 2006) or even longer in special cases due to firms'

[34] It is worth looking at the effectiveness of the export promotion measures in reducing the anti-export biases (Athukorala 2006). However, due to the highly demanding data requirement, the estimation is not carried out in this study.
[35] Direct exporters are firms having an export contract with a foreign party.
[36] Indirect exporters are firms producing goods to be used for export production of direct exporters.

production cycles (World Bank 2003a). The extension of the duty suspension period would be expected to provide exporters with more relief from additional working capital needs.

In the first ten years after introduction, despite the clear impetus of the scheme to exports, several problems of implementation appeared to limit the positive effects of the scheme on export production. According to the World Bank (2003a), while the time of processing duty rebate claims had been reduced from three months to three to five weeks, in line with the increasing experience of customs officers, there had been two main problems in the operation of the scheme, mainly due to the lack of clear implementation guidelines and complex customs procedures. The first is the long period of processing duty rebate claims. On the one hand, export producers are required to submit the export contract with foreign partners. In addition, they have to make their duty rebate claim for each shipment. On the other hand, customs officers have to spend time to look for information and decide the input-output ratios, combined with the 'use-up ratio' declared by the importer in calculating the amount of imports subject to duty free. The second is the creation of significant room for arbitrary interpretation of the rules applied on the case by case basis, giving rise to corruption and unofficial fees for exporters. In particular, private firms were still more disadvantaged than SOEs in accessing the duty rebate system due to their lack of experience, small scale and biased treatment from authorities.

In addition to refunding import duties, other domestic tax incentives have been applied. Most often, export producers are exempted from the value added tax (VAT)[37] and special sales tax[38] for their imported inputs used for export production (VAT) and exported products. Moreover, exporters are also given concessionary rates of tax compared with the standard rates[39] on their profit from exports (corporate income tax), depending on the export level of production. A profit tax rate of 20 percent is applied to firms exporting between 50 and 80 percent of production for the first twelve years of operation while a more preferential tax rate of 15 percent is applied to firms having more than 80 percent of production exported for 15 years. The corporate income tax incentive is also applied to

[37] The value added tax replaced the turn-over tax in 1999 (Athukorala 2006).
[38] The special sales tax was introduced in 1990, amended in 1993 and 1995 and has 10 rates, ranging between 15 and 100 percent (Wold Bank 2003a).
[39] The standard rates were 25 percent for industries and 32 percent for services between 1999 and 2003. The unified standard rate of 28 percent was applied since 2004.

non-exporting firms if they have investment in rural or remote areas, important contribution to employment creation and use advanced technology (Athukorala 2005). Once again, it is noted that there is still room for discretionary application of the tax concessions in the taxation system with less favorable treatment given to private firms (World Bank 2003a).

In line with the above tax incentives provided for exporters, most export taxes have been eliminated and limited to a small number of sensitive goods, mostly raw and processed agricultural inputs and raw mineral inputs on the grounds of protecting the environment, natural resource conservation and reserve input for domestic production, as in many other countries. Therefore, it is safe to say there have been dew distortions to export flows, even no distortions to manufactured exports due to the export taxes.

Another important measure of export promotion is export subsidies. While no significant direct export subsidies have been observed (CIEM-USAID 2003), Vietnam has used some forms of subsidy facilities to exporters. The export credit facilities had been provided in the Development Assistance Fund[40] and the Export Supporting Fund[41], which were established in 1999. The subsidized credits provided by the Development Assistance Fund (DAF) to exporters appeared to be limited because this fund mainly financed investment loans while in fact exporters needed more subsidized funding for their working capital. Moreover, due to complex loan approval procedures, private firms were much less able to obtain the loans from these funds (CIEM-USAID 2003). By 2004, SOEs accounted for about 90 percent of the fund's lending with interests being subsidized by the state budget (IMF 2006a). Since 2005, the export support in the DAF has been changed into short-term lending to finance exporter's working capital needs[42]. With regard to the Export Supporting Fund, financial support in terms of subsidized interest for export production is concentrated on agricultural and handicraft products and loss making export activities. Another form of subsidizing exports has been the Export Reward Program, which was set up in 1998 and then included in the Export Supporting Fund to provide exporters in various exporting industries, particularly apparel and footwear, with financial rewards on their outstanding export

[40] The Development Assistance Fund is aimed at providing policy lending for subsidized credit in term of policy lending from the government to prioritized investment projects in all sectors of the economy (IMF 2006a).
[41] This Fund was established by Decision 195/1999/QD-TTg dated 27 September 1999.
[42] This is set forth in Decision 59/2005/QD-TTg of the Prime Minister dated 23 March 2005.

performance in terms of volume or finding new markets or exporting new products. This program was implemented at a large scale in the period 2000-05 and then removed in 2007[43] due to Vietnam's accession to WTO. Subsequently, due to Vietnam's commitments under WTO framework, the Export Supporting Fund was also cancelled in 2008.[44]

Vietnam has also developed export processing zones (EPZs) as a policy tool for promoting exports and attracting FDI. The legislation on EPZs was passed in 1991 in parallel with the law on export and import duties, establishing the legal framework for applying various incentives of export promotion. EPZs are handled by a Board of Management of Industrial and Export Processing Zones attached to the Ministry of Planning and Investment (MPI) at both the central and provincial levels. [45] Firms in EPZs are provided with a number of tax incentives including duty-free access to imported inputs, domestic tax exemption and concessions, and non-tax incentives including secure and easier access to land, access to better utilities with favourable prices[46], and fast administrative procedures (UNCTAD 2008). A few incentives in EPZs are considered to be more favourable than those offered in other countries in the regions (Athukorala 2006). Since 1991, while six EPZs have been approved, only two are still in operation and other four were transformed into industrial zones soon after establishment. These two EPZs are located in Ho Chi Minh City in the South[47]. In contrast, there has been a proliferation of industrial zones, with the number increasing from 32 by mid-1997 (CIE 1998) to about 130 by the end of 2005[48].

Despite the very small and constant number of EPZs compared with that of industrial zones, these EPZs are considered successful and have made a considerable contribution to the national and local economy in terms of employment and export earnings as well as FDI attraction. The export value of the EPZs increased from USD 763 million in 2001 to about USD 1,522 million in 2005. The share of export earnings from the EPZ enterprises in the two zones in the country's total non-oil manufactured exports was 11 percent and 9.3

[43] Decision 1042/QD-BTM of the Ministry of Trade dated 29 June 2007.
[44] Decision 124/2008/QD-TTg of the Prime Minister dated 8 September 2008.
[45] This Authority was established by Decision No. 969/TTg dated December 1996, promulgated by the Prime Minister.
[46] Provision of power, water and telecommunications is more efficient and reliable, particularly the power supply is stable and continuous.
[47] They are Tan Thuan and Linh Trung export processing zones, established in 1991.
[48] See http://www.mofa.gov.vn/vi/tt_baochi/nr041126171753/ns060721160306/view (23/4/2009)

percent in 2001 and 2005. By the end of 2005, FDI capital accounted for 99.9 percent in capital invested in the two zones. The total employment in the two zones amounted to nearly 115,000, accounting for about 61 percent and 14 percent of the total labor employed in all industrial and export processing zones of Ho Chi Minh City and the whole country.[49] In the context of trade policy reforms in Vietnam, the evolution and contribution of the EPZs appear to support the view that the EPZs have acted as an experiment and a catalyst for further trade policy reforms and the overall market-oriented reform program, as experienced in China (Johansson and Nilsson 1997; Madani 1999). This is evident not only in the success of the EPZs, but also in the flourishing development of the industrial zones.

3.4 Trade liberalization and other domestic reforms

As a transitional economy, Vietnam has been implementing ownership reform as a part of its institutional reforms under the slogan 'developing multi-ownership economy', to provide incentives and exploit the diverse resources of the country for vibrant economic growth. The recognition of private property rights in the legal system provoked the ownership transformation process in the whole economy as well as in the manufacturing sector in three main dimensions: (i) reforming and reducing the state ownership sector; (ii) attracting foreign direct investment and establishing the foreign ownership sector; (iii) encouraging domestic private investment and developing the domestic non-state sector with different ownership forms, in which private ownership is dominant. As a result, the diversity of ownership structure has been developed in the whole economy as well as the manufacturing sector, in line with trade liberalization and the economic integration process. Importantly, the ownership reform process has created a market structure in various economic activities with the trend of increasing competition. Especially, as a part of the renewed reform process, the ownership reform process was also speeded up in 2000 in line with the accelerated trade liberalization by the introduction of the Enterprise Law, which aims at promoting development of the private sector and a new phase of the state-owned enterprise reform. An impressive result was the striking response of the private sector, with

[49] These figures are calculated from data obtained from GSO (2007) and HCMSO's website, see http://www.pso.hochiminhcity.gov.vn/so_lieu_ktxh/2005/Xay_dung_co_ban_va_dau_tu_nuoc_ngoai/0622.htm (23/4/2009).

a large and increasing number of new firms registered (Van Arkadie and Mallon 2003; Masina 2006).

Since 2000, accelerated trade liberalization appears to have induced further domestic reforms. Fulfilling bilateral and multilateral commitments such as the AFTA, USVBTA and accession to the WTO required Vietnam to further advance its structural and institutional reforms. These reforms include state-owned enterprise reform, banking system reforms, and especially reforms of the legal framework and administrative system for proper functioning of the market-based economy, particularly removing constraints on the development of private enterprises. It is worth noting that, in 2000, there were important amendments of the FDI law with the ease of entry and access to credit and land use, as well as removal of obstacles in administrative procedures. Moreover, in 2005, the Law on Foreign Investment and the Law on Domestic Investment Promotion were unified to become Investment Law. This law is equally applied to both foreign and domestic investors and has simpler investment approval procedures (Athukorala and Tien 2009). Clearly, these changes took place at the same time with the ongoing extensive trade reforms. Consequently, these accompanying institutional reforms were expected to result in more competition in the domestic markets for manufacturing firms. In addition, a more liberalized FDI regime combined with accelerated trade opening has resulted in the surge of FDI inflow in 2000-07[50]. Noticeably in the period 2000-03 was the increase in the FDI inflows into labor-intensive manufacturing industries (Tien 2007).

Overall, trade liberalization in Vietnam has resulted in a more competitive environment in the domestic market in the following dimensions: (i) making significant reduction of protection for import-competing industries; (ii) removing the barriers for import flows; (iii) reducing various anti-export biases due to import protection; (iv) promoting various domestic reforms, which help to significantly reduce entry barriers in many manufacturing industries, leading to a more competitive industrial structure. As evident in Table A3.6 of the Appendix, the manufacturing sector as a whole experienced a significant increase in the competition level with the average Herfindalh index falling from 0.105 in 2000 to 0.064 in

[50] The trend of FDI inflow will be discussed in Chapter 4.

2005. This trend is driven by a notable decrease in this competition index in a majority of two-digit VSIC manufacturing industries.

3.5 Estimation of manufacturing protection: Methodology

3.5.1 Conceptual framework

The level and structure of protection to a particular sector or the whole economy is one of the most important indicators of trade liberalization. Conceptually, protection by trade policy interventions is considered as the government's support for the domestic industries through raising the prices of their outputs and reducing the prices of their inputs. Therefore, protection affects the patterns of domestic production and consumption. In the course of trade liberalization, it is usually expected that the level of protection or price-distorted trade policy interventions will decrease. To understand the level and structure of protection, two key concepts are often used, namely nominal and effective rates of protection.

The nominal rate of protection (NRP) is concerned with how much the price level of products will go up due to the effects of imposing trade policy instruments, including tariffs. Tariffs are simply import duties, usually expressed as a percentage of product prices or value. Therefore, the heights of tariffs are the levels of nominal tariff protection or nominal rates of protection. However, nominal protection does not tell us much about the net effect of imposing tariffs or other trade barriers on the pattern of production and resource allocation because it does not take into account the impact of duties levied on the material inputs (Balassa 1965). Rather, nominal protection has more implications for the consumption effects (Athukorala 2005). Although nominal protection does not give us information about the production effects, it is a basis for estimating effective protection.

The effective rate of protection (ERP) has been very widely used in the literature on protection and trade policy studies for a long time (Greenaway and Milner 2003). The ERP is not concerned with the change in output price, but rather the change in the value added of an industry or the net effect of changes in output and input prices due to tariffs. The ERP concept was proposed by pioneer scholars such as Corden (1966, 1971) and Balassa (1966) with a basic formula derived as the following:

$$ERP = \frac{va_j^d - va_j^w}{va_j^w} \qquad (3.1)$$

where va_j^w and va_j^d are per unit value added of traded goods industry j at world (free trade) price and domestic price (affected by tariff or other intervention), which are defined by:

$$va_j^d = p_j^d - \sum_{i=1}^{n} a_{ij} p_i^d \qquad (3.2)$$

and

$$va_j^w = p_j^w - \sum_{i=1}^{n} a_{ij} p_i^w \qquad (3.3)$$

with p_j^d and p_j^d are domestic prices of output j and its inputs and p_j^w and p_i^w are their world prices respectively, and it is assumed that:

$$p_j^d = p_j^w(1+t_j) \qquad (3.4)$$

and

$$p_i^d = p_i^w(1+t_i) \qquad (3.5)$$

a_{ij} denotes the input coefficient, which shows the required amount of input i to produce one unit of output j. Finally, the commonly used expression of the ERPs is the following:

$$ERP_j = \frac{t_j - \sum_{i=1}^{n} a_{ij} t_i}{1 - \sum_{i=1}^{n} a_{ij}} \qquad (3.6)$$

A number of main assumptions have been made in the above definition of ERPs, which include: (i) fixed input coefficients under the protection; (ii) no exchange rate adjustment;

(iii) perfect substitute between domestic and foreign products; (iv) fixed international prices normalised to unity (Corden 1966; Balassa 1965; Holden 2001).

The basic formula (3.1) means that the ERP is the percentage change in the value added of an industry after the imposition of tariffs compared with the situation of no tariffs. This change could be positive or negative, making incentives or disincentives for resource allocation (investment) to that industry. In general, it is suggested that "domestic production will shift from low to high effective protective rate activities" (Corden 1966: 224).

Equation (3.6) implies that the net effect of imposing tariffs and other trade barriers on industry *j* depends on tariffs on industry outputs and its inputs as well as input coefficients. The tariffs on an industry's output can be considered as subsidies while the tariffs on its inputs act as taxes on that industry (Greenaway and Milner 2003; Athukorala 2006).

3.5.2 Data and estimation methods

Despite its useful meaning in policy analysis and quite simple formula, the estimation of the NRPs and especially the ERPs is rather complex and requires a lot of data to be used.

With the purpose of examining the manufacturing protection for the period 1997-2007, the estimation of the NRPs and NRPs is based on the main following data sources: (i) the tariff schedules for the period 2000- 07 obtained from CIEM (Central Institute for Economic Management) and Ministry of Finance (MOF). The reason for using only tariffs for estimating the NRPs is that non-tariff barriers, commonly including import quotas, import licensing (trading right), foreign exchange control and tariff rate quota are practically difficult to quantify or convert to tariff equivalence, either due to unavailability of information or the complicated nature of their incidence. Therefore, with regard to the manufacturing sector, we focus on the tariff instrument as it is the most important and quantifiable trade barrier in the trade policy regime; (ii) input coefficients are based on Input – Output (IO) tables 1995 and 2000 provided by the General Statistical Office (GSO). The 1995 IO table consists of 96 industries, including 75 traded goods industries and 21

service industries. The 2000 IO table has 112 industries, with 87 traded goods industries and 25 service industries. The traded goods industries are grouped into three main sectors: agriculture, mining and manufacturing. To capture dynamic changes of the technical relations between IO industries, it is better to have the IO table for 2005. However, there is not an official IO table for 2005 made by the GSO. Therefore, we have to use the 2000 IO table for the years from 2004 to 2007; (iii) import data provided by the GSO available for the period 2000-06. The import data is used for calculating weighted average at the aggregate IO industry level; (iv) various correspondence tables for mapping tariff lines based on HS classification into IO industries and manufacturing industries (based on Vietnamese Standard Industrial Classifications – VSIC), obtained from the GSO and United Nations Statistics Division.

Several complex estimation issues need to be clarified in here. The first issue is what price (domestic or world) is the basis to calculate value added before and after imposing tariffs. Equation (3.6) above is justified on the assumption that the world price is known. Otherwise we have to use other formula. The IO tables 1995 and 2000 for Vietnam's economy are constructed with both producer and basic prices, where basic price is the price before any kind of tax or subsidy and does not include import duties. This means that the basic price would be considered as the world price as implied in the study by the Institute of Economics (2001). Therefore, the input coefficients derived from the IO tables based on the basic prices are used in this study with Equation (3.6).

The second follow-up issue is the use of the tariff rates as a measure of nominal protection. Like previous studies such as Institute of Economics (2001) and Athukorala (2006), this study uses official applied tariff rates or ex-ante rates from tariff schedules to measure the nominal rate of protection, because of their available information. It is worth noting here the problems of using this measure of nominal protection. One the one hand, the use of official tariff rates may understate the actual nominal protection level when there is presence of non-tariff barriers like quantitative restrictions, import permits and administrative procedures. One the other hand, the use of the official tariff rates may overstate the actual protection level because of the existence of informal and formal tax exemptions or other subsidies in Vietnam (Athukorala 2006) or smuggling, like in other

developing countries like Indonesia (Warr 1992). However, these problems would be reduced as trade liberalization and trade policy reforms progress. The use of the official tariff rates is also justified on the fact that there is no other better method of measuring the nominal protection level.

While being similar in using the official tariff rates, this study differs from other existing studies in two main aspects. The first difference is that this study takes into account all different tariff schedules, including MFN, CEPT (ASEAN), ACFTA and NORMAL to make a more accurate estimation of the overall tariff heights in Vietnam. As discussed above, each tariff schedule accounts for a different share of the total imports. Using one tariff schedule, mostly the MFN schedule, as in other studies, may understate or overstate, to a certain extent, the overall nominal ex-ante tariff level. It should be noted that the overall discrepancies between using only MFN schedule and all tariff schedules appear to be small before 2003 when the coverage of the CEPT scheme was limited in terms of the number of lower tariff lines and their share of import. The limited coverage of the CEPT scheme was also due to the practical implementation of the CEPT, which requires the goods to have a certificate of origin (CO) paper from ASEAN countries to be eligible for CEPT tariffs. However, during the 2003-06 period, Vietnam's commitments to AFTA were more quickly implemented, and the CEPT tariffs account for almost all ASEAN tariff lines, leading to the very low average rate of the ASEAN tariffs as shown in Appendix Table A3.1. In addition, the share of NORMAL tariff schedule in the total imports is worth taking into account, although it is small as shown in Appendix Table A3.3 for a better measurement of the overall tariff level. When taking into account all tariff schedules, it is possible that estimation of the tariff protection level would be biased if it is based on the simple average across tariff schedules. Therefore, to get more accurate estimates, the weighted average is calculated across all HS tariff lines based on their import value.

The second difference is the use of the yearly average of all tariff lines at the eight-digit level of all tariff schedules, rather than the use of tariff schedules at a particular time of the year. This is aimed at accounting for the possible changes of tariff rates at HS eight-digit level as a response to the common practice of frequent and ad hoc changes in the tariff schedules on many kinds of commodities and a fact that goods are imported at all the time

of the year. This of course requires a lot of information obtained by tracing the detailed changes of tariffs on commodities during the years of interest. The use of the yearly average tariff lines is expected to better measure the level of nominal tariff barriers on imports.

The third issue involves a still controversial problem in the literature, which is the treatment of the non-traded inputs such as transportation, trade, banking, repair and maintenance etc. The underlying matter is determining free trade prices of the non-traded inputs and the concept of non-trade inputs (Warr 1992). One popular method suggested by Corden (1966) is treating the non-traded inputs as primary factors, contributing to value added because non-traded inputs are assumed purely not to use the traded inputs. Corden's method appears to be effective in separating the pure effects of the tariffs on traded inputs and in avoiding the problem of using free-trade prices of the non-traded inputs (Warr 1992). However, this assumption seems to be too restricted and Corden's additional assumption of perfect continuous substitutability between non-traded inputs and primary factors in traded-goods industries appears to be less realistic. Another common method proposed by Balassa (1965) considers non-traded inputs as non-material traded inputs, which are not included in value added with an assumption that there is no customs duty on these non-material inputs and their prices are unchanged. This assumption of Balassa (1965) is problematic when considering the protection level of the non-material input industries. Both methods have their own merits and disadvantages. This study follows Balassa's method for the following reasons: (i) the non-traded inputs today have become more tradable thanks to the globalization process with the fast development of telecommunications, modern transportation means and the internet and the surge of foreign investment and trade flows between countries. Many non-material inputs have been exported or imported as reflected in the IO tables; (ii) it is practically difficult to separate the pure non-traded and traded inputs used in the non-traded industries (service industries) as the number and share of the traded material inputs in the service industries are significant. However, one problem that should be noted with this approach is the possible overestimation of the ERPs as it is assumed that there is no tariff or other trade barrier on the service industries, which means that their tariffs are assumed to be zero. Nevertheless, the level of overestimation of ERPs

could be small for many traded IO industries as the shares of the services inputs in the traded-goods industries are relatively small in the total costs.

The last issue is the aggregation problems when estimating the NRPs and ERPs for IO industries and VSIC manufacturing industries. One problem is the difference in the average levels of the NRPs when converting from the IO industries and HS tariff lines into VSIC industries at two- or four-digit levels with different weights. Another problem is the bias of the estimated level of ERPs with weighted average when mapping from IO industries into two-digit VSIC manufacturing sectors. This is due to the overlap between IO industry classification and VSIC classification. Some two-digit VSIC industries consist of two or more IO industries and some IO industries have two or more VSIC industries. To avoid these problems, we try to estimate NRPs and ERPs at more disaggregate levels of three or four digits to compare with that at two-digit level to have a more accurate picture of the protection structure of Vietnam's manufacturing sector. In addition, the main idea is to keep the trend and structure (ranking) of the NRPs and ERPs qualitatively unchanged across aggregation levels of VSIC manufacturing sectors.

With the caveats of data and estimation methods discussed above, we now in turn look at the level and structure of protection of the manufacturing sector in Vietnam.

3.6 Trade liberalization and structure of nominal protection

Nominal protection structure provides information about which sectors or industries of the economy are likely to get higher prices for their products as a result of imposing tariffs or other non-tariff instruments on trade. Though nominal protection does not report net gains or loses to producers, it gives indication of which industries would get actual protection.

Table 3.1 presents the simple and weighted NRPs for three economic sectors and overall traded goods activities. As expected in the context of the trade liberalization process, the overall average rate of protection has declined over the period 1997- 2007. An exception can be seen between 1997 and 2000, when the simple average NRPs increased slightly due to the upward trend of the agriculture and manufacturing sectors. The weighted NRPs are

smaller than simple NRPs, indicating that the imports tend to concentrate in the lower range of the tariff lines. This appears to be common in many countries.

Table 3.1 Nominal rate of protection by sector: 1997-2007

Sector	1997	2000	2003	2006	2007
Simple average					
Agriculture	9.7	15.5	17.0	13.7	11.7
Mining	7.6	5.3	3.6	3.9	3.6
Manufacturing	28.0	29.2	24.9	21.3	20.2
Total	20.0	20.7	19.9	16.7	15.2
CV (Manufacturing)	0.85	0.85	0.89	0.89	1.02
CV (Total)	0.98	0.96	0.99	0.98	1.10
Import weighted average					
Agriculture	7.7	10.93	13.71	11.16	9.70
Mining	8.7	4.92	2.19	1.23	1.23
Manufacturing	26.5	23.01	20.41	16.92	14.65
Total	18.5	15.52	16.15	13.25	11.50
CV (Manufacturing)	0.88	1.05	1.04	0.96	0.96
CV (Total)	1.03	1.19	1.15	1.07	1.06

Note: (1) NRPs by sector is the average of the NRPs of IO industries weighted by their value added.
(2). CV is coefficient of variation measured as the ratio of standard deviation to mean.
Source: Author's calculations, the year 1997's average NRPs are calculated from NRPs by IO industries estimated by Institute of Economics (2001).

Among the three sectors, manufacturing has always enjoyed higher tariff protection than the other sectors, while the mining sector has had the lowest protection level. However, the manufacturing sector shows a much more significant reduction in its protection level, contributing to the reduction of overall protection level. Between 2000 and 2007, the manufacturing protection rate had a decrease of 10 percentage points while the agriculture sector experienced a very moderate reduction of about 1 percentage point and the mining sector about 1.8 percentage points (in the weighted NRPs). The dispersion of the NRPs is moderate in both cases among IO industries, compared with that of the HS tariff lines. The variation of simple NRPs seems to follow the pattern of that of the MFN tariff lines, while that of the weighted NRPs shows an upward trend between 1997 and 2000 and then a slight decrease to 2007.

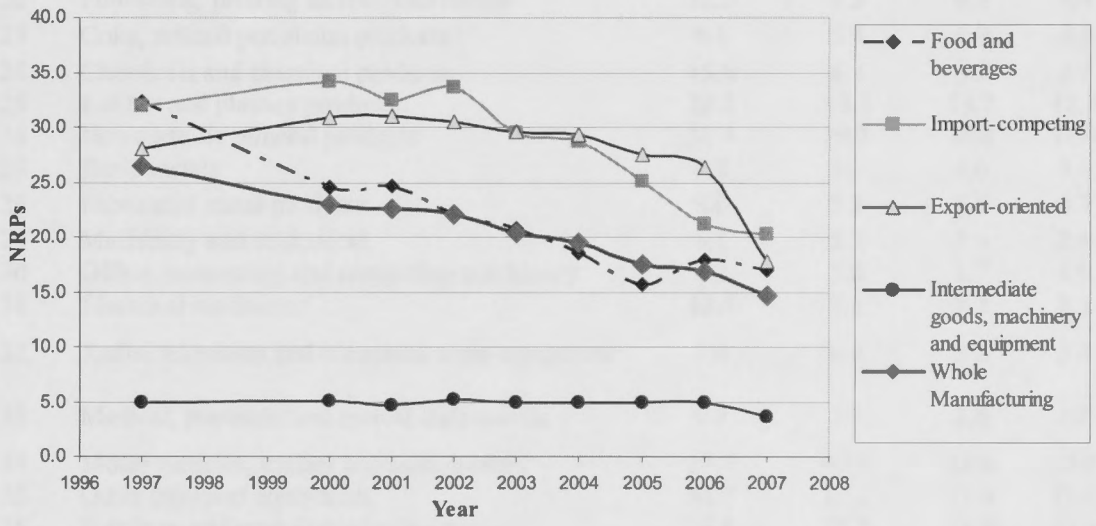
Given a significant reduction in the nominal protection of the manufacturing sector, a further examination of its protection structure, based on IO industries, will provide more

insights. Details of the weighted NRPs by IO industries are shown in Table A3.7 of the Appendix. As is often claimed in many studies, Vietnam's manufacturing sector features a dualistic structure, consisting of two different groups of industries, domestic-oriented (import-competing) and export-oriented groups. Therefore, it is worth classifying the IO industries into different groups based on market orientation and product characteristics. One problem is that there are no clear benchmarks or criteria to group manufacturing industries, partly due to the country's comparative advantages and conditions. Here we take into account the industries which have been commonly identified as having clearer market orientation and product characteristics. A majority of IO industries can be grouped into the four following groups: (A) Food and beverages, which is a big group of about ten IO industries, of which many are domestic market-oriented such as processing meat; dairy products; beer and alcohol; sugar; cigarettes and tobacco; (B) The import-competing group, including a number of product groups such as glass; ceramics; bricks and tiles, cement, paper pulp and paper products; soap and detergents; plastic products; motorcycles, bicycles and automobiles; (C) The export-oriented group, consisting of Vietnam's main export industries such as wood products and furniture; textiles; garments, leather goods and footwear; and (D) the group of industries mainly producing intermediate inputs, machinery and equipment such as chemicals; semi-processed and original plastics; machinery; ferrous and non-ferrous metals; and leather. An important point that should be noted here is that the tariffs are imposed on the products or goods to be sold in the domestic markets. Therefore, the export-oriented industries are not expected to benefit from the tariffs.

Based on this classification, the weighted NRPs for each group are estimated with their value-added weight and shown in Appendix Table A3.8. The trends of the manufacturing groups' nominal protection rates, as shown in Figure 3.1 below, suggest that all food and beverage, import-competing and export-oriented industries had high levels of nominal protection, especially the import-competing and export-oriented groups, while the group of intermediate input, machinery and equipment industries got a much lower level of nominal tariff protection. In the period 1997-2007, except for the intermediate goods groups with its NRPs at around only 5 percent, all other groups faced a significant reduction of nominal protection, leading to the same trend in the whole manufacturing sector. The food and beverage group appears to have experienced a more dramatic drop in tariff level between

1997 and 2005, and showed an upward trend between 2005 and 2007. This trend is quite in contrast with that of the import-competing and export-oriented groups, which had a sharp decline in the average tariffs between 2004 and 2007. In terms of absolute changes, the food and beverage groups had the biggest decrease of 7.8 percentage points in the nominal tariffs in the period 1997-2000. In contrast, the import-competing and export-oriented industry groups both had the highest reduction of 13.0 and 13.0 percentage points in the period 2000-07 (Table A3.7, Appendix). However, as we can see from Figure 3.1, two industry groups (import-competing and export-oriented) still had average tariffs significantly higher than that of the manufacturing sector. Moreover, the rankings of all four groups have remained basically the same over the whole period.

Figure 3.1 Nominal protection rates of the main groups of manufacturing industries



Source: Author's calculations.

Taking a different look at the manufacturing sector based on the Vietnam Industrial Standard Classification (VSIC)[51] at the two-digit level gives us a different picture of tariff protection as shown in Table 3.2. Because there is overlap between IO industries and VSIC industries, the average tariff level of each VSIC industry may be lower or higher than those of individual IO industries included in that VSIC industry. For example, the leather, leather goods and footwear industry (VSIC 19) consists of IO 80 (leather), producing intermediate

[51] VSIC classification is the same as International Standard Industrial Classification (ISIC).

inputs with a very low tariff (less than 7 percent) and IO 81 (leather goods), producing consumption goods with a high tariff (more than 20 percent). Despite this fact, a similar pattern is observed with the VSIC industries having the characteristics of the four groups discussed above. The food products and beverage (VSIC 15) appears to be similar to group A with high nominal tariff rate, but with a downward trend as shown in Table 3.2.

Table 3.2 Nominal rates of protection by industry at the two-digit level: 1997-2007

Code	Industry name	1997	2000	2003	2007
15	Food products and beverages	28.0	24.1	21.1	16.1
16	Tobacco products	86.0	30.7	31.9	42.8
17	Textiles	31.3	35.9	35.1	15.8
18	Wearing apparel	42.1	48.9	46.2	25.0
19	Leather, leather products and footwear	20.8	21.4	20.8	18.3
20	Wood and wood products, except furniture	10.2	5.9	4.4	4.0
21	Paper and paper products	24.4	16.7	16.6	9.8
22	Publishing, printing an recorded media	12.3	9.5	9.5	5.4
23	Coke, refined petroleum products	6.1	5.4	4.9	4.5
24	Chemicals and chemical products	15.0	6.4	5.3	3.7
25	Rubber and plastics products	22.8	13.3	13.7	12.3
26	Non-metallic mineral products	31.9	19.7	18.1	16.0
27	Basic metals	7.8	4.3	4.6	3.6
28	Fabricated metal products	8.0	5.1	5.8	4.7
29	Machinery and equipment	6.1	5.3	3.9	2.9
30	Office, accounting and computing machinery	2.2	3.0	1.7	1.9
31	Electrical machinery	10.4	7.1	7.2	8.1
32	Radio, television and communication equipment	7.0	6.9	8.3	3.4
33	Medical, precision and optical instruments	6.9	3.7	2.6	1.2
34	Motor vehicles, trailers and semi-trailers	27.7	49.3	38.0	21.4
35	Other transport equipment	34.7	14.7	13.4	11.8
36	Furniture and manufacturing n.e.c.	16.8	21.2	19.8	17.4
	Whole manufacturing	26.5	23.0	20.4	14.7

Source: Author's calculations and the 1997 NRPs by VSIC industries are calculated from NRPs by IO industries estimated by Institute of Economics (2001).

Four export-oriented VSIC industries, including apparel, leather and footwear, wood products and furniture (VSIC 17, 18, 19 and 36) all had the tariff protection level higher than the average. Import-competing oriented industries such as non-metallic mineral products, motor vehicles and other transport equipment (VSIC 26, 34, 35) appear to have had high tariff rates and also experienced significant reduction of protection. One exception is the tobacco products industry (VSIC 18), which had a very high and increasing tariff rate

over the period 2000-07. Other VSIC industries producing a majority share of intermediate inputs and equipment have tariff rates lower than the average. In terms of the rankings, the industries of groups A, B, C are still in the top list of the high tariff industries in the whole period 1997-2007.

Like in many other developing countries, Vietnam's tariff system is characterized by a cascading structure, which means that tariffs on the intermediate goods and raw materials are lower than those on the final goods. This feature has been observed by Athukorala (2006) with Vietnam's tariff system in 2003. Based on the Broad Economic Classification (BEC) issued by the United Nations Statistics Division and the concordance table between HS and BEC classifications, we extend the analysis of the structure of Vietnam's tariff system to 2007 to see how the escalating structure of tariffs changed with the results shown in Table 3.3 for a long period, 2000-07. Both simple and weighted tariffs are taken into account. Clearly, there has been a typical cascading structure of the tariff system with a very big gap between the average tariffs on intermediate goods and the consumption goods in 2000 (about 27 percent for simple average tariff and 30 percent for weighted average tariff). It also can be seen that trade liberalization has resulted in a dramatic reduction of the consumption goods tariffs and a smaller decline of the intermediate goods tariffs. The gap with weighted tariff was only about 10 percent in 2007.

Table 3.3 Average tariff on capital, intermediate and consumption goods: 2000-07

Category	2000		2003		2006		2007	
	Simple	Weighted	Simple	Weighted	Simple	Weighted	Simple	Weighted
Capital goods	6.4	6.8	5.7	5.0	5.0	4.1	4.7	4.0
Intermediate goods	11.4	9.9	10.5	10.8	9.0	8.2	6.6	5.7
Consumption goods	38.9	39.9	32.9	29.0	25.7	18.4	20.0	15.6
Total	17.5	15.4	15.3	12.2	12.6	8.5	9.7	6.3

Source: Author's calculations.

The main implication of the escalating tariff structure is the high effective protection given to those industries whose output tariffs are high and input tariffs are low. This will be discussed further in the next section.

3.7 Trade liberalization and structure of effective protection

The estimation results of the effective protection by economic sector are presented in Table 3.4 for selected years while the estimation results of all years are provided in Table A3.9 of the Appendix. The details of the ERP estimates by IO industries are reported in Table A3.10 of the Appendix.

In general, a clear trend of strong reduction of the ERPs for the manufacturing sector and the whole traded goods sector has been observed from 1997 to 2007. The ERP of the manufacturing sector in 2007 was only at 36.8 percent, lowered by nearly 2.5 times and 2 times compared with the years 1997 and 2000, respectively. In contrast, the ERP of the agricultural sector considerably increased from 8.2 percent to 17.9 percent between 1997 and 2003, then decreased moderately to 12.7 percent. Meanwhile, the ERP of the mining sector remained stable between 4 to 6 percent. This means that the dramatic decline of the ERP of the whole traded goods sector is mainly due to the impressive fall of manufacturing's ERP. Therefore, it could be possible to say that trade liberalization has effectively resulted in the reduction of the effective protection to the domestic manufacturing sector. The degree of the bias in favour of the manufacturing sector in terms of effective protection has reduced significantly, as can be seen by taking the ratio of manufacturing's ERP and agriculture's ERP. However, the ERPs of agriculture and mining are significantly lower than the average rate of all traded goods sectors.

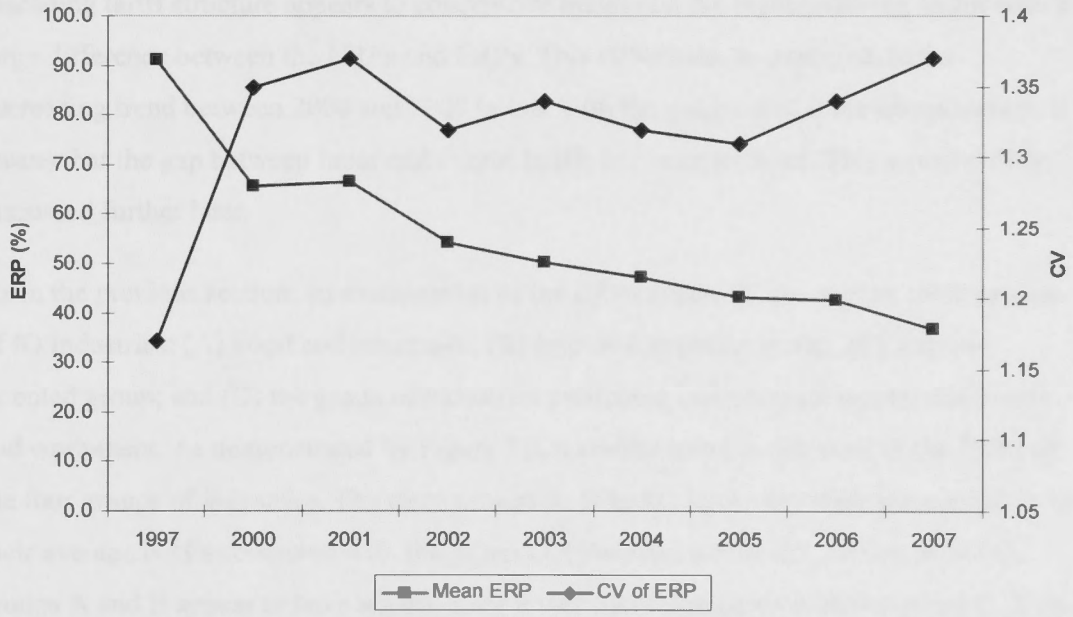
Table 3.4 Effective rate of protection by sector: 1997-2007

Sector	1997	2000	2003	2006	2007
Agriculture	8.2	14.6	17.9	14.7	12.7
Mining	4.0	5.5	5.74	5.3	5.2
Manufacturing	91.1	65.6	50.4	42.7	36.8
Total	54.9	34.6	30.5	25.5	22.1
CV (Manufacturing)	1.17	1.35	1.34	1.34	1.37
CV (Total)	1.46	1.50	1.51	1.49	1.52

Note: (1) ERP estimates are based on weighted NRPs by IO industries and the 1997 ERPs are calculated from NRPs by IO industries estimated by Institute of Economics (2001). The average ERP of each sector is weighted by value added of IO industries.
(2) CV is coefficient of variation measured as the ratio of standard deviation to mean.
Source: Author's calculations.

Despite the significant reduction of the average ERP, there have been increased variations in the ERPs of the manufacturing sector and the whole traded goods sector (Figure 3.2). However, the gap between the maximum and minimum ERPs has been reduced from about 300 percent in 2000 to 192 percent in 2003 and 165 percent in 2007 (Appendix Table A3.9). The number of ERPs above 100 percent decreased from 11 in 2000, to 6 in 2003 and 2 in 2007. Unfortunately, the NRPs for all traded goods sectors appear to have the same pattern as the NRPs in the manufacturing sector. This can be seen in the correlation coefficient between NRPs and ERPs from 2000 to 2007 (Table A3.9, Appendix). The increased dispersion of the NRPs implies that there is still some scope for resource allocation distortions between manufacturing industries and between economic sectors. A possible cause of this problem is a high number of tariff rates in the tariff schedules, or in other words, the non-uniformity of the input and output t ariffs.

Figure 3.2 The level and dispersion of the ERP in manufacturing: 2000-07



Source: Author's calculations.

A clearer picture of the pattern of the ERPs can be seen by the calculation of the annual average change of the ERPs in the sub-periods of the 2000-07 period as shown in Table

3.5.[52] The manufacturing sector had the constant largest reductions in all three sub-periods among the three sectors. With regard to the manufacturing sector, the sub-period 2000-03 had a larger decrease of the ERPs compared with the sub-period 2003-06. The largest fall of the ERPs occurred in 2007 when Vietnam joined the WTO.

Table 3.5 Annual average changes of ERPs (percentage point)

Sector	2000-03	2003-06	2006-07
Agriculture	1.1	-1.1	-2.0
Mining	0.1	-0.1	-0.1
Manufacturing	-5.1	-2.6	-5.9
Total	-1.4	-1.7	-3.4

Source: Author's calculations.

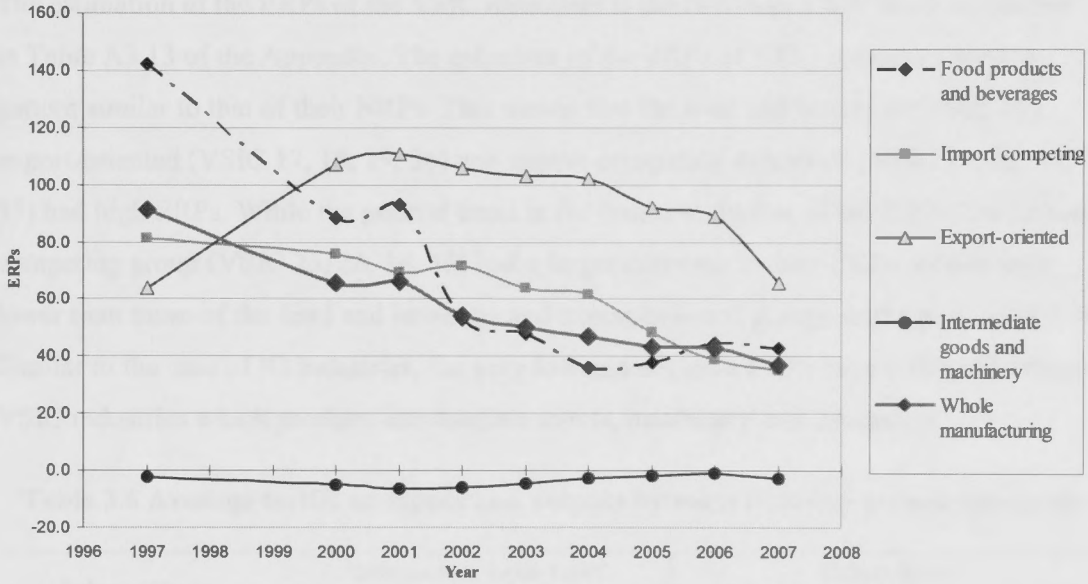
A comparison of the NRPs and ERPs by economic sector indicates further the implications of the cascading structure of the tariff system (Table A3.11, Appendix). The impact of the cascading tariff structure appears to concentrate mainly on the manufacturing sector with a large difference between the NRPs and ERPs. This difference, as expected, had a decreasing trend between 2000 and 2007 in line with the progress of trade liberalization. It means that the gap between input and output tariffs has been reduced. This aspect will be discussed further later.

As in the previous section, an examination of the ERPs is carried out on four main groups of IO industries: (A) Food and beverages; (B) Import-competing group; (C) Export-oriented group; and (D) the group of industries producing intermediate inputs, machinery and equipment. As demonstrated by Figure 3.3, a similar trend is observed in the ERPs of the four groups of industries. The three groups A, B and C have very high average ERPs as their average NRPs compared with the group D. However, a different pattern is that the groups A and B appear to have significantly lower ERPs compared with the group C. If the period 1997–2007 is taken into account, the largest reduction of the ERPs can be seen on the group A, followed by the group B and surprisingly a slight increase of the ERPs of the

[52] To divide the 2000-07 period into sub-periods, the year 2003 is chosen because the second substantial change in the tariff system occurred and the vigorous implementation of the CEPT scheme was started. The year 2006 was chosen as it is the year before WTO accession and the tariff reduction under the CEPT scheme was substantially completed.

group C between 1997 and 2000. If the 2000-07 period is considered, a different trend appears with a significant reduction of ERPs by more than 40 percentage points for all three group (Table A3.12, Appendix). For the whole period of 1997–2007, the group D had its ERPs slightly increased, but still under a very low level of effective protection. While the general trend is the dramatic decline of the ERPs, the import-competing industry group faced a faster reduction of protection level compared with the food and beverage and export-oriented industries.

Figure 3.3 Effective protection rates of main groups of IO manufacturing industries



Source: Author's calculations.

Unexpectedly, the export-oriented group, in which Vietnam is recognized as having a clear comparative advantage, has experienced the highest ERP. Having a similar observation, Athukorala (2006) considers the high level of protection found for the export-oriented industries as an unusual feature of Vietnam's tariff system. However, it is surprising that this feature has been observed in other countries such as China (Claro 2006) and Indonesia (Widodo 2008). Arguably, it could be said that, to a large extent, export-oriented industries do not benefit from tariff protection on their products as they are not intended to sell on the domestic markets. Therefore, the protection level provided by the policy regime for the export-oriented industries could be significantly lower. Another reason for the limitation of

estimated NRPs and ERPs in showing the true protection level of export-oriented industries is that the domestic prices of their products could be well lower than international prices due to Vietnam's comparative advantages in these industries. It could be, therefore, useful and informative to observe the actual domestic and international price ratios of exported products over time. It could be expected that these ratios increase over the years of deepening trade liberalization due to increased accessibility of Vietnam's exports to international markets and resulting higher world demand. However, the unavailability of disaggregate data on the domestic prices and comparable international prices of Vietnam's exported manufactured goods does not allow such a comparison

The estimation of the ERPs of the VSIC industries at the two-digit VSIC level is reported in Table A3.13 of the Appendix. The estimates of the ERPs of VSIC industries show a pattern similar to that of their NRPs. This means that the food and beverage (VSIC 15), export-oriented (VSIC 17, 18, 19, 36) and import-competing industries (VSIC 25, 26, 34, 35) had high ERPs. While the general trend is the dramatic decline of the ERPs, the import-competing group (VSIC 25, 26, 34, 35) had a larger decrease in their ERPs, which were lower than those of the food and beverage and export-oriented groups in the period 2003-07. Similar to the case of IO industries, the very low and negative ERPs have fallen onto those VSIC industries which produce intermediate inputs, machinery and equipment.

Table 3.6 Average tariffs on inputs and outputs by main industry groups (percent)

Industry Group	Intermediate Input Tariff				Output Tariff			
	2000	2003	2006	2007	2000	2003	2006	2007
Food products and beverages	9.4	9.8	8.7	8.3	29.4 (88.3)	28.6 (47.9)	21.8 (44.8)	19.9 (43.0)
Import competing	10.5	9.6	7.1	6.7	29.6 (81.9)	24.8 (69.8)	16.9 (48.7)	15.6 (45.6)
Export-oriented	12.4	12.0	11.1	6.9	30.2 (107.2)	28.8 (103.1)	26.0 (89.1)	15.8 (65.8)
Intermediate goods, machinery and equipment	5.8	5.6	4.5	4.0	4.5 (-5.0)	4.4 (-4.6)	4.2 (-0.7)	3.2 (-2.8)
Manufacturing	11.5	11.7	9.8	8.4	24.8 (65.6	22.0 (50.4)	18.5 (42.7)	16.0 (36.8)

Note: Numbers in brackets are the ERPs.
Source: Author's calculations.

Given the dramatic reduction of the ERPs of the manufacturing sector, one would question the sources of this reduction. By definition, the ERP could be reduced by two factors: a decrease of output tariffs and an increase of input tariffs with a given value added. Therefore, it is worth having a more detailed investigation of the cascading structure of the tariff system. Based on the IO table, the input and output tariffs have been estimated for main industry groups and the whole manufacturing sector in the selected years as reported in Table 3.6. The effect of the escalating tariff structure can be seen by comparing the input and output tariffs as well as the corresponding ERPs. The comparison reveals that both input and output tariffs have gone down, which have opposite effects on the ERPs. It can be said that the sharp decrease of the ERPs in the first three groups (A, B and C) and the whole manufacturing sector resulted from the much stronger reduction of the output tariffs. This is confirmed by the rank correlation between the NRPs and ERPs, which ranges from 0.87 to 0.93 between 1997 and 2007 (see Table A3.9, Appendix). Except for the sub-period 2000-03 for the food and beverage industries, the significant reduction of the ERPs resulted from both an increase of the input tariff and a decrease of the output tariffs. It is clear that the group D was worse off under the protection. Firms had to pay tariffs on their material and intermediate inputs considerably higher than tariffs on their outputs.

As the domestic markets are not the focus of the export-oriented industries, it could be inferred that the cascading structure of the tariff system has been designed to support import-competing industries (including food and beverage). Meanwhile, the high tariffs on output of the export-oriented industries are a disincentive to producers making efforts to look outward to foreign markets. This situation is called anti-export bias in the tariff structure, as already mentioned by Athukorala (2006). In addition, the anti-export bias can also be observed by comparing the input tariffs of the export-oriented industries with those of the domestic market-oriented ones. Except for 2007, in all other years in Table 3.6, tariffs on the inputs of the export-oriented industries were significantly higher than tariffs on those of the domestic-oriented industries. This means that export producers had more tariff burden than import-competing producers. Realizing this situation, the Vietnamese government made significant efforts to redress this anti-export bias by a number of measures such as import duty drawback schemes, import tax exemption for a certain number of imported inputs, turnover tax concessions and profit tax concessions as

discussed above. Another fact is that, despite the clear anti-export bias in the tariff structure, the export-oriented industries have quickly expanded. An explanation is that an underlying driving force of Vietnam's export growth is the foreign invested enterprises, for which the impact of high tariffs on inputs seems to be offset by the high profitability of the production thanks to low labor costs, which are Vietnam's comparative advantage (Athukorala 2006). A positive sign has emerged as the input tariffs of export-oriented production have been lowered, close to and even lower than those of the domestic-oriented industries.

3.8 Vietnam's manufacturing protection in comparison with other countries

It is worth making some comparisons of the protection level for the manufacturing sector between Vietnam and other countries in the region. Table 3.7 presents a number of ERP estimates by several studies on East Asian countries.

Table 3.7 Effective rates of protection in the manufacturing sector in selected East Asian countries

Country	Year	ERP (%)	Source of estimates
Vietnam	1997	91.1	This study
	2000	65.6	This study
	2003	50.4	This study
	2006	42.7	This study
	2007	36.8	This study
Indonesia	1987	70	Fane and Condon (1996)
	1990	59	World Bank (1993)
	1995	45.6	Widodo (2008)
	2000	25.7	Soesastro and Basri (2005)
	2001	23.4	Widodo (2008)
	2005	11.6	Widodo (2008)
South Korea	1975	55	World Bank (1993)
	1980	67	World Bank (1993)
	1985	80	World Bank (1993)
	1988	23	Panagariya (1994)
	2003	16	Athukorala (2005)
Malaysia	1979/80	31	Shalleh and Mayanadan (1993)
	1988	23	Panagariya (1994)
	2003	16	Athukorala (2005)
Philippines	1992	32	Panagariya (1994)
	1999	10	WTO (1999)
Thailand	1981	74	World Bank (1993)
	1988	51	Panagariya (1994)
	2002	25.2	Athukorala et al (2004)
	2004	22.7	Athukorala et al (2004)

Source: Athukorala (2006); Widodo (2008); and author's calculations.

As noted by Athukorala (2006), it is impossible to make a strict comparison in terms of elements taken into account for the estimation of the ERPs. However, the average levels of ERP given in Table 3.4 could give us some possible assessment of Vietnam's manufacturing protection in comparison with other countries in the region. Up to 2007, after Vietnam joined the WTO, the protection level of manufacturing sector in Vietnam was still significantly higher than Indonesia in 2000, South Korea in 1988, Malaysia in 1988, the Philippines in 1992 and Thailand in 2002. Despite such a significant reduction of the protection level thanks to the trade liberalization effort, the trade regime in Vietnam still remained highly protected compared with other countries in the region. As Vietnam has made many commitments within the WTO and AFTA frameworks, as well as other preferential trade areas, the level of protection in manufacturing sector will be further reduced.

Table 3.8 The level and dispersion of effective rates of protection in manufacturing: Vietnam, Indonesia and Malaysia (percent)

Country	Year	Simple Mean	Min	Max	Range	CV
Indonesia	1991	55.6	-18.8	178.0	196.8	0.6
	1995	45.6	20.1	117.5	97.4	0.5
	2001	23.4	6.6	82.9	76.3	0.8
	2005	11.6	4.0	29.4	25.4	0.4
Malaysia	2003	10.4	1.6	28.6	27.0	0.8
Vietnam	2000	45.3	-37.9	205.6	243.5	1.35
	2003	37.0	-40.3	201.9	242.2	1.34
	2006	29.5	-30.8	145.2	176.0	1.34
	2007	25.1	-29.9	134.9	164.7	1.37

Source: Widodo (2008); Athukorala (2006); and author's calculations.

Within the manufacturing sector, as shown in Table 3.8, the structure of protection in Vietnam's manufacturing sector is similar to that of Indonesia in terms of higher rates of protection given to the export-oriented industries. However, a main difference is that the dispersion of ERPs in the manufacturing sectors of Indonesia and Malaysia is significantly smaller than that of Vietnam's manufacturing sector. For example, the coefficient of variation of ERPs in Indonesia was 0.4 in 2005, 0.8 in Malaysia in 2003 while it was 1.31

in 2005 and 1.37 in 2007 in Vietnam. This aspect of comparison depends significantly on the elements of the ERPs and the classifications of the manufacturing sector. Therefore, the comparison here is made with some caution.

3.9 Conclusions

Vietnam has obtained impressive achievements in liberalizing its trade regime in the economic reform process and international economic integration. After reviewing this process, this chapter has estimated the nominal and effective rates of protection to examine how the level and the structure of the manufacturing protection have changed.

Two important features of trade liberalization process have been revealed. Firstly, the reform of the trade regime has taken place in line with the pace of international economic integration. In particular, extensive trade reforms occurred in the period 2000-07 when Vietnam implemented its commitments under key bilateral and multilateral trade agreements. Secondly, trade liberalization was accompanied by other domestic policy reforms, particularly institutional reforms. Most notable are the new legislation for the development of private sector, the amendments of the FDI attraction policy and enhanced SOE restructuring program. As a result, increased trade opening has been supplemented with greater domestic competition.

It was found that the level of protection in Vietnam's manufacturing sector has been significantly reduced with the largest amount compared with other sectors, particularly in the period of accelerated economic integration. In addition, the import-competing group appears to have experienced the largest reduction in the protection level compared with other manufacturing groups. The analysis indicated a considerable trend of reducing anti-export bias in the trade protection structure, as well as in the application of import liberalization and export promotion measures. However, the structure of protection in terms of the higher protection rates of import-competing industries and export-oriented industries remained unchanged.

In addition, there remained potential distortionary effects of the tariff system since the estimated ERPs among the IO manufacturing sector have been significantly dispersed. One

possible cause is a larger number of rates in the tariff system. This may act as a disincentive for investment in very low protected industries (most are intermediate goods industries) in the tariff structure, lending support to an argument of the less than expected development of the supporting industries in Vietnam (Ishida and Fujita 2010). The existence of many tariff rates in the tariff system also implies the need for more simplicity and transparency of the tariff structure to better create incentives for investment.

The estimated results of this chapter are the basis for the other chapters, which aim to examine the impact of the reduction on the protection level and trade expansion on manufacturing performance.

Chapter 4

Macroeconomic Context and the Patterns of Manufacturing Growth and Structural Changes

4.1 Introduction

In line with substantial trade and other policy reforms since the year 2000, the manufacturing sector has experienced many significant changes in terms of output, capital and employment structure. Examination of these structural changes is crucial to understand the relationship between trade liberalization and manufacturing performance. Moreover, the analysis of output growth and structural shifts is important to find empirical evidence for the theoretical predictions on the resource reallocation effects of trade opening. However, at the sectoral level, it is foremost essential to identify the macroeconomic conditions under which manufacturing growth and structural changes take place, as trade policy reforms have been closely connected with the implementation of macroeconomic policy reforms in Vietnam's transitional economy.

This chapter aims to achieve four objectives. The first is to identify the changes in macroeconomic variables, particularly inflation, exchange rate and balance of payment, which are deemed to have significant links with the growth and structural evolution of the manufacturing sector. The second is to examine how trade policy reforms have been linked with the macroeconomic policy reforms and resulting macroeconomic performance. The third is to determine the relative importance of manufacturing in macroeconomic performance. The final, but most important objective is to investigate the key features of the evolution of manufacturing in terms of growth and structural transformation to see how manufacturing has responded to changes in the policy regime.

Two specific questions this chapter will address are as follows: (i) What have been changes in resource allocation (in terms of capital and employment) and are these changes consistent with the theoretical implications reviewed in Chapter 2? (ii) Are the patterns of output growth and the changes in structure of output consistent with the resource allocation structure?

The chapter is structured as follows. Section 4.2 analyzes the macroeconomic environment with emphasis on the trends of inflation, exchange rate and balance of payment and related macroeconomic policy reforms. The macroeconomic condition analysis is followed by a review of the economy's performance in terms of growth and structural change, in which the contribution of manufacturing is highlighted. Section 4.3 focuses on the detailed examination of manufacturing growth and structural change in different aspects of output and factor allocation in the light of different phases of trade reforms. Finally, several conclusions are presented in Section 4.4.

4.2 Macroeconomic conditions and the performance of the economy

4.2.1 Macroeconomic conditions in the period 1990-2007

Maintaining macroeconomic stability is a key aspect of the reform process in Vietnam. While having interdependent relationships, macroeconomic policy reforms could be considered as an important component for other policy reforms. In general, Vietnam has been considered as being quite successful in maintaining a sound macroeconomic environment during the years of reform (Masina 2006; Kokko 2010). This sub-section will examine the key changes in the macroeconomic environment in relation to the process of international economic integration and implementing trade policy reforms. Important aspects of the macroeconomic environment influencing manufacturing performance will also be highlighted.

The period 1990-95

In the early 1990s, in facing near hyperinflation (two-digit level in 1990-92 as shown in Table A4.1, Appendix), bold reform measures resembling the IMF structural adjustment program[53] were adopted by the government to restore macroeconomic stability. Fiscal reforms were carried out to move down budget deficit. A fundamental change in the revenue sources was started with the development of the tax system, particularly foreign

[53] It is reported that at this time, the Vietnamese government decided to take strong stabilization measures without any assistance from the IMF (Van Arkadie & Mallon 2003).

trade taxes[54] and reducing the reliance on the contribution of SOEs in line with the initial steps of reforming the state-owned sector. Despite the loss of aid from the CEMA countries, the government budget improved from a surge in foreign trade taxes and crude oil exports. At the same time, the government continued to cut and eliminate direct subsidies to SOEs and shifted spending to infrastructure, rural development and social sectors (Dollar and Litvack 1994, cited in Riedel and Comer 1997; Van Arkadie and Mallon 2003).

Fiscal improvement was conducive to carrying out an active monetary policy to control inflation. An important effect was the reduction and elimination of demand pressures for money financing or printing money to finance the budget deficit. At the same time, the government started increasing the use of bond financing (Hung 1999). In addition, institutional reform in the banking sector commenced, with the creation of a two-tier banking system, which consists of a central bank with the responsibility of monetary control and commercial banks engaged in money business operations. This reform allowed the government to implement a positive interest policy to reduce money supply through attracting a significant amount of cash held by the public and businesses. As a result, money growth was effectively contained (Van Arkadie and Mallon 2003; Masina 2006). Moreover, large devaluations of domestic currency, which had been implemented since the late 1980s, took place between 1990 and 1992 with the official exchange rate[55] being nearly doubled (Table A4.1, Appendix). Domestic currency devaluation was aimed to make the official exchange rate close to the parallel (black) market rate, which reflects true market conditions. While devaluation is often expected to cause inflation, these large devaluations appear to make little influence on the inflation rate in Vietnam during this time[56]. The large

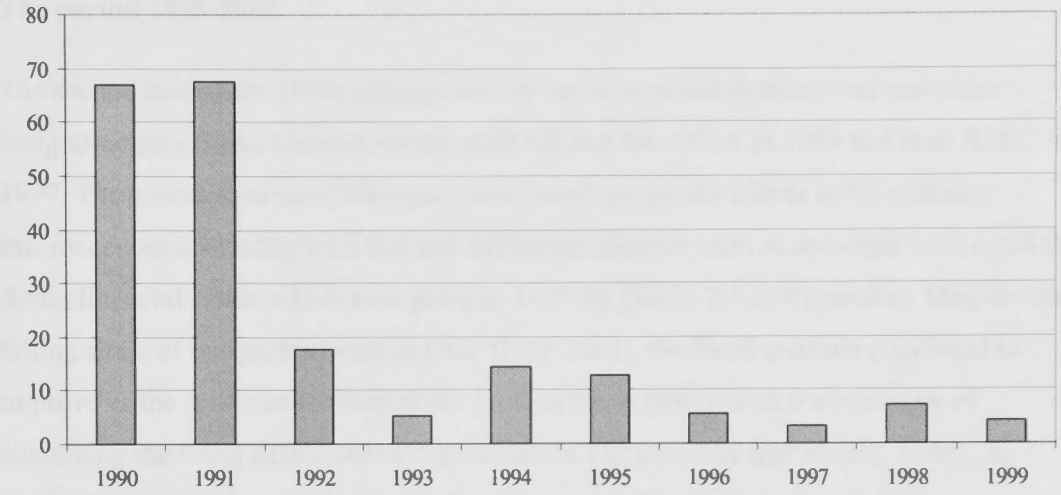
[54] It should be noted that during the early of the 1990s, additional changes in the trade tax system were taking place with the adoption of the Harmonized System of tariff nomenclature as mentioned in Chapter 3.

[55] The exchange rate between the VND and the USD (VND/USD) is considered a key indicator of Vietnam's foreign exchange rate policy as almost foreign trade transactions are settled in USD and domestic currency is pegged to USD (IMF 2005, 2009).

[56] The evidence is that the movement of inflation rate was opposite to that of the nominal exchange rate. Between 1986 and 1990, inflation rate had a dramatic drop from 487 percent to 67.1 percent (Masina 2006: 62) while the nominal exchange rate skyrocketed from 22.7 VND/USD to 6,482 VND/USD (Phuc and Tho 2009: 143). The two contrasting trends continued between 1990 and 1992 with inflation falling to 17.5 percent and the nominal exchange rate soaring to 11,202 VND/USD in 1992 as shown in Table A4.1, Appendix. This evidence is consistent with the explanations already mentioned that successful inflation control was attributed to the demand-side measures such positive interest rates on deposits, bond financing of budget deficit to reduce the growth of money supply and supply-side measures such as domestic trade reforms and land use right reforms, which boosted domestic production (Hung 1999). Moreover, it was argued that the

devaluations exerted their effectiveness when there was a very small gap between the official exchange rate and parallel market rate in 1993-96 (Phuc and Tho 2009).

Figure 4.1 Inflation Rate (%): 1990-99



Source: Compiled from Appendix Table A4.1.

Significant fiscal and monetary reforms played a critical role in curbing inflation on the demand side. On the supply side, institutional, price and domestic trade reforms had boosted agricultural production and light industries, resulting in the fast growth of food and foodstuff supply, particularly rice output, which account for a large share in the goods basket used to estimate consumer price index as well as consumer goods production (Hung 1999). Therefore, the inflation rate was brought down from 67.5 percent in 1991 to 17.5 percent in 1992 and to 5.2 percent in 1993 (Table A4.1, Appendix). However, inflationary pressures came back with the growth of price levels above 10 percent in 1994 and 1995 due to supply shocks caused by natural disasters and higher imported good prices (IMF 1996). This trend of inflation was accompanied by a sharp increase in the trade deficit as Vietnam expanded diplomatic and trading relations with other countries outside the Council for Mutual Economic Assistance (CEMA) bloc and experienced the rising FDI inflow. Trade balance turned from a surplus of 0.4 percent of GDP in 1992 to a large deficit of 7.1 percent

large devaluations during this time in fact contributed to reduce budget deficit because the new much higher exchange rates helped many trade-related SOEs to cut their losses and hence reduce government subsidies (Phuc and Tho 2009).

in 1993, 10.9 percent in 1994 and 13.1 percent in 1995. At the same time, the increase in trade deficit appears to be accompanied by a surge in the net FDI inflow, which increased from USD 473.9 million in 1992 to USD 1,780.4 million in 1995.

The period 1995-2000

The second half of the 1990s was marked by the start of the international economic integration process as Vietnam joined ASEAN and the AFTA in 1995 and then APEC in 1997. The period witnessed Vietnam's continued successful efforts in maintaining macroeconomic stability with low and declining inflation rates at one-digit level amid the Asian financial crisis, which took place in 1997-98 (Table A4.1, Appendix). Despite the falling share of budget revenues in GDP (IMF 2002), the fiscal position continued to improve as the government carried out prudent fiscal policy with the objective of containing the fiscal deficit below 5 percent of GDP (Arkadie and Mallon 2003). As a result of reducing the relative share of current expenditure, the budget deficit was consistently kept well below 2 percent (Table A4.1, Appendix), contributing significantly to reducing inflationary pressures. The government also adopted a cautious monetary policy, maintaining a positive real interest rate. In facing the regional financial crisis, the growth of credit to the economy was significantly reduced between 1997 and 1998 (Camen 2006).

The initial steps of international economic integration appeared to foster Vietnam's external sector with the rapid growth of exports and imports as well as foreign investment inflows until the onset of the Asian financial crisis in 1997. As discussed in Chapter 3, there was a clear tendency to increase import protection in this period in line with the bias in the government's development strategy toward import-substitution industrialization. However, as happened in many developing countries, Vietnam's import-competing industries are heavily dependent on the imported material inputs and capital goods (Kokko 2010). As a consequence, imports grew faster than exports, leading to a widening trade deficit from 13.1 percent of GDP in 1995 to 15.8 percent in 1996. Concurrently, the net foreign investment inflow reached its peak level in 1996 (Appendix Table A4.1).

The trade protection for domestic industries was significantly increased during the Asian financial crisis. Due to the concern that domestic inflation and the current account deficit

could be worse, more restrictive import control measures such as expanding the list of goods subjected to quantitative restrictions and foreign exchange rationing were adopted in 1997 and 1999. As a result, import growth rate dropped to 4 percent in 1997 from 36 percent in 1996 while exports still expanded at 26.6 percent. In 1998, the regional crisis exerted its negative impact on exports as the East and Southeast Asian countries accounted for a major share of Vietnam's export markets. Export growth rate slowed to 1.9 percent while imports contracted by 0.8 percent. In 1999, export growth rebounded back at 23.3 percent despite the modest growth of imports at 2.1 percent. Another possible factor causing the continuous halt to imports was a drop in the domestic aggregate demand for investment and consumption as evident by the increasing inventories of industrial plants (Masina 2006). Consequently, the trade deficit continued to reduce from 15.6 percent GDP in 1996 to the lowest level of 0.7 percent in 1999, contributing to the improvement of the current account balance and the balance of payment in the same period (both were in surplus in 1999). The contraction of aggregate demand also played an important role in containing inflation in 1999 and 2000.

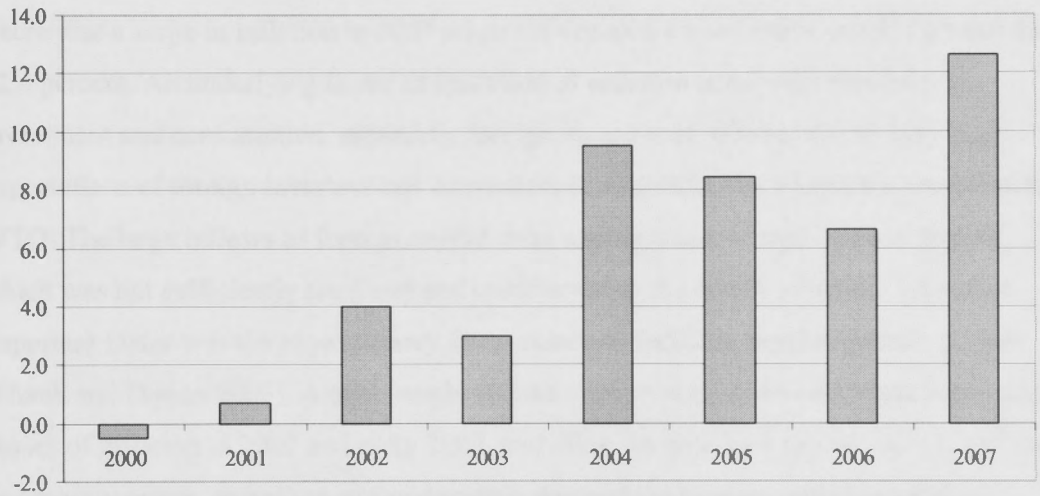
It is notable that there was a significant depreciation of domestic currency in terms of official exchange rate over this period. Holding a relatively stable exchange rate is one of the government's objectives to control inflation (IMF 1999a). However, in the midst of the financial crisis, many ASEAN and East Asian countries devalued their currencies. Currency devaluation in neighboring countries (Thailand, Indonesia, Malaysia and the Philippines) led to the appreciation of the Vietnamese dong (VND) and worsened Vietnam's export competitiveness and trade deficit. In addition, the shrinkage of FDI inflows due to the regional crisis posed a significant difficulty in financing its current account deficit. To counter this situation, Vietnam took a large devaluation of about 20 percent in 1998 and the value of the VND against the USD was slightly further reduced in 1999. Despite these changes, Vietnam's domestic currency was still appreciated against the currencies of other neighboring economies, except China and Hong Kong (Masina 2006). Nevertheless, Vietnam's trade balance and current account were significantly improved as a result of various trade restriction measures as mentioned above. Overall, due to a rather restricted trade regime and underdeveloped financial sector, Vietnam's economy was less affected by the Asian financial crisis (Van Arkadie and Mallon 2003; Masina 2006).

Therefore, Vietnam's macroeconomic movements were somewhat different from those in the neighboring countries such as Thailand, Indonesia and Malaysia.

The period 2000-2007

This period was characterized by rapid international integration and pervasive trade reforms in Vietnam. As discussed in Chapter 3, there were extensive trade reforms in this period, gradually leading to a more open and liberal trade regime, reducing import-substitution bias and promoting exports. The government's consistent commitments to trade opening and other domestic policy reforms strongly promoted foreign trade as well as private investment and foreign investment inflows. This means that Vietnam's macroeconomic environment was more subjected to external sector performance and international markets. It was recognized that the government's management of macroeconomic stability has become increasingly sophisticated (Van Arkadie and Mallon 2003).

Figure 4.2 Inflation Rate (%): 2000-07



Source: Compiled from Appendix Table A4.1.

While staying at one-digit level in nearly all years over this period, the inflation rate had a clear increasing trend from 2000 to 2007 as shown in Figure 4.2. The continued fall of food and foodstuff prices was a main cause of the first-ever deflation in 2000 and the price

change of less than 1 percent in 2001. The price level increased slightly in 2002 and 2003 and then soared by 9.5 percent in 2004. While one cause of this movement could be a much higher rate of credit expansion at about 41.6 percent in 2004 compared with 22.2 percent in 2002 and 28.4 percent in 2003 (IMF 2007b), it was widely agreed that supply shock was a very significant factor in contributing to the surge in price level. These supply shocks resulted from the avian flu and droughts, and higher world prices of commodities such as steel, petroleum and other materials (IMF 2005a). The government also took various measures such as delaying investment projects, reducing credit growth and other administrative measures including reducing imported commodity tariffs and energy price subsidies. As a result, inflation rates went down considerably in 2005 and 2006 (IMF 2007a). It is worth noting that the budget deficit was well maintained at less than 3 percent between 2000 and 2006 (Table A4.1, Appendix), although significant spending was used to accommodate supply shocks. A key factor of the low budget deficit was the rapid growth of budget revenues due to the rapid expansion of the economy and external sector. The budget revenues increased from 20.5 percent of GDP in 2000, to 23.1 percent in 2003 and 27.6 percent in 2007 (The Government of Vietnam 2005; IMF 2007b).

There was a surge in inflation in 2007 when the consumer price index quickly picked up to 12.4 percent. An underlying factor of this trend of inflation is the very rapid rise in investment and consumption, especially foreign investment inflows, due to very high expectations of foreign investors and consumers in responding to Vietnam's accession to WTO. The large inflows of foreign capital were a main cause of rapid money growth, which was not sufficiently sterilized and contributed to the rise in inflation.[57] Another important factor was the expansionary fiscal stance to facilitate rapid economic growth (Thanh and Duong 2009). Again, supply shocks were thought to be one of the important causes of inflation in 2007 and early 2008, including the increases in food prices, and world commodity prices, as well as strong domestic demand for housing and construction materials (IMF 2007).

[57] It should be noted that this situation culminated when inflation reached 19.9 percent in 2008 (IMF 2009). However, we do not take into account the year 2008 in the period under study because of significant macroeconomic shocks due to the global financial crisis and the unavailability of firm data in this year.

Table 4.1 Annual growth rates of export, import and total trade (%)

Period	Export growth	Import growth	Trade growth
1990-1995	17.8	24.3	21.4
1995-2000	21.6	13.9	17.2
2000-2007	18.9	22.0	20.5

Note: (i) Exports, imports, and total trade are measured in million of the current USD as shown in Table A4.1, Appendix; (ii) All growth rates used in this study are compound growth rates, which are defined as $r = \left(\exp(\frac{\ln X_n - \ln X_0}{n}) - 1 \right) * 100$

Source: Author's calculation based on Table A4.1, Appendix.

Far-reaching trade reforms combined with WTO accession in this period appeared to have played an important role in promoting strongly the expansion of trade flows and hence the openness of the economy. As Table 4.2 indicates, the higher growth rates of exports, imports and total trade in the earlier periods could be due to their low starting bases. Given this caveat, there is clear evidence that imports were significantly restricted while exports had a substantially higher growth rate in1995-2000.[58] In contrast, in 2000-07, import growth rate was much higher than in the previous period and than export growth rate. Overall, the growth rate of total trade in 2000-07 was significantly higher than that in 1995-2000. In addition, Table 4.2 clearly shows a much higher level of openness of Vietnam's economy in terms of export, import and trade shares in GDP in the last period. It also can be seen that import liberalization seems to have a stronger impact on trade flows than measures aimed at boosting export expansion as the import share increased faster than the export share.

Table 4.2 Trade openness 1990-2007 (%)

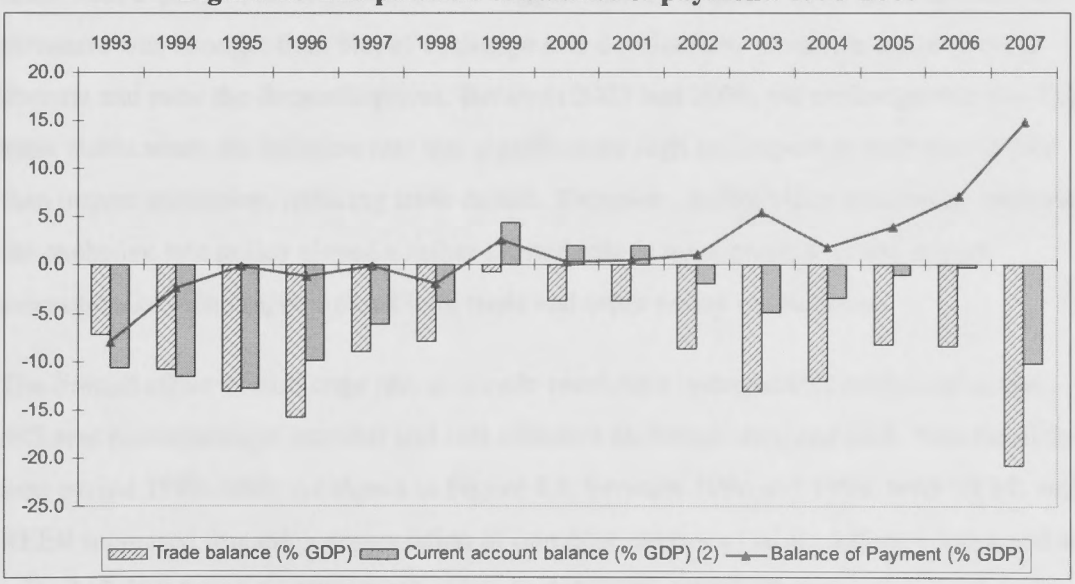
Period	Export share in GDP	Import share in GDP	Total trade share in GDP
1990-1995	25.7	33.5	59.2
1995-2000	36.0	43.8	79.7
2000-2007	58.6	69.5	128.1

Source: Author's calculation based on Table A4.1, Appendix.

[58] To a certain extent, this reflects the government's intention of following a dual development strategy, import-substitution and export-promotion as discussed in Chapter 3 on trade policy regime.

In the context of the accelerated opening of the economy, the trade deficit tended to expand significantly despite the substantial growth rates of trade flows from a higher base compared with the previous periods (Table A4.1, Appendix). In 2000, the high growth rate of exports continued partly as a result of regional economic recovery while a higher import growth came from increased domestic demand. In 2001, however, the world experienced an economic downturn (IMF 2002; Van Arkadie and Mallon 2003), which led to a considerable fall in the prices of many commodities, especially the primary goods.[59] Consequently, the values of Vietnam's exports and imports grew at a modest rate of nearly 4 percent. The higher rate of import expansion between 2000 and 2003 lifted trade deficit from 3.7 percent of GDP to a high level of 13.1 percent. In 2006, the higher rate of export growth, as a result of improved world demand, particularly market access to the US, brought down the trade deficit to 8.2 percent in 2005 and 8.5 percent. The WTO accession in 2007 was associated with a dramatic rise of nearly 40 percent in the imports, partly as a result of a huge influx of foreign investment while export growth slightly decreased. Therefore, the economy faced its largest ever trade deficit of 20.7 percent of GDP, or nearly 3 times the previous year's level.

Figure 4.3 The patterns of balance of payment: 1993-2007



Source: Compiled from Appendix Table A4.1.

[59] This impact was inferred using the price indices of exported and imported goods of Vietnam in 2000-07, provided by GSO at http://www.gso.gov.vn/default.aspx?tabid=393&idmid=3&ItemID=8626 (30/7/2010).

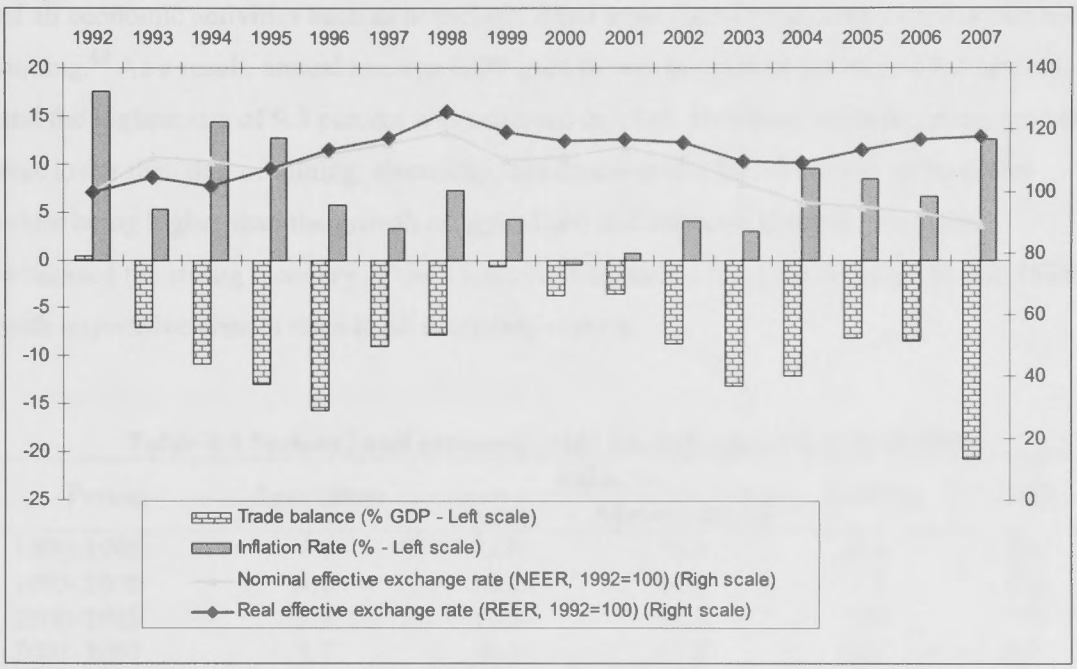
Due to an increasing trade deficit, the current account balance has turned negative since 2003. The current account deficit has been more than offset by strong inflows of foreign investments, which were induced by Vietnam's trade liberalization. Therefore, the balance of payment has been in surplus in the whole period with a record level in 2007 (Table A4.1, Appendix), leading to a fast build-up of foreign exchange reserves of the State Bank of Vietnam (SBV) in 2003 and between 2005 and 2007 (as shown in Figure 4.3). However, the net inflows of foreign exchange resulted in an increase in money supply because the large purchases of foreign exchange were not sufficiently sterilized as mentioned above. This intervention of the government has led to the significant rigidity of the exchange rate with respect to the movement of inflation and the current account balance.

Although the economy moved to a more liberal trade regime, exchange rate movement has been less consistent with trade balance and the inflation trend. With the official policy view of holding a stable exchange rate to control inflation, the VND has been continuously de-factor pegged to the USD (IMF 2007a, 2009a). However, it is surprising that in 2000-03, the VND was slightly devalued against the USD, with the average official exchange rate being increased by some 10 percent when the inflation rate remained low and imports grew faster than exports. This situation would suggest that the impact of import liberalization measures was stronger than that of exchange rate devaluation, which tended to prevent imports and raise the domestic prices. Between 2003 and 2006, the exchange rate was kept quite stable when the inflation rate was significantly high and export growth was higher than import expansion, reducing trade deficit. Therefore, unlike other developing countries, the exchange rate policy played a rather limited role in trade protection and export promotion in Vietnam, compared with trade and other policy instruments.

The limited effect of exchange rate as a trade restriction instrument is evidenced in the different movements of nominal and real effective exchange rates and trade balance in the long period 1992-2007. As shown in Figure 4.4, between 1996 and 1998, both NEER and REER increased (meaning appreciation of domestic currency) while inflation increased and trade deficit reduced. In 1998-2003, when both NEER and REER decreased (implying depreciation of domestic currency), inflation continued to reduce and stayed low while trade deficit increased. In 2003-07, NEER was continuously downward while REER had an

opposite trend. This means the official exchange rate was held stable while inflation was significantly higher. However, the trade deficit was reduced until 2006. The dramatically increased trade deficit in 2007 was largely driven by Vietnam's accession to the WTO, rather than the appreciation of domestic currency. Therefore, it appears that exchange rate played a rather limited role in driving trade balance and inflation. In other words, the extent of exchange rate protection seems to have been limited. Moreover, the upward trend of inflation promoted pressures on the devaluation of exchange rate between 2004 and 2007 and this happened in July, 2008 when inflation was nearly 30 percent (Thanh and Duong 2009).

Figure 4.4 The trends of trade balance, inflation rates, NEER and REER: 1992-2007



Source: Compiled from Appendix Table A4.1.

In summary, the review indicates that Vietnam has successfully obtained macroeconomic stability by implementing extensive macroeconomic policy reforms, transforming a centrally-planned economy to a market-based economy. It also reveals that trade policy reforms have been closely related to macroeconomic stability. The evolution of external balance suggests that macroeconomic performance was significantly influenced by the pace of the process of international economic integration and trade reforms. Given the

macroeconomic stability achieved in each of the above periods, it is worth examining how the economy evolved over time and the contribution of the manufacturing sector in line with the changes in the trade regime.

4.2.2 The growth and structural changes of the economy

Economic reforms and opening to international markets have contributed to the impressive performance of Vietnam's economy. Table 4.3 presents the growth rates of the whole economy and main sectors in different periods from 1990 to 2007. The detailed annual growth rates are given in Table A4.2, Appendix. In 1990-95, effective stabilization policies and institutional reforms not only brought down inflation, but also led to a strong expansion of all economic activities such as household retail trade (services sector), construction and mining.[60] As a result, annual average GDP growth was buoyant at the rate of 8.2 percent and the highest rate of 9.5 percent was achieved in 1995. However, manufacturing growth was lower than that of mining, electricity, construction and the whole industrial sector while being higher than the growth of agriculture and services. Overall, this period witnessed the strong recovery of the Vietnamese economy from the crisis in the late 1980s with impressive growth rates in all economic sectors.

Table 4.3 Sectoral and economy-wide growth rates (%): 1990-2007

Period	Agriculture	Industry		Services	GDP
		Total	Manufacturing		
1990-1995	4.1	12.0	10.3	8.6	8.2
1995-2000	4.4	10.6	11.2	5.7	6.9
2000-2005	3.8	10.3	11.7	7.0	7.5
2005-2007	3.7	10.3	12.9	8.6	8.3

Source: Compiled by author from the General Statistical Office (GSO) (1996), the World Bank's Development Indicator Database, http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport (21/7/2010) and GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=388&idmid=3&ItemID=8666 (30/3/2010).

[60] Institutional and domestic trade reforms helped Vietnam succeed in achieving substantial agricultural development in the 1990s. While being lower than other sectors, agricultural growth was relatively high by international standards (Van Arkadie & Mallon 2003). Moreover, sustained agricultural growth played a decisive role in political and macroeconomic stability (ensuring food security and keeping food prices low), export growth and poverty reduction.

Vietnam experienced a significantly slower economic growth in 1995-2000. The annual GDP growth rate was lowest compared with other periods despite lower inflation rates. Since the agricultural growth was higher, a substantially contracted growth of services appears to be the main driving force of the overall slow growth of the economy. In contrast, manufacturing had the highest growth rate, contributing to the better performance of the industrial sector compared with the rest of the economy in this period. Despite the faster expansion of manufacturing, the industrial sector grew more slowly than in 1990-95. It seems that the economic slowdown was significantly affected by the Asian financial crisis in this period. All economic sectors except mining experienced a fall in their growth rates in 1997 and 1998 (Table A4.2, Appendix). However, it was claimed that domestic factors, particularly the slow progress in structural reforms and increasing trade protection for domestic production, played an important role (Van Arkadie and Mallon 2003; Masina 2006; Kokko 2010). This proposition was evidenced by the even lower growth of the economy and individual sectors in 1999 (Table A4.2, Appendix) while other ASEAN economies recovered well following the crisis with much higher growth rates compared with the previous years (Van Arkadie and Mallon 2003).

The economy grew more rapidly with the continued leading role of manufacturing in 2000-07. The average GDP growth rate increased to 7.5 percent in 2000-05 and to 8.3 percent in 2005-07. The manufacturing and services sectors had a similar trend. However, the growth rate of the industrial sector did not improve due to the worse performance of mining and construction (Table A4.2, Appendix). Stimulated by accelerated economic integration and the new waves of policy reforms, the vibrant developments of the private sector, the large inflows of foreign investment and trading opportunities seem to have been the driving forces of the better economic performance. IMF (2007) observes that Vietnam's impressive economic growth was stimulated by the extensive liberalization of trade and investment regimes with the highest share of foreign investment flows in GDP compared with China, India and ASEAN countries[61] in 2001-06.

[61] These ASEAN countries are Indonesia, the Philippines, Malaysia and Thailand.

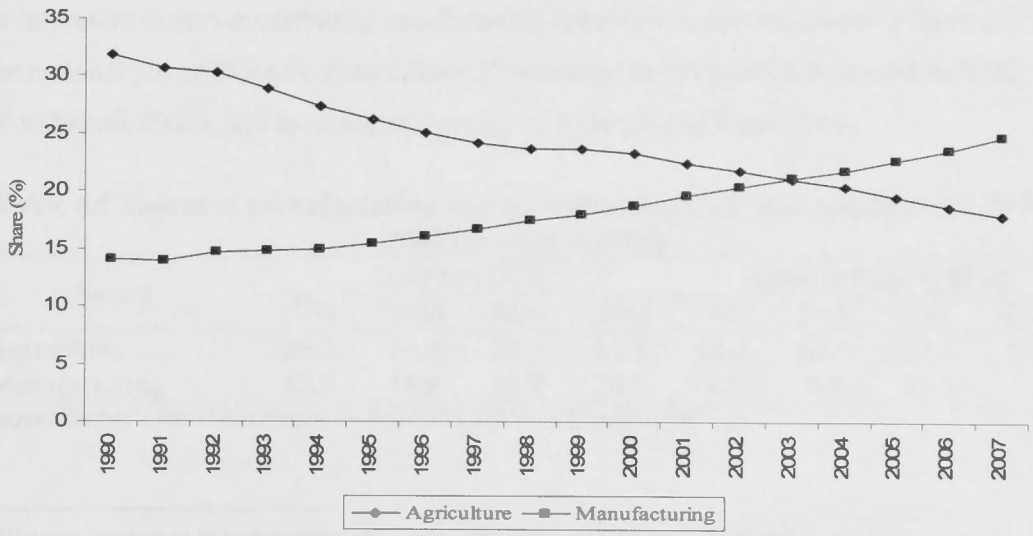
Table 4.4 Structural change of the economy: 1990-2007 (percent in total)

Period	Agriculture	Industry		Services	GDP
		Total	Manufacturing		
1990-1995	29.0	27.6	14.7	43.5	100.0
1995-2000	23.9	33.6	17.5	42.5	100.0
2000-2005	21.3	38.1	20.9	40.6	100.0
2005-2007	18.3	41.3	24.2	40.4	100.0

Note: Average percentage GDP share at constant 1994 prices.
Source: Compiled by author from the GSO (1996), the World Bank's Development Indicator Database, http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport (21/7/2010) and GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=388&idmid=3&ItemID=8666 (30/3/2010).

The continuous higher growth rates of manufacturing and the industrial sector has led to significant structural changes in the economy toward industrialization. As shown in Table 4.4, the average GDP share of manufacturing increased from 14.7 percent in 1990-95, to 17.5 in 1995-2000, and at a faster pace to 20.9 percent in the percent in 2000-05 and to 24.2 percent in 2005-07. The industrial sector became the largest sector in 2005-07 while accounting for the smallest share in 1990-95. At the same time, the agricultural sector continued to contract from 29.0 percent to 18.3 percent. While having a similar trend, the services sector experienced a mild decline in its relative importance in the economy.

Figure 4.5 Shares of agriculture and manufacturing in GDP at constant 1994 prices: 1990-2007



Source: Compiled from Appendix Table A4.3.

Figure 4.5 further illustrates the trend of the relative importance of manufacturing and agriculture in GDP. It can be seen that manufacturing had a gradual and consistent increase in its share in GDP from 1990 to 2007. Despite stable growth, agriculture continually had a lessening contribution to the whole economy due to its slower growth pace. Consequently, by 2003, manufacturing overtook agriculture in the share of GDP. To some extent, the relative movements of manufacturing and agriculture indicate the quite rapid progress of structural transformation of the economy under the impact of the outward-oriented reform process.[62] However, in terms of employment, a similar outcome did not occur as the change in relative importance between manufacturing and agriculture was much slower. As shown in Table 4.5, in contrast with the GDP share, the employment share of manufacturing was much lower than that of agriculture between 1995 and 2007. Moreover, agricultural employment dominated in 1995 and still accounted for more than a half of total employment in 2007. While this situation has been commonly observed in other developing countries (Ghee and Woon 1994, Sharma 1999), it is notable that the pace of increase in manufacturing employment was significantly higher in 2000-05 and 2005-07 than in 1995-2000. This would suggest that the employment impact of manufacturing growth was substantially different between the mentioned periods under the different trade policy regimes in Vietnam. A higher growth of jobs created by manufacturing firms was one of the important factors contributing to substantial reduction in national poverty (Binh 2008). The national poverty rate decreased from 37.4 percent in 1998, to 28.9 percent in 2002 (World Bank 2003), and to nearly 20 percent in 2004 (World Bank 2005).

Table 4.5 Shares of manufacturing and agriculture in GDP and employment: 1995-2007 (percent in total)

Sector	Share in GDP				Share in employment			
	1995	2000	2005	2007	1995	2000	2005	2007
Agriculture	26.2	23.3	19.6	17.9	69.7	65.1	57.1	53.9
Manufacturing	15.5	18.8	22.7	24.7	9.3	9.4	12.3	13.5

Source: Author's calculation based on Appendix Tables A4.3 and A4.4.

[62] Vietnam appears to have experienced a more rapid pace of structural transformation than some Asian regional countries due to its faster trade opening in the context of globalization with the waves of trade and investment liberalization. For example, according to Ghee and Woon (1994), in 1970, Malaysia had a similar structure with the relative shares of agriculture and manufacturing being 30.8 percent and 13.4 percent (31.8 percent and 14 percent in Vietnam in 1990). In Malaysia, manufacturing outpaced agriculture after 17 years (in 1987) while in Vietnam this happened after 13 years.

In summary, the growth and structural transformation of the Vietnamese economy have been closely associated with the pace of the policy reform and the country's trade policy regimes. Manufacturing with a higher average rate of growth has been a driving force of this transformation process. However, the extent of employment change in manufacturing seems to have lagged behind that of output change. Against this background, the next section will carry out a closer examination of manufacturing performance in line with the policy reform process.

4.3 The patterns of manufacturing growth and structural change

4.3.1 Methodological and data issues

This section focuses on the evolution of the manufacturing sector in terms of output expansion and relative changes in its composition at the two-digit and four-digit VSIC level. Due to the fact that the new industry classification system based on international standards, i.e. the VSIC system, has only been adopted in the published statistical data since 1995, the analysis is limited to the time span from 1995 to 2007. While being shorter than the period covered in the analysis of macroeconomic context, this time span could be divided into two quite distinct periods, i.e. 1995-2000 and 2000-07, in which the trade policy regime had markedly different features as discussed in Chapter 3. This allows us to notify and determine the differences in the manufacturing performance as being related to the trade policy changes in these two periods.

Until this chapter, the analysis has been limited to the use of gross output as a measure of output although value added is an output measure commonly used in many studies. The main reason is that there is no published annual statistical data on manufacturing value added at the disaggregate VSIC levels. Only the value added of the whole manufacturing sector is available as used above. Similarly, manufacturing employment data are not available for manufacturing industries. Therefore, we use the firm-level data obtained from the unpublished enterprise survey, which is annually conducted by GSO. However, the firm data are only available for the years since 2000. A note is that the firm data only cover organized manufacturing activities, not household production activities. On the one hand, this coverage of the firm data is similar to that in the definition of organized manufacturing

used in many other studies.[63] On the other hand, the organized sector accounts for the dominant share of manufacturing output, capital, employment and trade.[64] It is therefore reasonable to argue that the changes in organized manufacturing are driving the changes in the whole manufacturing sector.

The analysis in this chapter also aims at providing a background for the next two chapters focusing on the effects of trade reforms on the particular aspects of manufacturing performance. Due to the data limitations[65], the next two chapters will focus on manufacturing performance in 2000-05. Therefore, most of the analysis in this chapter is concentrated on this period while using the surveyed firm data. In addition, in order to see more clearly how the structural changes in manufacturing took place under the impact of trade liberalization, manufacturing industries will be classified into three trade groups based on the degree of trade volume compared with their output, i.e. the degree of trade openness of each industry. These trade groups include less-traded industries, export-oriented industries and import-competing industries. An important question arising here is what criteria are to be used to group manufacturing industries. Following Pavcnik (2002), a threshold of 15 percent is used to classify industries into the following three groups[66]: (i) The less-traded group consists of industries whose import and export shares are less than 15 percent; (ii) the export-oriented industries are those having export-output ratios greater than 15 percent, but export share is larger than import share; and (iii) the import-competing groups including industries having import-output ratios greater than export shares and import-output ratios of more than 15 percent.

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[63] See, for example, Athukorala and Rajapatirana (2000), Kalirajan and Bhiden (2005).

[64] This aspect will be shown in the ownership structure of manufacturing gross output, capital and employment.

[65] These will be explained in detail in each of the next two chapters.

[66] The choice of the threshold for export-output and import-output ratios is fairly arbitrary and different among studies. For instance, Bergoeing et al. (2006) use the threshold of 10 percent for the export share and 20 percent for the import penetration ratio at the three-digit ISIC level. Wong (2008) adopts a benchmark of 35 percent for the export share and 26 percent for import share at the four-digit ISIC level. It appears that the benchmark of trade orientation level is expected to reflect the country-specific import and export structure. This chapter uses the cutoff-point of 15 percent based on the median values of import –output ratio (17 percent) and export-share (20 percent). It is important to note that as this approach is also used in Chapter 6 and the results in Chapter 6 (patterns of firm group efficiency levels) are robust to alternative thresholds between 10 and 20 percent.

Based on the theoretical review in Chapter 2, it is hypothesized here that resource reallocations had happened among manufacturing industries toward the use of the country's comparative advantages in the context of trade liberalization. Therefore, it is expected that structural transformation in manufacturing would take place toward increasing the share of exported industries and import-competing industries using more labor and natural resources. The rationale behind this approach is that many manufacturing industries at the two-digit VSIC level consist of smaller industries with different trade orientation. Under trade opening, some of these smaller industries can expand while the others contract. Consequently, it is hard to identify the significant changes in the relative importance of industries at the two-digit VSIC level, particularly for a short period of 5 to 10 years. Therefore, the advantage of the adopted approach is to use firm data to identify at a more accurate level the trade orientation as well as trade exposure of manufacturing industries at the four-digit VSIC industries; making three large groups of clearly different trade orientation and exposure could allow us to identify better the structural changes in manufacturing.

4.3.2 Output structure

Gross industrial output had an increasing growth trend similar to, but significantly faster after 2000 than manufacturing value added. Table 4.6 presents the growth rates and output shares of two-digit VSIC manufacturing industries from 1995 to 2007. The average yearly growth rate of manufacturing output as a whole increased from 13.7 percent in 1995-2000 to 17.4 percent and 19.0 percent in 2000-05 and 2005-07 respectively. This means a majority of two-digit VSIC manufacturing industries obtained higher output growth rates in the latter periods.

Table 4.6 Growth rates and shares of manufacturing industries in gross output: 1995-2007

(%, constant 1994 prices)

VSIC	Industry Name	Growth rates			Shares		
		1995-2000	2000-05	2005-07	1995-2000	2000-05	2005-07
15	Food products and beverages	10.1	14.7	18.7	30.0	25.8	24.4
16	Tobacco products	7.6	14.4	5.4	4.0	3.5	2.6
17	Textiles	10.2	13.7	15.9	6.7	5.7	5.4
18	Wearing apparel; dressing and dyeing of fur	15.4	20.4	21.1	3.8	4.1	4.5
19	Leather, luggage, handbags and footwear	19.9	16.4	13.5	5.5	5.3	5.1
20	Wood and wood products	1.6	17.7	16.0	2.8	2.2	2.1
21	Paper and paper products	15.1	16.2	16.9	2.5	2.4	2.3
22	Publishing, printing and media products	8.5	15.3	12.8	1.5	1.3	1.2
23	Coke, refined petroleum products	-7.7	21.1	-14.6	0.2	0.2	0.1
24	Chemicals and chemical products	16.9	16.5	18.4	6.8	6.7	6.7
25	Rubber and plastics products	23.2	23.1	20.4	3.6	4.7	5.2
26	Other non-metallic mineral products	14.7	15.2	13.3	11.2	11.4	9.9
27	Basic metals	11.5	18.7	15.1	3.8	3.9	3.7
28	Fabricated metal products, except machinery and equipment	19.9	25.0	26.1	3.4	4.3	5.5
29	Machinery and equipment n.e.c.	15.5	14.8	14.7	1.7	1.7	1.4
30	Office, accounting and computing machinery	115.5	19.9	44.6	0.5	0.7	1.3
31	Electrical machinery and apparatus n.e.c.	27.2	27.1	29.7	1.9	3.0	3.9
32	Radio, television and communication equipment	16.3	15.8	16.8	2.9	2.8	2.3
33	Medical, precision and optical instruments	16.1	12.3	23.1	0.3	0.2	0.2
34	Motor vehicles, trailers and semi-trailers	17.2	24.7	14.1	1.6	2.7	2.4
35	Other transport equipment	27.7	19.8	33.6	2.9	4.1	5.3
36	Furniture; manufacturing n.e.c.	14.8	27.8	27.2	2.4	3.2	4.3
37	Recycle	11.0	12.3	23.7	0.1	0.1	0.1
	Total	13.7	17.4	19.0	100	100	100

Source: Author's calculation based on GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=89299 (19/7/2010)

It appears that significant changes have taken place in the structure of manufacturing production in response to a more liberal trade regime as presented in Table 4.6. As expected, among industries with a higher weight of export orientation, wearing apparel (vsic18) and furniture (vsic36) grew more rapidly and gained their gross output shares. As commonly perceived, these export-oriented industries are labor and resource-intensive, aligned to Vietnam's comparative advantages. However, other industries of the same group, including textiles (vsic17), footwear (vsic19) and wood products (vsic20), experienced declining shares in the total manufacturing output despite having faster growth rates (textiles and wood products).

Contrasting trends of changing shares are also observed among industries with the tendency of producing for import substitution. One the one hand, as expected, food products and beverages (vsic15), paper (vsic21), chemi cals (vsic24), non-metallic mineral products (vsic26), basic metals (vsic27) and radio and television (vsic32) are those industries having declining shares as their growth rates were lower than the sector's average growth rate, despite some of them having more rapid output expansion. On the other hand, rubber and plastics (vsic25), fabricated metals (vsic28), motor vehicles (vsic34), and other transport equipment (vsic35) increased in their gross output shares. Therefore, a mixed picture emerges as regard to the changing relative importance of export-oriented and import-competing groups of manufacturing industries at the two-digit VSIC level.

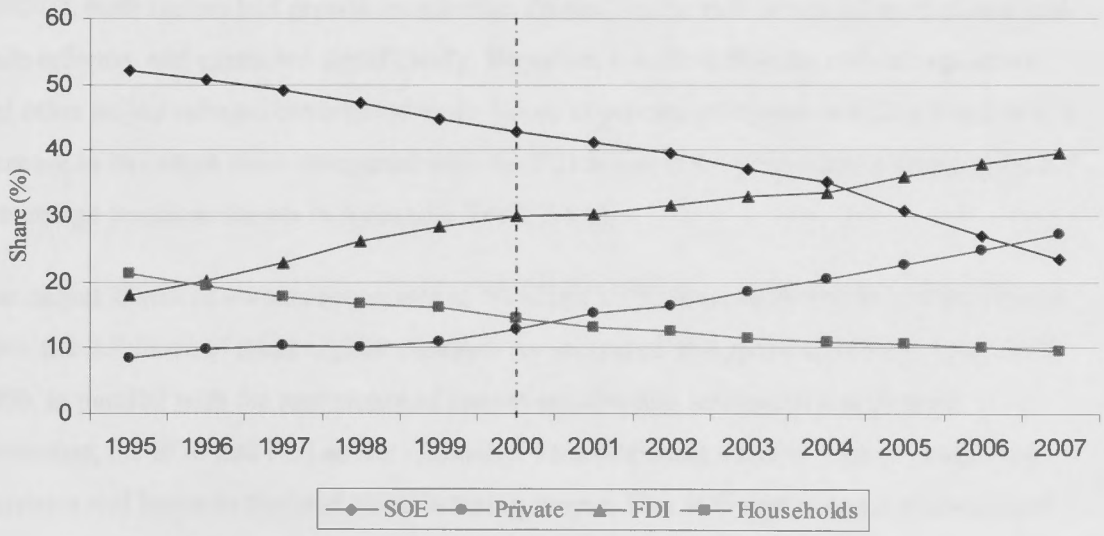
Table 4.7 Growth rate and output share of trade groups in the organized sector

Year	Less-traded		Export-oriented		Import-competing	
	Share (%)	Growth (%)	Share (%)	Growth (%)	Share (%)	Growth (%)
2000	25.4	100.0	33.4	100.0	41.1	100.0
2001	26.3	116.1	31.6	106.4	42.1	114.9
2002	27.2	130.6	30.8	122.8	42.1	126.3
2003	27.6	116.8	29.6	110.5	42.7	116.6
2004	27.3	116.2	30.3	120.3	42.4	116.8
2005	26.2	108.5	30.3	113.2	43.4	115.5
Average growth		17.4		14.5		18.0

Source: Author's calculation based on the unpublished enterprise survey.

In the organized manufacturing sector between 2000 and 2005, a clearer picture of structural shifts is revealed based on the disaggregate survey data. Table 4.7 shows the trends of relative shares of three main trade groups. It can be seen that while having a quite high growth rate, export-oriented industries did not grow as rapidly as less-traded and import-competing industries. As a result, the share of export-oriented industries in the organized sector shrank from 33.4 percent in 2000 to 30.3 percent in 2005, while import-competing group expanded from 41.1 percent to 43.4 percent. The less-traded group had the same trend as the import-competing group with its share rising from 25.4 percent to 26.2 percent. A plausible explanation of this compositional change could be the significantly faster expansion of domestic demand than export growth, which is the driving force of the output growth of export-oriented industries.[67] The trend of output composition seems to be at odds with the common expectation of expanding the export-oriented sector in the context of trade opening and with the reported strong response of exporters to the implementation of the AFTA and the USVBTA in the first half of the 2000s (Dordi et al. 2008). However, as will be shown later, the supply response seems to follow the orthodox predicted pattern with respect to employment and capital.

Figure 4.6 Gross output shares in manufacturing by ownership type: 1995-2007



Source: Author's calculation based on Appendix Table A4.6.

[67] More information on this indication will be shown in the analysis of manufactured exports.

The ownership composition of manufacturing output has undergone significant changes in more than a decade. These structural changes took place in all periods before and after 2000 at a different pace, reflecting the progress of the SOE restructuring program and other institutional reforms implemented by the government. As presented in Figure 4.6, there are two contrasting trends. On the one hand, the shares of SOE and household sectors continued to decrease from 1995 to 2007 due to their lower growth rates (Appendix Table A4.6, top panel). The share of SOEs dropped more sharply in 2000-07 than in 1995-2000, by -19.2 percentage points versus 9.4 percentage points respectively (Appendix Table A4.6, bottom panel), showing the impact of the accelerated SOE restructuring program and the faster growth of the private and FDI sectors. The household sector (i.e. informal or unorganized sector) registered a continuous decrease in its output share from more than 20 percent in 1995 to less than 10 percent in 2007. The sharper decline of the household sector in output between 1995 and 2000 reflects more unfavorable policy conditions for the development of the non-state sector in general. On the other hand, the private enterprise and FDI sectors experienced a continuous rise in their output shares. In 1995-2000, while the SOE sector grew at a quite high rate, a much higher growth rate in the FDI sector led to it being the fastest to expand in manufacturing output, followed by the private sector. In 2000-07, both sectors had growth momentum created by the new waves of institutional and trade reforms, and expanded significantly. However, it is clear that the radical regulatory and other policy reforms contributed to the boom in private enterprise, which led to a larger increase in its output share compared with the FDI sector (14.4 percentage points versus 9.5 percentage points as shown in Appendix Table A4.6).

The output shares of ownership sectors in two-digit VSIC manufacturing industries clearly show the influence of trade regime changes. As presented in Appendix Table 4.7, in 1995-2000, in parallel with the prevalence of import-substitution strategy and high trade protection, the SOE and FDI sector accounted for a dominant share in import-competing activities and hence in the total manufacturing output. The SOE sector had a predominant share in heavy and intermediate goods industries such as textiles, chemicals, non-metallic mineral products, basic metals and electrical machinery as well as light consumer goods

industries such as food and beverages, tobacco and cigarettes, and paper. The FDI enterprises played a dominant role in consumer durable and intermediate goods industries such as radio and television, motor vehicles, transport equipment, computing machinery and medial and precision equipment. In addition, in this period, the SOE and FDI enterprises accounted for a major share in export-oriented industries such as wearing apparel and footwear. The domestic private firms were limited, and concentrated in the light consumer goods production such as footwear, rubber and plastics, paper and wood products. At the same time, it is notable that households contributed the largest share in the output of wearing apparel, wood products, fabricated metal products and furniture.[68]

In the periods between 2000 and 2007, substantial shifts in the relative weights of ownership sectors occurred in each individual manufacturing industry. The SOEs contracted significantly in all production activities, except tobacco and cigarettes, particularly in all light consumer goods industries, including both import-competing and export-oriented ones such as food and beverages, paper, wearing apparel, footwear and wood products. While experiencing the declining trend, the SOE sector remained significant in the output of import-substituting capital and intermediate goods industries, including chemicals, non-metallic mineral products, basic metals, electrical machinery and textiles. In contrast, the FDI enterprises continued to be dominant in import-competing industries such as chemicals, machinery equipment, office and computing equipment, radio and television, medial and precision equipment, motor vehicles, transport equipment. Moreover, this sector expanded significantly their shares in export-oriented industries such as wearing apparel, footwear, and furniture. While having the same trend as the FDI sector, the private enterprises had a dramatic growth, with rapid expansion in the shares of both import-competing and export-oriented industries, most of which are producing light-consumer goods such as food and beverages, wearing apparel, footwear, wood products, paper, rubber and plastics, and furniture. These activities are mostly labor and resource-intensive with a lower-level of technological sophistication.

[68] An important explanation is that many large private businesses were operating informally in the form of households without registration due to complex and time-consuming administrative procedures and strict regulations in 1995-2000 (Van Arkadie & Mallon 2003).

4.3.3 Capital and employment

The changes in the composition of resource use, particularly capital and labor, are crucial to indicate the evolution of manufacturing structure in line with trade policy regimes. Limited availability of the published data on capital and employment prevents the examination of changes in the resource allocations in the whole manufacturing sector in the long period 1995-2007. Nevertheless, some important facts are observed from the available data for a shorter period from 1995 to 2003.

A central fact is that capital growth slowed down while employment expansion accelerated between 1995-2000 and 2000-03, as shown in Table 4.8.[69] In 1995-2000, the proof of the import-substitution tendency is seen by a marked difference between the average annual growth rate of capital, which was 22.4 percent and that of employment, which was only 5.2 percent. Moreover, the high capital growth was mostly contributed to by import-competing industries such as paper, chemicals, rubber and plastics, basic metals, non-metallic mineral products, office and computing machinery, motor vehicles and other transport equipment. Their capital expansion was much larger than labor growth. While export-oriented industries experienced the same tendency due to the dominant role of FDI, only leather and footwear had a higher capital growth rate than the manufacturing average. In 2000-03, the accelerated trade reforms with reduced import-substitution bias appear to exert their effects, with a substantially higher labor growth rate and lower capital growth rate compared with the previous period. While the capital expansion was still significant in many industries due to new private and foreign direct investments induced by the new policy reforms, it is clear that the gap between capital and employment growth rates was significantly reduced. The average growth rate of capital was 13.3 percent while that of employment closely followed at 12.6 percent. It is notable that not only export-oriented industries such as wearing apparel, leather and footwear, and furniture made a large contribution to the faster labor growth of the whole manufacturing sector, but also several import-oriented activities such as rubber

[69] It is important to note that, based on the existing data, capital in Tables 4.8 and 4.9 is defined to consist of fixed assets and long-term financial investment of enterprises (GSO 2006). Therefore, the defined capital is not confined to the production activities, but also extended to non-productive activities. The definition of capital used later in the unpublished enterprise survey data covers only fixed assets.

and plastics, fabricated metal products, electrical machinery, radio and television, motor vehicles and other transport equipment played a significant role.

The changes in the organized manufacturing sector have been the driving force of the rapid employment expansion in manufacturing activities in the early 2000s. Table 4.9 shows that, in 2000-03, the growth rate of employment in manufacturing enterprises was at 17.0 percent, considerably higher than that of capital, at 13.3 percent. This trend of organized manufacturing is reflected in the trend of the whole sector as discussed above. As a result, organized manufacturing's average capital labor ratio declined by 3.3 percent a year. However, the capital intensity of the whole manufacturing sector in the same period (2000-03) increased slightly by 0.6 percent (Table 4.8), implying that the household sector had invested more in capital rather than employing more labor. In addition, as observed in the whole sector, those manufacturing industries driving the faster employment generation are those in organized manufacturing. It should be noted that the period 2003-07 witnessed the tendency to capital deepening in organized manufacturing, which could be the result of intensified competition from both domestic and foreign markets. In general, there has been a clear tendency to use more labor in manufacturing in the context of substantial trade reforms since 2000.

In addition to faster labor growth, it is interesting to observe that there has been an increase in the relative importance of both export-oriented and import-substituting manufacturing activities. Table 4.10 presents the relative shares of manufacturing industries in the total capital and employment of the whole sector. Orthodox predictions on resource reallocation appear validated in the fact that, between 2000 and 2003, a significant mass of primary factors were diverted to the export-oriented activities, including wearing apparel, leather and footwear, and furniture, which became larger relative to other industries in terms of both employment and capital, and it is clear that these industries have their employment share being substantially larger than their capital share as they are labor-intensive. While increasing in its capital share, the wood processing industry slightly decreased its employment share, implying capital deepening. In the import-competing group, a mixed trend also emerged.

Table 4.8 Growth of employment, capital and capital intensity: the whole manufacturing

Code	Industry name	L Growth (%)		K growth (%)		K/L growth (%)	
		1995-2000	2000-03	1995-2000	2000-03	1995-2000	2000-03
15	Food products and beverages	5.5	7.3	16.5	7.0	10.4	-0.3
16	Tobacco products	-2.0	5.4	3.1	11.9	5.3	6.2
17	Textiles	-0.9	5.3	16.1	13.4	17.1	7.7
18	Wearing apparel	5.5	19.4	12.2	22.9	6.4	3.0
19	Leather, fake-leather products and footwear	25.2	15.7	30.2	16.3	4.0	0.5
20	Wood and wood products	-0.7	11.4	-9.9	21.7	-9.2	9.3
21	Paper and paper products	11.8	12.6	22.8	23.4	9.9	9.6
22	Publishing, printing and media products	9.0	12.0	11.1	30.4	2.0	16.4
23	Coke, refined petroleum products	9.4	-0.4	13.4	1.9	3.6	2.2
24	Chemicals and chemical products	6.0	7.1	26.6	14.8	19.5	7.2
25	Rubber and plastics products	17.3	15.8	32.3	16.7	12.9	0.8
26	Other non-metallic mineral products	-0.7	10.3	44.2	5.1	45.1	-4.7
27	Basic metals	1.5	8.4	10.5	26.8	8.9	16.9
28	Fabricated metal products, except machinery and equipment	8.4	17.7	36.2	14.3	25.6	-2.8
29	Machinery and equipment	2.5	7.7	28.3	10.7	25.2	2.8
30	Office, accounting and computing machinery	71.3	13.8	155.6	-5.3	49.2	-16.8
31	Electrical machinery and apparatus	21.0	25.6	46.1	14.2	20.8	-9.1
32	Radio, television and communication equipment	8.3	17.7	3.8	1.5	-4.2	-13.8
33	Medical, precision and optical instruments	16.1	16.3	61.4	12.6	39.0	-3.2
34	Motor vehicles, trailers and semi-trailers	14.5	17.7	28.5	36.4	12.2	15.9
35	Other transport equipment	9.0	17.7	31.7	19.8	20.9	1.8
36	Furniture; manufacturing n.e.c.	6.0	22.2	19.0	36.2	12.3	11.4
	Total	5.2	12.6	22.4	13.3	16.3	0.6

Source: Calculated by author based on GSO (2006a).

Table 4.9 Growth of labor and capital in manufacturing: the organized manufacturing sector

Code	Industry name	L Growth (%)		K growth (%)		K/L growth (%)	
		2000-03	2003-07	2000-03	2003-07	2000-03	2003-07
15	Food products and beverages	12.1	5.3	6.6	16.8	-4.9	11.0
16	Tobacco products	5.4	-0.9	11.9	22.4	6.2	23.5
17	Textiles	10.5	4.2	14.8	15.5	4.0	10.8
18	Wearing apparel	23.4	12.8	19.7	13.3	-3.0	0.4
19	Leather, fake-leather products and footwear	16.7	6.8	16.7	9.8	0.0	2.7
20	Wood and wood products	12.4	8.5	21.9	23.1	8.4	13.4
21	Paper and paper products	12.9	10.6	23.8	16.7	9.6	5.5
22	Publishing, printing and media products	13.6	11.8	29.8	13.5	14.3	1.5
23	Coke, refined petroleum products	1.0	14.8	1.8	1.8	0.7	-11.3
24	Chemicals and chemical products	6.9	6.8	14.0	14.8	6.6	7.5
25	Rubber and plastics products	20.8	13.4	17.6	21.4	-2.7	7.0
26	Other non-metallic mineral products	15.7	5.2	5.0	13.9	-9.2	8.3
27	Basic metals	9.3	8.9	26.5	29.2	15.7	18.6
28	Fabricated metal products, except machinery and equipment	20.9	18.4	10.5	26.4	-8.5	6.8
29	Machinery and equipment	16.8	6.8	14.3	22.1	-2.1	14.3
30	Office, accounting and computing machinery	13.8	45.4	-5.3	44.4	-16.8	-0.7
31	Electrical machinery and apparatus	17.1	14.8	14.6	17.6	-2.2	2.4
32	Radio, television and communication equipment	14.3	24.0	0.3	23.1	-12.2	-0.7
33	Medical, precision and optical instruments	19.1	9.7	13.9	-0.2	-4.4	-9.0
34	Motor vehicles, trailers and semi-trailers	23.2	11.4	37.5	-3.6	11.7	-13.4
35	Other transport equipment	20.4	15.5	18.5	26.4	-1.6	9.4
36	Furniture; manufacturing n.e.c.	36.2	21.0	39.9	30.8	2.7	8.1
	Total	17.0	10.2	13.1	17.3	-3.3	6.4

Source: Compiled by author based on GSO's Online Summarized Enterprise Survey Results, http://www.gso.gov.vn/default.aspx?tabid=409&idmid=4&ItemID=8718 (30/3/2010).

Table 4.10 Industry composition of manufacturing employment and capital: 1995-2003

Code	Industry name	Employment shares (%)			Capital shares (%)		
		1995	2000	2003	1995	2000	2003
15	Food products and beverages	22.6	23.0	19.9	27.6	21.6	18.2
16	Tobacco products	0.6	0.4	0.3	1.4	0.6	0.6
17	Textiles	11.0	8.1	6.7	11.0	8.4	8.5
18	Wearing apparel	11.5	11.7	13.9	6.5	4.2	5.4
19	Leather, fake-leather products and footwear	4.4	10.4	11.3	4.4	6.0	6.5
20	Wood and wood products	14.5	10.9	10.5	6.5	1.4	1.7
21	Paper and paper products	1.1	1.5	1.5	2.3	2.3	3.0
22	Publishing, printing and media products	0.8	1.0	1.0	1.6	1.0	1.5
23	Coke, refined petroleum products	0.02	0.03	0.02	0.4	0.3	0.2
24	Chemicals and chemical products	2.0	2.1	1.8	3.5	4.2	4.3
25	Rubber and plastics products	1.3	2.3	2.5	3.0	4.5	4.9
26	Other non-metallic mineral products	14.0	10.5	9.9	9.3	21.1	16.8
27	Basic metals	1.5	1.3	1.2	3.5	2.1	2.9
28	Fabricated metal products, except machinery and equipment	4.3	5.0	5.7	2.6	4.5	4.6
29	Machinery and equipment	1.5	1.3	1.2	1.5	1.9	1.8
30	Office, accounting and computing machinery	0.0	0.1	0.1	0.0	0.9	0.5
31	Electrical machinery and apparatus	0.7	1.4	2.0	1.2	3.0	3.1
32	Radio, television and communication equipment	0.4	0.5	0.6	6.3	2.8	2.0
33	Medical, precision and optical instruments	0.1	0.2	0.2	0.2	0.7	0.7
34	Motor vehicles, trailers and semi-trailers	0.4	0.7	0.8	2.1	2.6	4.6
35	Other transport equipment	1.3	1.5	1.7	2.6	3.8	4.5
36	Furniture; manufacturing n.e.c.	5.8	6.0	7.7	2.4	2.1	3.6
	Total	100	100	100	100	100	100

Source: Calculated by author based on the GSO (2006a).

Tobacco products and non-metallic mineral products are the two industries experiencing reduction in both capital and employment shares. In contrast, a number of other import-competing industries expanded their shares in either employment or capital or both factors. These industries include paper, chemicals, rubber and plastics, fabricated metal products, electrical machinery, motor vehicles and other transport equipment. An important factor for the increasing relative weight of these import-competing industries is the increased domestic demand for their products, particularly light-consumer goods (paper, rubber and plastics, fabricated metal products), which are produced using more labor and less sophisticated technologies than motor vehicles, electrical machinery and other transport equipment. Given the larger demand, the other factor is the relatively higher level of protection (despite this level declining) for some capital and durable goods such as motor vehicles, motorbikes, and radio and television. These factors, combined with reduced entry barriers, attracted significant private and foreign investment.

Table 4.11 Employment and capital shares of trade groups in the organized manufacturing sector

	Less-traded	Export-oriented	Import-competing	Total
Employment share (%)				
2000	16.3	53.8	29.9	100.0
2001	15.4	54.6	30.0	100.0
2002	14.5	56.4	29.1	100.0
2003	14.1	57.6	28.3	100.0
2004	13.8	57.7	28.5	100.0
2005	13.6	58.1	28.4	100.0
Capital share (%)				
2000	38.3	20.6	41.1	100.0
2001	34.6	22.2	43.3	100.0
2002	32.4	24.0	43.6	100.0
2003	31.4	25.1	43.6	100.0
2004	27.1	24.4	48.5	100.0
2005	26.7	26.1	47.3	100.0

Source: Author's calculation based on the unpublished enterprise survey data.

The employment and capital composition of the organized manufacturing sector based on the trade groups indicates a clearer pattern of resource allocation toward exportable goods sectors. Table 4.11 shows a prominent trend of resource movement as the manufacturing response to the changes in the incentive structure of trade policy regimes. Export-oriented

industries expanded significantly their shares in the total employment and capital between 2000 and 2005, from 53.8 percent to 58.1 percent in employment share and from 20.6 percent to 26.1 percent in capital share. Notwithstanding the upward trend, the data suggest that the export-oriented activities were as the largest contributor to employment generation in manufacturing. In line with the export-oriented sector, more investments were also directed to import-competing industries with their weight in total manufacturing capital moving up from 41.1 percent to 47.3 percent, leading to the corresponding contraction of the less-traded industries. However, as the indications in the capital expansion of some import-competing industries revealed, the import-competing group slightly declined in their share of employment despite their tendency of being more labor-intensive (as shown in Table A4.8, Appendix). The less-traded sector also experienced the same trend in their employment share as the import-competing sector. This means the rate of employment expansion of these two groups was substantially lower than that of the export-oriented group. Nevertheless, in terms of output shares, the export-oriented group did not improve like the other two groups, probably due to the stronger growth of domestic demand compared with export growth.

4.3.4 Trade patterns and growth and structural changes in manufacturing

Manufacturing growth appears to be closely related to the patterns of import changes. Table 4.12 presents several aspects of import growth in different periods from 1995 to 2007. The increasing trends of growth in total imports, non-fuel imports and manufactured imports are similar to the growth trend of manufacturing output as shown in Table 4.6. The faster pace of import growth over time is clearly associated with the progress of removing import restrictions in line with trade policy reforms. In one aspect, the expansion of manufactured imports implies more foreign competition for manufacturing industries. In another aspect, import growth shows a better access to foreign intermediate inputs with higher quality and more varieties, which allow domestic industries to expand production and improve efficiency. This is evidenced by a significantly higher growth rate of imported intermediate inputs. Further evidence in Appendix Table A4.9 suggests that Vietnam's import structure has been always dominated by capital and intermediate goods as a result of the fact that Vietnam is a developing country in the early stages of industrialization with many growing

industries being dependent on imports. Therefore, the rapid growth of intermediate input imports is a response to high demands from manufacturing industries to produce for domestic markets and exports.

While it is obvious that not all capital and intermediate goods are used in manufacturing, the higher growth rate of intermediate inputs compared with that of machinery and equipment seems to correspond to the trends of faster employment expansion and slower capital investment in manufacturing in the period 2000-03 as discussed above (Table 4.8). The growth of imported intermediate inputs rose significantly from 14.7 percent annually in 1995-2000 to 19.7 percent in 2000-05. The dramatic rise in the growth rate of machinery and equipment imports in 2005-07 seems to be associated with the faster growth rate of capital in the organized manufacturing after 2003 (Table 4.9).

Table 4.12 Growth patterns of trade: 1995-2007

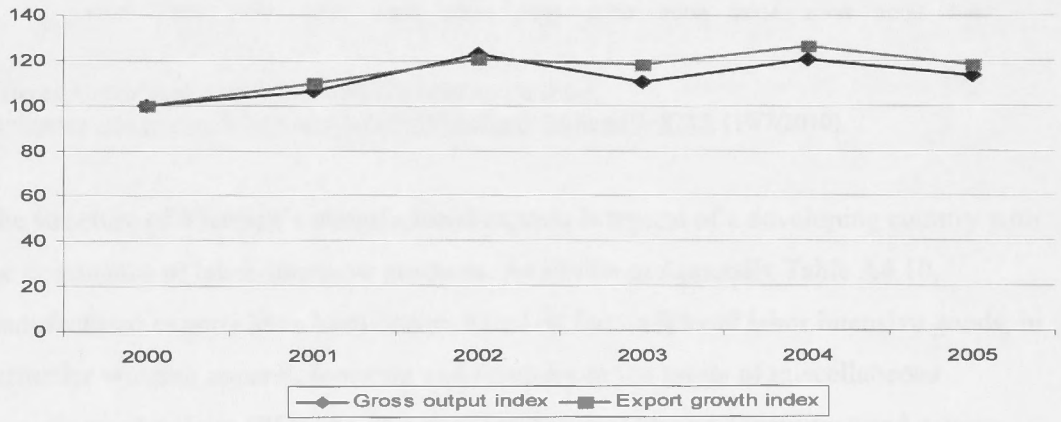
Indicators	1995-2000	2000-05	2005-07
Export growth (%)			
Total exports	21.6	17.5	22.3
Non-fuel exports	20.3	17.7	26.4
Manufactured exports	29.1	20.6	28.3
Machinery and transport equipment (SITC 7)	70.2	19.8	33.5
Miscellaneous manufactured articles (SITC 8)	25.2	21.0	24.6
Import growth (%)			
Total imports	13.9	18.6	30.7
Non-fuel imports	13.3	18.4	31.2
Manufactured imports	14.2	17.1	31.5
Import of intermediate inputs	14.7	19.7	28.1
Import of machinery and equipment	17.9	14.2	39.1

Source: Author's calculation based on GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8763; http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8758; and http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8757; (19/7/2010).

In contrast with the trends of gross output and import growth, manufactured exports and total exports experienced slower growth in 2000-05 compared with 1995-2000. As shown in Table 4.12, the growth rates of total exports and non-fuel exports noticeably declined from 21.6 percent and 20.3 percent to 17.5 percent and 17.7 percent respectively. Similarly, manufactured exports slowed down from 29.1 percent to 20.6 percent. A possible

explanation is a lower starting base of exports in the early stages of economic integration (Athukorala 2009). Another cause could be the faster growth of domestic demand, which stimulated the expansion of imported raw materials and intermediate inputs as mentioned above. The slower growth of exports could be an underlying cause of the slightly declining share of the export-oriented sector in the manufacturing gross output despite its prominent expansion in employment and capital. This is evidenced by the close relationship between the growth of exports and gross output of this sector as illustrated in the Figure 4.7. Nevertheless, manufactured exports show a strong response to the crucial step of trade liberalization in 2007 as presented by a dramatic increase in its growth rate in the period 2005-07.

Figure 4.7 Trends of output and export growth of the export-oriented organized sector: 2000-05

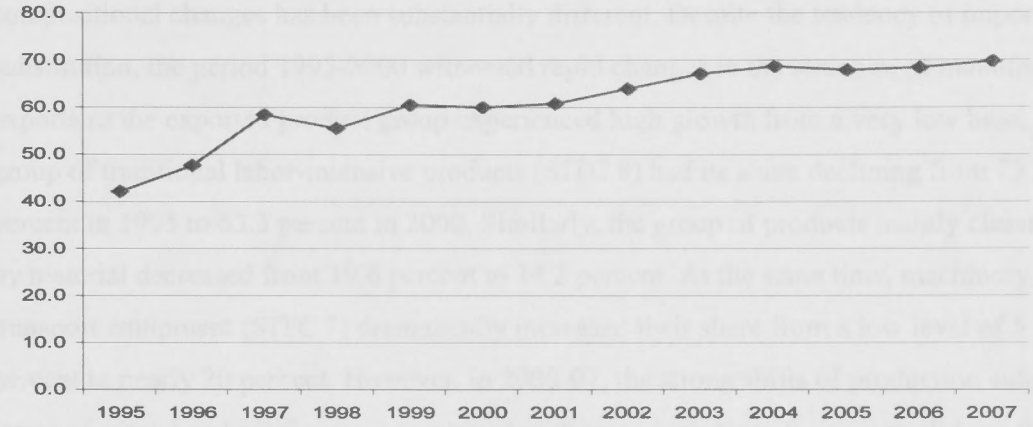


Source: Author's calculation based on the unpublished enterprise survey data and trade data.

Despite slowing down after 2000, the growth of manufactured exports has been impressive, being a driving force of the economy's export expansion. As shown in Table 4.12, in all periods, manufactured exports grew faster than total and non-fuel exports. As a result, the share of manufactured exports in the total and non-fuel exports has continued to increase. Figure 4.8 shows a trend of manufactured exports increasing in the share of the non-fuel exports. It can be seen that due to the higher growth rate, the relative weight of manufactured exports increased faster in 1995-2000 than in 2000-07. Moreover, it is important to note that the expansion of manufactured exports has been increasingly driven

by the FDI sector. The contribution of this sector in total manufactured exports increased from about 20 percent in 1995, to nearly 50 percent in 2000, and to about 60 percent in 2006 (Athukorala 2009).

Figure 4.8 Share of manufactured exports in non-fuel merchandise exports: 1995-2007



Source: Author's calculation based on GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8763; (19/7/2010).

The structure of Vietnam's manufactured exports is typical of a developing country with the dominance of labor-intensive products. As shown in Appendix Table A4.10, manufactured exports have been concentrated on the traditional labor intensive goods, in particular wearing apparel, footwear and furniture in the group of miscellaneous manufactured articles (SITC 8). The share of this group in total manufactured exports ranges from 60 percent to more than 70 percent in 1995-2007. Machinery and transport equipment (SITC 7) is another product group accounting for an increasing share, from about 5 percent in 1995 to nearly 21 percent in 2007. According to Athukorala (2009), in this group, there has emerged the increasing contribution of office machines, electrical goods, and telecommunication and sound recording equipment. It is notable that these products have been mostly exported in the form of parts and components. Moreover, their export expansion has been accompanied by the growth of assembly plants dominated the foreign investors. On the one hand, this feature indicates the labor-intensive nature of the activities involved in producing these products in Vietnam. On the other hand, this feature

shows the sign of Vietnam's increasing involvement in the production network in the region based on its comparative advantage.

The composition of manufactured exports shows a noticeable shift toward reducing the heavy concentration on traditional labor-intensive products. However, the pace of compositional changes has been substantially different. Despite the tendency of import-substitution, the period 1995-2000 witnessed rapid changes in the structure of manufactured exports as the exported product group experienced high growth from a very low base. The group of traditional labor-intensive products (SITC 8) had its share declining from 73.7 percent in 1995 to 63.3 percent in 2000. Similarly, the group of products mainly classified by material decreased from 19.6 percent to 14.2 percent. At the same time, machinery and transport equipment (SITC 7) dramatically increased their share from a low level of 5 percent to nearly 20 percent. However, in 2000-07, the strong shifts of production side in terms of capital and employment combined with more incentives for exports did not further result in the noticeable changes in the structure of manufactured exports established in 2000. In general, traditional labor intensive products still played a key role in the export structure. Moreover, the implementation of the USVBTA fostered the buoyant growth of wearing apparel and furniture, leading to the increase in the share of wearing apparel from 29.6 percent to 33.6 percent between 2000 and 2003, and the share of furniture from 4.9 percent in 2000 to 9.6 percent in 2005. In addition, the share of machinery and transport equipment group remained roughly stable around at 20 percent.

Overall, the structure of manufactured exports clearly indicates the tendency to exploit labor, a key comparative advantage of Vietnam in a more liberal trade regime. On the one hand, this situation shows that manufacturing responses have been aligned with the orthodox predictions of moving to labor-intensive production for a developing country. On the other hand, the reinforced pattern of labor intensity in the structure of manufactured exports may show the signs of locking in the low-growth path specialization pattern of manufacturing based on the products of low technological content and low demand elasticity[70] as predicted by the new endogenous growth theory. Nevertheless, given that the

[70] See Lall (2000) for a discussion of product classification based on the technological sophistication level and demand elasticity.

period under study was before the WTO accession, a longer time span is needed to evaluate the likelihood of the above pattern. At least, there have been promising signs of moving toward the more dynamic manufactured products as the result of new investments by Multinational Corporations (MNCs) in the technology-intensive manufacturing activities in the context of expanding regional production sharing, as indicated by Athukorala (2009).

4.4 Conclusions

This chapter has examined the growth performance of the economy and the structural changes of manufacturing. A number of important features of this process have been revealed. Firstly, Vietnam has achieved significant macroeconomic stability with impressive macroeconomic performance in the nearly two decades of economic reforms until the accession to the WTO. Moreover, trade policy reforms have had greater influence on macroeconomic stability, which has been increasingly related to the trade and foreign investment flows.

Secondly, in the context of the relatively stable macroeconomic environment, manufacturing had the best performance compared with other sectors of the economy and made an increasing contribution to the overall economic growth. Moreover, the manufacturing performance in terms of growth rate has been improved in line with the trade liberalization process.

Thirdly, there has been pronounced transformation of manufacturing structure in terms of output, capital and employment as well as exports, toward labor-intensive and export-oriented production in response to the changes in trade policy regimes. In particular, manufacturing did not only experience higher output growth, but also had much better employment absorption. This trend implies the important contribution of trade policy reforms in inducing higher manufacturing growth in line with more poverty reduction through larger employment expansion.

Fourthly, manufacturing changes also reflect the profound impact of structural reforms with the reducing importance of the SOE sector and the corresponding increase in the contribution of PE and FDI sectors in output growth and resource allocation as well as in

export growth. Importantly, the FDI sector has become a key driving force of manufacturing growth, particularly manufactured export performance.

Finally, it is notable that in the context of moving toward labor-intensive and export-oriented production, it can be inferred that domestic demands have played a bigger role than export expansion in manufacturing growth through the stronger growth of import-substituting industries.

Overall, the analysis in this chapter shows that manufacturing growth patterns appear to have been closely associated with different phases of trade policy reforms and international economic integration. In particular, the output growth rate was higher when trade flows expanded in line with trade policy reforms. The nature of output growth has been significantly changed toward using more labor and less capital. Production structure has been shifted toward export-orientation, suggesting a strong response from the production side to the changes in the trade policy regime. Given this background, the next chapters will carry out empirical investigation on the specific questions of whether trade liberalization in Vietnam has contributed to manufacturing output growth through improving productivity performance.

Chapter 5

Trade Liberalization and Manufacturing Productivity Growth

5.1 Introduction

Extensive trade liberalization and domestic reforms have taken place in Vietnam's economy, including the manufacturing sector in 2000-07 as reviewed in Chapter 3. These reforms have resulted in a substantial reduction in manufacturing protection and an associated increase in competition in domestic markets. It is therefore expected that the improvement in manufacturing performance, if it has taken place, could be significantly correlated with changes in the policy and business environment.

Based on the theoretical trade and growth literature reviewed in Chapter 2, this chapter examines the empirical evidence of the relationship between trade liberalization and the productivity performance of Vietnam's manufacturing sector. This chapter will focuses on three questions: (i) what are the patterns and nature of manufacturing output growth and the contribution of productivity to output growth? (ii) has trade liberalization been significantly correlated with productivity growth in Vietnam's manufacturing sector? and (iii) have domestic policy reforms in Vietnam played a role in determining the impact of trade reforms on the manufacturing productivity performance?

To answer these questions, the analytical framework applied in this chapter follows a two-step process: The first step is to estimate and decompose manufacturing output growth and then to determine the contribution of total factor productivity (TFP) growth to output growth. In the second step, the relationship between trade liberalization and manufacturing TFP growth is examined in a regression framework. Productivity is one of the most important aspects of manufacturing performance. At industry or firm level, the evolution of productivity could be determined by at least two groups of factors: (i) firm or industry-specific characteristics and (ii) policy environment variables. Therefore, regression work is carried out on these determinants to measure the impact of trade liberalization on productivity performance.

The chapter is organized as follows. Section 5.2 presents the estimation and decomposition of manufacturing output growth and discusses the estimation results. Consequently, Section 5.3 makes an inquiry into the relationship between trade liberalization and manufacturing productivity growth. Finally, Section 5.4 draws the main conclusions.

5.2 Patterns of manufacturing productivity growth in trade liberalization

5.2.1 Measuring productivity growth: the analytical framework

Productivity can be defined as the output to input ratio of a firm or an industry. When a bundle of production inputs is taken into consideration, the resulting measure is called total factor productivity (TFP). This is a comprehensive measure of productivity and suitable for evaluating the performance of firms and industries (Coelli et al. 2005).

While the assumption of the production function and underlying production technology is important for TFP growth estimation, the measure of output used is essential for making such an assumption. There are two common output measures for the manufacturing sector: gross output (GO) and value added (VA), with each having advantages and disadvantages.

On the one hand, the GO measure can be used to estimate productivity in a more comprehensive way than the VA measure. Since the VA measure is based on the main assumption of the separability of value added from gross output, this would be weakened by an argument that the production function is an integral combination of all production factors, including primary inputs (capital and labor) and intermediate inputs. Other advantages of the GO measure compared with the VA measure include being more relevant for describing disembodied technological change, having less distortion to TFP change over time and explicitly accounting for intermediate inputs in the TFP measure (Cobbold 2003). Therefore, many empirical studies on manufacturing TFP growth prefer the use of the GO measure.[71]

On the other hand, the GO-based measure of TFP growth is subject to the problem of double accounting due to intra-industry flows of intermediate goods. This problem makes it

[71] See, for example, Gollop and Jorgenson (1980), Rao (1996), Athukorala and Rajapatirana (2000), Sharma (1999) and Goldar and Kumari (2003).

difficult to compare the GO-based measures of TFP growth across different levels of aggregation.[72] It is also of little use in determining the relative importance of an industry for the productivity growth of the whole sector at the higher aggregate level. Whereas it is simpler to compute the VA-based measure of TFP growth at the aggregate level from that at the disaggregate levels (OECD 2001).

In this study, the VA measure is used to estimate the TFP growth. The main reason is that we pay particular attention to the estimates of TFP growth at four-digit VSIC industry level and the aggregation of these estimates to the two-digit VSIC industry level and the whole manufacturing sector. We are also interested in identifying the pattern of labor productivity in manufacturing. The VA-based labor productivity is less influenced by inter-industry differences in the use of intermediate inputs (the intermediate input and labor ratio) as well as the problem of outsourcing (OECD 2001). This aspect is particularly relevant for Vietnam where many firms in light and labor-intensive industries, such as garments and footwear, operate based on a subcontracting basis with a high intensity of imported intermediate inputs. While recognizing that the separability of VA from GO remains a concern underlying the VA output measure, we adopt the view that "information regarding TFP [based on VA measure] appears to have greater intrinsic value for it is value added that is the final measure of the value of production" (Rao 1996: 2929). Moreover, the availability of VA-based measures and related empirical studies appears to be greater than that of GO-based studies (OECD 2001; Cobbold 2003; Milner et al. 2007).

Finally, it is important to note that the meaning of total factor productivity and its change has been substantially broadened over time. The traditional Solow approach interprets the TFP change as technological or technical change. Such an interpretation has been considered by many authors as being narrow. For example, not long after the introduction of the Solow growth model in 1956, Domar (1961), when discussing the large contribution of technological progress to labor productivity in the United States, argued that:

[72] In fact, solving this problem has highly demanding data requirements as well as a strongly organized statistical system which appears to be a challenge in many countries (Cobbold 2003). Therefore, it is hardly expected to obtain systematic (consistent in both time and cross section dimensions) gross output data without double counting intra-industry good flows.

> True enough, this large contribution has not been made by technological progress alone; a whole group of actors consisting of technological progress in the narrow sense, economies of scale, external economies, improved health, education and skill of the labor force, better management, changes in product mix and many others have been involved. (1961: 709)

Another critic of the Solow approach claims that better management of the production processes, motivated by competition and adversity, constitutes the X-efficiency, which is a significant part of the unexplained residual in the output growth (Leibenstein 1966). More specifically, Nishimizu and Page (1984), based on the concept of a production frontier or 'best practice' production function introduced by Farrell (1957), indicate that TFP change consists of two components: technological progress and technical efficiency (X-efficiency) changes. Technological progress is defined as the shift in the production frontier and technical efficiency change refers to other sources of productivity change including learning-by-doing, diffusion of new technological knowledge, and improved managerial practice. A more recent component approach in the productivity measurement divides TFP growth further into more specific components, including technological change, efficiency change, change in the scale of operation and output mix effect (Coelli et al. 2005).

Therefore, we adopt the view that "at any point in time, TFP is the combined result of technical progress and technical efficiency, or the efficiency with which factors are used, given the technology" (Kalirajan and Bhide 2005: 136)[73]. This interpretation should be further elaborated in line with the measurement approach to TFP growth in this study. It is considered here that improvements in factor input quality are included in the measure of TFP growth. While the common reason for the data limitations on the composition of capital and labor is not of prime importance here, many aspects of labor and capital quality upgrading have been widely argued to reflect either technical efficiency change or technological progress. Regarding labor quality, it is clear that labor quality is improved

[73] Among empirical studies using the growth accounting approach, several studies have a similar view. For example, in their study on the impact of trade liberalization on manufacturing productivity growth in Thailand, Urata and Yokota (1994) consider TFP growth to consist of two components: technical efficiency change and technological progress. Iradian (2007) also presents a similar view when providing TFP growth estimates for transitional economies of the former Soviet Union to seek the role of efficiency gains under various market and institutional reforms.

when workers receive more education, on-the-job training and experience (learning-by-doing). Improved labor quality could promote the diffusion of technological knowledge. These factors constitute the technical efficiency component in the TFP growth measure. Regarding capital quality, new types of capital goods resulting from investments are often expected to be embodied with technical change and have higher marginal products (Mahadevan 2003). The technical change, embodied in capital, could be associated with movement of the production frontier, which is the technological progress component in the TFP growth measure. It is also possible that the TFP growth measure defined above comprises the effect of economies of scale contributed by individual firms in a particular industry. This factor may also be included in the technical efficiency change, as suggested by Coelli et al. (2005).

This view on the components of TFP growth is also consistent with the theoretical literature on trade and growth. As discussed in Chapter 2, the theoretical literature suggests the multiple links underlying the relationship between trade and productivity growth. Furthermore, it should be noted that, while it is possible to compute the components of TFP growth, it is not feasible to make the decomposition of TFP growth and relate its components with trade liberalization separately, at the same time, because of the multiple and overlapping links underlying the relationship between the components of TFP growth and the trade variables. Therefore, in this study, we focus on manufacturing TFP growth as a whole measure to examine its correlation with trade liberalization in Vietnam.

The estimates of manufacturing TFP growth are made for manufacturing industries at the four-digit VSIC level for the period 2000-05. This period is chosen due to data availability and the timing of trade liberalization in Vietnam. As mentioned in Chapter 3, the year 2000 started a new wave of the reform process in Vietnam with accelerated trade reforms and international economic integration. Various domestic reforms were also implemented to bring more competition into domestic markets. As a consequence, there were significant changes in the policy environment. Based on the enterprise survey data, officially made available since 2001, the estimates of TFP growth should capture the effects of these significant reforms, particularly the impact of trade liberalization.

5.2.2 Datasets and variable measurement

Since TFP growth estimation is taken at four-digit VSIC industry level, data used are compiled from the annual enterprise census, conducted by the General Statistical Office (GSO) since 2000. The enterprise census collects essential information on enterprises in all sectors of the economy, including the manufacturing sector. The information collected on firms includes main business activity (industry and sector), ownership, sales (revenue), profits, number of employees and income and compensation, assets (fixed and working) and liabilities, investments and taxes by the end of each year. Each firm is coded by a tax number at the four-digit level of Vietnam's Standard Industrial Classification (VSIC), which is the same as the International Standard Industrial Classification (ISIC) for the manufacturing sector.[74] However, information on production costs, which is essential to evaluation of a firm's performance, is collected on a smaller sample of selected firms, with a separate questionnaire in the enterprise census. In addition, a selected firm's production costs were not collected every year and hence the sample size varied from year to year. Therefore, there are two datasets for the manufacturing sector: a general and a sample dataset.

The general survey dataset is the main dataset used for calculating key variables in the TFP growth equation, including VA, K, and L. Basically, these variables at industry level are measured by aggregating variables at the firm level. However, the general survey dataset does not contain enough information to compute the VA and its components (K and L shares). Therefore, the sample firm survey dataset is used to obtain information to make estimation at the four-digit VSIC industry level. For both datasets, all observations with negative or zero nominal values of any key variables for firm performance such as output, employment, fixed assets, and intermediate input costs were deleted. The consistency check was done by comparing the gross output (firm revenue) and intermediate input costs (for the sample dataset only), and the number of skilled and unskilled employees and firm age (year of establishment).

[74] There are unmatched industry codes between VSIC and ISIC at the four-digit level for the services sector.

The measurement of *VA* is based on the factor income approach, which determines the incomes of capital and labor separately and then combines these two components. Following the General Statistical Office-GSO (2000), the value added of each industry (firm) is defined as the sum of labor compensation and the capital rental payment. This component approach is employed in this study, instead of using the deduction approach, for two reasons: (i) the data on production costs (particularly intermediate costs, including material inputs, energy and industrial services) are limited to the sample survey dataset and not available for the year 2004. This lack of production cost information for the whole manufacturing sector makes it difficult to calculate value added by subtracting gross output from intermediate costs at constant prices. Whereas the data on labor compensation, fixed capital depreciation and profits are available for adopting the component approach, (ii) separate measurement of VA components makes it easier to determine the capital and labor shares in the value added, which are then used to estimate the TFP growth.

Regarding the VA components, labor compensation is defined as the sum of wages or salaries, social insurance (such as sick leave and pension), and any bonus. In the GSO's (2000) definition, capital income consists of depreciation and net operating surplus (including profit, paid interest and other non-production income). This definition is consistent with the content of the rental payment, which includes depreciation, and interest and profit as suggested by Domar (1961) and the OECD (2001). It is noted, however, that the negative firm profit is not taken into account and is considered to be zero. This treatment of negative firm profit is aimed to reduce the downward bias of the estimated capital costs on two grounds: (i) when reported firm profit is negative and the annual depreciation is reduced by the amount of negative profits, then the capital cost is understated. This situation is not appropriate when a firm has to rent capital, as it still has to pay the capital rental whatever its profit may be. Moreover, even when the capital is owned by the firm, the depreciation cost should be the minimum cost of capital for producing goods. Hence, if negative profit is taken into account, the capital cost is understated; (ii) the annual enterprise census collects information by using questionnaires completed by enterprises. Firms commonly tend to underreport their annual profit to avoid income and other related taxes. Therefore, it is likely that there will be a downward bias in the reported

firm profits and capital income. As a result, the output value could be understated and hence a little or even no output growth could be observed.

The annual value of fixed assets of all firms in an industry is used as the proxy of capital stock. While it would be better to apply the perpetual inventory method to compute the capital stock, it is not applicable to this study due to the limited availability of information on the vintage composition and purchase prices of fixed asset stock of individual firms, and the work is more complicated with the aggregation of firms. Labor input is measured in terms of the annual average number of employees getting paid for the whole industry. It is again worth noting that a more accurate measure of labor input would be total working time, measured in working hours or working days (Gollop and Jorgenson 1980). However, this measure has highly demanding data requirements that are not available in the enterprise census, such as the average number of working hours per day and working days per month as well as worker groups by educational level. Therefore, it is assumed here that unit labor input is the same for different categories of labor. This means that labor input is not adjusted for labor quality based on educational level. Due to the limited data availability, many studies of a similar kind have used similar measures of capital and labor to estimate TFP growth.[75]

Finally, the value share of labor in the value added S_L is computed by taking the ratio of labor compensation over the value added in current terms. Consequently, the capital weight S_K is one subtracted by the value share of labor, based on the constant return to scale assumption. To compute the growth rates, the real VA at constant 1994 prices is obtained by dividing the VA at current prices by the VA deflator, which is equal to the ratio between the manufacturing value added at current prices and that at constant 1994 prices for the whole manufacturing sector, published by the GSO for each year in the period 2000-06. The real capital stock at constant 1994 prices is computed by deflating the current price value of the fixed capital stock using the capital deflator, which is the ratio between the value of fixed capital formation at current prices and that at constant 1994 prices.

[75] See, for example, Athukorala and Rajapatirana (2000), Sharma (1999), Goldar and Kumari (2003).

5.2.3 Growth and productivity change in Vietnam's manufacturing sector

The manufacturing output growth and its decomposition are estimated using the TFP growth formula as explained in the Appendix. The estimation results are presented in Table 5.1. Significant output growth rates were observed for the whole manufacturing sector. On average, in 2000-05, manufacturing output growth was driven by the input growth. Labor and capital together contributed to around 82 percent of the total output growth while their separate contributions to output growth were more or less equal for the whole period 2000-05 (about 41 percent). Despite the dominant share of factor inputs in the total output growth, TFP growth had an increasing trend and contributed an increasing share in the output growth. In 2000-03, TFP growth rate was around 1.6 percent with contribution of 11.5 percent and in 2003-05, it was around 4 percent with contribution of 29 percent. Overall, manufacturing TFP growth rate was about 2.5 percent. This is similar to the finding of Tien (2007) for the whole period 2000-05, based on the production function estimation method.

Table 5.1 Summary estimates of manufacturing growth, factor contributions and TFP growth, at four-digit VSIC industry level

Annual compound rates of growth (%)

Period	G_{VA}	G_L	G_K	TFPG	S_L*G_L	S_K*G_K	SL	SK	STFP
2000-2003	13.68	16.06	9.45	1.58	6.46	5.65	47.2	41.3	11.5
2003-2005	13.95	9.85	9.97	4.03	4.23	5.69	30.3	40.8	28.9
2000-2005	13.79	13.53	9.66	2.49	5.59	5.67	40.6	41.1	18.4

Note: the growth rates for the whole manufacturing sector are weighted average growth rates of the individual manufacturing industries.

G_{VA}, G_L, G_K and TFPG denote annual compound growth of output (value added), labor, capital stock and total factor productivity.

S_L and S_K denote the average value shares of labor and capital in output.

Source: Author's calculation.

A more detailed picture of TFP growth is shown in Table A5.1 in the Appendix for industries at the two-digit VSIC level for the period 2000-05, and sub-periods 2000-03 and 2003-05. There is significant variation in productivity performance across industries while a common trend of higher TFP growth emerged. Between the two sub-periods, a majority of industries experienced higher rates of productivity growth, resulting in the overall higher rate of TFP growth for the whole manufacturing sector. It appears that industries having more export-oriented activities such as textiles, wearing apparel, leather and footwear, wood and wood products, and furniture dominate among the industries with better

productivity performance. These industries are also labor-intensive industries. The few industries such as tobacco and cigarettes, chemical products, basic metals and motor vehicles, which have the worst productivity performance, are those with a more import-substitution orientation. Nevertheless, some industries with more import-competing activities such as paper and paper products, rubber and plastics, fabricated metal products and other transport equipment experienced higher productivity growth. Therefore, it appears that in line with the more open trading environment and increased domestic competition, the majority of manufacturing industries obtained higher productivity levels with export-oriented industries dominant.

Table 5.1 also indicates that the growth rate of labor is higher than that of capital, at about 13.6 percent compared with 9.7 percent for the whole period 2000-05. This appears to happen mostly in 2000-03 when the manufacturing employment growth rate well exceeded the growth rate of capital stock (16.1 percent and 9.5 percent on average). As a result, capital intensity (KL) decreased sharply between 2000 and 2004 as shown in Figure 5.1. This implies that manufacturing growth has become labor-intensive. The increasing labor intensity of manufacturing growth is consistent with the theoretical prediction that a developing country, when opening to international markets, will shift its production patterns toward the goods whose production is more intensive in using the country's relatively more abundant resources. To some extent, the declining capital intensity in Vietnam could be the expected response of manufacturing firms in import-competing industries. On the one hand, since import-competing industries are commonly capital-intensive, moving from a protected trade regime to a less protected one reduces the returns to capital due to lower product prices, which discourages capital investment in these industries. On the other hand, excessive capacity is a common problem of import-competing industries under a protected trade regime. Therefore, competition effects resulting from lower trade protection could induce these industries to exploit their idle capacity to survive in a more competitive market. In another respect, the expansion of export-oriented industries due to their improved access to international markets is likely to lead to increased employment of unskilled labor, which is Vietnam's comparative advantage.

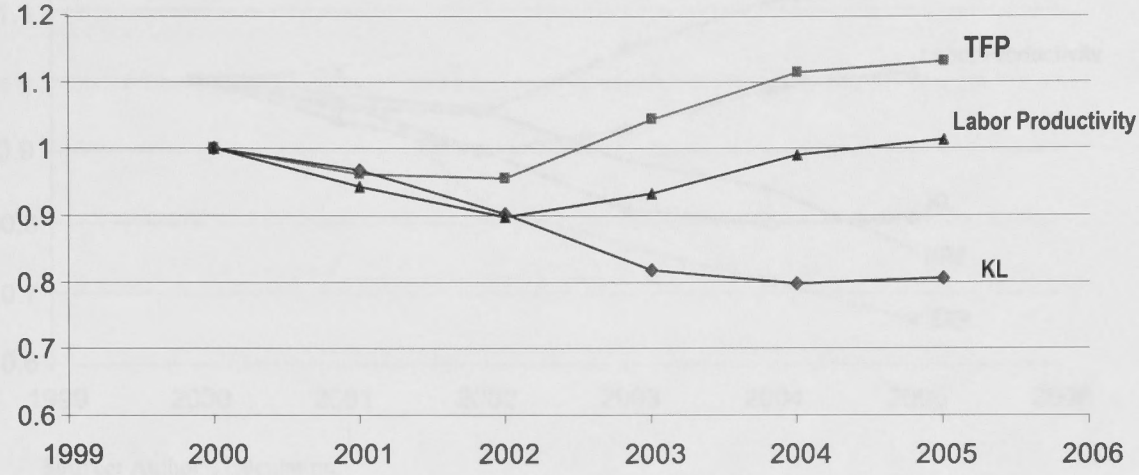
In contrast with capital intensity, manufacturing TFP shows an increasing trend, with sharp increases in 2003 and 2004. This upward trend of TFP growth appears to be in line with the reduction in the accumulation of capital stock and the significant rise in labor utilization in manufacturing. To some extent, this would suggest that manufacturing industries have become more productive through better utilization of factor inputs, according to the underlying comparative advantage in terms of using less capital, which is a relatively scarce factor, and more labor, which is an abundant factor in Vietnam.

These trends would suggest a more important role of improving technical efficiency rather than technological progress in manufacturing TFP growth. Since the average growth rate of labor is significantly greater than that of capital, manufacturing industries seem to exploit the production capacity of the existing capital stock combined with greater use of labor to increase output. In addition, if technological progress is positively associated with the expansion and quality improvement of capital stock, it would require more skilled labor to manage the advanced machinery or equipment. Despite significant growth in employment, the average share of skilled labor in the total employment of manufacturing industries remained unchanged or even fell over the years.[76] These two facts would indicate the limit of technological progress in the manufacturing industries while substantial TFP growth took place during the period 2000-05. Therefore, technical efficiency change could better explain the upward trend of TFP growth. The question here is whether the trend in increased labor utilization and reduction in capital intensity is significantly correlated with manufacturing TFP growth. This question will be dealt with in the econometric investigation.

Moreover, it is interesting to see that labor productivity, measured by value added per employee, had an upward trend, which follows closely the trend of TFP. While it has been shown that labor productivity growth results from TFP growth and capital deepening, labor productivity growth in Vietnam's manufacturing sector in the period 2000-05 appears to have been mainly driven by TFP growth rather than capital deepening. The patterns of labor and TFP growth are presented in Figure 5.1 and more detailed evidence on capital intensity, labor productivity and their growth rates are presented in Table A5.2, Appendix.

[76] The data will be shown in Section 5.3.

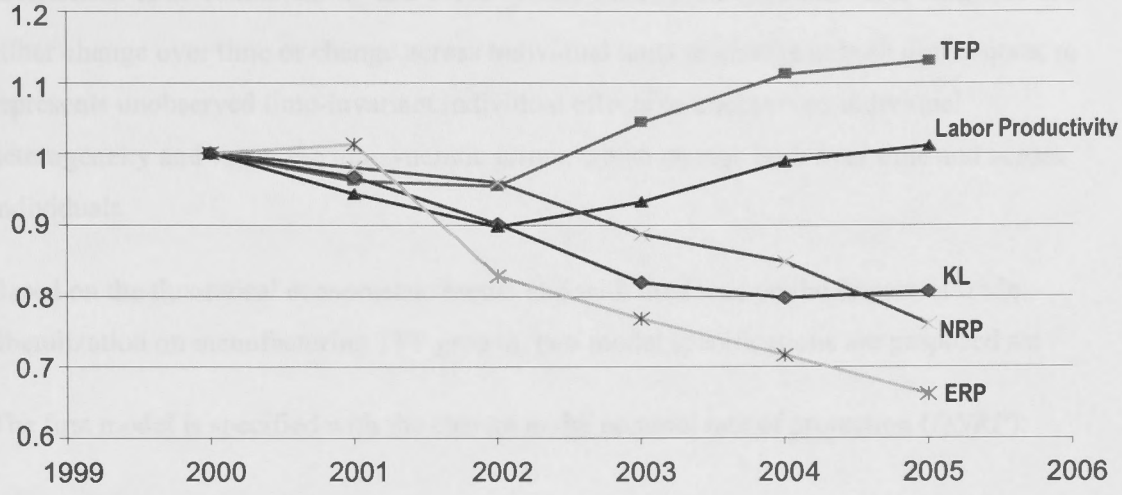
Figure 5.1 TFP, capital intensity and labor productivity indexes: 2000-05



Source: Author's calculation.

Given the contrasting patterns of capital intensity, TFP and labor productivity, Figure 5.2 adds the trend of trade liberalization in manufacturing, measured by simple average nominal and effective rates of protection (NRP and ERP). Except for the year 2001 for ERP, both NRP and ERP show a decreasing trend over the years in 2000-05. In general, NRP and ERP have contrasting patterns compared with TFP and labor productivity. It is also noticeable that the sharp drop of manufacturing TFP in 2001 is associated with the increase in NRP. Therefore, this comparison suggests that improved manufacturing performance has been in line with trade liberalization with the indication of a negative relationship between TFP and labor productivity, on the one side, and a reduction in manufacturing protection, on the other side.

Figure 5.2 Manufacturing performance and trade liberalization indicators



Source: Author's calculation.

Based on the estimation result of TFP growth and initial observations of the patterns of TFP, LP, KL and trade protection, we take the second step of the empirical work, which is to examine the determinants of manufacturing TFP growth, with a focus on the question of whether trade liberalization is significantly correlated with manufacturing productivity performance. Specific aspects of interest are the impact of trade policy and trade openness variables and their interaction with manufacturing TFP growth.

5.3 Trade liberalization and manufacturing productivity growth: an econometric investigation

5.3.1 Model specifications

To examine the relationship between trade liberalization and productivity growth of manufacturing industries, the econometric analysis of the study is based on the panel data model. Following Wooldridge (2002), the theoretical model is specified as follows:

$$y_{it} = x_{it}\beta + u_i + v_{it}, t = 1, 2, \ldots, T; i = 1, 2, \ldots, N. \quad (5.1)$$

where *i, t* indicate individual unit and time period, β is a K x 1 vector of the coefficients to be estimated, x_{it} is a 1 x K vector, which includes observable variables that either change over time or change across individual units or change in both dimensions, u_i represents unobserved time-invariant individual effects or unobserved individual heterogeneity and v_{it} are the idiosyncratic errors, which change both over time and across individuals.

Based on the theoretical econometric model and with the focus on the impact of trade liberalization on manufacturing TFP growth, two model specifications are proposed as:

The first model is specified with the change in the nominal rate of protection (*DNRP*):

$$\begin{aligned} TFPG_{it} = {} & \beta_0 + \beta_1 DAVGO_{it} + \beta_2 DNRP_{it} + \beta_3 DHFI_{it} + \beta_4 DNRP_{it} \times DHFI_{it} \\ & + \beta_5 DKL_{it} + \beta_6 SKILL_{it} + \beta_7 DSFDI_{it} + \beta_8 DSSOE_{it} + \beta_9 DIM_{it} \\ & + \beta_{10} DIM \times DHFI_{it} + \beta_{11} DEX_{it} + \beta_{12} DEX \times DHFI_{it} + \beta_{13} DNRP_{i,t-1} + u_i + v_{it} \end{aligned} \tag{5.2}$$

The second model is specified with the change in the effective rate of protection (*DERP*):

$$\begin{aligned} TFPG_{it} = {} & \beta_0 + \beta_1 DAVGO_{it} + \beta_2 DERP_{it} + \beta_3 DHFI_{it} + \beta_4 DERP_{it} \times DHFI_{it} \\ & + \beta_5 DKL_{it} + \beta_6 DSKILL_{it} + \beta_7 DSFDI_{it} + \beta_8 DSSOE_{it} + \beta_9 DIM_{it} \\ & + \beta_{10} DIM \times DHFI_{it} + \beta_{11} DEX_{it} + \beta_{12} DEX \times DHFI_{it} + \beta_{13} DERP_{i,t-1} + u_i + v_{it} \end{aligned} \tag{5.3}$$

where:

$TFPG_{it}$ is the annual growth rate of total factor productivity of industry *i* between years *t* and *t-1*.

$DAVGO_{it}$ is the annual change of average firm gross output in log form of industry *i* between years *t* and *t-1* to capture the effect of output growth on the basis of the Verdoorn Law.

$DNRP_{it}$, $DERP_{it}$, DIM_{it}, DEX_{it} denote changes in the nominal rates of protection, effective rates of protection, import shares (the ratios of imports to the gross output), export shares (the ratios of exports to the gross output) of industry *i* between years *t* and *t-1*. These are key variables of interest used to test the main hypothesis on the positive impact of trade liberalization on manufacturing productivity performance.

$DHFI_{it}$ is the change in the competition level of industry *i* at the four-digit VSIC level between years *t* and *t-1*, measured by the annual difference of industry's Herfindal index.

$DNRP_{it} \times DHFI_{it}$, $DERP_{it} \times DHFI_{it}$, $DIM_{it} \times DHFI_{it}$, and $DEX_{it} \times DHFI_{it}$ are interaction terms to examine whether the impact of trade policy and trade openness is conditional on domestic competition.

DKL_{it} is the change in capital intensity of industry *i* between the years *t* and *t-1*.

$DSKILL_{it}$ is the change in the share of skilled labor employed in industry *i* between the years *t* and *t-1*.

$DSFDI_{it}$ is the change in the share of foreign direct invested enterprises (FIEs) in the gross output of industry *i* between the years *t* and *t-1*.

$DSSOE_{it}$ is the change in the share of state-owned enterprises (SOEs) in the gross output of industry *i* between the years *t* and *t-1*.

Therefore, if all industry fixed effects are captured by the term u_i, other time varying industry-specific effects should be captured by the idiosyncratic term v_{it}.

Since the focus is on the impact of trade liberalization on productivity performance, trade policy measures are the central variables of interest in this chapter. As indicated in Chapter 2, one of the most common measures of trade policy stance is the nominal rate of protection. Reduction in *NRP* is considered as a move toward trade liberalization. Therefore, we concentrate on this measure in the first model (5.2) to investigate the impact of trade liberalization on industry performance. Since the true protection level underlying nominal

measures of trade policy is reflected in the effective rate of protection (*ERP*), we replace changes in nominal protection (*DNRP*) with changes in effective protection (*DERP*) in the second model with similar specifications. This is a different feature of this study compared with many other studies which usually use only one of the two measures due to the lack of data. In addition, these two measures of trade policy are employed in the panel data model framework.[77] Importantly, using two measures of trade policy incidence allows examination of the robustness of the impact of trade liberalization on Vietnam's manufacturing productivity growth. Given their interrelationship, the significance of the estimation results, if it were the case, could indicate the consistency of the two measures used to gauge the pace of trade liberalization in Vietnam. Since trade liberalization is perceived to be a reduction in trade protection, both *DNRP* and *DERP* are expected to have negative coefficients if trade liberalization induces higher manufacturing TFP growth.

An important feature of Vietnam's transitional economy is the process of adopting market-based principles. In line with trade reforms, other domestic reforms, particularly the 2000 enterprise law, restructuring the SOE sector and banking system, and regulatory reforms have been implemented to reduce entry barriers and introduce market principles to all economic activities. While the outcome of these domestic reforms can be seen in different aspects such as the diversification of ownership and the increasing number of new firms, a central aspect is the increased competition level within sectors or industries. A common measure of competition used in empirical studies is the Herfindahl index, which takes into account both firm size and the number of firms in an industry.[78] Although this measure is commonly used in studies on other developing countries, it is particularly relevant for this study on Vietnam because most industries in transitional economies were highly concentrated with the dominance of SOEs in the centrally planned era. Therefore, we use changes in the Herfindal index (*DHFI*) to measure the outcome of the domestic reforms to

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[77] Other studies such as Phan (2004) and Sharma (1999) use these two measures in a cross-sectional data framework, which is less effective in controlling for unobserved industry-specific effects and identifying the true impact of trade reforms on productivity growth.

[78] The Herfindalh index is defined as: $HFI4_j = \sum_{i=1}^{n}\left(\frac{s_{ij}}{S_j}\right)^2$ where s_{ij} is the total sale of firm i in industry j with its gross output S_j.

be included in the two models. As it is commonly suggested in the theoretical literature that more competition promotes and forces firms to be more efficient to survive in the markets, the coefficient on *DHFI* is expected to be negative. It should be noted, however, that excessive competition (in terms of free entry and too many firms in an industry) could reduce performance due to diseconomies of scale (Schmidt 1997).

It has been observed that in many countries, the impact of trade liberalization is highly dependent on domestic conditions, particularly the domestic competition environment (Dijkstra 2000). Therefore, given that both trade reforms were followed by domestic policy reforms in Vietnam, one of the proposed key hypotheses in this chapter is that the productivity impact of trade opening could be significantly influenced by the competition condition in manufacturing industries. To examine this hypothesis, the interaction terms, combining changes in nominal and effective protection with changes in industry competition level ($DNRP_{it} \times DHFI_{it}$, $DERP_{it} \times DHFI_{it}$), are used.

In Chapter 2, it has been indicated that trade liberalization can be measured by different methods. To check robustness and capture additional effects of trade liberalization, we also include the measures of trade openness[79], i.e. policy-outcome measures, including changes in import share[80] (*DIM*) and the share of exported output (*DEX*). Inclusion of these two measures of trade openness is also based on multiple links between trade opening and productivity performance suggested by the theoretical literature. It is both theoretically and practically conjectured that reduction in protection level would result in a higher volume of imports, implying higher competition from foreign producers. More importantly, import expansion reflects the better access of domestic or local producers to foreign intermediate and capital goods, which are the key to fostering technological diffusion and exploiting local productive capacity. Therefore, changes in import share (*DIM*) are expected to have a positive impact on manufacturing productivity growth. It should be noted, however, that increased import penetration induced by trade opening may have a negative influence on

[79] The inclusion of alternative measures of trade policy and trade openness is common in empirical studies on the relationship between trade and productivity performance. See, for example, Authukorala and Rajapatirana (2000), Sharma (1999), and Goldar and Kumari (2003).

[80] Many studies use the import penetration ratio instead of import share to gauge the extent of trade openness. The reason for using import share in this study is given in sub-section 5.3.2.

manufacturing productivity performance due to the economies of scale effect because import inflows may reduce the output and market share of domestic firms (Rodrik 1988).

Trade liberalization is also associated with better access to international markets as a result of reciprocal commitments in bilateral and multilateral trade agreements. Hence, export volume is expected to increase under trade opening. As already discussed in the literature review, more exports could help firms and industries to improve their productivity through exploiting economies of scale due to the larger size of foreign markets, accessing new technology and learning know-how from foreign importers, and exerting more effort to survive fiercer competition in foreign markets. Consequently, industries having increased their exported output in the total output could obtain higher productivity levels, giving rise to the expectation of a positive coefficient on the change in export share (*DEX*). Similar to policy incidence measures, the influence of trade openness variables is hypothesized to vary with the industry competition structure, which may play an important role in determining the pace of price change transmissions and producers' responses within each industry. Given the positive expected coefficients on *DIM* and *DEX*, the two variables, that is, $DIM \times DHFI$ and $DEX \times DHFI$, representing the interaction between trade openness and domestic competition level, may have either positive or negative effects on industry productivity performance.[81] The question of interest here is whether industry competition structure plays a significant role in determining the impact of trade liberalization-related variables.

While the estimated effects of trade policy changes are of primary interest, it is essential to control for other key determinants of industry productivity growth, which are industry-specific characteristics. To a large extent, we take into account industry-specific factors, commonly used in the empirical literature, including output growth, capital intensity, skilled labor share, and the involvement of FDI enterprises.

Output growth is considered to be a driving force of productivity growth in the manufacturing sector. This positive relationship has been known as the Verdoorn-Kaldor

[81] The idea of using an interaction term combining import penetration and market concentration is based on the specification of the trade – productivity model of the early World Bank research project 'Industrial competition, productivity, and their relation to trade regimes' (the ICPT project) in 1988 (Tybout 1992).

Law, which is based on an explanation that productivity growth results from output growth due to economies of scale (McCombie and De Ridder 1984; Jefferson 1988). Therefore, output growth is a commonly used explanatory variable in the regression analysis of productivity growth. This analytical reasoning provides a reason to include a measure of output growth in the specified regression equations. To capture the effect of output growth on productivity growth, we use the annual growth of average firm gross output (*DAVGO*). The use of this proxy for output growth is different from previous industry-level studies which were based on the growth accounting method to compute productivity growth, and which used the growth of industry output (Value Added or Gross Output) in the productivity regression equation.[82] This approach could entail spurious regression since the output growth has been already used to estimate productivity growth as claimed by Tybout (1992).

Industry capital intensity is another important industry-specific factor included in the models. Capital intensity can lead to significant differences in TFP manufacturing performance and particularly labor productivity. On the one hand, higher capital intensity is usually thought to promote productivity growth as it is associated with capital growth and underlying technological progress, leading to increasing returns to scale (Nishimizu and Page 1991). On the other hand, given the findings of a negative correlation between capital intensity and TFP growth in many developing countries, Sharma (1999) argued that developing countries often lack conditions conducive to efficient use of capital such as small market size constraining the effect of economies of scale, the development of infrastructure and the use of skilled workers. Therefore, the expected sign of capital intensity change (*DKL*) might be either positive or negative.

Given the important role of skilled workers, we control for this factor by taking into account the annual changes in skilled labor share of industry (*DSKILL*) in both models. The role of skilled labor is widely accepted in achieving the efficient use of capital through learning-by-doing and fostering technical progress. In addition, skilled labor is a key factor for firms to acquire technological information embodied in imported inputs and capital

[82] See, for examples, Athukorala and Rajapatirana (2000), Sharma (1999), Goldar and Kumari (2003) and Phan (2004).

goods. Industries differ significantly in their level of skilled labor use, due partly to their technological characteristics and institutional settings. Hence, industries with higher shares of skilled workers are expected to obtain higher productivity growth.

Similar to many other developing countries, the FDI inflows have been a driving force of growth in many sectors and industries in Vietnam since the FDI law and related policies have been put into effect. The FDI firms are often recognized to possess better technologies, know-how, management skills and access to foreign markets compared with domestic firms. This fact suggests that industries could obtain greater potential of productivity and output growth if the FDI firms play a more important role in their production activities. Therefore, we use changes in the share of FDI firms in industry gross output (*DSFDI*) to capture this effect on the industry productivity in the regression models.

As already discussed Chapter 3, the restructuring of the SOEs, a core part of ownership reform, is a prominent feature of Vietnam's transitional economy, particularly for the manufacturing sector. To some extent, the SOE restructuring has contributed to fostering market competition by reducing the dominance of the SOEs and hence entry barriers to private firms. Moreover, as a key reason for restructuring, the SOE sector has been recognized to have serious inefficiency problems due to the lack of competition pressures (for example, trade protection and market entry restrictions) and management skills. In responding to these problems, all manufacturing industries have been involved in the SOE restructuring process. Therefore, unlike studies on other developing countries, we introduce the variable (*DSOE*), which measures the change in the share of the SOE firms in the industry gross output, into the regression equations to control for the possible impact of the SOE restructuring process on industry productivity performance. Accordingly, this variable is expected to have a negative coefficient, implying that reducing SOE dominance could have a positive effect on industry productivity growth.

5.3.2 Data and variable measurement

The data used in the econometric analysis include production data (enterprise survey data), trade data (import, export and tariffs) obtained from the GSO, and concordance tables, obtained from the GSO and the UN Statistics, to match trade data with production data. All

variables in both econometric models have been calculated for four-digit VSIC manufacturing industries.

Based on trade data, NRPs and ERPs have been estimated for about 120 four-digit manufacturing industries in Chapter 3. The estimates of NRPs and ERPs are measured in percentage in the level form. Hence, the variables *DNRP* and *DERP* are measured in percentage point changes of NRP and ERP. As mentioned above, trade openness variables used in this study are changes in import and export shares (*DIM* and *DEX*), which are the ratios of current import and export values to the gross output values. Primary import and export data are converted from the six-digit HS (Harmonized System) to the four-digit VSIC industry product categories, using concordance tables. Then the import and export values in the current USD are converted into the current VND using the average annual official exchange rates published by the IMF (2002b, 2003b, and 2007b). While the import penetration ratio[83] is commonly used in the literature to measure the extent of import competition in the domestic market, the import share is used in this study due to inconsistencies between the trade data and production data. The problem arises in the four-digit industries belonging to two-digit industries VSIC 18 and VSIC 19 (wearing apparel, and leather and footwear products) when the export values are much larger than the sums of import and production values in all years from 2000-07, implying the negative import penetration ratios.[84] One possible explanation for the discrepancies would be the manufacturing exports of businesses which register their main business in non-manufacturing activities (for example, trading or service companies) and hence their output values are recorded in the non-manufacturing sector. Jenkins (2004) suggests another possible explanation that the recorded production value contains only processing costs while the export data include the full value of the product. This may be more likely to happen in the garment and footwear industries where subcontracting one or a few production stages is common.

Similar to the dependent variable, which represents the estimated productivity growth rates obtained from the first step as discussed in Section 5.2, the construction of the explanatory

[83] The import penetration ratio is defined as [import/(import + domestic production-export)].
[84] This problem has also been observed by Jenkins (2004) for garments, leather and footwear, and office, accounting and computing machinery in the period 1995-99.

variables based on the production data also relied on the annual enterprise census conducted by the GSO. At four-digit VSIC manufacturing industry, capital intensity (*KL*) is the ratio between the value of total industry fixed assets at the constant 1994 prices (in million VND) and the number of employees. Thus, change in capital intensity (*DKL*) is measured in million VND. The proportional change variables include *DSKILL*, *DSFDI*, *DSOE*, and *DHFI*. The industry skilled labor share (*SKILL*) is defined as the ratio of employees, with at least a vocational training degree, after the high school degree[85], to the total employees. Changes in the share of the FIEs and SOEs were defined above, with industry gross output being measured in million Vietnamese dong (VND) at current prices. Similar to other studies, the Herfindahl index (competition index – *HFI*) is defined as the sum of the squares of firm market shares in the industry gross output.[86] Variables based on the production data have been computed for 107 four-digit manufacturing industries.

After matching the trade data-based variables with the production data-based variables at the four-digit VSIC level, a final panel dataset for the two regression models was obtained with 105 manufacturing industries over the period of five years (2001-05), giving a total of 525 observations. The summary statistics of the variables are presented in Table A5.3 and their correlations are shown in Table A5.4 in the Appendix.

5.3.3 Estimation method

Given the panel data structure, it is important to find the most suitable estimation method to obtain consistent and efficient estimates on the determinants of manufacturing productivity growth. The pooled OLS estimator has been used in a number of previous studies on the determinants of TFP growth of manufacturing industries. However, the pooled OLS estimates could be biased due to time-invariant industry-specific effects[87] (u_i) such as the sectoral institution (for example, regulatory framework) and marketing and distribution system, especially when the explanatory variables (given productivity growth rate as the dependent variable) are measured in levels. Other studies include industry dummies to control for industry fixed effects while applying the OLS estimation method, which is

[85] A high school degree in Vietnam is awarded to people who finish Year 12.
[86] This definition of *HFI* means that the lower the index, the higher the competition level of the industry.
[87] It should be noted that some industry fixed effects are not strictly time-invariant, but rather have very little change in the short period (several years) such as institution and management method.

argued to amount to using the fixed effects (FE) model. However, even if individual industry heterogeneity is controlled for by the dummy or fixed effect estimation, there may still exist a problem of heteroskedasticity in the residuals because there are other unobserved industry-specific factors that may change over time, which cannot be removed by the fixed effect procedure. These factors may be production methods, different types of incentives and rent-seeking activities and industry-specific demand shocks. Moreover, they may be correlated with regressors such as the capital labor ratio, skilled labor share, firm size and industry competition and they may have a significant impact on the performance of an individual industry, leading to inaccurate estimates of the TFP growth determinants.

One important feature of the dataset used in this study is that all the variables are not in the level form, but rather in the form of growth rates or changes such as TFP growth rates and changes in the level of nominal and effective rates of protection. Consequently, unobserved fixed industry effects could be removed by the construction of variables. It is also important to note that, apart from the trade liberalization-related variables, the econometric models take into account a large number of the key determinants of industry TFP growth which are industry-specific and time-varying characteristics such as capital intensity, skilled labor, level of competition, the share of SOE enterprises and the participation of foreign direct investment. As a result, the problem of correlation between the model regressors and the composite error term could be significantly reduced. In such a case, the random effects (RE) estimator could be more appropriate to use as this estimation method gives more efficient estimates of the coefficients compared with those of the FE estimation. Therefore, two alternative model specifications were estimated using the FE and RE estimators. The results of the FE and RE estimation are presented in Tables A5.5 and A5.6 in the Appendix for both models with NRP and ERP respectively.

With a panel data assumption that there is no correlation between the explanatory variables $\mathbf{x}_{is}$ (either $s = t$ or $s \neq t$) and the idiosyncratic errors v_{it} (Wooldridge 2002: 282), the Hausman test results show that the RE estimates are preferred in both specifications, with the low value of the Chi-squared statistic and its large p-values. This means that there is no significant difference between the FE and RE overall estimates and the RE estimates are consistent and more efficient. In addition, the F statistic value of the test obtained from the

FE estimation on the hypothesis that all individual industry fixed effects are negligible indicates that this hypothesis cannot be rejected. Therefore, it can be said that unobserved time-constant industry factors are not a concern of the model specifications and the composite error term could be most accounted for by the idiosyncratic error. This is consistent with the structure of specified econometric models. Moreover, when the Breusch-Pagan Lagrange Multiplier test[88] is used on the RE estimates, all the values of the χ^2 statistic and their respective p-values indicate the significant existence of industry-specific error variances and the RE estimator provides more efficient estimates than does the pooled OLS estimator.

While the favor is given to the RE estimates, there is a concern over the idiosyncratic error as a dominant component in the composite error. The first problem could be cross-sectional heteroskedasticity due to time-varying unobserved industry factors as discussed above. To test whether this problem is present in the estimation results, we adopt and calculate the modified Wald statistic, based on the residuals of the FE estimation suggested by Green (2000).[89] The null hypothesis is homoskedasticity of the idiosyncratic error variance. The large values of the χ^2 statistic associated with their zero p-values for the modified Wald test obtained in both models (Tables A5.5 and A5.6 in the Appendix) indicate that the error variances are industry–specific. The second problem involves the possible existence of serial correlation because some unobserved industry factors may systematically change over time. The procedure suggested by Wooldridge (2002) was used to determine whether the idiosyncratic error follows an AR(1) process. The heteroskedasticity robust regression of v_{it} on $v_{i,t-1}$ was carried out using the residuals of the FE and RE estimation. The estimated coefficients on $v_{i,t-1}$ (ρ_1) with p-values based on robust standard errors, shown in Table A5.5 and Table A5.6 in the Appendix for both empirical models, indicate strong evidence of negative serial correlation in the idiosyncratic error (v_{it}). Therefore, we used the feasible generalized least squares (FGLS) estimator for the panel data models of productivity growth in this chapter, which takes into account both heteroskedasticity and serial correlation problems in order to obtain more efficient estimates of the coefficients.

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[88] See Baum (2006) for the details of the test.
[89] The test command in Stata is developed by Baum (2001).

A final caveat is that we assume that time-varying unobserved industry factors, which may be present in the idiosyncratic error, have no effects on explanatory variables.[90] While this assumption is needed to apply the above chosen estimation method, there are other reasons for its appropriateness based on the model specifications. First, as mentioned above, a number of key time-varying industry-specific determinants, including *KL, SCALE, SKILL, DSOE, SFDI, DIM* and *DEX* have been included in the two models to capture the time-varying industry-specific factors. These variables are more observable and better quantifiable than other factors of the same kind such as production methods, industry-specific policies and barriers to entry and exit. Second, the first order lag of *NRP* and *ERP* has been included in the models to account for the lagged effects of import liberalization on TFP growth. Given our primary interest in trade protection, which is also industry-specific, changes in protection may have lagged effects on productivity growth and correlation with the explanatory variables. More specifically, these changes could be expected to result in lagged responses of industries and firms, which may be observed in the variables such as *SCALE, KL, SKILL* and *SFDI*. Moreover, changes in trade policy alone could be systematic over time. In particular, if trade liberalization is a trend in Vietnam's trade regime, changes in *NRP* and *ERP* could be expected to be positively correlated with those changes in subsequent periods and associated with increased import penetration and exported outputs. Table A5.4 in the Appendix provides some evidence on the correlation of changes in trade protection over different years. While the correlation of annual changes in both *NRP* and *ERP* is not statistically significant in the whole period 2000-05, it is positive and statistically significant in 2003-05 and negative and statistically significant in 2000-03. The negative correlation of the *NRP* and *ERP* changes in 2000-03 could be due to a slight increase in protection level in 2001 and the subsequent reduction in 2002 and 2003. The changes in both NRP and ERP have expected lagged effects on other key variables such as *KL, SCALE, SKILL, SFDI, DIM,* except *DEX*, but these effects are not statistically significant.

[90] The correlation between time-invariant industry effects and explanatory variables has been excluded by the Hausman test above.

5.3.4 Estimation results

The results are presented in Table 5.2 for the model specification with NRP and Table 5.3 for the model specification with ERP. To verify the robustness and conditionality of the impact of the trade policy variables on productivity growth with respect to domestic competition, the estimation was carried out with three alternative specifications for each regression equation. In the basic specification (1), no interaction variable between trade and competition variables is included. In the second specification (2), the interaction term between either *DNRP* or *DERP* and industry competition index *HFI4* is taken into account. In the full specification (3), all trade openness variables and their interactions with the industry competition index are included to capture the various links between trade and productivity growth.

The estimation results in Tables 5.2 and 5.3 indicate that inter-industry differences in TFP performance can be considerably explained by differences in the reduction in industry trade protection. The estimated coefficients on the key variables of interest, *DNRP* and *DERP*, are statistically significant at 1 percent level and consistent with prior theoretical expectations. Moreover, they are consistently unchanged in sign and significance level and their magnitude becomes larger when including the interaction terms and trade openness variab

les. This indicates a robust and significant impact of the reduction in trade protection on the performance of manufacturing industries after taking into account the possible effects of other productivity determinants. Table 5.2 suggests that, holding other factors constant, a reduction of 1 percentage point in the nominal rate of protection might increase productivity by 0.4 percent. This effect increases to 0.54 percent if the change in nominal protection is allowed to depend on industry competition level and to 0.57 percent if trade openness and its interaction with industry competition are taken into account. Similarly, in Table 5.3, the impact of 1 percentage point reduction in the effective rate of protection on productivity growth is 0.07 percent, 0.1 percent and 0.11 percent respectively. As discussed in Chapter 3, the effective rate of protection takes into account the impact of tariffs on the cost of imported inputs to manufacturing industries or, in other words, it reflects the real protection level of the trade regime for manufacturing industries. Therefore, while being

smaller[91], the productivity effect of the reduction in the effective rate of protection could be better in capturing the true effect of trade liberalization on manufacturing TFP growth. The magnitude of the productivity effect of the reduction in ERPs seems to be quite similar to the finding of Urata and Yokota (1994) for the case of the Thai manufacturing sector in the period 1982-88.

Table 5.2 Determinants of TFP growth: Regression results with nominal rate of protection

Dependent variable: ***TFPG***;
Alternative specification: **Nominal Rate of Protection (NRP); XTGLS estimator**

Variables	(1)	t-stat	(2)	t-stat	(3)	t-stat
DSCALE	0.1278***	7.11	0.1430***	7.71	0.1612***	7.70
DNRP	-0.0040***	-4.11	-0.0054***	-9.66	-0.0057***	-11.48
DHFI	-0.1441**	-1.93	-0.2656***	-3.14	-0.1823**	-2.13
DKL	-0.0018***	-10.29	-0.0018***	-10.56	-0.0018***	-9.75
DSKILL	1.0933***	6.33	1.0123***	6.11	1.1384***	6.61
DSFDI	0.2818***	4.18	0.3372***	5.33	0.3821***	5.62
DSOE	-0.0863	-1.36	-0.0275	-0.41	-0.0107	-0.15
L.DNRP	-0.0009	-0.80	-0.0008	-1.09	-0.0003	-0.43
DNRPxDHFI			-0.0314***	-3.39	-0.0232***	-2.68
DIM					0.0114***	2.99
DIMxDHFI					0.0751***	3.38
DEX					0.0601	0.73
DEXxDHFI					-1.1893***	-2.76
Constant	0.0216***	4.90	0.0193***	4.53	0.0185***	4.25
No. of observations	420		420		420	
No. of industries	105		105		105	

Note: *, ** and *** denote the 10 percent, 5 percent and 1 percent significant level respectively.
Source: Author's estimation.

The coefficient on the change in competition index (*DHFI*) is significant at least at 5 percent level with expected negative signs in both regression equations. This finding confirms a theoretical prediction that industries with more competition could obtain higher productivity growth. This means that domestic policy reforms, particularly institutional reforms, have generated a positive impact on the productivity performance of manufacturing. The effect of change in industry competition is also robust in both regression models. However, its magnitude varies when the interactions between foreign competition and domestic competition are included. In particular, the inclusion of

[91] Ferreira and Rossi (2003) also found a significantly larger effect from nominal tariff reduction than from reduction in effective protection.

interaction between changes in import protection and domestic competition increases the effect of *DHFI* from -0.14 to -0.27 in the regression model with NRP and from -0.15 to -0.25 in the regression model with ERP. In contrast, adding the trade openness variables and their interactions with domestic competition reduces the effect of *DHFI* to -0.18 and -0.178 in two regression equations respectively. Therefore, it can be said that the effect of domestic competition, while being robust, also depends on the pace of trade liberalization. This implies the interrelationship between trade policy reform and other domestic policy reforms.

Table 5.3 Determinants of TFP growth: Regression results with effective rate of protection

Dependent variable: ***TFPG***;
Alternative specifications: **Effective Rate of Protection (ERP); XTGLS estimator**

Variables	(1)	t-stat	(2)	t-stat	(3)	t-stat
DSCALE	0.1253***	7.00	0.1362***	7.33	0.1546***	7.15
DERP	-0.0007**	-2.55	-0.0010***	-5.00	-0.0011***	-6.14
DHFI	-0.1494**	-2.01	-0.2521***	-3.03	-0.1777**	-2.04
DKL	-0.0018***	-10.61	-0.0018***	-10.91	-0.0018***	-10.02
DSKILL	1.1579***	7.10	1.0818***	6.86	1.1643***	6.90
DSFDI	0.2856***	4.41	0.3267***	5.16	0.3678***	5.27
DSOE	-0.0792	-1.25	-0.0268	-0.40	-0.0007	-0.01
L.DERP	-0.0003	-0.85	-0.0002	-0.95	-0.0001	-0.56
DERPxDHFI			-0.0090**	-2.40	-0.0083**	-2.36
DIM					0.0112***	2.93
DIMxDHFI					0.0753***	3.37
DEX					0.0732	0.83
DEXxDHFI					-1.2183***	-2.77
Constant	0.0226***	5.17	0.0207***	4.65	0.0202***	4.46
No of observations	420		420		420	
No of industries	105		105		105	

Note: *, ** and *** denote the 10 percent, 5 percent and 1 percent significant level respectively.
Source: Author's estimation.

The estimation results give strong support to our hypothesis that the impact of the reduction in trade protection depends on the other domestic policy reforms which bring more competition to the manufacturing industries. The interactions between changes in trade protection and industry competition (*DNRPxDHFI* and *DERPxDHFI*) in both regression models are highly significant at 1 percent level. The negative signs of the coefficients on the interaction terms imply that the productivity impact of trade liberalization could be lower in more competitive industries. Similar evidence is found in Phan (2004) for Thai manufacturing industries at the two-digit level in the period 1990-94. The finding is

plausible in the sense that, given competition-induced efficiency effects on firms, if the level of domestic competition in an industry is already high, the extent of foreign competition is limited and hence its influence on firm efficiency in that industry is curbed. With this interaction, in those industries which have a lower competition level (a higher competition index) such as import-competing industries, increased foreign competition would have a larger effect on productivity improvement. In a similar vein, the efficiency impact of enhanced domestic competition could be lower if industries experienced more reduction in trade protection. Therefore, while the productivity effect of trade reform is offset by that of domestic policy reforms, the main implication is that increasing competition is the key for productivity improvement. The role of domestic competition is particularly important from the perspective of whether domestic firms are able to cope with increasingly intense competition of foreign firms when domestic markets are more and more integrated with international markets as trade liberalization deepens further.

There is substantial evidence that the trade openness variables account for the additional effects of trade liberalization on manufacturing productivity growth. The impact of the change in import share (*DIM)* and its interaction with the industry competition index (*DIMxDHFI*) are highly significant at 1 percent level. This variable may show both effects, including foreign competition and better access to imported intermediate inputs for manufacturing industries. Apart from the effect of tariff reduction, the change in import share (*DIM*) may result from the removal of other trade control measures such as quantitative restrictions, trading right issuances, and line ministry regulations. While the positive impact of import share is consistent with our expectation, the significant coefficient on the interaction between the import share and competition index indicates that the productivity impact could be larger in more concentrated industries. Interestingly, this result is consistent with the above finding that the role of foreign competition is more limited in less concentrated industries. The coefficient on the change in export share (*DEX*) is not significant, despite its expected sign. However, the interaction term between export share and industry competition index (*DEXxDHFI*) is highly significant and negative, suggesting the impact of exports could be present in more competitive industries. This evidence is consistent with the fact that more competitive industries are often export-oriented industries with a high level of private sector participation and the involvement of

FDI firms. This implies that exports do not play an important role in productivity growth of import-competing industries which often have a higher level of concentration.

All other industry-specific determinants of industry TFP growth have expected signs and highly significant coefficients. Their impacts are robust across all three specifications in both regression models. Similar to other studies[92], the evidence in both regression equations confirms the role of output growth in promoting productivity as stated by the Verdoorn Law. In the third column of Tables 5.2 and 5.3, it appears that a 1 percent growth of firm average output is associated with the productivity growth of about 0.15 or 0.16 percent. As expected, the involvement of FDI contributes positively to the productivity growth of manufacturing industries due to various advantages of FDI firms over domestic firms as discussed above. Specifically, industries having one percentage point more in the share of FDI in gross output may increase their productivity by nearly 0.4 percent. In contrast, there is some indication that reduction in the SOE share in the industry output (*DSOE*) may lead to industry TFP growth, which is consistent with our prior reasoning. However, the estimated coefficient on this variable is not statistically significant. One possible explanation is that in some industries SOE firms might be more productive than private firms[93] due to their privileged access to capital sources (bank credit), land and other favorable treatment from the government as well as their possession of more skilled labor and better equipment.

It is interesting to see that the coefficient of capital intensity change (*DKL*) is negative and highly significant with the unchanged magnitude across all specifications. While a positive impact of capital intensity on TFP growth may be expected according to the hypothesis of capital-embodied technological change (OECD 1998), this finding has been obtained in a number of previous studies on developing countries such as Ahluwalia (1991) for India, Perkins et al. (1993) for China, Okuda (1994) for Taiwan, Kwak (1994) for Korea, and Phan (2004) for Thailand. Interestingly, an opposite finding of the positive coefficient on capital intensity was found by Mahadevan (2002) for Australia, a developed country. The significant negative impact of capital intensity on TFP growth has been attributed to a

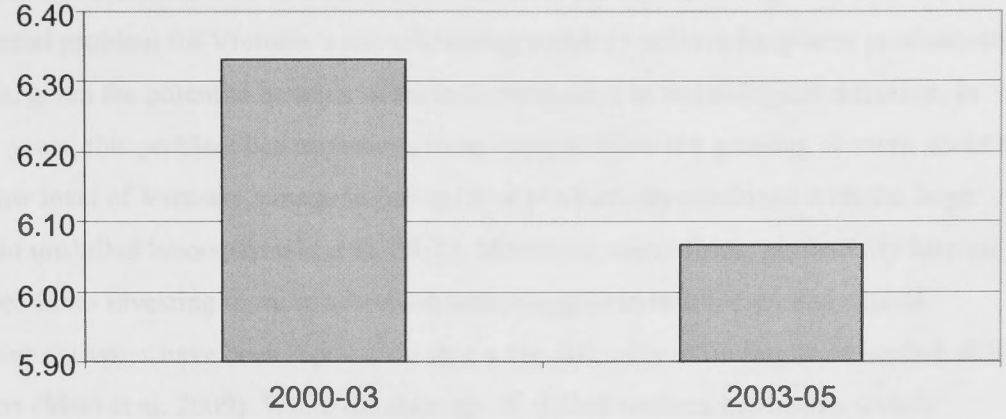
[92] See, for example, Rao (1996), Athukorala and Rajapatirana (2000), Sharma (1999), Goldar and Kumari (2003), and Phan (2004).
[93] Chapter 6 shows that SOEs are more technically efficient than private firms.

number of factors underlying the efficiency of capital use, of which two important ones are infrastructure and workers' skills (OECD 1998). In the context of a developing country, Vietnam's manufacturing sector has been facing a problem of underdeveloped infrastructure, ranging from unstable electricity supply, poor road and rail network and underdeveloped ports (Perkins and Tu Anh 2010; Ketels et al. 2010)[94]. While infrastructure is a perceptible, but hardly quantifiable determinant, the skill level of workers is more visible and industry-specific. As discussed below, the data show that this is a significant constraint on Vietnamese manufacturing industries in achieving long-term productivity growth.

However, what is now more important than looking at why the capital-labor ratio has a significantly negative coefficient is the implication of its trend during the period 2000-05. The decreasing trend of capital intensity indicates that manufacturing industries reduced capital accumulation and utilized more labor to obtain higher efficiency. More specifically, if capital deepening is associated with technological progress, manufacturing industries seem to have obtained higher technical efficiency by using factor inputs more efficiently. This could allow us to conclude that the reduction in capital-labor ratio is a rational response of manufacturing firms to the move to a more liberalized trade regime and consistent with the theoretical prediction that an integrating country's production patterns change toward using those more relative abundant production factors. As a result, trade liberalization may have induced manufacturing industries to exploit the nation's comparative advantage, that is, unskilled labor, to achieve higher productivity. Our conclusion is consistent with that of other studies on developing countries. For example, Sharma (1999) had a similar observation for the case of the Nepalese manufacturing sector during the late 1980s and early 1990s.

[94] For example, until recently, the results of the Provincial Competitiveness Index (PCI) Survey in 2009 reveals that, on average, firms had to cope with the power interruption of about 50 hours a month. Furthermore, poor road quality is the main cause to the annual product damage of 43 million VND, on average, for about 71 percent of firms surveyed (Ketels et al. 2010).

Figure 5.3 Weighted average share of skilled labor (percent) in manufacturing industries: 2000-03 and 2003-05



Source: Author's calculations.

Another important point to note is that the coefficient on the change in the share of skilled labor (*DSKILL*) is positive, robust and highly significant at 1 percent level with a much larger magnitude (compared with the share of FDI). On the one hand, this consistent evidence confirms the essential and commonly expected role of skilled labor in achieving technological progress and higher productivity growth in the long term. On the other hand, the trend of the skilled labor share in the whole manufacturing sector suggests that the overall achievement of TFP growth from using the skilled labor is quite limited during the study period. As shown in Figure 5.3, the share of skilled labor in manufacturing industries stayed at very low levels and had a decreasing trend over the years from 2000 to 2005.

One plausible explanation for this trend in using skilled labor in manufacturing could be the sharp increase in the number of private firms, particularly in labor-intensive activities. A majority of private firms are smaller and have less comparative advantages in capital, business experience and access to other resources compared with FDI and SOE firms. With more concentration in labor-intensive and export-oriented activities, private firms tend to hire more unskilled workers. Moreover, there was a tendency to use more unskilled labor in the FDI sector as more FIEs invested in labor-intensive activities since 2000 and FIEs in

other activities became more labor-intensive. Therefore, the decreasing share of skilled labor is a reality for manufacturing industries. To some extent, this trend in skilled labor use further indicates the response of manufacturing firms to increased foreign competition and Vietnam's better access to international markets. However, the flip side of this trend is a potential problem for Vietnam's manufacturing sector to achieve long-term productivity growth, given the potential benefits of trade liberalization in technological diffusion. In recent years, this problem has become to loom large as there is a growing concern about the very low level of Vietnam's manufacturing labor productivity combined with the large share of unskilled labors (Ketels et al. 2010). Moreover, many firms, particularly foreign invested firms investing in more advanced technology or in technology and capital-intensive activities have been reported to face a big difficulty in finding their needed skilled workers (Mori et al. 2009). While the shortage of skilled workers has been a widely recognized problem, anecdotal evidence suggests that available workers' skills are not matched with the skills required by firms (Ketels et al. 2010). Consequently, the availability of skilled labor has been emerging as the key to manufacturing transformation to achieve higher productivity and output growth.

In summary, trade liberalization, domestic policy reforms and industry-specific factors have been found to have expected, significant and robust impacts on the productivity growth of manufacturing industries. Given the different trends of these productivity determinants in the period 2000-05, policy-related variables appear to have played a key role in explaining the inter-industry differentials in TFP growth. Among industry-specific productivity determinants, change in capital intensity seems to have positively contributed to manufacturing TFP growth while the role of skilled labor appears to be rather limited. The results also indicate that increasing average firm size and the involvement of FDI firms are significant factors in industry productivity growth.

5.4 Conclusions

This chapter has examined the patterns of TFP growth in manufacturing and its relationship with trade liberalization in Vietnam over the period 2000-05. During this time, substantial progress occurred in trade and domestic policy reforms and international economic

integration. In this chapter, the patterns of manufacturing TFP growth were investigated by estimating TFP growth of individual industries at four-digit VSIC level based on the growth accounting framework with the Tornqvist productivity index. The impact of trade liberalization was examined using econometric analysis. Unlike previous studies, the econometric model used in this study differs in the measurement of variables in the forms of growth rate and change, which allowed us to better capture how the changes in the trade policy regime are associated with the changes in the productivity performance of industries. Another different feature of the econometric analysis is the use of the generalized least square estimator on the panel data (XTGLS), which is more efficient than the OLS and RE estimators in estimating the effects of trade liberalization-related variables and other determinants on productivity growth.

The assessment of overall productivity performance indicates that the Vietnamese manufacturing sector has obtained a significant improvement in TFP growth, which contributed an increasing share to the output growth. As a result, TFP growth appears to play a key role in driving labor productivity growth, rather than capital deepening. Moreover, the trends of capital, labor and TFP growth seem to indicate that TFP growth is driven by the improvement in technical efficiency rather than technological progress in the operation of manufacturing industries. On the other hand, the declining trend of capital intensity would suggest that trade liberalization and domestic reforms have promoted manufacturing growth in line with Vietnam's comparative advantage, by using its abundant unskilled labor.

The econometric analysis finds strong evidence for the positive impact of trade liberalization on the productivity performance of Vietnam's manufacturing sector. Given their implementation in line with trade liberalization, the effect of domestic policy reforms was also found to be significant, robust and conducive to manufacturing TFP growth. Consequently, the estimation results indicate the importance of interactions between trade opening and promoting domestic competition. Together, they appear to be driving forces of manufacturing performance through competition effects and changing behaviors of manufacturing firms, which can be seen in the trends of the industry-specific variables. While all the industry-specific variables have expected and significant coefficients with

respect to their relationship with productivity growth, it is important to see two key contrasting results: (i) the positive contribution of the capital-labor ratio to TFP growth due to its negative effect and declining trend; (ii) the small, even negative contribution of skilled labor resulted from its strongly significant and positive effect and declining trend. These findings confirm the indication derived from the analysis of the patterns of output and TFP growth, that manufacturing TFP growth was driven by technical efficiency improvement rather than technological progress. This trend appears to be consistent with the theoretical prediction for a developing country in the early years of trade opening that trade liberalization has promoted resource allocation in line with the country's comparative advantage and toward improving efficiency of resource utilization.

A key policy implication of the analysis is that the negative impact of capital intensity, combined with the low share of skilled labor, could be a significant problem for manufacturing productivity growth if the trend of capital intensity reversed toward capital deepening, as it seemed to commence in 2005. This is a fundamental and long-term issue for manufacturing growth that needs the attention of policy makers.

Chapter 6

Trade Liberalization and Firm Technical Efficiency

6.1. Introduction

In Chapter 5, it was found that extensive trade liberalization has led to the considerable improvement in TFP growth of manufacturing industries at the four-digit VSIC level. Moreover, the analysis in Chapter 5 suggests technical efficiency improvement as a driving force of manufacturing TFP growth in the period 2000-05. Therefore, it would be worthwhile further examining the manufacturing performance at the firm level to confirm these findings. This is the main objective of this chapter, which investigate the efficiency performance of the continuing (or incumbent) firms in the same period and its relationship with trade reforms.

The theoretical arguments discussed in Chapter 2 suggest that one of the most important dimensions of the trade and productivity relationship is technical efficiency. However, in their search for evidence of the positive link between trade and productivity, empirical studies at the firm level differ significantly as to whether technical efficiency is taken into account. A conventional approach is to derive the TFP measure as the residuals after taking into account contributions of all input factors in the production process. An underlying assumption in this approach based on the neoclassical production theory is that firms are producing at full efficiency level using the available technology, and factor inputs are paid their marginal products (Bartelsman and Doms 2000). As Kalarajan and Shand (1999) note, however, that such an assumption is too restrictive because in reality firms using identical levels of inputs and technology can produce different output level due to bottlenecks in production such as poor management. Thus, firms' actual production efficiency level may be less than the full potential efficiency level for the given technology. Hence, it is rational to assume that not all firms are producing on their maximum potential production capacity and there are efficiency gaps across firms. This necessitates modeling the output function in the production frontier framework, in which, unlike the conventional production function framework, firms are allowed to operate below their production frontiers. The output gap

between the estimated output and the actual realized output is due to the efficiency gap, which may be due to firm-specific characteristics and the environment in which firms operate. Improvement in terms of reducing the efficiency gap is considered as productivity improvement of firms. In this respect, the production frontier framework is followed in this chapter to examine whether trade liberalization has helped to reduce the efficiency gap of the Vietnamese manufacturing firms.

Following the above discussion, it is a central hypothesis of this chapter that trade liberalization had positive impacts on the productive efficiency of the manufacturing firms. These positive impacts are induced by more competition pressure due to more import competition and reduction in trade protection. Moreover, the impact from trade liberalization is expected to be conditioned by domestic competition from domestic policy reforms. The higher competition pressure is expected to force firms to respond and change to become more efficient, especially to eliminate their managerial and other operational slacks, and to obtain better input utilization.

This chapter is structured as follows. The next section presents estimation methodology, including the theoretical framework given the main hypothesis and empirical model specifications. Section 6.3 discusses data, variable construction and summary statistics. Section 6.4 provides and discusses estimation results, sensitivity analysis, and then analyses firm technical efficiency. Finally, conclusions are presented in Section 6.5.

6.2 Methodology and data

6.2.1 Theoretical model

To examine the impact of trade liberalization on manufacturing productive efficiency, the study adopts the stochastic production frontier models to estimate technical efficiency and take into account the inefficiency effect model. The stochastic production frontier models (SPF) were first independently introduced by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977) for cross-sectional data based on the basic framework of production frontier proposed by Farrell (1957). Subsequently, the SPF was extended to panel data (Battese and Coelli 1995, Kalirajan and Shand 1999). Following Battese and

Coelli (1995), the stochastic frontier production function model for panel data can be defined in the following form:

$$Y_{it} = f(X_{it};\beta)\exp(v_{it} - u_{it}) \tag{6.1}$$

or

$$\ln Y_{it} = \ln(f(X_{it};\beta)) + v_{it} - u_{it} \tag{6.2}$$

where Y_{it} denotes the actual or observed output of the *i*th firm at time *t*, X_{it} is the *i*th firm's input vector with a corresponding vector of parameters β to be estimated and $f(\cdot)$ presents the production function (which can be Cobb-Douglas or Translog, etc.). The frontier or maximum possible output of the firm is presented by $f(X_{it},\beta)$, which can be achieved if the firm uses all inputs efficiently, following the best practice technique of the chosen technology. This frontier output varies due to v_{it}, which is a random error to account for statistical noise such as measurement and approximation errors. The disturbance terms v_{it} is assumed to be independently and identically distributed *(i.i.d)* normal with mean at zero and variance of σ_v^2 as $N(0,\sigma_v^2)$. The distinct term of the SPF model u_{it} is a one-sided random term, assumed to be non-negative, i.e. $u_{it} \geq 0$ and independently distributed, which represents possible inefficiency in a firm's production or the possible efficiency gap emanating from the difference between a firm's realized output and the frontier output with a given technology and a set of inputs. Given a certain distributional assumption of the inefficiency term (for example half-normal, truncated normal or exponential), the SPF is estimated using the common method of maximum likelihood. Given the existence of inefficiency effects, a firm's performance is then evaluated by the following measure of technical efficiency:

$$TE_{it} = \frac{f(X_{it};\beta)\exp(v_{it} - u_{it})}{f(X_{it};\beta)\exp(v_{it})} = \exp(-u_{it}) \qquad (6.3)$$

While the literature has established the practical ground that inefficiency commonly exists and prevents firms from achieving their potential output, an important question has been raised as to what explains the inefficiency of firms. It has been recognized that the inefficiency can result from firm-specific characteristics (firm size, ownership and managerial skills) and market-related environmental factors affecting a firm's performance (particularly market structure and government policy), which can be called non-input factors. In determining the efficiency levels of firms, it is assumed here that trade liberalization plays a significant role, among those influential factors.

A key issue is how to model the impact of the non-input factors on the firms' efficiency levels. In the stochastic production frontier framework, there have emerged two distinct approaches, namely one-stage and two-stage approaches. Under the two-stage approach, firm-specific technical efficiencies are derived in the first stage from the estimation of the SPF under the assumption of independence and identical distribution of the inefficiency term with respect to exogenous factors. Subsequently, the second stage undertakes a regression of the technical efficiency levels obtained from the first stage as the dependent variable and on certain exogenous factors to explain the variation in predicted technical efficiency levels. However, a long established criticism is that if inefficiencies were affected by exogenous factors in the second step, the independence and identical distribution assumption of the one-sided error term would become invalid in the first step (Coelli et al. 2005). Importantly, failing to take into account the determinants of inefficiency in the first stage not only leads to biased estimates of the SPF, but also biased effects of the non-input exogenously-assumed variables on inefficiency (Wang and Schmidt 2002). The criticism of the two-stage approach makes justification for the one-stage approach, under which the hypothesized relationship between the exogenous factors and technical efficiency (inefficiency) is determined at the same time when estimating the production technology and the firms' technical efficiency levels. Therefore, the one-stage approach is followed in this chapter.

With the one-stage approach, we need to specify the way that non-input variables affect the firms' technical efficiency levels. Following Battese and Coelli (1995), the non-input factors are modeled to directly influence the inefficiency term by specifying that the u_{it} follows a general normal distribution with a non-negative truncation of the form $N(\mu_{it},\sigma_u^2)$ and u_{it} is assumed to be a function of the non-input explanatory variables as

$$u_{it} = \delta_0 + \sum_{j=1}^{m} \delta_j z_{j,it} + \varpi_{it} \qquad (6.4)$$

where z_j denote the non-input influential variables, δ_0 and δ_j are parameters to be estimated and ϖ_{it} is a random error, assumed to have a normal distribution with zero mean and variance σ_ϖ^2 or $N(0,\sigma_\varpi^2)$ such as u_{it} is obtained by a non-negative truncation of $N(\delta_0 + \sum_1^m \delta_j z_{j,it},\sigma_u^2)$. Equation (6.4) is called the inefficiency effect model. Equations (6.2) and (6.4) are simultaneously estimated using the maximum likelihood method with the likelihood function being parameterized in terms of $\sigma^2 = \sigma_u^2 + \sigma_v^2$ and $\gamma = \sigma_u^2 / \sigma^2$ as suggested by Battese and Corra (1977). The parameter γ ranges between 0 and 1, showing the degree of deviation from the potential output frontier due to technical inefficiency. For $\gamma = 0$, it means that all output deviations are caused by random effects while $\gamma = 1$ implies that all deviations from the frontier are due to inefficiency effects. Then, following Battese and Coelli (1993), technical efficiency can be calculated for each firm per year according to the conditional expectation of $\exp(-u_{it})$, given $\varepsilon_{it} = v_{it} - u_{it}$ as follows:

$$TE_{it} = E[\exp(-u_{it} \mid \varepsilon_{it})] = \left\{\exp\left[-\mu_{it}^* + \frac{1}{2}\sigma_*^2\right]\right\} \cdot \left\{\Phi\left[\frac{\mu_{it}^*}{\sigma_*} - \sigma_*\right] \Big/ \Phi\left[\frac{\mu_{it}^*}{\sigma_*}\right]\right\}, \qquad (6.5)$$

where $\Phi(\cdot)$ is a density function of the standard normal random variable,

$\mu_{it}^* = (1-\gamma)\left[\delta_0 + \sum_{j=1}^{m} \delta_j z_{j,it}\right] - \gamma\varepsilon_{it}$, and $\sigma_*^2 = \gamma(1-\gamma)\sigma^2$.

6.2.2. Empirical model specifications

As the study covers the manufacturing sector consisting of different industries and a wide range of firms, a more flexible functional form appears to present better the "true" production frontier. Therefore, at the outset, a more general functional form of the Translog function is assumed to present the production technology for manufacturing firms in Vietnam:

$$\ln Y_{it} = \beta_0 + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \frac{1}{2}\beta_3[\ln L_{it}]^2 + \frac{1}{2}\beta_4[\ln K_{it}]^2 + \beta_5[\ln L_{it} \ln K_{it}] + \beta_6 T + \frac{1}{2}\beta_7 T^2 + \beta_8 \ln L_{it} T + \beta_9 \ln K_{it} T + v_{it} - u_{it} \quad (6.6)$$

where Y denotes the real output (here defined by value added), L and K represent the labor and capital inputs, T is the time trend, which acts as a proxy for technical change. Subscripts i and t present a panel data structure indicating firm and time (year). As above, v_{it} is the random error term and u_{it} is the one-sided non-negative error term representing the technical inefficiency of the firm. By the term u_{it}, the impacts of trade liberalization and other non-input factors on the technical efficiency of the firms are modeled in the inefficiency model as follows:

$$\mu_{it} = \delta_0 + \delta_1 KL_{it} + \delta_2 SKILL_{it} + \delta_3 AGE_{it} + \delta_4 PRIV_{it} + \delta_5 JOINS_{it} + \delta_6 FDI_{it} + \delta_7 ERP(NRP, IM)_{jt} + \delta_8 HFI4_{jt} + \delta_9 MED_{it} + \delta_{10} BIG_{it} + \delta_{11} Y2001 + \delta_{12} Y2002 + \delta_{13} Y2003 + \varpi_{it} \quad (6.7)$$

where the determinants of the firm's inefficiency can be classified into three groups. The first group consists of key variables of interest, i.e. measures of trade liberalization, including the effective rates of protection (*ERP*), the nominal rates of protection (*NRP*), and import ratio (*IM*) defined as a share of the total output of the manufacturing industry j that firm i belongs to. The second group represents firm-specific characteristics, including firm capital intensity, defined as the capital-labor ratio (*KL*), share of skilled labor in firm total employment (*SKILL*), firm age (*AGE* and *AGE2*), and two firm size dummies, measured by firm total employment with three categories, i.e. small (*SM*), medium (*MED*) and big size

(*BIG*)[95]. The third group covers industry-specific factors, which are represented by the competition index of the industry *j* the firm *i* belongs to. This competition index is measured by the Herfindalh index (*HFI4*). Finally, the three year dummies are included to capture the change of inefficiencies over time.

6.3. Data and variable construction

6.3.1 Data

Production data

This chapter uses two principal datasets provided by the General Statistical Office (GSO), which are the enterprise and trade datasets. The enterprise dataset is based on GSO's annual enterprise census of the period 2000-06, which collects essential information on all enterprises in all sectors of the economy, including the manufacturing sector. The basic information collected on firms includes main business activity (industry and sector), ownership, sales (revenue), profits, number of employees and income and compensation, assets (fixed and working) and liabilities, investments and taxes by the end of each year. Each firm is coded by a tax number at the four-digit level of Vietnam's Standard Industrial Classification (VSIC), which is the same as the International Standard Industrial Classification (ISIC). However, the information on production costs, which is essential to evaluate a firm's performance, is collected on a smaller sample of selected firms with a separate questionnaire in the enterprise census. In addition, firm production costs were not collected every year and the sample size varied from year to year. Therefore, there are two datasets for the manufacturing sector, a general and sample datasets.

The empirical analysis of firm performance is based on the sample dataset, which is available for the years 2000-03 and 2005. However, the sample size decreased. The number of observations is more than 9,500 in 2000-01, while it is around 3,500 for the years 2002-03 and 2005. The raw sample data were processed in two steps. At the first step, all observations with negative or zero nominal values of any key variables of firm performance such as output, employment, fixed assets, and intermediate input costs were deleted. The

[95] Only two size dummies, *MED* and *BIG*, are included in the inefficiency model to avoid perfect collinearity or the dummy trap. The definition of firm size will be explained later.

consistency check was done by comparing the total output (firm revenue) with intermediate input costs; the number of skilled and unskilled employees with total firm employment. At the second step, the current price values of all valued variables, including gross output (firm sales or revenue), intermediate inputs, and capital stock were transformed into the 1994 constant price values with appropriate price deflators for manufacturing industries at the two-digit VSIC level. Subsequently, the real value added (VA) as a measure of firm output was computed by deducting the values of intermediate inputs from the gross output value at the 1994 constant prices. Finally, the unbalanced data panel of 26,508 observations was obtained for five years in the period 2000-05, except the year 2004.

For the purpose of examining the pattern of change and distribution of the firms' efficiency levels over time, it is better to have a balanced data panel. Unfortunately, due to reduction of the sample survey size over time, there were not many enterprises being continuously selected for the production cost survey. In addition, the absence of the sample survey in 2004 prevents the use of 2005 sample survey data. Therefore, the balanced panel of 1,312 observations in the period 2000-03 is chosen for the empirical analysis because it better represents the whole manufacturing sector. The use of panel data provides us with more observations and makes it possible to examine the change of the firms' technical efficiency levels over time under trade liberalization.

While the sample survey dataset is used for evaluating the firms' performance, the general dataset of the whole manufacturing sector is important for calculating the two and four-digit VSIC industry-specific variables as discussed in Chapter 5 such as the competition index (Herfindalh index), industry output, and import competition index.

Trade data

The trade dataset consists of import and export data at the six-digit level HS of tariff nomenclature. In addition, data on all detailed (eight and ten-digit level) tariff schedules (AFTA, MFN, NORMAL, ACFTA), including all casual tariff adjustments during 2000-07 were also obtained from the Central Institute for Economic Management (CIEM) and Ministry of Finance (MOF). The trade data were used to estimate the key measures of trade liberalization, including the NRPs, ERPs, import and export shares, import penetration and

export orientation levels of Vietnam's trade policy regime. The NRPs and ERPs were estimated in the previous chapter. The import competition measures were estimated by combining the import data with firm (production) data of the four-digit VSIC manufacturing industry with the concordance tables obtained from COMTRADE. All estimated measures of trade liberalization were then merged with the firmdata set to make a full set of data for the empirical model.

6.3.2 Variable construction

For the stochastic production frontier, three key variables need to be constructed. The firm output (Y) is defined by the real value added[96] at the constant 1994 price in million Vietnamese dongs (VND). The real value added of the firm is the difference between the real gross output (revenue) and the real value of all intermediate inputs (including raw materials and energy costs) at the constant 1994 price. The real output and intermediate inputs values are obtained using respective deflators constructed at the two-digit VSIC level. Because the producer price index at the two-digit VSIC level is not available, the output price deflators are calculated using the current and constant 1994 price values of the manufacturing outputs at the two-digit VSIC level obtained from the GSO (2005, 2006). The intermediate input price deflators are computed indirectly using the 2000 Input-Output table (the 2000 IO table) and respective output price indices at the two-digit VSIC level following the method adopted by Tien (2007). First, using the concordance obtained from the GSO, the intermediate input shares (weights) for each manufacturing industry at two-digit level are computed by aggregating the expenditure shares of 73 IO industries producing industrial goods into respective two-digit VSIC manufacturing industries. The input price indices are then obtained by taking the average of output price indices of all industrial sectors weighted by their input shares in the total input expenditure of the respective two-digit manufacturing industries.

[96] Beside the reasons to use the VA measure as discussed in Chapter 5, as an alternative, the gross output (revenue) has been attempted with intermediate inputs added to the model specification. However, the estimated coefficients are unstable and unreliable due to the multicollinearity problems among the explanatory variables as suggested and experienced by Movshuk (2004).

The capital input (K) is defined as the net value of the fixed assets[97] at the constant 1994 price in million VND. The capital price indices are calculated by taking the ratio of the current and constant 1994 price values of new investments in fixed assets for the whole manufacturing sector obtained from GSO (2006b). The labor input is measured by the total number of the firm's full-time employees at the year-end.[98]

The impact of trade liberalization on firm-level technical efficiency, the focus of this chapter, will be examined by three main trade policy variables, namely the ERPs, NRPs and IM. The use of alternative measures of trade liberalization aims to see whether the effect of trade liberalization is consistent and robust, as is commonly seen in the literature (Edward 1997; Harrison and Hanson 1999; Driffiled and Kambhampati 2003). These variables represent the competition effect of trade liberalization, which is expected to encourage firms to become more efficient through increased managerial efforts. Among these variables, the ERP is the first variable of interest because it shows the net effect of market forces under the impact of trade policy reforms (Greenaway and Milner 2003). Using tariff, import and firm data combined with the 2000 IO table and concordance tables mapping between HS and VSIC based data, the study has calculated the ERPs, NRPs and IM variables for about 110 VSIC manufacturing industries at the four-digit level. Higher disaggregate level of trade policy variables allows more variation in data for better examination of the competition impact of trade liberalization.[99]

While the focus of the study is on the impact of trade liberalization, firm-specific characteristics are controlled because of their foremost importance in determining the firms' performance. As mentioned above, ownership transformation has been undertaken as a significant part of the transition process in Vietnam to promote economic growth,

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[97] It should be noted that a popular method of measuring capital stock is the perpetual inventory method (PIM). This method requires at least information on the initial benchmark estimate of the capital stock, net investments and a depreciation function (OECD 2001; Kalirajan and Bhide 2005). However, this method is not applicable in this chapter due to data constraint at firm level.

[98] Another common measure of the labor input is the total number of labor hours used in each firm per year. Unfortunately, the enterprise survey did not ask the firms any questions about the average number of working hours per day, number of working days per week, or per month as well as the wage rate per man-day or man-hour. Therefore, it is not possible to use this measure in this chapter.

[99] It should be noted that there are useful measures of trade exposure at firm level, such as the firm's export shares in the total output and imported input share in total input, which allows us to examine other channels of impact of trade liberalization on firm productivity. However, limited data availability prevents this chapter investigating these variables.

resulting in a multi-ownership economy. In the survey data, the GSO classifies in detail 14 different types of ownership. For simplicity and due to similarity of characteristics, these types of ownership are grouped into four main categories, namely state-owned enterprises (*SOE*), private enterprise (*PRIV*), domestic join-stock enterprises (*JOINS*) and foreign-invested enterprises (*FDI*). In the inefficiency effect model, *SOEs* are taken a reference group. It is clear that different performance exists among ownership types, which can be explained by many factors, including their underlying characteristics and government policies. The important point is that diverse ownership structure is usually argued to be associated with more competition, which is expected to promote efficiency. In addition, it is interesting to see how enterprises of different ownership types perform under trade policy reforms.

The capital-labor ratio (*KL*), measured by the net value of fixed assets per employee in million VND, is included in the model in the logged value to see whether the firms with more capital investments would have higher efficiency. It is often argued that higher capital intensity leads to higher efficiency because of fewer management problems and more standardized products (Driffield and Kambhampati 2003). However, as discussed in Chapter 5, it might not be the case when the efficient use of capital depends on the managerial skills and ability of workers to master the machinery and equipment and infrastructure availability (Mahadevan 2002; Pack 1988). The conditional efficiency of capital utilization implies the positive role of skilled workers in making better use of capital and other inputs and improving the firm's technical efficiency as commonly agreed in all studies. Therefore, again as in Chapter 5, the share of skilled employees (*SKILL*) in the total employment of the firm is included to see if the estimated impact is consistent with expectation.

Firm size appears to be a commonly interested determinant of technical efficiency as it is closely related to market structure (market power) and economies of scale. While many competing arguments have been put forward regarding the direction of the impact of firm size, they are not in consensus. On one hand, large firms are considered to be more efficient than smaller firms because of their ability to exploite economies of scale or operate at lower points of their cost functions, and because they have much better access to capital and

technologies (Sun et al., 1999). On the other hand, larger firms in a more concentrated market tend to be more rigid in organizational changes and have less incentive to improve their efficiency due to market entry barriers and less competition, as opposed to the more competitive structure of smaller firms (Lundvall and Battese 2000). To some extent, the ambiguous effect of firm size could result from measurement problems. In the literature, total sales, value added, employment and capital stock have been alternative proxies for firm size. However, these measures appear to be biased due to industry-specific features when firms are compared across the whole manufacturing sector. In addition, bias may due to collinearity when firm market shares are included at the same time as the industry competition index. To mitigate this bias, the study uses the measure of firm employment with a dummy to be a proxy for firm size within the framework of a production frontier for the whole manufacturing sector. Using the official definition of the Ministry of Planning and Investment, three dummies are applied to group firms by their employment size. A dummy *SM* takes the value 1 for small firms employing less than 50 employees, *MED* is a dummy for medium firms having from 50 to less than 300 employees and *BIG* is another dummy for large firms using more than 300 employees. Two dummies *MED* and *BIG* are included in the inefficiency model to see if the larger firms are more efficient. Finally, another firm-specific variable, *AGE* is a natural log of firm age is taken into account to see if there is a positive impact of firm age on firm technical efficiency.

The manufacturing sector consists of different industries with specific characteristics, for example the factor use intensity and market structure, which might have significant effects on firm performance. It is therefore worth taking into account industry-specific effects. While a number of studies have used industry dummies to account for industry-specific effects, this chapter adopts the competition index at the four-digit VSIC level for two reasons. First, the competition index, to a certain extent, indicates the industry-specific feature in terms of market structure.[100] Second, this index shows the impact of some important institutional reforms in Vietnam since 2000, particularly the removal of entry barriers to business for the private sector and renewed SOE reform. These reforms were expected to promote more competition in manufacturing industries. To have a more

[100] Zhang et al. (2001) observe that the collinearity problem may result when both industry dummies or the competition indices are included in the regression model.

approximate measure of the industry competition level, the Herfindalh index (*HFI4*) has been computed for manufacturing industries at a more disaggregate four-digit VSIC level.[101] Because the Herfindalh index is based on the firm market share in terms of total sales (revenue), the competition level in an industry can have either positive or negative effects on firm performance as discussed above.

6.3.3 Summary statistics

Table 6.1 presents basic statistics for key variables. It appears that all existing firms grew significantly between 2000 and 2003. The average firm output measured by VA increased consistently from nearly 13 billion VND (at constant 1994 prices) to more than 16.7 billion VND.

Table 6.1 Summary statistics of key variables: Average indicators

Variables	Unit	2000	2001	2002	2003
Output (*VA*)	mill VND	12,935.2	13,160.7	15,731.1	16,712.6
Number of employees (*L*)	persons	331.6	351.7	386.9	402.5
Capital stock (*K*)	mill VND	25,743.1	25,829.6	25,122.1	25,287.8
Capital-labor ratio (*KL*)	mill VND	92.6	88.4	80.8	75.7
Share of skilled labor (*SKILL*)	percent	9.0	8.9	8.6	8.7
Firm age (*AGE*)	years	7.3	8.3	9.3	10.3
Effective protection (*ERP*)	percent	65.9	58.8	54.0	49.0
Nominal protection (*NRP*)	percent	22.6	20.8	20.4	18.6
Import share (*IM*)	-	0.858	0.765	0.772	0.903
Herfindalh Index (*HFI4*)	-	0.0813	0.1001	0.0734	0.0621

Source: Author's calculations from datasets.

There is a clear trend of increasing labor intensity among firms. The average capital stock of the firms reduced slightly while firm employment size grew up significantly from 331.6 in 2000 to 402.5 in 2003, resulting in a reduction of firm capital intensity from 92.6 to 75.7. It is notable that the average share of skilled labor was not only at a rather fairly low level, but also went down slightly when firms increased their employment. Firms in the manufacturing sector appear quite young, with the average age of 7.3 years in 2000, mainly

[101] Herfindalh index is defined as follows: $HFI4_j = \sum_{i=1}^{n}\left(\frac{s_{ij}}{S_j}\right)^2$ where s_{ij} is the total sale of firm i in industry j with its gross output S_j.

as a result of emerging private and foreign-invested sectors. The data also reveals a clear impact from various ownership and institutional reforms reducing entry barriers to various manufacturing industries. The Herfindalh index decreased considerably from 0.0813 in 2000 to 0.0621 in 2003. Importantly, as discussed above, significant trade liberalization took place with the reduction of both nominal and effective protection for the manufacturing sector. However, overall import response in the manufacturing sector seemed to lag, with a significant increase in the import share in 2003 after falling in 2001 and 2002.

6.4. Model estimation results

6.4.1. Model specification tests

The empirical model is estimated using the FRONTIER 4.1[102] software that uses the maximum likelihood estimation method. The parameters of the stochastic production frontier and inefficiency model were simultaneously estimated for the whole manufacturing sector. Three alternative models have been estimated with respect to different measures of trade liberalization, namely, effective rate of protection, nominal rate of protection and import ratio (import competition).

Alternative hypotheses need to be tested to justify our SPF approach with the assumption of inefficiency effects. As suggested by Battese and Coelli (1995), generalized likelihood ratio (LR) tests are required to confirm the functional form and specification. The relevant test statistic is

$$LR = -2\{\ln[L(H_0)/L(H_1)]\} = -2\{\ln[L(H_0)] - \ln[L(H_1)]\}$$

where $L(H_0)$ and $L(H_1)$ are the values of the likelihood function under the null and alternative hypotheses respectively. According to Coelli (1995), under the null hypotheses on the maximum likelihood estimates, this test statistic has an asymptotical mixed chi-square distribution. The critical values of the mixed chi-square distribution are obtained from Kodde and Palm (1986) at the 1 percent level of significance with the degree of

[102] For more detail about the program, see Coelli (1996).

freedom equal to the number of parameters assumed to be zero under the null hypothesis. The results of all hypothesis tests are reported in Table 6.2.

Table 6.2 Likelihood ratio tests of hypotheses for functional forms of the stochastic production frontiers and parameters of the inefficiency effect models

Null hypothesis	$\chi^2_{0.99}$ [a] value & df	Model with *ERP*		Model with *NRP*		Model with *IM*	
		χ^2 - stat	Decision to Ho	χ^2 - stat	Decision to Ho	χ^2 - stat	Decision to Ho
$\beta_3 = \beta_4 = \beta_5 = \beta_7 = \beta_8 = \beta_9$ (Cobb-Douglass form)	16.07 (6)	143.4	reject	156.4	reject	140.8	reject
$\gamma = 0$ (Mean response function)	5.41 (1)	49.0	reject	49.0	reject	49.0	reject
$\gamma = \delta_1 = \ldots = \delta_{13} = 0$ (All inefficiency effects are absent)	28.5 (14)	272.2	reject	276.2	reject	265.5	reject
$\delta_1 = \ldots = \delta_{13} = 0$ (Trade liberalization and firm and industry-specific factors have no effects on inefficiency)	27.0 (13)	108.4	reject	112.6	reject	102.0	reject
$\delta_{11} = \delta_{12} = \delta_{13} = 0$ (Efficiency not improving over time)	10.5 7.1[b] (3)	9.0	reject (at 5% level)	12.2	reject	15.6	reject

Note: (a) The critical values for the hypotheses are obtained from Kodde and Palm (1986), Table 1; (b) This critical value is at the 5% level of significance.
Source: Author's calculations.

At first, the presumed translog functional form is tested against the alternative Cobb-Douglas form for the present dataset. The test results strongly reject the Cobb-Douglas form in favour of the translog form in all three alternative model specifications. This indicates changing relationships between inputs among firms and across manufacturing industries and the translog function better accounts for the diversity of manufacturing firms. Subsequently, it is important to confirm that inefficiency matters in firm operation, and depends on various firm-specific and environmental factors. This involves testing various

hypotheses for the significance of $\gamma = \sigma_u^2 / (\sigma_v^2 + \sigma_u^2)$ and the joint significance of coefficients of the technical inefficiency model. The first null hypothesis, which specifies that the inefficiency effects are not stochastic (this means the variance of the inefficiency effects σ_u^2 is zero), is strongly rejected. This indicates that technical inefficiency effects are stochastic, significant and the OLS estimates associated with the mean response function are not appropriate in this case. The second null hypothesis, that inefficiency effects are absent from the model, is rejected at the 1 percent level of significance. The third null hypothesis, that trade liberalization and firm and industry-specific factors do not jointly influence firm technical inefficiencies, is also strongly rejected at the 1 percent level of significance. Additionally, the test results of joint significance of time factors (years) confirms that technical efficiency of manufacturing firms improved over time in all three model specifications.

6.4.2 Parameter estimates of the stochastic production frontiers

The parameter estimates of the production frontiers associated with three measures of trade liberalization are presented in Table 6.3, corresponding with three model specifications: the first specification with *ERP* (effective protection), the second specification with *NRP* (nominal protection), and the last specification with *IM* (import ratio). Except the coefficient of $0.5(\ln L^2)$, all other estimated coefficients of the production frontiers are statistically significant. On average, manufacturing firms have increasing returns to scale with the computed scale elasticity of 1.077 and both capital and labor have nearly equal output elasticities as shown in Table A6.1 of the Appendix. Among manufacturing industries, the garments and leather and footwear industries (VSIC 18 and 19) appear to operate at points of decreasing return to scale on their output frontier with a majority of firms having the scale elasticity of less than 0.995. Another two industries, i.e. tobacco and textiles (VSIC16 and 17), have a majority of firms operating at a range of constant returns to scale. It is surprising that a large number of two-digit VSIC manufacturing industries (the rest industries) have increasing returns to scale with a majority of firms having the scale elasticity of more than 1.05 (Table A6.2, Appendix). This implies that a majority of firms in Vietnam's manufacturing sector have a small size in terms of capital and labor or

output. Nevertheless, in the period 2000-03, it appears that the scale elasticity decreased slightly (Table A6.3, Appendix) as the firm size in terms of employment and value added output became larger, as shown in Table 6.1 above.

Table 6.3 Estimation results of the stochastic production frontier and inefficiency model: Alternative models with different measures of trade liberalization

Variables	Model with *ERP*		Model with *NRP*		Model with *IM*	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Stochastic production frontier						
Constant	0.567***	13.85	0.577***	15.13	0.546***	12.15
$\ln L$	0.542***	24.70	0.540***	25.71	0.539***	29.71
$\ln K$	0.535***	37.57	0.538***	36.72	0.532***	38.55
$0.5(\ln L)^2$	-0.006	-0.28	-0.009	-0.45	-0.014	-0.72
$0.5(\ln K)^2$	0.083***	9.77	0.084***	10.16	0.082***	9.15
$\ln L \ln K$	-0.059***	-5.00	-0.058***	-5.05	-0.056***	-4.68
T	-0.041**	-2.45	-0.044**	-2.14	-0.055**	-2.37
$0.5T^2$	0.078**	2.04	0.056*	1.95	0.097*	1.72
$T \ln L$	-0.021*	-1.66	-0.024*	-1.78	-0.023*	-1.82
$T \ln K$	0.020**	2.15	0.019*	1.95	0.021**	2.33
Technical inefficiency model						
Constant	-7.215***	-6.21	-7.026***	-5.22	-4.682***	-4.70
Capital labor ratio (*KL*)	0.978***	8.47	0.972***	7.63	0.942***	7.55
Skilled labor (*SKILL*)	-6.545***	-6.21	-7.666***	-6.56	-9.163***	-7.29
Age (*AGE*) (logged)	-1.003***	-7.37	-1.079***	-7.09	-1.006***	-7.06
Private (*PRIV*)	-0.106	-0.59	-0.121	-0.72	-0.288	-1.56
Join-stock (*JOINS*)	-6.453***	-6.89	-6.067***	-6.92	-6.201***	-7.55
Foreign invested (*FDI*)	-2.269***	-7.30	-2.302***	-6.69	-2.197***	-6.38
Trade policy measures	0.016***	9.67	0.055***	7.66	-0.109***	-4.45
Herfindalh index (*HFI4*)	4.938***	6.81	4.123***	4.92	5.218***	5.63
Medium firm (*MED*)	-0.418***	-2.90	-0.484***	-3.17	-0.637***	-4.28
Big firm (*BIG*)	-1.406***	-5.42	-1.444***	-5.99	-1.871***	-8.29
Y2001	-1.354***	-6.88	-1.508***	-6.95	-1.953***	-7.12
Y2002	-2.040***	-8.04	-2.253***	-8.44	-3.095***	-8.41
Y2003	-2.243***	-7.60	-2.299***	-7.43	-2.943***	-8.52
Sigma-squared (σ^2)	6.629***	9.03	6.582***	8.55	6.234***	9.65
Gamma (γ)	0.858***	49.91	0.858***	49.50	0.849***	48.30
Log-Likelihood (LLF)	-8150.6		-8148.6		-8153.9	
Average efficiency level	60.5%		60.8%		61.1%	

Note: *, ** and *** denote the significance level of 10, 5 and 1 percent; t-stat is asymptotic t-ratio.
Source: Author's calculation.

The estimated value of γ is about 0.85 and it is highly statistically significant in all three model specifications. This indicates that a majority share of the deviations of firms' actual output from the frontier output is due to the inefficiency effects. Here, the question of

interest is whether these deviations decreased over the period 2000-03 under the impact of trade liberalization and other non-input factors. This question will be examined in the next section.

6.4.3 The impact of trade liberalization and other determinants on the firms' technical efficiency

The estimated coefficients of the three inefficiency models are also presented in Table 6.3. It appears that all estimates are consistent across the alternative specifications in their sign and magnitude, except, as expected, trade policy variables. In addition, while the dummy for private firms is not statistically significant, all other coefficients are individually significant at a 1 percent level of significance. This implies the important role of the trade regime and other factors in determining firm performance.

The estimation results suggest that trade liberalization has an expected positive and robust impact on firm technical efficiency across three models with alternative trade policy measures. This finding is consistent with the impact of trade liberalization measures on TFP growth found in Chapter 5 and with other empirical studies based on technical efficiency measurement[103]. In terms of policy openness measures, reduction in nominal and effective protection contributes to improving technical efficiency of firms. In terms of trade policy outcome, a similar effect results from more imports in the total supply of the manufacturing industry at the four-digit VSIC level. In addition, the stronger improvement of efficiency appears to be associated with the reduction in nominal tariffs rather than in the effective rate of protection. This would be explained by a more intermediate impact of tariff reduction on industry and firm output prices. The significant effects of different proxies of exposure to foreign competition at the industry level, not the firm level, seem to confirm the hypothesis of the competition effects of trade liberalization, which is assumed to create both incentives and challenges for firms to be more active in utilizing better available resources and reducing managerial slack to survive in the domestic market with increasing foreign competition.

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[103] For example, the negative association between trade protection and firm technical efficiency was found in Urata and Yokota (1994), Alam and Morrison (2000), Kambhampati and Driffied (2003), Phan (2004), and Abuka (2005).

The estimated coefficient of the Herfindalh index is positive in all three models, implying that high concentration associated with less competition in some manufacturing industries not only has negative effects on the performance of dynamic and efficient firms in those industries, but also allows inefficient firms to remain in the markets or to be less active in increasing efficiency. Therefore, it appears that technical efficiency was further enhanced by the reduction of the overall competition index and a majority of four-digit manufacturing industries in the period 2000-03 (as shown in Table A6.4 of the Appendix). This means that various domestic reforms, particularly legal and institutional reforms had a significant impact on manufacturing firm performance, supplementing to external competition effects created by trade liberalization. A similar finding on the impact of competition index was found by other studies such as Kambhampati and Driffied (2003).

While more concentration has negative effects on firm technical efficiency, larger firms in terms of employment are more efficient as indicated by the highly significant coefficients on the variables *MED* and *BIG*. These effects, albeit counter-intuitive, are reasonable because the use of dummies for employment size mitigates the collinearity between market share and competition index despite a common expectation that larger firms tend to be associated with more concentrated industries. The results support the above mentioned hypothesis that larger firms are able to exploit economies of scale and operate at lower cost curves. Consequently, as already mentioned, the increasing firm size in terms of employment would contribute to reducing inefficiencies of firms over the period in question.

We now turn our attention to the effects of more particular firm-specific factors, which are controlled in the inefficiency model. As expected, we find a robust and highly significant impact of skilled labor on firm performance. A higher skilled labor share considerably increases technical efficiency. It is, however, surprising that using more capital does not improve firm efficiency as, indicated by a positive, significant and robust coefficient on the capital intensity, as this effect is not expected in a developing country with abundance of labor and scarcity of capital where additional capital is assumed to have increasing returns. While some studies such as Mahadevan (2002), Movshuk (2004) and Abuka (2005) find a positive effect of the capital intensity on technical efficiency, other studies such as Driffied

and Kambhampati (2003) and Phan (2004) have similar findings to this chapter. In the light of contrasting findings, it is reasonable to argue that the efficient use of capital at firm level is largely attributed to the firm's ability to master the newly invested machinery and equipment and technical knowledge. Therefore, the skilled labor share is as low as below 10 percent on average of the manufacturing firms as shown above appears to be a responsible factor underlying the negative relationship between capital intensity and firm efficiency. The coefficient on firm age (*AGE*) is consistently and significantly negative, implying that older firms are more efficient than younger firms. This result seems to support the learning-by-doing hypothesis that older firms have accumulated more managerial and market experience.

As discussed, ownership transformation is a key element of institutional reforms, marking a distinguishing feature of the transitional economies like Vietnam and China. Therefore, the performance of firms is expected to be markedly different by ownership types. With the SOEs being used as the common reference group, we find that both joint-stock (JVEs) and foreign-invested (FIEs) enterprises perform better than SOEs. In addition, the joint-stock enterprises seem to outperform the FDI enterprises as the coefficient of the JVEs (more than -6.0) is considerably larger than that of the FIEs (around -2.0). This finding is not a surprise, given the commonly argued problems of the SOEs in their management and incentive structure. In addition, the better performance of the joint-stock enterprises gives evidence on the positive impact of SOEs reform, under which many SOEs have been equitized and transformed into joint-stock companies. In contrast with the joint-stock and foreign-invested firms, the private firms (PEs) are found not to have a significantly better performance compared with the SOEs. This finding is consistent with the conclusions made by several studies that, despite the removal of entry and exit barriers, the private sector has been disadvantaged in terms of access to important resources such as land and credit as well as continuing discrimination in the administrative system (Hakkala and Kokko 2007; World Bank 2005; Tenev et al. 2003).

Finally, the significant and robust coefficients on all time dummies indicate that the technical efficiency of manufacturing firms has increased over time. The improvement of manufacturing firm performance over time implies the dynamics of changing determinants

of the inefficiency effects. While the direct impact of trade liberalization has been directly modeled as a determinant of firm technical efficiency by alternative measures of trade policy and exposure to foreign competition, its indirect effects appear to be much more important in terms of incentives and competition pressures on firm operation and behaviour. This aspect will be further elaborated in examining the changing patterns of firm efficiency levels and associated efficiency determinants.

6.4.4 Sensitivity analysis

The use of three alternative measures, i.e. ERP, NRP, and IM has indicated the robustness of the finding on the impact of trade liberalization on firm technical efficiency performance. To see if the above finding is consistent with that in Chapter 5, it would be informative to have a further examination of whether its impact is affected by the condition of domestic competition or vice versa. In addition, it would be important to investigate whether the estimated effects of other firm-specific determinants remain consistent when policy change variables are taken into account. Therefore, for each measure of trade liberalization, three additional models based on the stochastic frontier framework were estimated with the firm-specific factors and time effects of technical efficiency being controlled for. The first model takes into account only the impact of trade liberalization. The second model considers only the influence of domestic institutional reforms, which is presented by Herfindalh index. Finally, the interaction between trade reforms and domestic institutional reforms is taken into account in the last model.

The estimates of three additional models are shown in Table A6.5a, A6.5b, and A6.5c of the Appendix. In these tables, the first column presents the estimates of the models in Section 6.4.2 as the basic model for comparison. The estimation results of the first, second and third models are reported in the second, third and fourth columns respectively. There are four important points to be noted from examining the estimation results presented in these tables. Firstly, regardless of including or excluding any measure of trade liberalization, competition index, and their interaction, the estimated coefficients on the firm-specific variables (which are capital labor ratio, skilled labor share, firm age, firm ownership, and firm size) remain unchanged in their expected signs and statistical significance. Secondly, a similar trend is also observed among the estimated coefficients on year-specific dummies,

which account for the improvement of firm technical efficiency overtime. Thirdly, the estimated impact of trade or domestic institutional reforms remains robust in terms of expected sign and significance level when each factor is separately taken into account. Finally, the high significance of the interaction term between trade reforms and domestic institutional reforms in all three specifications suggest that their effects on technical efficiency performance of manufacturing firms are dependent on each other. In particular, the impact of increased foreign competition is smaller in more competitive industries as suggested by a positive coefficient on the interaction term between *NRP* and *HFI4* (*NRPxHFI*) or *ERP* and *HFI4* (*ERPxHFI*) and a negative coefficient on the interaction term between *IM* and *HFI4* (*IMxHFI*). Interestingly, this result is consistent with the finding in Chapter 5. However, when these interaction terms are included in the models, the estimated coefficient on *HFI4* (industry competition index) becomes insignificant with a much smaller value. In addition, the magnitude of the coefficients on *ERP* and *NRP* is also reduced while the coefficient on *IM* is statistically insignificant. Further checks suggest that this problem could be caused by the high correlation between *ERPxHFI4* (or *NRPxHFI4* or *IMxHFI4*) and *HFI4, ERP, NRP*, and particularly *IM* at the firm level.

In conclusion, the impact of trade liberalization on the technical efficiency performance of manufacturing firms is found to be consistent with different proxies. Furthermore, the effects of all firm-specific characteristics are found to be robust to alternative model specifications. Finally, it is interesting that the findings in this chapter are consistent with those in Chapter 5.

6.4.5 An analysis of technical efficiency level

The average efficiency scores of the whole manufacturing sector and two-digit VSIC industries are presented in Table 6.4. It can be seen that, in line with trade liberalization, an increasing trend of the mean efficiency level is observed in all industries and the whole sector, reflecting the time trend of reducing inefficiencies among firms as indicated in the inefficiency model.

The average efficiency level increased from 55 percent in 2000 to nearly 64 percent in 2003 and the time average is about 60.5 percent. The estimated levels of efficiency are

comparable with those reported by other studies for Vietnam such as Hung et al. (2010) with nearly 62 percent for the whole manufacturing in 2002, Minh (2005) with 55 percent for textiles and garments in 2003 and for other transitional economies such as Bulgaria (John et al. 1998), Czechoslovakia and Hungary (Brada et al. 1997), and the former Soviet Union (Brock, 1999).

Table 6.4 Average efficiency level by 2-digit VSIC industry: 2000-03

VSIC2	VSIC name	2000	2001	2002	2003	Average	Change[(a)]
15	Food products and beverages	50.9	58.1	63.2	64.1	59.1	13.2
16	Tobacco products	71.8	74.5	79.3	80.2	76.5	8.4
17	Textiles	48.4	51.2	59.1	59.8	54.6	11.4
18	Wearing apparel	45.8	53.6	49.1	52.9	50.3	7.1
19	Leather, leather products and footwear	53.9	61.0	60.7	62.5	59.6	8.6
20	Wood and wood products	59.3	64.0	66.3	66.8	64.2	7.4
21	Paper and paper products	59.6	62.2	64.9	64.0	62.7	4.4
22	Publishing, printing and recorded media	56.0	59.1	65.0	64.0	61.1	8.0
24	Chemicals and chemical products	65.3	71.0	70.1	70.5	69.2	5.1
25	Rubber and plastics products	53.9	58.1	63.2	61.0	59.0	7.1
26	Non-metallic mineral products	61.2	65.2	68.2	69.1	65.9	7.9
27	Basic metals	65.0	63.9	70.7	71.6	67.9	6.7
28	Fabricated metal products	53.6	59.0	54.4	56.0	55.7	2.4
29	Machinery and equipment	56.7	64.9	66.7	67.5	64.3	10.9
31	Electrical machinery	52.5	58.5	62.3	60.1	58.3	7.7
32	Radio, television and communication equipment	65.6	66.3	68.7	69.4	67.5	3.8
33	Medical, precision and optical instruments	50.6	42.9	53.1	54.9	50.4	4.3
34	Motor vehicles, trailers and semi-trailers	52.2	52.1	50.0	58.2	53.1	6.0
35	Other transport equipment	56.7	47.1	57.9	58.6	55.1	1.8
36	Furniture and other manufacturing	50.0	57.6	58.7	59.0	56.2	9.0
	Whole manufacturing	55.0	60.3	63.1	63.8	60.5	8.8

Note: (a) Change is defined as the percentage point difference in mean technical efficiency in 2000-03.
Source: Author's calculation.

In addition, the pace of technical efficiency increase seems to be higher in some export-oriented industries such as textiles, garments, and furniture than in some import-competing industries like motor vehicle, transport equipment, fabricated metal products and chemicals, despite the fact that these export-oriented industries tend to have lower technical efficiency

levels. However, despite the comparable level of the estimated technical efficiency, the manufacturing sector still had a significant gap (nearly 40 percent) between the actual and potential outputs, on average, in the period 2000-03.

As a fairly high aggregate level of the two-digit VSIC manufacturing industries does not allow the dynamics of efficiency changes to be seen under the impact of trade liberalization, we group sample manufacturing firms based on their trade orientation. Industry's trade orientation is defined by the import-output and export-output ratios at the four-digit VSIC level. The approach of classifying manufacturing industries into different groups based on trade orientation was already discussed in Chapter 4. Consequently, the patterns of firm efficiency levels of these groups are presented in Table 6.5. Other features of these three groups are shown in Table A6.6 of the Appendix. Here, it is interesting to see a common trend for a developing country such as Vietnam, that is, the export-oriented firms appear to be more labor-intensive with the smallest capital-intensity.

Table 6.5 Mean efficiency level (%) by trade orientation

Trade-orientation	2000	2001	2002	2003	Average	Change[(a)]
Less-traded	56.0	60.9	65.5	65.8	62.0	9.7
Export-oriented	52.2	59.0	61.6	62.8	58.9	10.6
Import-competing	57.1	61.1	62.9	63.5	61.2	6.5
Overall	55.0	60.3	63.1	63.8	60.5	8.8

Note: (a) Change is defined as the percentage point difference in mean technical efficiency in 2000-03.
Source: Author's calculation

It is clear that all three groups of firms show a consistent and quite rapid trend of increasing efficiency levels. This can be explained by the fact that all firms have reduced their capital intensity, used more labor and consequently increased the relative skilled labor per capital ratio in facing more competition from trade opening and domestic markets (Table A6.6 of the Appendix). In particular, between 2000 and 2003, the average employment size of the export-oriented and import-competing firms increased by 1.26 and 1.20 times while the less-traded firms also experienced an increase of 1.1 times in their employment size. The combination of enlarging employment size and keeping little changed capital stock has led to a fall in the capital intensity of all three groups. As suggested by the inefficiency effect model, these changes clearly contributed to improving firm efficiency. Therefore, it can be said that manufacturing firms have responded to more competition pressures created by

trade liberalization and institutional reforms by using their available resources more efficiently as well as exploiting Vietnam's comparative advantage in labor resource. It should be noted, however, that the share of skilled labor of all three groups remained roughly the same over the period 2000-03 as shown in Table A6.6 of the Appendix. This means that the employment expansion of existing firms was not associated with increase in their skill labor force. It should be noted that, the average skilled labor share of existing firms was higher than that of the whole manufacturing sector (8.8 percent compared with 6.32 percent in 2000-03). Therefore, the new entrant firms, mostly private firms could have a lower skilled labor share, supporting the proposition made in Chapter 5 on the increasing trend of unskilled labor.

It is again observed that, while having a more substantial increase in the technical efficiency, the export-oriented firms are less efficient compared with the other two groups. One possible factor is that the export-oriented firms tend to pay for higher imported input costs (with intermediate input tariffs of 12 percent compared with 5.6 percent and 9.6 percent for less-traded and import-competing industries in 2003). Moreover, while the domestic protection level was significantly reduced and various measures of export promotion were implemented during this period (2000-03), it seems that there were still considerable anti-export biases against the manufacturing industries such as garments, footwear and plastic products where Vietnam has comparative advantage for exporting (Athukorala 2006). Another significant factor is the fact that the export-oriented industries appear to have the lowest share of skilled labor compared with other two groups despite possessing larger employment (Table A6.6 of the Appendix).

Table 6.6 Mean efficiency level by ownership and trade orientation

Trade orientation	State-owned	Private	Joint-stock	FDI	Overall
Less-traded	64.0	57.0	72.9	67.4	62.0
Export-oriented	58.0	58.2	70.3	60.3	58.9
Import-competing	63.1	57.0	73.8	62.6	61.2
Overall	62.2	57.5	72.8	62.7	60.5

Source: Author's calculation

The patterns of the mean efficiency levels by ownership type and trade orientation group, presented in Table 6.6, provide some more insight into the links between ownership types

and the performance of firms by trade orientation group. Overall, the private enterprises have the lowest efficiency level, as suggested by the inefficiency effect model. Although the private firms are a bit more efficient than the state-owned enterprises in the export-oriented industries, the lower efficiency of the export-oriented industries appears to be driven by the major share of the private firms (about 65.8 percent of the export-oriented firms as shown in Table A6.7 of the Appendix). The state-owned enterprises also contributed to the low efficiency level of the export-oriented firms, but with a significantly smaller share (about 16 percent as shown in Table A6.7 of the Appendix). The higher efficiency levels of the less-traded and import-competing groups are attributed to the larger share and higher efficiency levels of the state-owned, foreign-invested and joint-stock firms, despite the fact that the private enterprises alone account for a majority share in all three groups of trade orientation.

Despite its significant contribution to the lower level of efficiency of the export-oriented sector, the private enterprises appear to perform better in the export-oriented industries with less entry barriers and higher labor intensity. Table 6 shows that, compared with other two groups, the private enterprises in the export-oriented industries have a higher efficiency level while the firms of other ownership types are significantly less efficient than their counterparts. In addition, more private enterprises (47.2 percent) are concentrated in the export-oriented industries, which seem to be more competitive (as shown in the last panel of Table A6.6 of the Appendix). In terms of the temporal pattern of firm efficiency levels, the private and foreign-invested enterprises appear to have the largest gains in their technical efficiency with 9.8 and 9.9 percentage points, followed by the state-owned firms with 2.9 percentage points and then the joint-stock enterprises with a modest gain of 2.9 percentage points (Table A6.8 of the Appendix).

6.5 Conclusions

This chapter has examined the impacts of trade liberalization on firm performance in terms of productive efficiency in Vietnam as a developing and transitional economy using firm-level panel data over the period 2000-03. By using the stochastic production frontier framework, the impact of trade liberalization was investigated by the inefficiency model simultaneously estimated with the frontier production function, in line with controlling for

other important determinants of firm performance, including firm-specific characteristics and industry-specific effects.

The findings support the theoretical implications of the positive and robust impact of trade liberalization on firm performance. Reduction of protection is associated with higher firm technical efficiency over time and across manufacturing industries while more import competition promotes firms to reduce their inefficiencies. The improvement of firm efficiency could be attributed to the direct competition effect of trade liberalization. At the same time, other important determinants of inefficiency effects have also been found to have significant and robust effects on firm technical efficiency level. While skilled labor is found to have an expected, robust and significant effect on firm technical efficiency, the finding of higher capital intensity leading to lower efficiency is not surprising, given a relative low level of skilled labor among firms. It is notable that firms having larger employment size appear to have higher efficiency.

The analysis of technical efficiency levels based on the trade orientation group indicates consistent patterns as suggested by the estimation model. All three industry groups experienced technical efficiency gains in line with facing declining protection levels. Among the three defined groups of manufacturing firms, the export-oriented industries appear to have lower efficiency levels, which are attributed to the remaining anti-export biases in the trade policy regime and their lower level of skilled labor. However, the changes in the ERPs alone are not enough to explain the gains in technical efficiency in the three different trade orientation groups, particularly the import-competing firms. This chapter also found that, to some extent, the firms have become more efficient by using more labor (increasing employment size) and, at the same time, considerably reducing capital intensity, rather than increasing the share of skilled labor in their employment. This trend is attributed to the competition-induced incentive effects of trade liberalization and other associated domestic reforms, and resulting response of manufacturing firms. It is also found that the share of skilled labor remained nearly unchanged at a low level.

A distinguishing feature of Vietnam's case is that firm performance is also substantially affected by a transition process featured by ownership type and domestic competition, which results from various domestic reforms, particularly institutional reforms. The

estimation results show that these factors matter significantly in determining firm efficiency level. By taking into account these factors, our frontier model suggests that trade liberalization seems to play a more important role in making more competition pressure and more opportunities for firm to become more productive in order to survive in the markets. This finding is not a surprise in the literature, but it is an important explanation for the interesting case of Vietnam, where manufacturing firms have become more efficient by using more labor as their response to increasing competition. Moreover, the estimation results also indicate that, while more trade liberalization is conducive to better performance, increasing the share of skilled labor is the key for firms to achieve higher potential output in the long term, rather than using more labor because it is relatively more abundant in Vietnam. Therefore, more attention should be paid to making incentives and providing support for enterprises in training their workforce as well as making more opportunities for workers to upgrade their skills by themselves.

Chapter 7

Conclusions and Policy Implications

7.1 Overview, key findings and contributions

7.1.1 Overview

Over more than two decades since 1986, Vietnam has emerged as a transformed economy resulting from extensive market-oriented reforms, and has achieved high economic growth and rapid poverty reduction. The perspective of a developing country means the transition reforms are associated with an inevitable process of industrialization, which has become an underlying force of economic growth and structural transformation. An important part of this transformation is trade liberalization, which has helped the Vietnamese economy become more integrated with the global economy. Opening to trade and foreign investment, facilitated through the globalization process, helped accelerate the pace of industrialization in Vietnam. To further open up the economy, in 2000 the Vietnamese government undertook extensive trade reforms. Since then the Vietnamese economy has undergone a period of accelerated international economic integration, recognized by the landmark event in 2007 of accession to the WTO. It was expected that these reforms and the accelerated pace of integration with the global economy would positively contribute to the performance of manufacturing sector.

The trade policy regime has experienced profound changes to become more liberal in the past decade. In the 1990s, following the introduction of the official goal of industrialization by 2020, Vietnam appeared to follow East Asian and ASEAN economies in adopting a dual approach to its trade policy regime. The import control measures were increasingly employed to encourage the import- substitution industries in line with the development of various incentives to promote export-oriented activities. However, in the second half of the 1990s, there emerged an increasing trend of import-substitution bias with various trade protection measures, particularly non-tariff barriers. In contrast, the period 2000-07 witnessed a reversal in policy orientation toward a more neutral trade regime due to extensive trade reforms as a result of the implementation of Vietnam's commitments under

the AFTA, USVBTA, ACFTA and WTO frameworks. A transition style of trade reforms emerged, with the rapid removal of non-tariff barriers and follow-up tariff reduction while export promotion was enhanced.

Substantial trade liberalization has been one of the driving forces of Vietnam's economic reform process. Trade policy reforms have brought about a notable reduction in the protection of domestic production in terms of both tariff and non-tariff barriers, import licensing and various anti-export biases. In addition, fulfilling bilateral and multilateral commitments required Vietnam to further advance its structural and institutional reforms, particularly: state-owned enterprise reform; private sector development; the amendments of foreign investment policy; and administration reform for proper functioning of the market-based economy. Consequently, trade liberalization has taken place and accompanied by an increasing degree of competition in domestic industries.

7.1.2 Key findings

The thesis has investigated the trade liberalization process and explored how Vietnamese manufacturing has responded to this critical change in the policy environment in terms of growth and structural transformation. After reviewing theoretical and empirical literature, the empirical analysis began by examining changes in the trade policy regime, related policy reforms and the impacts of trade reforms on the level of manufacturing protection over the period 2000-07. Given the background of policy changes, the relationship between trade liberalization and manufacturing performance has been investigated in three key aspects: (i) the pattern of manufacturing growth and structural changes; (ii) the manufacturing TFP growth at the industry level of the four-digit VSIC; and (iii) the changes in the firm technical efficiency level. The results obtained from the empirical analysis are summarized below to answer the research questions posed in Chapter 1.

In Chapter 3, it was found that various trade reforms have resulted in substantial reduction in manufacturing protection as expected. The estimates of NRPs and ERPs show a consistent trend of significant import liberalization between 2000 and 2007. The import-competing industries, particularly agriculture-based industries, experienced the largest decline in protection levels. While export-oriented industries appeared to have a high level

of protection and experienced the second largest reduction in protection, their real incentives came from various export promotion measures, the reduction in the import-substitution bias, and better access to the export markets due to the effect of Vietnam's bilateral and multilateral trade agreements. On the contrary, manufacturing industries producing intermediate goods, machinery and equipment enjoyed a slight increase in the trade barrier, albeit at a very low level compared with other manufacturing industry groups. Despite the impressive pace of import liberalization and neutrality-oriented policy change, there still existed a distortionary structure of protection with a high level of dispersion of NRPs and ERPs among manufacturing industries. A number of import-competing and export-oriented manufacturing industries producing consumer goods still had protection rates significantly higher than those of capital and intermediate goods industries. This problem resulted from a large number of rates in the tariff system and could be an important cause of the limited development of supporting industries producing intermediate goods. Overall, Vietnam experienced a very short period of exercising import-substitution industrialization compared with other developing countries, particularly its Asian neighbors. However, the decisive policy shift to trade opening was inevitable, leading to a sharp change in the business environment for manufacturing firms.

The analysis in Chapter 4 finds crucial evidence of the trade liberalization impact on manufacturing performance at the aggregate level. From 1995 to 2007, overall manufacturing growth was found to be higher during the time of trade reforms and was the highest compared with other sectors, increasing its contribution to GDP growth. Moreover, manufacturing growth appeared to be closely associated with the pace of import expansion. Importantly, the best growth performance of manufacturing was accompanied by the structural change toward export-oriented and labor-intensive growth, reflecting the resource reallocation into the activities in which Vietnam has comparative advantages. In 2000-05, there was a clear increasing trend in the share of export-oriented industries in terms of both labor and capital. Clearly, the export-oriented industries were found to be ones making labor-intensive products, particularly light consumer goods. However, the relative expansion of the export-oriented sector was not observed in terms of output compared with

the import-competing and less-traded sectors, partly due to the faster growth of domestic demand compared with the manufactured export growth.

Increasing labor intensity of manufacturing growth was revealed by a substantially higher employment elasticity of output growth in 2000-07 compared with 1995-2000. Moreover, it is notable that the increase in employment intensity not only resulted from shifting toward export-orientation, but also from the large employment expansion of import-competing and less-traded industries in facing import liberalization.

The examination of manufactured exports also shows clearly the dominance of labor-intensive products in the structural pattern of Vietnam's trade specialization. Trade liberalization seemed to induce and reinforce this specialization pattern, as indicated by the more sluggish change in the structure of manufactured exports in 2000-07 compared with the high import protection period of 1995-2000. On the one hand, this tendency is consistent with the predictions of the traditional trade theory (the HO theory). On the other hand, it implies a possibility that Vietnam may be locked in a slow path of output and export growth if the country stays in or gains a slow technological upgrading in the current structure of trade specialization for a long time as predicted by the new trade and endogenous growth theory.

The significant influence of other domestic policy reforms, which accompanied trade reforms, was also observed in the growth and structural transformation of manufacturing. Between 1995 and 2007, the SOE sector experienced a consistent reduction in its relative importance in manufacturing growth. At the same time, the PE and FDI sectors both increased their contribution to manufacturing performance. Noticeably, the PEs expanded much faster after 2000, when extensive legal and institutional reforms were undertaken matching with the pace of the accelerated trade opening of the economy. While the growing private sector reflects the transitional nature of the economy, the most notable feature of the institutional aspect of manufacturing evolution is that the FDI sector has become the main driving force in the growth of output and exports. The further increase of the FDI contribution to manufacturing growth has resulted from both trade liberalization and the government's efforts to reform the FDI policy regime. Vietnam tends to share this feature

of the leading role played by the FDI sector in manufacturing growth with other more advanced ASEAN countries such as Indonesia, Malaysia and Thailand.

Given the faster and more labor-intensive growth of manufacturing in the period of trade liberalization, Chapter 5 finds that, from 2000 to 2005, TFP growth has accounted for an increasing share of output growth in manufacturing industries at the four-digit VSIC level. Moreover, it is interesting to observe the improvement of labor productivity despite the drastic reduction in the capital intensity. This finding suggests that labor productivity growth has been driven largely by TFP growth, rather than capital deepening. Importantly, a further examination of the capital, labor and TFP growth trend gave a significant indication that TFP growth has been driven by the improvement of technical efficiency rather than technological progress in the operation of manufacturing industries. These findings imply that trade liberalization and domestic reforms have promoted manufacturing growth in conformity with Vietnam's comparative advantage, by using more abundant unskilled labor.

The key finding obtained in Chapter 5 is the strong evidence for the robust and positive impact of trade liberalization on manufacturing TFP growth. Lower levels of protection were significantly associated with higher productivity growth. A larger inflow of imports appeared to promote the improvement in manufacturing productivity. In addition, other domestic policy reforms (represented by the competition index of individual industries) were also found to have a significant and robust effect on manufacturing TFP growth, suggesting that more competition is conducive to manufacturing productivity improvement. It was also found that the productivity effect of lower trade protection and higher import competition is reduced or smaller in more competitive industries. The productivity-enhancing effect of export expansion seemed to exist in less concentrated industries, which are usually the export-oriented industries with a high level of private sector participation. These results suggest that the impact of trade liberalization was conditioned by the other domestic policy reforms, particularly institutional reforms. Consequently, it means that promoting domestic competition would help domestic firms to be more responsive to the increased foreign competition, thereby being conducive to better performance.

Empirical evidence in Chapter 5 also confirms the critical significance of other important determinants of manufacturing TFP growth, including output growth, capital intensity, skilled labor and FDI. The evidence found is consistent with the findings of other empirical studies. The robust and positive impact of output growth implies the importance of demand growth to achieve higher productivity and confirm the validity of the Verdoorn Law. It is important to observe the significantly negative impact of capital labor ratio and the robust and positive effect of skilled labor. However, despite their expected effects, two contrasting findings emerged: (i) the positive contribution of capital-labor ratio to TFP growth due to its negative effect and declining trend; and (ii) the small, even negative contribution of skilled labor resulting from its declining trend over the period 2000-05. These findings strengthen the indication that manufacturing TFP growth was driven by technical efficiency improvement rather than technological progress. This trend appears to be consistent with theoretical predictions reviewed in Chapter 2 that trade liberalization has promoted resource reallocation in accordance with the country's comparative advantage, and toward improving the efficiency of resource utilization. The positive and significant impact of FDI lends support to the argument that the FDI sector plays a leading role in driving manufacturing TFP and output growth thanks to its advanced technology and management. The negative estimate of the SOE impact suggests a positive role of the SOE restructuring program to promote manufacturing productivity growth.

Chapter 6 further confirms the findings in Chapter 5 with empirical evidence showing the positive impact of trade liberalization at firm level. The finding that the technical efficiency level of existing firms increased substantially from 2000 to 2003 lends some support to the proposition that technical efficiency improvement played a greater role in the TFP growth of manufacturing industries. Importantly, based on the stochastic production frontier framework, it was found that reduction in trade protection was significantly and positively associated with the fall in the technical inefficiency of manufacturing enterprises. In contrast, import expansion led to a lower level of technical inefficiency. Moreover, higher domestic competition had a positive and significant impact on firm technical efficiency. It is also interesting to find the robust and significant impacts of skilled labor share and capital labor ratio. Higher share of skilled labor was negatively related to technical inefficiency, while higher capital intensity reduced technical efficiency. In addition, firm

size in terms of employment was found to be positively related to technical efficiency level. This means that larger firms seem to be more efficient than smaller firms. The ownership type of firms is important to explain differences in firm efficiency performance. While the proxy of FIEs was found to have an expected positive effect, the PEs were not found to be more efficient than the SOEs.

Examination of the firm-specific characteristics indicates that all existing firms became larger in employment size and lower in capital intensity. Moreover, the skilled labor share of existing firms remained unchanged, even slightly decreased. These patterns of firm behavior were consistent with the trends of industry variables found in Chapter 5. Therefore, it may be concluded that the existing firms have become more efficient by using more labor (increasing employment size) and, at the same time, significantly reducing capital intensity, rather than increasing the share of skilled labor in their employment. This trend in capital intensity is attributed to the competition-induced incentive effects of trade liberalization and other associated domestic reforms, which induced manufacturing firms to exploit cheaper production factors in a more competitive market. This trend is also consistent with the patterns of Vietnam's manufactured trade specialization, and supportive to the indication that the country may possibly fall into the low growth path suggested in Chapter 4.

7.1.3 Thesis contributions

Overall, the thesis has provided a significant amount of empirical evidence to add to the existing literature on trade and growth, showing the positive impact of trade liberalization on manufacturing productivity growth in the case of a transitional economy. It is important that the additional empirical evidence has been obtained using a different approach to the econometric analysis at the industry level in two aspects. First, the econometric model specifications employed the consistent measures of dependent and explanatory variables in the form of growth rates or changes. Second, the regression equations were estimated using the feasible generalized least squares (XTGLS) estimator for panel data. Moreover, the estimation results produced by the XTGLS estimator at the industry level are consistent with those obtained from the stochastic production frontier (SPF) framework at the firm

level. Therefore, the consistency of the estimation results made the empirical evidence obtained robust and conclusive.

7.2 Policy implications

The main implication from the thesis is the importance of relying on comparative advantages and the need to transform Vietnam's industrial structure for the long-term sustained growth of productivity and output under trade opening. As expected, trade liberalization has resulted in considerable improvement in manufacturing performance in terms of output, productivity growth and structural transformation. However, these gains have been obtained by exploiting Vietnam's existing comparative advantages rather than the dynamic factor endowments. Given theoretical predictions that trade specialization patterns are shaped by comparative advantages (i.e. initial conditions), the key to industrial transformation could be promotion of dynamic factor endowments. Consequently, a number of important issues have emerged that are worthy of consideration.

While the development of labor-intensive manufacturing is still overwhelmingly important for Vietnam in the medium term, expansion of a skilled labor force in manufacturing should be a prime concern for policy makers for at least three reasons. Firstly, the fact is that the share of skilled workers in Vietnamese manufacturing in the total employment is very low. While the role of skilled labor has been well documented in the literature, empirical evidence in this thesis again confirms its robust and strong positive effect on the productivity performance of Vietnamese manufacturing. Secondly, providing skilled workers is the key to attracting new technological intensive or high quality FDI, particularly MNC's investment and moving up the technological ladder. "Where MNCs invest, they transfer equipment and technologies suited to existing skills and capabilities" (Lall 2000: 356). The evidence found in this thesis shows that Vietnam has relied heavily on FDI to achieve manufacturing growth and structural transformation. Therefore, at least in the near future, it is undeniable that this sector will continue to play a crucial role in promoting technological progress and productivity growth. Finally, the importance of skill upgrading could also be seen in the relationship between labor productivity and labor costs. A likely situation is the expected rise in wages when the living standards in the society improve due to economic growth. A potential problem is the wage rise when the abundant

labor force is dominated by unskilled workers with low productivity level. This may result in the shift of FDI to other, lower wage countries (Ohno 2008: 2), and contraction of domestic investment in manufacturing, leading to a significant share of workers, being unemployed and unskilled.

Increased availability of skilled labor could be considered in two initiatives with the active involvement of the government. The first proposed initiative is upgrading the skills of the existing manufacturing labor force through learning-by-doing and on-the-job training programs. However, there is a contradiction between the public good nature in the knowledge and skills provision and the private good characteristics of human capital accumulated from the learning process, causing disincentives for firms to provide training. Therefore, various incentives should be considered to encourage firms to provide on-the-job training and for workers to upgrade skills by themselves. Incentives may also be given to vocational training centers or schools to provide affordable training for workers. The second proposed initiative is to increase the supply of new skilled workers by supporting the expansion of vocational training providers (vocational schools and universities). An encouraging start in this direction has already been made by the government in the last decade to develop vocational training schools and reform the tertiary education system. These reforms are expected to continue.

Promoting competition is vital in making the business environment conducive to efficiency-induced efforts and innovation. While this is a complex and multi-dimensional issue, at least two facets could be looked at. The continuity of institutional reform is needed to make the legal and regulatory system conducive to functional markets. In addition, the reform of the SOE sector should be continued toward reducing and eliminating preferential treatment and access to key productive resources (land and capital) as well as further reducing the share of the SOEs in manufacturing activities. Any remaining SOEs should be exposed to market disciplines to operate on the grounds of efficiency. These reforms would also help to avoid the violation of Vietnam's commitments under the WTO and other trade agreements.

To take advantage of technological transmissions through trade opening and the FDI inflows, the technological capability of domestic firms becomes crucial. Domestic firms

play the main role in raising the country's technological level despite reliance on FDI as a driving force of manufacturing growth (Lall 2000; Ohno 2009). Therefore, in addition to availability of skilled labor, the government's incentives should be provided to encourage and support domestic firms to adopt and adapt foreign advanced technologies and management skills, and then in the involvement in R&D activities (particularly imitation). As the FDI sector is leading in technology and management, the government's policy measures should support domestic enterprises to increase their links, through subcontracting, with FDI firms, particularly MNCs, as a realistic and fundamental step toward building their technological capabilities. At the same time, it is obviously suggestive that FDI policy be targeted to attract foreign firms to invest in technology-intensive and skilled labor-intensive production stages and products. In this regard, more policy attention should be paid to the patterns and dynamics of the production network because this phenomenon has become a driving trend in the expansion of MNCs activities in the East Asia since the late 20th century (Athukorala 2011).

Firms' efficient use of capital requires a good infrastructure base, particularly the availability and continuity of the electricity supply. The evidence of a negative capital intensity effect found in this thesis could be due to the lack of supporting infrastructure needed for firm operations. This problem appears to be common in developing countries. Moreover, new investments induced by trade liberalization have been resulting in increased demand for infrastructure. Therefore, the active role of the government to mobilize resources in infrastructure development is desirable in dealing with this national issue.

Finally, the estimation results show that output growth is an important determinant of productivity growth. In addition, the faster output expansion of many import-competing industries compared with export-oriented activities seems to be enhanced by domestic demand growth. Therefore, the domestic market plays a crucial role for manufacturing growth and transformation despite the fact that industrialization in the globalization age is outward-oriented. The need to pay more attention to the domestic market appears to be relevant in Vietnam with its large population and increasing per capita income.

7.3 Limitations and suggestions for further research

While having examined the most important aspects of the relationship between trade liberalization and manufacturing performance in Vietnam, the thesis faces some limitations due to the shortcomings of the databases used. First, the unavailability of information on imported intermediate inputs in the enterprise survey datasets prevented the examination of changes in imported inputs use under trade liberalization and their effects on the productivity growth at the firm and industry levels. Second, the study has not examined the process of resource reallocation within manufacturing industries in terms of firm turnover and its implication on the TFP growth at industry level under trade liberalization. Intra-industry resource reallocations play an important role in driving the aggregate productivity growth of manufacturing (Melitz 2003; Tybout 2003). Therefore, it is important to know whether the expansion of incumbent firms or the entry of new firms made a greater contribution to industry productivity improvement and how trade opening is related to firm turnover. However, the lack of information on production costs of all enterprises in the manufacturing industries is the main problem making the estimation of TFP growth for every firm impossible. Finally, due to the time and financial constraints, the thesis has not examined the structure of manufactured exports in detail to have a better and more accurate evaluation of Vietnam's trade specialization patterns, as well as the extent of structural transformation of manufacturing under trade liberalization.

Given the main message of the thesis on the need and possibility of transforming the industrial structure to achieve high and sustained productivity growth, further research is needed on the following issues:

Firstly, a disaggregate analysis of the structure of manufactured exports based on technological content or sophistication level would give an important insight into Vietnam's trade specialization pattern and its dynamics under trade opening. The time frame should cover a long period, for example, from 1995 to 2010. Furthermore, a comparison of Vietnam's trade pattern with other ASEAN countries and China could be valuable. However, a crucial condition for this disaggregate analysis is a feasible and relevant methodology of measuring the technological content and the factor intensity of

exported and imported goods. A search for such a methodology could be a valuable research direction.

Secondly, a broad perspective examination of resource allocation under trade liberalization between manufacturing and other sectors would indicate significant implications for the future growth of manufacturing and the whole economy. This analysis can be implemented using an extended general enterprise dataset, covering all sectors of the economy.

Thirdly, the investigation of labor training and R&D programs implemented in the manufacturing enterprises could be desirable to have a deep understanding of their productivity performance. Moreover, the examination of the extent and determinants of these programs at the firm level could provide significant policy implications.

Finally, as agriculture still plays a major role in economic growth and accounts for a dominant share of employment in Vietnam, the growth of agriculture-based industries under trade liberalization remains important. Consequently, an in-depth examination of this industry group in terms of output and productivity growth and trade performance under trade opening could be desirable.

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APPENDIX

Table A3.1 The evolution of Vietnam's tariff system

Year	Simple average rate (%)					Number of tariff lines				
	MFN	NORMAL	CEPT	AFTA	ACFTA	MFN	NORMAL	CEPT	AFTA	ACFTA
1995	12.80	19.20				3135	3135			
1996	12.30	18.45	0.94	8.82		3216	3216	848	3121	
1997	13.40	20.10	4.56	9.65		3126	3126	1463	3294	
1998	13.60	20.40	6.08	9.90		3612	3612	1714	3299	
1999	16.02	24.03	7.06	14.56		6224	6224	3579	6299	
2000	16.10	24.15	7.26	13.70		6365	6365	4231	6398	
2001	16.19	24.29	6.75	11.44		6425	6425	4985	6488	
2002	16.40	24.60	6.92	11.17		6539	6539	5568	6621	
2003	18.66	27.99	6.97	9.37		10689	10689	10137	10657	
2004	18.27	27.41	5.93	8.32		10693	10693	10150	10693	
2005	17.88	26.82	4.52	6.65		10693	10693	10265	10693	
2006	17.22	25.83	2.49	4.43	12.94 (15.06)	11393	11393	10342	10693	9132 (10693)
2007	13.87	20.81	2.45	4.10	12.08 (14.12)	11108	11108	10342	10693	9908 (10693)

Notes: CEPT is the Inclusion List of import tariff items and AFTA is a whole tariff schedule for ASEAN imports.
Source: CIE (1998), author's calculations based on data obtained from CIEM and MOF (Ministry of Finance).

Table A3.2 Shares of tariff schedules in the total import

Tariff schedule	2000	2002	2004	2006
MFN	66.7	73.2	74.5	53.9
ASEAN	28.5	24.2	24.3	27.9
NORMAL	4.9	2.7	1.2	1.7
CAFTA				16.5
Total	100.0	100.0	100.0	100.0

Source: Author's calculations based on data obtained from CIEM and MOF (Ministry of Finance).

Table A3.3 Implementation of CEPT scheme: 1996-2007

Year	Number of CEPT rates	Total ASEAN tariff lines	Share of CEPT rates (%)	Simple average of CEPT rates (%)
1996	848	3,121	27.2	0.93
1997	1,463	3,294	44.4	4.56
1998	1,714	3,299	52.0	6.07
1999	3,579	6,299	56.8	7.06
2000	4,231	6,398	66.1	7.26
2001	4,985	6,488	76.8	6.75
2002	5,568	6,621	84.1	6.92
2003	10,137	10,657	95.1	6.97
2004	10,150	10,693	94.9	5.94
2005	10,265	10,693	96.0	4.52
2006	10,342	10,693	96.7	2.49
2007	10,342	10,693	96.7	2.45

Source: Author's calculations based on data obtained from CIEM and MOF (Ministry of Finance).

Table A3.4 Vietnam's import tariff rate structure (MNF Schedule): 1995-2007

Tariff rates	May 1995		March 1997		December 2000		December 2003		December 2006		December 2007	
	No of lines	%	No of lines	%	No of lines	%	No of lines	%	No of lines	%	No of lines	%
0	976	31.1	978	31.3	2019	31.7	3092	28.9	3552	31.2	3255	29.3
0 - 10	944	30.1	999	32.0	1764	27.7	2976	27.8	3274	28.7	3422	30.8
10 - 20	638	20.4	413	13.2	609	9.6	1029	9.6	1150	10.1	1937	17.4
20 - 50	543	17.3	695	22.2	1905	29.9	3261	30.5	3035	26.6	2129	19.2
50 - 100	20	0.6	35	1.1	68	1.1	319	3.0	332	2.9	310	2.8
> 100	14	0.4	6	0.2	0	0.0	12	0.1	50	0.4	55	0.5
Total number of tariff lines	3135		3126		6365		10689		11393		11108	
Number of rates	36		35		19		15		25		26	
Average rate	12.80		13.40		16.20		18.49		17.22		13.87	
Tariff range	0 - 200		0 - 200		0 - 100		0 - 150		0 - 150		0 - 150	
Coefficient of Variation	1.31		1.28		1.17		1.21		1.29		1.33	

Source: CIE (1998) and author's calculations based on data from CIEM, MOF.

Table A3.5 Products subject to quantitative restriction

Number	1996	1998	1999	2000	2001	2002	2003
1.	Petroleum	Petroleum	Petroleum	Petroleum	Petroleum	Petroleum	Petroleum
2.	Sugar	Sugar	Sugar	Sugar	Sugar	Sugar	Sugar
3.	Fertilizer	Fertilizer	Fertilizer	Steel	Steel	Cement	
4.	Steel	Steel	Steel	Cement	Cement	Motorcycles	
5.	Cement	Cement	Cement	Glass	Motorcycles		
6.		Glass	Glass	Motorcycles	Cars		
7.		Motorcycles	Motorcycles	Cars	Vegetable oil		
8.		Cars	Cars	Paper			
9.		Paper	Paper	Vegetable oil			
10.			Electric fans				
11.			Ceramic tiles				
12.			Porcelain				
13.			Caustic soda				
14.			Bicycles				
15.			Vegetable oil				
16			Plastics				
17.			Plastic packaging				
Total number of commodity groups	5	9	17	9	7	4	2

Source: CIE (1998); Athukorala (2005).

Table A3.6 Herfindalh Indices of Two-digit Manufacturing Industries, 2000-05

Code	Industry Name	2000	2001	2002	2003	2004	2005
15	Food products and beverages	0.008	0.009	0.008	0.007	0.006	0.006
16	Tobacco products	0.123	0.121	0.142	0.140	0.176	0.161
17	Textiles	0.027	0.021	0.019	0.018	0.017	0.019
18	Wearing apparel	0.020	0.017	0.015	0.012	0.011	0.010
19	Leather, luggage, handbags and footwear	0.042	0.041	0.039	0.045	0.040	0.041
20	Wood and wood products	0.019	0.018	0.012	0.009	0.009	0.009
21	Paper and paper products	0.075	0.030	0.020	0.015	0.015	0.019
22	Publishing, printing and media products	0.030	0.034	0.031	0.030	0.026	0.023
23	Coke, refined petroleum products	0.278	0.214	0.254	0.242	0.216	0.195
24	Chemicals and chemical products	0.028	0.026	0.024	0.023	0.021	0.021
25	Rubber and plastics products	0.015	0.016	0.013	0.011	0.010	0.007
26	Other non-metallic mineral products	0.028	0.023	0.019	0.017	0.015	0.013
27	Basic metals	0.086	0.081	0.058	0.051	0.052	0.048
28	Fabricated metal products	0.013	0.010	0.008	0.008	0.008	0.007
29	Machinery and equipment n.e.c.	0.039	0.029	0.025	0.023	0.044	0.038
30	Office, accounting and computing machinery	0.992	0.981	0.802	0.539	0.526	0.480
31	Electrical machinery and apparatus n.e.c.	0.041	0.034	0.035	0.031	0.057	0.025
32	Radio, television and communication equipment	0.076	0.063	0.054	0.052	0.054	0.050
33	Medical, precision and optical instruments	0.112	0.114	0.103	0.089	0.085	0.090
34	Motor vehicles, trailers and semi-trailers	0.117	0.096	0.098	0.092	0.070	0.076
35	Other transport equipment	0.117	0.068	0.086	0.073	0.066	0.069
36	Furniture; manufacturing n.e.c.	0.020	0.017	0.041	0.009	0.008	0.007
	Total	0.105	0.094	0.087	0.070	0.070	0.064

Source: Author's calculations.

Table A3.7 Nominal rates of protection by IO industry (weighted average)

IO code	IO industry name	Weighted NRPs							
		2000	2001	2002	2003	2004	2005	2006	2007
1	Paddy (all kinds)	13.57	17.06	20.00	20.00	18.06	5.00	15.02	15.02
2	Raw rubber	3.01	3.31	3.02	3.02	3.01	3.01	2.76	2.76
3	Coffee beans	20.00	19.94	19.57	19.32	10.39	10.39	10.22	9.07
4	Sugarcane	0.00	0.00	0.00	5.00	6.67	6.67	6.65	6.65
5	Tea	50.00	52.30	50.24	48.93	49.54	50.67	35.11	34.10
6	Other crops	8.16	8.42	9.82	11.89	9.34	11.40	8.97	6.30
7	Pig (all kinds)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Cattle (all kinds)	0.00	0.00	0.00	0.00	0.19	0.19	0.00	0.00
9	Poultry	0.99	1.03	0.88	0.88	2.08	2.50	2.50	2.50
10	Other Livestock	1.93	5.55	2.17	0.43	1.65	0.91	0.34	0.34
13	Forestry	0.02	0.26	0.16	0.15	0.12	0.18	0.15	0.14
14	Fishery	34.59	26.47	24.05	23.16	26.65	26.34	28.07	27.66
15	Fish farming	11.81	14.56	12.45	16.97	20.73	14.61	15.47	6.55
16	Coal	0.00	2.58	2.56	2.41	3.37	2.51	0.65	0.65
17	Metallic ore	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	Stone	0.02	0.19	0.53	0.74	1.17	1.89	1.68	1.67
19	Sand, gravel	3.41	3.55	3.86	4.13	4.38	3.81	3.38	3.38
20	Other non-metallic minerals	2.40	3.90	2.52	2.94	3.01	3.11	2.31	2.31
21	Crude oil, natural gas (except exploration)	5.36	5.00	7.57	5.32	6.41	5.00	5.00	4.98
22	Processed, preserved meat and by-products	6.70	9.22	10.20	9.32	9.85	8.77	11.03	10.33
23	Processed vegetable, and animal oils and fats	8.23	8.61	5.18	3.39	3.62	2.18	1.87	1.85
24	Milk, butter and other dairy products	20.20	20.00	22.04	19.33	18.99	17.75	17.12	17.05
25	Cakes, jams, candy, coca, chocolate products	42.15	42.17	42.93	30.28	23.99	16.99	10.45	9.50
26	Processed and preserved fruits and vegetables	39.61	46.37	37.59	37.17	36.67	31.49	30.66	22.81

27	Alcohol and liquors (excluding beer)	98.24	97.89	93.29	96.79	76.22	43.60	28.72	28.72
28	Beer	6.36	5.83	6.80	6.26	5.53	5.70	6.06	5.79
29	Non-alcoholic beverages	50.00	39.42	30.54	30.36	19.06	11.66	13.73	13.73
30	Sugar, refined	10.00	11.74	10.20	9.57	6.17	12.39	18.30	17.11
31	Coffee, processed	0.00	33.54	50.00	50.00	44.04	38.62	47.54	38.29
32	Tea, processed	50.00	42.62	42.85	40.51	50.00	50.00	46.59	37.35
33	Cigarettes and other tobacco products	30.65	31.16	31.01	31.88	33.56	33.82	37.50	42.84
34	Processed seafood and by-products	26.15	21.70	25.38	22.83	22.10	21.12	20.31	17.96
35	Rice, processed	27.14	34.26	20.19	20.17	15.50	5.98	18.03	18.03
36	Other food manufactures	26.10	21.05	21.16	21.50	22.24	22.23	18.48	17.03
37	Glass and glass products	8.12	8.78	9.72	11.01	10.04	10.02	8.94	8.54
38	Ceramics and by-products	11.87	13.02	12.51	11.23	11.72	12.80	11.11	10.82
39	Bricks, tiles	49.13	49.91	49.76	43.52	46.66	48.99	45.28	45.26
40	Cement	29.19	22.37	30.50	21.51	27.01	10.83	6.39	6.39
41	Concrete, mortar and other cement products	21.30	10.67	14.36	16.91	13.59	12.91	14.53	14.52
42	Other building materials	9.03	4.83	7.46	7.68	8.75	9.05	9.57	9.37
43	Paper pulp and paper products and by-products	16.74	15.98	16.58	16.64	13.48	12.74	10.73	9.84
44	Processed wood and wood products	5.91	5.61	4.43	4.41	4.13	4.87	4.08	3.95
45	Basic organic chemicals	0.88	1.33	1.87	1.51	1.61	1.18	0.86	0.85
46	Basic inorganic chemicals	1.40	1.29	1.18	1.46	1.46	1.50	1.36	1.36
47	Chemical fertilizer	0.48	0.30	0.36	0.28	0.34	0.30	0.29	0.29
48	Other fertilizer (non-chemical)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	Pesticides	2.50	3.01	2.56	2.83	2.83	2.85	2.95	2.85
50	Veterinary drugs	0.31	0.61	0.45	0.63	0.59	0.50	0.48	0.48
51	Medicine	5.78	5.42	4.94	5.13	4.50	4.28	4.48	4.43
52	Processed rubber and by-products	9.46	8.70	8.12	9.06	8.69	7.98	6.37	6.17

53	Soap, detergents	42.71	29.16	22.19	22.59	18.09	13.44	9.19	8.12
54	Perfumes and other toiletry preparations	25.33	21.25	17.46	16.31	15.05	12.42	10.17	9.66
55	Plastic, original and semi-processed	0.91	0.80	0.84	0.86	1.03	0.95	0.94	0.91
56	Plastic products	14.26	14.79	14.96	15.34	16.16	16.70	16.94	15.95
57	Paints	5.43	5.30	6.29	7.11	7.28	7.64	7.57	7.57
58	Ink, varnish and other painting materials	5.36	5.42	5.45	5.58	5.66	5.84	5.83	5.83
59	Other chemical products	5.90	5.71	5.90	4.96	4.72	4.61	4.18	4.07
60	Medical instruments and apparatus	0.22	0.78	0.83	0.51	0.44	0.46	0.27	0.24
61	Precision and optical equipment, meters (all kinds)	6.94	4.85	4.73	4.59	4.01	3.41	2.36	2.09
62	Home appliances and parts	36.31	35.43	35.02	28.75	30.54	26.48	15.74	14.02
63	Motorcycles and accessories	59.70	59.35	58.39	58.59	47.41	43.55	41.10	37.19
64	Bicycles and accessories	50.32	49.74	48.77	46.05	47.71	44.44	40.28	36.21
65	Machine tools	7.22	7.14	6.92	7.25	7.18	6.59	4.98	4.79
66	Other general-purpose machinery	3.92	8.58	6.11	6.20	6.65	7.05	3.90	3.54
67	Special-purpose machinery	3.01	2.48	2.15	1.69	1.74	1.72	1.89	1.87
68	Automobiles	54.83	57.30	56.66	42.23	39.01	38.45	24.37	23.38
69	Other transport equipment	2.19	1.09	1.46	1.06	1.69	4.42	6.00	4.86
70	Transformers	3.28	8.27	6.72	7.18	7.74	4.27	4.02	3.64
71	Other electrical machinery and equipment	7.12	10.43	10.73	7.19	8.53	8.26	8.37	8.14
72	Broadcasting, television and communication machines	6.88	9.51	11.41	8.30	5.33	4.39	3.48	3.45
73	Non-ferrous metals and products (except machinery equipment)	4.92	5.14	5.56	5.71	5.24	4.35	4.80	4.58
74	Ferrous metals and products (except machinery equipment)	2.31	2.53	2.53	1.59	1.35	0.93	0.57	0.57
75	Textiles	40.11	40.16	40.02	39.10	38.25	38.47	35.16	17.21

76	Fibers, thread (all kinds)	12.61	8.82	11.76	12.06	12.53	15.12	15.59	6.18
77	Clothing (garments)	48.91	48.54	47.44	46.20	44.47	44.03	41.23	24.98
78	Carpets and tapestry textiles	22.05	25.41	23.61	21.48	20.48	17.31	19.17	10.57
79	Weaving and embroidery of textile -based goods (except carpets)	31.85	30.70	30.64	29.75	28.12	29.27	28.40	12.32
80	Leather (products of tanneries)	7.63	6.08	7.32	5.88	6.70	6.92	7.02	7.01
81	Leather goods	24.05	25.50	25.60	24.50	26.19	20.15	21.12	20.75
82	Animal feeds	10.28	10.32	7.09	6.72	7.85	7.09	7.46	7.24
83	Products of printing industry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	Publishing	13.19	12.90	12.16	11.76	10.45	9.84	8.78	8.10
85	Other products, unclassified	23.80	20.83	21.78	22.37	23.06	21.69	20.30	19.94
	All traded goods sectors	15.52	16.00	16.31	16.15	15.21	11.93	13.25	11.50

Source: Author's calculations.

Table A3.8 Nominal protection rates by the main groups of IO manufacturing industries (percent)

Year	Food and beverages	Import-competing	Export-oriented	Intermediate goods, machinery and equipment	All Manufacturing
1997	32.3	32.0	28.0	5.0	26.5
2000	24.5	34.2	30.8	5.1	23.0
2001	24.6	32.5	31.1	4.7	22.6
2002	22.1	33.6	30.5	5.2	22.1
2003	20.8	29.4	29.6	5.0	20.4
2004	18.6	28.7	29.4	4.9	19.5
2005	15.7	25.1	27.6	4.9	17.5
2006	17.9	21.2	26.4	4.9	16.9
2007	17.0	20.2	17.8	3.6	14.7
1997-2000	-7.8	2.2	2.8	0.1	-3.5
2000-2007	-7.5	-14.0	-13.0	-1.5	-8.3

Source: Institute of Economics (2001); and author's calculations.

Table A3.9 Effective rate of protection by sector: 1997-2007

Sector	1997	2000	2001	2002	2003	2004	2005	2006	2007
Agriculture	8.2	14.6	15.6	16.4	17.9	16.8	10.9	14.7	12.7
Mining	4.0	5.5	5.2	7.99	5.74	7.6	5.6	5.3	5.2
Manufacturing	91.1	65.6	66.2	54.1	50.4	47.1	43.4	42.7	36.8
Total	54.9	34.6	35.5	31.1	30.5	28.5	23.7	25.5	22.1
CV (Manufacturing)	1.17	1.35	1.37	1.32	1.34	1.32	1.31	1.34	1.37
CV (Total)	1.46	1.50	1.54	1.48	1.51	1.48	1.48	1.49	1.52
Correlation between NRPs and ERPs (All traded goods sectors)	0.90	0.89	0.87	0.93	0.93	0.93	0.93	0.94	0.93

Note: (1) ERP estimates are based on weighted NRPs by IO industries and the 1997 ERPs are calculated from the ERPs by IO industries estimated by Institute of Economics (2001). The average ERP of each sector is weighted by value added of IO industries;
(2) CV is coefficient of variation measured as the ratio of standard deviation to mean.
Source: Institute of Economics (2001); and author's calculations.

Table A3.10 Effective rates of protection by IO industry

IO code	IO industry name	Weighted ERPs							
		2000	2001	2002	2003	2004	2005	2006	2007
1	Paddy (all kinds)	18.40	23.21	27.25	27.30	24.62	6.61	20.43	20.43
2	Raw rubber	3.20	3.55	3.01	3.28	3.35	3.35	2.96	2.86
3	Coffee beans	29.54	29.41	28.69	28.58	15.23	15.23	14.89	13.07
4	Sugarcane				5.61	7.65	7.64	7.55	7.51
5	Tea	77.12	80.70	77.08	75.61	76.70	78.52	53.92	52.10
6	Other crops	9.23	9.56	11.17	13.70	10.69	13.15	10.28	7.10
7	Pig (all kinds)	-9.73	-10.02	-8.53	-8.76	-8.31	-7.80	-7.82	-6.91
8	Cattle (all kinds)		-6.60	**-5.72**	**-5.79**	-5.05	-5.59	-5.29	-4.74
9	Poultry	-3.34	-3.51	-3.17	-3.09	-1.32	0.66	-0.28	-0.14
10	Other Livestock	-0.12	4.82	0.45	-1.93	-0.30	-0.68	-1.92	-1.86
13	Forestry	-1.09	-0.85	-1.26	-0.79	-0.67	-0.60	-0.70	-0.87
14	Fishery	66.79	48.65	39.68	43.25	52.13	50.96	52.32	49.40
15	Fish farming	13.07	17.06	14.12	20.43	25.32	17.35	18.38	6.59
16	Coal		-0.12	-0.79	0.42	2.22	0.98	-1.75	-2.06
17	Metallic ore	-3.00	-3.24	-3.84	-2.80	-2.50	-2.45	-2.65	-2.92
18	Stone	-12.40	-10.60	-11.85	-9.08	-8.68	-5.13	-4.96	-5.22
19	Sand, gravel	-0.34	0.48	-0.77	1.97	2.22	2.80	2.12	1.57
20	Other non-metallic minerals	-2.37	0.86	-2.79	-0.53	-0.51	0.61	-0.68	-0.97
21	Crude oil, natural gas (except exploration)	6.38	5.90	9.13	6.47	8.05	6.18	6.08	5.92
22	Processed, preserved meat and by-products	21.86	32.40	36.53	33.14	34.04	29.55	38.89	36.19
23	Processed vegetable, and animal oils and fats	10.94	12.12	0.17	-3.15	-2.37	-5.71	-5.62	-4.54
24	Milk, butter and other dairy products	43.78	42.48	49.45	42.75	42.64	38.61	36.51	36.87
25	Cakes, jams, candy, coca, chocolate products	113.18	113.47	118.49	74.67	54.84	31.16	5.66	3.47
26	Processed and preserved fruits and vegetables	99.80	117.97	91.57	91.08	92.89	77.45	74.81	53.24
27	Alcohol and liquors (excluding beer)	205.01	203.58	193.88	201.95	156.96	84.52	51.68	52.89

28	Beer	-0.98	-3.82	1.70	0.53	0.67	3.93	2.50	2.33
29	Non-alcoholic beverages	174.22	131.37	95.71	96.12	53.93	22.35	28.75	29.84
30	Sugar, refined	27.34	33.66	27.31	19.31	5.75	27.21	46.84	42.36
31	Coffee, processed	-	57.45	96.86	97.46	92.23	79.74	100.91	80.08
32	Tea, processed	87.41	64.09	66.52	61.69	88.10	87.13	93.54	68.30
33	Cigarettes and other tobacco products	82.70	85.37	83.22	85.69	96.58	97.53	113.94	134.89
34	Processed seafood and by-products	44.28	36.23	59.10	47.31	36.75	36.82	29.02	23.72
35	Rice, processed	205.57	260.68	42.94	43.42	3.52	22.33	70.16	69.91
36	Other food manufactures	110.81	76.10	75.79	76.79	88.90	91.26	66.93	64.44
37	Glass and glass products	12.40	13.57	14.36	18.86	17.16	17.31	14.72	13.18
38	Ceramics and by-products	34.19	38.01	34.46	31.75	34.14	39.74	33.62	31.56
39	Bricks, tiles	119.14	121.02	118.63	105.14	113.81	120.48	110.49	109.39
40	Cement	71.65	50.38	71.59	49.24	66.42	18.69	5.01	3.69
41	Concrete, mortar and other cement products	38.99	13.47	19.46	30.27	19.73	23.63	29.33	29.15
42	Other building materials	5.96	-2.88	0.85	5.12	6.58	11.61	14.28	13.48
43	Paper pulp and paper products and by-products	40.54	38.27	38.10	41.16	32.19	30.28	23.76	20.68
44	Processed wood and wood products	17.02	15.45	9.67	11.23	10.71	13.75	10.41	9.56
45	Basic organic chemicals	-15.23	-12.64	-15.44	-10.90	-11.32	-7.94	-7.85	-8.92
46	Basic inorganic chemicals	-1.74	-2.25	-3.34	-1.68	-1.34	-0.84	-0.95	-1.15
47	Chemical fertilizer	-4.65	-4.86	-5.43	-4.24	-4.01	-3.53	-3.57	-3.98
48	Other fertilizer (non-chemical)	-3.58	-3.71	-3.93	-3.61	-3.67	-3.38	-3.09	-2.92
49	Pesticides	-0.13	1.33	0.07	1.06	1.17	1.36	1.87	1.67
50	Veterinary drugs	-2.26	-1.40	-1.77	-1.58	-1.65	-1.74	-1.57	-1.53
51	Medicine	9.14	8.39	7.00	7.71	6.33	6.17	6.93	6.86
52	Processed rubber and by-products	16.22	14.35	11.41	16.09	15.78	14.28	9.99	8.63
53	Soap, detergents	174.25	115.86	85.09	87.79	68.63	49.66	32.25	27.61
54	Perfumes and other toiletry preparations	74.60	61.04	47.82	44.85	40.82	32.36	25.46	24.04
55	Plastic, original and semi-processed	-2.28	-2.52	-2.77	-2.40	-2.10	-2.23	-2.38	-2.39
56	Plastic products	37.28	39.19	39.49	40.87	43.15	45.05	45.88	43.09

57	Paints	11.45	10.76	13.53	16.94	18.04	20.40	20.00	20.13
58	Ink, varnish and other painting materials	2.74	3.31	3.01	4.06	5.30	6.05	6.93	7.24
59	Other chemical products	9.16	8.58	9.23	7.76	7.36	7.67	7.06	6.84
60	Medical instruments and apparatus	-5.50	-4.16	-4.31	-4.24	-4.08	-3.60	-3.65	-3.71
61	Precision and optical equipment, meters (all kinds)	8.51	3.00	1.86	2.27	1.55	0.44	-2.27	-2.77
62	Home appliances and parts	82.16	79.01	77.22	63.36	68.51	59.14	32.94	28.80
63	Motorcycles and accessories	155.28	154.27	151.32	152.35	122.61	112.87	106.32	95.89
64	Bicycles and accessories	136.91	135.42	132.09	124.67	129.76	121.23	109.40	97.78
65	Machine tools	5.56	5.32	3.44	6.08	6.79	6.87	2.14	1.98
66	Other general-purpose machinery	1.87	14.38	7.18	8.18	9.55	11.44	3.15	2.28
67	Special-purpose machinery	-20.42	-22.74	-24.29	-22.47	-19.61	-17.41	-14.71	-13.56
68	Automobiles	84.58	88.63	87.44	64.39	59.52	58.85	36.25	34.75
69	Other transport equipment	-5.32	-8.31	-10.54	-7.06	-4.22	2.40	4.59	0.32
70	Transformers	-1.78	13.37	6.99	10.55	12.88	3.28	2.04	0.53
71	Other electrical machinery and equipment	12.11	23.69	22.51	11.58	20.32	20.63	22.44	21.65
72	Broadcasting, television and communication machines	6.97	13.85	18.19	11.37	3.98	2.40	1.37	1.55
73	Non-ferrous metals and products (except machinery equipment)	1.08	2.46	1.78	5.03	4.27	2.25	4.33	3.18
74	Ferrous metals and products (except machinery equipment)	-37.42	-38.67	-40.34	-40.26	-32.26	-30.15	-28.55	-26.30
75	Textiles	147.91	154.70	147.88	145.10	140.73	140.25	125.87	56.93
76	Fibers, thread (all kinds)	20.63	11.68	18.45	19.29	20.85	27.40	29.34	7.52
77	Clothing (garments)	178.34	178.46	169.61	165.10	156.25	152.95	145.20	97.82
78	Carpets and tapestry textiles	40.97	55.82	47.13	40.57	37.14	24.37	31.77	18.67
79	Weaving and embroidery of textile -based goods (except carpets)	54.40	52.86	51.25	49.88	46.10	48.75	48.21	17.73
80	Leather (products of tanneries)	0.17	-3.68	-1.06	-3.87	-0.77	-0.25	1.42	8.00
81	Leather goods	82.91	92.88	91.15	88.21	96.93	65.02	72.11	81.66

82	Animal feeds	-8.66	-7.09	-19.48	-20.35	-9.75	-7.47	-10.47	-8.13
83	Products of printing industry	-37.96	-34.01	-35.54	-36.19	-35.50	-33.46	-30.81	-29.88
84	Publishing	24.26	23.86	21.62	20.87	18.97	17.86	16.11	14.78
85	Other products, unclassified	53.62	44.79	47.31	50.43	53.44	49.99	47.60	49.26
	All traded goods sectors	205.57	260.68	193.88	201.95	156.96	152.95	145.20	134.89
	Min (all traded goods)	-37.96	-38.67	-40.34	-40.26	-35.50	-33.46	-30.81	-29.88
	Simple Average (All traded goods)	37.76	36.00	32.18	30.30	28.70	25.74	24.27	20.85
	CV (All traded goods)	1.50	1.54	1.48	1.51	1.48	1.48	1.49	1.52
	Max (Manufacturing)	205.57	260.68	193.88	201.95	156.96	152.95	145.20	134.89
	Min (Manufacturing)	-37.96	-38.67	-40.34	-40.26	-35.50	-33.46	-30.81	-29.88
	Simple Average (Manufacturing)	45.27	43.99	39.05	37.02	34.88	31.23	29.46	25.10
	CV (Manufacturing)	1.35	1.37	1.32	1.34	1.32	1.31	1.34	1.37
	Correlation between NRPs and ERPs (All traded goods sectors)	0.89	0.87	0.93	0.93	0.93	0.93	0.94	0.93

Note: (1) ERP estimates are based on weighted NRPs by IO industries;
(2) CV is coefficient of variation measured as the ratio of standard deviation to mean;
(3) The ERPs of the year 1997 are not presented here because of the different IO Table.
Source: Author's calculations.

Table A3.11 Nominal and effective rates of protection by economic sectors (percent)

Sector	1997		2000		2003		2006		2007	
	NRP	ERP	NRP	ERP	NRP	ERP	NRP	ERP	NRP	ERP
Agriculture	7.7	8.2	10.93	14.6	13.71	17.9	11.16	14.7	9.70	12.7
Mining	8.7	4.0	4.92	5.5	2.19	5.74	1.23	5.3	1.23	5.2
Manufacturing	26.5	91.1	23.01	65.6	20.41	50.4	16.92	42.7	14.65	36.8
Total	18.5	54.9	15.52	34.6	16.15	30.5	13.25	25.5	11.50	22.1

Note: The ERPs of the year 1997 are calculated from ERPs by IO industries estimated by Institute of Economics (2001).
Source: Institute of Economics (2001); and author's calculations

Table A3.12 Effective rates of protection by the main groups of IO manufacturing industries

Year	Food products and beverages	Import competing	Export-oriented	Intermediate goods, machinery and equipment	All manufacturing
1997	142.4	81.3	63.7	-2.3	91.1
2000	88.3	75.8	107.2	-5.0	65.6
2001	92.9	69.4	110.9	-6.1	66.2
2002	52.8	71.7	105.6	-6.1	54.1
2003	47.9	64.0	103.1	-4.6	50.4
2004	36.0	61.5	102.2	-2.8	47.1
2005	37.8	48.3	92.0	-1.9	43.4
2006	44.8	38.7	89.1	-0.7	42.7
2007	43.0	35.3	65.8	-2.8	36.8
1997-2007	-99.4	-46.0	2.1	-0.5	-54.3
2000-2007	-45.3	-40.6	-41.4	2.2	-28.7

Note: The ERPs of the year 1997 are calculated from ERPs by IO industries estimated by Institute of Economics (2001).
Source: Institute of Economics (2001); Author's calculations.

Table A3.13 Effective rates of protection by VSIC industry at the two-digit level

Code	Industry name	Effective protection rate								
		1997	2000	2001	2002	2003	2004	2005	2006	2007
15	Food products and beverages	152.8	62.7	53.7	59.0	52.2	49.4	47.7	39.3	34.7
16	Tobacco products	206.3	82.7	85.4	83.2	85.7	96.6	97.5	113.9	134.9
17	Textiles	59.6	124.4	127.9	123.2	123.0	118.7	119.2	108.5	50.2
18	Wearing apparel	109.2	178.3	178.5	169.6	165.1	156.2	153.0	145.2	97.8
19	Leather, leather products and footwear	32.2	69.7	77.4	76.4	69.8	79.3	53.2	59.3	68.4
20	Wood and wood products, except furniture	18.2	17.0	15.5	9.7	11.2	10.7	13.7	10.4	9.6
21	Paper and paper products	65.3	40.5	38.3	38.1	41.2	32.2	30.3	23.7	20.7
22	Publishing, printing an recorded media	25.3	13.2	16.5	17.5	13.7	9.0	7.8	6.6	6.1
23	Coke, refined petroleum products	4.8	4.3	3.7	3.0	3.9	4.1	3.8	3.1	2.8
24	Chemicals and chemical products	28.0	11.1	8.7	7.0	7.9	7.2	7.1	6.4	4.3
25	Rubber and plastics products	83.8	32.9	33.5	32.6	34.5	34.5	35.0	33.7	30.8
26	Non-metallic mineral products	74.9	41.8	36.5	40.2	37.6	42.4	38.3	33.9	32.7
27	Basic metals	9.7	-8.6	-7.9	-8.8	-6.7	-4.8	-5.8	-3.9	-4.1
28	Fabricated metal products	6.5	1.5	2.8	2.1	5.3	4.6	2.6	4.6	3.4
29	Machinery and equipment	-6.3	-11.7	-12.7	-14.8	-14.2	-11.3	-9.8	-9.9	-9.3
30	Office, accounting and computing machinery	-20.3	-20.4	-22.7	-24.3	-22.5	-19.6	-17.4	-14.7	-13.6
31	Electrical machinery	20.5	12.0	23.6	22.4	11.6	20.3	20.5	22.3	21.5
32	Radio, television and communication equipment	6.8	7.0	13.8	18.2	11.4	4.0	2.4	1.4	1.5
33	Medical, precision and optical instruments	10.8	1.7	-0.5	-1.2	-0.9	-1.2	-1.5	-2.9	-3.2
34	Motor vehicles, trailers and semi-trailers	88.6	75.2	78.7	77.4	57.1	53.0	53.0	32.9	31.1
35	Other transport equipment	90.7	29.9	27.7	25.2	27.4	23.8	26.8	26.7	21.2
36	Furniture and manufacturing n.e.c.	37.6	49.3	41.9	42.9	45.7	46.6	44.2	41.6	42.9
	All manufacturing	91.1	65.6	66.2	54.1	50.4	47.1	43.4	42.7	36.8

Note: The ERPs of the year 1997 are calculated from ERPs by IO industries estimated by Institute of Economics (2001).
Source: Institute of Economics (2001); Author's calculations.

Chapter 4

Table A4.1 Selected macroeconomic indicators: 1990-2007

Variable	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
GDP growth (annual %)	5.1	6.0	8.7	8.1	8.8	9.5	9.3	8.2	5.8	4.8
GDP (current US$ mill)	6,471.7	9,613.4	9,867.0	1,3181.0	16,286.4	20,736.2	24,657.5	26,843.7	27,209.6	28,683.7
Goods exports (current US$ mill) [1]	2,404.0	2,087.0	2,581.0	2,985.0	4,054.0	5,449.0	7,255.9	9,185.0	9,360.3	11,541.4
Goods imports (current US$ mill) [1]	2,752.0	2,338.0	2,541.0	3,924.0	5,826.0	8,155.4	11,143.6	11,592.3	11,499.6	11,742.1
Growth of goods exports (%)		-13.2	23.7	15.7	35.8	34.4	33.2	26.6	1.9	23.3
Growth of goods imports (%)		-15.0	8.7	54.4	48.5	40.0	36.6	4.0	-0.8	2.1
Trade balance (US$ mill)	-348.0	-251.0	40.0	-939.0	-1,772.0	-2,706.4	-3,887.7	-2,407.3	-2,139.4	-200.7
Trade balance (% GDP)	-5.4	-2.6	0.4	-7.1	-10.9	-13.1	-15.8	-9.0	-7.9	-0.7
Current account balance (US$ mill)[2]				-1395	-1,872	-2,648	-2431	-1664	-1067	1,285
Balance of payment (US$ mill) [2]				-1056	-387	-23	-281	-4	-524	768
Budget deficit (% of GDP) [2]				-2.4	-1.7	-0.7	-0.7	-1.7	-0.1	-1.6
Official exchange rate (VND/USD, annual average)	6,482.8	10,037.0	11,202.2	10,641.0	10,965.7	11,038.3	11,032.6	11,683.3	13,268.0	13,943.2
Nominal effective exchange rate (NEER, 1992=100)[3]			100.0	111.3	109.8	107.1	112.1	115.5	119.4	110.4
Real effective exchange rate (REER, 1992=100) [3]			100.0	104.7	101.5	107.2	113.5	117.2	125.9	119.4
Real effective exchange rate (REER, 2000=100) [4]										
Inflation Rate (%)[5]	67.1	67.5	17.5	5.2	14.4	12.7	5.7	3.2	7.3	4.1
Real interest rate (%)[6]			0.9	1.1	3.7	3.4	4.9	4.1	0.6	4.0
Foreign investment flow (net, US$ mill)	180.0	375.2	473.9	926.3	1,944.5	1,780.4	2,395.0	2,220.0	1,671.0	1,412.0
Foreign investment flow (net, % GDP)	2.8	3.9	4.8	7.0	11.9	8.6	9.7	8.3	6.1	4.9

Note: (1) Data on import and export in the period 1990-94 are based on WDI, data on the period 1995-2007 are obtained from GSO; (2) Data from IMF (1999, 2003, 2006, 2007); (3) Data from Phuc and Tho (2009); (4) Data from IMF (2006, 2007); (5) Data obtained from GSO (1996, 2008) and IMF (2005); (6) Data from IMF (1999, 2003, 2006, 2007) three-month savings deposits.

Source: World Bank Development Indicators (WDI), http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport (21/7/2010); GSO, Online Statistical Data http://www.gso.gov.vn/default.aspx?tabid=393&idmid=3&ItemID=8763 & http://www.gso.gov.vn/default.aspx?tabid=393&idmid=3&ItemID=8758 (19/7/2010); GSO (1996); IMF, (1999, 2003, 2006, 2007); and Phuc and Tho (2009).

Table A4.1 Selected macroeconomic indicators: 1990-2007 (continued)

Variable	2000	2001	2002	2003	2004	2005	2006	2007
GDP growth (annual %)	6.8	6.9	7.1	7.3	7.8	8.4	8.2	8.5
GDP (current US$ mill)	31,172.5	32,685.2	35,058.2	38,867.1	45,404.4	5,2803.9	59,835.2	68,624.8
Goods exports (current US$ mill) [1]	14,482.7	15,029.2	16,706.1	20,149.3	26,485.0	32,447.1	39,826.2	48,561.4
Goods imports (current US$ mill) [1]	15,636.5	16,217.9	19,745.6	25,255.8	31,968.8	36,761.1	44,891.1	62,764.7
Growth of goods exports (%)	25.5	3.8	11.2	20.6	31.4	22.5	22.7	21.9
Growth of goods imports (%)	33.2	3.7	21.8	27.9	26.6	15.0	22.1	39.8
Trade balance (US$ mill)	-1,153.8	-1,188.7	-3,039.5	-5,106.5	-5,483.8	-4,314.0	-5,064.9	-14,203.3
Trade balance (% GDP)	-3.7	-3.6	-8.7	-13.1	-12.1	-8.2	-8.5	-20.7
Current account balance (US$ mill)[2]	642	670	-676	-1,935	-1,565	-497	-164	-6,999
Balance of payment (US$ mill) [2]	115	194	395.0	2,151	883	2,131	4,322	10,168
Budget deficit (% of GDP) [2]	-2.7	-2.8	-1.4	-2.0	-1.4	-1.2	-0.3	-3.4
Official exchange rate (VND/USD, annual average)	14,167.8	14,725.2	15,279.5	15,509.6	15,746.0	15,858.9	15,994.3	16,105.1
Nominal effective exchange rate (NEER, 1992=100)[3]	111.3	114.2	110.3	102.7	96.7	95.1	93.2	89.2
Real effective exchange rate (REER, 1992=100) [3]	116.6	117.1	116.1	109.8	109.4	113.4	116.6	117.7
Real effective exchange rate (REER, 2000=100) [4]	100.0	100.9	98.3	90.6	89.3	93.2	96.7	97.6
Inflation Rate (%)[5]	-0.5	0.7	4.0	3.0	9.5	8.4	6.6	12.6
Real interest rate (%/year)[6]	4.8	5.9	2.5	3.4	1.4	2.6	3.6	2.7
Foreign investment flow (net, US$ mill)	1,298.0	1,300.0	1,400.0	1,450.0	1,610.0	1,954.0	2,400.0	6,700.0
Foreign investment flow (net, % GDP)	4.2	4.0	4.0	3.7	3.5	3.7	4.0	9.8

Note: (1) Data on import and export in the period 1990-94 are based on WDI, data on the period 1995-2007 are obtained from GSO; (2) Data from IMF (1999, 2003, 2006, 2007); (3) Data from Phuc and Tho (2009); (4) Data from IMF (2006, 2007); (5) Data obtained from GSO (1996, 2008) and IMF (2005); (6) Data from IMF (1999, 2003, 2006, 2007) on three-month savings deposits.

Source: World Bank Development Indicators, http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport (21/7/2010); GSO, Online Statistical Data http://www.gso.gov.vn/default.aspx?tabid=393&idmid=3&ItemID=8763 & http://www.gso.gov.vn/default.aspx?tabid=393&idmid=3&ItemID=8758 (19/7/2010); GSO (1996); IMF, (1999, 2003, 2006, 2007); and Phuc and Tho (2009).

Table A4.2 Annual sectoral and economy-wide growth rates, 1990-2007

(%, 1994 constant prices)

Economic activity	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Agriculture	1.0	2.2	6.9	3.3	3.4	4.8	4.4	4.3	3.5	5.2
Industry	2.3	8.3	12.2	12.6	13.4	13.6	14.5	12.6	8.3	7.7
Mining	-	29.9	8.8	15.9	21.0	13.5	13.6	13.2	14.0	13.4
Manufacturing	-6.3	5.6	13.7	9.5	9.3	13.5	13.6	12.8	10.2	8.0
Electricity, gas and water	-	-4.5	14.2	14.6	9.2	18.5	17.8	14.7	12.3	7.7
Construction	-	5.2	10.7	17.3	18.2	12.7	16.1	11.3	-0.5	2.4
Services	10.2	7.4	7.3	8.9	9.6	9.8	8.8	7.1	5.1	2.3
Total GDP	5.1	5.9	8.4	8.2	8.8	9.5	9.3	8.2	5.8	4.8

Note: '- ' denotes not available data.

Source: Compiled by author from GSO (2004); World Bank Development Indicators; http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport (21/7/2010) and GSO Online Database; http://www.gso.gov.vn/default.aspx?tabid=388&idmid=3&ItemID=8666 (19/7/2010).

Table A4.2 Annual sectoral and economy-wide growth rates, 1990-2007 (continued)

(%, 1994 constant prices)

Economic activity	2000	2001	2002	2003	2004	2005	2006	2007
Agriculture	4.6	3.0	4.2	3.6	4.4	4.0	3.4	3.7
Industry and construction	10.1	10.4	9.5	10.5	10.2	10.7	10.4	10.2
Mining	7.2	4.1	1.1	6.3	8.9	1.9	0.8	-4.9
Manufacturing	11.7	11.3	11.6	11.5	10.9	12.9	12.4	13.4
Electricity, gas and water	14.6	13.2	11.4	11.9	12.0	12.3	11.8	7.2
Construction	7.5	12.8	10.6	10.6	9.0	10.9	11.0	12.1
Services	5.3	6.1	6.5	6.5	7.3	8.5	8.3	8.9
Total GDP	6.8	6.9	7.1	7.3	7.8	8.4	8.2	8.5

Note: '- ' denotes unavailable data.

Source: Compiled by author from GSO (2004); World Bank Development Indicators; http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport (21/7/2010) and GSO Online Database; http://www.gso.gov.vn/default.aspx?tabid=388&idmid=3&ItemID=8666 (19/7/2010).

Table A4.3 Sectoral composition of GDP: 1990-2007

(%, at constant 1994 prices)

Economic activity	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Agriculture	31.8	30.7	30.3	28.9	27.4	26.2	25.1	24.2	23.7	23.8
Industry	25.2	25.7	26.6	27.7	28.9	29.9	31.3	32.6	33.4	34.4
Mining	3.5	4.3	4.3	4.6	5.1	5.3	5.5	5.8	6.2	6.7
Manufacturing	14.0	14.0	14.7	14.8	14.9	15.5	16.1	16.8	17.5	18.0
Electricity, gas and water	1.6	1.4	1.5	1.6	1.6	1.7	1.9	2.0	2.1	2.2
Construction	6.1	6.0	6.2	6.7	7.3	7.5	7.9	8.2	7.7	7.5
Services	43.0	43.6	43.1	43.4	43.7	43.8	43.6	43.2	42.9	41.9
Total GDP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Compiled by author from GSO (2004), World Bank Development Indicators, http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport (21/7/2010) and GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=388&idmid=3&ItemID=8666 (19/7/2010).

Table A4.3 Sectoral composition of GDP: 1990-2007 (continued)

(%, at constant 1994 prices)

Economic activity	2000	2001	2002	2003	2004	2005	2006	2007
Agriculture	23.3	22.4	21.8	21.1	20.4	19.6	18.7	17.9
Industry	35.4	36.6	37.4	38.5	39.4	40.2	41.0	41.7
Mining	6.7	6.6	6.2	6.1	6.2	5.8	5.4	4.8
Manufacturing	18.8	19.6	20.4	21.2	21.8	22.7	23.6	24.7
Electricity, gas and water	2.3	2.5	2.6	2.7	2.8	2.9	3.0	2.9
Construction	7.5	8.0	8.2	8.5	8.6	8.8	9.0	9.3
Services	41.3	41.0	40.8	40.5	40.3	40.3	40.3	40.5
Total GDP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Compiled by author from GSO (2004), World Bank Development Indicators, http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport (21/7/2010) and GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=388&idmid=3&ItemID=8666 (19/7/2010).

Table A4.4 Sectoral employment: 1995-2007

(Persons)

Economic activity	1995	2000	2001	2002	2003	2004	2005	2006	2007
Agriculture	24121.7	24480.6	24469.6	24455.8	24443.4	24430.7	24424	24349.9	24369.4
Industry	4507.9	4929.2	5554.8	6084.7	6670.5	7216.5	7785.2	8459.1	9032.3
Mining	207.4	255.8	271.7	283.4	296.2	324.4	343.2	375.5	406.8
Manufacturing	3227.2	3550.3	3887.3	4160.3	4560.4	4832	5279.1	5739.5	6103
Electricity, gas and water	77.7	82.7	104	114.7	125.8	137.2	152.3	176	201.6
Construction	995.6	1040.4	1291.8	1526.3	1688.1	1922.9	2010.6	2168.1	2320.9
Services	5960	8199.8	8538.3	8967.2	9459.9	9939.1	10565.8	11171.3	11806.3
Total	34589.6	37609.6	38562.7	39507.7	40573.8	41586.3	42775	43980.3	45208

Source: Compiled by author from GSO (1999), and GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8629 (19/7/2010).

Table A4.5 Annual growth index of gross output of manufacturing industries (previous year =100)

Code	Industry Name	1995	1996	1997	1998	1999
15	Food products and beverages	100.0	114.4	110.1	107.3	103.4
16	Tobacco products	100.0	105.5	104.9	111.2	98.0
17	Textiles	100.0	103.2	113.9	115.2	100.3
18	Wearing apparel	100.0	115.3	127.2	107.9	111.8
19	Leather, luggage, handbags and footwear	100.0	125.2	148.0	107.1	109.1
20	Wood and wood products	100.0	96.2	98.3	94.0	107.6
21	Paper and paper products	100.0	117.8	115.3	120.2	109.2
22	Publishing, printing and media products	100.0	100.3	107.0	115.3	107.7
23	Coke, refined petroleum products	100.0	60.8	40.0	129.1	93.2
24	Chemicals and chemical products	100.0	123.5	115.0	112.8	118.9
25	Rubber and plastics products	100.0	121.5	127.8	125.2	122.8
26	Other non-metallic mineral products	100.0	110.0	120.8	112.4	107.6
27	Basic metals	100.0	119.2	97.9	102.0	122.6
28	Fabricated metal products	100.0	126.1	121.0	118.3	119.6
29	Machinery and equipment n.e.c.	100.0	116.0	107.3	122.5	105.5
30	Office, accounting and computing machinery	100.0	141.6	95.4	604.8	746.8
31	Electrical machinery and apparatus n.e.c.	100.0	123.4	123.0	139.9	127.5
32	Radio, television and communication equipment	100.0	149.1	106.5	106.1	114.8
33	Medical, precision and optical instruments	100.0	129.1	91.4	154.1	107.5
34	Motor vehicles, trailers and semi-trailers	100.0	94.2	118.5	102.4	110.7
35	Other transport equipment	100.0	104.7	91.5	186.2	135.4
36	Furniture; manufacturing n.e.c.	100.0	115.0	113.2	109.8	120.6
37	Recycle	100.0	138.4	108.5	120.6	79.2
	Total	100.0	113.8	113.6	112.1	110.8

Source: Author's calculation based on GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8929 (19/7/2010).

Table A4.5 Annual growth index of gross output of manufacturing industries (previous year =100) (continued)

Code	Industry Name	2000	2001	2002	2003	2004	2005	2006	2007
15	Food products and beverages	115.6	115.4	111.3	115.2	115.7	115.8	119.2	118.3
16	Tobacco products	119.8	116.5	114.5	120.0	110.6	110.6	99.6	111.6
17	Textiles	119.8	105.9	115.9	115.2	117.0	114.8	124.4	108.0
18	Wearing apparel	115.8	113.6	119.2	127.9	122.2	119.6	125.2	117.1
19	Leather, luggage, handbags and footwear	114.6	107.7	116.4	122.0	118.3	118.1	118.9	108.3
20	Wood and wood products	113.1	108.5	115.0	122.2	119.8	123.6	107.9	124.8
21	Paper and paper products	113.2	116.1	106.9	116.0	126.3	116.4	113.3	120.5
22	Publishing, printing and media products	113.0	107.9	117.2	122.2	107.4	122.6	112.5	113.1
23	Coke, refined petroleum products	228.5	142.5	99.7	97.1	140.8	134.2	85.0	85.8
24	Chemicals and chemical products	114.9	115.5	114.5	110.9	116.6	125.3	120.3	116.5
25	Rubber and plastics products	119.0	125.9	119.4	116.3	134.3	120.2	117.2	123.8
26	Other non-metallic mineral products	123.5	118.4	119.8	115.2	112.2	110.7	118.2	108.6
27	Basic metals	118.3	115.7	124.5	122.5	107.6	124.3	112.6	117.7
28	Fabricated metal products	114.6	122.4	120.4	125.2	121.8	135.7	129.8	122.5
29	Machinery and equipment n.e.c.	127.6	123.9	108.5	124.3	116.5	102.3	101.2	130.0
30	Office, accounting and computing machinery	76.1	75.4	102.7	153.4	120.0	173.7	162.9	128.3
31	Electrical machinery and apparatus n.e.c.	123.1	142.8	126.1	114.5	121.3	132.5	132.1	127.4
32	Radio, television and communication equipment	110.1	123.0	114.1	116.1	111.1	114.8	100.0	136.4
33	Medical, precision and optical instruments	107.9	105.9	110.2	115.4	117.7	112.4	94.0	161.0
34	Motor vehicles, trailers and semi-trailers	175.1	132.0	135.4	143.8	104.6	112.2	95.8	135.9
35	Other transport equipment	140.3	110.5	120.4	113.4	125.8	130.1	130.8	136.5
36	Furniture; manufacturing n.e.c.	115.8	121.1	127.3	129.5	129.7	131.8	135.2	119.7
37	Recycle	117.3	100.7	115.6	116.9	128.1	102.4	120.3	127.2
	Total	118.2	116.1	116.4	118.3	117.2	119.2	119.2	118.8

Source: Author's calculation based on GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8929 (19/7/2010).

Table A4.6 Gross output and shares of ownership sector: 1995-2007

Sector	1995	1996	1997	1998	1999	2000	1995-2000
Gross output (billion VND)							Growth rate
SOE	43400.6	48098.1	52864.2	56829.7	59702.3	67493.6	9.2
Private	7125.9	9212.7	11200.0	12295.1	14751.2	20268.3	23.3
FDI	15083.6	19093.6	24606.6	31469.3	37892.1	47578.3	25.8
Households	17650.4	18382.1	18991.6	20071.4	21356.8	22757.7	5.2
Total manufacturing	83260.5	94786.5	107662.4	120665.5	133702.4	158097.9	13.7
Shares (%)							Change in shares
SOE	52.1	50.7	49.1	47.1	44.7	42.7	-9.4
Private	8.6	9.7	10.4	10.2	11.0	12.8	4.3
FDI	18.1	20.1	22.9	26.1	28.3	30.1	12.0
Households	21.2	19.4	17.6	16.6	16.0	14.4	-6.8
Total manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	

Source: Compiled by author based on GSO Online Database:
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8925, (19/7/2010),
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8912 (19/7/2010),
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8905 (19/7/2010),
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8903 (19/7/2010), and
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8901 (19/7/2010).

Table A4.6 Gross output and shares of ownership sector: 1995-2007 (continued)

Sector	2001	2002	2003	2004	2005	2006	2007	2000-07
Gross output (billion VND)								*Growth rate*
SOE	75830.9	84380.6	93619.7	104113.6	109236.9	113750.0	117406.6	8.2
Private	28050.6	34950.2	46916.7	60986.1	79818.5	104923.6	136384.1	31.3
FDI	55430.5	67636.8	83216.2	99018.6	126996.2	159749.2	198114.0	22.6
Households	24229.9	26729.3	29133.4	32175.5	37163.0	42520.9	48252.5	11.3
Total manufacturing	183541.9	213696.9	252886.0	296293.8	353214.6	420943.7	500157.2	17.9
Shares (%)								*Change in shares*
SOE	41.3	39.5	37.0	35.1	30.9	27.0	23.5	-19.2
Private	15.3	16.4	18.6	20.6	22.6	24.9	27.3	14.4
FDI	30.2	31.7	32.9	33.4	36.0	38.0	39.6	9.5
Households	13.2	12.5	11.5	10.9	10.5	10.1	9.6	-4.7
Total manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

Source: Compiled by author based on GSO Online Database:
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8925, (19/7/2010),
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8912 (19/7/2010),
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8905 (19/7/2010),
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8903 (19/7/2010), and
http://www.gso.gov.vn/default.aspx?tabid=391&idmid=3&ItemID=8901 (19/7/2010).

Table A4.7 Output shares of ownership sector in two-digit VSIC manufacturing industries: 1995-2007

Code	Industry Name	State-Owned Sector			Private Firms			FDI Firms			Households		
		1995-2000	2000-05	2005-07	1995-2000	2000-05	2005-07	1995-2000	2000-05	2005-07	1995-2000	2000-05	2005-07
15	Food products and beverages	46.3	37.8	23.6	12.5	23.5	35.8	21.4	24.0	27.7	19.9	14.7	12.9
16	Tobacco products	99.2	98.9	98.7	0.2	0.6	0.3	0.5	0.5	0.9	0.1	0.0	0.0
17	Textiles	53.9	45.9	33.1	7.3	13.5	22.6	21.9	27.2	32.1	17.0	13.5	12.2
18	Wearing apparel	33.4	26.4	18.9	16.5	21.1	26.6	21.4	33.2	39.6	28.7	19.4	14.9
19	Leather and footwear	30.8	18.7	7.6	18.0	24.1	25.5	44.4	51.6	62.3	6.9	5.6	4.6
20	Wood and wood products	21.0	15.1	9.9	20.6	30.2	34.9	9.9	15.2	17.3	48.6	39.4	37.8
21	Paper and paper products	54.0	38.4	28.7	20.8	38.2	44.0	13.7	15.0	21.2	11.6	8.4	6.1
22	Publishing, printing and media products	90.2	85.9	80.6	1.5	5.9	9.4	2.1	3.0	5.5	6.2	5.1	4.4
23	Coke, refined petroleum products	0.0	0.0	3.2	52.4	49.4	53.4	33.9	49.4	40.3	0.8	1.2	3.1
24	Chemicals and chemical products	65.9	47.2	37.5	6.8	14.3	18.3	24.1	36.2	42.5	3.1	2.3	1.7
25	Rubber and plastics products	35.7	26.8	16.5	24.9	34.9	40.9	19.9	26.2	33.9	19.5	12.0	8.7
26	Other non-metallic mineral products	62.5	53.9	44.1	6.4	12.8	20.6	15.1	23.5	26.4	16.0	9.9	9.0
27	Basic metals	51.7	39.8	33.3	3.7	15.4	27.7	37.9	38.5	33.5	6.6	6.3	5.6
28	Fabricated metal products,	15.4	13.9	15.1	13.3	25.5	25.1	24.3	29.2	37.2	46.9	31.4	22.5
29	Machinery and equipment n.e.c.	61.4	34.7	24.2	10.3	19.5	29.6	18.4	39.6	40.1	10.0	6.2	6.1
30	Office, accounting and computing machinery	0.0	0.0	0.0	1.5	2.1	0.8	97.5	97.9	99.2	0.0	0.0	0.0
31	Electrical machinery and apparatus n.e.c.	56.7	42.4	32.8	7.4	10.7	16.3	29.1	44.5	49.7	6.8	2.4	1.2
32	Radio, television and communication equipment	24.3	16.9	12.7	2.0	5.1	5.3	72.8	77.5	81.6	0.9	0.5	0.4
33	Medical, precision and optical instruments	21.2	9.0	5.8	11.3	11.7	14.5	58.7	78.3	78.8	8.8	1.0	0.8
34	Motor vehicles, trailers and semi-trailers	13.2	11.6	10.0	5.7	4.1	9.6	72.7	81.0	77.9	8.4	3.3	2.5
35	Other transport equipment	25.2	19.6	20.6	4.4	9.2	10.1	60.2	66.8	66.7	10.1	4.5	2.6
36	Furniture; manufacturing n.e.c.	8.7	6.8	6.1	15.4	23.9	23.6	21.6	36.8	45.7	54.4	32.6	24.6
37	Recycle	0.0	0.0	3.7	8.3	19.2	31.6	0.0	1.0	6.3	91.7	79.7	58.3
	Total	47.0	36.7	26.7	10.7	18.6	25.2	25.2	32.9	38.0	17.1	11.8	10.0

Source: Compiled by author based on GSO Online Database with tables as used for Table A4.6.

Table A4.8 Capital intensity of major trade groups of manufacturing industries

(million VND/person, 1994 constant prices)

Year	Less-traded	Export-oriented	Import-competing	Manufacturing average
2000	131.2	21.3	76.7	55.8
2001	121.1	21.9	77.9	54.0
2002	112.2	21.4	75.2	50.2
2003	101.2	19.9	70.1	45.6
2004	87.3	18.8	75.8	44.4
2005	88.1	20.1	74.7	44.9

Source: Author's calculation based on the unpublished enterprise survey data.

Table A4.9 Composition of imports by BEC: 1995-2007

Commodity group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Capital and intermediate goods	73.8	76.5	79.6	83.1	82.0	80.2	79.9	81.2	81.5	80.9	77.3	77.3	78.6
Machinery and equipment	25.7	27.6	30.3	30.6	29.9	30.6	30.5	29.8	31.6	28.8	25.3	24.6	28.6
Raw materials	48.1	48.9	49.3	52.6	52.2	49.7	49.4	51.4	49.8	52.1	52.0	52.7	50.0
Consumer goods	15.2	12.4	10.1	8.5	8.4	6.2	7.9	7.9	7.8	6.7	8.1	7.8	7.4
Mineral fuels, lubricants and related materials	11.1	11.1	10.3	8.4	9.5	13.6	12.1	11.0	10.7	12.5	14.6	14.9	13.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: BEC stands for Broad Economic Categories developed by the United Nations Statistics Division.
Source: Compiled by author based on GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8758; and http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8757; (19/7/2010)

Table A4.10 Composition of manufactured exports by SITC: 1995-2007

(%)

Commodity group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Chemicals and related products (SITC 5)	1.7	2.4	2.4	2.2	2.7	2.5	3.2	3.1	3.2	3.0	3.3	3.8	3.8
Manufactured goods classified chiefly by material (SITC 6)	19.6	14.1	12.8	10.1	15.6	14.2	14.1	13.4	12.6	13.6	13.3	14.2	14.8
Plastics and plastic products	0.0	0.0	0.0	0.0	0.0	1.5	1.7	1.7	1.6	1.7	2.2	2.2	2.6
Machinery and transport equipment (SITC 7)	5.0	15.3	17.1	18.6	17.7	19.9	19.9	15.9	16.7	18.4	19.2	20.4	20.8
Miscellaneous manufactured articles (SITC 8)	73.7	68.2	67.7	69.1	64.1	63.3	62.8	67.6	67.6	65.0	64.2	61.6	60.6
Footwear	16.6	19.6	22.2	23.7	25.0	23.0	22.6	22.3	21.0	19.3	18.6	17.5	14.9
Wearing apparel	42.9	36.6	34.1	33.3	31.5	29.6	28.1	32.5	33.6	31.8	29.2	28.4	28.8
Furniture	0.0	0.0	0.0	0.0	0.0	4.9	4.9	5.5	5.7	7.9	9.6	9.4	8.9
Total manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Author's calculation based on GSO Online Database, http://www.gso.gov.vn/default.aspx?tabid=387&idmid=3&ItemID=8763; (19/7/2010).

Chapter 5

A5.1 Derivation of TFP growth formula

With the VA measure, we assume a general production function with two inputs, capital (K) and labor (L) at the sectoral or industry level as follows:

$$Y_t = F(K_t, L_t, t) \qquad \text{(A5.1)}$$

Where Y_t is total output, K_t is the capital stock, L_t is labor, and t is a time index, which represents the shifts of the production function over time. By total differentiating (A5.1) with respect to time, we obtain the growth terms for both sides:

$$\frac{dY}{dt} = \frac{\partial F}{\partial K}\frac{dK}{dt} + \frac{\partial F}{\partial L}\frac{dL}{dt} + \frac{\partial F}{\partial t} \qquad \text{(A5.2)}$$

Dividing both sides by Y_t gives:

$$\frac{dY}{dt}\frac{1}{Y_t} = \frac{\partial F}{\partial K}\frac{1}{Y}\frac{dK}{dt} + \frac{\partial F}{\partial L}\frac{1}{Y}\frac{dL}{dt} + \frac{\partial F}{\partial t}\frac{1}{Y} \qquad \text{(A5.3)}$$

Further manipulation of the right hand side of equation (A5.3) gives:

$$\frac{dY}{dt}\frac{1}{Y_t} = \frac{\partial F}{\partial K}\frac{K}{Y}\frac{dK}{dt}\frac{1}{K} + \frac{\partial F}{\partial L}\frac{L}{Y}\frac{dL}{dt}\frac{1}{L} + \frac{\partial F}{\partial t}\frac{1}{Y} \qquad \text{(A5.4)}$$

$$\dot{Y}/Y = \alpha_K \dot{K}/K + \alpha_L \dot{L}/L + \dot{F}/Y \qquad \text{(A5.5)}$$

$$\hat{Y} = \alpha_K \hat{K} + \alpha_L \hat{L} + \dot{F}/Y \qquad \text{(A5.6)}$$

$$\dot{F}/Y = T\hat{F}P = \hat{Y} - \alpha_K \hat{K} - \alpha_L \hat{L} \qquad \text{(A5.7)}$$

where a dot over a variable denotes its total derivative with respect to time and a hat over a variable indicate its growth rate, α_K and α_L are the elasticity of output with respect to capital (K) and labor (L) respectively. The term $\frac{\partial F}{\partial t}\frac{1}{Y}$ or $\dot{F}/Y$ is the elasticity of output with respect to time. This is the residual of growth equation (A5.7), a part of output growth not explained by the growth of inputs. It is referred to the total factor productivity growth ($\hat{TFP}$).

Following the traditional growth accounting framework, we adopt the key assumptions: (i) profit-maximizing firms are operating in competitive input and output markets; (ii) the production of firms is subject to constant returns to scale; (iii) and the underlying production function is in Translog form (Gollop and Jorgenson 1980, Van Biesebroeck 2003). The competitive market condition implies that the price of each primary factor is equal to the value of its marginal product. Therefore, it is possible to replace output elasticities with factor shares in the total output and hence the TFP growth is in the form of the Divisia index (Tybout 1992) with equation (A5.7) being changed to:

$$\hat{TFP} = \hat{Y} - S_K\hat{K} - S_L\hat{L} \qquad \text{(A5.8)}$$

For estimation of (5.8), it is required that the instantaneous changes of variables with respect to time be approximated by their discrete changes over time. Like other studies such as APO (2004), and Kompas et al. (2009), the Tornqvist index is used to represent the discrete changes over time for the residual and other variables in the logarithmic forms[1]:

$$TFPG = (\ln Y_t - \ln Y_{t-1}) - \frac{1}{2}(S_{L,t} + S_{L,t-1})(\ln L_t - \ln L_{t-1}) - \frac{1}{2}(S_{K,t} + S_{K,t-1})(\ln K_t - \ln K_{t-1}) \qquad \text{(A5.9)}$$

[1] The Tornqvist index is the discrete approximation to the continuous Divisia index. In the general logarithmic form, the Tornqvist productivity index is defined as:

$$\ln TFP_{st} = \ln \frac{OutputIndex_{st}}{InputIndex_{st}} = \ln OutputIndex_{st} - \ln InputIndex_{st} = \frac{1}{2}\sum_{m=1}^{M}(r_{is} + r_{it})(\ln q_{mt} - \ln q_{ms}) - \frac{1}{2}\sum_{n=1}^{N}(s_{is} + s_{it})(\ln x_{nt} - \ln x_{ns})$$

where q and x denote output and input, s and t denote time periods, r and s denote the share of the m^{th} output and n^{th} input respectively (Coelli et al. 2005: 119).

where *TFPG* is the TFP growth rate, the log differences of *Y*, *K*, and *L* represent the growth rates of *Y*, *K*, and *L* respectively. The shares of *K* and *L*, namely S_K and S_L are replaced by their simple averages between times *t* and *t-1*.

In a reduced form with VA as the output measure, we have:

$$TFPG = G_{VA} - \bar{S}_K G_K - \bar{S}_L G_L \qquad \text{(A5.10)}$$

where G_{VA}, G_K, and G_L denote the growth rates of *VA*, *K*, and *L* respectively, and $\bar{S}_K$ and $\bar{S}_L$ are average input shares.

5.2. Additional data tables for Chapter 5

Table A5.1 TFP growth rates by two-digit VSIC manufacturing industry (percent)

Code	Industry Name	2000-03	2003-05	2000-05
15	Food products and beverages	1.9	10.0	5.0
16	Tobacco products	9.3	-7.1	2.4
17	Textiles	-3.4	2.6	-1.0
18	Wearing apparel	-0.1	5.0	1.9
19	Leather, luggage, handbags and footwear	-0.8	5.0	1.5
20	Wood and wood products	-1.2	7.4	2.2
21	Paper and paper products	-21.3	4.3	-11.9
22	Publishing, printing and media products	-1.8	4.3	0.6
23	Coke, refined petroleum products	-0.9	22.4	7.8
24	Chemicals and chemical products	5.7	-3.6	1.9
25	Rubber and plastics products	-2.3	2.5	-0.4
26	Other non-metallic mineral products	1.1	3.8	2.2
27	Basic metals	-3.1	-15.8	-8.4
28	Fabricated metal products	-1.1	13.8	4.6
29	Machinery and equipment n.e.c.	9.1	7.4	8.4
30	Office, accounting and computing machinery	-15.0	16.2	-3.7
31	Electrical machinery and apparatus n.e.c.	7.1	0.6	4.5
32	Radio, television and communication equipment	11.6	7.0	9.8
33	Medical, precision and optical instruments	1.9	11.1	5.5
34	Motor vehicles, trailers and semi-trailers	28.2	-19.8	6.3
35	Other transport equipment	1.6	2.0	1.7
36	Furniture; manufacturing n.e.c.	-4.9	4.4	-1.3
	Total Manufacturing	1.6	4.1	2.5

Source: Author's calculations.

Table A5.2 Relative indicators of manufacturing performance

Year	LP	KL	LP growth	KL growth	S_L	S_K
2000	19.6	55.7			0.366	0.634
2001	18.5	53.9	-5.9	-3.3	0.390	0.610
2002	17.6	50.3	-4.9	-7.1	0.414	0.586
2003	18.3	45.6	3.8	-9.7	0.433	0.567
2004	19.4	44.5	6.0	-2.5	0.423	0.577
2005	19.9	44.9	2.2	1.0	0.432	0.568

Note: LP is the weighted mean level of labor productivity of the whole manufacturing sector, measured in mill VND/employee at constant 1994 prices. Similarly, KL denotes the weighted capital labor ratio or capital intensity, measured in mill VND/employee at constant 1994 prices. S_L and S_K are the shares of labor and capital in value added of the whole manufacturing sector.
Source: Author's own calculations

Table A5.3 Summary statistics of model variables

Variable name	Description	Observation	Mean	Std. Dev.	Min	Max
GTFP	TFP growth rates	525	0.033	0.243	-0.941	1.387
DSCALE	Growth of average firm output	525	0.065	0.369	-1.871	2.020
DNRP	Change in nominal rate of protection	525	-0.842	3.906	-32.615	20.175
$DNRP_{-1}$	Lag(1) of change in nominal rate of protection	420	-0.713	3.604	-21.090	20.175
DERP	Change in nominal rate of protection	525	-2.110	12.648	-88.979	94.829
$DERP_{-1}$	Lag(1) of change in nominal rate of protection	420	-1.907	12.676	-88.979	94.829
DIM	Change in import share	525	-0.052	7.163	-59.581	127.496
DEX	Change in export share	525	0.015	0.900	-6.761	17.038
DHFI	Change in competition index	525	-0.012	0.092	-0.591	0.585
DNRPxDHFI	Interaction term	525	0.010	0.603	-6.461	10.885
DERPxDHFI	Interaction term	525	0.024	1.422	-14.125	24.175
DIMxDHFI	Interaction term	525	-0.030	1.723	-23.002	27.870
DEXxDHFI	Interaction term	525	-0.001	0.017	-0.242	0.111
DKL	Change in capital intensity (in million VND)	525	-3.114	40.448	-253.051	391.54
DSKILL	Change in the share of skilled labor	525	-0.002	0.037	-0.205	0.161
DSFDI	Change in the share of FDI firms	525	0.007	0.111	-0.618	0.812
DSSOE	Change in the share of SOE firms	525	-0.030	0.121	-0.782	0.561

Source: Author's calculations.

Table A5.4 Matrix of correlation between key explanatory variables

Period 2000-05	DERP	L.DERP	DNRP	L.DNRP	SCALE	DHFI4	DKL	DSKILL	DSFDI	DEX	DIM	DSOE
DERP	1											
L.DERP	-0.0737	1										
DNRP	0.9227*	-0.0207	1									
L.DNRP	-0.0171	0.9206*	0.0543	1								
SCALE	0.0540	0.0373	0.0366	0.0237	1							
DHFI4	-0.0018	0.0403	-0.0021	0.0613	0.3802*	1						
DKL	0.0301	-0.0026	0.0373	-0.0078	0.1719*	0.0666	1					
DSKILL	0.0300	0.0145	0.0223	0.0166	0.1172*	0.1044*	0.0295	1				
DSFDI	0.0090	0.0109	0.0385	0.0262	0.2295*	0.0332	0.2007*	-0.0444	1			
DEX	0.0310	-0.0082	0.0375	-0.0086	-0.4076*	-0.1054*	-0.0986*	-0.0758	-0.0923*	1		
DIM	-0.0194	0.0161	-0.0304	0.0119	-0.3230*	-0.0459	-0.0770	0.0245	-0.2508*	0.2222*	1	
DSOE	-0.036	-0.1210*	-0.0825	-0.1566*	0.1575*	0.1890*	-0.1087*	0.0182	-0.3407*	-0.0661	0.0496	1

Period 2000-03	DERP	L.DERP	DNRP	L.DNRP	SCALE	DHFI4	DKL	DSKILL	DSFDI	DEX	DIM	DSOE
DERP	1											
L.DERP	-0.2549*	1										
DNRP	0.9135*	-0.2040*	1									
L.DNRP	-0.2359*	0.9327*	-0.2032*	1								
SCALE	0.0354	0.1003	0.0126	0.1061	1							
DHFI4	-0.0242	0.0295	-0.0244	0.0334	0.3124*	1						
DKL	0.0268	-0.0323	0.041	-0.0521	0.2079*	-0.0091	1					
DSKILL	0.001	0.0195	-0.0066	0.0224	0.2442*	0.0976	-0.0138	1				
DSFDI	0.0172	-0.0386	0.0495	-0.0212	0.1168*	-0.0271	0.3195*	-0.0252	1			
DEX	0.0234	-0.0352	0.0458	-0.0187	-0.3300*	-0.0497	-0.0806	-0.1344*	-0.0405	1		
DIM	-0.0707	0.013	-0.0882	0.0189	-0.1731*	0.1079	-0.1068	-0.1247*	0.0806	0.1443*	1	
DSOE	0.0115	-0.0658	-0.0372	-0.0784	0.1565*	0.2615*	-0.1250*	0.0605	-0.3005*	-0.0894	0.1545*	1

Note: * denote the significance level of less or equal to 5 percent.
Source: Author's calculations.

Table A5.4 Matrix of correlation between key explanatory variables (continued)

Period 2003-05	DERP	L.DERP	DNRP	L.DNRP	SCALE	DHFI4	DKL	DSKILL	DSFDI	DEX	DIM	DSOE
DERP	1											
L.DERP	0.3559*	1										
DNRP	0.9426*	0.3624*	1									
L.DNRP	0.5031*	0.9381*	0.5478*	1								
SCALE	0.0752	0.0123	0.0567	0.0221	1							
DHFI4	0.0259	0.0261	0.0273	0.0904	0.4753*	1						
DKL	0.0333	0.0351	0.0371	0.0627	0.1343	0.1580*	1					
DSKILL	0.0762	0.1101	0.0751	0.1915	-0.0762	0.1032	0.0913	1				
DSFDI	0.0017	0.0296	0.0326	0.0555	0.3356*	0.0935	0.0992	-0.0797	1			
DEX	0.0455	-0.0085	0.0356	-0.0032	-0.5662*	-0.2270*	-0.1387*	0.0548	-0.1784*	1		
DIM	0.0139	0.0191	0.005	0.0125	-0.4423*	-0.1765*	-0.0629	0.1652*	-0.4369*	0.3520*	1	
DSOE	-0.0715	-0.1739*	-0.1146*	-0.2153*	0.1419*	0.038	-0.0815	-0.0801	-0.3818*	-0.0775	-0.0376	1

Note: * denote the significance level of less or equal to 5 percent.
Source: Author's calculations.

Table A5.5 The FE and RE estimates of the manufacturing TFP growth model with the Nominal Rate of Protection (Equation 5.1)

Dependent variable: ***TFPG*** (industry TFP growth)				
Variables	FE	t-stat	RE	t-stat
DSCALE	0.2410***	4.86	0.2083***	5.06
DNRP	-0.004	-1.17	-0.0045*	-1.73
DHFI	-0.0283	-1.29	-0.0225	-1.18
DNRPxDHFI	-0.2373	-1.31	-0.1392	-0.92
DKL	-0.0017***	-5.67	-0.0018***	-6.84
DSKILL	1.0321***	2.84	1.0177***	3.21
DSFDI	0.4001***	3.11	0.3949***	3.5
DSOE	0.0709	0.48	0.0165	0.13
DIM	0.0054*	1.73	0.0059**	2.21
DIMxDHFI	0.0447***	2.75	0.0340**	2.55
DEX	0.3333*	1.73	0.2637*	1.67
DEXxDHFI	-1.4581	-1.59	-1.1251	-1.63
L.DNRP	-0.0003	-0.07	0.0001	0.03
Constant	0.0155	1.15	0.0166	1.38
R-squared	0.2165			
FE vs. RE (Hausman test – χ^2_{12} statistic)			6.95	(0.8610)
RE vs. OLS (Breusch – Pagan test - χ^2_1 statistic)			12.33	(0.0004)
Cross-sectional heteroskedasticity (Modified Wald test - χ^2_{105} statistic)	3.0e+05	(0.000)		
Serial correlation (ρ_1 on the AR(1) process)	-0.2465	(0.000)	-0.252	(0.000)
No of observations	420		420	
No of industries	105		105	

Note: Figures in parentheses are the p-values of the *t*, *F* and χ^2 statistics; * p<0.1; ** p<0.05; *** p<0.01.
Source: Author's estimations.

Table A5.6 The FE and RE estimates of the manufacturing TFP growth model with the Effective Rate of Protection (Equation 5.2)

Dependent variable: ***TFPG*** (industry TFP growth)				
Variables	FE	t-stat	RE	t-stat
DSCALE	0.2408***	4.84	0.2079***	5.03
DERP	-0.0006	-0.57	-0.0009	-1.03
DHFI	-0.0127	-1.38	-0.0097	-1.21
DERPxDHFI	-0.2373	-1.34	-0.133	-0.9
DKL	-0.0017***	-5.67	-0.0018***	-6.86
DSKILL	1.0367***	2.86	1.0156***	3.2
DSFDI	0.3992***	3.11	0.3901***	3.46
DSOE	0.0836	0.57	0.0237	0.19
DIM	0.0054*	1.72	0.0058**	2.19
DIMxDHFI	0.0448***	2.76	0.0340**	2.55
DEX	0.3374*	1.75	0.2646*	1.68
DEXxDHFI	-1.5209	-1.64	-1.1470	-1.64
L.DERP	0.0001	0.06	0.0000	0.03
Constant	0.0186	1.42	0.0192	1.63
R-squared	0.2154			
FE vs. RE (Hausman test – χ^2_{12} statistic)			6.95	(0.8610)
RE vs. OLS (Breusch – Pagan test - χ^2_1 statistic)			11.99	(0.0005)
Cross-sectional heteroskedasticity (Modified Wald test - χ^2_{105} statistic)	2.8e+05	(0.000)		
Serial correlation (ρ_1 on the AR(1) process)	-0.2267	(0.000)	-0.2363	(0.000)
No. of observations	420		420	
No. of industries	105		105	

Note: Figures in parentheses are the p-values of the *t*, *F* and χ^2 statistics; * p<0.1; ** p<0.05; *** p<0.

Source: Author's estimations.

Chapter 6

Table A6.1 Summary of input and scale elasticities

Variable	Mean	Std. Dev.	Min	Max
labor	0.542	0.144	0.065	1.046
capital	0.535	0.133	-0.088	1.071
scale	1.077	0.078	0.826	1.315

Source: Author's calculation

Table A6.2 Shares of three firm groups by scale elasticity and by 2-digit VSIC industry (percent)

VSIC2	VSIC name	(1)	(2)	(3)	Total
15	Food products and beverages	11.1	12.7	76.2	100
16	Tobacco products	21.9	68.8	9.4	100
17	Textiles	25.0	38.5	36.5	100
18	Wearing apparel	54.0	30.3	15.7	100
19	Leather, leather products and footwear	79.4	15.4	5.1	100
20	Wood and wood products	19.5	18.4	62.1	100
21	Paper and paper products	5.1	28.4	66.5	100
22	Publishing, printing and recorded media	2.4	18.3	79.4	100
24	Chemicals and chemical products	6.1	35.0	59.0	100
25	Rubber and plastics products	8.4	16.2	75.3	100
26	Non-metallic mineral products	9.2	31.5	59.4	100
27	Basic metals	0.0	0.0	100.0	100
28	Fabricated metal products	7.3	18.0	74.7	100
29	Machinery and equipment	16.1	26.8	57.0	100
31	Electrical machinery	28.8	16.7	54.5	100
32	Radio, television and communication equipment	6.9	20.8	72.2	100
27	Medical, precision and optical instruments	0.0	20.0	80.0	100
34	Motor vehicles, trailers and semi-trailers	4.1	19.4	76.5	100
35	Other transport equipment	10.1	35.4	54.4	100
36	Furniture and manufacturing n.e.c.	29.4	27.1	43.5	100
	All manufacturing	15.8	22.0	62.2	100

Note: (1) Decreasing returns to Scale (Scale elasticity <0.995); (2) Constant Returns to Scale ((0.995<=Scale elasticity <=1.05); and (3) Increasing Returns to Scale (Scale elasticity >1.05).
Source: Author's calculation.

Table A6.3 Scale elasticity of 2-digit VSIC manufacturing industry over 2000-03

VSIC2	VSIC name	2000	2001	2002	2003	Average
15	Food products and beverages	1.116	1.115	1.113	1.113	1.114
16	Tobacco products	1.020	1.015	1.022	1.025	1.021
17	Textiles	1.038	1.036	1.033	1.031	1.035
18	Wearing apparel	0.998	1.000	0.990	0.992	0.995
19	Leather, leather products and footwear	0.959	0.953	0.948	0.949	0.952
20	Wood and wood products	1.079	1.072	1.063	1.065	1.070
21	Paper and paper products	1.077	1.077	1.068	1.072	1.074
22	Publishing, printing an recorded media	1.079	1.083	1.082	1.081	1.081
24	Chemicals and chemical products	1.080	1.078	1.074	1.074	1.076
25	Rubber and plastics products	1.097	1.089	1.084	1.084	1.089
26	Non-metallic mineral products	1.076	1.072	1.072	1.069	1.072
27	Basic metals	1.114	1.101	1.092	1.098	1.101
28	Fabricated metal products	1.103	1.097	1.092	1.092	1.096
29	Machinery and equipment	1.065	1.066	1.067	1.065	1.066
31	Electrical machinery	1.089	1.070	1.065	1.050	1.069
32	Radio, television and communication equipment	1.085	1.080	1.073	1.068	1.077
33	Medical, precision and optical instruments	1.092	1.157	1.165	1.169	1.135
34	Motor vehicles, trailers and semi-trailers	1.098	1.092	1.097	1.092	1.095
35	Other transport equipment	1.071	1.066	1.058	1.063	1.065
36	Furniture and manufacturing n.e.c.	1.051	1.051	1.038	1.035	1.044
	All manufacturing	1.081	1.078	1.074	1.074	1.077

Source: Author's calculation.

Table A6.4 Manufacturing Herfindalh index at four-digit VSIC level

VSIC4	2000	2001	2002	2003
1511	0.3376	0.3110	0.4137	0.4231
1512	0.0235	0.0178	0.0169	0.0174
1513	0.0677	0.0896	0.0934	0.0436
1514	0.2026	0.3432	0.3869	0.4473
1520	0.5153	0.5098	0.4414	0.4018
1531	0.0088	0.0175	0.0179	0.0157
1532	0.1884	0.2552	0.1837	0.0930
1533	0.1312	0.1137	0.0674	0.0615
1541	0.1378	0.1252	0.1079	0.2999
1542	0.0565	0.0610	0.0632	0.0560
1543	0.2317	0.1478	0.1608	0.1421
1544	0.2406	0.1054	0.1581	0.2024
1549	0.1289	0.1400	0.1014	0.0528
1551	0.1909	0.2432	0.2955	0.2024
1552	0.6175	0.3008	0.3133	0.4459
1553	0.1640	0.1681	0.1908	0.1666
1554	0.0660	0.0808	0.0834	0.0709
1600	0.1226	0.1214	0.1419	0.1398
1711	0.0378	0.0340	0.0306	0.0286
1721	0.1044	0.0903	0.0817	0.0690
1722	0.1988	0.1600	0.1716	0.1048
1723	0.2823	0.2412	0.2038	0.1842
1729	0.0708	0.0661	0.0664	0.0573
1730	0.1362	0.1345	0.1174	0.0827
1810	0.0200	0.0169	0.0155	0.0121
1820	0.2923	0.4708	0.5069	0.2830
1911	0.2526	0.4392	0.2851	0.2585
1912	0.0607	0.0518	0.0554	0.0638
1920	0.0475	0.0469	0.0450	0.0533
2010	0.0753	0.0866	0.0550	0.0181
2021	0.1315	0.1051	0.0845	0.0929
2022	0.1033	0.0801	0.0605	0.0597
2023	0.7500	0.6380	0.1318	0.0965
2029	0.0388	0.0423	0.0239	0.0176
2101	0.1415	0.1288	0.1049	0.0807
2102	0.0408	0.0250	0.0217	0.0181
2109	0.3156	0.0928	0.0491	0.0489
2211	0.3476	0.6501	0.4197	0.4424
2212	0.1388	0.1521	0.1329	0.1707

Table A6.4 Manufacturing Herfindalh index at four-digit VSIC level (continued)

VSIC4	2000	2001	2002	2003
2213	0.9755	0.8390	0.4995	1.0000
2219	0.3400	0.0996	0.3315	0.3542
2221	0.0419	0.0355	0.0304	0.0300
2222	0.1827	0.1614	0.0562	0.0450
2230	0.8077	0.3662	0.2388	0.2905
2310	0.3186	1.0000	1.0000	1.0000
2320	0.2914	0.2138	0.2546	0.2426
2411	0.0880	0.0859	0.0755	0.0787
2412	0.2131	0.1735	0.1474	0.1159
2413	0.4028	0.5385	0.4280	0.1963
2421	0.1602	0.1175	0.1124	0.1105
2422	0.0699	0.0735	0.0624	0.0534
2423	0.0328	0.0330	0.0347	0.0271
2424	0.2112	0.1952	0.2156	0.2162
2429	0.0740	0.1447	0.1512	0.1011
2430	0.7207	0.9932	0.7653	1.0000
2511	0.1816	0.1806	0.1798	0.1767
2519	0.0529	0.0430	0.0347	0.0434
2520	0.0172	0.0207	0.0181	0.0139
2610	0.2179	0.1849	0.1627	0.1446
2691	0.0374	0.0357	0.0358	0.0297
2692	0.1393	0.1092	0.0852	0.0817
2693	0.0321	0.4930	0.0242	0.0292
2694	0.0804	0.0727	0.0655	0.0568
2695	0.0404	0.0487	0.0387	0.0289
2696	0.0713	0.0726	0.0771	0.0414
2699	0.0738	0.2265	0.1647	0.1480
2710	0.0925	0.0911	0.0685	0.0581
2720	0.2243	0.2379	0.2588	0.2049
2811	0.0444	0.0358	0.0296	0.0216
2812	0.3384	0.1081	0.0644	0.0496
2813	0.4690	0.4733	0.6001	0.5566
2891	0.1173	0.0815	0.0621	0.0631
2892	0.1547	0.0999	0.1394	0.1572
2893	0.1535	0.1146	0.1247	0.0926
2899	0.0225	0.0280	0.0209	0.0227
2911	0.7994	0.3316	0.1852	0.2137
2912	0.1312	0.1221	0.1080	0.0702
2913	0.2416	0.2558	0.2760	0.3318
2914	1.0000	0.5790	0.5500	0.3029
2915	0.2180	0.1887	0.2502	0.2052
2919	0.1247	0.2516	0.2782	0.1708
2921	0.0922	0.0649	0.0548	0.0568

Table A6.4 Manufacturing Herfindalh index at four-digit VSIC level (continued)

VSIC4	2000	2001	2002	2003
2922	0.1682	0.1041	0.1599	0.1059
2925	0.5033	0.8168	0.5721	0.2347
2926	0.5317	0.2670	0.1622	0.1857
2929	0.1545	0.1626	0.1043	0.0888
2930	0.1883	0.2184	0.1864	0.1324
3000	0.9918	0.9810	0.8023	0.5388
3110	0.1789	0.1495	0.1755	0.1767
3120	0.2024	0.1129	0.1353	0.1842
3130	0.1113	0.0806	0.0805	0.0816
3140	0.2364	0.2492	0.2590	0.2859
3150	0.2538	0.2533	0.2751	0.2082
3190	0.3249	0.4402	0.3499	0.1448
3210	0.1198	0.0861	0.0810	0.1293
3220	0.0783	0.1071	0.1914	0.2167
3230	0.1695	0.1364	0.1129	0.1113
3311	0.1781	0.1711	0.1249	0.1262
3312	0.3291	0.7905	0.4905	0.4772
3313	0.5285	0.5000	0.5136	0.4227
3320	0.6321	0.6631	0.6196	0.5183
3330	0.7513	0.5448	0.6271	0.6523
3410	0.2055	0.1535	0.1517	0.1341
3420	0.2292	0.3446	0.5057	0.3434
3430	0.1124	0.0865	0.0755	0.0801
3511	0.0753	0.1038	0.1006	0.1036
3512	0.7409	0.7245	0.7996	0.7060
3520	0.3062	0.2928	0.2935	0.2886
3530	0.9903	0.9720	1.0000	1.0000
3591	0.1921	0.1250	0.1584	0.1387
3592	0.4136	0.2005	0.2085	0.2229
3599	0.3923	0.1767	0.1084	0.2230
3610	0.0204	0.0235	0.0832	0.0119
3691	0.4128	0.4810	0.5115	0.4077
3692	0.6809	0.4377	0.3447	0.3450
3693	0.2305	0.2086	0.1628	0.2051
3694	0.2698	0.2514	0.2244	0.3616
3699	0.0748	0.0503	0.0431	0.0361
All manufacturing	0.0813	0.1001	0.0734	0.0621

Source: Author's calculation.

Table A6.5a Comparison of alternative model specifications: Models with ERP (Effective rate of protection)

Variables	Basic model		Only trade reforms		Only domestic reforms		Trade & domestic reforms	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Stochastic production frontier								
Constant	0.567***	13.85	0.585***	15.46	0.535***	11.53	0.599***	14.80
$\ln L$	0.542***	24.70	0.542***	28.54	0.530***	26.93	0.548***	31.17
$\ln K$	0.535***	37.57	0.543***	40.12	0.544***	34.49	0.530***	42.18
$0.5(\ln L)^2$	-0.006	-0.28	-0.002	-0.09	-0.003	-0.17	-0.010	-0.51
$0.5(\ln K)^2$	0.083***	9.77	0.087***	10.57	0.085***	9.71	0.083***	10.06
$\ln L \ln K$	-0.059***	-5.00	-0.062***	-5.57	-0.061***	-5.12	-0.058***	-5.13
T	-0.041**	-2.45	-0.041**	-2.09	-0.046*	-1.87	-0.044**	-2.34
$0.5T^2$	0.078**	2.04	0.042	1.08	0.081	1.39	0.040	0.79
$T \ln L$	-0.021*	-1.66	-0.021*	-1.66	-0.016	-1.22	-0.024*	-1.83
$T \ln K$	0.020**	2.15	0.019*	1.91	0.017*	1.77	0.021**	2.18
Technical inefficiency model								
Constant	-7.215***	-6.21	-7.859***	-7.07	-5.240***	-4.20	-6.983***	-6.33
Capital labor ratio *(KL)*	0.978***	8.47	1.082***	9.62	1.048***	7.23	0.999***	9.29
Skilled labor *(SKILL)*	-6.545***	-6.21	-6.920***	-6.08	-8.479***	-6.42	-7.146***	-7.03
Age *(AGE)* (ln)	-1.003***	-7.37	-1.039***	-7.83	-1.081***	-5.54	-1.019***	-7.68
Private *(PRIV)*	-0.106	-0.59	-0.080	-0.41	-0.166	-0.85	-0.158	-0.82
Join stock *(JOINS)*	-6.453***	-6.89	-6.464***	-7.46	-6.038***	-6.23	-6.635***	-7.43
Foreign invested *(FDI)*	-2.269***	-7.30	-2.124***	-7.29	-2.127***	-6.25	-2.400***	-7.49
Trade policy measures *(ERP)*	**0.016***	**9.67**	**0.016***	**11.25**			**0.010***	**7.16**
Herfindalh index *(HFI4)*	**4.938***	**6.81**			**4.023***	**3.80**	**0.475**	**0.60**
Trade*Competition *(ERP*HFI4)*							**5.535***	**5.06**
Medium firm *(MED)*	-0.418***	-2.90	-0.162	-1.14	-0.622***	-3.86	-0.415***	-2.82
Big firm *(BIG)*	-1.406***	-5.42	-1.211***	-5.06	-1.761***	-6.77	-1.439***	-5.32
Y2001	-1.354***	-6.88	-1.362***	-7.42	-1.727***	-5.64	-1.217***	-7.54
Y2002	-2.040***	-8.04	-2.091***	-8.54	-2.750***	-7.17	-1.938***	-9.33
Y2003	-2.243***	-7.60	-2.494***	-8.40	-2.695***	-7.47	-2.494***	-11.11
Sigma-squared (σ^2)	6.629***	9.03	7.080***	9.72	6.157***	7.79	6.899***	10.12
Gamma (γ)	0.858***	49.91	0.868***	57.63	0.843***	43.57	0.864***	63.37
Log-Likelihood (LLF)	-8150.6		-8152.2		-8155.2		-8148.3	

Note: *, ** and *** denote the significance level of 10, 5 and 1 percent respectively.
Source: Author's calculation.

Table A6.5b Comparison of alternative model specifications: Models with NRP (Nominal rate of protection)

Variables	Basic model		Only trade reforms		Only domestic reforms		Trade & domestic reforms	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Constant	0.577***	15.13	0.574***	15.08	0.535***	11.53	0.572***	13.54
$\ln L$	0.540***	25.71	0.542***	29.30	0.530***	26.93	0.541***	23.79
$\ln K$	0.538***	36.72	0.538***	41.39	0.544***	34.49	0.534***	35.09
$0.5(\ln L)^2$	-0.009	-0.45	-0.009	-0.49	-0.003	-0.17	-0.011	-0.52
$0.5(\ln K)^2$	0.084***	10.16	0.083***	10.80	0.085***	9.71	0.083***	9.51
$\ln L \ln K$	-0.058***	-5.05	-0.058***	-5.21	-0.061***	-5.12	-0.057***	-4.68
T	-0.044**	-2.14	-0.044**	-2.19	-0.046*	-1.87	-0.050**	-2.66
$0.5T^2$	0.056*	1.95	0.070	1.58	0.081	1.39	0.082*	1.80
$T \ln L$	-0.024*	-1.78	-0.022**	-1.71	-0.016	-1.22	-0.023*	-1.80
$T \ln K$	0.019*	1.95	0.019***	2.02	0.017*	1.77	0.020**	2.08
Technical inefficiency model								
Constant	-7.026***	-5.22	-7.008***	-8.22	-5.240***	-4.20	-6.794***	-4.72
Capital labor ratio *(KL)*	0.972***	7.63	0.995***	14.42	1.048***	7.23	0.962***	7.09
Skilled labor *(SKILL)*	-7.666***	-6.56	-6.943***	-9.19	-8.479***	-6.42	-8.263***	-6.30
Age *(AGE)* (ln)	-1.079***	-7.09	-1.123***	-16.55	-1.081***	-5.54	-1.035***	-7.08
Private *(PRIV)*	-0.121	-0.72	-0.291*	-1.75	-0.166	-0.85	-0.245	-1.41
Join stock *(JOINS)*	-6.067***	-6.92	-6.302***	-24.18	-6.038***	-6.23	-6.301***	-5.61
Foreign invested *(FDI)*	-2.302***	-6.69	-2.387***	-11.83	-2.127***	-6.25	-2.403***	-6.53
Trade policy measures *(NRP)*	**0.055*** **	**7.66**	**0.058*** **	**16.44**			**0.046*** **	**4.54**
Herfindalh index *(HFI4)*	**4.123*** **	**4.92**			**4.023*** **	**3.80**	**2.432**	**1.28**
Trade*Competition *(ERP*HFI4)*							5.620**	2.14
Medium firm *(MED)*	-0.484***	-3.17	-0.418***	-2.89	-0.622***	-3.86	-0.490***	-3.20
Big firm *(BIG)*	-1.444***	-5.99	-1.407***	-7.65	-1.761***	-6.77	-1.498***	-4.83
Y2001	-1.508***	-6.95	-1.634***	-8.68	-1.727***	-5.64	-1.646***	-6.69
Y2002	-2.253***	-8.44	-2.428***	-10.96	-2.750***	-7.17	-2.500***	-6.79
Y2003	-2.299***	-7.43	-2.516***	-8.56	-2.695***	-7.47	-2.688***	-5.20
Sigma-squared (σ^2)	6.582***	8.55	6.859***	14.97	6.157***	7.79	6.803***	8.63
Gamma (γ)	0.858***	49.50	0.863***	89.15	0.843***	43.57	0.863***	52.03
Log-Likelihood (LLF)	-8148.6		-8149.6		-8155.2		-8147.4	

Note: *, ** and *** denote the significance level of 10, 5 and 1 percent respectively.
Source: Author's calculation.

Table A6.5c Comparison of alternative model specifications: Models with IM (Import share)

Variables	Basic model		Only trade reforms		Only domestic reforms		Trade & domestic reforms	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Constant	0.546***	12.15	0.549***	12.48	0.535***	11.53	0.564***	16.76
$\ln L$	0.539***	29.71	0.540***	27.53	0.530***	26.93	0.537***	28.46
$\ln K$	0.532***	38.55	0.539***	35.34	0.544***	34.49	0.536***	37.58
$0.5(\ln L)^2$	-0.014	-0.72	-0.016	-0.78	-0.003	-0.17	-0.012	-0.61
$0.5(\ln K)^2$	0.082***	9.15	0.082***	9.09	0.085***	9.71	0.083***	9.34
$\ln L \ln K$	-0.056***	-4.68	-0.055***	-4.51	-0.061***	-5.12	-0.057***	-4.75
T	-0.055**	-2.37	-0.056**	-2.40	-0.046*	-1.87	-0.048**	-2.71
$0.5T^2$	0.097*	1.72	0.091**	2.04	0.081	1.39	0.077**	2.01
$T \ln L$	-0.023*	-1.82	-0.018	-1.37	-0.016	-1.22	-0.021	-1.64
$T \ln K$	0.021**	2.33	0.020**	2.06	0.017*	1.77	0.019*	2.01
Technical inefficiency model								
Constant	-4.682***	-4.70	-4.843***	-4.95	-5.240***	-4.20	-6.785***	-7.24
Capital labor ratio *(KL)*	0.942***	7.55	1.004***	7.92	1.048***	7.23	1.139***	11.39
Skilled labor *(SKILL)*	-9.163***	-7.29	-8.904***	-6.91	-8.479***	-6.42	-10.716***	-8.00
Age *(AGE)* (ln)	-1.006***	-7.06	-0.985***	-7.07	-1.081***	-5.54	-1.128***	-12.17
Private *(PRIV)*	-0.288	-1.56	-0.226	-1.26	-0.166	-0.85	-0.112	-0.68
Join stock *(JOINS)*	-6.201***	-7.55	-5.995***	-8.01	-6.038***	-6.23	-5.722***	-13.66
Foreign invested *(FDI)*	-2.197***	-6.38	-2.056***	-6.88	-2.127***	-6.25	-2.474***	-6.93
Trade policy measures *(IM)*	**-0.109*** **	-4.45	**-0.070*** **	**-3.25**			**0.082**	**1.03**
Herfindalh index *(HFI4)*	**5.218*** **	5.63			**4.023*** **	**3.80**	**6.460*** **	**8.96**
Trade*Competition *(ERP*HFI4)*							-0.601***	-3.30
Medium firm *(MED)*	-0.637***	-4.28	-0.365**	-2.29	-0.622***	-3.86	-0.753***	-5.00
Big firm *(BIG)*	-1.871***	-8.29	-1.443***	-6.70	-1.761***	-6.77	-2.047***	-9.19
Y2001	-1.953***	-7.12	-2.071***	-8.57	-1.727***	-5.64	-1.952***	-9.94
Y2002	-3.095***	-8.41	-3.262***	-9.14	-2.750***	-7.17	-3.117***	-10.95
Y2003	-2.943***	-8.52	-3.144***	-8.24	-2.695***	-7.47	-3.254***	-8.55
Sigma-squared (σ^2)	6.234***	9.65	6.258***	10.45	6.157***	7.79	7.348***	10.88
Gamma (γ)	0.849***	48.30	0.847***	59.75	0.843***	43.57	0.870***	65.40
Log-Likelihood (LLF)	-8153.9		-8156.1		-8155.2		-8151.2	

Note: *, ** and *** denote the significance level of 10, 5 and 1 percent respectively.
Source: Author's calculation.

Table A6.6 Average values of key determinants of firm inefficiency by trade orientation group

Trade-orientation	2000	2001	2002	2003	Mean
Real capital stock (mill VND)					
Less-traded	53,789.9	52,537.1	50,256.1	50,952.9	51,888.5
Export-oriented	10,527.4	11,069.2	11,275.4	11,056.0	10,980.0
Import-competing	22,961.2	23,485.6	22,586.2	23,123.8	23,037.0
Mean	25,743.1	25,829.6	25,122.1	25,287.8	25,495.6
Employment size (person/firm)					
Less-traded	227.1	225.6	235.6	253.1	235.3
Export-oriented	494.2	537.6	618.7	624.3	568.1
Import-competing	241.8	252.0	267.9	290.3	263.3
Mean	331.6	351.7	386.9	402.5	368.2
Capital – intensity (mill VND/person)					
Less-traded	126.6	126.0	117.3	114.3	121.1
Export-oriented	39.4	37.4	33.3	34.0	36.1
Import-competing	121.9	113.9	102.0	90.5	106.9
Mean	92.6	88.4	80.8	75.7	84.4
Skilled labor share (%)					
Less-traded	0.099	0.102	0.106	0.108	0.104
Export-oriented	0.043	0.048	0.042	0.040	0.043
Import-competing	0.128	0.119	0.114	0.117	0.119
Mean	0.090	0.089	0.086	0.087	0.088
Competition index					
Less-traded	0.082	0.086	0.081	0.076	0.081
Export-oriented	0.054	0.051	0.049	0.044	0.049
Import-competing	0.112	0.097	0.087	0.076	0.093
Mean	0.083	0.077	0.071	0.064	0.074

Source: Author's calculation.

Table A6.7 Distribution of firms by ownership and trade orientation

Trade orientation	State-owned	Private	Joint-stock	FDI	All
Shares within each ownership type (%)					
Less-traded	37.7	20.0	27.9	15.2	23.8
Export-oriented	24.9	47.2	21.6	27.7	36.6
Import-competing	37.5	32.8	50.5	57.1	39.6
Total	100	100	100	100	100
Shares within each ownership type (%)					
Less-traded	38.1	42.8	7.0	12.1	100
Export-oriented	16.3	65.8	3.5	14.3	100
Import-competing	22.8	42.3	7.7	27.3	100

Source: Author's calculation.

Table A6.8 Mean efficiency level (%) by ownership type over time

Ownership type	2000	2001	2002	2003	Mean	Change[(a)]
State-own	58.1	62.3	63.8	64.6	62.2	6.6
Private	51.4	57.0	60.6	61.2	57.5	9.8
Joint stock	70.8	73.2	73.1	73.7	72.8	2.9
FDI	56.6	62.4	65.3	66.5	62.7	9.9
Mean	55.0	60.3	63.1	63.8	60.5	8.8

Note: (a) Change is defined as the percentage point difference in mean technical efficiency in 2000-03.
Source: Author's calculation