

Firms in International Trade: Evidence from Indonesia

Deasy Damayanti Putri Pane

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

April 2019

© Copyright by Deasy Damayanti Putri Pane 2019
All Rights Reserved

Declaration

With the exception of Chapter 4, this entire thesis is my own work. Chapter 4 is a collaboration with Professor Prema-chandra Athukorala; 60 percent of which is my contribution. All inaccuracies are mine.

A handwritten signature in black ink, consisting of a series of loops and vertical strokes, likely representing the name Deasy Damayanti Putri Pane.

Deasy Damayanti Putri Pane
10 April 2019

Acknowledgements

First of all, I thank Almighty God.

I would like to offer my gratitude to my supervisory panel members for their invaluable guidance and constant support. This thesis has been completed under the excellent supervision of my main supervisor, Dr Arianto Patunru, to whom I am very grateful. I thank him for all his comments, academic support, exceptional help and encouragement throughout my PhD journey. I also give a big thankyou and acknowledgement to my two panel members, Professor Hal Hill and Professor Premachandra Athukorala, who have always given their time to discuss ideas, afford insightful feedback and suggestions, and provide enormous intellectual strength.

I have benefited from the intellectual environment at the Arndt-Corden Department of Economics (ACDE) at the Crawford School of Public Policy, The Australian National University (ANU), especially because of its unique focus on the economies of the Asia–Pacific region, particularly Indonesia. I thank Blane Lewis, Budy Resosudarmo, Chris Manning, Paul Burke, Peter Warr, Raghbendra Jha, Ross McLeod, Sarah Dong, Shuhei Nishitaten, Nurkemala Muliani, Kate McLinton, Heeok Kyung and Sandra Zec for all their fruitful discussions and helpful assistance. I am grateful to fellow PhD students for their friendship, for being supportive peers and for providing me with a stimulating environment during my candidature. They are Umbu Raya, Ryan Edwards, Samuel Weldeegzie, Agung Widodo, Yessi Vadila, Sadia Afrin, Rohan Best, Deni Friawan, Barli Suryanta, Adrianus Hendrawan, Rus'an Nasrudin, Nguyen Hieu, Panittra Ninpanit, Chandra Putra, Anna Falentina, Huong Tran, Donny Pasaribu, Yuventus, Chitra Retna, Inggrid, Umi Yaumidin, Wishnu Mahraddika, I Made Krishna Gupta, Riswandi, Abdul Nasir, Ruth Nikijuluw, Joseph Marshan, Martha Primanthi,

Gusti Via, Cerdikwan, Phan Le, Wannaphong Durongkaveroj, Alongkorn Tanasritunyakul, Chi Hoong Leong, Sun Htoo Aung, Thanh Nguyen, Taehyun Ryu and Christopher Cabuay. Special thanks to Donny, Phan and Wannaphong for serving as discussants in my PhD seminars. I am also thankful for the wonderful support from Megan Poore and Tracy McRae on HDR administrative matters and for all their help.

I received valuable feedback on my papers from anonymous reviewers, two editors, as well as seminar participants at the ACDE–ANU Economics PhD seminars, the Australasian Development Economics Workshop (ADEW) in 2017 and 2018, the East Asian Economic Association International Convention (EAEA) in 2018, the Asian and Australasian Society of Labour Economics (AASLE) in 2018, and the Adelaide PhD Summer Institute in International Trade in 2018 and 2019. Special thanks to Dionisius Nardjoko for the discussions and insights on my papers as well as for giving access to some data that I use in my research. I want to express my thanks to Sadayuki Takii for providing me some data for this thesis. I also thank Dr Carolyn Brewer for copyediting my thesis.

I gratefully acknowledge the financial support I received from the Australian Award Scholarship (AAS) and the Department of Foreign Affairs and Trade (DFAT) that allowed me to undertake my PhD program. Special thanks to the amazing AAS team at the Crawford School: Liz Ingram, Ngan Le, Nooraishah Zainuddin, Lam Que Hua and Ida Wu, who provided me with valuable support. I am grateful to have been awarded the 2018 Hadi Soesastro Prize (HSP) by DFAT that provided me with additional support to conduct further research. Special thanks to Michael Bracher for his assistance regarding the HSP program. I also acknowledge the HDR Student Conference Funding I received from the Crawford School of Public Policy and the Vice-Chancellor's HDR Travel Grants that provided funding for some conferences that I attended.

I thank my colleagues in the Directorate of Trade, Investment and International Economic Cooperation in the Badan Perencanaan Pembangunan Nasional (BAPPENAS) for their friendship and support. Special thanks to Amalia Adininggar Widyasanti, who provided me with the opportunity to pursue a PhD degree. I also thank Prasetyo Widjoyo Malangyudo, Leonard Tampubolon, Florentinus Kristiartono and the Human Resources Development Bureau team for supporting me particularly in the early phase of my PhD application.

I am extremely grateful to my beloved mom and my mother-in-law for their unconditional love, care, sacrifice and prayers. I warmly thank my sisters and brother: Nina, Titin, Uli, Tika and Romy, as well as my in-laws, Riki, Meiti, Jehan, Jimmy, Yanyan and Nadia for their love, laughter and constant support. Special grateful thanks and love to my late father who was sick and passed away while I was doing my PhD. I feel very regretful that I was not able to accompany him during his struggle. I dedicate this work to him.

Finally, heartfelt thanks go to my dearest husband, Yudi Suwarna, and my daughter, Kalya Suwarna, who are always my motivation to pursue our dreams. I thank them so much for their love, care, patience, understanding, support and encouragement. Because of them, I have been able to complete my PhD work.

Abstract

This thesis consists of four research papers analysing Indonesian firms and their activities in international trade. The first two papers investigate the ‘learning-by-exporting’ (LBE) hypothesis that suggests an increase in firms’ performance once they enter foreign markets due to exposure to new knowledge and experience from abroad. The first paper explores the impact of export experience on firm productivity. Using firm-level data for 2000–12, I apply a fixed-effect technique by incorporating propensity score matching (PSM) in the first stage to control for the self-selection bias. I find that exporters’ total factor productivity (TFP) increases with export age, but not linearly. Larger exporting firms and those engaged in particular industries undergo a clearer learning process. However, the LBE effect is only evident for firms that have had high productivity since the beginning, supporting the ‘self-selection’ hypothesis.

The second paper discusses the policy consequence of LBE evidence. If LBE exists, should we endorse export promotion policies? I address this question by investigating the learning channels of firms in the garment industry. Firms in this industry experienced three decades of quota regulations under the Multi Fibre Arrangement (MFA), which governed world trade patterns before its abolition in 2005. This investigation allows me to conduct a natural-experiment-type study on how export quotas affected the performance of apparel exporters. Applying PSM and difference-in-difference (DID) methods to firm-level data covering 25 years, I find that the impact of exporting on TFP during the MFA implementation period was mixed; but after its abolition, productivity increased by 9–13 percent. This implies that exporters gain a significant LBE benefit from competition (that is, without a special facility such

as the MFA), and interventions that protect exporters from such competition might lessen the benefit.

The third paper examines the patterns and determinants of apparel exports from Indonesia after the MFA's abolition. Contrary to predictions, Indonesia has not been able to achieve market share gains under competitive market conditions. The analysis of export patterns and Constant Market Share Analysis (CMSA) suggest that the lacklustre export performance was caused by supply constraints that hindered volume expansion to counterbalance the price-lowering effect of the quota abolition and the failure to diversify the product mix and the direction of exports in line with changing global demand patterns. The firm-level analysis suggests that productivity growth, the domestic textile base and access to imported inputs are key determinants of export performance in the post-MFA era.

The fourth paper investigates the impact of increasing imported intermediate inputs on firms' TFP and firms' manufacturing exports. To tackle the simultaneity problem between imports and exports, I employ import tariffs and real exchange rates as instruments, using a weighting procedure that utilises each industry's use of imported inputs. Using firm-level data matched with detailed Customs data of exports and imports for 2008–12, the findings suggest that imported inputs raise productivity and export performance. Higher access to input varieties has a larger impact than an increase in import volumes on export performance. The effect is larger for imports from developed countries, suggestive of a positive effect from technology and product quality. Interestingly, the causal relation does not hold for firms in global production sharing (GPS) sectors, suggesting that firms in these industries manage their input and export decisions differently.

Table of Contents

Declaration of Originality	iii
Acknowledgements	iv
Abstract	vii
List of Figures	xi
List of Tables	xii
Glossary	xiv
1. Introduction	1
1.1. Firm-level trade	1
1.2. The Indonesian case	10
1.3. Productivity	12
1.4. Key research questions, methods, results and contributions	12
1.4.1. Chapter 2: Export experience and firms' performance	12
1.4.2. Chapter 3: Learning by exporting: The role of competition	13
1.4.3. Chapter 4: Patterns and determinants of apparel exports in the post-MFA world	15
1.4.4. Chapter 5: The role of imported intermediate inputs on firms' productivity and exports	16
1.5. Organisation	17
2. Export Experience and Firms' Performance	19
Abstract	19
2.1. Introduction	20
2.2. Literature review	23
2.2.1. Indonesian context	28
2.3. Methodology	32
2.3.1. Preliminary analysis	32
2.3.2. The impact of export experience on firms' performance	35
2.3.3. Strategies to reduce potential biases	38
2.3.4. Alternative approach	40
2.4. Data	42
2.4.1. Data Overview	42
2.5. Results	52
2.5.1. Preliminary results	52
2.5.2. Main results	54
2.5.3. Sectoral and size effects	57
2.5.4. Results from alternative approach	59
2.6. Concluding remarks	61
2.A. Appendix 2	63
3. Learning by Exporting: The Role of Competition	69
Abstract	69
3.1. Introduction	70
3.2. The implementation of the Multi-Fibre Arrangement in Indonesia	74
3.3. The model of learning by exporting	84
3.3.1. Productivity estimation	86
3.3.2. Identification strategy: Learning by exporting under a quota intervention	90
3.4. Data description	95

3.5. Results	99
3.5.1. Matching procedures	99
3.5.2. Results from main equations	100
3.5.3. Placebo tests	105
3.5.4. Robustness checks	106
3.6. Concluding remarks	109
3.A. Appendix 3	111
Dealing with the missing capital stock data	111
4. Patterns and Determinants of Garment Exports in the Post-MFA World	113
Abstract	113
4.1. Introduction	114
4.2. The global context: MFA era and after	117
4.3. The Indonesian apparel industry: A brief history	122
4.4. Post-MFA export performance	125
4.4.1. Trends	125
4.4.2. Export composition	128
4.4.3. Direction of exports	130
4.5. Constant market-share analysis	132
4.6. Determinants' export performance: A firm-level analysis	136
4.6.1. Model	136
4.6.2. Data and the estimation method	140
4.6.3. Results	142
4.7. Concluding remarks	148
4.A. Appendix 4	151
5. The Role of Imported Intermediate Inputs in Firm's Productivity and Exports	155
Abstract	155
5.1. Introduction	156
5.2. Theoretical framework	162
5.2.1. Total factor productivity	163
5.2.2. Export performance	164
5.3. Empirical strategy	167
5.3.1. Total factor productivity	167
5.3.2. The impact of imported intermediate inputs on exports	168
5.3.3. Instruments	169
5.4. Data	172
5.5. Results	178
5.5.1. TFP estimations	178
5.5.2. Imported inputs and export performance	180
5.5.3. Some possible channels	189
5.5.4. Robustness checks	193
5.6. Concluding remarks	195
5.A. Appendix 5	197
6. Conclusions	207
6.1. Summary	208
6.2. Contributions and policy implications	210
6.3. Limitations and suggestions for further studies	212
Bibliography	215

List of Figures

2.1.	Indonesia's exports, 2000–14	29
2.2.	The export age	45
2.3.	TFP by sector groups	48
2.4.	TFP: Exporters vs. non-exporters	49
2.5.	TFP by firms' export classifications	50
2.6.	Price indexes	52
2.7.	Comparing treatment and control groups after export	60
3.1.	Effect of MFA quota on exporting country	77
3.2.	Apparel exports from various countries	80
3.3.	Deflator comparison for garment industry, 2000 = 100, index in IDR	97
3.4a–f.	Comparing garment and footwear performance	99
3.5a–b.	Results from matching procedures	100
3.6.	Placebo test by moving the lower (upper) cut-off of the intervention removal year	106
4.1.	Apparel exports from Indonesia, 1975–2016	123
4.2.	Employment in the Indonesian apparel industry, 1990–2014	124
4.3.	Apparel exports: Indonesia and selected Asian countries	126
4.4.	Indonesia's apparel exports: Volumes, prices and values indices (2000 = 100)	127
4.5.	Export share by destination (in percentage)	131
4.6.	Unit value indices apparel exports by destination (2000 = 100)	132
5A.1.	Export and imported intermediate inputs in manufacturing sectors 2012–15, by region	198

List of Tables

2.1.	Export market destination of manufacturing product	30
2.2.	Export share by selected sectors	30
2.3.	Number of active firms, exporting firms and new exporting firms (on average)	44
2.4.	Differences between exporting firms and non-exporting firms	53
2.5.	Effect of export experience on productivity	55
2.6.	Sectoral and size effects of export experience	58
2.7.	Estimated LBE effects	60
2A.1.	Summary statistics	63
2A.2.	Export participation and export intensity	63
2A.3.	Number of firms that stay exporting for t years	64
2A.4.	Industry classifications	65
2A.5.	Construction of the TFP variable	65
2A.6.	Selection into export	66
2A.7.	Heckman selection model of the relation between the export age and sales	67
2A.8.	Alternative specifications	68
3.1.	Apparel export annual growth rates from Asian developing countries, nominal value of SITC 84 in percentage	78
3.2.	Textiles and apparel export fill rate of quota products on average, from some countries to the USA, in percentage	79
3.3.	Descriptive statistics	98
3.4.	Results from Equation 3.6	102
3.5.	Results from Equation 3.7	104
3.6.	Robustness checks	107
3.7.	Size effects	108
3.8.	Domestic firms and foreign-owned firms	109
3A.1.	Test for attrition bias using xtprobit estimator	112
4.1.	Average annual growth of apparel exports: Indonesia and selected Asian countries (in percentage)	125
4.2.	Export market share of apparel products: Indonesia and selected Asian countries (in percentage)	128
4.3.	Indonesian apparel exports: Top 20 products, 2003–04 and 2013–14	129
4.4.	Shares of women/girls wear and men/boys wear in total apparel exports from Indonesia	131
4.5.	Constant market share analysis of apparel exports from Indonesia and selected Asian countries (in percentage)	135
4.6.	Regression results: Determinants of export propensity	142
4.7.	Regression results: Determinants of export intensity	143
4.8.	Correlation between variables	145
4A.1.	Results from export equation estimate with TFP as the productivity measure	151
4A.2.	Marginal effects from probit equation	152
4A.3.	Results from model with contemporaneous effects of explanatory variables	153
4A.4.	Results from export equations estimated with minimum wage as additional explanatory variable	154
5.1.	Exporting and importing firms	175
5.2.	Top 10 source countries for Indonesian firms' imports of intermediate goods, 2012	176
5.3.	Summary statistics	177
5.4.	TFP estimation	179
5.5.	The impact of imported input varieties on exports	183
5.6.	The impact of the increase of intermediate input value on exports	184

5.7.	Foreign-owned firms and domestic firms	187
5.8.	Firms in GPS and non-GPS sectors	188
5.9.	Firms in resource-based sectors and non–resource-based sectors	189
5.10.	Heterogeneous impact of the increase of import varieties on export by different combinations of source-destination groups of countries	191
5.11.	Heterogeneous impact of the increase of import values on export by different combinations of source-destination groups of countries	193
5.12.	Robustness checks	195
5A.1.	Exports – imports on intermediate inputs, and tariffs on manufacturing goods, by regions (2002 and 2015)	197
5A.2.	Top 10 export destinations of Indonesia’s manufacturing products, 2012	198
5A.3.	Exogenous tariff changes to initial industry characteristics	199
5A.4.	Constructed weighted tariffs and RER	200
5A.5.	Imported input variation by sectors	201
5A.6.	Imported input variation by years	201
5A.7.	Sourcing decisions of a firm: An example	202
5A.8.	Resource-based sectors	203
5A.9.	Definitions of certain regions used in the model	203
5A.10.	Manufacturing trades with East-Asian regions and non-East-Asian regions, by GPS classification (2012)	203
5A.11.	First stage results using different definitions of tariff	204
5A.12.	Average imported input tariffs in Indonesia	204
5A.13.	Global Production Sharing (GPS) industries	205

Glossary

ACFTA	ASEAN–China Free Trade Area
AFC	Asian Financial Crisis
AGOA	USA’s African Growth and Opportunities Act
ANU	The Australian National University
ASEAN	The Association of Southeast Asian Nations
ATC	Agreement on Textiles and Clothing
BAPPENAS	Badan Perencanaan Pembangunan Nasional – National Development Planning Agency of Indonesia
BPS	Badan Pusat Statistik – Central Bureau of Statistics of Indonesia
CMSA	Constant Market Share Analysis
DDD	Difference-in-difference-in-difference
DFQF	Duty Free Quota Free
DID	Difference-in-difference
EBA	EU’s Everything but Arms
ELE	Electronics (sector)
ERIA	The Economic Research Institute for ASEAN and East Asia
EU	European Union
FCI	Footloose Capital-Intensive (Sector)
FDI	Foreign Direct Investment
FE	Fixed Effects
FTA	Free Trade Agreement
G7	Group of Seven
GATT	General Agreement on Tariffs and Trade
GPS	Global Production Sharing
GSP	Generalised System of Preference
GVC	Global Value Chains
HS	Harmonised System
IDR	Indonesian Rupiah
IJEPA	Indonesia–Japan Economic Partnership Agreement
ISIC	The International Standard Industrial Classification
LBE	Learning by Exporting
LDCs	Least Developed Countries
LP	Levinsohn–Petrin
NIEs	Newly Industrialising Economies

NTMs	Non-tariff Measures
MFA	Multi-Fibre Arrangement
MFN	Most Favoured Nation
MW	Minimum Wages
OLS	Ordinary Least Square (Regression)
OP	Olley–Pakes
PSM	Propensity Score Matching
RCI	Resource-based Capital-intensive (Sector)
RE	Random Effects
RER	Real Exchange Rate
RLI	Resource-based LaboUr-intensive (Sector)
SI	<i>Statistik Industri</i> – Industrial Statistics of Indonesian Manufacturing Firms
SITC	Standard International Trade Classification
TFP	Total Factor Productivity
TRAINS	Trade Analysis Information System
ULI	Unskilled Labour-intensive (Sector)
UN	United Nations
UNCOMTRADE	United Nations Comtrade Database
USA	The United States of America
USD	US Dollar
WPI	Wholesale Price Index
WTO	World Trade Organization

Chapter 1

Introduction

This thesis presents four research chapters on the impact of participating in international trade on firms' productivity and performance. The results indicate that there is a causal effect of entering export markets on productivity performance and that export experience has positive effects on further productivity improvement, even though the impact reduces when export age increases. In addition, the competition channel is significant for stimulating learning processes in export markets. Moreover, any interventions that protect exporters from competition, or impede export access, might lessen the learning benefits. In addition, further productivity growth and access to intermediate inputs are important factors in determining the ability of firms to remain competitive in export markets. Finally, there is a causal effect of an increase of imported input values and varieties on total factor productivity and export performance.

1.1. Firm-level trade

Some firms trade across borders and some do not. The trading firms and non-trading firms are different in many aspects, but the former are generally superior. Trading firms are found to be larger, more productive and more 'skill-intensive' and more 'capital intensive'. They also tend to pay higher wages (Bernard, Redding & Schott 2007). This phenomenon is interesting since, all over the world, apparently only a small portion of firms participate in international trade—both export and import. Many

studies find that being active in international markets is restricted to higher performing firms—the most productive firms that can compete and make profits in the global market (Bernard et al. 2018). This phenomenon is evident everywhere, including in the most advanced countries.¹ There are at least two explanations. First, doing trade is costly; therefore, only efficient firms are able to overcome the costs of entering international markets. Second, the performance of trading firms, compared to non-trading ones, is improving when they start being internationalised due to the learning effects. Understanding the issue of firms' behaviour towards international trade is therefore crucial. This is particularly relevant for the policy context since most governments consider international trade—especially export—as a good thing, a welfare-improving activity that is essential for economic growth.

Studies on firms, the key players that actually drive trade flows, are relatively new. Firms have not been the focus of attention of scholars in the area of international trade until recently. Even though economists have always been curious to understand why and how trade happens, as well as its implications, such investigations have not been possible without the availability of micro-level data. The previous waves of research on international trade mainly have focused at country-level (and industry-level) trade phenomenon. The earliest theory of international trade suggests that trade occurs due to welfare gains from natural differences in comparative advantages between countries. The 'Ricardian' comparative advantage suggests that the productivity differences between countries caused trade, while the 'Heckscher–Ohlin' comparative advantage theorem suggests that it occurs due to the combination of cross-industry differences in factor intensity and cross-country differences in factor

¹ Bernard et al. (2018) show that only 35 percent of USA firms export, while 20 percent import and 16 percent do both.

abundance (Bernard et al. 2007). The new trade theory pioneered by Krugman (1980) adds a more detailed explanation of intra-industry trade since apparently trade takes place within the same industries between countries. Economies of scale and consumer preferences on varieties encourage producers to be more specialised to enhance their competitiveness; and this specialisation leads to trade. In addition, technology differences, factor-price inequality and trade costs also contribute to the explanation of trade patterns (Helpman & Krugman 1985). These theories provide the majority of explanations of international trade. Although they are successful in facilitating a wider understanding of international trade issues, these theories typically simplify trade by assuming that a firm represents an industry and they disregard the micro-level variation of firms' behaviour towards trade.

Since the mid-1990s, a large number of empirical studies have investigated the firms' roles as the main actors of globalisation through exports and imports.² They have found some regularities; only some firms export, exporters are more productive than non-exporters, and trade could increase aggregate industry productivity. Based on these findings, Melitz (2003) generates a formal framework of 'firm heterogeneity' that provides a natural explanation for self-selection mechanisms related to exports.³ In this model, the existence of sunk costs makes firms act differently; that is, only those firms with productivity higher than a particular 'export productivity cut-off level' find it profitable to export, while the less efficient firms serve only the domestic

² Exporting firms are found to be larger, more productive, more skill- and capital-intensive; they use different input mix and pay higher wages than non-exporting firms (Bernard et al. 2007). Bas and Strauss-Kahn (2013) show that importers are larger, more productive, more capital intensive and pay higher wages than non-importers.

³ The framework to analyse a firm-level decision about whether to export that was introduced by Melitz (2003) has inspired many studies to also analyse a firm's import decision (Antràs, Fort & Tintelnot 2017).

market and the least efficient exit altogether.⁴ This hypothesis postulates that the differences between exporters and non-exporters are not because of exporting but are already present before the exporting begins. Empirically, this hypothesis has solid evidence, because it has not been rejected by analyses from various countries with different datasets and over different periods.

Another hypothesis suggests the learning-by-exporting (LBE) effects that explain the differences between exporting and non-exporting firms are the result of exposure to markets abroad that allow the former to improve their efficiency levels. There are two possible learning channels. Exporters can learn from buyers and from competitors (Blalock & Gertler 2004; De Loecker 2007). This mechanism, however, has not been completely validated. Previous empirical investigations have shown mixed results; some found evidence of productivity improvement after a firm entered export markets and some showed that exporting did not have a significant effect on productivity. A research survey suggests that the LBE effect varies across countries, but it tends to be observed more in the case of developing rather than developed economies (Martins & Yang 2009). One possible explanation is that firms in developing countries are more likely to face a significantly larger and more competitive market once they export, which challenges them to upgrade their products, production processes and technical standards, and improve their quality control, management techniques as well as their workers' capabilities. All these result in productivity improvement. That said, firms from more advanced countries are more likely to enter a market that is as challenging as their domestic market, or less so. For these firms the productivity impact is also minimal (Fernandes & Isgut 2015).

⁴ Sunk costs can be costs to find buyers, to research about foreign markets and to ensure that products conform to foreign standards.

A stream of research has been conducted to try to understand the LBE phenomenon. However, some questions arise. First, if it is true that firms gain more knowledge through exporting, does the productivity keep improving throughout the years of exporting? Is LBE a temporary or permanent phenomenon? Do firm size, industry structure and ownership also play a role? Answering these questions is key to understanding how firms behave with respect to participation in international trade.⁵ It is especially relevant from a policy standpoint since governments are motivated to improve export performance and are concerned with overall productivity improvement; and at the same time, they would like to know the implications of formulating a specific policy (or no policy, for that matter) on firms' performance. For example, they might want to know the short-term and long-term effects of an export promotion program. Does it encourage firms to export for a long-term period? Does it initiate long-term productivity improvement?

Second, if LBE does exist, does it mean that export can be seen as a strategy for productivity improvement? Subsequently, if exporting can improve firms' performance, should we endorse export promotion policies? This question is central to policy since many governments believe in and put effort into export promotion projects. Then again, the opponents of this argument believe that interventions could result in counterproductive outcomes.⁶ Even if there was a compromise between the two opposing views, each would still ask: how long should the government provide

⁵ Studies on how exporting experience affects productivity are relatively rare: Alvarez and Lopez (2005) on Chilean firms, De Loecker (2007) on Slovenian firms, Fernandes and Isgut (2015) on Colombian firms and are among the few such studies.

⁶ This is related to the infant industry argument, which suggests that a government intervention only raises 'spoiled' firms; it only temporarily benefits firms during its implementation, but it has no effect afterward.

support for firms to export? Do exporting firms that receive such support perform as productively as those that are independent?

Third, how do firms react to a significant change in the global market? It is obvious that business circumstances keep changing in response to natural and/or external and internal policy shocks. A shock is most likely to force business players to adjust to new situations. Therefore, understanding patterns or how structural adjustments operate during the process would be beneficial. More importantly, if a shock has disincentive effects, a comprehension of factors that encourage firms to stay in the export market would be valuable, especially for policy makers.

Fourth, how about imports? Many studies have pointed out the role of imported intermediate inputs on firms' performance (e.g. Amiti & Konings 2007; Goldberg et al. 2010). However, few have a convincing method to show the effect of imported inputs on exports.⁷ Moreover, some of the following relevant components are also lacking in the literature. In particular, these include the aspects of imported inputs that can actually cause, if any, improvement in firms' exports as well as the importance of sources of inputs. In addition, in a world where final products are now produced together across countries within global production networks, understanding the role of imported inputs is even more needed.

Many empirical studies have answered some of these questions. But some remain unresolved. My thesis aims to contribute towards filling these gaps. There have been extensive studies on LBE, but only a few papers discuss the connections between export experience and firms' performance.⁸ The current research on LBE has not been

⁷ See Bas and Strauss-Kahn (2013) on France, and Feng, Li and Swenson (2016) on China.

⁸ See some studies for developing countries, such as Alvarez and Lopez (2005) for Chile, Blalock and Gertler (2004) for Indonesia, Du et al. (2012) for China, Fernandes and Isgut (2015) for Columbia and

entirely successful in explaining the channels through which LBE operates and in identifying its implications. The second research chapter of this thesis proposes a methodological innovation to address these issues. Discussions on how firms react after an exogenous shock have also been popular recently. Exploring different situations, in terms of a specific shock in a particular country, would be beneficial for enriching our understanding and supplying more evidence to the literature. Lastly, the existing empirical studies have not completely resolved some biases in their models due to the interdependence of imports and performance variables.⁹

The first two parts of my thesis aim to empirically test the evidence of LBE among Indonesian firms. In the first part I scrutinise firm heterogeneity in terms of the LBE mechanism. Particularly, I ask how experience in export markets affects performance. As learning is associated with repeating and stimulating activities, export experience might not always have a significant productivity improvement (Fernandes & Isgut 2015).¹⁰ I investigate the effect of export age on firm productivity by employing various techniques to check the nature of their relation. In addition, I also consider the self-selection process, which is often discussed in conjunction with the LBE mechanism.

Van Biesebroeck (2005) for African countries that find positive learning effects from exporting. However, results from developed countries are mixed. Bernard and Jensen (1999) for the USA, Delgado, Farinas, and Ruano (2002) for Spain, Greenaway, Gullstrand and Kneller (2005) for Sweden find no effects from exporting, while Baldwin and Gu (2003) for Canada, De Loecker (2007) for Slovenia, and Girma, Greenaway and Kneller (2004) for the UK suggest the presence of LBE. See note 5 for research on exporting experience and firm's productivities.

⁹ The decisions on imported inputs and exports are interdependent (Aristei, Castellani & Franco 2013; Bernard et al. 2018; Kasahara & Lapham 2013). Two of the few recent studies provide causal evidence. They are Bas and Strauss-Kahn (2013) on France and Feng, Li and Swenson (2016) on China.

¹⁰ Arrow (1962) suggests that repetition in doing activities might not always be associated with learning since it has diminishing return effects. However, 'stimulus situations' in doing repetitive activities might have learning effects.

Subsequently, in the second part of the thesis I investigate the policy consequences of LBE. Would productivity outcomes be different should there be an external policy intervention involved in the learning process? I relate this question to the learning channels framework in which firms can learn from buyers and competition. In my hypothesis, I argue that the increased competition in the export market is an important factor for learning, and interventions that protect exporters from such competition might lessen the benefit. As for intervention, I use a specific exogenous event that happened in a specific industry, namely the garment industry. Firms in this labour-intensive industry experienced a long period of a quota facility, the Multi-Fibre Arrangement (MFA), which governed the global competition mechanism in the industry before the MFA was abolished in 2005. This allows me to conduct a natural-experiment-type study on how the MFA affected apparel exporters' performance. During the MFA period, Indonesian apparel exporters obtained special treatment that allowed them to access markets in developed countries almost without competition; while, after the abolition, the apparel markets changed significantly and export competition became very intense. Therefore, in this part, I compare the LBE effects—especially, the channels of competition—of two different policy regime periods.

The third part of my thesis provides further discussion on the MFA intervention and its abolition, using an in-depth case study of Indonesia. I investigate patterns and determinants of Indonesian apparel exports after the removal of the MFA as well as the ways in which firms reacted to the policy change. Contrary to the prediction of many studies prior to the MFA's abolition, Indonesia has not been able to improve its market share in the more competitive market conditions. This part seeks possible

explanations about this issue by providing an extensive analysis of export patterns and a decomposition of the sources of export growth at the country-product level as well as a comprehensive firm-level study. I hypothesise that there have been structural adjustments since the MFA abolition, in which the new competitive market setting has forced exporting countries to adjust the commodity mix in line with changing global demand patterns and to direct exports to more dynamic markets. The new situation also makes firms adjust their strategies in order to face the more intense competition.

The fourth part of the thesis focuses on the other key dimension of international trade: importing behaviour. Many studies have shown the advantage of using imported inputs in production. The imported inputs could improve productivity, increase product scope and increase exports.¹¹ The learning process from technologies embodied in imported inputs has been recognised as the channel through which the performance of a firm is increased. This study aims to explain how imports of intermediate inputs affect the productivity and export performance of Indonesian firms. However, decisions on imported inputs and exports could be simultaneous, even though the direction is more obvious from import to export than the other way around (Aristei, Castellani & Franco 2013; Kasahara & Lapham 2013). This two-way relationship raises a challenge to the empirical investigation of examining the impact of imported inputs on exports. To reduce the problem, an instrument variable strategy is adopted. This study also provides further explorations. I compare the imported inputs in terms of value and variety. I investigate how the sources of imports matter.

¹¹ Recent empirical studies have demonstrated how importing intermediate inputs has increased firms' total factor productivity (Amiti & Konings 2007; Bas & Strauss-Kahn 2013; Halpern, Koren & Szeidl 2015; Kasahara & Rodrigue 2008), increased the product scopes (Damijan, Konings & Polanec 2014; Goldberg et al. 2010) and improved product quality (Bas & Strauss-Kahn 2015; Fan, Li & Yeaple 2015).

Furthermore, an extensive analysis of the role of imported inputs in production networks is given.

1.2. The Indonesian case

This thesis uses Indonesian firms as a study case. There are at least four reasons. First, at the macro level, because of its uniqueness, Indonesia is a good laboratory to explore how international trade relates to productivity. Exports have become an important component of the Indonesian economy since the 1980s, yet its export performance has been always mediocre compared to other countries in East Asia (Anas 2012). The recession after the oil price hikes in the 1970s provided incentives for manufacturing producers to export. The reform packages in the mid-1980s that included quicker customs procedures, more efficient and flexible financial services, easier licensing requirements and fewer restrictions on foreign investment, as well as the flexible real exchange rates policy and the duty exemptions and drawback schemes all contributed to higher export growths. Rapid export growth in the lead up to the Asian financial crisis (AFC) in the mid-1990s contributed to high productivity, fast economic growth, job creation and poverty reduction. But in the aftermath of the AFC, export growth, productivity growth and economic growth have been lacklustre. The export performance failed to recover even into recent years (Basri & Patunru 2012). One explanation is that ambivalence toward international trade and weak supply-side support such as infrastructure and human resource development have meant that Indonesia's competitiveness has lagged behind its neighbours (Hill & Pane 2018). Meanwhile, the international commercial architecture has been much changed for at least two decades. Competition has been intensified. The rise of China, as well as the

growing importance of other export competitors in the region (such as Bangladesh, Cambodia and Vietnam), explain the slower export growth of Indonesia.

Second, at the micro level, similar to other countries' experience, the export participation of Indonesian manufacturing firms is relatively low, that is, less than 20 percent on average. Some industries, such as furniture and electronics, have quite high export participation rates (at around 40 percent); while other industries, such as food and beverages as well as fabricated metal, have participation rates at about 10 percent. However, the average export intensity among exporting firms is relatively high, at about 74 percent, which indicates that once firms decide to export, they will focus on their export market rather than on the domestic market. This might indicate the presence of a major threshold, though it could vary from one firm to another. It is important to understand how firms behave in different circumstances. This is particularly crucial since policy makers often create policies without understanding and paying much attention to these micro-level features. Therefore, a firm-level analysis is important so that the specific characters of Indonesian firms can be scrutinised.

Third, the micro-level data of Indonesian firms have been well recorded for decades. The Central Bureau of Statistics (Badan Pusat Statistik, BPS) conducts an annual survey of firms in the formal sector with 20 or more employees that captures comprehensive information such as location, inputs and components of production costs, outputs and value added, ownership, export status and export intensity, import status and volume, employment, capital and new investment. The availability of this information makes a micro-level study possible.

And fourth, even though some studies have extensively discussed Indonesian firms' behaviours, only a few of them focus on the questions that this thesis raises.

Some discuss factors that differentiate exporting firms from non-exporting firms. Sjöholm (2003) shows the importance of foreign ownerships and import status; Rodriguez-Pose et al. (2013) focuses on firm age, capital ownership and location. Narjoko and Atje (2007) argue that sunk costs matter in a firm's decision to 'always export' or 'never export', whereas export experience affects the current status of firms. Finally, Blalock and Gertler (2004) found evidence of LBE among Indonesian firms in the period before the AFC.

1.3. Productivity

Firm productivity is central to this thesis. It is the main outcome variable that represents firms' performance. Two definitions of productivity are used: labour productivity and total factor productivity (TFP).

I use various models to estimate TFP. I follow Olley and Pakes (1996) and Levinsohn and Petrin (2003) as well as modified versions of their models. Both models are preferable to ordinary least squares (OLS) estimates in that they control for simultaneity bias in the production function that may arise from input variables and unobserved productivity shocks. These methods also reduce the selection bias due to the possibility that some unproductive firms leave the industry and are replaced by more productive ones.

1.4. Key research questions, methods, results and contributions

1.4.1. Chapter 2: Export experience and firms' performance

Chapter 2 asks the following questions. How does export experience affect firms' performance in Indonesia? Do these effects vary for firms in different industries and across different sizes? To answer these questions, I conduct a fixed-effect technique by

incorporating a propensity score matching (PSM) in the first stage to control for self-selection bias. For comparison, I also run an alternative approach by matching exporting firms that have specific export ages with their corresponding non-exporters then combine it with a difference-in-difference (DID) technique to see if different export experiences, in terms of export age, matter in determining the total factor productivity.

In the discussion, I begin by presenting evidence that shows that exporting firms have higher productivity than non-exporting firms. I also present evidence of both self-selection and LBE. My empirical analysis suggests that export experience increases firms' performance, but the impact is not linear. Furthermore, larger exporting firms and those engaged in specific industries undergo a clearer learning process. Even though export experience matters in defining productivity, it is only applicable for firms that already have high productivity from the beginning—a support for the self-selection hypothesis. To the best of my knowledge, this is the first study that investigates the impact of export experience as a medium of learning, using the case of Indonesia.

1.4.2. Chapter 3: Learning by exporting: The role of competition

This chapter follows directly from the findings in the Chapter 2. As noted, I find evidence of LBE, which means exports matter to productivity improvement. In the policy realm, one may interpret this finding as support for policy interventions to promote exports. I address this assertion by comparing two situations, with and without an exogenous intervention, and contrasting the LBE effects on both. The relevant research questions are: first, how does a policy intervention affect the LBE

mechanism? Second, how does the intervention explain the LBE channels? And third, what are the policy implications?

To answer these questions, I use a specific intervention in the garment industry; that is, the MFA. It was a complex system of country- and product- specific export quotas that covered more than 80 percent of global trade in textiles and garments. Firms in the garment sector experienced a long period of the quota facility, which controlled the global competition mechanism in the industry before the abolition of the MFA in 2005. This allows me to conduct a natural-experiment-type of study into how the MFA affected apparel exporters' performance by applying DID methods to 25 years of firm-level data. To control for other possible non-MFA-containing factors that may bias the results during the period of observations, I compare the LBE effects of garments firms with footwear firms that arguably have similar characteristics, and each experienced all containing factors during the period, except the MFA. Therefore, the difference-in-difference-in-difference (DDD) technique is applied. Some other possible issues are also tackled by combining the method with other techniques: PSM for reducing the selection bias and fixed effects to absorb any unobserved variable bias at the firm level.

The findings of this chapter are as follows. First, a policy intervention could affect the impact of exporting on productivity. During the MFA-implementation period, the evidence of LBE is mixed; and the main channel of LBE is arguably from buyers. Results suggest that the impact of exporting on total factor productivity was 9–13 percent higher after the intervention was removed. This implies that exporters gain additional LBE effects from competition; or they learn better in a more competitive situation.

To the best of my knowledge, this is the first paper that studies the impact of a certain policy on LBE. More importantly, it sheds light on the channels of learning, something that has not been investigated in the previous literature. From a methodological perspective, this study also points to the importance of ‘measuring the TFP correctly’, especially when studying a situation under a certain policy regime that affects prices.

1.4.3. Chapter 4: Patterns and determinants of apparel exports in the post-MFA world

As shown in Chapter 3, the MFA discriminated in export markets, diverted export sources and yet provided opportunities for many developing countries to start accessing advanced countries’ markets. The removal of this intervention caused a large transformation, in which competition significantly increased. Many studies undertaken before the abolition predicted that large apparel-producing countries whose exporting capacity remained constrained by MFA quotas and countries in close proximity to the main markets would gain market shares (Yang, Martin & Yanagishima 1997; Martin 1999; Nordås 2004). As it turned out, this prediction is true in some countries, but it fails in others. Bangladesh, Cambodia, China, Sri Lanka and Vietnam have gained market shares and many countries in Africa and Latin America have experienced export contraction (Staritz 2010). However, contrary to the predictions, Indonesia’s share in world exports of apparel contracted during the post-MFA era. Unlike other successful apparel exporters in the region, the volume expansion of Indonesian exports barely counterbalanced the price-lowering effect of the quota abolition.¹²

¹² Some other factors might also contribute to the lower performance of Indonesian exports in the post-MFA era. The abolition of the MFA occurred shortly after a major regime and policy change in Indonesia

This chapter aims to explain factors that determine why Indonesia could not increase its global apparel market shares in the post-MFA era. Three methods are proposed. The first one is the analytical narrative of export patterns; second, the constant market share analysis (CMSA); and third, a firm-level econometric analysis of export performance.

The findings are as follows. The descriptive analysis concludes that the Indonesian apparel industry has failed to diversify its product mix and export destinations in line with rapidly changing global demand patterns that have emerged in response to the lifting of product-specific export quotas. The CMSA confirms that the failure to catch up with improving competitiveness and negative market effects are the major contributors to Indonesia's failure to penetrate global apparel markets in the post-MFA era. Finally, the firm-level analysis shows that productivity growth, a domestic textile base, and access to complementary intermediate inputs are key characteristics in export performance in the post-MFA era.

1.4.4. Chapter 5: The role of imported intermediate inputs on firms' productivity and exports

This Chapter discusses another dimension of international trade; that is, imports of intermediate inputs. The objective of this chapter is to examine the causal evidence of increasing importing inputs on firm productivity and exports. Furthermore, this chapter explores the channels of imported inputs that improve the firms' performance. To tackle the simultaneity problem between imports and exports, the identification relies on an instrumental variable strategy by employing import tariffs

(i.e., the AFC in 1997 and a new labour policy in 2003) that adversely affected export performance in labour-intensive industries, including garments.

and real exchange rates as instruments, using a weighting procedure that utilises each industry's use of imported inputs.

The findings suggest that imported inputs improve firm productivity and exports. The main channel of improvement is through access to wider input varieties, instead of an increase in import values alone. The origins of imported materials are important. Importing from more advanced countries results in higher performance. This suggests a positive effect of technology and product quality. However, the causal relation between imported inputs and exports does not hold for firms in global production sharing (GPS) sectors, suggesting that firms in these industries manage their imported input and export decisions differently. As for the contribution, this study provides additional evidence on the positive effects of imported inputs on firm productivity in a developing country. In addition, this chapter, among very few studies, provides causal evidence of how imported intermediate inputs affect export performance.

1.5. Organisation

This thesis has six chapters. Chapters 2 to 5 present the core research of how Indonesian firms behave toward international trade. Chapter 2 investigates the LBE evidence; in particular it scrutinises the impact of export experience on firms' productivity. Chapter 3 analyses the policy consequences of LBE by examining how an exogenous intervention—the MFA—affects the LBE mechanism and discusses the channels of LBE. Chapter 4 presents more discussion on the effects of the MFA on Indonesia's garments exports at the product and firm level. Chapter 5 provides analysis on how imports of intermediate inputs affect firms' productivity and export performance. Chapter 6 summarises the key findings and discusses their implications.

Chapter 2

Export Experience and Firms' Performance

Abstract

The learning-by-exporting hypothesis suggests that once a firm enters a foreign market, its productivity will increase thanks to the exposure to new knowledge and experience abroad. Is this true? If so, does productivity keep improving throughout the years of exporting? Using Indonesia's firm-level data from 2000 to 2012, I scrutinise the learning process of exporters by incorporating the 'export age'—the number of years a firm is engaged in exporting activities—as an explanatory variable in the model. I find that an exporter's total factor productivity increases with export age, but not linearly. Furthermore, larger exporting firms and those engaged in particular industries undergo a clearer learning process. However, even though export experience can boost productivity, it is only applicable for firms that have high productivity from the beginning—thus supporting the self-selection hypothesis.

2.1. Introduction

Relative to selling domestically, exporting activity is relatively rare. In various developed and developing countries, exporters represent just a tiny fraction of the total number of producers (Bernard et al. 2012). However, the differences between exporters and non-exporters are not random. A growing body of empirical evidence has shown that exporting firms are larger, more productive, and more skill- and capital-intensive than non-exporting firms. They also use a more varied input-mix and pay higher wages.¹

Two explanations for these differences have been proposed: self-selection and learning by exporting (LBE). The self-selection hypothesis suggests that the pre-conditions of exporters before exporting are already different compared to non-exporters. Exporters are already more productive than non-exporters, hence more able to make profits in the export market (Bernard, Redding & Schott 2007). Melitz (2003) develops a theoretical model showing that only firms with productivity above a certain ‘export productivity cut-off level’ find it profitable to export. This offers one explanation of the relation between productivity and export: more productive firms self-select into exporting.

The alternative hypothesis is that a firm becomes more productive after it engages in exporting. This second hypothesis, known as learning by exporting, postulates that when a firm breaks into an export market it obtains external knowledge from abroad, and this exposure allows it to improve its efficiency level. On the contrary, those that serve only domestic markets are denied such learning benefits

¹ See Aw, Chung and Roberts (2000) for Taiwanese and Korean firms, Bernard and Jensen (1999, 2004), for USA firms, Bernard and Wagner (1997) for German firms, Clerides, Lach and Tybout (1998) for Colombia, Mexico and Morocco.

(Blalock & Gertler 2004). Evidence regarding this hypothesis is mixed. Aw and Hwang (1995), Bernard and Jensen (1999), Clerides, Lach and Tybout (1998), Delgado, Farinas and Ruano (2002) and Haidar (2012) find no learning effect from exporting. In contrast, Baldwin and Gu (2003), Blalock and Gertler (2004), De Loecker (2007) and Van Biesebroeck (2005) show some evidence of LBE. Martins and Yang (2009) conducted a survey analysis across countries and found that the impact of exporting on productivity tended to be higher in the case of exporters from developing countries than those from developed economies.

There are at least two channels through which LBE takes place; exporters can learn from buyers and competitors (Blalock & Gertler 2004). Buyers, especially of intermediate goods, may have the incentive to share knowledge, such as the latest design specifications and production techniques, as they want to obtain precise specifications and good-quality products. Meanwhile, more intense competition in foreign markets encourages firms to improve their efficiency and learn from competitors on how to survive in the markets.

Some studies suggest that export experience matters in determining future performance. Exporters often start by selling small quantities to a single neighbouring country. If this venture succeeds, they tend to keep exporting and start expanding to a new market and/or with new products (Albornoz et al. 2012; Álvarez, Faruq & Lopez 2013). Firms obtain more knowledge by exporting, and this generates persistence in exporting because profitability in the market rises with the length of export experience (Timoshenko 2015). Moreover, per period fixed costs, such as the costs involved in maintaining overseas distribution networks, are expected to fall as firms become more experienced and able to forecast foreign demand more accurately and find more

reliable overseas partners (Inui, Ito & Miyakawa 2016). All these studies show that export experience is a medium of learning.

If it is true that firms gain more knowledge through exporting, are older (or more experienced) exporters always more productive than the younger (or less experienced) ones? Blalock and Gertler (2004), using Indonesian data from 1990 to 1996, find evidence of LBE in Indonesia and show that a firm's productivity increases by between 2 percent and 5 percent after it starts exporting. However, their study only compares productivity changes before and after exporting. De Loecker (2007) shows that Slovenian manufacturing firms are almost 9 percent more productive once they start exporting and 13 percent more productive after four years of exporting.² Alvarez and Lopez (2005), using Chilean firm-level data, find that productivity gains from exporting take place only for new exporters and not for permanent exporters, suggesting a short run effect of LBE.³

This chapter aims to provide an empirical analysis of how export experience can affect a firm's productivity. Using firm-level data for Indonesian manufacturing over the period 2000–12, the study starts with some preliminary analyses to explore the behaviour of exporters and then employs several approaches to find evidence of LBE. In doing so, this study incorporates the export age as the proxy for experience. The preliminary analyses confirm that exporters in Indonesia are different from firms that serve only the domestic market; that there is evidence of a self-selection mechanism; and that export sales increase throughout the year of exporting. The main model in this study finds that productivity increases with export age, but the effect is not linear;

² The impacts after exporting for five years and above are not significant due to decreased sample size.

³ In Alvarez and Lopez (2005), permanent exporters are firms that always exported during the observed period.

it decreases once the firm becomes more experienced. Furthermore, LBE is more likely to be experienced by relatively larger firms and by those in certain industries in the unskilled labour-intensive sector. As far as I know, this is the first study that evaluates the learning mechanism of Indonesian exporters using recent firm-level data.⁴

The remainder of this study is organised as follows. Section 2.2 briefly discusses the relevant literature. Section 2.3 describes the method and highlights some potential sources of bias. Section 2.4 explains the data and variables used. Section 2.5 discusses the results. Section 2.6 provides an array of robustness checks and, finally, Section 2.7 concludes the study.

2.2. Literature review

There are many empirical studies that show the higher performance of exporting firms relative to those that serve only domestic markets. Exporting firms are found to be larger, more productive, more skill- and capital-intensive, using more different input mix and paying higher wages than non-exporting firms (Bernard, Redding & Schott 2007). Two hypotheses have been used to explain these differences: the self-selection mechanism and the LBE mechanism (Greenaway & Yu 2004; Greenaway, Gullstrand & Kneller 2005). The first hypothesis postulates that the distinctions between exporters and non-exporters are already present even before exporting begins. That is, exporting firms are more productive, not as a result of exporting, but because only the most productive firms are able to overcome the costs of entering the export markets (Bernard & Jensen 1999, 2004). These sunk costs, such as those associated with finding

⁴ The data this study used is at plant level. This can reflect a single firm but some plants could be related under a holding company. Since the information is untraceable, for simplicity, a plant is defined as a firm for the rest of the chapter.

buyers, researching the foreign regulatory environment and ensuring that the products can conform to foreign standards, such as testing, packaging and labelling, can be substantial. In some instances, this may include the costs to set up new distribution channels in the foreign country and to adapt to the shipping regulations in that country (Roberts & Tybout 1997). Prior to exporting, firms make a prediction and estimate their export profits in the future based on their expectation of future market conditions, including potential sunk costs that they have to pay (Das, Roberts & Tybout 2007). An array of evidence from many countries using various methods has confirmed the hypothesis of selection-into-export (Bernard et al 2011). Bernard and Jensen (1999) using USA data show that performing firms are those that export and they already show good performance several years before exporting. The study by Clerides, Lach and Tybout (1998) for several developing countries (Columbia, Mexico and Morocco) finds that more efficient firms tend to become exporters. Comparing Taiwan and Korea, Aw, Chung and Roberts (2000) find that productivity matters in determining the self-selection into export in the case of Taiwan, but not in Korea. For Indonesia, Rodriguez-Pose et al. (2013) show that productivity is a significant determinant in the decision to export.

These findings, with respect to the self-selection hypothesis, prompted Melitz (2003) to develop the theory of heterogeneous firms. In this theory, attitudes towards sunk costs is heterogeneous across firms, in that only the most efficient firms can break into a foreign market and make a stable stream of export revenue and profit from exporting, whereas the less productive ones serve the domestic market only and the least productive ones exit altogether. In other words, the presence of sunk costs

ensures that only those firms with productivity above a certain ‘export productivity cut-off level’ find it profitable to export.

The heterogeneity of firms occurs in various dimensions—observable and non-observable. Most empirical studies utilise characteristics of firms that are available from statistics or surveys, such as foreign ownership status, information about imports, location, the age of a firm, capital and labour, to analyse the self-selection hypothesis of export. Sjöholm (2003) suggests that international networks, such as foreign ownership and imports might be the most important factors in determining export propensities because they can decrease export costs and open more opportunities to learn about overseas markets. If other information is accessible, the study can be further extended, such as examining the product quality or innovation and research and development. Most available data about firms, however, does not have detailed information about prices, costs and profits. Some studies have tried to establish proxies to investigate them. Other dimensions of heterogeneity, such as how production technology, management practice, firm organisation and product attributes lead to variations in revenues across firms also contribute to a firm’s decision to export (Melitz & Redding 2014). However, since data about these are not available either, they remain the ‘unobservable heterogeneity’ among firms.

The second hypothesis, LBE, suggests that when a firm breaks into the export market, it will obtain external knowledge from abroad, and such exposure allows it to improve its efficiency level, whereas other firms that serve only domestic markets are devoid of such an opportunity. There are two channels through which this effect takes place: buyers and competitors (Blalock & Gertler 2004; De Loecker 2007). Exporting firms may benefit from technical assistance given by their foreign buyers. Since buyers

want to obtain precise specifications and good quality products, they often have the incentive to share knowledge with their suppliers when ordering products—such as the latest design specifications and production techniques. Blalock and Gertler (2004) provide some examples of Indonesian exporters that obtain technology transfers from their buyers. A garment exporter, which exported 100 percent of its output to Germany, obtained technical assistance from its main buyer who sent efficiency experts and product designers to advise the firm about capacity expansion as well as new consumer trends. Another example is a textile exporting firm that received some advice from its Japanese buyer about production methods and efficiency. In addition, exporting firms may learn from fierce competition in foreign markets. To survive and make profits in these markets, exporting firms have to increase their efficiency and adopt best-practice technology (Athukorala & Rajapatirana 2000b). De Loecker (2013) mentions that investing in marketing, upgrading product quality, innovating, or dealing with foreign buyers are competition mechanisms that might induce productivity gains during the learning process.

There have been many studies that test this hypothesis. Most of them compare the change in productivity before and after the starting date of the export venture (Wagner 2007). The evidence is mixed, implying that exporting does not necessarily improve a firm's productivity. Many studies do not find learning effects from exporting (Aw & Hwang (1995) for Taiwan; Bernard & Jensen (1999) for the USA; Clerides, Lach & Tybout (1998) for Colombia and Mexico; Delgado, Farinas & Ruano (2002) for Spain; Greenaway, Gullstrand & Kneller (2005) for Sweden; Haidar (2012) for India). However, some studies suggest the presence of LBE (Alvarez & Lopez (2005) for Chile; Baldwin & Gu (2003) for Canada; Blalock & Gertler (2004) for Indonesia; De Loecker (2007) for

Slovenia; Greenaway & Kneller (2007a), Girma, Greenaway & Kneller (2004) for the UK; Julian et al. (2012) for China; Van Biesebroeck (2005) for six sub-Saharan African countries). Martins and Yang (2009) summarise the findings and suggest that the effect of export on a firm's performance varies across countries, but it tends to be higher in developing countries and lower in developed economies. The learning effects also vary across firms in different industries (Greenaway & Kneller 2007a) or in different export destinations (De Loecker 2007). That is, exporting to developed countries is most likely to produce higher learning effects. One explanation is that firms from developing countries that export to more advanced countries would face larger and more competitive markets that challenge them to improve their productivity through product and production process upgrading or via management technique improvement. Meanwhile, firms from more developed countries may face foreign markets that are as (or less) competitive than their own domestic market (Fernandes & Isgut 2015).

Meanwhile, more recent studies of learning mechanisms incorporate the effects of export experience on export performance and future export decisions (Álvarez, Faruq & Lopez 2013; Inui, Ito & Miyakawa 2016; Timoshenko 2015). Eaton et al. (2008) show that export starters learn by selling small quantities to a single neighbouring country, and if the venture is successful, they tend to expand their exports. Albornoz et al. (2012) introduce the concept of 'sequential exporting' to explain a firm's use of its initial export experience to infer information about its future success. Moreover, it is shown that there is a positive relationship between previous export experience and the probability of exporting a new product and/or into a new market in the following year (Álvarez, Faruq & Lopez 2013). The previous experience

may help to reduce entry costs for firms in the international market. Inui, Ito and Miyakawa (2016) explain the types of cost that are expected to fall as firms become more experienced in the overseas markets. These are the ‘per period fixed costs’, or the costs involved in maintaining an overseas distribution network. As exporting firms become more experienced, they are more likely to have a better understanding of the foreign market, and this can help them to forecast future demands accurately as well as develop a more reliable foreign partnership. Through the learning mechanism, the uncertainty that exporters face in the overseas market (which is related to future sales, transaction partners, or contract forms) decreases. As a result, the per-period fixed costs decline. In addition, LBE also generates persistence in exporting since the profitability in the foreign market rises with the length of export experience (Timoshenko 2015). Békés and Muraközy (2012) suggest that even though an exporting firm is hit by productivity or demand shocks, it probably still persists in the export market because its past experiences help it to cope with the shock.

To measure export experience, several articles use years of exporting as the proxy. A study by Timoshenko (2015) models learning as an age-dependent concept, where an older and more experienced exporting firm is more profitable in foreign markets compared to younger or less experienced exporting firms. Inui, Ito and Miyakawa (2016) use a firm’s export duration as a proxy for experience and find that the exit probability from export markets decreased over the duration of the export.

2.2.1. Indonesian context

Like most other developing countries, manufacturing export is an important source of growth in Indonesia, although the relative share was lower during the last decade (Figure 2.1) due to the increase in commodity prices that reduced the relative

attractiveness of the manufacturing sector. The main traditional market destinations of manufacturing product exports from Indonesia were ASEAN, Europe, the USA and Japan; and in recent years, exports to China and India increased significantly (Table 2.1). Because of its abundant low-skilled and relatively cheap labour, Indonesia's comparative advantage is still in low-tech products. The leading sectors for export were food and beverage products, wood products, textiles and wearing apparel. Only recently, has the share of chemical products and basic metal products been larger.

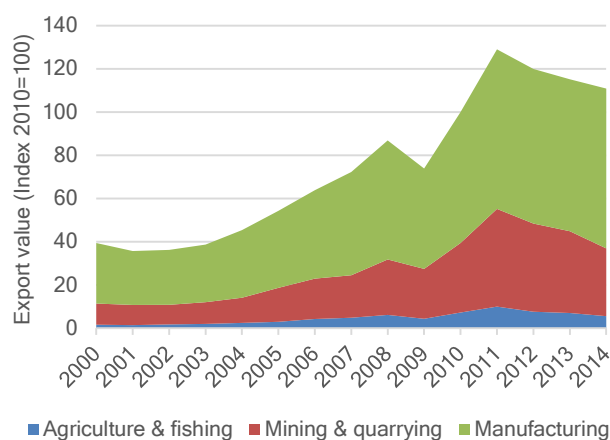


Figure 2.1. Indonesia's exports, 2000–14

Source. UNCOMTRADE, calculated by the author

The export performance of the manufacturing sector dropped significantly in the aftermath of the Asian financial crisis (AFC) of 1997–98 and it has failed to recover even to recent years (Basri & Patunru 2012). The average export growth of manufacturing products during 1986–96 was remarkably high at 20.3 percent, but it has been less than 10 percent during the last 15 years. Export earnings after the crisis were more likely to be driven by the price effect rather than volume expansion (Athukorala 2006). The increase in commodity prices led to a commodity boom and then lowered the contribution of the exports of industrial goods on average—an indication of possible Dutch disease (Corden 1984). Resource-based manufacturing

goods, such as crude palm oil (CPO), have taken the highest proportion in industrial exports (see Table 2.2). The global financial crisis that started in 2007 also affected Indonesia's exports. Manufacturing exports dropped during 2007–08, though they recovered after 2009.

Table 2.1. Export market destination of manufacturing product

	2000	2014
ASEAN	21	24
China	4	9
EU27	18	13
India	2	5
Japan	15	8
Korea, Rep.	3	3
United States	17	12
Share 7	80.2	73.4

Source. Author's calculation from UNCOMTRADE database

Table 2.2. Export share by selected sectors

	Industry (ISIC 3 - 2 digit)	1996	2000	2005	2014
15	Manufacture of food products and beverages	0.11	0.08	0.14	0.22
1514	Manufacture of vegetable and animal fat	0.05	0.04	0.09	0.16
1512	Processing and preserving of fish	0.05	0.29	0.28	0.03
17	Manufacture of textiles	0.10	0.09	0.06	0.05
18	Manufacture of wearing apparel	0.10	0.09	0.08	0.05
19	Tanning and dressing of leather	0.07	0.04	0.03	0.03
20	Manufacture of wood and products	0.16	0.08	0.06	0.03
24	Manufacture of chemicals and chemic	0.07	0.08	0.09	0.10
27	Manufacture of basic metals	0.04	0.05	0.08	0.10
28	Manufacture of fabricated metal	0.01	0.01	0.01	0.01
29	Manufacture of machinery and equipment	0.01	0.02	0.03	0.04
31	Manufacture of electrical machinery	0.03	0.04	0.05	0.04
32	Manufacture of radio, television	0.07	0.10	0.08	0.06
34	Manufacture of motor vehicles	0.01	0.01	0.02	0.03
36	Manufacture of furniture	0.07	0.06	0.05	0.04
	Total export of manufacture	1.00	1.00	1.00	1.00

Source. Author's calculation from UNCOMTRADE database

The export participation of Indonesian manufacturing firms was relatively low at about 18 percent on average during 2000–12, implying that export activity was rare Bernard et al. (2012). Furniture, wood products and radio and television are some sectors that are relatively export-oriented; their participation rates are 45 percent, 39 percent and 38 percent, respectively (see Table 2A.2, Appendix 2). The export participation is relatively low among firms in food and beverages (10 percent), fabricated metal (12 percent), textiles (14 percent) and wearing apparel (16 percent). However, the export intensity (the share of output that is exported among exporting firms) is relatively high, at about 74 percent on average. This indicates that once a firm decides to export, it will focus on its export market rather than on the domestic market. Furniture, wearing apparel and wood products have the highest export intensity above 80 percent. However, during the observed period, the export intensity seems to decrease for all sectors, from 79 percent in 2000 to 71 percent in 2012. The decrease might be the result of the slowing down of foreign demand following the world economic crisis, which has forced exporters to turn to the domestic market.

The behaviour of Indonesian exporting firms has been studied in various ways. As found in other countries, exporting firms from Indonesia are more productive than firms that serve only domestic markets (Rho & Rodrigue 2015; Rodriguez-Pose et al. 2013). Foreign direct investment (FDI) ownerships and import status are the key distinguishing factors between exporters and non-exporters (Sjöholm 2003), as well as the age of firms, capital ownership and the location of firms (Rodriguez-Pose et al. 2013). Also, sunk costs matter in a firm's decision to 'always export' or 'never export', whereas export experience affects the current status of firms (Narjoko & Atje 2007). It can also be noted that Blalock and Gertler (2004) found an increase in productivity of

about 2–5 percent from exporting activity among Indonesian firms in the period from 1990 to 1996, prompting them to conclude that productivity gains followed the initiation of exports rather than preceded it. The productivity gains did not disappear if the manufacturer stopped exporting. These results suggest evidence of LBE, attributable to knowledge and efficiencies gained from participating in international markets.

2.3. Methodology

2.3.1. Preliminary analysis

Before investigating the LBE hypothesis, I ran some preliminary analyses of the behaviour of exporting firms. These analyses can give more understanding about how exporting firms behave and may help us to interpret the main results better. First, I needed to ascertain that exporting firms are not similar to firms that serve only the domestic market. I conducted an analysis of the differences of exporting firms compared to non-exporting firms in various firm-level outcome performance, such as productivity, employment, wages and capital per worker. Second, I examined the hypothesis of self-selection into export. As explained in an earlier section, the high performance of exporting firms can be explained because it is only higher performance firms that are able to make profits in the more competitive international markets. This test is important in order to check for the reverse causality relation between exporting and productivity. Third, I investigated the export experience, the variable of interest that I used in the main model. In this analysis, I checked how export experience and export sales are related in order to facilitate the investigation of the learning channel.

Exporting firms are different from non-exporting firms

Various studies have found that exporters are systematically different from non-exporters (Bernard et al. 2012). I test whether this fact holds for the Indonesian case as well. I follow a model by Bernard and Jensen (1999) to check this characteristic:

$$x_{ikrt} = \alpha + \beta EXP_{ikrt} + \delta Emp_{ikrt} + \sum_k \gamma_k Ind_k + \sum_r \vartheta_r Prov_r + \sum_t \tau_t Year_t + \varepsilon_{ikrt} \quad (2.1)$$

where x_{ikrt} is a measure of the performance of firm i in industry k and region r at period t , EXP_{ikrt} is an export dummy equal to 1 when the firm is an exporting firm and 0 otherwise and Emp_{ikrt} is the log of the number of employees of firm i . I control for industry k , province r , and year t effects. The interest lies in the coefficient β that defines whether the relevant firm's performance is different for exporting firms compared to those that serve only the domestic market.

Self-selection hypothesis

The self-selection hypothesis suggests a positive relationship between firm productivity and export status because only the most efficient performing firms are capable of entering international markets (Bernard & Jensen 1999; Greenaway, Gullstrand & Kneller 2005; Melitz 2003; Yi & Wang 2012). Firms incur sunk costs before exporting, and only the most productive firms can continuously make profits from exporting. Following Alvarez and Lopez (2005), I conduct a maximum likelihood analysis to determine the factors that affect the decision to start export. That is,

$$\Pr(EXP_{ikrt} = 1 | EXP_{ikrt-1} = 0) = F(\beta' Z_{ikrt-1} + \tau_t + \kappa_k + \varepsilon_{ikrt}) \quad (2.2)$$

where EXP_{ikrt} is a dummy variable equal to 1 if firm i in industry k and region r starts exporting at period t , and 0 otherwise. Z_{ikrt-1} is a vector of firm characteristics at

time $t - 1$, including productivity as measured by total factor productivity (TFP), foreign ownership share, import share, firm age and capital; and τ_t and κ_k are the dummies for year and industry fixed effects. As a comparison, I borrow an approach by Yi and Wang (2012) who conducted a maximum likelihood analysis of decisions to export by including the last year export status in the model to control for sunk cost.⁵

Age-dependence of export sales

In this analysis, I want to test whether greater export experience is associated with higher export revenue. The result of this investigation may help our understanding of the learning channel. That is, firms continue to export since they found that exporting was profitable and their revenues increased over the year of exporting. Following Timoshenko (2015), I examine the relationship between export age and export value as follows:

$$\ln X_{ikrt} = \alpha + \beta AGEX_{ikrt-1} + \gamma Z_{ikrt-1} + \vartheta Ind_{kt-1} + \zeta Prov_{rt-1} + \tau_t + \kappa_k + \varepsilon_{ikrt} \quad (2.3)$$

where $\ln X_{ikrt}$ is the log of export sales of firm i in industry k and region r exported at period t . Z_{ikrt-1} is a vector of firm characteristics at time $t - 1$, including foreign ownership share, import share and the age of the firms. The model also includes spill over effects ϑInd_{kt-1} and $\zeta Prov_{rt-1}$, year dummy τ_t and industry dummy κ_k . To account for the possibility of selection into export, I ran the Heckman two-step selection model. The first step involved a probit regression of the decision to export.

⁵ The model suggested by Yi and Wang (2012): $\Pr(EXP_{ikrt} = 1) = F(\beta'Z_{ikrt-1} + \delta EXP_{ikrt-1} + \tau_t + \kappa_k + \varepsilon_{ikrt})$ follows Robert & Tybout (1997) and Das et al. (2007) to include the last year's export status in the model in order to capture the existence of sunk costs. I also include all control variables as in Equation 2.2.

Once a firm is selected in the first regression, then that firm will be included in the second regression.

2.3.2. The impact of export experience on firms' performance

I now turn to the main model examining the impact of export experience on the firm's performance. The variable of interest is export age, and the aim is to evaluate to what extent this factor affects the performance of the Indonesian manufacturing firms. The model takes the following form:

$$\ln TFP_{ikrt} = \alpha + \beta AGEX_{ikrt-1} + \gamma Z_{ikrt-1} + \vartheta Ind_{kt-1} + \zeta Prov_{rt-1} + \delta_i + \tau_t + \kappa_k + \varepsilon_{ikrt} \quad (2.4)$$

where TFP_{ikrt} represents the total factor productivity for an exporting firm i in industry k and province r at time t , $AGEX_{ikrt-1}$ is the export age in period $t - 1$, Z_{ikrt-1} is the lagged values of a set of firm characteristics (foreign ownership share, import share, firm's age, and firm's age squared), Ind_{kt-1} is the number of exporting firms in the industry k at time $t - 1$ and $Prov_{rt-1}$ is the number of exporting firms in the province r at time $t - 1$. This lag structure is adopted because the initial level of productivity before exporting might influence the performance after exporting. I also included the firm's fixed effects, year dummies and industry dummies to control for unobservable factors at the firm's level, in a certain year and in a certain industry.

As noted, the key variable of interest in this study is exporting experience. Inui, Ito and Miyakawa (2016) use a firm's export duration as a proxy for experience and find that the probability of exit from export markets decreases over the export duration. Timoshenko (2015) uses export age in his model to explain learning and persistence in exporting. I follow these two papers and use export age to capture the

experiences gained from exporting. I construct the variable based on the duration of export or the period in which a firm is engaged in export activities over consecutive years. Firms need to pay sunk costs once when they first enter the export market (Melitz (2003)). Roberts and Tybout (1997) show that if a firm stops exporting for only one year and starts to export again in the following year, it does not need to pay more sunk costs. However, if the firm exits for two years before starting to export again, it needs to pay sunk costs again since the export market condition might have changed. Hence I assume that if a firm exits (i.e., stops exporting) for at least two years and starts exporting again, then the 'age of export' starts from zero again.⁶ I drop those whose export age cannot be defined at all. To examine how export experience and productivity relate, the square form of the export age is included. In addition, for each separate regression, I also examine the cubed export age, log of export age and dummy variables of export age.

Similar to other studies, firm characteristics are included in the model to evaluate the extent to which heterogeneity plays a role. It is believed that firm-specific characteristics can affect the cost and benefits of production and product quality, and these are crucial for explaining firm export performance (Sjöholm 2003). First, the foreign ownership share is incorporated in the model, and it is expected to have a positive effect on productivity. A firm that has foreign ownership usually has a better international network that is useful in marketing activities (Sjöholm & Takii 2008).

⁶ For comparison, we also check to ascertain if the export age variable is constructed differently. First, the export age is 1 if the firm exports in a certain year but not in the previous year. That is, we assume that a firm needs to pay sunk costs every time it starts to export when it did not export in the previous year, even though that firm did export two years ago but stopped for only one year. This method decreases the number of observations of exporting firms. Second, since our dataset starts from 2000, it is also possible that some firms that had already exported in 1999, did not export in 2000, but started to export again in 2001. To reduce the measurement error issue, we constructed the export age for firms that only started exporting in 2002.

Exporting firms with foreign ownership also generally have better financing capacities and do more investment activities which are important for growing and expansion (Rho & Rodrigue 2015) as well as for paying the sunk costs.

The exporting activity might also be affected by importing activity (Aristei, Castellani & Franco 2013). Generally, firms that import some of their inputs are more efficient in producing goods since the imported inputs reduce the cost of production and also have better quality (Kasahara & Rodrigue 2008). Importing is also a networking activity, where firms that have foreign contacts may have better access to foreign markets (Sjöholm 2003). Furthermore, Kasahara and Lapham (2013) point out that both exporting and importing activities are complementary. Assuming that both exporting and importing activities bear sunk costs, the most productive firms will self-select into a two-way trade. To the extent that the same sunk costs are at least partially shared by exporting and importing activities, the cost of exporting (importing) decreases when a firm already carries out importing (exporting) activities, and this increases the probability of becoming a two-way trader, once the firm is already a one-way trader (Kasahara & Rodrigue 2008). Given these findings, I also include import shares in the model.

This study also considers the existence of spill over associated with other firms' export activities. Clerides, Lach and Tybout (1998) suggest that the presence of exporters can generate positive externalities. In particular, firms in the affected industry or region should exhibit changes in their cost process when there is a change in the number of firms that export. Increases in the number of exporting firms may also make it easier for others to break into the foreign market. This also means that an increase in the number of exporting firms in an industry or in a location can improve

the productivity and the probability of those other firms in that industry or that location. To accommodate for this possibility, I include the number of exporting firms in the industry and in the location associated with any given firm in the observation.

2.3.3. Strategies to reduce potential biases

There are some possible biases. First, there might be an endogeneity problem associated with measurement error because the main data are based on surveys that possibly carry errors from collection processes. The measurement error may also come from data constructions, especially due to missing data problems when constructing the TFP.⁷ The second problem is reverse causality. There is a two-way relationship between productivity and exports, where export activities can increase the firm's productivity, and the efficient firm is more likely to continue to export. To address this issue, I apply propensity score matching (PSM) procedures in the first step by matching the exporters and non-exporters that have similar characteristics and only incorporating the matched samples in the main model. In the PSM, a discrete choice estimator (probit) is applied to estimate the participation in exporting. I include some observable characteristics, such as one-year lagged firm characteristics (FDI shares, import shares, firm's age and firm's age squared), spill over variables, year and industry dummies as well as productivity in the base year to predict the decision to export. By using this technique, I reduce the relationship between productivity and export that is due to self-selection. Subsequently, the predicted values from probit regression are used to generate the propensity score for all treatments (exporting

⁷ In particular, the capital data could be problematic since there are many missing observations in various years. To fill the missing data in 2006, an interpolation strategy is carried out. Attrition bias could also happen since we have had to drop some observations.

firms) and comparison group (non-exporting firms) members. The propensity score is estimated using a probit model with a 'nearest-neighbours' match. These two groups are balanced. To match and balance the pairs, the restricted samples with common support conditions are employed.

We apply lags for all the independent variables to minimise other possible endogeneities in the model. A performing exporting firm may increase the share of foreign ownership and the share of imported materials. In addition, the spill-over variables may suffer from endogeneity problems because when a firm decides to export, the number of exporters in the industry and the location also increases.

To examine the effect of previous export experience I need to take into account the potential effects of unobserved heterogeneity. For example, managers of some firms may be more willing, or more capable, to explore new export markets, while some firms may enter new export markets because they have established relationships with distributors in other markets. Since the dataset does not allow us to directly distinguish these effects from the role of experience, I use a fixed-effect strategy to mitigate these concerns. The model therefore includes firm-fixed effects to control for the remaining unobserved time-invariant heterogeneity at the firm level.

Rodríguez-Pose et al. (2013) suggest that the firm's age matters but has ambiguous effects on the productivity of exporting firms. On the one hand, it can be envisaged that the involvement of a firm with international markets is a gradual development process. On the other hand, studies have highlighted that export-oriented firms are born and not bred into exporting. That is, exporters are firms that are heavily involved in exporting activities from the time they are set up. So I include the firm's age and the firm's age squared to see how those variables influence the model.

Finally, the model incorporates industry-fixed effects and year-fixed effects to control for the industry and/or year characteristics that influence the error term. The fact that the timespan includes the global financial crisis may result in a biased estimation since it affects the variables in the dataset in a certain year. Thus, I control for the year-fixed effect to mitigate against the problem. A particular industry may also obtain certain treatment from government policies, so the industry-fixed effects should lessen the impact. Moreover, the commodity boom may affect some particular sectors in a certain year, such as the export of crude palm oil and other resource-based products that significantly increased during the boom. This kind of noise can also be reduced using a combination of industry- and year-fixed effects.

2.3.4. Alternative approach

Following De Loecker (2007), I apply a strategy that matches exporting firms with their resemblant non-exporters then combine it with a difference-in-difference technique. I compare the results with the main model as a robustness check. The identification strategy is as follows. First, I group exporting firms based on their export ages. These separate export-age classifications are our treatment groups. I pooled all exporting firms that have an export age equal to one year in the first treatment groups, exporting firms that have an export age equal to two years in the second treatment groups, and similarly for the export ages three to five years. Therefore, I have several treatment groups that contain firms that have exported for one year, two years, up to five years. Subsequently, I pooled all firms that never exported during the period of observation into one control group. Then, I employed propensity score matching (PSM) and matched each treated group with the control group based on their similar characteristics over the last year. The matching procedure includes one-year lagged

productivity and one-year lagged firms' characteristics to reduce the selection bias. The year dummy and the industry dummy are also included to make sure each treated firm is well matched with its controls and to reduce the possible omitted variable bias at the year and industry levels. Thus, every exporting firm in a treated group is matched with non-exporters with similar productivity levels, similar characteristics, and in the similar year and industry:

$$\Pr\{Export_{i,age} = 1\} = \phi\{h(\omega_{i-1}, Z_{i-1}, year, industry)\} \quad (2.5)$$

The outcomes are the total factor productivity in terms of level and growth. I also checked for both year-on-year productivity growth as well as t -years productivity growth. For the latter outcome, if the exporting firms in the treated group are those with 1-year's exporting experience, then the outcome is one-year productivity growth. Also, if exporting firms in the treated group have two years of export experience, then the outcome is two years productivity growth. Similarly, for the treated groups with export ages of three years, four years and five years, I constructed the respective outcome variables.

The matching strategy uses the standard technique of one-to-one matching. The number of treated observations and control observations decreases due to the resampling of future productivity since I estimated the probability of exporting after one to five years. For each year of exporting, the number of off-support observations in the treatment group is relatively low—less than 15 observations for each matching estimate.

2.4. Data

2.4.1. Data overview

This study employs establishment level data from Indonesia's Industrial Statistic Survey (*Statistik Industri, SI*) as the main data source. The SI contains comprehensive information about medium and large manufacturing firms in Indonesia, which are derived from an annual survey of firms in the formal sectors with 20 or more employees.⁸ It is collected by the Central Bureau of Statistics (Badan Pusat Statistik, BPS) and captures various types of detailed information on firms, such as location, inputs and components of production costs, outputs and value added, ownership, export status and export intensity, import status and volume, employment, capital and new investment.

This chapter focuses on the period from 2000 to 2012, the period after the AFC and the time when Indonesia underwent its structural reformation (Aswicahyono, Bird & Hill 2009). During this period, I expect limited noise from the crisis in the data, as the AFC broke up in 1997, three years before our starting year of observation. There are still a lot of factors, however, that might distort the data such as the commodity boom and the global financial crisis, but these will be dealt with using some fixed effect strategies. The number of observations of firms every year varies with overall observations of 286,262.

The capital stock data could be problematic given there are many missing observations in various years. In the raw data, some observations have no information about capital. For 2006, there is no record about capital stock at all. To deal with these

⁸ SI does not give detailed explanations about the status of an establishment, whether it is a single firm or a plant that belongs to another firm. For simplicity, we refer to any individual establishment as a 'firm'.

issues, I undertook the following.⁹ All firms with no capital data in all years were dropped. As for 2006, I interpolated the capital stock data based on the values in 2005 and 2007. One consequence is that all firms with missing capital stock data for both 2005 and 2007 were dropped. These cleanings removed about 24 percent of the total sample. Next, firms with missing capital data in three or more continuing years were also removed. For those with missing data up to two consecutive years, I again applied interpolation. And finally, firms with negative capital data were removed. This further reduced observations by about 20 percent. The final number of observations was 153,890.

Aswicahyono, Hill and Narjoko (2010) classified industries into five groups to examine trends and patterns of manufacturing performance. The five groups are the unskilled labour-intensive sector (ULI), the resource-based labour-intensive sector (RLI), the resource-based capital-intensive sector (RCI), electronics (ELE), and footloose capital-intensive sector (FCI). This chapter adopts these classifications to understand better how different groups of firms behave. Table 2A.4 in Appendix 2 lists all the industries in each category.

Table 2.3 shows the average number of firms including those that are exporting. As expected, the number of firms that do export is few. In 2000, 2,162 of the surveyed firms were exporting; by 2012 this number had increased by 54 percent to 3,321 exporting firms. The total number of firms in this period also increased, but only by 15 percent, resulting in a net increase of the share of exporting firms in Indonesian manufacturing. The third row indicates ‘new exporters’ or the average number of firms that started to export during the period. On average 26 percent of exporting firms are new entrants to the export market and in total, 7,210 firms

⁹ For some of the steps in cleaning the capital data, we follow Blalock & Gertler (2004).

entered the market at different points of time between 2001 and 2012. Table 2.3 also presents the average number of firms in each group of industries during the observed period. I removed exporting firms that had already exported prior to 2000 since I could not define the first year of export for those firms. The summary statistics of all variables used in the study are shown in Table 2A.1 in Appendix 2.

Table 2.3. Number of active firms, exporting firms and new exporting firms (on average)

	Annual average (2000–12)					
	All observations	ULI	RLI	RCI	ELE	FCI
Number of active firms	12,603	2,860	601	227	117	566
Number of exporting firms	2,300	788	289	59	41	68
Number of new exporting firms ^a	601	177	64	15	11	20

Note. ^a The average from 2001 to 2012

Source. *Statistik Industri*, calculated

2.4.1.1. Export age

Figure 2.2 shows the export age for all firms that started exporting from 2001 to 2012. The number of observations decreases throughout the export age, implying that the number of firms that export for a long period of time is small relative to the number of firms that start exporting. It is important to note that more than half of the firms in the observations exported only once (export age equal to 1). This shows that many firms tried to export but they could not make a profit and survive in the foreign markets in the first year of exporting. They then stopped exporting. Only 5.2 percent of firms that start exporting in 2001 stayed in the export market for 12 years and 6.4 percent of firms which starting exporting in 2001 and 2002 continued exporting for 11 years (see Table 2A.3, Appendix 2).

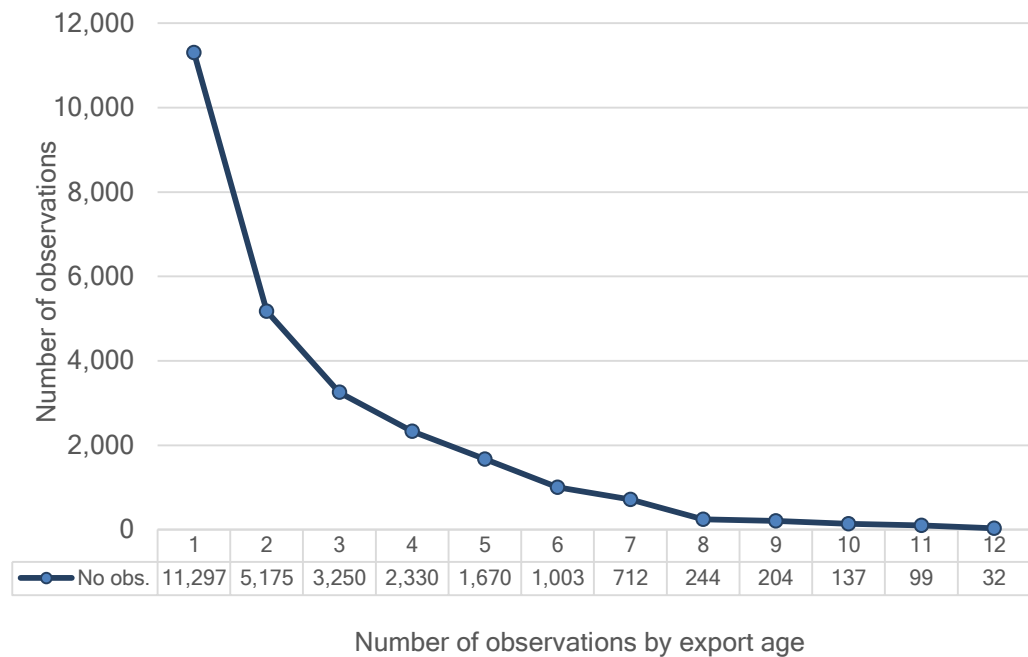


Figure 2.2. The export age

Source. *Statistik Industri*, calculated

2.4.1.2. Productivity

To evaluate the learning process of firms, I use TFP as the outcome variable. In this study, I construct the TFP series using the Levinsohn and Petrin (2003) model, which is an extension of the Olley and Pakes (1996) model.¹⁰ The strength of this approach lies in two innovations. Similar to Olley and Pakes's estimates, the Levinsohn and Petrin model is preferable to ordinary least squares (OLS) estimates in that it controls for simultaneity bias in the production function that may arise from input variables and unobserved productivity shocks. Since firm-specific productivity is known by the firm but not by the econometrician, a firm may adjust its inputs in response to the productivity shocks. In addition, this method also reduces the selection bias because

¹⁰ Many models can be used to construct TFP. See Aswicahyono (1998) to estimate TFP growth for Indonesia industries for period 1975–93.

some unproductive firms might leave the industry and be replaced by more productive enterprises. Furthermore, Levinsohn and Petrin could be preferable to Olley and Pakes because the latter uses investment as a proxy for unobservable shocks. This investment variable is most likely to have been derived from the capital and may not smoothly respond to productivity shock. Furthermore, the investment proxy is only valid for firms that report non-zero investment. But then, Levinsohn and Petrin uses intermediate inputs, such as materials and electricity, instead of investment. Therefore, using Levinsohn and Petrin in this study avoids truncating all the zero investment firms.

To estimate the TFP, I start by specifying the production technology of a firm as a Cobb-Douglas function:

$$y_t = \beta_0 + \beta_l l_t + \beta_k k_t + \varepsilon_t, \quad (2.6)$$

where y_t is the firm's value added at time t , l_t is the freely variable input labour; and k_t is the state variable capital¹¹—all these variables are logged. If ε_t is uncorrelated with the regressors, the production function can be estimated using OLS. However, there is a possibility that the error term impacts on the choices of inputs that I cannot observe, but that are observable by the firm; then, ε_t may be correlated with the right-hand side. If this is true, it would lead to a simultaneity bias. Thus I follow Olley and Pakes (1996) and Levinsohn and Petrin (2003) to decompose the error ε_t into two components: ω_t , the transmitted productivity component that is correlated with input choices and η_t , the error term that is uncorrelated with input choices. Then, I

¹¹ In Levinsohn and Petrin, labour is modelled as a fully flexible variable input and capital is the predetermined variable, which shifts the mean of the production function but does not affect ω_t .

have $\varepsilon_t = \omega_t + \eta_t$, where ω_t is a state variable of productivity that affects the firm's decision rules.

In Levinsohn and Petrin (2003), it is assumed that demand for the intermediate input m_t depends on the firm's state variables, capital and productivity shocks; so $m_t = m_t(k_t, \omega_t)$. The demand function is monotonically increasing in ω_t , which allows an inversion of the intermediate demand function. I obtain $\omega_t = \omega_t(k_t, m_t)$, in which the unobservable productivity term is now expressed solely as a function of two observed inputs. The production function can now be written as:

$$y_t = \beta_l l_t + \phi(k_t, \omega_t) + \eta_t, \quad (2.7)$$

where $\phi(k_t, \omega_t) = \beta_0 + \beta_k k_t + \omega_t(k_t, m_t)$. This equation can be estimated using the procedures discussed in Petrin, Poi and Levinsohn (2004). This study uses the consumption of material inputs and electricity as the intermediate input.

In Levinsohn and Petrin's estimation, there are two options of the dependent variable: value added and output (gross) revenue. In the main model, TFP is constructed using the value-added estimation from Levinsohn and Petrin with material and electricity used as proxies for the intermediate input. For completeness and comparison, however, the results using OLS, Olley and Pakes, and Levinsohn and Petrin-revenue are also reported.¹² Table 2A.5 in Appendix 2 compares the parameter estimates from OLS, Olley and Pakes's model, Levinsohn and Petrin-revenue and Levinsohn and Petrin-value-added to construct the TFP.

¹² In the robustness check, I also apply the other estimations of the TFP.

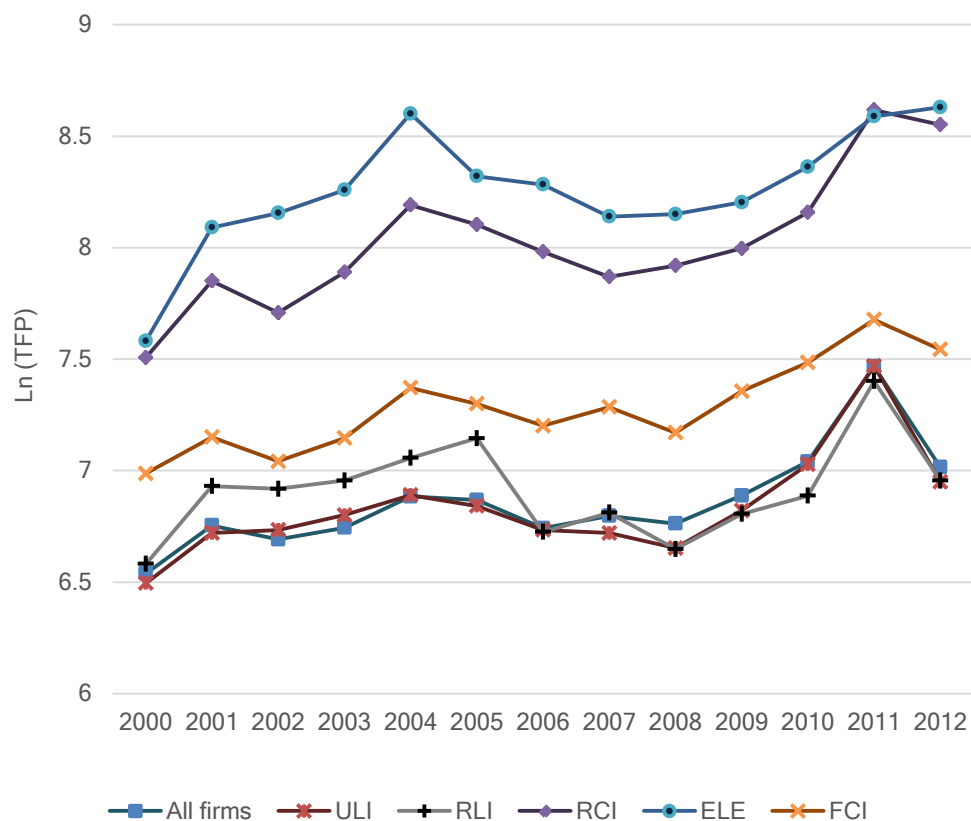


Figure 2.3. TFP by sector groups

Source. Results from TFP estimations using the Levinsohn–Petrin value-added model

Figure 2.3 shows the average values of the constructed TFP for all observations and five different industry groups. On average the productivity of firms in the ELE is the highest among other sectors and that those in the ULI have the lowest productivity. It can be noted that the Indonesian economy is biased towards ULI sectors, so the number of observations of firms for this group is the largest among others, and this contributes to the overall low average TFP (for all firms).

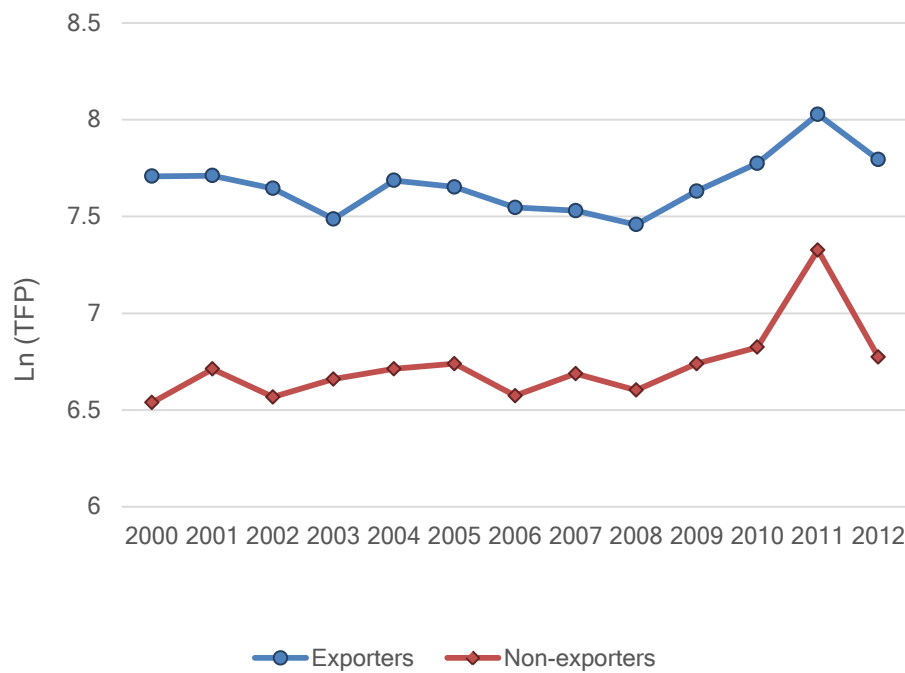


Figure 2.4. TFP: Exporters vs. non-exporters

Source. Results from TFP estimations using the Levinsohn–Petrin value-added model

Figure 2.4 compares the productivity level between exporting firms and non-exporting firms in Indonesia. As expected, it shows that, on average, exporters' productivity levels are much larger than the firms that serve only the domestic market. Further, to reflect our focus on the export age, I classify firms based on three categories. They are: 'incumbents'—firms that have already been exporting since the beginning of the observation period; 'starters' or new exporting firms—firms that started exporting in 2001–2012; and 'never export'—firms that did not export during the observation period. Figure 2.5 presents the average productivity level of these three groups. Exporting firms that are relatively older have higher productivity levels than new ones. Meanwhile, firms that have never exported have much lower productivity levels than the other groups.

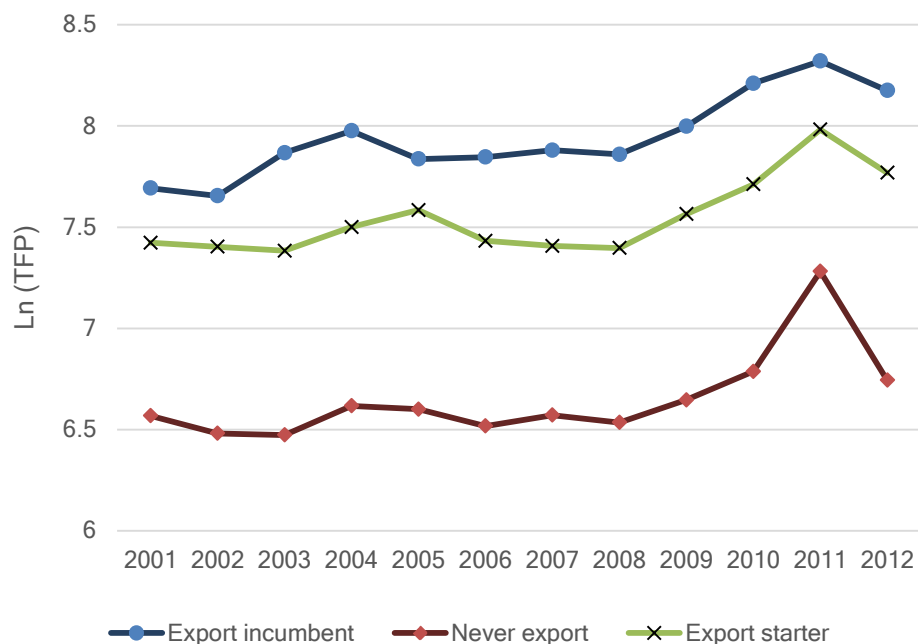


Figure 2.5. TFP by firms' export classifications

Source. Results from TFP estimations using the Levinsohn–Petrin value-added model

2.4.1.3. Other variables

We use some firm's characteristics, such as foreign-owned shares, import shares and a firm's age as control variables in the main model. They are readily used in firm-level data. Since both a firm's age and the export age are included, one might suspect that there is a high correlation between these two variables. But it turns out the correlation is only 0.13. As explained in the previous section, I also control for the spill over from other firms' export activities that is constructed by aggregating the number of exporting firms at the industry level and the province level.

In addition, I also construct an export-value variable. This variable is used in the preliminary analysis to check whether the export experience is associated with export performance. The export-value variable is derived from multiplying the export intensity and the total output and then deflated using export prices. The export price data is not readily available, but some proxies can be used. I construct the export

prices using the UNCOMTRADE database. In the database, I can get the data relating to export value and export volume for each group of 4-digit international standard industrial classifications (ISIC) Revision 3. Then, the export prices (unit values) are calculated by dividing the value of export with its volume. Once I get the export price, I translate it into a price index by converting the prices from dollar value to rupiah, using 2000 as the base year. To translate the dollar value into rupiah, I used exchange rates that are available from the Bank Indonesia website. I then matched each 4-digit ISIC Revision 3 product to every firm to get the export value of each firm. Alternatively, I also could use export price data for the USA as proxies for world export prices.

Figure 2.6 shows the constructed price indexes in dollars and rupiahs, along with the wholesale price indexes (WPI). BPS collects WPI by interviewing Indonesian firms in 33 provinces, and this reflects producer prices. The WPI is used to deflate most variables in values in this study, except for export sales, since the WPI is biased towards domestic prices. Over the consecutive periods, there is a slight difference between export prices in the dollar and rupiah, indicating small exchange rate effects. The WPI, nevertheless, is relatively much higher than the export prices, indicating higher domestic prices in general. Since the data in SI is in rupiah (IDR), the export sales variable is also deflated by export prices in rupiah.¹³

¹³ The number of observations of exporters with non-zero export value is decreased. This is because some firms report doing exports but do not report the export intensity for certain years.

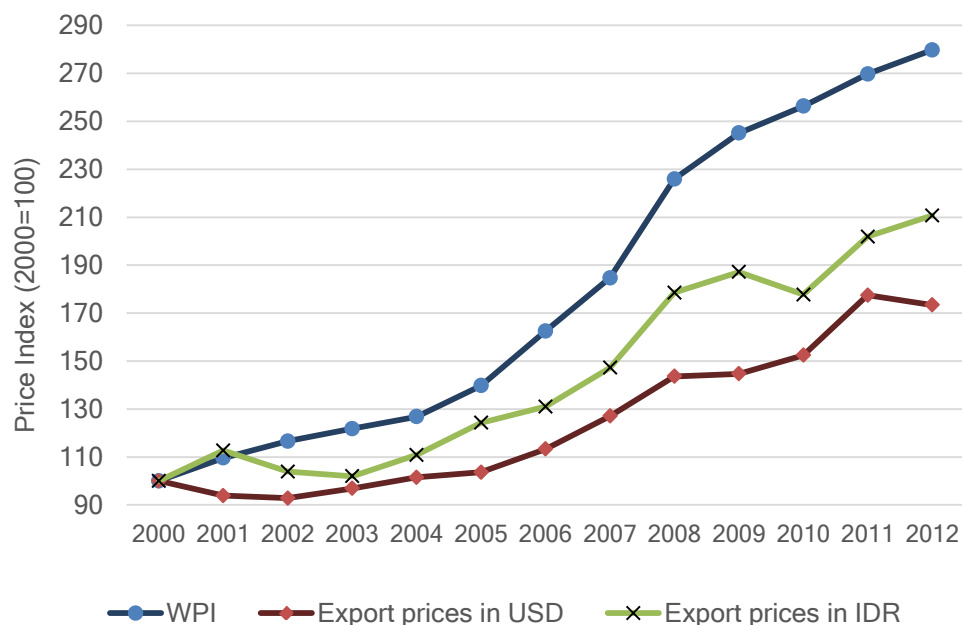


Figure 2.6. Price indexes

Source. BPS and UNCOMTRADE, calculated

2.5. Results

2.5.1. Preliminary results

Exporters are different from non-exporters

The results from the OLS regression of Equation 2.1 confirm that exporting firms are different in many aspects from firms that serve only the domestic market. Table 2.4 shows that exporting firms are better than non-exporting firms in terms of TFP (12 percent higher), labour productivity (26 percent higher) and value added per worker (16 percent higher). They also have higher inputs (95 percent larger in employment and 26 percent larger in capital per worker) and they pay higher wages than firms that serve only the domestic market. These findings are similar to previous studies that show the exceptional performance of exporting firms.

Table 2.4. Differences between exporting firms and non-exporting firms

Firm characteristics	Differences
Employment	0.952
Average wage of production workers	0.018
Capital per worker	0.261
Value added per worker	0.163
Output per worker	0.260
Total factor productivity (TFP)	0.118

Notes. All dependent variables are in the natural log form. All regressions control for the size effect except for the employment regression. All regressions include year, industry and province effects. All monetary variables are deflated with WPI. All coefficients are statistically significant at 1 percent level, except for average wage of production workers that is significant at 5 percent level.

Self-selection hypothesis

The results for the estimation of a probit model are shown in Table 2A.6 in Appendix 2.

This analysis confirms our hypothesis that a self-selection phenomenon occurs in export decision-making; only higher performance firms are able to start to export. The estimates, which correspond to the marginal effects, show that a 10 percent increase in productivity increases the probability of starting to export by 0.09 percent. Meanwhile, a 10 percent increase in productivity associates with the probability to export by 0.1 percent. In addition, higher shares of foreign ownership, capital and import shares increase the probability to export and to start to export. However, the age of the firm variable has a negative coefficient, which suggests that younger firms are more likely to export (or start to export) compared with older firms.

Age-dependence of export sales

After controlling for the self-selection effect, the results show that firms' sales increase with export experience (detailed results are shown in Table 2A.7, Appendix 2). Older or more experienced exporting firms earn more profits in foreign markets compared to younger or less experienced ones. Every one-year addition of exporting increases export sales by about 0.08 percent. This shows a learning effect in exporting: as the

export age increases, firms learn and accumulate knowledge and then become more enduring and make more profits in the export markets.

These preliminary findings confirm the results of previous studies. First, firms that export are different from non-exporters in many aspects. Second, the difference can be explained by the self-selection mechanism. Third, the export experience has a positive correlation with export sales, which also implies a learning channel. These preliminary investigations provide us with a better foundation from which to further our main analysis: whether or not firms are getting more productive as they become more experienced in the export markets.

2.5.2. Main results

Table 2.5 shows the main results of the impact of export age on productivity. The first two columns are the results of pooled OLS and firm-fixed effect estimations without controls. I introduce more controls in Column 3, and different combinations of year and industry-fixed effects in Columns 4 and 5. Overall, the variable of interest, the export age, is significant at the 1 percent level and has a consistent positive sign. This suggests that as the export experience increases, productivity also increases.

Columns 4 and 5 suggest that the effect of export age is about 3.5 percent. In all fixed-effect estimations, the export-age-squared variable is significantly negative with relatively consistent magnitudes. This implies an inverse U-shaped effect of export experience; as the export age increases, its marginal impact decreases. The increase of productivity for relatively younger exporting firms is larger than relatively older exporting firms. This is consistent with the finding of Alvarez and Lopez (2005) who suggest that productivity gains from exporting are more likely to affect new exporters than experienced ones.

Foreign-owned shares, import shares, and the ages of firms have a positive impact on productivity. Despite the expected signs, however, the magnitude of these control variables is mostly not significant especially after controlling for industry and/or year-fixed effects. The spill-over variables have small magnitudes and are insignificant implying that there is no effect of a firm's exporting activity on the productivity of other firms in the same sector or same region.

Table 2.5. Effect of export experience on productivity

VARIABLES	1 ^a	2 ^a	3 ^a	4 ^b	5 ^b
	Ln (TFP _{it})				
Export Age _{i,t}	0.408*** (0.00739)	0.0637*** (0.00742)	0.0550*** (0.00785)	0.0349*** (0.00907)	0.0345*** (0.0105)
(Export Age _{i,t}) ²	-0.0320*** (0.00111)	-0.00326*** (0.000908)	-0.00456*** (0.000924)	-0.00384*** (0.000866)	-0.00401*** (0.00101)
FDI Share _{i,t-1}			0.000627* (0.000331)	0.000382 (0.000400)	0.000493 (0.000408)
Firm Age _{i,t-1}			0.0317*** (0.00137)	-0.00241 (0.00233)	-0.00206 (0.00242)
(Firm Age _{i,t-1}) ²			-0.000239*** (2.86e-05)	-4.87e-05* (2.83e-05)	-5.19e-05* (2.59e-05)
Import Share _{i,t-1}			0.000369 (0.000273)	0.000478 (0.000437)	0.000435 (0.000427)
Number of exporters _{k,t-1}			-2.51e-05 (4.73e-05)	5.51e-05 (7.92e-05)	2.65e-05 (6.22e-05)
Number of exporters _{r,t-1}			-0.000109** (5.44e-05)	-0.000143 (9.90e-05)	-0.000112 (9.06e-05)
Constant	6.786*** (0.00374)	6.882*** (0.00287)	6.602*** (0.0111)	6.806*** (0.0490)	6.838*** (0.0444)
Firm fixed effects	No	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	No	Yes
year fixed effects	No	No	No	No	Yes
Industry - year fixed effects	No	No	No	Yes	No
Observations	123,129	123,129	123,129	123,129	123,129
R-squared	0.058	0.711	0.714	0.731	0.726

Notes. All estimations only include on-support firms from the matching procedure. *** p<0.01, ** p<0.05, * p<0.1; ^a Robust standard errors in parentheses; ^b Standard errors are clustered at industrial level.

To clearly understand the behaviour of export experience, I run separate regressions using the cubed form of export age, the log of export age and a dummy variable of export age, as reported in Table 2A.8 in Appendix 2. As shown in the first column, when the cube of the export age is included, the impact of the export age remains significant with a slightly higher magnitude. The square and cube form of the export age are not significant. These results confirm that the relation of export age and productivity indeed follow an inverted U-shaped curve, rather than a linear or oscillating function. The coefficient of the export age (in the natural log term) is significantly positive with a similar magnitude with the main model (Column 2). Meanwhile, the results for estimation with export age dummies in Column 3 show that the relation between export age and the TFP is non-linear. That is, the experience effect is significant only from two to five years of exporting.

Table 2A.8 in Appendix 2 also provides the results from other specifications used to check the robustness of the main model. Column 4 contains the results from a specification similar to the main model but with the export age variable constructed differently. In the main model, the export age keeps accruing so long as the exporters continue exporting—or halt exporting but only for one year and then resume afterwards. However, for the estimation in Column 4, the temporary stop of exporting is not counted as part of the exporting period, so if the firm resumes exporting, the export age will start from one again. Despite the different ways of constructing the export age, however, the results are similar to the main model, confirming that the effect of export age is around 3.5 percent.

There is a possibility that a firm that started exporting in 2001 is a firm that did not export in 2000 but did in 1999. Under the assumption that a firm needs to repay

sunk costs if it stops exporting for at least two years (Roberts & Tybout 1997), as a robustness check, I drop all exporting firms that started exporting before 2002. By doing this, I avoid the measurement error of export age, but I have a smaller size cohort of observations. Column 5 presents the results that accommodate this assumption. The magnitude of export age is now about 3.4 percent and the conclusion that the export age affects productivity, but not in a linear fashion, still holds.

Since I dropped many observations during the construction of the TFP, I check with an alternative approach where I use labour productivity as the dependent variable. As presented in Column 6 in Table 2A.8 in Appendix 2, I can keep all observations and replicate the model. The result shows that export age is associated with 2.6 percent increase in labour productivity and the squared form of export age is still negative and significant.

2.5.3. Sectoral and size effects

Table 2.6 shows the effects of specific sector or size. In these estimations, I treat export age in the natural log form as the variable of interest and interact it with specific sectoral dummies or the size of the dummy. The first row of columns (1–5) shows that a 10 percent increase in export age can raise productivity by 2.8–4.0 percent, and these numbers are true for all firms in all sectors except for those in the specific sectors (ULI, RLI, RCI, ELE or FCI). Meanwhile, the export age effect on productivity varies among those particular sectors. Adding the coefficient of the export age variable and the interaction variable yields a significant learning effect of 10.2 percent for firms in the FCI category. This category includes the production of motor vehicles and accessories as well as the production of chemicals. I may infer that firms in these industries can have a higher productivity growth, as they are more experienced in exporting. The magnitude

for the interaction variable for the RLI sector is negative and significant at 4.7 percent. This category includes firms that produce very low-tech wood and mineral products. Meanwhile, the magnitude of the interaction variable of the export experience with the RCI, ELE and ULI sectors are not significant.

Table 2.6. Sectoral and size effects of export experience

VARIABLES	1	2	3	4	5	6
	Ln (TFP _{it})					
Ln (Export age _{ikrt})	0.0396*** (0.0137)	0.0379*** (0.0124)	0.0305** (0.0119)	0.0338*** (0.0118)	0.0279** (0.0120)	0.00803 (0.0145)
Ln (Export age _{ikrt}) x ULI	-0.0253 (0.0185)					
Ln (Export age _{ikrt}) x RLI		-0.0472* (0.0270)				
Ln (Export age _{ikrt}) x RCI			0.0460 (0.0521)			
Ln (Export age _{ikrt}) x ELE				-0.0592 (0.0863)		
Ln (Export age _{ikrt}) x FCI					0.102** (0.0473)	
Ln (Export age _{ikrt}) x Large firm						0.0417** (0.0177)
Constant	6.841*** (0.0634)	6.841*** (0.0634)	6.841*** (0.0635)	6.842*** (0.0634)	6.847*** (0.0630)	6.748*** (0.0628)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	123,129	123,129	123,129	123,129	123,129	123,129
R-squared	0.726	0.726	0.726	0.726	0.726	0.729

Notes: All estimations include only on-support firms from the matching procedure. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All control variables from the main estimation are included. The signs and magnitudes for these variables are consistent. The dummy variable for each sector is also included. I use industry effects and year effects separately in order to ensure acceptable degrees of freedom.

Column 6 in Table 2.6 exhibits the estimation results from the model that includes the interaction variable between export age and firm size. This model also includes a dummy for a large firm equal to 1 if the number of total workers in that firm

is 100 or more, and zero otherwise. The estimation shows that LBE is evident only in larger firms and not in smaller ones. The total magnitude is 4.2 percent, which is almost as big as the result from the main estimation, indicating that the learning effects are driven by larger firms.

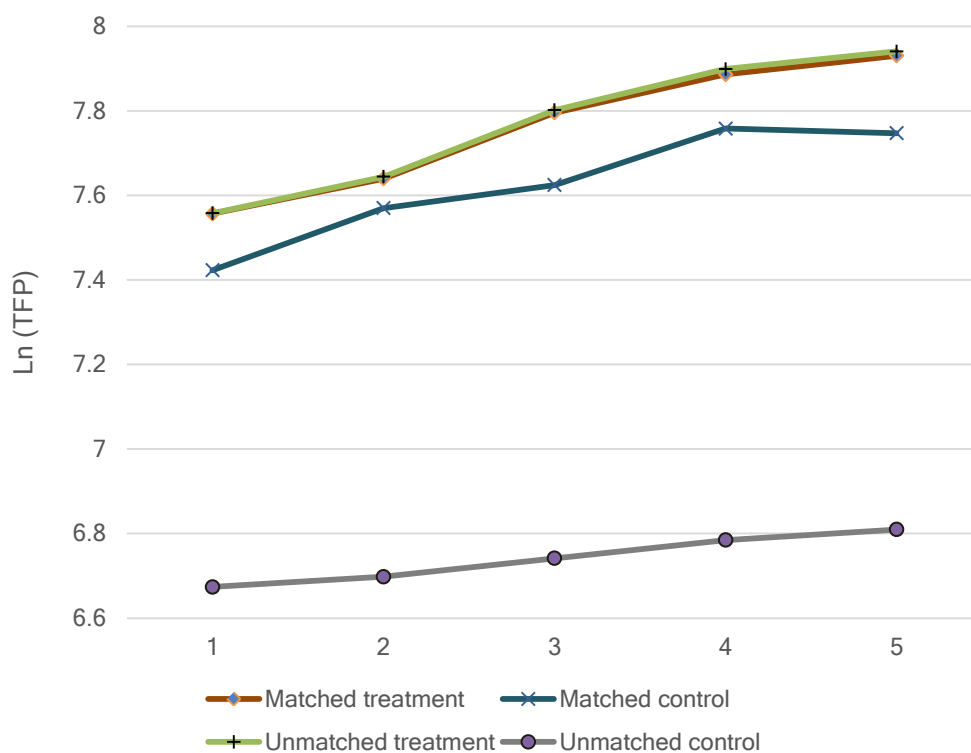
2.5.4. Results from alternative approach

The results from the alternative approach are shown in Table 2.7. Note that these results have different interpretations from the previous model. The productivity level of firms after one year of exporting is 0.13 percent higher compared to their counterfactuals of non-exporting firms. In the following years, the difference in productivity levels between exporting firms and control firms are 0.07 percent, 0.17 percent, 0.13 percent and 0.18 percent after two, three, four and five years of exporting, respectively. However, the difference becomes insignificant after six years of exporting. This might be due to the diminishing effects of export, or the decline in the number of observations for the treatment group after resampling. Meanwhile, the difference in productivity growth between both groups is 0.02 percent in the first year of exporting. Compared to the base year, the difference in productivity growth becomes larger as the export age increases. The year-on-year productivity growth of the treatment group is also significantly higher than that of the control groups, except in the second year of exporting. Figure 2.7 compares the productivity level between treatment and control groups before and after the matching procedures. It shows that the productivity level for exporting firms in various export age stages is higher than their counterfactual. To sum up, results from all outcomes confirm the presence of the LBE mechanism in Indonesian firms.

Table 2.7. Estimated LBE effects

Export age	1	2	3	4	5
Outcome: Productivity					
β_1	0.133*** (0.0253)	0.069* (0.0403)	0.171*** (0.0484)	0.128** (0.0598)	0.183*** (0.0714)
Outcome: Productivity growth (compared to base year)					
β_2	0.019*** (0.0029)	0.053*** (0.0076)	0.051*** (0.014)	0.088*** (0.029)	0.188*** (0.066)
Outcome: Productivity growth (year-to-year)					
β_3	0.019*** (0.0029)	0.008 (0.0009)	0.022*** (0.005)	0.016*** (0.005)	0.033*** (0.007)
No. treated	8,211	3,082	2,306	1,667	1113
No. controls	95,405	78,370	63,410	50,554	39,186

Note. Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

**Figure 2.7. Comparing treatment and control groups after export**

2.6. Concluding remarks

Exporting firms have a higher performance than firms that serve only the domestic market, and this difference is already present before they start exporting. I confirm these findings by applying the empirical strategy of previous studies to Indonesian firm-level data from 2000 to 2012. The relationship between export age and export sales is also identified, where the more experienced exporting firms are more likely to have higher export values.

Using this basic understanding, this study further explores the learning mechanism of exporting firms. Using export age as the proxy for experience, this study asks whether export experience affects firm productivity. Employing the fixed effects as well as propensity score matching techniques, I find that export experience does matter. Yet, it is only applicable to firms that have high productivity from the beginning; a support for the self-selection hypothesis.

From the fixed-effect technique, I find that an increase in the export age increases the productivity of firms, but the effect diminishes as the age increases. A series of robustness checks confirms the findings. Moreover, I find that export sales affect productivity positively, which may imply the channel for learning. As exporting firms become more experienced, have a better understanding of the foreign markets and succeed in increasing their revenues, their productivity also increases. Furthermore, I also find that learning by experience is more likely to happen in the relatively bigger firms and firms in footloose capital intensive sectors.

The result from PSM shows, also, that firm performances increase as their export experiences increases. Both productivity levels and the productivity growth of exporting firms are higher than their matched non-exporters control group. The

difference is significant until five years of exporting, at which time it becomes insignificant, which may imply that there are diminishing effects of learning.

Whether or not exporting promotes firm productivity is a central issue in the assessment of the effectiveness of export-promotion development policies. Unfortunately, it is an unresolved issue since many previous studies have failed to detect significant LBE effects. This study finds that export experience affects performance, which suggests that exporting is good for firms. General policies to make exporting easier, such as simplifying export procedures, or providing information about export markets might be beneficial for firms. However, I have to be careful with the policy implications of these findings. It is true that there is gain from export, but not all firms are able to export. Therefore, export promotion policies may mistarget firms in the economy. For example, a certain policy is formulated to promote exports, but since we do not know which firms have the capabilities to learn and grow in the export market, that policy may pick firms that are not able to do so. Furthermore, it remains unclear why there are many firms that quit exporting after several years, even though they gain benefits from exporting. Is this phenomenon something that is related to policies? Further work is needed to investigate this.

2.A. Appendix 2

Table 2A.1. Summary statistics

VARIABLES	Obs	Mean	Std. Dev.	Min	Max
$\ln(TFP_{i,t})$	153,890	6.87	1.29	-1.86	17.13
$\ln(\text{Output per worker}_{ikrt})$	153,963	5.41	1.37	-1.66	14.54
$\ln(\text{Value added per worker}_{ikrt})$	153,963	4.38	1.30	-4.97	14.38
$\ln(\text{Average wage of production worker}_{ikrt})$	153,729	3.32	1.09	-5.79	11.03
$\ln(\text{Capital}_{ikrt})$	155,421	12.79	2.05	-1.16	26.39
$\ln(\text{Total Worker}_{ikrt})$	153,964	3.95	1.05	3.00	10.63
$\ln(\text{Export value}_{ikrt})$	19,831	15.02	2.30	0.35	24.78
Export Age _{i,t}	155,423	0.40	1.24	0.00	12.00
FDI Share _{i,t}	153,964	4.66	20.12	0.00	100.00
Firm Age _{i,t}	155,423	11.11	13.86	1.00	112.00
Import Share _{i,t}	153,958	5.98	20.32	0.00	100.00
Number of exporters _{k,t}	155,423	40.95	133.66	0.00	846.00
Number of exporters _{r,t}	155,423	37.46	119.66	0.00	705.00

Table 2A.2. Export participation and export intensity

	Sector	Average export participation (%)	Export intensity * (%)		
			Average	2000	2012
15	Manufacture of food products and beverages	10	71.1	76.5	65.2
17	Manufacture of textiles	14	56.0	65.6	53.1
18	Manufacture of wearing apparel	16	80.4	88.2	73.1
19	Tanning and dressing of leather	21	68.1	65.0	60.4
20	Manufacture of wood and of products	39	79.8	83.9	72.1
24	Manufacture of chemicals and chemic	19	42.7	51.3	37.1
27	Manufacture of basic metals	27	57.1	49.3	61.5
28	Manufacture of fabricated metal	12	40.8	43.3	40.1
29	Manufacture of machinery and equipment	18	40.8	43.3	40.1
31	Manufacture of electrical machinery	29	56.8	64.7	53.0
32	Manufacture of radio, television	38	79.1	85.0	78.7
34	Manufacture of motor vehicles	17	48.1	58.5	37.5
36	Manufacture of furniture	45	85.7	91.7	78.7
	The average of export participation	18	73.6	79.0	71.5

Note. * The shares of output that are exported among only exporters

Source. *Statistik Industri*, calculated

Table 2A.3. Number of firms that stay exporting for t years

t	The number of export starters	Firms that can stay for t years	Percentage
12	610	32	5.25
11	1,544	99	6.41
10	2,058	137	6.66
9	3,040	204	6.71
8	3,374	244	7.23
7	5,299	712	13.44
6	5,999	1003	16.72
5	7,403	1670	22.56
4	8,215	2330	28.36
3	9,353	3250	34.75
2	10,559	5175	49.01

Source. *Statistik Industri*, calculated

Table 2A.4. Industry classifications

Group	ISIC 4-digit sector	
Unskilled labour-intensive industries (ULI)	3610	Manufacture of furniture
	1711	Preparation and spinning of textile fibres; weaving of textiles
	1920	Manufacture of footwear
	1810	Manufacture of wearing apparel, except fur apparel
Resource-based labour-intensive industries (RLI)	2021	Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board etc.
	2022	Manufacture of builders' carpentry and joinery
	2023	Manufacture of wooden containers
	2029	Manufacture of other products of wood; manufacture of articles of cork, straw etc.
	2691	Manufacture of non-structural non-refractory ceramic ware
	2695	Manufacture of articles of concrete, cement and plaster
	2699	Manufacture of other non-metallic mineral products n.e.c.
	2692	Manufacture of refractory ceramic products
	2693	Manufacture of structural non-refractory clay and ceramic products
Resource-based capital-intensive industries (RCI)	3691	Manufacture of jewellery and related articles
	2101	Manufacture of pulp, paper and paperboard
	2511	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres
	2710	Manufacture of basic iron and steel
Electronic industries (ELE)	2411	Manufacture of basic chemicals, except fertilisers and nitrogen compounds
	3000	Manufacture of office, accounting and computing machinery
	3140	Manufacture of accumulators, primary cells and primary batteries
	3150	Manufacture of electric lamps and lighting equipment
	3190	Manufacture of other electrical equipment n.e.c.
	3210	Manufacture of electronic valves and tubes and other electronic components
	2922	Manufacture of machine-tools
	3220	Manufacture of television and radio transmitters and apparatus for line telephony etc.
	3230	Manufacture of television and radio receivers, sound or video recording etc.
Footloose capital-intensive industries (FCI)	3120	Manufacture of electricity distribution and control apparatus
	3410	Manufacture of motor vehicles
	3420	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers etc.
	3430	Manufacture of parts and accessories for motor vehicles and their engines
	2520	Manufacture of plastics products

Table 2A.5. Construction of the TFP variable

	OLS	Olley-Pakes	Levinsohn–Petrin Revenue	Levinsohn–Petrin VA	Levinsohn–Petrin VA*
Capital	0.118	0.076	0.035	0.096	0.096
Labour	0.269	0.261	0.224	0.428	0.406
Material	0.617	0.609	0.788		

Note. * Represents estimation using intermediate input material used and electricity used.

Source. Results from regressions

Table 2A.6. Selection into export

VARIABLES	Export Starter _{ikrt}		Export Status _{ikrt}	
	probit	dy/dx	probit	dy/dx
Ln(TFP _{i,t-1})	0.120*** (0.0067)	0.0091*** (0.0005)	0.115*** (0.0059)	0.0122*** (0.0008)
FDI Share _{i,t-1}	0.0022*** (0.0003)	0.0002*** (2.23e-05)	0.004*** (0.0003)	0.0004*** (0.0006)
Firm Age _{i,t-1}	-0.0064*** (0.0011)	-0.0005*** (8.21e-05)	-0.0073*** (0.0010)	-0.0007*** (0.0001)
(Firm Age _{i,t-1}) ²	6.35e-05*** (1.25e-05)	4.81e-06*** (9.49e-07)	6.33e-05*** (1.19e-05)	6.72e-06*** (1.26e-06)
Import Share _{i,t-1}	0.0020*** (0.0003)	0.0002*** (2.27e-05)	0.0026*** (0.0003)	0.0003*** (3.07e-05)
Ln(Capital _{i,t-1})	0.0773*** (0.00445)	0.0059*** (0.0003)	0.0774*** (0.0038)	0.0082*** (0.0004)
Export Status _{i,t-1}			2.299*** (0.0146)	0.244*** (0.0013)
Constant	-3.650*** (0.0595)		-3.606*** (0.0554)	
Industry fixed effects	Yes	Yes	Yes	Yes
Year Fixed effects	Yes	Yes	Yes	Yes
Observations	127,751	127,751	127,751	127,751

Note. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 2A.7. Heckman selection model of the relation between the export age and sales

VARIABLES	Ln (Export value _{ikrt})	Export Status _{ikrt}	Mills
Export Status _{i,t-1}		2.069*** (0.0236)	
Export Age _{i,t-1}	0.0792*** (0.0221)		
(Export Age _{i,t-1}) ²	-0.000460 (0.00251)		
FDI Share _{i,t-1}	0.00429*** (0.000384)	0.00371*** (0.000270)	
Ln(TFP _{i,t-1})	0.698*** (0.0109)	0.116*** (0.00593)	
Firm Age _{i,t-1}	-0.000926 (0.00218)	-0.0104*** (0.00107)	
(Firm Age _{i,t-1}) ²	-2.49e-05 (2.50e-05)	8.97e-05*** (1.25e-05)	
Import Share _{i,t-1}	0.00399*** (0.000491)	0.00251*** (0.000289)	
Ln(Capital _{i,t-1})	0.315*** (0.00658)	0.0659*** (0.00373)	
Number of exporters _{k,t-1}	0.000278*** (0.000104)	0.000599*** (6.30e-05)	
Number of exporters _{r,t-1}	-0.000225*** (8.18e-05)	0.000857*** (6.52e-05)	
Lambda			-0.117*** (0.0349)
Constant	5.449*** (0.159)	-3.406*** (0.0550)	
Industry effects	Yes	Yes	
Year effects	Yes	Yes	
Observations	126,555	126,555	126,555

Note. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 2A.8. Alternative specifications

VARIABLES	1	2	3	4 ^a	5 ^b	6
			Ln (TFP _{it})			Ln (Labour Productivity _{it})
Export Age _{it}	0.0370*** (0.0128)			0.0345*** (0.00794)	0.0339*** (0.00913)	0.0259*** (0.00595)
(Export Age _{it}) ²	-0.00484 (0.00341)			-0.00394*** (0.000936)	-0.00440*** (0.00115)	-0.00353*** (0.000662)
(Export Age _{it}) ³	6.20e-05 (0.000245)					
Ln (Export Age _{it})		0.0327*** (0.0118)				
Export Age _{it} = 1			0.00391 (0.0164)			
Export Age _{it} = 2			0.0784*** (0.0202)			
Export Age _{it} = 3			0.0903*** (0.0225)			
Export Age _{it} = 4			0.0728*** (0.0253)			
Export Age _{it} = 5			0.0942*** (0.0284)			
Export Age _{it} = 6			0.0224 (0.0346)			
Export Age _{it} = 7			0.101** (0.0412)			
Export Age _{it} = 8			0.0124 (0.0621)			
Export Age _{it} = 9			0.00111 (0.0729)			
Export Age _{it} = 10			0.0326 (0.0983)			
Export Age _{it} = 11			-0.245** (0.102)			
Export Age _{it} = 12			0.0371 (0.132)			
Constant	6.838*** (0.0635)	6.842*** (0.0634)	6.840*** (0.0634)	6.838*** (0.0635)	6.711*** (0.0748)	9.435*** (0.0498)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	123,129	123,129	123,129	123,129	111,603	218,439
R-squared	0.726	0.726	0.726	0.726	0.725	0.723

Notes. All estimations only include on-support firms from the matching procedure. Standard errors are clustered at industrial level, *** p<0.01, ** p<0.05, * p<0.1. Columns 4 and 5 use a different definition of export age. ^a The export age is calculated differently. ^b Exporting firms that started exporting before 2002 were dropped to reduce potential measurement error.

Chapter 3

Learning by Exporting: The Role of Competition

Abstract

This chapter finds that increased competition in export markets could reinforce firms' learning-by-exporting processes. I investigate competition, as a learning channel, by employing 25 years' worth of Indonesian garment firms' data. Firms in this labour-intensive industry experienced a long period of a quota regulation under the Multi-Fibre Arrangement (MFA), which governed much of the global trade in garments before its abolition in 2005. This allows me to conduct a natural experiment type of study on how the MFA affected apparel exporters' performance. Using propensity score matching and difference-in-difference methods, I find that the impact of exporting on total factor productivity during the MFA implementation period is mixed; but after it was abolished, productivity increased by 9–13 percent. This implies that exporters gain a significant learning-by-exporting benefit from competition (that is, without a special facility such as the MFA), and that interventions that protect exporters from such competition might lessen the benefit.

3.1. Introduction

The learning-by-exporting (LBE) hypothesis argues that exposure to the export market enables firms to improve their efficiency levels, whereas non-exporting firms do not obtain such learning benefits. Interactions with buyers and competitors abroad provide channels through which exporters can absorb foreign knowledge. Taking advantage of such opportunities can increase the performance of exporters, relative to firms that serve only the domestic markets. While earlier studies showed mixed evidence of LBE, a number of new case studies in developing countries have recently confirmed this hypothesis (Bigsten & Gebreeyesus 2009; De Loecker 2007; Du et al. 2012; Van Biesebroeck 2005). Unfortunately, they stop short of exploring the channels through which LBE operates.

Identifying the LBE channel is necessary to examine or to propose policies that aim to improve productivity. If LBE does exist, does it mean that exporting can be seen as a strategy for productivity improvement? Furthermore, if exporting can improve firms' performance, should we endorse export promotion policies? Based on their findings in China, Du et al. (2012) suggest that the learning effects from exporting could motivate the government to design export promotion policies that encourage domestic firms to exploit benefits from exporting. This might explain the claim by Girma, Greenaway and Kneller (2004) that almost all governments in the world have a 'mercantilist instinct' to do export promotion activities because they see export as the key to productivity growth.

This chapter seeks to shed light on these issues by testing the argument of the importance of policy intervention on the learning ability of firms as well as examining

the channels through which exporters increase their productivity.¹ As for the intervention of interest, this study employs the implementation (and subsequent abolition) of the Multi-Fibre Arrangement (MFA) as a natural experiment for analysing the LBE hypothesis. The MFA is well-known as a global and massive intervention that governed the world trade of garments for about three decades.² It greatly influenced competition in the world apparel trade. It helped firms from various developing countries, especially in the early implementation of the policy, to access markets in advanced countries such as the USA and the European Union (EU); even though, in the later period, it limited further expansion of a given exporter as its quota was already fulfilled (Hill 1992; Brambilla, Khandelwal & Schott 2010). During the period of the quota regimes, it could be argued, many developing countries could enter the specific-quota markets without meaningful global competition. However, starting from the beginning of 2005, after 10 years of preparation, the MFA restrictions were abolished and the battle for unhindered access to the world clothing market was back.³ The competition has since been intensified; cheap products from all over the world can access markets in previously constrained countries without limitation. This large, measured and statistically exogenous change in trade policy provides the natural experiment that I use in this chapter to test the learning effects of exporting.

¹ I use the general term ‘intervention’ to refer to any policy that could directly facilitate export access, but excludes economy-wide measures such as the exchange rate policy (later in the model, however, I use the year-fixed effect to control for these other factors).

² The MFA affected textiles and garments, but this study focuses on garments only. This is because it is an important labour-intensive industry in Indonesia that has become the largest industry in terms of employment. It has been an export-oriented sector and the MFA was an important export-promotion intervention for the garment industry.

³ The announcement of the elimination of the MFA was at the Uruguay Round meeting in 1994.

This paper tests two fundamental predictions. First, a policy regime can influence LBE effects. A policy intervention may create a situation that opens up or closes down channels of learning. As mentioned in Blalock and Gertler (2004), buyers might implicitly or explicitly assist exporters in order to obtain good quality products and precise specifications. Meanwhile, intense competition is theoretically believed to be the driver for faster productivity improvement. The intervention could intensify or reduce the degree of competition as well as the level of interaction with buyers. Second, the competition effect is the main channel of LBE. Learning through competition is an important hypothesis that is mentioned in various studies but has not been confirmed in formal empirical analyses. Based on these two hypotheses, this chapter argues that exporting under quota regimes leads to smaller learning effects compared to what happens after the quota is removed since there should be a significant difference in the degree of competition under the two regimes.

Comparing the LBE effects of firms in Indonesia's apparel industry in the MFA period (before 2005) and in the period after its abolition (after 2005), this study employs 25 years of longitudinal firm-level data from surveys of medium and large establishments from 1990 to 2014. Several empirical strategies are applied. To start the analysis, a simple difference-in-difference (DID) approach is conducted to examine LBE effects before and after the MFA was abolished. The learning effect is identified by comparing the productivity of matched exporters with their matched non-exporters after they export. The total factor productivity (TFP) is used as an outcome indicator and some strategies are applied to overcome the endogeneity issues in estimating the TFP. Subsequently, this chapter introduces a way to reduce biases from containing non-MFA intervention. I compare the learning benefits of garment exporters in the

two observed periods with firms in the footwear sector, a very similar industry, especially for the case of Indonesia, but one with no such global market access regulations. A series of robust results explains that removing the intervention that protects exporters from competition has improved the learning premium of exporters in the garment sector by 9 to 13 percent. Results from this study run counter to the support of export promotion interventions. The finding suggests that exporters learn better in a more competitive situation, while, on the contrary, interventions to help exporters export might result in firms that are less competent.⁴

Indonesia provides an interesting setting for this study. The MFA had contributed to the growth of the apparel industry in Indonesia due to exclusive market access that resulted from the quota facility (Hill 1992). This sector has become a key export-oriented industry as well as one of the most important employment generators by absorbing over 12 percent of the manufacturing labour force. After the MFA abolition, Indonesia's export performance has not been growing as strongly as Bangladesh, China or Vietnam, but it has not experienced an export contraction like that of Mexico. Apart from its mediocre export performance after the post-MFA era, Indonesia's productivity performance due to LBE gives a different story. The removal of the quota intervention provides a better opportunity for exporters to improve their productivity.

To the best of my knowledge, this is the first study that tries to examine the LBE effects under a policy intervention. More importantly, it sheds light on the channel of learning, something that has not been investigated in previous literature. During the

⁴ These findings could have significant implications not only for single-country analysis but also for the multilateral trading system. Some trade preference interventions that reduce competition among exporters under WTO are still implemented (see Collier & Venables 2007 for examples).

MFA period, the main channel of learning was arguably limited to the relationship with foreign buyers. The strong linkages with clients allowed the garment exporters to provide a high-quality product due to supervision from buyers (Thee 2009). However, after the MFA was abolished, the competition effects have been much intensified because the market access facility from quota intervention was removed. This condition has introduced a new learning channel on top of learning from buyers. Results from this study highlight the significance of competition as a LBE factor. Meanwhile, from the methodological perspective, this study also points to the importance of ‘measuring the true TFP’, especially when studying a certain policy regime that affects prices. As suggest by Keller (2010), using revenues instead of physical quantities may confound results based on higher productivity and higher mark-ups. However, data to measure the physical TFP are rarely available. This study proposes a methodology to reduce this problem by correcting the deflator used in the TFP estimations.

The next section discusses the MFA and its implementation in Indonesia, providing the background and justification of the model treatment that follows. Section 3.3 provides the formal LBE model. Section 3.4 explains some econometric strategies to implement the model and techniques to reduce some possible bias. Section 3.5 discusses my data sources and data construction. Section 3.6 provides results and discussion as well as some robustness checks. The final section provides concluding remarks and policy implications.

3.2. The implementation of the Multi-Fibre Arrangement in Indonesia

World trade in apparel had been highly regulated for over three decades before the MFA was abolished with effect from 1 January 2005. However, the MFA was initiated

much earlier by a massive quota regime of Voluntary Export Restraint (VER) that had been established in the 1950s. The USA imposed VER for Japanese textiles and the United Kingdom (UK) imposed quotas on products from Hong Kong, India and Pakistan. When the production and exports of textiles and apparels from Asian countries continued to grow, developed countries set up a more systematic control mechanism (Brambilla, Khandelwal & Schott 2010; Krishna & Tan 1998). This led to the signing of the MFA under the General Agreement on Tariffs and Trade (GATT) in 1974.

Starting from that year, the USA and some European countries imposed MFA quotas on imports of garments from developing countries because they were concerned that import competition had serious adverse effects on their domestic garment industry. These countries first introduced quotas on exports from the three newly industrialising economies (NIEs)—Hong Kong, South Korea and Taiwan—which experienced spectacular export growth with these products during that time (Hill & Suphachalasai 1992). When the tightened MFA quotas on the NIEs resulted in the spread of garment production to other low-wage countries, such as Bangladesh, India, Indonesia, Sri Lanka and Pakistan, these countries also came under the MFA regime. The MFA, therefore, evolved from a protection tool for developed countries into one facility that allowed small developing countries to access their markets (Brambilla, Khandelwal & Schott 2010). Thus by the mid-1990s, almost all garment exports from developing countries were subject to MFA quotas. For example, during the period from 1984 to 2004, the USA signed bilateral MFA agreements with 71 countries using 149 three-digit MFA specific-limit groups that had on average 17 harmonised system (HS) products each. These specific country-products-volumes-timeframes quotas were adjusted by importing countries through bilateral negotiations periodically depending

on the rate of export growth and the perceived threat to their domestic industries (Krishna & Tan 1998; Hamilton 1984).⁵

It is instructive to explain how quotas work. Figure 3.1 illustrates how MFA quotas restrict exports and at the same time create quota rents for the existing exporting firms in a given garment-exporting country. When an importing country imposes an MFA quota, it limits the import volume from the exporting country from R to Q . The price in the importing country rises from P_0 to P_1 , resulting in the quota rent in the shaded area. In a normal situation, the whole rent is potentially received by the exporting country since it controls the quota policy. Some conditions, such as monopsony and bilateral monopoly, may prohibit the exporting country from capturing all the rents. A study about Indonesia by Krishna and Tan (1998) suggests that, on average, exporters obtained about USD 0.41 quota rent per product or 9 percent of the export price per unit in 1987. The rents were lower in 1988, at about USD 0.3 or 6 percent per unit. Krishna and Tan also show that these figures could be higher if incorporating quality effects, hidden costs associated with the quota distribution system, and market imperfections that most likely occurred.

⁵ The concept of MFA is unique and quite different from other quota concepts. Similar to quota barriers, it is a measure by which the importing country imposes an upper limit on foreign supply. However, it is distinct in that it is targeted to a very specific commodity category at a certain period, is defined in volume rather than in value terms, and is discriminatory by the country of origin (Hamilton 1984). For example, the USA specified four MFA groups of textile and clothing: yarn, fabric, made-ups, and clothing. Each of these groups can be classified into very detailed products, such as women's and girls' trousers, breeches and shorts (cotton); or robes, dressing gowns, etc. (cotton). Every year, each exporting country and the USA negotiated quotas of a mixture of product groups that were valued by kilogram, dozen, or squared metre. Conversion factors for every unit were established into a single term of SME of fabric to define the quota volumes (Brambilla, Khandelwal & Schott 2010).

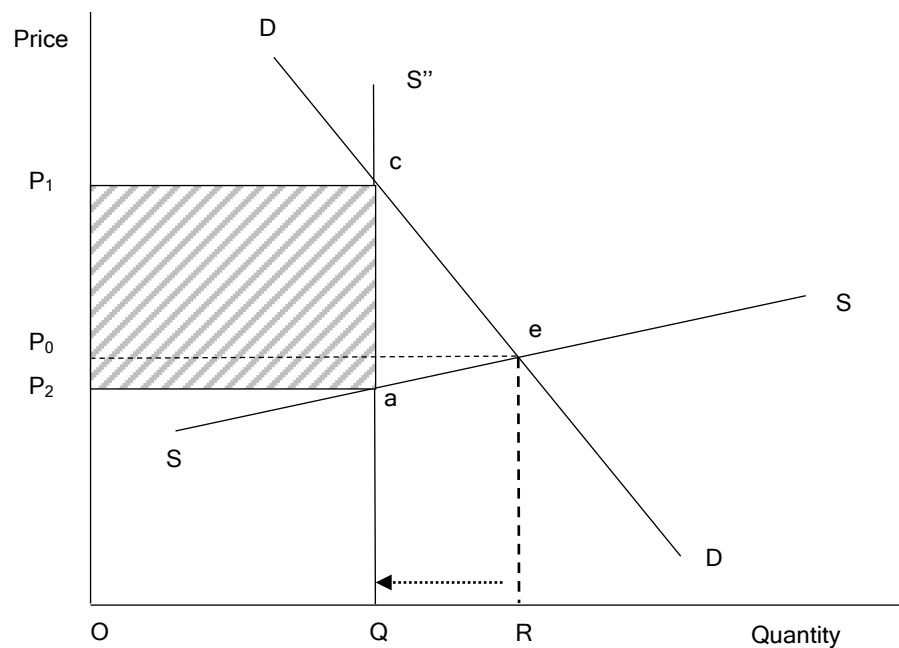


Figure 3.1. Effect of MFA quota on exporting country

The imposition of MFA quotas on garment exports from NIEs opened up opportunities for some developing countries, including Indonesia, to begin accessing developed countries' markets. These new exporting countries could enter the specific country-products-volumes-timeframes market with almost no competition pressure from other rival countries. Because of this opportunity, export growth from developing countries was high in the beginning until they could fulfil the quota volumes and could not further expand the export of those specific products. For example, Indonesia's apparel export growth was higher in the beginning years of the implementation of MFA (see Table 3.1). Note that other than the MFA factor, there are many reasons why the apparel industry in Indonesia was once successful (Hill 1992). These include a decline in the protection of manufacturing, reform packages from government and the oil boom period that provided incentives for manufacturing producers to export. In

those years, Indonesia had not achieved full quota volumes. However, in the later period, when the quota fill rates were high, the export growth of apparel was lower. One of the reasons was that firms faced the more challenging task of increasing sales as the constraints became binding; they needed to penetrate the non-MFA markets or do quality upgrading.

Table 3.1. Apparel export annual growth rates from Asian developing countries, nominal value of SITC 84 in percentage

Countries	1980–84	1985–89	1990–94	1995–99	2000–04	2005–09	2010–14
Indonesia	38.20	32.32	24.97	5.86	3.65	5.92	3.72
India	8.82	23.02	11.48	7.07	6.35	11.91	8.83
Bangladesh		49.59	27.26	22.56	10.24	14.73	14.02
China		31.35	24.27	5.35	15.79	12.57	11.92
Vietnam					22.15	15.53	18.86
Cambodia					19.60	5.21	17.45

Source. Calculated from UNCOMTRADE

The specifications of MFA quota limits are broad and not in terms of value but in physical quantities. This way of specification could cause quality upgrading. Quality upgrading occurs when the quota causes the composition of imports to be set towards goods that would be relatively more expensive under free trade. There are potentially two distinct types of quality upgrading: a change in the characteristics of given varieties and a shift in demand toward higher quality varieties. With a physical quantity quota, firms set quota rents as the same dollar amount over marginal costs (Harrigan & Barrows 2009).

Table 3.2 provides information about average fill rates of constrained goods under the MFA from several countries to the USA. During the decade before the MFA expiration date, except in the last three years, the fill rates of these countries had been very high in almost every specific product. Many product quota lines achieved 100

percent fill rates, except for a small number of categories that have fill rates less than 50 percent. From the table, Bangladesh had the highest quota fill rates among these countries.

Table 3.2. Textiles and apparel export fill rate of quota products on average, from some countries to the USA, in percentage

Countries	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Indonesia	83.1	80.8	94.8	96.0	87.7	89.0	83.3	75.0	69.4	62.3
India	89.1	98.6	99.6	99.9	97.8	90.9	79.7	76.7	75.6	68.6
China	80.2	76.8	81.7	80.3	80.3	81.6	78.8	81.8	84.5	
Bangladesh	99.9	99.8	98.5	99.1	99.5	100.0	98.4	90.8	93.3	75.7
Vietnam									99.7	70.4
Cambodia			97.4		79.9	72.3	72.2	66.3	55.3	58.5

Source. Office of Textiles and Apparel (OTEXA)

The phase-out process of the MFA began after the Uruguay Round in 1995. The trade talks agreed to replace the MFA with the Agreement on Textiles and Clothing (ATC), which arranged the gradual elimination of the quota schemes.⁶ The ATC organised a series of phasing out stages at the beginning of 1995, 1998, 2002 and 2005, at which time all the remaining quotas were eliminated (Harrigan & Barrows 2009). However, during the quota removal stages, many importing countries retained the bulk of the quota restrictions to the end of the transition period. Indonesia was one of the exporting countries that still had a large quota coverage before the elimination of MFA. For the USA quota categories, Indonesia still held a 64.2 percent quota coverage until midnight of 31 December 2004, which meant that most of Indonesia's apparel exports to the USA were under MFA frameworks at that time (Harrigan & Barrows 2009). As the New Year started, quota restrictions were gone. Indonesia had the opportunity to expand its exports without quota limitations. So did exporters from various other developing

⁶ In this paper, to keep acronym profusion in check, I will continue to use the MFA term even though the name was changed to the ATC.

countries; and so apparel products from Indonesia started to compete with other cheap products from all over the world. This exogenous shock was large, but it was anticipated as the exporters had been given 10 years to adjust. Some countries, such as China and Bangladesh, had intensified their apparel export significantly after the quota regime ended. That said, many other developing countries' exports, such as Mexico, have been shrinking. Prices and qualities of products that enter the USA have decreased, especially for those that were constrained before (Harrigan & Barrows 2009).

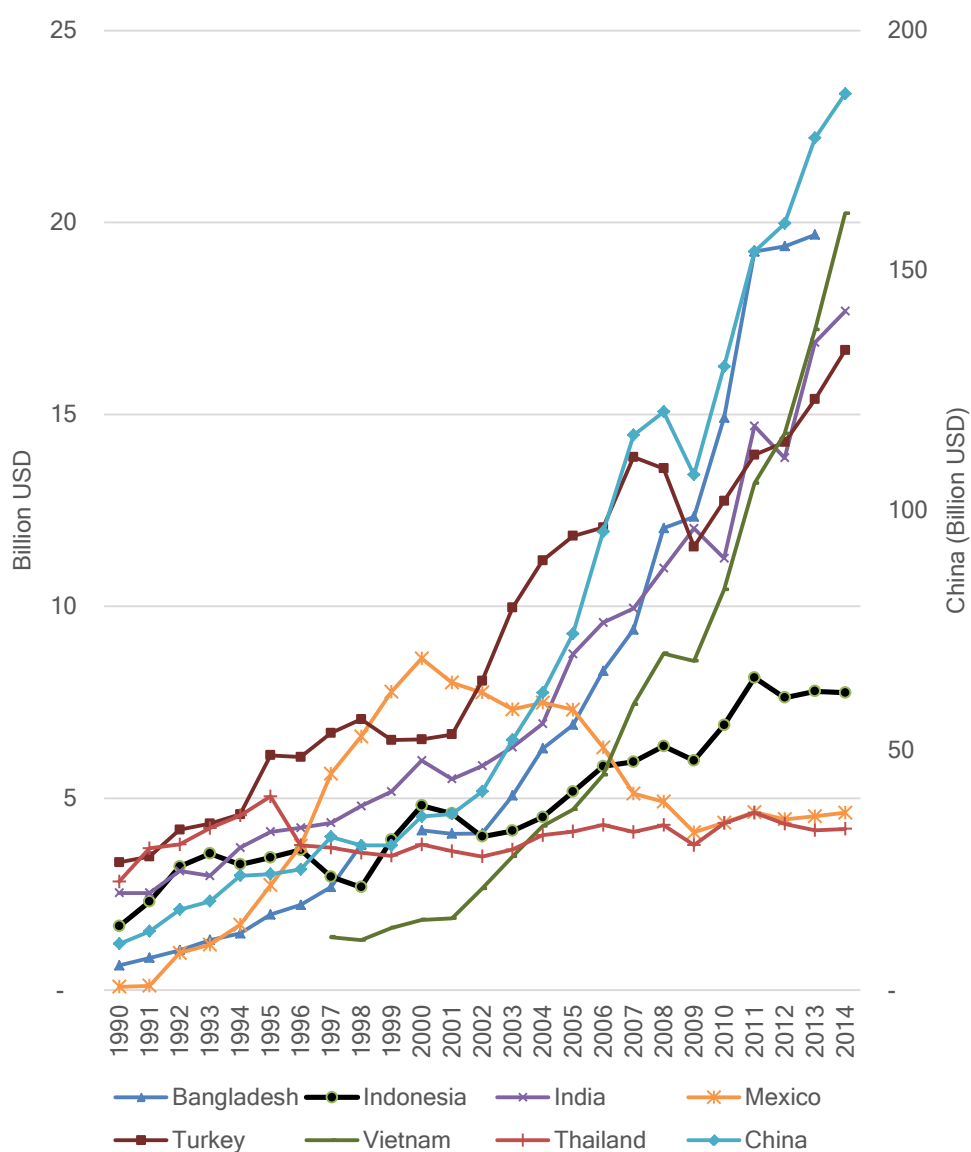


Figure 3.2. Apparel exports from various countries

Figure 3.2 shows the value of apparel exports from several countries over time. I use a different axis for China because of its massive export expansion to the global apparel market. Bangladesh, Vietnam and India are also among the top clothing exporters and experienced significant export increase after the abolition of the MFA. From Figure 3.2, we also find that Mexico and Turkey experienced export contraction. Indeed, Mexico's performance declined dramatically—in spite of it being a member of the North American Free Trade Agreement (NAFTA). Turkey's exports seem to have increased in recent years. Meanwhile, Indonesia has not been one of the top gainers from the abolition of the MFA; its export performance continues to increase, but it is relatively stagnant.

Indonesia, the focus of this study, had benefited from the MFA. During the implementation of the MFA, export had increased, and Indonesia became one of the noticeable players in apparel exports with a global export share of around 2 percent. The majority of apparel exports, about 60–80 percent, went to the USA and EU countries, most of which were under quota arrangements. Compared to other industries, firms in the garment industry had special treatment and an opportunity to boost their exports. Many firms had been able to access markets in developed countries. Propensity to export and the export intensities were higher compared to those in other sectors. This condition may also have reflected Indonesia's comparative advantage in garments. The Ministry of Trade made rules to distribute quotas among firms. The quota allocation system was uncertain and the regulations were changed over time (Krishna & Tan 1998). There were some requirements to be a registered exporter and every year the government announced which firms got quota allocations for specific products. The government divided exporters into four categories: exporters

with past performance or experience; new exporters; economically weak groups and cooperatives; and export-only producers. Each of them had different volume allocations that could change every year. Firms that obtained this privilege could export garments without any restriction or competition pressure except for volume limitations.

The revocation of the MFA has significantly affected Indonesian firms in several ways. Even though the total apparel export has increased, some firms died or stopped exporting while others grew. The number of exporters has declined, and those that survived were able to learn, adjust and compete in the new arena.

The MFA was not the only policy that might have affected exports of Indonesian garments. The increased support from the government since the mid-1980s—with the introduction of a series of trade reforms to reduce the ‘anti-export bias’—as well as the ability to properly respond to change in the real exchange rate (Thee 2009), positively impacted on Indonesian firms. The reforms included: first, the decline in the protection of manufacturing sectors; second, quicker custom procedures, more efficient and flexible financial services, easier licensing requirements, and fewer restriction on foreign investments. Another reason is due to the fact that the recession after oil boom provided incentives for manufacturing producers to export (Hill 1992). The deregulation package in 1986, which introduced a duty exemption and drawback scheme that enabled exporters to purchase their input at international prices, also benefited export-orientated firms.

The Asian Financial Crisis (AFC) in 1997–99 also affected the performance of the garment industry and other industries due to a deep economic contraction. A massive capital outflow, a sharp rupiah depreciation and deep financial distress contributed to

the contraction of almost 14 percent (Aswicahyono, Hill & Narjoko 2010). A political crisis worsened the condition. As a result, macroeconomic stability collapsed and investment from domestic and foreign sources declined significantly. As discussed in Aswicahyono, Hill and Narjoko (2010), the manufacturing sector was slowing down. It only started to recover after 2000, but since then the manufacturing performance has been lower compared to before the crisis.

Furthermore, the 2003 Labour Law might have affected labour-intensive industries, including garment manufacturing (AIPEG 2016). The law increased protection for labour which increased the costs of permanent employees. Some companies responded to this regulation by hiring more workers on short fixed-term contracts that reduced the incentives to invest in training and skills' upgrading. This might have potential implications for measuring productivity, which is one of the main variables of interest in this study. Some techniques to minimise this potential bias are introduced in the next section.

Another factor that has happened simultaneously during the period of observation was the recent commodity boom. Prices of commodities significantly increased during the first decade of the new millennium—a phenomenon that might affect the performance of manufacturing industries due to Dutch disease effects. The real exchange rate is likely to appreciate during the boom and lower the incentives of expansion in non-commodity tradable sectors, including manufacturing. Again, this factor might influence the performance of garment sectors, the focus of this study. I will explain some strategies to lessen this bias later.

James, Ray and Minor (2003) argue that China's accession to the World Trade Organization (WTO) has become the biggest threat to Indonesian garment exports.

China has a significant competitive advantage in various sectors since it has a highly mobile and relatively cheap labour force as well as economies of scale in the domestic market. The massive expansion of China's exports is not only affecting Indonesia but also all countries in the world. China clearly increases the degree of competition in the global market including garments, and it has an impact on Indonesian exporters. This factor may also bias the analysis, and some techniques are applied to reduce the impact.

3.3. The model of learning by exporting

LBE addresses a concept in which a firm improves its productivity once it enters foreign markets and gets exposed to knowledge and experience from abroad. Empirically, this mechanism has been identified mainly in developing countries, but is not as clear in the case of advanced countries.⁷ One possible explanation is that firms in developing countries are more likely to face a significantly larger and more competitive market once they export, which challenges them to upgrade their products, production processes and technical standards, improve their quality control, management techniques as well as their workers' capabilities. These challenges result in productivity improvement. However, firms from more advanced countries are more likely to enter a market that is as (or less) challenging as their domestic market, so that the productivity impact is also minimal (Fernandes & Isgut 2015). Adopting best-practice technology, investing in marketing, upgrading product quality, and doing innovation

⁷ See some studies for developing countries (i.e. Alvarez & Lopez (2005) for Chile; Blalock & Gertler (2004) for Indonesia; Du et al. (2012) for China; Fernandes & Isgut (2015) for Columbia; Van Biesebroeck (2005) for African countries) find positive learning effects from exporting. Then again, results from developed countries are mixed. Bernard and Jensen (1999) for the USA, Delgado, Farinas and Ruano (2002) for Spain, Greenaway, Gullstrand and Kneller (2005) for Sweden find no effects from exporting, while Baldwin and Gu (2003) for Canada, Girma, Greenaway and Kneller (2004) for the UK and De Loecker (2007) for Slovenia suggest the presence of LBE.

are some activities that firms might undertake during the learning process to be able to survive in the market (Athukorala & Rajapatirana 2000; De Loecker 2013). There are two channels of LBE. Firms learn from their clients or they learn from their competitors. The first channel refers to implicit and explicit assistance from foreign buyers since they have incentives to share knowledge in order to obtain good quality products and precise specifications. The latter refers to a fiercer competition situation that forces firms to improve their performance.

The hypothesis of LBE cannot be separated by the idea of self-selection into exporting. The self-selection mechanism argues that the distinction between exporting firms and non-exporting firms are already present before they start exporting, but only the more productive firms are able to overcome the cost of entering export markets (Bernard & Jensen 1999, 2004). Starting to export is expensive since firms need to pay sunk costs, such as making connections with buyers, finding out about the foreign regulatory guidelines and assuring that the products conform to foreign standards, such as testing, packaging and labelling. In some instances, this may include the costs to set up new distribution channels in the foreign country and to adapt to the shipping regulations in that country (Roberts & Tybout 1997). Evidence from many countries has been consistent with the self-selection hypothesis.⁸ Theoretically, Melitz (2003) has shown that attitudes towards sunk costs determine firms' decisions to export: only the most efficient firms can break into foreign markets and make stable profits from

⁸ See studies from Bernard and Jensen (1999), Clerides, Lach and Tybout (1998), and Aw, Chung and Roberts (2000).

exporting, whereas the less-productive firms serve only domestic markets and the least productive firms exit the market altogether.⁹

Both the LBE and self-selection hypotheses show the two-way relationship between exporting and productivity; therefore, one cannot ignore either when analysing how exporters are different from non-exporters.¹⁰ This unique relationship is a challenge for researchers in analysing the causality between exporting and productivity as well as in interpreting the results of empirical estimation. The argument of self-selection into exporting is relatively established since most studies in various countries find similar evidence. However, the other hypothesis has mixed evidence; some studies find support for this argument and some do not.

The explanation of the model starts with a general LBE framework that has been developed in previous studies. In the next subsection, the identification strategy is further explained for a model of LBE under a policy intervention—the focus of this chapter.

3.3.1. Productivity estimation

Consider a Cobb-Douglas production function (in logs) for firms i at a time t where y_{it} is output, l_{it} is labour, k_{it} is capital and m_{it} is material inputs as follows:

⁹ As discussed in Greenaway and Kneller (2007b), foreign investors with knowledge of international markets might not have to deal with these start-up costs. In this regard, the FDI regime becomes important, in that allowing for foreign ownership can help reduce the sunk costs problem.

¹⁰ Exporting firms are systematically different from non-exporting firms in various ways. The former are larger, more productive and more skill- and capital- intensive. They use more varied input mix and pay higher wages than the latter (Bernard et al. 2012). Many studies from various countries have provided evidence. A simple and well-known model by Bernard and Jensen (1999) has been replicated in many articles and case studies.

$$y_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \omega_{it} + v_{it} \quad (3.1)$$

where ω_{it} captures productivity and v_{it} is the standard *i.i.d* error term capturing unanticipated shocks to production and measurement error. We can then derive the total factor productivity (TFP) $\hat{\omega}_{it}$ as a residual $\hat{\omega}_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_m m_{it}$. We hypothesise that TFP depends, amongst other things, on whether or not the firm was exporting in the previous year:

$$\hat{\omega}_{it} = \delta \text{export}_{i,t-1} + \varphi \text{controls} + \vartheta_{it} + \varepsilon_{it} \quad (3.2)$$

where *controls* denotes industry dummy and year dummy and ϑ_{it} is firm-level specific aspects that impact on productivity and ε_{it} is pure random error.

3.3.1.1. Bias in production function estimation

The usual practice involves a two-step approach, where the TFP is first derived from Equation 3.1 and then regressed on prior exporting status and other controls with Equation 3.2. If the ω_{it} is uncorrelated with the regressor, the productivity function can be estimated using ordinary least squares (OLS). However, the correlation between the factors and possible unobserved effects that include productivity may affect the coefficients of the factors, thus biasing the estimated TFP. If the unobserved effects are time-invariant firm characteristics, then a fixed-effect estimation could reduce the bias. However, there is another source of endogeneity that might not be solved. If export status is correlated with inputs, then omitting the export dummy from the production function regression could yield inconsistent input coefficients and productivity estimates. In that case, incorporating export status in the function might reduce the bias. Substituting the export decision in Equation 3.1 and, following Van

Biesebroeck (2005), assuming that productivity evolves according to an autoregressive process, yields the dynamic model:

$$y_{it} = \gamma y_{it-1} + \beta_k k_{it} + \beta_l l_{it} + \beta_m m_{it} + \delta export_{it-1} + \varphi controls + \omega_{it} + v_{it} \quad (3.3).$$

In Equation 3.3, the export propensity is treated as an endogenous variable. To solve this problem, some studies apply a generalised method of moments (GMM) technique to obtain input coefficients $\beta_k, \beta_l, \beta_m$ and productivity estimates ω_{it} that are free from simultaneity bias.

Another issue that may appear in estimating production function parameters is selection bias. This bias is due to the relationship between productivity shocks and the probability of exit from the market. If a firm's profitability is positively related to its capital stock, then a firm with more capital can be expected to produce greater future profits. The negative correlation between capital stock and the probability of exit, for a given productivity shock, will cause the coefficient on the capital variable to be biased downward unless we control for this effect. We can solve this problem by following a method suggested by Olley and Pakes (1996) in which it is assumed that productivity shocks ω_{it} follow the first order Markov process and capital is accumulated by firms through a deterministic dynamic investment process. Profit maximisation yields an investment demand function that depends on state variables capital and productivity, as well as export participation, an additional state variable, as suggested by De Loecker (2007) and Amiti and Konings (2007), $I_{it} = i(k_{it}, \omega_{it}, export_{it})$. Inverting the investment function gives an expression of productivity as a function of state variables: capital, decision to export and investment, $\omega_{it} = h(k_{it}, I_{it}, export_{it})$. It is assumed that the adjusted investment function in productivity (Van Biesebroeck 2005). By

substituting the productivity expression in (3.1), we can express the production function as:

$$y_{it} = \beta_l l_{it} + \beta_m m_{it} + \phi(k_{it}, l_{it}, export_{it}) + v_{it} \quad (3.4).$$

Equation 3.4 can be estimated using the procedures discussed in Yasar, Raciborski and Poi (2008). In the first step, we obtain consistent estimates of β_l and β_m . In the second step of the estimation procedure, the probability that a firm exits from the sample is determined by the probability that the end-of-period productivity falls below an exit threshold. And in the third step, the coefficients of the state variables are estimated using nonlinear least squares.

The preferable model in this paper is that based on the Olley and Pakes methodology because this procedure takes account of the simultaneity between input choices and productivity shocks, as well as the sample selection bias of surviving firms. The model also incorporates the firms' decisions to enter international markets via exporting.

3.3.1.2. Price difference effects

There is a possibility of bias in the TFP measurement due to price effects. Since physical quantities are rarely observed, it is very challenging to measure the physical TFP accurately. Most studies use sales to replace output, but the TFP estimates from this strategy may also contain firm-level mark-ups (Amiti & Konings 2007). Keller (2010) argues that the use revenues, capital spending and input expenditures instead of physical quantities of output, capital and intermediate inputs may confound higher productivity with higher mark-up. Katayama, Lu and Tybout (2009) argue that productivity estimations using these data might not reflect the technical efficiency, but

might be correlated with policy shocks and managerial decisions in misleading ways. The standard solution in the literature is by deflating firm-level sales in the hope of eliminating price effects. However the standard solution can still potentially bias the coefficients of inputs if they are correlated with price errors, and it generates productivity estimates that contain price and demand variation (De Loecker 2011). De Loecker et al. (2016) try to control for unobserved prices and demand shocks to separate revenue productivity and physical productivity by using multi-product firm-level data during trade liberalisation episodes.

One alternative way of dealing with the issue is by adjusting the exporter's output. If information about revenue from the domestic market and export market is available, we can adjust the output by using the deflator gained from world price and domestic price data. If total revenue can be defined as $Y_{it}^{Tot} = Y_{it}^{Dom} + Y_{it}^{Exp}$, then we can obtain the proxy for output with this following expression:

$$y_{it}^{Tot} = \frac{Y_{it}^{Dom}}{p_{it}^{Dom}} + \frac{Y_{it}^{Exp}}{p_{it}^{Exp}} = \frac{Y_{it}^{Dom}}{p_{it}^{Dom}} + \frac{Y_{it}^{Exp}}{p_{it}^{world}} \quad (3.5).$$

3.3.2. Identification strategy: Learning by exporting under a quota intervention

We consider two periods that differ according to whether or not a policy intervention is implemented. These periods are denoted: $MFAabol$, is equal to zero if the MFA intervention is in effect and one if it has been abolished (i.e. is not implemented). The $prod_{it}$ is the term of productivity performance in the firm level that can be represented by total factor productivity:

$$prod_{it} = \beta_0 + \beta_1 export_{it-1} + \beta_2 MFAabol + \beta_3 (export_{it-1} \times MFAabol) + \delta Z_{it-1} + \varepsilon_{it} \quad (3.6).$$

Equation 3.6 suggests that the productivity of firm i in time t depends on last year's exporting status as well as the implementation (and elimination) of the MFA. I include the interaction term of the two variables to indicate the learning effect of a certain period. This interaction variable is our key interest. Z_{it-1} represents a series of observable firm-level characteristics in the last year (foreign ownership, import share, size). The error term ε_{it} can be divided into some unobservable firm characteristics that may affect the firm's performance—time effects and a pure random error. Several combinations of estimation are applied to compare the results, given potential error bias. In Equation 3.6, we observe only firms in the garment sector—the focus of this study—so my analysis is arguably free from any industrial effect that might bias the estimation. However, later on, a dummy control is included to specify some firms that produce multiple products, both garment and textile.¹¹

The quota regime was abolished starting in early 2005, so we denote 2005 and years after as *MFAabol* equal to one. However, we have to be careful to identify *MFAabol* equal to zero. As explained in the previous section, the plan to eliminate the MFA was announced during the Uruguay Round in 1994 and the phase out process started at the beginning of 1995. Even though, until 31 December of 2004, the quota coverage of Indonesian exports was still quite high (64.2 percent in the USA), it is possible that firms had undergone adjustments before the complete elimination of the MFA. Table 3.2 shows that the fill rate of quota products from Indonesia to the USA decreased gradually after 2000, implying that exporters might have adjusted their

¹¹ Some garment firms in Indonesia also produce textiles. I include the textile dummy because this kind of firm might have a systematic different performance with firms that produce only apparels. The former might also control inputs (textile products) to produce better clothing in term of quality, cheaper price and so on.

constrained–unconstrained product mix combination some years before the MFA really ended. To tackle this situation, besides comparing before and after 2005 learning effects, this chapter also contrasts the periods before 1995 ($MFAabol = 0$) and 2005 onward ($MFAabol = 1$). The former setting allows us to observe more data, whereas the latter gives us a clearer picture of the effect of the MFA.¹²

3.3.2.1. Containing other possible non-MFA interventions

Equation 3.6 might still have some problems due to the possible effects from other interventions. As explained earlier, there are some other possible factors that affect both export participation and productivity. As explained in the previous section, a series of trade reforms in the 1980s had benefited exporting firms and might still have an impact on firms' performance in the 1990s. The commodity boom in the 2000s might also have affected manufacturing performance—both productivity as well as the decision to export. Moreover, we cannot ignore that China's expansion in the global market has influenced firms all over the world, including Indonesia. The fiercer competition could affect a firm's performance and exports. In addition, the 2003 Labour Law as well as other labour-related regulations, such as minimum wage regulations, might also affect the productivity and export participation of labour-intensive industries like garment. Furthermore, if we directly compare firm performance before 1994 and after 2005, there might be some other potential biases because the situations in both periods are very different. The AFC in 1998, followed by reformation and decentralisation could induce structural changes and influence a firm's performance. However, all these factors also affect firms in every manufacturing

¹² A series of robustness checks is examined to see how results differ if some combination of the MFA period definitions are used.

sector, not only the garment industry. Therefore, to reduce biases due to those external interventions, we can compare garments with another sector that also experienced all the other external interventions except the MFA.

The footwear industry might be comparable with garments. Both are footloose, labour-intensive industries that are mainly located on the island of Java. They are both export-oriented industries and exporters in these two sectors have strong connections with their foreign buyers. Even though they have some unique characteristics, such as mass production in footwear and fashion-intensive segments in garments, their buyers have supervised exporting firms in both sectors in design, fabric, quality, as well as delivery schedules (AIPEG 2016; Thee 2009). More importantly, both have experienced similar external interventions to those mentioned earlier. The 1980s trade reforms, commodity boom, China effects and labour regulation crises have affected both sectors in arguably similar ways. Since both the MFA implementation and its abolition are in the same period with those other external interventions, and the MFA affects only garments and not footwear, comparing those two sectors in the model can reduce the bias from other interventions. To examine this, we estimate the following:

$$\begin{aligned} prod_{it} = & \beta_0 + \beta_1 export_{it-1} + \beta_2 MFAabol + \beta_3 garment_i + \beta_4 (export_{it-1} \times \\ & MFAabol) + \beta_5 (export_{it-1} \times garment_i) + \beta_6 (garment_i \times MFAabol) + \\ & \beta_7 (export_{it-1} \times MFAabol \times garment_i) + \delta Z_{it-1} + \varepsilon_{it} \end{aligned} \quad (3.7).$$

In Equation 3.7, $garment_i$ refers to a dummy variable equal to one if firm i is in the apparel industry and zero if it is in the footwear industry. We have some forms of interaction variables, but the main focus are β_5 and β_7 . β_5 is the coefficient that reflects how garments differ compared to footwear; or reflects the LBE effects of

garments after controlling others that contain non-MFA interventions. β_7 is the coefficient for the interaction of three variables that indicate the difference of the LBE effects of garment exporters relative to footwear exporters after the abolition of the MFA, compared to when it was still in operation. This coefficient also can be interpreted as the effect of exporting on productivity in the garment sectors after the removal of the quota intervention compared to the implementation periods after controlling for other variables containing non-MFA interventions.

3.3.2.2. Reducing selection bias

Some earlier LBE studies propose that comparing the treated (exporting firms) with all (non-exporting) groups might lead to bias, since selection of the treated group is not random and both groups have different characteristics. One solution is to compare these two with similar characteristics through matching procedures. In so doing, some firms in the control group are selected to match with similarly treated firms and some firm-level variables are used to determine how similar the firms in both groups are (Girma, Greenaway & Kneller 2004; Bigsten & Gebreeyesus 2009).

First of all, variables that make a firm more likely to export are identified. The literature suggests foreign ownership, size, capital intensity, import share, firm age and productivity determine the propensity to export (Bigsten & Gebreeyesus 2009; Roberts & Tybout 1997). The location of firms, as well as the type of industry and time effects, defines the probability of exporting. In this study, the probability to export is estimated using the following export participation equation:

$$EX_{it} = FDI_{it-1} + Size_{it-1} + (K/L)_{it-1} + (VA/L)_{it-1} + Age_{it-1} + location + garment + Year + u_{it} \quad (3.8)$$

where EX_{it} is an export dummy, equal to one if the firm does export in year t and zero otherwise. FDI_{it-1} is the lag foreign ownership dummy, equal to one if the firm has foreign ownership last year and zero otherwise. $Size_{it-1}$ is the lag number of employees and $(K/L)_{it-1}$ is the ratio of capital to the number of workers in last year (in the Ln term). $(VA/L)_{it-1}$ is the Ln value added per labour in the last year, and Age_{it-1} is the firm's age or the number of years since the firm existed in the data.¹³ I include the location dummy (Java and non-Java) of the firms, industry dummy (garment and footwear) and year dummy in the matching procedures.

The propensity score is estimated with a probit model with 'nearest-neighbours' matching applied. The common support condition is imposed and the outputs are the TFP and the growth of TFP. Only matched observations are then included in the main Equations 3.6 and 3.7.

3.4. Data description

The main source of data is the panel data of Industrial Statistic (*Statistik Industri*, SI) that attempts to survey all medium and large manufacturing establishments in Indonesia—firms that have 20 or more workers. The data is collected by the Central Bureau of Statistics (Badan Pusat Statistik, BPS) and captures various categories of information about firms, such as location, inputs and components of production costs, outputs and value added, ownership, export status and export intensity, import status and volume, employment, capital and new investment.

We can observe 25 years panel data from 1990 to 2014, but, as explained in the previous section, this study used two different sets of data: 1990–2004 and 2005–14

¹³ The survey does not identify the year of a firm's establishment. To proxy a firm's age, this chapter calculates the number of years that the firm exists in the dataset.

as well as 1990–94 and 2005–14. Since in the data we still have the periods of the AFC, 1997–99, and the global financial crisis, 2008–09, I included a year dummy in the estimation. As explained earlier, there are still a lot of factors that might distort the data, but these will be dealt with in our identification strategy to minimise the bias. Since my focus is to see the learning effect from exporting, I ignore firms that export once only for the whole period. That is, I assume that these firms only export for trial and error so I do not expect them to learn from exporting. Incorporating them may therefore lead to biased results.

The capital stock data could be problematic given there are many missing observations for various years (see 3A. Appendix 3). I am aware that this data problem could lead to a serious attrition bias. I test for this bias and the result shows that there are no significant differences in exports, foreign ownership and import share variables before and after the attrition, but the test shows that larger firms are the removed observations (see Table 3A.1, Appendix 3). Table 3.3 presents the statistics of the data set. It compares the statistics for garments and footwear as well as the periods with the MFA and without the MFA. I expect that the statistics of some control variables for garments before and after the removal of the MFA remain similar. The average proportion of foreign-owned firms remains similar in both periods. As explained in the model section, some establishments do both garment and textile activities ('multiproduct firms'). The average number of exporting firms decreases and the labour productivity increases.

All data in values are deflated. The main deflator is the sector-specific wholesale price index (WPI) from the BPS. However, since I am concerned that there are price difference effects between exported products and domestic-orientated

products in estimating the TFP, this study also uses a proxy of world prices. I include the USA import price for garments to deflate exporters' output as the proxy for world prices. Even though we do not have data about physical output, the deflating strategy may have resulted in a better estimation of the TFP. Figure 3.3 shows a comparison between the WPI and world prices with 2000 as the base year; and both are in rupiahs. The world prices had been relatively stable during the observed period with a significant increase after the AFC due to exchange-rate effects. However, the WPI increased significantly after the 1997 crisis. The graph reflects a significant inflation difference between these two prices; and not considering these deflator effects in the estimation may lead to a measurement error problem.

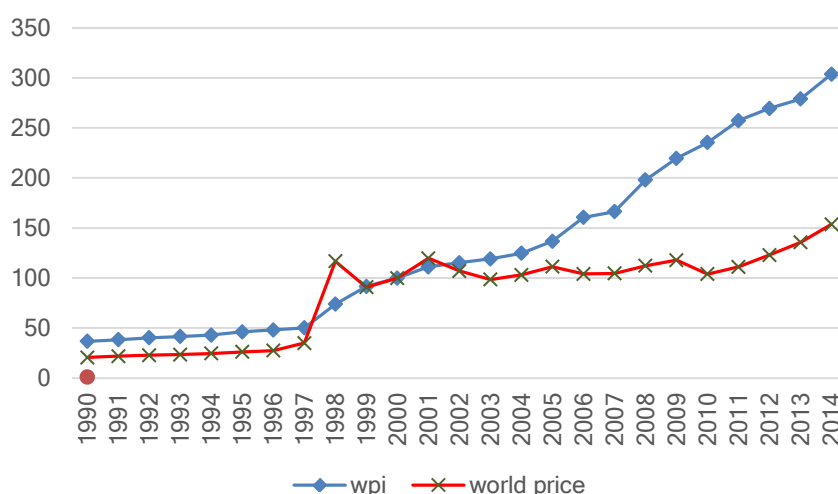


Figure 3.3. Deflator comparison for garment industry, 2000 = 100, index in IDR

Source. BPS and the USA Import Prices

Using the USA import prices as a deflator might not give the best proxy for the exported products. This is because products under quota constraints may have different prices from non-MFA products. The prices of MFA items may contain significant quota rents while prices of non-MFA goods should be more competitive. Regarding this condition, I assume that the USA prices data may already reflect prices

for quota-restrained products and non-quota-restrained products. Furthermore, the USA import prices could be different from prices in other export-destination countries. However, since the USA is the largest export destination for Indonesia garments as well as the largest market in the world, this paper argues that it can still be used as the proxy for world prices.

Table 3.3. Descriptive statistics

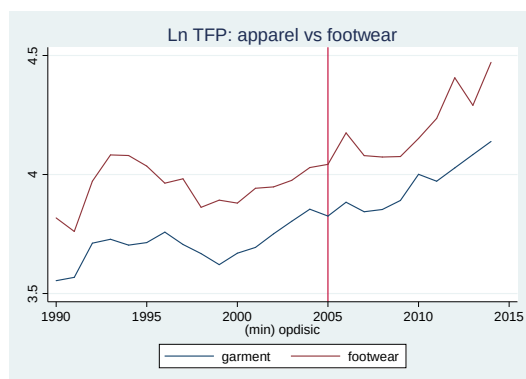
VARIABLES	MFA = 0				MFA = 1	
	1990–94		1990–2004		2005–14	
	Mean	Sdt. Dev.	Mean	Sdt. Dev.	Mean	Sdt. Dev.
Garment						
Number of observations	2,419		12,598		15,450	
Ln value added per worker	8.35	0.93	8.65	0.97	9.08	0.93
Ln TFP - Olley Pakes	3.67	0.55	3.72	0.50	3.94	0.53
Exporting firms (0-1)	0.22	0.41	0.18	0.39	0.14	0.35
Export intensity (0-100)	18.50	36.94	15.41	34.30	10.48	28.51
FDI (0-1)	0.04	0.20	0.05	0.22	0.05	0.22
Import share (0-100)	9.42	24.51	10.47	26.55	8.16	24.21
Total workers	234.04	652.84	206.03	598.34	174.43	587.95
Multiproduct firm	0.57	0.49	0.57	0.50	0.58	0.49
Footwear						
Number of observations	431		1,918		1,960	
Ln value added per worker	8.86	0.88	9.07	0.91	9.59	0.86
Ln TFP - Olley Pakes	3.99	0.54	3.96	0.45	4.19	0.43
Exporting firms (0-1)	0.33	0.47	0.25	0.43	0.13	0.34
Export intensity (0-100)	25.06	39.33	17.58	34.72	8.39	25.39
FDI (0-1)	0.11	0.31	0.09	0.29	0.08	0.27
Import share (0-100)	24.08	35.21	16.55	30.09	6.38	20.96
Total workers	699.59	1,446.57	644.22	1,539.37	312.46	1,181.93

Source. Statistics Industry (1990–2014) and TFP estimations

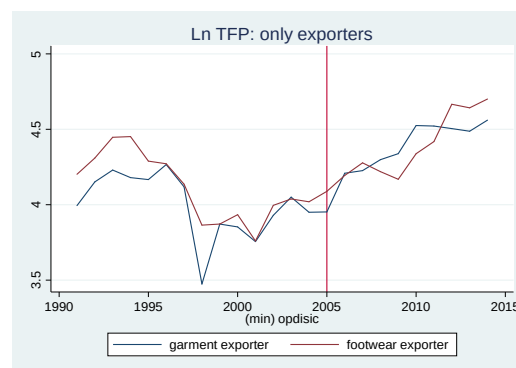
Comparing garments and footwear might also be problematic because they may have different industry characteristics. To reduce this problem, industry characteristics are included when doing matching procedures as well as estimating how those sectors differ in LBE in both periods. Figures 3.4a to 3.4f show the average performance and average characteristics of the garment and footwear industries over years. These two sectors have similar trends in labour productivity and the total factor productivity.

Moreover, in both sectors, the trend of foreign-ownership participation, one of the control variables, seems to move in the same direction during the period of observation.

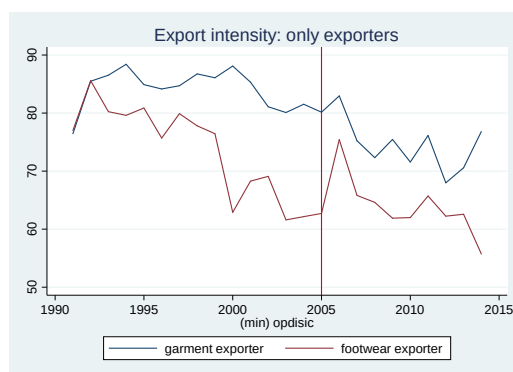
These figures indicate that the two sectors (garments and footwear) are comparable.



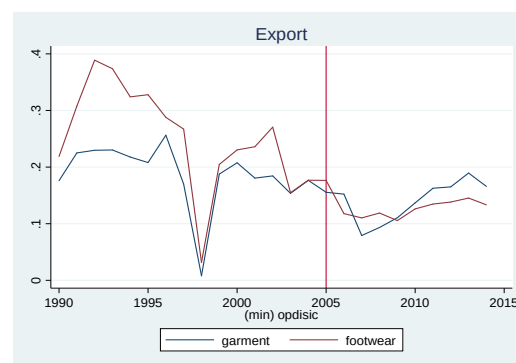
a. Trend of TFP of two sectors



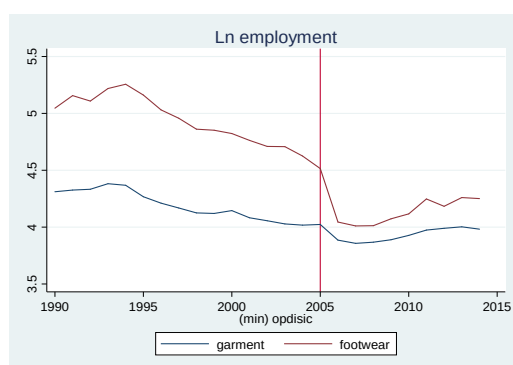
b. Trend of TFP for exporters of two sectors



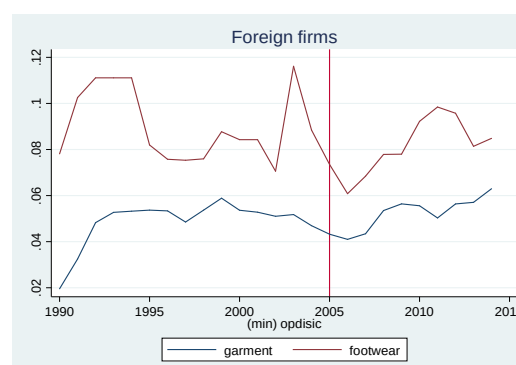
c. Trend of export intensity



d. Trend of export participation



e. Trend of employment



f. Trend of foreign owned participation

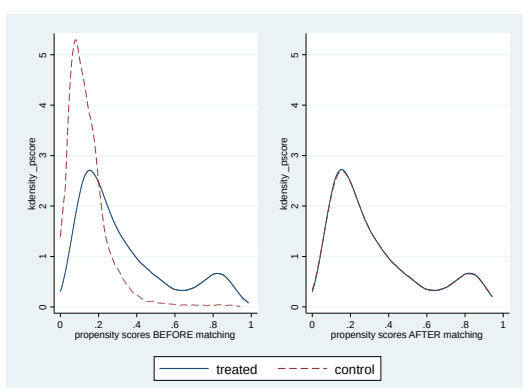
Figures 3.4a–f. Comparing garment and footwear performance

3.5. Results

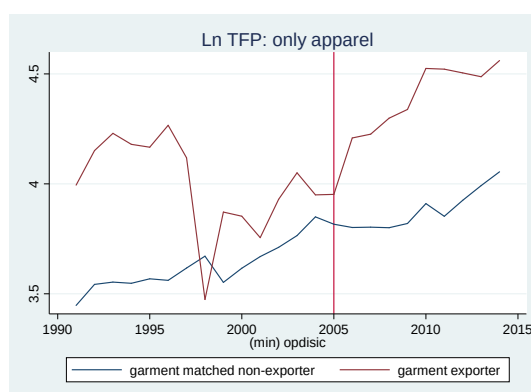
3.5.1. Matching procedures

As noted earlier, to reduce the selection bias from exports, I applied propensity score-matching procedures before doing the main equation. I matched exporters with their non-exporter counterparts with similar characteristics. The results from the matching show that foreign ownership, firm age, capital per labour (K/L), value-added per worker and import share are significant in determining export participation. The industry dummy is also significant, but the variable location (Java) is not significant. Figure 3.5a shows the results distribution of exporters and non-exporters before and after matching.

Figure 3.5b presents the naïve TFP difference between exporters and non-exporters after matching. The figure shows that before the AFC there was a huge productivity difference between exporters and their matched non-exporters. The performance gap was smaller from then until 2005. After the removal of the MFA, the gap between the two groups has been widening.



a. Kernel density before and after matching



b. The naïve TFP difference between matched exporters and non-exporters

Figures 3.5a–b. Results from matching procedures

3.5.2. Results from main equations

Table 3.4 shows the results from the model in Equation 3.6. Columns 1–4 show that there is a significant evidence of LBE. The first column denotes that the average impact of exporting on productivity is 28 percent. The LBE effect varies across periods. Columns 2–3 show results for the MFA implementation periods; and Column 4 presents the result for the period after the abolition of the MFA. Columns 5–8 present results of the difference-in-difference model with various specifications, and the results are mixed. Columns 5–6 show results when we consider the adjustment effects after the announcement of the abolition of the MFA. The coefficient of interest, the one from the interaction between variable last year's export and the MFA abolition dummy, are negative for both specifications but not significant after we include the firm-fixed effects. However, when we use different definitions of the MFA abolition variable, before and after 2005, the results are different. The LBE effect is positive and significant by about 11–13 percent (see Columns 7 and 8).

Coefficients for other control variables are consistent for all specifications. Firms with foreign ownership significantly have higher productivity by 13–17 percent, which is consistent with the literature. Larger firms are also more productive than smaller ones, confirming our expectations. The impact of employment size on productivity is about 3–5 percent. The variable of import share is negative and significant with a very small magnitude. Since we do not have detailed information about the types of firms' inputs, we cannot ignore the possibility that domestic input may have a better quality in some types of material inputs. Firms that produce both garments and textiles have a negative sign for all specifications but the significance

varies. This may be evidence of the importance of specialisation that suggest firms have better productivity when they specialise and focus on their competitiveness.

Table 3.4. Results from Equation 3.6

	1	2	3	4	5	6	7	8
	Ln (TFP)							
VARIABLES	all years	1990–94	1990–2004	2005–14	1990–94 vs 2005–14	1990–2004 vs 2005–14		
Export _{it-1} × MFA_abolition					-0.0899*** (0.0308)	-0.0187 (0.0441)	0.106*** (0.0179)	0.128*** (0.0231)
Export _{it-1}	0.277*** (0.0109)	0.434*** (0.0346)	0.223*** (0.0145)	0.331*** (0.0162)	0.422*** (0.0289)	0.176*** (0.0411)	0.224*** (0.0135)	0.0419** (0.0186)
MFA_abolition = 1					0.591*** (0.0299)	0.557*** (0.0374)	0.555*** (0.0299)	0.516*** (0.0328)
FDI _{it-1}	0.156*** (0.0184)	0.128* (0.0682)	0.141*** (0.0232)	0.171*** (0.0284)	0.170*** (0.0262)	0.0731 (0.0514)	0.155*** (0.0183)	0.0293 (0.0393)
Import_share _{it-1}	-0.001*** (0.00012)	0.0003 (0.00058)	-0.001*** (0.00018)	-0.0009*** (0.00017)	-0.0008*** (0.00016)	-0.0004 (0.00032)	-0.001*** (0.00012)	-0.0003 (0.00025)
Multiproduct _i	-0.129*** (0.00656)	-0.127*** (0.0258)	-0.130*** (0.00973)	-0.131*** (0.00889)	-0.131*** (0.00839)	-0.109 (0.0888)	-0.130*** (0.00655)	-0.0892 (0.102)
Ln_total_worker _{it-1}	0.051*** (0.00358)	0.033*** (0.0121)	0.054*** (0.00474)	0.047*** (0.00543)	0.045*** (0.00496)	0.021 (0.0150)	0.050*** (0.00358)	0.0046 (0.0142)
Constant	3.390*** (0.0293)	3.422*** (0.0548)	3.391*** (0.0321)	3.674*** (0.0267)	3.388*** (0.0327)	3.552*** (0.0800)	3.403*** (0.0294)	3.645*** (0.0836)
Firm-fixed effects	No	No	No	No	No	Yes	No	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,079	1,582	9,673	12,406	13,988	13,988	22,079	22,079
R-squared	0.182	0.189	0.129	0.157	0.181	0.101	0.184	0.104
Number of firms						2,314		2,517

Note. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 3.5 presents results from Equation 3.7 whereby I control for other non-MFA interventions by including footwear as a control. Columns 1–4 show the average differences between garments and footwear in various periods. These results can also be interpreted as the LBE effects of garments after controlling for other factors containing non-MFA interventions. Column 1 shows the impact of exports on productivity for all observations, Columns 2 and 3 provide results for observations during the MFA implementation period, and Column 4 gives results after the removal of the quota intervention. If we compare Tables 3.4 and 3.5, results from Columns 1, 3

and 4 from both tables may infer similar magnitudes; all are positive and significant, but slightly higher for results in Table 3.4 by 4–6 percent. The LBE effect is around 22–28 percent for 25 years, 17–22 percent during 1990–2004 and 27–33 percent after the MFA abolition period. However, the results are significantly different for period 1990–94 (see Column 2 in Tables 3.4 and 3.5). The magnitude of LBE in the period 1990–94 before controlling for other non-MFA interventions are much higher than those after including the control. It can also be seen in Figure 3.5b in which the TFP differences between exporters and matched non-exporters were much higher in the early observation years. The TFP difference is smaller and not significant after controlling for other variables containing non-MFA factors (Column 2 in Table 3.5).

Columns 5–8 in Table 3.5 provide results for the difference-in-difference-in-difference (DDD) estimates. All specifications indicate positive and significant impacts of exporting on productivity after the abolition of the MFA and after controlling for other variables containing non-MFA interventions. Columns 7 and 8 provide the results if we define the MFA implementation and abolition as before and after 2005. The LBE effect after the removal of the quota intervention and after controlling for non-MFA interventions is about 9–13 percent. These specifications also indicate similar results to those in Table 3.4.

To interpret the results, we focus on Columns 7 and 8 in Tables 3.4 and 3.5. During the MFA period, the channel of learning was mainly from the relationship with foreign buyers. About 60–80 percent of garment export from Indonesia went to the USA and the EU and most of these exports were under a quota arrangement. There could be a relatively small degree of competition during the MFA period but most of the LBE effects were from interactions with buyers. After the MFA abolition, it could be

argued that exporters could still learn from buyers as much as they did during the MFA implementation period. Therefore, we can interpret the LBE effects (without the interaction term) in Column 7 in Tables 3.4 and 3.5 as the effect of export on productivity through the buyers' channel. The LBE effect from buyers was about 17–22 percent. The effect is still positive and significant but with smaller magnitudes (about 4 percent) after we include firm-fixed effects (see Column 8, Table 3.4). However, it becomes insignificant after controlling for other containing factors of the non-MFA interventions (see Column 8, Table 3.5). These results show mixed effects of LBE from the buyers' channel.

Table 3.5. Results from Equation 3.7

	1	2	3	4	5	6	7	8
	Ln (TFP)							
VARIABLES	all years	1990–94	1990–2004	2005–14	1990–94 vs 2005–14	1990–2004 vs 2005–14		
Export _{it-1} x Garment x MFA_abolition					0.244*** (0.0841)	0.281*** (0.105)	0.0900* (0.0492)	0.125* (0.0749)
Export _{it-1} x Garment	0.221*** (0.0233)	0.0394 (0.0777)	0.169*** (0.0300)	0.264*** (0.0393)	0.0216 (0.0747)	-0.159* (0.0902)	0.171*** (0.0297)	-0.0341 (0.0365)
Constant	3.586*** (0.0289)	3.575*** (0.0652)	3.572*** (0.0334)	3.871*** (0.0269)	3.528*** (0.0475)	3.573*** (0.0976)	3.576*** (0.0310)	3.657*** (0.0942)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	No	No	Yes	No	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25,027	1,787	11,000	14,027	15,814	15,814	25,027	25,027
R-squared	0.182	0.213	0.124	0.159	0.184	0.107	0.183	0.108
Number of firms						2,611		2,867

Note. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Meanwhile, after the abolition of the MFA, competition effects have been much intensified because the market access facility from the quota intervention was removed. Cheap products from all over the world could access markets (that were previously constrained) without limitation. Producers from Indonesia have to compete

with those from Bangladesh, China or Vietnam to the previously specific country-products-volumes-timeframes markets. Therefore, we can interpret the LBE effect after the abolition of the MFA in Columns 7 and 8 in Tables 3.4 and 3.5 as competition effects. Exporters get additional LBE benefits from competition of about 9–13 percent.

3.5.3. Placebo tests

There is a possibility that the behavioural change of exporters of garments is not due to the abolition of the MFA. I conduct a placebo test on this argument by shifting the lower (upper) of the 2005 cut-off to change the group of control and treatment observations. I compare the LBE effect of apparel firms before the lower cut-off with the LBE effect after the upper cut-off. In the first scheme, I define the years of 2000–04 as the lower cut-off, and 2005 as the upper cut-off. I expected that the results of comparing these two groups would be insignificant because they are not the actual cut-off years for the abolition of the MFA. Subsequently, I defined 2005 as the lower cut-off year, and 2006–10 as the upper cut-off years. The results of these specifications should be significant suggesting that the LBE effect of apparel firms in any year after 2005 are significantly different from before 2005.

Figure 3.6 shows our coefficient of interest in Equation 3.7 by moving the lower (upper) cut-off of the intervention removal year. As expected, the results are not significant when shifting the cut-offs following the first scheme (lower cut-off), and significant for the upper cut-off. These results support the argument that the MFA abolition in 2005 can be associated with a transformation of the garment industries' performance in Indonesia.

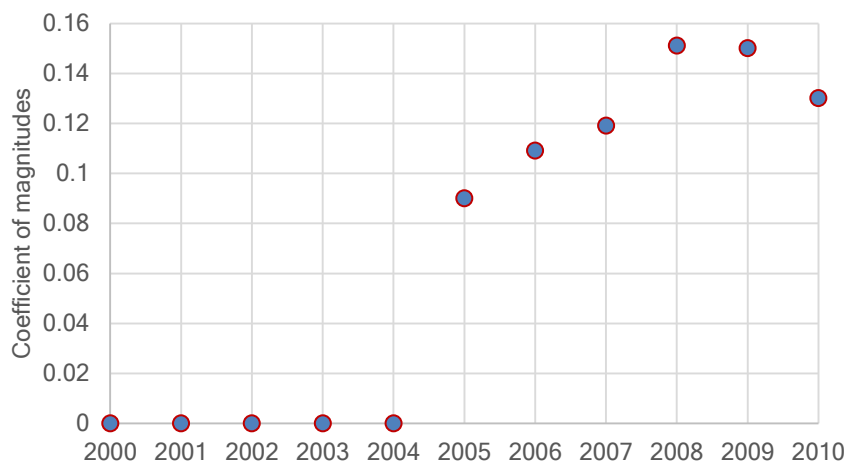


Figure 3.6. Placebo test by moving the lower (upper) cut-off of the intervention removal year

3.5.4. Robustness checks

3.5.4.1. Some firms had already exported during the MFA implementation

There is a possibility that we compare groups of different firms during the two periods. Some firms may die and some may be born during the 25 years of observations. It would be better if we compared the learning effects of the same exporters to reveal evidence about how they were different during these two periods. I apply this strategy by incorporating only firms that exported for at least two years in both periods of the estimations. Columns 1 and 2 in Table 3.6 provide the results. They present almost similar results with those in Tables 3.4 and 3.5.

3.5.4.2. Some exporters are 'newbies'

Alvarez and Lopez (2005) argue that LBE effects may be different for export starters and firms that always export. Some studies support this finding by showing that the export experience or export age has diminishing return effects on productivity (Fernandes & Isgut 2015). Therefore, following De Loecker (2007), I also investigate the LBE effects only for export starters and see how the effects are different between the

two periods. Column 3 in Table 3.6 shows the results of estimations if we include only export starters. The results show that the export starters have LBE effects from buyers but not from competition.

Table 3.6. Robustness checks

	1	2	3
	Ln (TFP)		
VARIABLES	Export incumbents	Export starters	
Export _{it-1} x MFA_abolition	0.0897*** (0.0218)	0.128*** (0.0273)	0.0263 (0.0709)
Export _{it-1}	0.228*** (0.0175)	0.0163 (0.0237)	0.327*** (0.0463)
MFA_abolition =1	0.581*** (0.0347)	0.534*** (0.0372)	0.586*** -0.033
FDI _{it-1}	0.119*** (0.0213)	-0.0517 (0.0502)	0.0500 (0.0600)
Import_share _{it-1}	-0.00167*** (0.000128)	-0.000528** (0.000268)	-0.00202*** (0.000143)
Multiproduct _i	-0.104*** (0.00713)	-0.102 (0.107)	-0.0979*** (0.00814)
Ln_total_worker _{it-1}	0.0530*** (0.00443)	-0.00757 (0.0178)	0.0591*** (0.00799)
Constant	3.353*** (0.0349)	3.669*** (0.0979)	3.268*** (0.0426)
Firm fixed effects	No	Yes	No
Year dummy	Yes	Yes	Yes
Observations	18,014	18,014	13,989
R-squared	0.166	0.110	0.118
Number of firms		2,057	

Note. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

3.5.4.3. Size of the firms may vary

I also compared how performance differs across firms of different sizes. Following the BPS definition, I define medium-size firms as those with 21 to 99 workers and large firms as those that have more than 100 workers. Table 3.7 shows that the LBE effect from buyers is higher for relatively small firms, but the LBE effects from competition is significantly higher for larger firms.

Table 3.7. Size effects

	1	2	3	4
	Ln (TFP)			
VARIABLES	Medium firms (21–99 employees)	Large firms (≥100 employees)		
Export _{it-1} x MFA_abolition	0.0458 (0.0293)	0.0714* (0.0376)	0.126*** (0.0302)	0.155*** (0.0346)
Export _{it-1}	0.310*** (0.0206)	0.0454 (0.0335)	0.180*** (0.0191)	0.0508** (0.0227)
MFA_abolition =1	0.566*** (0.0346)	0.524*** (0.0387)	0.560*** (0.0626)	0.492*** (0.0676)
Import_share _{it-1}	-0.00187*** (0.000143)	-0.000421 (0.000290)	0.000916*** (0.000217)	-0.000539 (0.000467)
Multiproduct _i	-0.103*** (0.00740)	-0.0437 (0.0924)	-0.189*** (0.0151)	-0.177 (0.265)
Constant	3.543*** (0.0306)	3.570*** (0.0585)	3.770*** (0.0473)	3.915*** (0.149)
Firm fixed effects	No	Yes	No	Yes
Year dummy	Yes	Yes	Yes	Yes
Observations	17,080	17,080	4,997	4,997
R-squared	0.137	0.085	0.222	0.168
Number of firms		2,217		594

Note. Robust standard errors in parentheses, p** p<0.01, ** p<0.05, * p<0.1

3.5.4.4. Does ownership matter?

Table 3.8 compares the results for observations of firms with only foreign ownership and only domestic firms. The findings show that the LBE effect is more evident for foreign firms. Furthermore, the results also show that domestic exporters have an LBE effect from both channels—buyers and competitors—while foreign-owned firms have higher LBE effects from competition.

Table 3.8. Domestic firms and foreign-owned firms

	1	2	3	4
	Ln (TFP)			
VARIABLES	Foreign owned firms		Domestic firms	
Export _{it-1} x	0.185**	0.183**	0.0917***	0.131***
MFA_abolition	(0.0727)	(0.0826)	(0.0196)	(0.0246)
Export _{it-1}	0.0883*	0.0763	0.233***	0.0329*
	(0.0464)	(0.0624)	(0.0144)	(0.0195)
MFA_abolition =1	0.484***	0.374**	0.0532***	0.00631
	(0.135)	(0.166)	(0.00373)	(0.0149)
Import_share _{it-1}	0.000890**	-0.000228	-0.00134***	-0.000386
	(0.000435)	(0.000686)	(0.000126)	(0.000273)
Multiproduct _i	-0.0891***		-0.129***	-0.0979
	(0.0306)		(0.00671)	(0.103)
Constant	4.121***	3.840***	3.387***	3.623***
	(0.130)	(0.306)	(0.0301)	(0.0859)
Firm fixed effects	No	Yes	No	Yes
Year dummy	Yes	Yes	Yes	Yes
Observations	1,060	1,060	21,032	21,032
R-squared	0.245	0.216	0.161	0.102
Number of firms		165		2,462

Note. Robust standard errors in parentheses, p** p<0.01, ** p<0.05, * p<0.1

3.6. Concluding remarks

This chapter has investigated how a policy intervention may affect the LBE mechanism and the main channel of LBE comes from the effect of competition. Employing 25 years of Indonesia's firm-level data, this chapter uses the implementation (and the subsequent abolition) of the MFA as the intervention and applies a natural experiment analysis.

There are three main findings. First, a policy intervention may create a situation that opens up or closes down channels of learning. It can intensify or reduce the degree of competition as well as the level of interaction with buyers. Second, exporters can learn from their interaction with clients. However, results show mixed evidence of this learning channel. Meanwhile, the third finding gives an indication that the competition effect is the main channel of LBE. The impact of exporting on total

factor productivity is 9–13 percent due to competition effects. This suggests that it is important to keep the competitive environment to gain higher productivity effects. Policy interventions that protect exporters from competition might lessen the LBE benefits.

These findings could have significant implications not only in a single country's policy but also in the multilateral trading system. Even though the MFA preference has been abolished, other types of export preference interventions for developing countries to access developed countries' markets are still allowed by the WTO under the Generalised System of Preference (GSP), Duty Free Quota Free (DFQF), the EU's Everything but Arms (EBA) and the USA's African Growth and Opportunities Act (AGOA). Even though some studies have shown export increases from least-developed countries (LDCs) due to these programs (see Collier & Venables 2007; Gnanon & Priyadarshi 2017; Ito Aoyagi 2018); none has investigated the impact on the firm's productivity. These programs could reduce the level of competition needed to access export markets, which is the main source of the learning channel from exporting. Furthermore, are the positive effects of these programs on export long lasting even if these preferences are removed?

This chapter makes contributions to the LBE literature. This is the first study that has tried to examine LBE effects under a certain policy intervention. Second, this is also the first study that investigates channels of learning.

3.A. Appendix 3

Dealing with the missing capital stock data

In the raw data, some observations have no information about capital. For 2006, there is no record about the capital stock at all. To deal with these issues, I undertook the following steps. For some of the steps in cleaning the capital data, I follow Blalock and Gertler (2004). All firms with no capital data in any year were dropped. As for 2006, I interpolated the capital stock data based on the values in 2005 and 2007. One consequence is that all firms with missing capital stock data for both 2005 and 2007 were not included in the study. Next, firms with missing capital data in three or more continuing years were also removed. For those with missing data for up to two consecutive years, I again applied interpolation. And finally, firms with negative capital data were removed. These procedures reduce observations by about 48 percent. The final number of observations was 28,048 for garments and 3,878 for footwear.

Table 3A.1. Test for attrition bias using xtprobit estimator

VARIABLES	1 Pr(attrition)=1
Export	0.00504 (0.392)
FDI	0.0263 (0.272)
Import share	0.00325 (0.00210)
Ln value added per worker	0.377*** (0.107)
Ln total worker	0.219** (0.109)
Ln output	-0.0778 (0.0921)
Export intensity	-0.00408 (0.00471)
Java	1.225*** (0.425)
Constant	-4.205*** (0.892)
Year dummy	Yes
Random effects	Yes
Observations	55,222
Number of firms	5,061

Notes. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Chapter 4

Patterns and Determinants of Garment Exports in the Post-MFA World

Abstract

This chapter examines patterns and determinants of apparel exports from Indonesia following the abolition of the Multi-Fibre Arrangement (MFA), which had restrained export expansion through a complex system of country- and product-specific export quotas for over three decades. Contrary to predictions in the lead up to the abolition of the MFA, Indonesia has not been able to achieve market share gains under the competitive market conditions compared to other major apparel exporting countries in the region. Our analysis of export patterns and the decomposition of sources of export growth suggest that the lacklustre export performance was mainly caused by supply constraints that hindered volume expansion and diversification of the product mix in line with changing global demand patterns to counterbalance the price-lowering effect of the quota abolition. According to the firm-level econometric analysis, productivity growth, domestic textile base and access to imported intermediate inputs are key supply-side determinants of export performance in the context of competitive market conditions in the post-MFA era.

4.1. Introduction

The global landscape of the apparel industry is being profoundly transformed following the termination of the Multi-fibre Arrangement (MFA) on 1 January 2005. During the MFA-era of over 30 years, country-specific import quotas imposed by major importing countries determined both the levels and patterns of apparel exports from each exporting developing country. Following the abolition of the MFA, international buyers are now free to source apparel from any country, subject only to the system of tariffs. Buyers, as they are no longer constrained by country-specific quotas, demand many more attributes of products from suppliers in addition to competitive prices, such as product variety, quality and timely delivery. They have also started to aggressively restructure their sourcing patterns to procure from fewer efficient suppliers worldwide and to develop long-term strategic partnerships with core suppliers by setting up local sourcing offices. The importance of these non-price factors in export success in the post-MFA era has been further elevated by the ongoing process of 'lean retailing', a business strategy that has become widespread in the apparel trade in developed countries since the mid-1990s. This strategy suggests that lean retailing results in very short cycles for replenishing clothes on offer on the shop floor and inventory costs are defrayed due to low stocks. Some activities, such as labelling, packaging and bar coding, that were traditionally organised in the buyers' warehouses and distribution centres, have increasingly become the supplier's tasks (Abernathy, Volpe & Weil 2006; Fung, Fung & Wind 2007).

According to various predictions in the lead up to the MFA's abolition, some countries were expected to gain market shares at the expense of countries where the apparel industry had grown under quota protection despite their limited production

potential (Evans & Harrigan 2005; Martin 1999; Nordås 2004; Yang, Martin & Yanagishima 1997). These are large apparel-producing countries whose exporting capacity remained constrained by MFA quotas, such as China, India and Indonesia. The predictions also include countries in close proximity to the main markets that were well placed to cater for lean retailing, such as Mexico, Turkey and countries in the European periphery. However, the actual outcome over the past decade has not been consistent with these predictions. As predicted, China has become by far the biggest gainer and many countries in Africa and Latin America have experienced export contraction. At the same time, a number of countries such as Bangladesh, Cambodia, Honduras, Indonesia, Nicaragua, Sri Lanka, Vietnam and Peru have maintained or gained market shares (Gereffi & Frederick 2010; Staritz 2010). Indonesia, contrary to predictions, has not achieved a notable market share gain compared to other main apparel exporting countries.

The purpose of this chapter is to examine the export performance and structural adjustment of the Indonesian apparel industry during the post-MFA era. The garment industry is a key export-oriented industry in Indonesia that accounts for over 10 percent of the country's total merchandise exports. It is also one of the most important employment generators in the manufacturing sectors, accounting for over 12 percent of the manufacturing labour force. By employing mostly low-skilled workers, especially female workers, it plays a vital role in poverty reduction, presumably disproportionate to its aggregate employment share. Understanding the process and drivers of export performance and industrial upgrading in the competitive market conditions in the post-MFA era is, therefore, vital for crafting national development policy.

The study also aims to broaden the understanding of the patterns and determinants of the global apparel trade following the MFA's abolition. Much has been written about how the MFA shaped the global apparel trade and export performance of developing countries. However, there is a dearth of empirical evidence on the experience of individual countries in adjusting to the MFA's abolition. Of course, it is not possible to generalise from an individual country's experience to other countries. However, insights gained from an in-depth country study are relevant for conceptualising the drivers of patterns and determinants of export performance in other countries.

There are two aspects of structural adjustment in the export-oriented apparel industry in a given country in reaction to the demise of the MFA quota. First, in the new competitive market setting, exporting countries have an opportunity to increase exports by changing their commodity mix in line with changing global demand patterns and thus directing exports to more dynamic markets. The second aspect is the structural adjustment at the firm/company level. In the new competitive market conditions, some firms that managed to remain profitable in quota-protected markets could go out of business. Other firms, that faced the competition well through product and market diversification, and productivity improvement, could have the potential to expand exports. The analysis in this chapter encompasses the dynamics of both these aspects of industrial adjustment and structural change in the Indonesian apparel industry. We analyse the disaggregated export data compiled from the UNCOMTRADE database to examine changes in the product mix and the geographic profile of exports. Following an analytical narrative of export patterns, the standard constant market share analysis (CMSA) is used to delineate the impact of competitiveness of the

Indonesian apparel industry from the impact of changes to the product mix and market diversification. This is followed by a firm-level econometric analysis of export performance using a panel dataset compiled from Indonesia's Industrial Statistic Survey (Statistik Industri, SI) conducted by the Central Bureau of Statistics (Badan Pusat Statistik, BPS).

The chapter is structured into seven sections. Section 4.2 provides an overview of the way the MFA moulded the world apparel trade for over 30 years and the challenges faced by exporting countries during the post-MFA era. Section 4.3 provides a historical overview of the Indonesian apparel industry. Section 4.4 examines Indonesia's performance in apparel exports, paying attention to changes in commodity composition and direction (geographic profiles) in the post-MFA era. Section 4.5 provides discussion on the CMSA. Section 4.6 presents results of the firm-level analysis of the determinants of export performance with emphasis on specific characteristics that explain better export performance during the post-MFA era. The key findings are summarised in the final section.

4.2. The global context: The MFA era and after

The apparel industry is widely considered the quintessential 'starter' industry of export-oriented industrialisation in labour-abundant developing countries.¹ High labour intensities of production and low entry barriers in terms of low fixed costs and well-diffused technology place it ahead of most other industries as a gateway to

¹ In common usage, textile and apparel are often lumped together as a single industry. However, for the purpose of a meaningful discussion of the role of these products in the process of economic development, it is important to distinguish clearly between the two. This is because, in contrast to clothing, textile (yarn and fabric) production is more capital and skill intensive, and thus production remains largely confined to high-income (developed) or upper-middle-income countries. The focus of this paper is on clothing, although textile receives attention in the discussion on industrial upgrading within the global apparel value chain.

industrialisation for these countries (Jones 2006). However, the abilities of countries to enter this industry and expand exports purely based on their comparative advantage remained severely constrained for over three decades (from 1974) by a complex system of export quotas imposed by the major importing countries under the MFA (Keesing & Wolf 1981; Krishna & Tan 1998; Srinivasan 1998).

The MFA, which came into effect in 1974, restricted trade in textile and apparel exports from developing countries through a complex maze of country- and product-specific quotas, imposed by the individual importing countries. It went through four successive extensions of five-year periods in 1978, 1982, 1986 and 1990, with each round encompassing a wider range of products and countries.

The introduction and subsequent tightening of MFA quotas on exports from the newly industrialising countries (NIEs) in East Asia played an important role in the global spread of the apparel industry. In response to binding MFA quotas, entrepreneurs from these countries (especially those from Hong Kong and Taiwan) moved production to low-wage countries in Asia and subsequently to even high-cost locations in Latin America and Africa. Thus, many countries with relatively high labour costs and limited technical or business skills 'benefited' from the guaranteed market access provided by the MFA because it severely distorted the global spread of the clothing industry in two ways.

First, there was a clear developing-country bias in the implementation of quota restrictions (Srinivasan 1998). This resulted in a notable reallocation of world production from quota-constrained developing-country suppliers to relatively low-cost countries in the developed world such as Italy, Portugal and Spain, which were high-cost countries by developing country standards. Second, there were inter-country

differences in restraint levels, with a bias in favour of first comers and the politically powerful (Keesing & Wolf 1981). The three established exporters in East Asia—Hong Kong, South Korea and Taiwan—were able to maintain international competitiveness even after their comparative advantage had eroded because the ‘quota rent’ was an effective buffer against escalating domestic cost pressures on profit margins. By contrast, quotas were imposed on new exporting countries at levels well below those enjoyed by established exporters, purely based on initial rapid growth regardless of the low starting base, effectively short-circuiting the industrialisation process at a very early stage.

As a part of the Uruguay Round that concluded in 1994, the MFA was replaced by the Agreement on Textiles and Clothing (ATC),² which was designed to incorporate trade in textiles and clothing into the General Agreement on Tariffs and Trade (GATT) of the World Trade Organization (WTO) so that protection could only take the form of bound non-discriminatory tariffs. The ATC put in place a program for eliminating MFA quotas in four stages in 1995, 1998, 2002 and 2004. In the implementation process, most importing countries did not go beyond the minimum liberalisation required in the first three stages, retaining the bulk of the quota restrictions to the very end of the transition period. Given this ‘back-loading’ of implementation, the final removal of quotas with effect from 1 January 2005 represented a systemic trade policy change that entailed considerable adjustment for all stakeholders. Some quantitative restraints on apparel exports from China (‘China safeguards’) continued to remain place in the European Union (EU), Turkey, and the USA after this date, as permitted

² In this paper we use the terms ‘clothing’, ‘apparel’ and ‘garments’ interchangeably.

under the China WTO accession protocol. These safeguard quotas were also eliminated by the end of 2008.

Following the phasing out of MFA quotas and the ending of the China safeguard, international buyers are now free to source apparel from any country, subject only to the system of tariffs. Therefore, the cost competitiveness is of course much more important in export success in the post-MFA era because 'quota rents' no longer distort market prices. However, since they are no longer constrained by country-specific quotas, buyers demand many more attributes in addition to prices, such as product variety, quality and timely delivery. Moreover, since there are no limits on the amount procured from a given country (or a firm), scale economies (the volume factor) could counterbalance export competitiveness based purely on cost competitiveness. Thus, global apparel production is likely to become more concentrated among the most capable firms in a handful of low-cost production sites (Fung, Fung & Wind 2007).

The importance of these non-price factors in export success in the post-MFA era has been further elevated by the ongoing process of lean retailing, a business strategy which has become widespread in the apparel trades in developed countries since the mid-1990s (Abernathy, Volpe & Weil 2006; Evans & Harrigan 2005; Harrigan & Barrows 2009). Lean retailing involves replenishing the range of clothes on offer on the shop floor in very short cycles (rather than seasonally, as was traditionally done), while defraying the inventory risk by holding low stocks. For products subject to rapid replenishment, direct costs related to labour, textile inputs, shipping and tariffs are balanced against the cost associated with lead times, inventory maintenance and their attendant risks. In the process of lean retailing, the buyers, therefore, increasingly

require suppliers to undertake tasks such as labelling, packaging and barcoding that were traditionally done in the buyer's warehouses or distribution centres (Abernathy, Volpe & Weil 2006; Fung, Fung & Wind 2007). Suppliers therefore need to adhere to 'flexible manufacturing'³ in order to enable them to respond swiftly to changing demands, while cutting batch sizes and reducing inventories.

A key determinant of a firm's success in flexible manufacturing is the backward integration of the production process—domestic availability of high quality fabric at competitive prices. Without quota restrictions on the amount of production in a particular country, it can become cheaper for a country, which produces both textiles and clothing to compete on world markets, thus avoiding the transport costs of inputs, time delays and the management time needed to coordinate the fragmented supply chain (Audet 2007; Audet, Tokatli & Kızılgün 2009). During the MFA era, the textile industry did not migrate to developing country locations as fast as the clothing industry. In the post-MFA period, there are no longer artificial obstacles (quotas) to prevent the emergence of a high-quality textile capacity in developing countries and stronger clusters of expertise. While low wages can still give developing countries a competitive edge in world markets, a strong domestic textile base can now play an important role in determining international competitiveness in the fashion-oriented and time-sensitive apparel markets by ensuring a quick turnaround time.

³ Flexible manufacturing refers to the ability to customise a product, to produce to order, or to shift quickly from production of one model to another on the same line in order to serve relatively small, specialised niche segments (Abernathy, Volpe & Weil 2006).

4.3. The Indonesian apparel industry: A brief history

Indonesia has a long tradition of factory-based textile production, but apparel production emerged as a factory activity only in the mid-1970s (Dicken & Hassler 2000; Hill 1992, 1991; Thee 2009). At the beginning, the expansion of the apparel industry was driven by expanding domestic demand. The industry started to become export-oriented following the end of the oil boom in the early 1980s when export proportion became a key emphasis of the national development policy. In addition to the macroeconomic policy reforms that redressed real exchange rate misalignment and improved the international competitiveness of export-oriented production, the government introduced some packages of reforms such as duty exemptions and drawback schemes that facilitated export-oriented manufacturing firms to access cheaper imported inputs (Thee 2009). A significant import tariff reduction on textiles—that is from over 30 percent in the late 1980s to 5 percent by the late 1990s—helped the industry meet the standards required by global buyers by importing high-quality textiles. The other reforms that helped export expansion included streamlining customs procedures, improving access to export financing and relaxing the restriction on foreign direct investment (Hill 1992).

The reforms that created an environment that was conducive for export production coincided with the global spread of apparel productions from East Asia. Consequently, Indonesian apparel producers would not have been able to compete with the established exporters from East-Asian NIEs, which had hitherto not been subject to quota restrictions. Then again, as MFA quotas were imposed, initially an absence of, and subsequently under-utilised quotas in Indonesia, firms from NIEs (in particular firms from Hong Kong and Taiwan, which also utilised the traditional

‘Chinese’ business links) were encouraged to do the ‘quota-hopping’. In this way fully export-oriented apparel firms were established in Indonesia (Thee 2009; Wells & Warren 1979).

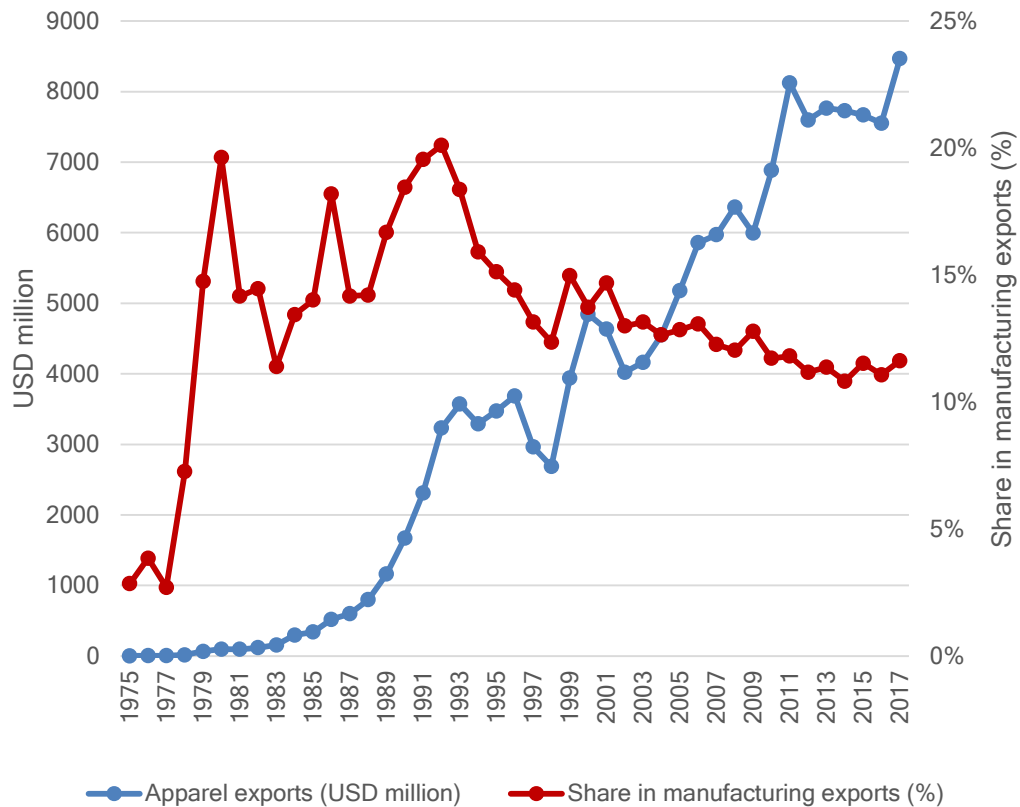


Figure 4.1. Apparel exports from Indonesia, 1975–2017

Source. Based on data compiled from UNCOMTRADE (SITC Rev 1)

Total apparel exports from Indonesia increased from around 10 million in the late 1970s to over 3.7 billion in the early 1990s (Figure 4.1). By this time, apparel was ranked as the second largest export product of Indonesia after plywood and it accounted for over a fifth of all total merchandise exports from the country. The total employment in apparel-producing firms in ‘organised’ manufacturing⁴ increased from

⁴ Employment in manufacturing plants employing more than 20 workers.

160 thousand in 1990 (8.3 percent of total manufacturing employment) to 549 thousand in 2004 (13.2 percent) (Figure 4.2).

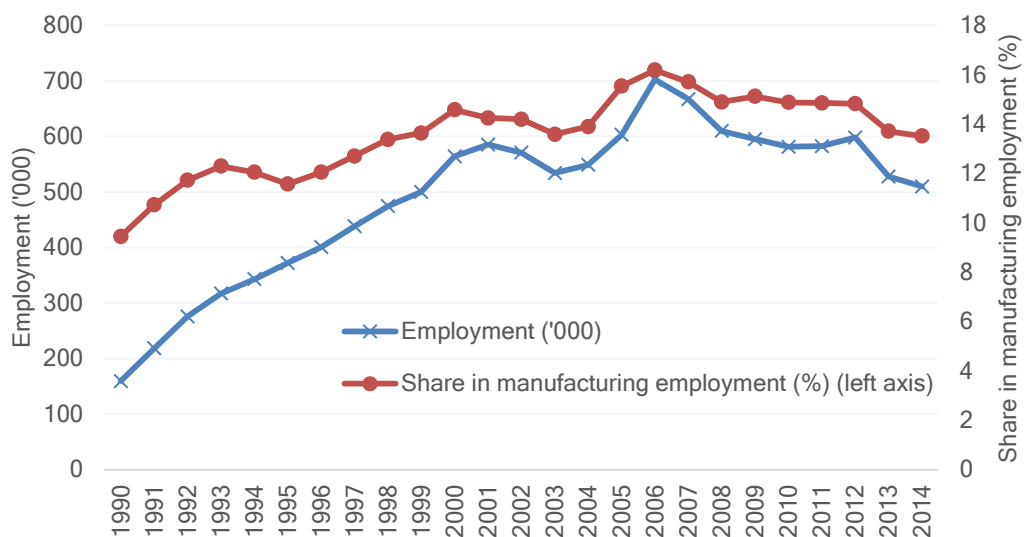


Figure 4.2. Employment in the Indonesian apparel industry, 1990–2014

Source. Based on data compiled from the Industrial Statistic database

Indonesia came under MFA quotas in the late 1980s. Product coverage expanded and the quota limit on each category tightened during the subsequent years. Reflecting a tightening of quota restrictions, the export tax equivalent of MFA quotas imposed by importing countries increased from 26 percent in 1992 to 56 percent in 2005 on exports to the US and from 48 percent to 64 percent on exports to the EU (Hertel et al. 1999). Binding MFA quotas were a major contributing factor to the slowdown of export expansion from about the early 1990s, notwithstanding some attempts by firms to export products to non-quota markets and some product upgrading in exports to the USA and the EU within the quota limits. The average annual growth rate of exports (in nominal USD terms) declined from 25 percent during 1990–94 to 5.8 percent during 1995–99 and 3.6 percent during 2000–04 (Table 4.1).

The share of apparel exports in total manufacturing exports from Indonesia varied in the narrow range of 11.5 percent to 14 percent for about a decade in the lead up to the abolition of the MFA.

Table 4.1. Average annual growth of apparel exports: Indonesia and selected Asian countries (in percentage)

Countries	Before MFA abolition			After MFA abolition			
	1990–94	1995–99	2000–04	1995–04	2005–09	2010–14	2005–14
Indonesia	25.0	5.8	3.6	4.7	6.1	5.7	5.9
India	11.5	6.9	6.4	6.6	11.9	9.0	10.4
Bangladesh	27.3	22.6	10.2	16.4	14.7	14.0	14.4
China	24.3	5.4	15.8	10.6	12.6	11.9	12.2
Sri Lanka	27.0	8.0	4.5	6.3	3.4	8.9	6.2
Vietnam	38.9	17.2	28.4	22.8	16.7	17.9	17.3
Cambodia	-8.7	98.0	21.0	59.5	8.0	20.0	14.0
World	16.4	5.3	8.3	6.7	4.8	8.4	6.6

Notes. Growth rates are at current USD calculated using ‘mirror’ export data for Cambodia and Vietnam and ‘own’ (reporter) export data for other countries.

Source. Compiled from UNCOMTRADE database

4.4. Post-MFA export performance

4.4.1. Trends

The Indonesian apparel industry managed to record a modest increase in exports following the demise of MFA quotas. The average annual growth rate increased from 4.7 percent during 1995–2004 to 5.9 percent during 2005–14 (Tables 4.1, 4.2; Figure 4.3). However, the growth rate in the post-MFA period was below the growth rate of world apparel exports during this period. Consequently, Indonesia’s world market share of apparel dropped from 2.2 percent to 1.9 percent during these two decades. By contrast, not only China, but also Bangladesh, Cambodia, India and Vietnam gained market share by recording double-digit export growth during the post-MFA decade. China’s share in world apparel exports jumped from 25.0 percent to 39.2 percent

between 1995 and 2004, and 2005 and 2014 (Table 4.2). Given that Bangladesh, Cambodia, India and Vietnam have recorded impressive market share increases side-by-side with China, it is not possible to argue that Indonesia's poor export performance was due to competition from China. What these figures seem to suggest is that 'apparel' is a bundle of differentiated products, not a homogenous commodity as commonly assumed by the trade flow modellers, and hence individual exporting countries have room for carving out a niche in specific products.

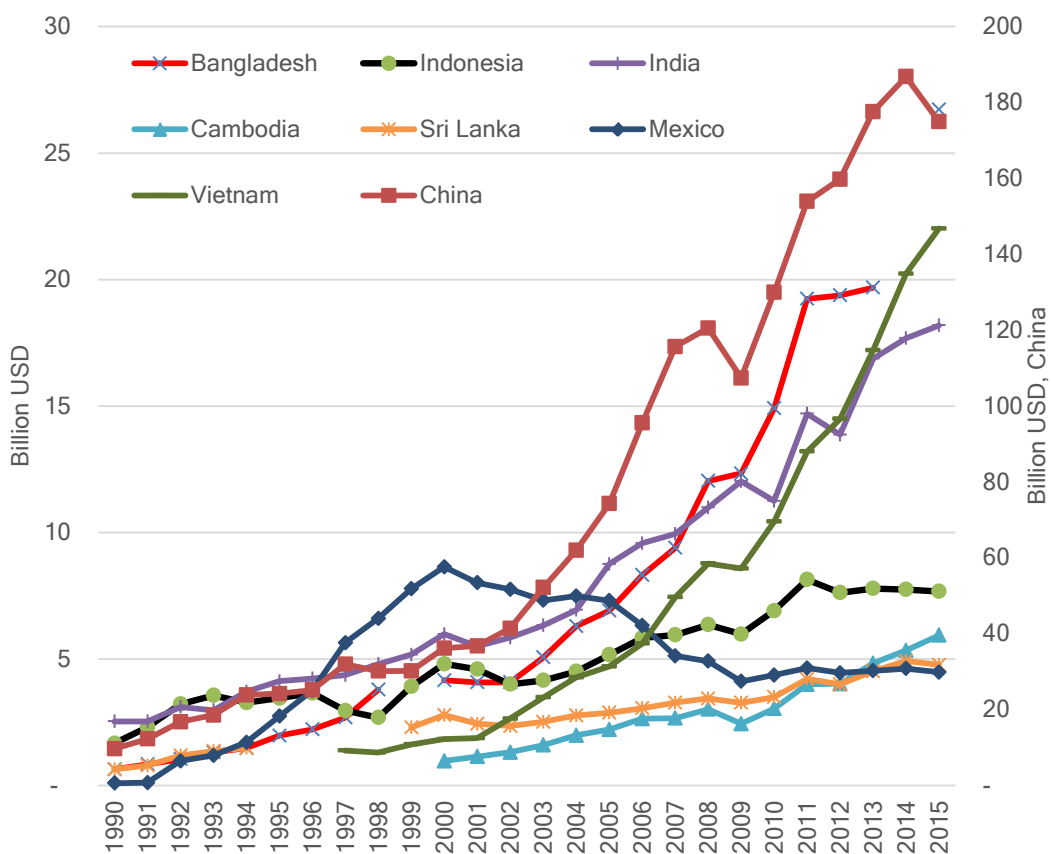


Figure 4.3. Apparel exports: Indonesia and selected Asian countries

Export volumes, prices (unit values) and value indices of Indonesian apparel exports are depicted in Figure 4.4. There was a mild increasing trend in the unit value

index from about late 1990 when the MFA quota became increasingly binding, but this has tapered off during the post-MFA era. It seems that the price-lowering effect of quota abolition has not been counterbalanced by shifting the commodity mix in favour of more dynamic, high-value product lines. There is evidence that most other apparel-exporting countries experienced similar price trends (a decline in the export unit value index or a tapering off of the increasing trend) in the post-MFA era (Savchenko & Acevedo 2012; Staritz 2010; Tewari 2008).⁵ Thus, it seems that inter-country differences in export growth are closely related to differences in the rates of volume expansion in the new quota-free markets.

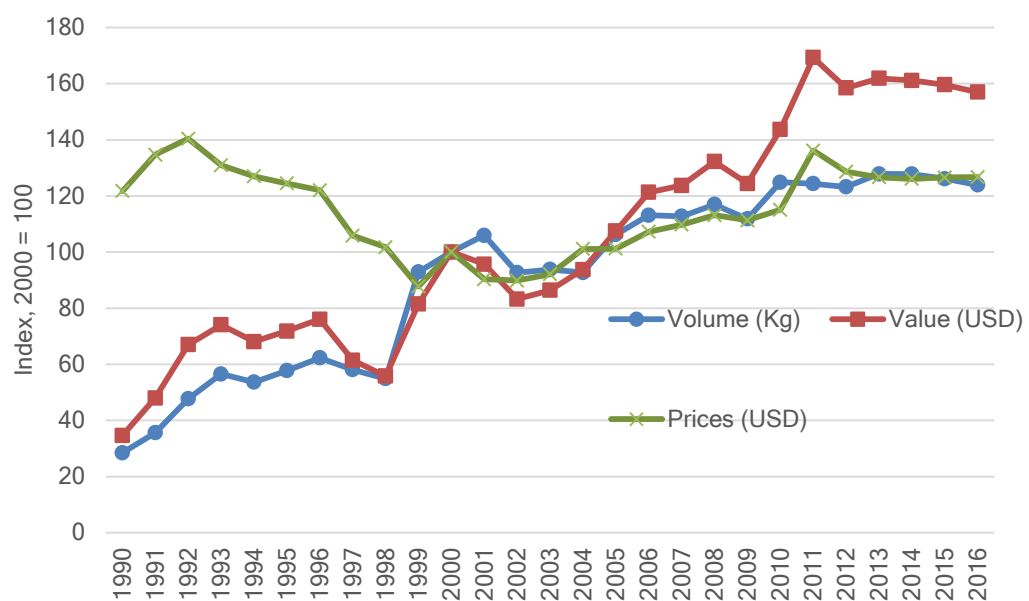


Figure 4.4. Indonesia's apparel exports: Volumes, prices¹ and value indices (2000 = 100)

Notes. ¹Export unit value computed by dividing export value (USD) by weight of exports

⁵ A notable exception to this general pattern is apparel exports from Sri Lanka; export growth in the post-MFA era has largely increased in unit value as the commodity mix shifted toward high-value apparel products (Athukorala & Ekanayake 2018; Tewari 2008).

Table 4.2. Export market share of apparel products: Indonesia and selected Asian countries (in percentage)¹

	Countries	Before MFA abolition			After MFA abolition	
		1990–94	1995–99	2000–04	2005–09	2010–14
World	Indonesia	2.6	2.1	2.2	1.9	1.9
	India	2.6	2.7	2.8	3.7	3.9
	Bangladesh	1.1	1.8	2.6	3.6	5.9
	China	17.2	22.6	27.4	37.8	40.6
	Sri Lanka	0.9	1.1	1.2	1.2	1.2
	Vietnam		0.7	1.2	2.4	4.1
	Cambodia		0.2	0.8	1.1	1.6
US Market	Indonesia	2.8	3.4	3.5	5.0	5.9
	India	3.1	3.2	3.2	4.2	4.0
	Bangladesh	2.1	2.9	3.0	4.0	5.3
	China	16.1	14.4	15.6	32.6	39.3
	Sri Lanka	2.1	2.5	2.3	2.1	1.9
	Vietnam		0.1	1.8	5.5	8.7
	Cambodia		0.4	1.6	2.8	2.9
EU Market	Indonesia	1.7	2.0	2.2	1.5	1.3
	India	2.9	3.2	3.3	4.5	4.7
	Bangladesh	1.1	2.2	3.7	4.8	8.1
	China	7.3	8.6	14.0	25.8	28.9
	Sri Lanka	0.6	0.9	1.2	1.4	1.3
	Vietnam	0.3	0.8	0.9	1.2	1.9
	Cambodia	0.0	0.2	0.5	0.6	1.4
Others	Indonesia	1.3	1.3	1.0	1.2	1.8
	India	1.6	1.5	1.7	2.2	2.9
	Bangladesh	0.2	0.3	0.6	1.3	3.4
	China	35.7	49.1	57.5	60.5	56.2
	Sri Lanka	0.2	0.2	0.2	0.3	0.6
	Vietnam	0.4	1.1	1.3	1.7	4.0
	Cambodia	0.0	0.1	0.2	0.4	1.1

Note. ¹Annual average

Source. Compiled from UNCOMTRADE database

4.4.2. Export composition

As noted, a unique feature of the MFA was that export quotas were both country and product specific. This feature constrained the ability of exporting countries to increase export revenues within the overall quota limit by moving to high-value apparel products.

Have the Indonesian apparel exporters managed to change export composition in favour

of high value products following the removal of the quota constraint? To help answer this question, data relating to the commodity composition of Indonesian apparel exports in 2003–04 and 2013–14 are reported in Table 4.3. The table covers the top 20 products at the 5-digit level of the Standard International Trade Classification (SITC), which accounts for almost 80 percent of total exports in both time points. Interestingly, this comparison does not show a notable change in product mix following the MFA abolition.

Table 4.3. Indonesian apparel exports: Top 20 products, 2003–04 and 2013–14

2003–04 ¹			2013–14 ¹		
SITC code	Product ²	Export share (%)	SITC code	Product ²	Export share (%)
84530	Jerseys/pullovers	8.14	84530	Jerseys/pullovers	10.99
84140	Trousers woven (M/B)	7.73	84270	Blouse woven (B/G)	7.18
84150	Shirts, woven (M/B)	7.72	84150	Shirts woven (M/B)	6.51
84270	Blouses woven (W/G)	7.30	84140	Trouser/woven (M/B)	6.45
84260	Trousers woven (W/G)	7.15	84260	Women/g trousers woven	6.11
84540	T-shirts/singlets knit	5.64	84151	Trousers cotton woven (M/B)	5.08
84151	Trousers cotton woven (M/B)	5.37	84540	T-shirts/singlets knit	4.83
84551	Brassieres	4.77	84426	Trouser knit (W/G)	4.47
84119	Overcoats woven	3.48	84551	Brassieres	3.63
84240	Women/girls dresses woven	2.91	84240	Dresses woven (W/G)	2.60
84470	Women/girls blouses knits	2.41	84470	Blouses knit (W/G)	2.55
84159	Trouser fibre woven (M/B)	2.35	84119	Overcoat woven (M/B)	2.38
84112	Coats other fibres (W/G)	1.82	84324	Trouser/knit (M/B)	2.34
84219	Coats woven (W/G)	1.71	84424	Dresses knit (W/G)	2.12
84221	Suits woven (W/G)	1.69	84112	Coats other fibres (W/G)	2.01
84371	Men/boys trouser cotton k/c	1.53	84130	Jackets/blazer woven (W/G)	1.55
84280	Under/night wear woven (W/G)	1.50	84159	Trouser fibre (M/B)	1.42
84211	Overcoat woven (W/G)	1.50	84512	Baby clothes knit	1.39
84629	Women's hosiery	1.30	84511	Baby clothes woven	1.34
84250	Skirts woven (W/G)	1.24	84564	Swimwear knit	1.23
	Others	22.74		Others	23.83
	Total	100.00			100.00

Notes. ¹ Two-years average, ² W/G = women's/girl's, M/B = Men's/boy's, k/c knitted or crocheted
Source. Compiled from UNCOMTRADE database

4.4.3. Direction of exports

A notable pattern of the geographic profile of apparel exports is the continuous decline in the share of exports to EU markets over the past three decades. The rate of decline has been sharper during the post-MFA period. The export share to the USA increased continuously about 30 percent in the mid-1990s, reaching over 60 percent by 2008. It has since declined, stabilising at 50 percent in recent years. From about 2010, export shares of the other markets (mostly to 'easy' markets in neighbouring Asian countries) increased sharply, from 20 percent to over 30 percent.

Overall, the anticipated market penetrative effect of the removal of the MFA quota restriction in the major markets in the USA and EU is not reflected in the Indonesian export data. This presumably helps explain Indonesia's slower growth of apparel exports compared to other major exporting countries in the region. The growing importance of exports to regional markets is also consistent with the patterns we have observed in the commodity composition of Indonesia's apparel exports. There is evidence that quality upgrading in apparel exports is closely associated with the degree of market penetration in developed-country markets (Tewari 2008). In particular, the fashion content of apparel exported to EU markets seems be much higher compared to exports to the US market because speciality stores and brand marketers play, relatively, a much more important role in the former markets compared to latter which is dominated by large retail stores. As depicted in Figure 4.6, during the post-MFA era, unit values of Indonesian exports to the EU market have increased at a much faster rate compared to both the unit value of total exports and of exports to the USA. However, this has not translated into an increase in Indonesia's

market share (in value terms) in European markets presumably because of supply-side constraints on volume expansions.

Table 4.4. Shares of women/girls wear and men/boys wear in total apparel exports from Indonesia

	1990	1995	2000	2005	2010	2015
Women	40.52	37.26	39.14	43.37	42.47	43.64
Woven apparel	26.89	25.59	26.73	26.03	23.37	22.27
Knitted apparel	9.87	6.78	6.60	9.10	11.36	12.86
Brassieres	1.31	2.50	3.49	5.46	4.69	5.00
Other	2.45	2.39	2.32	2.78	3.05	3.50
Men	37.79	39.57	36.05	33.70	28.06	28.85
Woven apparel	26.67	30.22	28.61	24.43	20.73	19.81
Knitted apparel	9.09	7.78	6.55	8.39	6.34	8.11
Other	2.49	1.57	0.89	0.88	0.99	0.93
Other ¹	21.68	23.16	24.81	22.93	29.47	27.51

Note. ¹ Mostly Jerseys, pullovers and T-shirts for both women and men

Source. Compiled from UNCOMTRADE database

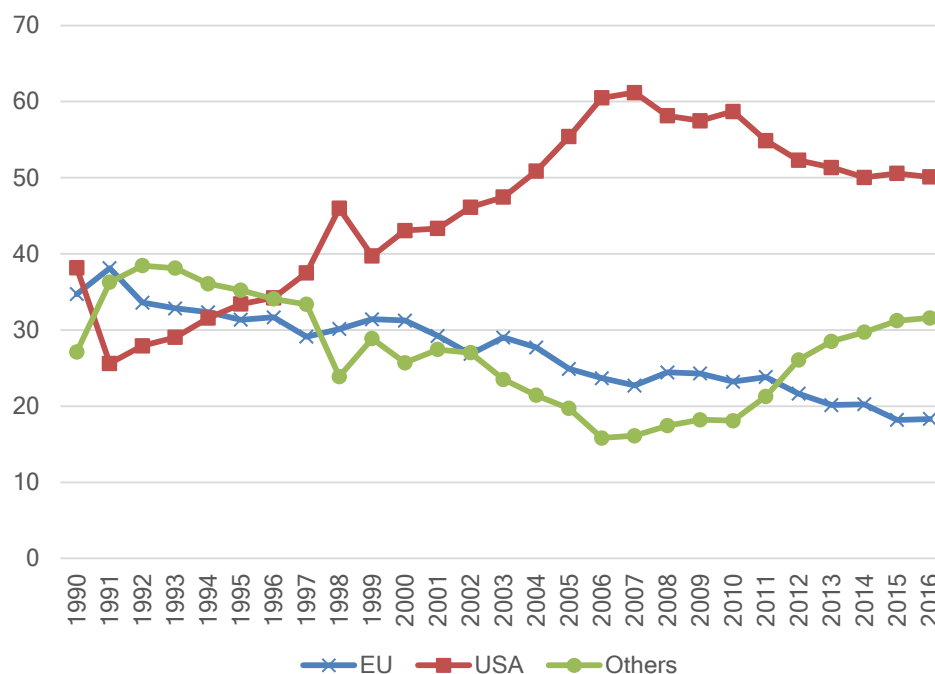


Figure 4.5. Export share by destination (in percentage)

Source: Compiled from UNCOMTRADE database

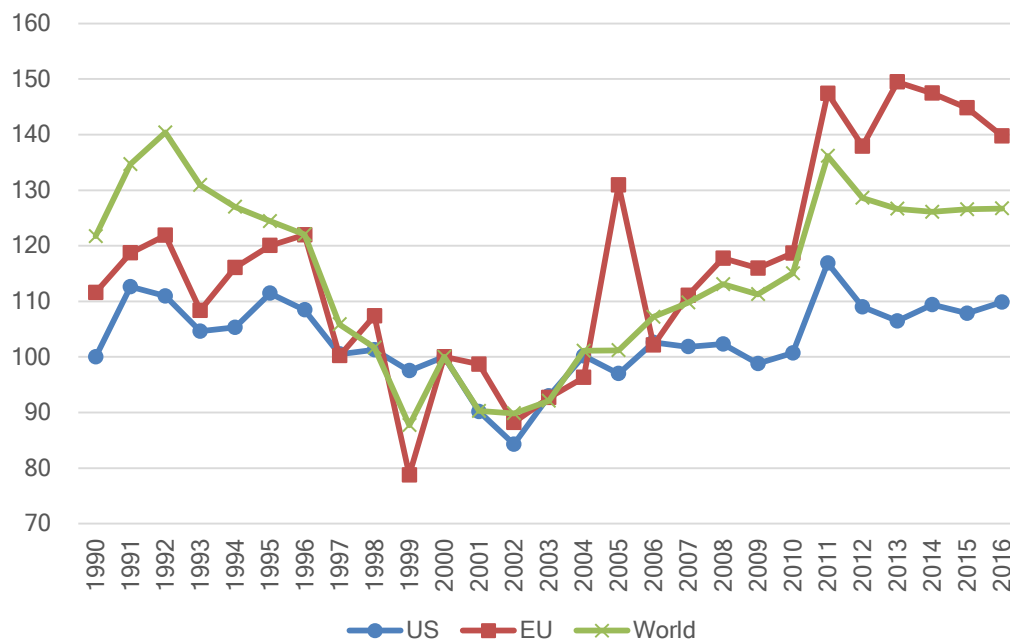


Figure 4.6. Unit value indices apparel exports by destination (2000 = 100)

Source. Compiled from UNCOMTRADE database

4.5. Constant market-share analysis

The analytical narrative so far in the previous sections suggests that a combination of development relating to the product mix, the direction of exports and the competitiveness of the industry have contributed to Indonesia's lacklustre performance in post-MFA apparel exports compared to other major exporting countries. In this section, we proceed to delineate the impact of these three sources in explaining Indonesia's relative export performance. The methodology used for this purpose is the standard CMSA that is also called shift-share analysis. The CMSA involves measuring the contribution of geographical, product specialisation and competitiveness to the growth of exports of a given country under the assumption that its share has remained in the combined exports of every product by all competing exporters.

The following equation sums up the decomposition procedures:⁶

$$V_i^t - V_i^{t-1} = r^t V_i^{t-1} + \sum_k (r_k^t - r^t) V_{ik}^{t-1} + \sum_j \sum_k (r_{jk}^t - r_k^t) V_{ijk}^{t-1} + \sum_j \sum_k (V_{ijk}^t - V_{ijk}^{t-1} (1 + r_{jk}^t)) \quad (4.1).$$

i	Exporting country indexes
j	Importing country indexes
k	Product indexes
t	Time indexes
r^t	Global annual growth rate of exports
r_k^t	Global growth rate of product k exports
r_{jk}^t	Global growth rate of exports of product k to country j
V_i^t	Value of total export of country i in period t
V_{ik}^t	Value of export of product k of country i in period t
V_{ijk}^t	Value of export of product k of country i to country j in period t

In Equation 4.1, the first term is the average export growth rate of the given country i . The second term, $\sum_k (r_k^t - r^t) V_{ik}^{t-1}$, is the commodity composition effect, which measures the extent to which country i exports are concentrated in commodity classes with growth rates more favourable than the world average. If the world export of product k increased by more than the world average for all commodities, then $(r_k^t - r^t)$ is positive. Accordingly, the sum of the commodity composition effect would be positive if country i had concentrated on the export of goods whose markets were growing relatively fast and negative if country i had concentrated in slowly growing commodity markets. Similarly, the third term, $\sum_j \sum_k (r_{jk}^t - r_k^t) V_{ijk}^{t-1}$, captures the market effects. It would be positive if country i had concentrated its exports in markets that experience relatively rapid growth and negative if it concentrated in

⁶ The derivation of the equation and underlying assumptions are spelled out in Leamer and Stern (1976), Chapter 7, and Richardson (1971). For applications see Amador and Cabral (2008), Balassa (1979), Cheptea, Fontagné and Zignago (2014), Gilbert and Muchová (2018) and Merkies and van der Meer (1988).

relatively stagnant regions. The fourth term is the residual that we called the competitiveness effect. A negative value of this term is interpreted as an indicator of the country's failure to maintain its market share in world trade (supply-side factors adversely affecting export performance). The supply-side constraints could include a plethora of factors including a diminishing profitability of the tradable product compared to the non-tradable product (or the real exchange rate appreciation), poor quality of products by international standards, failure to develop new products in line with changing demand patterns, inefficiencies of production and marketing, and financial constraints on business operations.⁷

For the purpose of comparison, we undertake CMSA analysis for Indonesia and the other five major apparel exporting Asian countries, Bangladesh, Cambodia, China, India, Sri Lanka and Vietnam. Export increments between 1993 and 1994, 2003 and 2004, 2005 and 2006 and 2012 and 2013 are decomposed in order to see the impact of the abolition of the MFA. Two-year averages (rather than single years) are used to demarcate the two periods in order to reduce sporadic variability effects. The computations of export are done in current USD at the 3-digit level of SITC Revision 3.

Table 4.5 presents the results. In both periods, the export growth rate of Indonesia was below the world rate, although the gap has significantly narrowed in the post-MFA period (from -6.61 percent to -1.65 percent). Exports from all other countries (other than Sri Lanka) exhibited growth rates well above the world rate during the post-MFA era. Vietnam has recorded the fastest market penetration with an

⁷ There are some limitations of the CMSA method (Leamer and Stern 1976). Choice of the level of aggregation and the period may emerge different conclusions. The competitiveness term is a residual and may reflect the interaction of both demand and supply factors.

average growth rate which is 25 percent above the world rate, followed by Bangladesh (17.83 percent).

Table 4.5. Constant market share analysis of apparel exports from Indonesia and selected Asian countries (in percentage)¹

	Indonesia	Bangladesh	India	China	Sri Lanka	Vietnam	Cambodia
During the MFA era (1993–94 to 2003–04)							
Growth differential ²	-6.61	24.52	1.26	9.22	0.02	---	---
Commodity composition effect	-0.11	-1.73	-0.61	-0.53	-0.50	---	---
Market effect	0.21	1.09	-0.02	-0.17	0.89	---	---
Competitiveness effect	-6.72	25.17	1.89	9.92	-0.37	---	---
After MFA abolition (2005–06 to 2012–13)							
Growth differential ²	-1.65	16.83	2.72	7.67	-1.07	24.99	5.1
Commodity composition effect	-0.07	-0.93	-0.21	0.24	0.62	0.06	5.18
Market effect	-2.70	-2.08	-1.21	2.58	-3.73	-1.94	-6.42
Competitiveness effect	1.11	19.83	4.13	4.86	2.04	26.88	6.34

Notes. ¹ Growth rates reported are the annual averages of percentage increase in exports between the two time points. They are therefore not distorted by export contractions caused by the Asian financial crisis (1997–98) and the global financial crisis (2008–09). ² Difference between the export growth rate of a given country and the rate of world export growth. --- Data not available.

Source. Compiled data extracted from UNCOMTRADE Database using the methodology described in the text

During the MFA era, negative competitiveness to the effect of 6.72 percent was by far the most important contributor to Indonesia's growth differential of -6.61 percent. This seems to reflect Indonesia's apparel industry's failure to upgrade the product mix within the limits set by the MFA quota. The competitive effect has entered positive territory in the setting of the post-MFA era, but the measured effect (at 1.11 percent) has been much lower compared to all other countries covered in our analysis. Indeed failure to catch up with improving competitiveness with other countries is by far the most important explanation of Indonesia's lacklustre relative export performance. The competition-driven export growth of Vietnam was 26.88 percent followed by 19.83 percent for Bangladesh.

The market effect on Indonesia's post-MFA export growth was -2.7 percent compared to a marginal positive effect (0.21 percent) during the MFA era. This finding is consistent with what we have seen from the changing geographic profile of Indonesia's apparel exports. During the post-MFA era, there were clear shifts in export patterns from developed markets (especially the EU) to other markets (mostly to countries in the region). Moreover, there has been a persistent decline in the share of exports to EU markets, where the fashion (high-value) content of sales is presumably higher compared to the US market.

4.6. Determinants' export performance: A firm-level analysis

We have observed that the competitiveness of Indonesia's apparel exports has been much lower compared to the major apparel exporting countries in the region. To shed further light on the competitiveness issue, in this section I undertake an econometric analysis of the determinants of export orientation firms and the export intensity of exporting firms in the Indonesia apparel industry, which emphasise possible changes in key determinants following the abolition of the MFA quota restrictions.

4.6.1. Model

Consider a firm that has the choice of selling in both domestic and foreign markets. Its profit maximisation is based on prices and quantities in the foreign market f and the domestic market d as well as production costs $h(\cdot)$ and distribution costs $m_d(\cdot)$ and $m_f(\cdot)$.⁸ Differentiating costs reflects the idea that serving different markets leads to

⁸ The theoretical framework used here draws on Aitken, Hanson and Harrison (1997), and Greenaway, Sousa and Wakelin (2004).

different cost components, such as design, advertising and transportation. Thus, the profit maximisation condition of the firm can be written as:

$$\max_{q_d, q_f} P_d q_d + P_f q_f - h(q_d + q_f) - m_d(q_d) - m_f(q_f) \quad \text{s.t. } q_d, q_f \geq 0 \quad (4.2)$$

The production and distribution cost functions can be written as:

$$h(q_d + q_f) = \frac{a}{2}(q_d + q_f)^2 + g(q_d + q_f) \quad (4.3)$$

$$m_i(q_i) = \frac{1}{2} b_i q_i^2 + c_i q_i \quad (4.4)$$

where a, g, b_i and c_i are scalar parameters and $i = d, f$ represents domestic and foreign markets. It is assumed that g and c_i are functions of cost variables to make output decisions:

$$g = g(X), c_d = c_d(X, Z_d), \text{ and } c_f = c_f(X, Z_f) \quad (4.5)$$

where X is the cost variable that is common to producing goods in both markets and Z_i is the cost variable of production that depends on a certain market i .

In theory, the optimal choice of output can be zero in either market. In practice, if the firm exists, it serves at least one market, i , which can be the domestic market or the export market or both. In this model, it is assumed that firms always serve the domestic market but have a choice whether or not to export. Accordingly, we focus on the corner solutions for the variable q_f , the export quantity, which can be zero or have a positive value. The optimal solution for q_d and q_f from Equation 4.2 are as follows:

$$q_d = \frac{1}{a+b_d} (P_d - a q_f^* - g(X) - c_d(X, Z_d)) \quad (4.6)$$

$$q_f^* = \frac{1}{a+b_f} (P_f - a q_d - g(X) - c_f(X, Z_f)) \quad (4.7)$$

Thus, we can rewrite Equations 4.6 and 4.7 as follows:

$$q_{dj} = \alpha_1 P_d + \alpha_2 q_{fj}^* + \alpha_3 Z_{dj} + \alpha_4 X_j + u_{dj} \quad (4.8)$$

$$q_{fj}^* = \beta_1 P_f + \beta_2 q_{dj} + \beta_3 Z_{fj} + \beta_4 X_j + u_{fj} \quad (4.9)$$

where j indexes the firm, Z_{ij} is a $1 \times K$ vector of cost variables specific to market i , X_j is a $1 \times J$ vector of cost variables common to both markets, α_3 and β_3 are $1 \times K$ vectors of coefficients, α_4 and β_4 are $1 \times J$ vector of coefficients, and u_{ij} is a normally distributed error term for market i and firm j , which has a mean zero and variance σ_u^2 .

Equations 4.8 and 4.9 represent a simultaneous equation model. Given that our interest is in the firm's export decisions, we choose to focus the estimation on estimating the probability that a firm exports (y_i). By defining the dummy variable y_j , which takes a value equal to 1 if $q_{fj} > 0$ and 0 otherwise, the export propensity can be specified as:

$$\Pr(y_i = 1) = \Pr[\beta_1 P_f + \beta_2 (\alpha_1 P_d + \alpha_3 Z_{dj}) + \beta_3 Z_{fj} + (\beta_2 \alpha_4 + \beta_4) X_j + v_j > 0] \quad (4.10)$$

where, $v_j = \beta_2 u_{dj} + u_{fj}$. Subsequently, if the $y_i = 1$, the optimal quantity of output to be sold in the foreign market is given by

$$q_{fj} = \delta_1 P_f + \delta_2 (\alpha_1 P_d + \alpha_3 Z_{dj}) + \delta_3 Z_{fj} + (\delta_2 \alpha_4 + \delta_4) X_j + w_j \quad (4.11)$$

where $\text{corr}(w_j, v_j) \neq 0$. From Equations 4.10 and 4.11, the probability of exporting is a function of the price of the goods, firm-specific production costs, and distribution costs in the foreign and domestic markets.

Based on Equations 4.10 and 4.11, the export behaviour of a firm involves two decisions: whether to export and what proportion of output is to be exported. Based on the existing literature on the determinants of export performance, we hypothesise that both decisions are determined by the same explanatory variables. Therefore, the specification of the empirical model is as follow:

$$\left. \begin{matrix} EXP_{ilt}^{PR} \\ EXP_{ilt}^{IN} \end{matrix} \right\} = \beta_0 + \beta_1 PROD_{ilt} + \beta_2 SIZE_{ilt} + \beta_3 FDI_{ilt} + \beta_4 IMP_{ilt} + \beta_5 TEX_i + \beta_6 MW_l + L_l + T_t + \varepsilon_{ilt} \quad (4.12).$$

i	Firm indexes		
l	Location indexes		
t	Year indexes		
EXP_{ilt}^{PR}	A binary variable taking 1 if the firm exports and 0 otherwise	$TEX (+ \text{ or } -)$	A binary variables taking 1 if the firm produces both textiles and garments; and 0 if it produces only garments
EXP_{ilt}^{IN}	The export intensity of the firm	$MW (+ \text{ or } -)$	The minimum wage
$PROD (+)$	Productivity	$IMP(+)$	The share of import of total input
$SIZE (+)$	The firm size that is defined by the number of employees	L	Province dummies
$FDI (+)$	A binary variable taking 1 if the firm has foreign ownership and 0 if the firm is domestically owned	T	Year dummies
		ε_{ilt}	The error term

EXP_{ilt}^{PR} is a binary variable that indicates the firm exports (equal to 1) or does not export (equal to 0). EXP_{ilt}^{IN} is the natural logarithm of export intensity. $PROD$, $SIZE$ and MW are measured in natural logarithms, and IMP is measured as a

percentage. Labour productivity and total factor productivity (TFP) are used as two alternative indicators of productivity.

In order to examine whether the postulated impact of the explanatory variables has changed following the abolition of the MFA, we add an intercept dummy variable and measure the interaction of the dummy variable with each explanatory variable in the basic model (Equation 4.12). With this augmentation the estimation equation becomes:

$$\left. \begin{matrix} EXP_{ilt}^{PR} \\ EXP_{ilt}^{IN} \end{matrix} \right\} = \beta_0 + \beta_1 MFA_{abol} + \beta_2 PROD_{ilt} + \beta_3 SIZE_{ilt} + \beta_4 FDI_{ilt} + \beta_5 IMP_{ilt} + \beta_6 TEX_i \\ + \beta_7 MW_i + \beta_8 (MFA_{abol} \times PROD_{ilt}) + \beta_9 (MFA_{abol} \times SIZE_{ilt}) \\ + \beta_{10} (MFA_{abol} \times FDI_{ilt}) + \beta_{11} (MFA_{abol} \times IMP_{ilt}) \\ + \beta_{12} (MFA_{abol} \times TEX_i) + \beta_{13} (MFA_{abol} \times MW_i) + L_i + T_t + \varepsilon_{ilt} \quad (4.13)$$

where, MFA_{abol} , is equal to 1 for the years after the abolition of the MFA (2005–14) and 0 for the pre-MFA years (1990–2004).

4.6.2. Data and the estimation method

The model is estimated using a panel dataset compiled from the annual survey of manufacturing (SI) conducted by the Indonesian Central Bureau of Statistics (BPS). Other than the minimum wage data, which also come from the official records of the BPS, all data series used are compiled from SI. The annual survey covers all medium and large manufacturing establishments in Indonesia—firms that have 20 or more workers. The panel data set covers the years from 1990 to 2014. Given that the incidence of entry and exist of firms varies across the years, the panel data set is unbalanced with 46,434 observations.

The TFP is estimated using the methodology proposed by Olley and Pakes (1996) and the algorithm developed by Yasar, Raciborski and Poi (2008). There are no

capital stock data for 2006 for all firms. Some capital data is also missing for some firms in many years. For TFP calculations, we first dropped all firms with no capital data for all years, and then interpolated data for firms in 2006 based on the values in 2005 and 2007. All firms with negative capital stocks were removed. This procedure reduced observations of the dataset with capital stock series to 22,108, less than half of the number of observations of the dataset converting all other variables.

To calculate, the labour productivity and TFP output of exporting firms is converted into real terms using the US apparel import price index as the proxy for the world price. Other variables are deflated using sector specific apparel wholesale price index (WPI) from the BPS. Given the limited firm coverages, inference will be made based on the models estimated with labour productivity as the productivity measure. And alternative estimation is undertaken with TFP as the productivity measure as a robustness check.

The export propensity equation is estimated using the probit technique. We also use xtprobit with random effects for comparison. The export intensity equation is estimated using the firm-fixed effects method to reduce the omitted variable bias at the firm level. Mindful of the possibility of selection bias when estimating export intensity equation, we apply the Heckman 2 step selection model by estimating the probability of exporting in the first step using the probit model. We include the Mills' ratio from the first regression in the second step to estimate the export intensity. We use a one-year lag on all explanatory variables to reduce a possible simultaneously bias with the dependent variables. We also report the contemporaneous effects in the robustness check to show consistencies in our results.

4.6.3. Results

The results for the export propensity equation that is estimated, with labour productivity as the productive measure, is reported in Table 4.6. The full probit estimates of the equation are given in Column 2. The results from xtprobit are reported in Column 3. Marginal effects derived from the probit estimation are reported in Table 4A.2 in Appendix 4.

Table 4.6. Regression results: Determinants of export propensity

VARIABLES	Probit ¹ (Export=1)	Xtprobit RE (Export=1)
PROD: Ln Labour Productivity _{it-1}	0.203*** (0.0148)	0.126*** (0.0190)
SIZE: Ln firm size _{it-1}	0.478*** (0.0107)	0.563*** (0.0213)
FDI _{it-1}	0.301*** (0.0463)	0.329*** (0.0708)
IMP: Imported share in input _{it-1}	0.00162*** (0.000466)	0.00452*** (0.000701)
TEX: Textile base	0.0406 (0.0253)	-0.0850 (0.0649)
MFA_abol x PROD _{it-1}	0.0898*** (0.0214)	0.117*** (0.0273)
MFA_abol x FDI _{it-1}	-0.0903 (0.0630)	-0.0820 (0.0838)
MFA_abol x SIZE _{it-1}	-0.00415 (0.0144)	0.0847*** (0.0210)
MFA_abol x IMP _{it-1}	0.00436*** (0.000611)	0.00333*** (0.000889)
MFA_abol x TEX _i	0.115*** (0.0358)	0.321*** (0.0566)
MFA_abol	-1.498*** (0.213)	-2.360*** (0.278)
Constant	-3.796*** (0.271)	-4.287*** (0.922)
Year effects	Yes	Yes
Province effects	Yes	Yes
Firm fixed effects	No	RE
Observations	46,434	46,434
Number of firms		4,993
Wald Chi2	10432.33	3192.61
Pseudo R2	0.3702	

Notes. ¹Heteroscedasticity corrected (robust) standard errors are given in parentheses. The statistical significant of regression coefficients are denoted as: *** 1 percent, ** 5 percent and * 10 percent.

Table 4.7. Regression results: Determinants of export intensity¹

Dependent variables: Ln_Export_Intensity	FE	Standard Heckman estimate	Modified Heckman estimate with FE
VARIABLES			
PROD: Ln Labour Productivity _{it-1}	0.0122*** (0.00313)	0.00498 (0.00490)	0.0391*** (0.00933)
SIZE: Ln firm size _{it-1}	0.0221*** (0.00598)	7.37e-05 (0.00400)	0.0876*** (0.0224)
FDI _{it-1}	0.0260 (0.0267)	0.0242* (0.0134)	0.0622** (0.0292)
IMP: Imported share in input _{it-1}	0.000752*** (0.000178)	0.000538*** (0.000158)	0.000948*** (0.000188)
TEX: Textile base	-0.00344 (0.0226)	-0.0714*** (0.00941)	0.00619 (0.0220)
MFA_abol x PROD _{it-1}	0.00337 (0.00369)	0.0204*** (0.00723)	0.0186*** (0.00601)
MFA_abol x FDI _{it-1}	-0.0134 (0.0282)	0.0434** (0.0181)	-0.0327 (0.0286)
MFA_abol x SIZE _{it-1}	0.00726 (0.00506)	-0.00302 (0.00525)	0.00537 (0.00503)
MFA_abol x IMP _{it-1}	0.000240 (0.000198)	-0.000117 (0.000215)	0.000794*** (0.000265)
MFA_abol x TEX _i	0.0222** (0.0104)	-0.00534 (0.0135)	0.0394*** (0.0119)
MFA_abol		-0.2474*** (0.7657)	-0.3650*** (0.7657)
Mills' ratio		-0.102*** (0.00759)	0.179*** (0.0815)
Constant	-0.0165 (0.0369)	0.879*** (0.0552)	-0.808*** (0.260)
Year effects	Yes	Yes	Yes
Province effects	No	No	No
Firm fixed effects	FE	No	FE
Observations	46,765	46,765	46,765
R-squared	0.043		0.050
Number of firms	5,039		5,039

Notes. ¹ Heteroscedasticity corrected (robust) standard errors are given in parentheses. The statistical significant of regression coefficients are denoted as: *** 1 percent, ** 5 percent and * 10 percent.

Table 4.7 provides results for the export intensity equation. Column 2 presents results using the fixed effects estimator that may still suffer from selection bias. Results from the second step of the standard Heckman selection estimator are given in Column 3. Even though the Heckman method may overcome the selection bias, results

may still suffer from omitted variable bias at the firm level. Therefore, we estimate the equation with firm-fixed effects in the second step by incorporating the Mills' ratio from the first step as an additional variable. This alternative estimate, which is our preferred estimate, is reported in Column 4.

The correlation matrix of all variables is reported in Table 4.8. The alternative export equation estimated with TPF as the productivity variable is reported in Table 4A.1 in Appendix 4. We also provide the contemporaneous effects version of the model in Table 4A.3 in Appendix 4. Note that we were not able to retain the provincial minimum wage (MW) variable in equations estimated with province-specific fixed effects because of the high correlation between that variable and province dummies. Alternative estimates of the export equation with the MW but excluding the province effect are reported in Table 4A.4 in Appendix 4.

In the export propensity equation, coefficients of all base variables (that is variables without interaction dummies) other than the textile base (TEX) are statistically significant at the 1 percent level or better with the expected (positive) signs. These suggest that the productivity, the firm size, the foreign ownership and the import share are significant determinants of the export decision of firms (Table 4.6, Columns 2 and 3). Results from probit and xtprobit estimates are similar in terms of the statistical significance of the coefficients even though the magnitudes are different. The multicollinearity does not seem to have a notable impact on the coefficient estimates (Table 4.8).

According to marginal effect estimates from the probit model (see Table 4A.2, Appendix 4), a one percentage point difference increase in labour productivity helps distinguish exporting firms from non-exporting firms by 0.03. The comparable

elasticity estimates of export orientation with respect to the firm size and the foreign direct investment (FDI) participation are 0.07 and 0.04, respectively. The share of imports in total intermediate inputs, which is presumably important in maintaining the quality standards required by international buyers, is a statistically significant determinant of export orientation in general, but the marginal effect of this variable is small (0.0002).

Table 4.8. Correlation between variables

	EXP	LPB	SIZE	FDI	IMP	TEX
EXP	1					
LPB	0.255	1				
SIZE	0.4645	0.3302	1			
FDI	0.29	0.2328	0.4538	1		
IMP	0.234	0.1405	0.3322	0.3303	1	
TEX	-0.0323	-0.0976	-0.0899	-0.0918	-0.0055	1

To comment on the results for the export intensity estimates, the results from the preferred model (the modified Heckman with FE) reveal that the coefficient of the base variables, other than TEX, is statistically significant. These suggest that productivity, firm size, foreign ownership and import share are significant variables in determining inter-firm differences. A 1 percent increase in productivity associates with a 0.04 percent increase in the export intensity. The effect of firm size and the FDI participation are 0.09 percent and 0.06 percent respectively. Again, there is an increase of foreign content in production in determining the export intensity, even though the magnitude is small.

To comment on the results for the post-MFA international variables, the labour productivity, the imported input source and the backward integration with the textile base have a distinctive effect on the post-MFA export participation decision (Table

4.6). In particular, labour productivity associates with 0.04 percent in the post-MFA period, which is larger compared to the estimate for the overall period (0.03 percent). Even though the coefficient of TEX is not statically different from zero for the entire period, the interaction term 'TEX*MFA' has a highly significant magnitude with the expected sign (positive). The marginal effect of TEX*MFA is 0.02. This result supports the view that having its own textile base helps a firm to meet just-in-time supply requirements in a competitive market setting. The coefficient of MFA*IMP is also highly significant suggesting that the use of imported inputs has a distinct effect on export performance during the post-MFA era. The statistical significance of both MFA*TEX and MFA*IMP are consistent with the view that imported inputs (both high-quality textile and ancillary inputs in apparel production) are complementary to, rather in competition with, domestic procurement of textiles in producing apparel for a competitive global market (Fung, Fung & Wind 2007; Gereffi 1999).

The results for the post-MFA era from the export propensity equation in Table 4.7 (Column 4) are consistent with results from the export decision equation. Labour productivity, imported input and the domestic textile base are key determinants for apparel exporters to increase their export. As postulated, after the abolition of the MFA, productivity has become a more important factor in export performance. The coefficient of the productivity variable is about 0.02 percent larger compared to the whole period. Furthermore, findings from the second equation in Table 4.7 also strengthen our argument about the importance of reliable inputs (both domestically owned textile inputs and imported inputs) on export performance in the competitive setting after the removal of the quota system. An export success in the competitive era

depends on how well a firm manages the quality, the time and the variation of inputs for production.

The MFA interaction term for FDI is not statistically significant for both export performance variables, even though it is highly significant with the expected positive sign for the base variable. The upshot is that while FDI participation is important for export orientation through the study period, it does not have a distinctive additional effect on export performance in the post-MFA era. A similar inference applies to the impact of firm size on export performance.

A comparison of results reported in Tables 4.6 and 4.7 and those in Table 4A.1 in Appendix 4 shows that the results are basically robust in relation to the use of labour productivity and the TFP as alternative indicators of productivity. Of course, there are marginal differences (which do not alter the basic inferences) understandably because of the big difference in the number of observations on which the estimates are based. The results from the model with contemporaneous effects are in Table 4A.3 in Appendix 4. This table also shows very similar findings to the one with lags. The significance for all explanatory variables are consistent, but with a higher magnitude for all variables.

Finally, an alternative estimate of the export equation with minimum wages (MW) as an additional explanatory variable (but excluding province dummies) reported in Table 4A.4 in Appendix 4, do not enable us to reject the hypothesis that 'minimum wages do not have an adverse effect on apparel exporting from Indonesia'. Of course further research is needed to test this hypothesis, but there is evidence that, in the competitive post-MFA market setting, international buyers (in particular those who procure apparel for upmarket band retailers) place particular emphasis on workers'

welfare before placing orders with domestic suppliers in exporting countries (Athukorala & Ekanayake 2018; Perry, Wood & Fernie 2015).

4.7. Concluding remarks

The apparel industry, given the labour-intensity of production and low entry barriers (low fixed cost and simple/well-diffused technology), is the quintessential ‘starter’ industry of export-oriented industrialisation in developing countries. However, for over three decades beginning in 1974, the ability of developing countries to enter this industry based purely on their comparative advantage remained severely constrained by a complex system of country- and product-specific export quotas imposed by the importing (developed) countries under the MFA. Replacing the MFA with the ATC and the removal of export quotas under the ATC with effect from 2005 was a major achievement of the Uruguay Round of world trade negotiations.

In this chapter, we have examined the export performance and structural adjustment of the Indonesian apparel industry during the post-MFA era. The study was motivated by the continued significance of the apparel industry for the Indonesian economy, both in terms of export earnings and generating employment for workers belonging to the low-income brackets. Furthermore, this industry still has high potential for further expansion in a global context in which product- and country-specific quotas no longer inhibit market penetration. Insights gained from our analysis of the Indonesian experience would also be relevant for conceptualising factors that impact on any adjustments to cope with the MFA abolition of apparel industry quotas and policy options for facilitating the adjustment process in other developing countries.

Contrary to predictions in the lead up to the MFA's abolition, Indonesia's share in world exports of apparel contracted during the post-MFA era. This was in sharp contrast to significant market share gains not only by China but also by other apparel exporting countries in the region. Thus, there is no evidence to suggest that Chinese competition is a major constraint to export expansion from Indonesia.

The abolition of MFA quotas has had a dampening effect on export prices as the theory of quantitative export restrictions predicted. In this context inter-country differences, in the degree of world-market penetration, were primarily underpinned by differences in the rates of export volume expansion. Unlike successful apparel exporters in the region, in Indonesia volume expansion barely counterbalanced the price-lowering effect of quota abolition.

Our analysis of the commodity composition of exports indicates that the Indonesian apparel industry has so far failed to diversify its product mix linked with rapidly changing global demand patterns that have benefited from the lifting of product-specific export quotas. The product mix has remained virtually unchanged during the post-MFA decade compared to the previous decade. Contrary to what one would have expected in a quota-free trading world, the geographical profile of Indonesian apparel exports also shows a notable shift in the direction of trade from competitive developed country markets to regional markets. In particular, the share of exports to the European markets, in which the demand for fashion content in apparel is much higher compared to the US and other countries, has continuously declined over the past decade.

The results of the CMSA confirm that failure to catch up with improving competitiveness and the negative market effect (that is a significant diversion of

exports from dynamic markets) are the major contributors to Indonesia's failure to penetrate global apparel markets in the post-MFA era. The competitiveness effect, which we have delineated, using the CMSA, is simply a catch-all indicator of supply-side factors adversely affecting export performance. According to firm-level econometric analysis, productivity growth, the domestic textile base of firms, and access to complementary imported intermediate inputs are the key determinants of export performance in the context of the competitive market conditions in the post-MFA era.

4.A. Appendix 4

Table 4A.1. Results from export equation estimate with TFP as the productivity measure

VARIABLES	Probit	Modified Heckman estimate with FE
	(Export = 1)	(Ln Export Intensity)
PROD: Ln TFP _{it-1}	0.343*** (0.0377)	0.0410*** (0.0127)
SIZE: Ln firm size _{it-1}	0.565*** (0.0162)	0.0680*** (0.0195)
FDI _{it-1}	0.474*** (0.0767)	0.0709 (0.0479)
IMP: Import share _{it-1}	0.000586 (0.000763)	0.000380* (0.000230)
TEX: Textile base	-0.0155 (0.0396)	0.0289 (0.0198)
MFA_abol x PROD _{it-1}	0.0729 (0.0491)	0.0406*** (0.0103)
MFA_abol x FDI _{it-1}	-0.0771 (0.108)	-0.0815** (0.0411)
MFA_abol x SIZE _{it-1}	0.0338 (0.0215)	0.0180*** (0.00685)
MFA_abol x IMP _{it-1}	0.00355*** (0.00101)	0.000300 (0.000260)
MFA_abol x TEX _i	0.210*** (0.0550)	0.0437*** (0.0147)
Mills' ratio		0.110*** (0.0414)
Constant	-4.819*** (0.231)	-0.462** (0.180)
Year effects	Yes	Yes
Province effects	Yes	No
Firm fixed effects	No	FE
Observations	22,376	22,376
Number of firms		2,622
R-squared		0.062
Wald chi2	5526.27	
Pseudo R ²	0.4469	

Note. Heteroscedasticity corrected (robust) standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4A.2. Marginal effects from probit equation

VARIABLES	Marginal effects	
	Probit (Export = 1)	
PROD1: Ln Labour Productivity _{it-1}	0.0304	
PROD2: Ln TFP _{it-1}		0.0483
SIZE: Ln firm size _{it-1}	0.0717	0.0796
FDI _{it-1}	0.0452	0.0669
IMP: Import share _{it-1}	0.0002	0.0001
TEX _i	0.0061	0.0002
MFA_abol x PROD1 _{it-1}	0.0135	
MFA_abol x PROD2 _{t-1}		0.0103
MFA_abol x FDI _{it-1}	-0.0135	-0.0109
MFA_abol x SIZE _{it-1}	-0.0006	0.0048
MFA_abol x IMP _{it-1}	0.0007	0.0005
MFA_abol x TEX _i	0.0172	0.0296

Table 4A.3. Results from model with contemporaneous effects of explanatory variables

VARIABLES	Probit (Export = 1)	Modified Heckman estimate with FE (Ln Export Intensity)	Probit (Export = 1)	Modified Heckman estimate with FE (Ln Export Intensity)
PROD1: Ln Labour Productivity _{it}	0.277*** (0.0134)	0.0800*** (0.0144)		
PROD2: Ln TFP _{it}			0.550*** (0.0358)	0.131*** (0.0190)
SIZE: Ln firm size _{it}	0.471*** (0.0100)	0.114*** (0.0250)	0.577*** (0.0156)	0.0865*** (0.0206)
FDI _{it}	0.265*** (0.0415)	0.0821*** (0.0290)	0.481*** (0.0735)	0.0856** (0.0430)
IMP: Import share _{it}	0.00246*** (0.000436)	0.00143*** (0.000203)	0.000934 (0.000721)	0.000474** (0.000201)
TEX: Textile base	0.0356 (0.0246)	0.0162 (0.0212)	-0.00217 (0.0379)	0.0492* (0.0295)
MFA_abol x PROD1 _{it}	0.122*** (0.0193)	0.0283*** (0.00788)		
MFA_abol x PROD2 _{it}			0.102** (0.0466)	0.0241** (0.0109)
MFA_abol x FDI _{it}	-0.0660 (0.0585)	-0.0304 (0.0282)	-0.0777 (0.105)	-0.0801** (0.0375)
MFA_abol x SIZE _{it}	-0.00878 (0.0137)	0.00170 (0.00487)	0.0259 (0.0209)	0.0153** (0.00635)
MFA_abol x IMP _{it}	0.00406*** (0.000607)	0.000995*** (0.000264)	0.00374*** (0.000984)	0.000430* (0.000256)
MFA_abol x TEX _i	0.127*** (0.0348)	0.0422*** (0.0122)	0.223*** (0.0534)	0.0341** (0.0145)
Mills' ratio		0.221*** (0.0654)		0.119*** (0.0427)
Constant	-4.793*** (0.264)	-1.442*** (0.346)	-6.316*** (0.247)	-1.023*** (0.237)
Year effects	Yes	Yes	Yes	Yes
Province effects	Yes	No	Yes	No
Firm fixed effects	No	FE	No	FE
Observations	51,902	51,902	24,883	24,883
R-squared		0.075		0.095
Number of firms		5,061		2,639

Note. Heteroscedasticity corrected (robust) standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0

Table 4A.4. Results from export equations estimated with minimum wage as additional explanatory variable

VARIABLES	Probit (Export=1)	Modified Heckman estimate with FE (Ln Export Intensity)	Probit (Export=1)	Modified Heckman estimate with FE (Ln Export Intensity)
PROD1: Ln LP _{it-1}	0.226*** (0.0127)	0.119*** (0.00873)		
PROD2: Ln TFP _{it-1}			0.470*** (0.0332)	0.177*** (0.0177)
SIZE: Ln firm size _{it-1}	0.387*** (0.00963)	0.215*** (0.0158)	0.458*** (0.0142)	0.189*** (0.0186)
FDI _{it-1}	0.262*** (0.0436)	0.118*** (0.0292)	0.393*** (0.0742)	0.149*** (0.0491)
IMP: Import share _{it-1}	0.000621 (0.000456)	0.000930*** (0.000173)	-0.00197*** (0.000732)	-0.000475** (0.000238)
TEX: Textile base	0.0471** (0.0237)	0.0255 (0.0232)	-0.0434 (0.0345)	0.0204 (0.0190)
MW: Minimum Wage	-0.000188 (0.000153)		0.000833*** (0.000274)	
MFA_abol x PROD1 _{it-1}	0.0234 (0.0183)	0.0236*** (0.00397)		
MFA_abol x PROD2 _{it-1}			0.0389 (0.0441)	0.0566*** (0.0104)
MFA_abol x FDI _{it-1}	-0.0338 (0.0595)	-0.0291 (0.0276)	0.0114 (0.105)	-0.0875** (0.0403)
MFA_abol x SIZE _{it-1}	0.0264** (0.0134)	0.0155*** (0.00501)	0.0687*** (0.0199)	0.0368*** (0.00713)
MFA_abol x IMP _{it-1}	0.00459*** (0.000608)	0.00234*** (0.000249)	0.00414*** (0.000961)	0.00161*** (0.000276)
MFA_abol x TEX _i	0.134*** (0.0336)	0.0821*** (0.0112)	0.191*** (0.0486)	0.100*** (0.0141)
MFA_abol x MW	0.000408** (0.000159)		-0.000409 (0.000286)	
MFA_abol	-1.325*** (0.188)	-0.720*** (0.0576)		
Mills' ratio		0.634*** (0.0452)		0.489*** (0.0436)
Constant	-4.406*** (0.124)	-2.661*** (0.201)	-4.373*** (0.162)	-1.945*** (0.190)
Year effects	Yes	Yes	Yes	Yes
Firm fixed effects	No	Yes	No	Yes
Observations	46,574	46,574	22,298	22,298
R-squared		0.060		0.073
Number of firms		5,021		2,617

Note. Heteroscedasticity corrected (robust) standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0

Chapter 5

The Role of Imported Intermediate Inputs in Firms' Productivity and Exports

Abstract

This chapter examines the impact of imported intermediate inputs on firms' productivity and manufacturing exports in Indonesia using firm-level data matched with detailed customs data of exports and imports for the years 2008 to 2012. To tackle the simultaneity problem between imports and exports, I apply an instrumental variable strategy by employing import tariffs and real exchange rates as instruments, using a weighting procedure that utilises each industry's use of imported inputs. The findings suggest that imports raise productivity and export performance. Higher access to input varieties has a larger impact than just an increase in import volume on export performance, 1.8 percent and 0.5 percent respectively, implying that the main benefits of importing come from access to broader alternatives of inputs. The causal relation between imported inputs and exports does not hold for firms in global production sharing (GPS) sectors, suggesting firms in these industries manage their input and export decisions differently. The impact of imported inputs on exports is larger when imports originate from developed countries, suggesting a positive effect of technology and product quality. Effects on exports to countries in East Asia are particularly large. Imported inputs thus help Indonesian firms connect to regional manufacturing value chains.

5.1. Introduction

The rise in the interconnectedness of production around the world has highlighted the role of imported intermediate inputs in manufacturing trade performance. The increasing degree of vertical specialisation has escalated the use of imported inputs in production as well as exports (Hummels, Ishii & Yi 2001). From the perspective of a single country (or a firm), the role of imported inputs is essential due to their function as the source of productivity enhancing technology. Especially for trade in parts and components, imported inputs become a ‘ticket’ to participate in GPS (Pierola, Fernandes & Farole 2018). Firms work together to produce final products by building cross-country production networks or relationships with buyers and suppliers. As a result, the flow of unfinished goods has increased across economies while trade in intermediate goods has now surpassed half of the total world trade.¹

The advantage of using imported inputs in production is significant. Theoretically, Ethier (1982) and Markusen (1989) demonstrate the gains from imported inputs due to a finer division of labour. Recent empirical studies have demonstrated how importing intermediate inputs has increased firms’ total factor productivity (Amiti & Konings 2007; Bas & Strauss-Kahn 2013; Halpern, Koren & Szeidl 2015; Kasahara & Rodrigue 2008), increased product scopes (Goldberg et al. 2010; Damijan, Konings & Polanec 2014) and improved product quality (Bas & Strauss-Kahn 2015; Fan, Li & Yeaple 2015). The learning process from technologies embodied in the variety of imported inputs has been recognised as the channel by which the performance of a firm can be increased through several mechanisms. First, the

¹ This chapter defines intermediate inputs as any material inputs used in production, including parts and components. Later, I also analyse parts and components separately.

potentially higher quality of imported intermediate inputs may increase the quality of the final product, and thus increase the demand for the firm's product and subsequently raise profitability. Moreover, utilising more imported input varieties that are not available domestically can provide additional gains through product innovation that may increase revenues. Second, imported inputs also may reduce the cost of production since firms have access to cheaper inputs from foreign countries in order to optimise their price-quality decisions. Third, imported inputs may affect a firm's output indirectly, through the production function, by increasing the efficiency of the division of labour or from the quality effect that can increase the overall firm's total factor productivity (Feng, Li & Swenson 2016). The combination of these channels defines the profit functions for firms' import decisions.

This chapter investigates the role of imported inputs in enhancing a firm's productivity and its performance in international markets. Many studies have found evidence of the effect of imported inputs on productivity. However, the effect on exports has been relatively under-explored.² For countries eager to boost their exports while having ambivalence towards imports, this research question carries economic and political interests.³ Therefore, the finding of this study will give insight to policymakers into understanding firms' behaviour especially their import-export decisions.

² Two of the few recent studies are Bas and Strauss-Kahn (2013) on France, and Feng, Li, and Swenson (2016) on China. These studies have empirically shown the significant impact of imported intermediate inputs' expansion on a firm's export outcomes. There is another strand of literature that focuses on how imported intermediate inputs relate to exports. Mostly at the country level, studies on global value chains (GVCs) pioneered by Hummels, Ishii and Yi (2001), have developed measurements of foreign value-added (or imported inputs) share in a country's exports.

³ See Patunru (2018) for an example of this ambivalence. Table 5A.1 and Figure 5A.1 in Appendix 5 show that regions with relatively low import tariffs on intermediate goods used for manufacturing do not only have a higher import of intermediate goods but also a higher export of manufacturing products.

The mechanism of how imported inputs relate to export performance is straightforward. When a firm decides to scale up its production and to access foreign markets, it also needs to scale up its inputs. In order to minimise costs, it can choose to supply the intermediate inputs domestically or by importation.⁴ Given a certain level of productivity, the manager of a firm would estimate the potential costs and revenues from this export-input decision and, in so doing, pay attention to the technology and quality embedded in the inputs. Even though the correlation between import and export in firm-level decisions is clear, the causality is ambiguous. Papers, written by Aristei, Castellani and Franco (2013) and Kasahara and Lapham (2013), show that there might be two-way relationships between exporting and importing decisions.⁵ These simultaneous decisions make the connection between imports and exports more complicated because they are both functions of a firm's productivity.

To examine the causal relationship between import and export, this study applies an instrumental variable method proposed by Feng, Li and Swenson (2016). This study instruments import activities with two exogenous variables that affect the relative cost of foreign inputs; the changes in intermediate input import tariffs as well as import-weighted exchange rate movements. Earlier studies have suggested the

⁴ The framework to analyse a firm-level decision to export introduced by Melitz (2003) has inspired many studies to also analyse a firm's import decisions. Moreover, Antràs, Fort and Tintelnot (2017) show that a foreign sourcing (that is, input importing) decision is much more complicated since there is inter-dependency within the sourcing decisions across markets. As an importing firm seeks to lower its marginal costs, the decision to import from one market also affects the decision to import from other markets.

⁵ There are some explanations for this two-way relationship between exports and imports. First, assuming there are sunk costs associated with both activities, the most productive firms self-select into two-way trade. Second, firms that have previously traded one-way would switch to two-way trade as they see an opportunity to spread the sunk costs between two activities. The cost of exporting (importing) decreases when the firm in question has already carried out importing (exporting) activities. Third, importing (exporting) may have an effect on exporting (importing) due to the opening up of information channels or because of the indirect channels of productivity—augmentation and innovation.

importance of accessing the intermediate inputs at free trade prices (Keesing & Lall 1992). As shown by Johnson and Noguera (2017), the changes in trade frictions, such as tariffs, for manufacturing inputs play a major role, particularly for firms engaged in production networks. Change in import tariffs is a good instrument because it has no direct effect on exports, that is, import tariffs can affect exports only through imported inputs. In addition, import tariffs have been used in many studies to predict imports (Amiti & Konings 2007; Bas & Strauss-Kahn 2013). To ensure further the exclusion restriction of tariffs, this study applies a weighting procedure that utilises each industry's use of imported inputs. Meanwhile, the import behaviour of a firm may be affected by exchange rate movements according to their degree of exposure to foreign markets. Note, however, that the standard measurement of real exchange rates can influence import costs and have a correlation with exports (Greenaway, Kneller & Zhang 2012). To construct an exchange rate instrument that is free from such direct relation to exports, this study implements a weighting procedure that utilises imported input dynamics but excludes export dynamics.

This study uses two definitions of imported inputs: the total value of a firm's imported input and the number of varieties of a firm's imported inputs that are defined as product-country pairs.⁶ The relation of total imported values with exports may show the general inference of the importance of imported inputs to exports. It could contain the quality- and revenue increasing- effects of imports even though we cannot disentangle these specific effects. That said, the number of import varieties might provide a richer explanation. Broda and Weinstein (2006) show that import

⁶ There are many definitions of product varieties. The most common used in empirical exercises is by relating the varieties with the available product classifications. This chapter follows Broda and Weinstein (2006) and Bas and Strauss-Kahn (2013) who define varieties as product-country pairs.

varieties have become an important source of gain from trade via the ‘love of variety’ mechanism (Krugman 1979). Some types of intermediate inputs might not be available domestically. Thus, access to those inputs from foreign countries could increase a firm’s capability of producing a certain product. This is relevant with current developments within international trade where countries (or firms) become more specialised. This results in there being only a few particular countries (or firms) that are able to produce a specific intermediate input. Furthermore, access to more varieties (product-country pairs) of imported inputs could give a firm the opportunity to be more efficient in expanding its outputs because it has more choices in managing its inputs. A firm can have more alternatives for obtaining a certain input from more than one country (both from domestic and imports) by optimising the price and quality decision; thus minimising costs and maximising profits. Therefore, the benefits from multiple varieties may enhance the effects of imported inputs on exports.

The study uses the Indonesian firm-level dataset merged with detailed import and export data at the 10-digit harmonised system (HS) product level and at the country level (both sources of import and export destinations) from Indonesian Customs for the period from 2008 to 2012. These datasets are further merged with constructed HS 6-digit tariffs and the exchange rate dataset as instruments and control variables.⁷ First, following Bas and Strauss-Kahn (2013), I estimate total factor productivity (TFP) using the semi-parametric method of Levinsohn and Petrin (2003) by incorporating the decision to import intermediate inputs in the production function. This study finds a positive effect of imported inputs on firm productivity. Subsequently,

⁷ This study extracts the detailed tariffs data (HS 6-digits products) from the TRAINS database while the real exchange rate (RER) data are constructed from the Penn World Table.

controlling for the estimated TFP, this study investigates how the use of imported intermediate inputs affects export performance. By employing the instrumental variable method explained above, the empirical result shows that the increase of imported inputs used in production enhances the firm's export performance. The effects are escalated when I use the variety (product-country pairs) of imported intermediate inputs as the explanatory variable, implying significant gains from variety.

Moreover, to further confirm the causality between imported inputs and exports, I extend the analysis by excluding foreign firms and firms in a production network that might manage their import-export decisions differently. I find that the impact of imported inputs on exports is more significant for domestic firms and firms that are not in GPS sectors. The lead firm at the headquarters office may give a direction regarding import-export decisions for multinational firms. In addition, firms in production sharing may already have time-based contracts regarding import-export activities. Additionally, to obtain further insights into the channel of how imported inputs affect exports, this study links the source of imports with export destinations. I decompose the import sources and export markets into developed countries, developing countries, East-Asian countries and non-East-Asian countries.⁸ Compared to the baseline, I find that the effect is larger for imports from developed countries, suggesting a positive effect of technology and product quality associated with imported inputs. As expected, the technology transfer through imported inputs used in production could promote the firm's performance. Furthermore, this study reveals

⁸ I follow the previous studies to decompose countries based on their level of development (Bas & Strauss-Kahn 2013; Feng, Li & Swenson 2016). However, instead of G7 and non-G7 countries, I use the United Nations (UN) definition of developed and developing countries. Since Indonesia's main trade partners are from the East-Asian region, I also differentiate countries based on their regions. This could reflect the gravity-distance effects of trade and also could explain Indonesia's participation in a regional value chain. See Table 5A.9 in Appendix 5 for the classification of countries.

that the effect of imported inputs on exports to East-Asian countries is much higher and more significant than to destination countries outside the region. This provides an indication that imported inputs have helped Indonesian firms to connect to the regional value chain.

This study contributes to the growing literature on imported inputs and firms' performance. First, this study provides additional evidence on the positive effects of imported inputs on firm productivity in a developing country. Furthermore, even though there are some investigations that have related the importance of imported inputs to export, this research, among very few studies, provides causal evidence of how imported intermediate inputs affect export performance. In the current era of trade disputes, many countries are getting more protectionist—or mercantilist—where imports are seen as a threat to the economy. In that regard, this study highlights the importance of imported input on domestic firms' productivity and export performance.

The rest of this chapter is structured as follows. Section 5.2 provides the theoretical framework on how imports of intermediate inputs affect a firm's performance, which is followed by Section 5.3 that describes the empirical strategy. In Section 5.4, I explain the dataset and discuss some stylised facts of import and export activities of manufacturing firms in Indonesia. Section 5.5 reports the main results and demonstrates some extensions of those results. Section 5.6 concludes my discussion.

5.2. Theoretical framework

In this section, I discuss the theoretical mechanism of how an increase in imported intermediate inputs affects a firm's performance.

5.2.1. Total factor productivity

I follow the partial equilibrium model of Kasahara and Rodrigue (2008) and Bas and Strauss-Kahn (2013) who develop a Melitz-type heterogeneous firm's model with intermediate goods to explain the simultaneous choices related to importing intermediate goods. In the framework, importing inputs may affect the TFP due to the technological and quality factors that are embedded in the imported inputs.

It can be supposed that to produce a total output Y_{it} for each period of t , a firm i uses different types of inputs, namely capital K_{it} , labour L_{it} , energy R_{it} , and a set of horizontally differentiated intermediate materials $Z(g)$ that can be domestically sourced or imported.

$$Y_{it} = e^{\omega_{it}} K_{it}^{\beta_k} L_{it}^{\beta_l} R_{it}^{\beta_r} \left[\int_0^{N(d_{it})} Z(g)^{\frac{\theta-1}{\theta}} dg \right]^{\frac{\beta_z \theta}{\theta-1}} \quad (5.1).$$

The variable, ω_{it} , represents serially-correlated productivity shocks. The elasticity of substitution between any two material inputs is given by $\theta > 1$. The variable $N(d_{it})$ denotes the range of intermediate inputs needed in the production that can be obtained from home country $N_{h,t}$ or that are available in the world market $N_{f,t}$. The decision on intermediate input is a discrete choice function, denoted by $d_{it} \in \{0,1\}$, to import from abroad or not: $N(d_{it}) = (1 - d_{it})N_{h,t} + d_{it}N_{f,t}$. There is a range of intermediate inputs that are not produced locally but can be imported from other countries. Consider the equilibrium in which all intermediate goods are symmetrically produced at level $\bar{z}$. Substituting $z(g) = \bar{z}$ into Equation 5.1 leads to:

$$Y_{it} = e^{\omega_{it}} N(d_{it})^{\frac{\beta_z}{\theta-1}} K_{it}^{\beta_k} L_{it}^{\beta_l} R_{it}^{\beta_r} \bar{z}^{\beta_z} \quad (5.2)$$

where $Z_{it} = N(d_{it})\bar{z}$. The TFP is defined as $A_{it} = \frac{Y_{it}}{K_{it}^{\beta_K} L_{it}^{\beta_L} R_{it}^{\beta_R} Z_{it}^{\beta_Z}}$. Then, from equation (5.2), we get:

$$\ln A(d_{it}, \omega) = \frac{\beta_Z}{\theta-1} \ln(N(d_{it})) + \omega_{it} \quad (5.3).$$

Equation 5.3 indicates that productivity is positively related to the range of intermediate inputs utilised in production. Firms importing intermediate inputs from abroad can employ a larger variety of intermediate inputs and hence have higher productivity than those employing domestic intermediate inputs only.

5.2.2. Export performance

This study connects the decision on intermediate inputs with export performance. Consider the standard profit maximisation problem of firm i : $\max \pi_{it} = r(y)_{it} - c(y)_{it}$, where r is revenue and c is cost. Both depend on the quantity of production y_{it} . Noted that firm i might export part of its production in as much as y_{it}^{EX} ; where $y_{it} = y_{it}^{EX} + y_{it}^{DOM}$. As explained in Equation 5.1, the quantity of output produced y_{it} depends on the input choices, including intermediate inputs obtained from domestic producers $N_{h,t}$ and from import $N_{f,t}$. Each intermediate input is selected to maximise the firm's export profits, therefore the profit is also a function of intermediate inputs, $\pi_{it} = f\{N(d_{it})\}$.

Input decisions affect the cost of production, $c(y)_{it}$ in several ways. When the firm selects its combined inputs, the fixed and marginal costs of acquiring the inputs determine the optimal input use. As discussed by Kasahara and Lapham (2013) and Damijan, Konings and Polanec (2014), the fixed costs of getting intermediate inputs

could be significant, especially for imported inputs.⁹ The firm might face credit constraints that limit the amount of working capital available; thus only more productive firms (or firms that can utilise inputs efficiently) are able to import. This is also explained by Equation 5.3 that correlates the import decision with productivity.

The marginal costs of obtaining inputs depend on the prices of the inputs as well as other variable costs. Given a certain level of quality required, a firm will choose the cheapest from various options of a specific intermediate material either from domestic or foreign markets. Even though an imported input could be cheaper, firms need to consider additional variable costs before deciding to import. These costs may include import tariffs as well as the costs associated with real exchange rates. Any change in these factors may affect the decision to import intermediate inputs. The firm could thus respond to the changes in these variable costs by adjusting its set of imported intermediate inputs or the levels of the imported inputs used in production or both.

The decision on inputs could affect the revenue $r(y)_{it}$ via prices as well as the quantities demanded (Fan, Li & Yeaple 2015). As imported inputs potentially have higher quality, the amount (and the variety) of imported intermediate inputs used in the production could improve the firm's total revenue. The firm's export revenue could also increase since specific export markets might demand a specific quality of final products. Additionally, the increase in imported intermediate inputs could influence the firm's output through the production function as noted. The production

⁹ These fixed costs include sunk costs and per-period fixed costs. The former include costs for establishing a network with a foreign supplier and for learning about government regulations, while the latter includes fixed costs per shipment that force firms to reduce the frequency of shipments but with a higher volume (Kasahara & Lapham 2013; Kropf & Saure 2014).

technology could become more efficient due to an increased division of labour (Ethier 1982), or due to the superior quality of imported inputs relative to domestic inputs (Halpern, Koren & Szeidl 2015), or the combination of both.

In the globalisation era where trade costs are getting lower, firms no longer have to focus only on domestic markets but now they have the incentive to serve foreign markets as well. In serving these different markets, the skills needed to navigate the abundant choice of intermediate inputs become more crucial. Access to intermediate inputs at free trade prices becomes a key determinant of export success. This is even more so, as firms become involved in production networks. The increasing degree of specialisation at country level and firm level amplifies the need of intermediate inputs. As discussed in many literatures on global value chains (GVCs), as the global trade intensifies, cross-country transactions via both import on intermediate inputs and exports, also increases (Athukorala & Kohpaiboon 2014; Hummels, Ishii & Yi 2001; Johnson & Noguera 2017). At the micro level, the proportion of manufacturing firms engaged in both importing and exporting activities also increases.

Since many firms both import and export, there could be a two-way relation between the import of intermediate inputs and export performance. Aristei, Castellani and Franco (2013) and Kasahara and Lapham (2013) have discussed some possible mechanisms by which these two activities could be complementary and simultaneous—even though the direction is more obvious from import to export than the other way around. Assuming there are sunk costs for import and export, the most productive firms would self-select into two-way trade. Firms that are one-way traders might switch and become two-way traders if they can spread the sunk costs across the two activities. The cost of exporting (importing) can be reduced whenever the firm in

question already carries out importing (exporting) activities. If a firm has been exposed to foreign markets by importing (exporting), its productivity could be further increased due to the learning mechanism which in turn affects its export (import) performance.

5.3. Empirical Strategy

5.3.1. Total factor productivity

To see whether imported inputs improve firms' productivity, this study follows the Levinsohn and Petrin (2003) method, which is an extension of the Olley and Pakes (1996) method. The Levinsohn and Petrin method controls for simultaneity bias in the production function that may arise from input variables and unobserved productivity shocks. Firm-specific productivity is known by the firm but not by the econometrician and the firm responds to expected productivity shocks by adjusting its inputs. This method also reduces the selection bias in which unproductive firms are likely to leave the industry and be replaced by firms that are more productive. The Levinsohn and Petrin method is preferable to the Olley and Pakes method due to data reasons. The latter relies on investment data as the proxy for the unobservable shocks. The investment proxy is valid only for firms that report non-zero investment; alas, many datasets do not report investment data. Nevertheless, Levinsohn and Petrin use material or energy inputs as proxy, and data input variables are mostly available in all datasets, reducing the problem of data truncation.

Another problem that may arise in the TFP estimation is that the imported input decision can be correlated with other inputs; therefore, omitting the import variable in the estimation could yield inconsistent input coefficients and productivity estimates. In that case, incorporating imported input variables should reduce this bias

(De Loecker 2007; Kasahara & Rodrigue 2008; Bas & Strauss-Kahn 2013). Therefore, this study modifies the Levinsohn and Petrin method by including import variables in the TFP estimation. From Equation 5.2 above, we can specify the Cobb–Douglas production function:

$$y_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_r r_{it} + \beta_z z_{it} + \beta_d d_{it} + \omega_{it} + v_{it} \quad (5.4)$$

where lower-case variables denote log values and d_{it} is the discrete choice of whether or not to import from abroad; ω_{it} captures productivity and v_{it} is the standard *i.i.d* error term capturing unanticipated shocks to production and measurement error. All variables in values are deflated to proxy for physical quantities. After estimating Equation 5.4 and getting all coefficients of inputs, the TFP is obtained by using the procedures explained by De Loecker and Warzynski (2012) and Mollisi and Rovigatti (2017) with the simplification as: $\hat{\omega}_{it} = \varphi_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_r r_{it} - \hat{\beta}_z z_{it} - \hat{\beta}_d d_{it}$.

5.3.2. The impact of imported intermediate inputs on exports

Our main interest is to see how imported intermediate inputs affect export performance. The basic empirical model follows a supply equation:

$$Export_{ijt} = \alpha + \beta Import_{ijt} + \gamma X_{ijt} + \varepsilon_{ijt} \quad (5.5)$$

where $Export_{ijt}$ is the export performance of firm i in industry j (5-digit International Standard Industrial Classification (ISIC)) in year t . The export performance is defined as the natural log of firm i 's total export value. The primary interest is in estimating the impact of imported inputs on export through coefficient β . This study uses two definitions of imported inputs; namely the natural log of total import value and the

natural log of imported country-product pair varieties. Several firm-level control variables are included in X_{ijt} such as the number of workers, the estimated TFP and the status of foreign ownership. The error term is defined as $\varepsilon_{ijt} = \delta_{ij} + \sigma_t + \rho_j + \epsilon_{ijt}$ with ϵ_{ijt} following an independent and identically distributed (*i.i.d.*) distribution. To account for the potential unobserved firm-level invariant factors that might influence the firm's decision to export, we include firm-fixed effects (δ_{ij}). Additionally, dummies for sectors are also included in the model to absorb any industry-specific characteristics (ρ_j). Finally we include a time dummy to control for time-varying determinants of exports (σ_t).¹⁰

Equation 5.5 can be estimated using an ordinary least squares (OLS) fixed-effects estimator if we believe the import variable is exogenous on export. However, as noted, some simultaneities between these two variables might take place. To overcome this possibility, this study uses two exogenous variables that measure the relative costs of foreign inputs so as to instrument the import decision.

5.3.3. Instruments

The two instrumental variables used are inputs' import tariffs and inputs' import real exchange rates. Both instruments are weighted at the industry-year level to reduce the reverse causality problem between import at the firm-level and these instruments. Following Feng, Li and Swenson (2016), I identify the input import tariff and import-weighted real exchange rate in industry j in year t as follows:

¹⁰ One might expect a lagged structure in this equation as imports might take time before they affect exports. But due to data limitation (five years' observations), I do not employ lags in the model. To reduce the endogeneity problem between export and import, I use an instrumental variable (IV) strategy.

$$ImDuty_{jt} = \sum_{p=1}^{P_j^M} \frac{\overline{IM}_{pj}}{\sum_{p=1}^{P_j^M} \overline{IM}_{pj}} \tau_{pt} \quad (5.6)$$

$$ImRER_{jt} = \sum_{c=1}^{C_j^M} \frac{\overline{IM}_{cj}}{\sum_{c=1}^{C_j^M} \overline{IM}_{cj}} RER_{ct} \quad (5.7).$$

The input import tariff $ImDuty_{jt}$ is constructed from detailed import data of HS 10-digit products p for each year t that are aggregated into HS 6-digit tariffs τ_{pt} . The P_j^M is the set of imported intermediate input products needed for all firms in the 5-digit ISIC industry j during the years of 2008 to 2012. I calculate average value of imports of each HS 6-digit products p at industry j during the period of observation to construct the weight. The $\overline{IM}_{pj} / \sum_{p=1}^{P_j^M} \overline{IM}_{pj}$ reflects the average proportion of imported input p needed in industry j . Subsequently, I multiply it with the applied import tariffs of product p at year t and then do the aggregation at industry level to obtain the import tariffs at the industry-year level.

Similarly, the import-weighted exchange rate $ImRER_{jt}$ is constructed from detailed total imports sourced from a specific country c . The C_j^M is the set of countries where firms in industry j purchase their imported inputs. I calculate the average proportion of imports from country c for each industry j during 2008–12 to construct the weight $\overline{IM}_{cj} / \sum_{c=1}^{C_j^M} \overline{IM}_{cj}$. The RER_{ct} is an index constructed from the nominal exchange rates of Indonesia and each country c for each year t ; expressed as units of Indonesia's market basket per basket of foreign country c , obtained from the Penn World Table.¹¹

¹¹ To construct the RER, I follow Feenstra, Inklaar and Timmer (2015).

The instruments are at the 5-digit ISIC industry-year level that should give sufficient variation to estimate the import of intermediate inputs at the firm's level. However, the period of observation covers only five years. I cannot employ year-fixed effects in the IV model since it will absorb all time variation on the instruments. Therefore, I modify the basic model by changing the year-fixed effect term. Since the observation period includes the crisis years of 2008 and 2009, this chapter uses the crisis dummy equal to one if it is in the crisis years and zero otherwise. I expect this crisis dummy to play a similar role as the year-fixed effects do by absorbing most of the unobserved time variant confounding factors in the model. Equation 5.5 can thus be modified to:

$$Export_{ijt} = \alpha + \beta Import_{ijt} + \gamma X_{ijt} + \delta_{ij} + crisis_t + \rho_j + \epsilon_{ijt} \quad (5.8).$$

In addition to the control variables in X_{ijt} , some variables that affect the costs of exports are also included. They are output tariffs that Indonesian firms have to pay in export-destination markets and export-weighted real exchange rates, which are constructed as in Feng, Li and Swenson (2016). These two variables are at the 5-digit ISIC industry-year level to reduce the possibility of reverse causality between exports and these variables. In particular, the output tariff measure is constructed as:

$$ExDuty_{jt} = \sum_{p=1}^{P_j^E} \sum_{c=1}^{C_j^E} \frac{\overline{EX}_{pcj}}{\sum_{p=1}^{P_j^E} \sum_{c=1}^{C_j^E} \overline{EX}_{pcj}} \tau_{pct} \quad (5.9)$$

where $\overline{EX}_{pcj}$ is the average export value during 2008–12 of 6-digit product p exported by firms in the 5-digit ISIC industry j in country c ; and P_j^E and C_j^E are the sets of exported products and destination countries, respectively. The most favoured nation

(MFN) tariffs imposed on product p by export-destination country c in year t is denoted τ_{pct} .

Similarly, the export-weighted real exchange rate is defined as:

$$ExRER_{jt} = \sum_{c=1}^{C_j^E} \frac{\overline{EX}_{cj}}{\sum_{c=1}^{C_j^E} \overline{EX}_{cj}} RER_{ct} \quad (5.10)$$

where RER_{ct} is the constructed real exchange rate between Indonesia and country c in year t , expressed as units of Indonesia's market basket per basket of foreign country c , obtained from the Penn World Table, and $\overline{EX}_{cj}$ is the average export value during 2008–12 shipped by firms in industry j to country c .

5.4. Data

This study uses an unbalanced panel dataset of Indonesian manufacturing firms from 2008 to 2012 obtained from several sources. The first one is the Industrial Statistic (Statistik Industri, SI) based on an annual survey conducted by the Central Bureau of Statistics (Badan Pusat Statistik, BPS). The survey covers all firms that employ 20 or more workers.¹² The data captures detailed information from firms, such as inputs—capital stock, labour, material and energy used in production—outputs, and ownership, which are important for the construction of the TFP as well as for estimating the main model.¹³ The data are available for each firm at the 5-digit level of the ISIC.¹⁴

¹² The survey is actually conducted at plant level. Some plants could be related to each other under a holding company. However, the information about that is untraceable. For simplicity, this chapter uses the definition 'firms' for the rest of the chapter.

¹³ We use the wholesale price index (WPI) data to deflate several variables. This index is also published by BPS. I thank Sadayuki Takii from Seinan Gakuin University for sharing his aggregation of BPS' WPI

The second source of data is the Indonesian Customs Office that records detailed transactions of the exports and imports of manufacturing firms.¹⁵ This import dataset contains information at the firm level about import sources, USD import values and import volumes in kilograms for each detailed HS 10-digit product.¹⁶ The export dataset is firm-level export data that provides information about export destinations; USD export values, and the net weight of export volumes in kilograms for each detailed HS 10-digit product. All these datasets are then merged using the firm identifier. Together they provide a rich dataset with detailed firm-level information as well as import and export activities. Since the matched dataset covers only manufacturing firms, it is assumed that all import transactions are for intermediate inputs for production.¹⁷

To estimate the TFP, this study employs the whole sample from the Industrial Statistics. However, for analysing the behaviour of exporting (and importing) firms, the main model uses only those firms that participate in export and/or import activities as recorded in the Customs data.¹⁸ Table 5.1 provides information on the trading

from the published WPI code to 4-digit ISIC Revision 3. Capital stock data could be problematic given there are many missing observations in various years. I drop firms with missing capital data for two consecutive years or more. If there is missing data for only one year, I do an interpolation.

¹⁴ I use a 5-digit ISIC classification to construct the instruments. Due to a computational issue, I use 2-digit ISIC to estimate the TFP. I also use 2-digit ISIC for the industry-fixed effect in the main model.

¹⁵ I thank Dionisius Narjoko and Chandra Putra from the Economic Research Institute for ASEAN and East Asia (ERIA) for providing the customs data with the firms' identifiers that can be matched with those from SI.

¹⁶ The standard HS data are expressed in 6-digit classifications. However, the Indonesian government classifies import and export products up to a 10-digit HS.

¹⁷ The customs data only identifies manufacturing firms that do exports and/or imports directly. Some firms might trade through trading companies. This study does not include such firms. Therefore, the results of this study might be underestimated compared to the results that could have been achieved if we had used all direct and indirect traders.

¹⁸ There is a possibility that firms do export (import) indirectly. They trade through the trading companies and their activities are reported in the SI. However, this study focuses only on firms that

activities of firms that are used in the main model. Some firms trade only one-way, but others both export and import.¹⁹

I also collected tariff data from the TRAINS database to construct the instrument import-weighted tariffs ($ImDuty_{jt}$) and control variable export-weighted tariffs ($ExDuty_{jt}$). For the latter, I collect detailed import-applied Most Favourite Nation (MFN) tariffs at HS 6-digit product in all countries and connect them with each export destination of Indonesia's 10-digit HS exported products. As for the instrument, this study uses detailed Indonesian import tariffs at the HS 6-digit product classification, which is then matched with the HS 10-digit imported inputs data.

For the import tariff instruments, this study employs the average applied preference tariffs instead of the applied MFN tariffs. This is because the applied MFN tariffs, for almost all of Indonesia's imported products, had not changed significantly during the observation period as Indonesia had passed the period of the liberalisation of MFN tariffs. Since I rely on the variations of the instrument, I instead use the variation of tariffs associated with preferential trade agreements (PTAs). During the period of observation, Indonesia increased its engagement with neighbouring countries by participating in bilateral or regional free trade agreements (FTAs).²⁰ Even though we cannot track which firms use which tariffs, the change in the preferential

trade directly. Due to this selection bias, I might underestimate the results. If so, the effects of imported intermediate inputs might, in reality, be higher.

¹⁹ It is a bit puzzling that the largest group of firms falls into the 'only exporter' category. This implies that all their inputs are domestically sourced. Table 5A.5 in Appendix 5 might explain this situation. The three largest observations of firms in the dataset indeed came from the food industry (ISIC 15), the furniture industry (ISIC 36) and the manufacture of rubber and plastic (ISIC 25).

²⁰ Particularly the Indonesia–Japan Economic Partnership Agreement (IJEPA) in 2007 and the ASEAN China Free Trade Agreement (ACFTA) in 2010.

tariffs schedule can be assumed to affect the firms' participation in international trade as the tariffs affect the cost of imports.²¹

Table 5.1. Exporting and importing firms

Year	Only exporter	Only importer	Exporter and importer	Total
2008	1087	549	742	2378
2009	1165	585	794	2544
2010	1134	667	837	2638
2011	1113	696	875	2684
2012	935	775	962	2672
All	5434	3272	4210	12916

Source. Calculated from Customs data

Table 5.2 shows the top 10 originating countries for Indonesian firms' imports of intermediate goods in 2012. China, Japan and South Korea are the three largest sources of imports that cumulatively account for 34.6 percent of imports of intermediate goods. ASEAN countries, namely Malaysia, Singapore and Thailand are also large sources of imports; and together with the former group—as well as other ASEAN countries—they account for more than half of the imports of intermediate goods. Indonesia has PTAs with all these countries. Furthermore, even though there are no preferential tariffs, Indonesia also imports a large number of intermediate goods from Germany (and other European countries), Hong Kong, Taiwan and the USA. These whole groups are the source countries for almost 80 percent of Indonesia's imports of intermediate products. Therefore, to construct the instrument I use the average applied preferential tariffs of each of the HS 6-digit products from these countries. As explained in the methodology section, these tariffs are then aggregated

²¹ Note that the utilisation rates of FTAs by Indonesian firms are relatively small albeit increasing over the years (Anas & Narjoko 2018). Among ASEAN FTAs, the highest utilisation rate for exports is the concession with China under the ACFTA (around 70 percent in 2015) and among ASEAN members (around 60 percent in 2015). For imports, the IJEPA and the ASEAN Trade in Goods Agreement (ATIGA) have the highest utilisation at around 24 percent in 2016.

at a 5-digit ISIC industry classification. To give some comparison, Table 5A.2 in Appendix 5 provides the top 10 export destinations of Indonesian manufacturing products in 2012.

Table 5.2. Top 10 source countries for Indonesian firms' imports of intermediate goods, 2012

	Rank by			Number of importers		Value of imports	
	Frequency	Firms	Value	Firms	% of total	Imports (Million USD)	% of total
Japan	1	2	1	893	46.7	4410	15.3
China	2	1	2	1391	72.8	3980	13.8
South Korea	3	4	4	754	39.4	1590	5.5
Taiwan	4	3	8	861	45.0	959	3.3
Singapore	5	6	6	669	35.0	1130	3.9
Germany	6	9	9	577	30.2	740	2.6
Hong Kong	7	10	10	366	19.1	462	1.6
USA	8	8	5	619	32.4	1390	4.8
Malaysia	9	5	7	685	35.8	1030	3.6
Thailand	10	7	3	625	32.7	2020	7.0

Source. Calculated from Customs data

It is possible that there would be problems with preferential tariffs. If trade policies across industries are influenced by industry lobbying and expected exports, there could be a serious correlation issue between tariff changes and industry-specific characteristics. To confirm there is no such issue, I follow a strategy designed by Bas and Strauss-Kahn (2013) that examines the correlation of tariff changes with initial industry performance. I regress changes in input tariffs on a number of industry characteristics computed as the average firm's initial characteristics in the initial year. They are TFP, employment, wages and exports at the industry level. Table 5A.3 in Appendix 5 provides the results and shows that there is no statistical correlation between input tariffs and industry characteristics.

Table 5.3. Summary statistics

VARIABLES	Obs	Mean	Std. Dev.	Min	Max
Import-weighted tariffs	12,916	1.99	1.95	0	18.63
Import-weighted RER	12,916	98.96	9.20	72.08	184.24
Export-weighted tariffs	12,916	8.80	21.74	0	587.33
Export-weighted RER	12,916	100.79	7.98	69.76	252.20
Ln(Export value)	12,916	10.24	6.41	0	21.78
Ln(Import value)	12,916	8.15	7.17	0	21.26
Ln(Import varieties)	12,916	1.71	1.77	0	7.09
Import varieties	12,916	26.06	64.81	0	1204.00
Number of workers	12,916	486.90	1315.48	20.00	38343.00
Foreign-owned status	12,916	0.32	0.47	0	1.00
Ln(TFP)	12,916	1.23	0.16	-0.34	1.62

Note. Variables in natural logarithmic form are calculated by adding a one for zero value to reduce the data truncation.

To construct the import- (and export-) weighted real exchange rates (RER), this study utilises the longitudinal data on countries that is available in the Penn World Table 9. The dataset provides information on the bilateral nominal exchange rate between the currency of any particular country and USDs over the years. I transformed these into an index of bilateral exchange rates with Indonesian Rupiah (IDR). The dataset also includes information on the domestic prices in every country over the years. I transform the prices data into indexes (2008 = 100) and express the prices as units of Indonesian baskets per basket of a specific foreign country. Using this information, I construct the import- (and export-) weighted real exchange rates by incorporating the weighting procedures explained in the methodology section. Table 5A.4 in Appendix 5 provides detailed information on the import- (and export-) weighted tariffs and exchange rates that are aggregated into a 2-digit ISIC. Table 5.3 shows the descriptive statistics for all the variables used in the main model. Table 5A.5 in Appendix 5 gives more detailed information about the imported input variation across the 2-digit ISIC sectors.

5.5. Results

5.5.1. TFP estimations

Various empirical studies have reported the positive effects of imported intermediate inputs on firms' productivity. This chapter tests the hypothesis using Indonesian manufacturing firms' data from 2008 to 2012. Table 5.4 shows the estimation results of production function in Equation 5.4 using the Levinsohn and Petrin (2003) method. The estimates in Column 1 present the baseline results of the standard model. Columns 2 to 6 show results when different definitions of variables of imported intermediate inputs are included in the model. In line with the findings of other studies (Amiti & Konings 2007; Bas & Strauss-Kahn 2013; Halpern, Koren & Szeidl 2015; Kasahara & Rodrigue 2008), we find that importing some of the intermediate inputs for production increases the TFP. From Column 2, we can infer that the decision to import some intermediate inputs can improve the TFP by 0.06 percent. Meanwhile, a 1 percent increase in the number of varieties of imported inputs improves the TFP by 0.03 percent. By way of comparison, Bas and Strauss-Kahn (2013), using French data, find that increasing the variety of imported inputs by 1 percent could increase productivity by 0.1 percent. There are two reasons why the impact for Indonesia is not as high as that in France. One could be related to the type of products they produce and the source of inputs they use. French manufacturers are more likely to produce more advanced products with higher technology, while Indonesian manufactured productions are mainly still in the low-skilled and labour-intensive sectors. In addition, French manufacturers are more likely to import inputs from neighbouring countries in the EU, who provide advanced technology products, while imported inputs for

Indonesian firms are sourced mainly from economies in the East-Asian region, with more varying industrial advancement.

Table 5.4. TFP estimation

VARIABLES	1	2	3	4	5	6
	Ln(Production Output) _{it}					
Ln(Labour) _{it}	0.289*** (0.00520)	0.286*** (0.0101)	0.285*** (0.0147)	0.286*** (0.0120)	0.285*** (0.0133)	0.286*** (0.00727)
Ln(Material) _{it}	0.937*** (0.00152)	0.936*** (0.00341)	0.937*** (0.00352)	0.937*** (0.00170)	0.936*** (0.000560)	0.936*** (0.00307)
Ln(Capital) _{it}	0.0064*** (0.00083)	0.00553*** (0.00137)	0.0040*** (0.00100)	0.00399*** (0.00102)	0.00432*** (0.00139)	0.00521*** (0.00166)
Import dummy _{it}		0.0621*** (0.00418)				
Ln(Import variety) _{it}			0.029*** (0.00099)			
Ln(Import value from Developed countries) _{it}				0.00245*** (0.000763)		
Ln(Import value from Developing countries) _{it}				0.00694 (0.00649)		
Import (dummy - East-Asia region) _{it}					0.0942*** (9.13e-05)	
Import (dummy - non-East-Asian region) _{it}					0.0016*** (0.000425)	
Import (dummy - East-Asian region - GPS sectors) _{it}						0.343*** (0.00309)
Import (dummy - East-Asia region - non-GPS sectors) _{it}						0.0387*** (0.00184)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	112,017	112,017	112,017	112,017	112,017	112,017
Number of groups	27,078	27,078	27,078	27,078	27,078	27,078

Notes. The TFP estimations use the Levinsohn–Petrin method from the prodest estimator. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

In Columns 4 to 6 in Table 5.4, I further examine the source of imported inputs to identify some possible channels of improved TFP. The coefficients of imported inputs from developed and developing countries are positive, but are only significant for developed countries (see Column 4). The technology (and quality) effects embedded in the inputs from developed countries could be the source of the

augmented productivity. Column 5 shows the results when the sources of inputs are divided into regions. Importing intermediate inputs from any region improves TFP, but importing from neighbouring countries in the East-Asian region has higher effects on productivity. This may imply the effects of regional value chains. In Column 6, this factor is further scrutinised. When the industry of a firm is classified using GPS sectors, it is revealed that the effect of imported inputs for firms engaged in GPS industries is much higher.²²

5.5.2. Imported inputs and export performance

Tables 5.5 and 5.6 provide the estimated impact of importing intermediate inputs on exports. Table 5.5 uses the definition of the variety of the import as the explanatory variable, while Table 5.6 uses import value. First, I conduct the standard fixed-effects technique. Columns 1 to 3 in Table 5.5 provide the results with different specifications that show the positive and significant associations of importing intermediate inputs with exports. Column 1 excludes the year-fixed effects. The magnitude of the variable of interest is smaller when I include the year-fixed effects—as in Column 2. As expected, the year-fixed effect absorbs the unobserved variable bias at specific years. As for the IV model, since I can no longer use the year-fixed effects, I replace it with a crisis dummy in the IV model, as shown in Column 3. It turns out that the coefficient of import varieties is almost the same as that in Column 2, albeit a bit higher. This means that the crisis dummy could absorb most of the omitted time bias although not completely. With this caveat, the rest of the identification strategies rely on the crisis dummy to absorb the bias related to the time effects.

²² This chapter uses the classification of GPS industries by Athukorala and Kohpaiboon (2014). See Table 5A.13 in Appendix 5.

Column 4 in Table 5.5 presents the results from the IV estimation. The coefficient of import varieties is much bigger. A 1 percent increase in imported input varieties escalates the export value by 1.8 percent. Incorporating other firm-level variables, namely TFP, size and foreign ownership, does not notably alter the magnitude of the import coefficient, as shown in Column 6. Similarly, this tendency also occurs in the fixed-effects identification in Column 5. For all specifications in Columns 1 to 6, the control variables are not (or they are less) significant with relatively small magnitudes. Most of variations in firm-level variables might have already been absorbed by the firm-fixed effects, so these control variables become insignificant. Interestingly, export-weighted tariffs and RER variables are not significant. This indicates that changes in export costs do not affect firm-level exports. It reveals that Indonesian firms are price takers and any changes in variable costs of exporting might not change the level of exports by firms that have already been exporting.

Columns 7 and 8 in Table 5.5 present the first stage results of the instrumental variable technique that corresponds with the second stage results provided in Columns 4 and 6 respectively. Both instruments have negative and significant coefficients on import varieties. The import-weighted tariff variable has the expected impact on import variety; imports increase as the import tariff declines. However, the coefficient of the other instrument, the import-weighted exchange rate, is negative. As the rupiah appreciates in real terms against the currencies of input-supplying partners, there is a decrease in the import of intermediate inputs of manufacturing products. This might be due to the way this variable is constructed in this study. Recall that the variable of weighted exchange rates only takes the importation of intermediate inputs into

account while ignoring export dynamics. Feng, Li and Swenson (2016) find a similar result, that is, a negative relationship between domestic currency appreciations and imports of intermediate inputs. The IV results are supported by first stage statistics that confirm the acceptability of selected instruments; that is the F statistics are larger than 10 percent; the Stock-Yogo critical value. Additionally, the Hansen tests infer that the over-identification restrictions are valid.

Table 5.6 shows the results when the variable of interest is import value. Columns 1 to 3 and 5 present the results with the fixed-effects estimator. It turns out that the impact of an increase in imported input values on export values is not clear cut. The fixed-effects model shows a significant negative association of import on export, with very small magnitudes and at 10 percent significance only. Since the fixed-effects identification still contains a simultaneity bias, as explained in the methodology section, we cannot rely on this result. The IV strategy provides a more acceptable result and shows a positive and significant effect of increasing imported input values on exports. Columns 4 and 6 indicate that a 1 percent increase in imported input value increases exports by 0.4–0.5 percent. Columns 7 and 8 demonstrate the first stage results of IV specification for Columns 4 and 6 respectively. Similar to the results in Table 5.5, the decline in import tariffs increases the import of intermediate inputs; and local currency appreciation reduces the import of manufacturing inputs.

Table 5.5. The impact of imported input varieties on exports

	1	2	3	4	5	6	7	8
	Dependent variable: $\text{Ln}(\text{Export values})_{ijt}$						First stage	
	FE	FE	FE	IV FE	FE	IV FE	$\text{Ln}(\text{Import varieties})_{ijt}$	
$\text{Ln}(\text{Import varieties})_{ijt}$	0.151*** (0.039)	0.085** (0.039)	0.090** (0.039)	1.765*** (0.497)	0.088** (0.039)	1.796*** (0.490)		
ExRER_{jt}	0.003 (0.004)	-0.000 (0.004)	-0.005 (0.004)	-0.005 (0.005)	-0.005 (0.004)	-0.005 (0.005)	0.000 (0.001)	0.000 (0.001)
ExDuty_{jt}	0.000 (0.002)	-0.000 (0.002)	0.000 (0.001)	-0.000 (0.002)	0.000 (0.002)	-0.000 (0.002)	0.000 (0.000)	0.000 (0.000)
Crisis dummy			-0.339*** (0.035)	-0.043 (0.093)	-0.338*** (0.035)	-0.037 (0.092)	-0.167*** (0.013)	-0.166*** (0.013)
TFP_{ijt}					-0.077 (0.187)	-0.213 (0.221)		0.081 (0.065)
Size_{ijt}					0.097** (0.045)	0.048 (0.051)		0.034** (0.014)
FDI_{ijt}					0.062 (0.109)	0.053 (0.125)		0.008 (0.037)
ImDuty_{jt}							-0.022*** (0.005)	-0.022*** (0.005)
ImRER_{jt}							-0.003*** (0.001)	-0.003*** (0.001)
Constant	9.668*** (0.550)	9.532*** (0.605)	10.652*** (0.577)		10.178*** (0.680)			
Observations	12523	12523	12523	12523	12523	12523	12523	12523
Number of Firms	2901	2901	2901	2901	2901	2901	2901	2901
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	Yes	No	No	No	No	No	No
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage IV statistics								
Hansen J statistic				0.15		0.15		
p-value of Hansen J statistic				0.70		0.70		
Endogeneity Tests				14.72		15.90		
LM test statistic				48.04		49.51		
F statistic Kleibergen-Paap				24.27		25.01		
Stock-Yogo 10%				19.93		19.93		
Stock-Yogo 15%				11.59		11.59		
Stock-Yogo 20%				8.75		8.75		
Stock-Yogo 25%				7.25		7.25		

Notes. The IV estimation uses the xtivreg2 estimator. The TFP is from an omega prediction using the prodest estimator which resulted from a specification in Column 2 in Table 5.4. Industry-fixed effects are in 2-digit ISIC. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. There are 393 singleton observations.

Table 5.6. The impact of the increase of intermediate input value on exports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: $\text{Ln}(\text{Export values})_{ijt}$						First stage	
	FE	FE	FE	IV FE	FE	IV FE	$\text{Ln}(\text{Import value})_{ijt}$	
$\text{Ln}(\text{Import value})_{ijt}$	-0.004 (0.012)	-0.023* (0.013)	-0.022* (0.013)	0.450*** (0.127)	-0.022* (0.013)	0.461*** (0.127)		
ExRER_{jt}	0.004 (0.004)	-0.000 (0.004)	-0.006 (0.004)	-0.003 (0.005)	-0.005 (0.004)	-0.003 (0.005)	-0.001 (0.004)	-0.001 (0.004)
ExDuty_{jt}	0.000 (0.002)	-0.000 (0.002)	0.000 (0.002)	0.000 (0.001)	0.000 (0.002)	0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Crisis dummy			-0.369*** (0.035)	-0.061 (0.088)	-0.368*** (0.035)	-0.053 (0.088)	-0.617*** (0.051)	-0.616*** (0.051)
TFP_{ijt}					-0.061 (0.186)	-0.252 (0.228)		0.401 (0.249)
Size_{ijt}					0.101** (0.045)	0.066 (0.051)		0.096* (0.051)
FDI_{ijt}					0.064 (0.109)	0.034 (0.119)		0.071 (0.134)
ImDuty_{jt}							-0.084*** (0.019)	-0.085*** (0.019)
ImRER_{jt}							-0.011*** (0.003)	-0.012*** (0.003)
Constant	9.975*** (0.560)	9.903*** (0.617)	11.087*** (0.591)		10.569*** (0.692)			
Observations	12523	12523	12523	12523	12523	12523	12523	12523
Number of Firms	2901	2901	2901	2901	2901	2901	2901	2901
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	Yes	No	No	No	No	No	No
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage IV statistics								
Hansen J statistic				0.11		0.10		
p-value of Hansen J statistic				0.74		0.75		
Endogeneity Tests				18.24		19.61		
LM test statistic				55.34		56.15		
F statistic Kleibergen-Paap				27.76		28.16		
Stock-Yogo 10%				19.93		19.93		
Stock-Yogo 15%				11.59		11.59		
Stock-Yogo 20%				8.75		8.75		
Stock-Yogo 25%				7.25		7.25		

Notes. The IV estimation using xtivreg2 estimator. TFP is from omega prediction using prodest estimator resulted from specification in Column 2 in Table 5.4. Industry fixed effects are in 2-digit ISIC. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. There are 393 singleton observations.

Comparing the results from Tables 5.5 and 5.6 can enrich our understanding of the impact of imported inputs on export. As discussed in the previous section, the import varieties have become an important source of gain (Broda & Weinstein 2006).

The access to a wider range of import varieties helps increase export performance. Some types of intermediate inputs might not be produced locally, therefore importing them should be beneficial and improve the firm's ability to produce and export. Additionally, broader options of varieties from various countries could help increase the firm's efficiency in producing exported products. The results of this study confirm this hypothesis. While a 1 percent increase in the value of imported inputs increases exports by 0.5 percent, a 1 percent increase in the number of varieties of the imported inputs increases exports by 1.8 percent. This might imply that the main source of benefit from importing is through access to a broader range of options of inputs rather than just through increasing import values.

Some possible explanations for why the impact of import variety is larger than that of the values of imported inputs can be investigated in the dataset. Over the years of observations, on average, firms could increase the number of countries from which imports were sourced in terms of 10-digit HS products (see Table 5A.6, Appendix 5). If we scrutinise the data, there seems to be at least three reasons. First, firms would like to source from countries that offer lower prices (price-substitute motives). Second, firms tend to increase the quality of goods produced by sourcing the material inputs from countries that offer better inputs (often associated with inputs that have higher prices or inputs from more advanced countries). Third, firms prefer to combine inputs from several countries for price and quality reasons or to produce more product varieties in its own production lines. Table 5A.7 in Appendix 5 gives a sample of a firm in my dataset, showing its sourcing strategy. Each year, this firm, sources a type of product (HS 10-digit: 3919109000) from more than 10 countries, with different volumes and price combinations. Over the years, we can see that the firm tends to

source a large amount of the product from the country offering the cheapest input, yet it still maintains inputs sourced from other countries albeit with more expensive prices. Elsewhere in the dataset, I found that many firms increased the number of their product varieties (again, in terms of 10-digit HS products) over time (see Table 5A.6 in Appendix 5). This may reflect that the firms acquired more access to new product varieties (new HS categories were introduced) or the firms simply wanted to increase their own product varieties. All these possible reasons are more likely to be pronounced for exporting firms since they need to be competitive in the export market by offering cheaper prices with higher qualities. When they are trying to access more markets, they are more likely to produce more differentiated products to fulfil different tastes or quality requirements.

The relationship between imported inputs and exports might not be clear for foreign-owned firms and the ones that participate in global production networks. The lead company in the country where the headquarters are located may give a direction regarding an import–export decision for a foreign-owned manufacturing firm in Indonesia. Recall that many multinational firms in Indonesia have their headquarters in Japan, Korea, the USA and other developed countries. In addition, firms that participate in GPS may already have time-based contracts regarding import–export activities. Therefore, focusing solely on fully domestic-owned firms and firms that do not participate in GPS may give a clearer view of the effects of imports on intermediate inputs on exports. To define which firms make up part of the GPS sector, I use the definition from Athukorala and Kohpaiboon (2014) who define which 4-digit ISIC sectors are in the GPS system. Table 5.7 provides the results if firms are separated into foreign-owned firms and domestic firms, while Table 5.8 differentiates the subsamples

into firms in the GPS and non-GPS sectors. The results show that fully domestic-owned firms have a higher and more significant impact on imported inputs on exports than foreign firms. In addition, firms in non-GPS sectors have a significant impact on imported inputs on exports, while firms in GPS sectors do not seem to have such a relationship. Thus, these two analyses confirm a clear causality relationship between imported inputs and exports.

Table 5.7. Foreign-owned firms and domestic firms

	1	2	3	4
	Foreign-owned firms		Fully domestic-owned firms	
Second Stages IV	Dependent variable: Ln(Export values) _{ijt}			
Ln(Import varieties) _{ijt}	1.453** (0.598)		2.225*** (0.827)	
Ln(Import values) _{ijt}		0.412** (0.171)		0.509*** (0.190)
Firm-fixed effects	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes
Crisis dummy	Yes	Yes	Yes	Yes
Observations	3998	3998	8324	8324
Number of Firms	942	2026	942	2026
p-value of Hansen J statistic	0.619	0.579	0.955	0.833
F statistic Kleibergen-Paap	8.864	10.09	13.393	15.812
First Stages	Ln(Import varieties) _{ijt}	Ln(Import values) _{ijt}	Ln(Import varieties) _{ijt}	Ln(Import values) _{ijt}
Ln(ImDuty) _{it}	-0.030** (0.012)	-0.100** (0.039)	-0.015*** (0.006)	-0.071*** (0.022)
Ln(ImRER) _{it}	-0.003* (0.002)	-0.012** (0.006)	-0.003*** (0.001)	-0.011*** (0.004)

Notes. The IV estimation using xtivreg2 estimator. Industry fixed effects is in 2-digit ISIC. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Furthermore, I divide the firms based on resource-based sectors and non-resource-based sectors (see Table 5A.8, Appendix 5 for the classification). Indonesia produces various kinds of primary goods, including minerals as well as forestry products, which are the main inputs for firms in the resource-based manufacturing sectors. Therefore, we expect that these industries obtain the inputs mainly from the domestic market. I test this possibility; and the results are shown in Table 5.9. As expected, the impact of imported inputs on exports in resource-based industries is not significant, while in non-resource-based sectors it is positive.

Table 5.8. Firms in GPS and non-GPS sectors

	1	2	3	4
	GPS Sectors		Non-GPS Sectors	
Second Stages IV	Dependent variable: Ln(Export values) _{ijt}			
Ln(Import varieties) _{ijt}	2.869 (2.695)		1.703*** (0.470)	
Ln(Import values) _{ijt}		0.623 (0.548)		0.435*** (0.121)
Firm-fixed effects	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes
Crisis dummy	Yes	Yes	Yes	Yes
Observations	1869	1869	10576	10576
Number of Firms	437	437	2497	2497
p-value of Hansen J statistic	0.872	0.986	0.693	0.871
F statistic Kleibergen-Paap	1.557	2.647	23.641	26.039
First Stages	Ln(Import varieties) _{ijt}	Ln(Import values) _{ijt}	Ln(Import varieties) _{ijt}	Ln(Import values) _{ijt}
Ln(ImDuty) _{jt}	-0.019 (0.017)	-0.103* (0.059)	-0.023*** (0.006)	-0.082*** (0.020)
Ln(ImRER) _{jt}	-0.001 (0.002)	-0.004 (0.008)	-0.003*** (0.001)	-0.014*** (0.004)

Notes. The IV estimation using xtivreg2 estimator. Industry-fixed effects are in 2-digit ISIC. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 5.9. Firms in resource-based sectors and non-resource-based sectors

	1	2	3	4
	Resource-based sectors		Non-resource-based sectors	
Second Stages IV	Dependent variable: Ln(Export values) _{ijt}			
Ln(Import varieties) _{ijt}	0.910 (1.374)		1.777*** (0.492)	
Ln(Import values) _{ijt}		0.188 (0.228)		0.521*** (0.150)
Firm-fixed effects	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes
Crisis dummy	Yes	Yes	Yes	Yes
Observations	3850	3850	8537	8537
Number of Firms	930	930	2010	2010
p-value of Hansen J statistic	0.646	0.950	0.574	0.627
F statistic Kleibergen-Paap	3.006	6.533	23.748	21.553
First Stages	Ln(Import varieties) _{ijt}	Ln(Import values) _{ijt}	Ln(Import varieties) _{ijt}	Ln(Import values) _{ijt}
Ln(ImDuty) _{jt}	0.007 (0.010)	-0.034 (0.044)	-0.028*** (0.006)	-0.094*** (0.022)
Ln(ImRER) _{jt}	-0.003** (0.001)	-0.014** (0.007)	-0.003*** (0.001)	-0.012*** (0.004)

Notes. The IV estimation using xtivreg2 estimator. Industry-fixed effects are in 2-digit ISIC. Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

5.5.3. Some possible channels

To examine the mechanism by which imported intermediate inputs affect exports, I conduct further tests. The data on the source of imports is connected with the data on export destinations. Countries are grouped based on their level of development (UN classification) as well as on their region (see Table 5A.9, Appendix 5).

Previous studies argue that technology and the quality embedded in the imported inputs are the reason why a firm's performance increases as it imports. This study examines this potential channel by grouping the import sources into developed and developing countries. Importing inputs from more technologically advanced countries is expected to have a higher effect on exports.

Furthermore, as discussed in any standard gravity model of trade, the geographical distance is an important factor that determines trade. This is especially relevant in the context of regional value chains. Manufacturing firms in a certain country intensify their trade with firms in neighbouring countries, both to supply inputs or to export their products. This study also investigates this potential channel by classifying countries based on regions—the East-Asian region and the non-East-Asian region.

Tables 5.10 and 5.11 provide the results. Each table provides 25 different empirical estimations that combine different sources of imports and export destinations. I decompose the country sources of intermediate inputs and the export destinations to analyse the impact of imported inputs on exports. As expected, I find that the effect is larger for the case of importing from developed countries (see Row 2 in Tables 5.10 and 5.11). Compared to the baseline in Row 1, sourcing input varieties from more technologically advanced countries provides a higher impact at about 35 percent for total exports; 37 percent for exports to developed countries and 31 percent for exports to the East-Asian region. Moreover, compared to the baseline, getting more inputs, in terms of value, from developed countries, which are expected to provide higher quality intermediate inputs, increases the export revenue by more than 62 percent. This might be due to the higher quality of produced products (and hence they obtain a higher price), that, in turn, is made possible by the higher quality of inputs. Based on these results, we can infer that the technology transfer through imported inputs from high-tech countries that are used in production could promote the export performance of firms.

Table 5.10. Heterogeneous impact of the increase of import varieties on export by different combinations of source-destination groups of countries

		1	2	3	4	5
		Outcome variable : Destination: Ln(Export values) _{ijt}				
Variable of interest		Total	Developed countries	Developing countries	East-Asian regions	Non-East-Asian regions
Sources: Ln(Import varieties) _{ijt}						
1	Total	1.796*** (0.490)	1.332** (0.571)	3.018*** (0.769)	3.764*** (0.836)	0.708 (0.587)
	<i>p</i> -value of Hansen J statistic	0.70	0.96	0.17	0.10	0.21
	F statistic Kleibergen-Paap	25.01	25.01	25.01	25.01	25.01
	Developed countries	2.424*** (0.710)	1.823** (0.798)	3.974*** (1.117)	4.949*** (1.241)	0.852 (0.803)
2	<i>p</i> -value of Hansen J statistic	0.46	0.87	0.08	0.04	0.17
	F statistic Kleibergen-Paap	16.72	16.72	16.72	16.72	16.72
	Developing countries	2.006*** (0.555)	1.487** (0.644)	3.374*** (0.870)	4.209*** (0.954)	0.793 (0.657)
	<i>p</i> -value of Hansen J statistic	0.95	0.18	0.11	0.21	0.71
3	F statistic Kleibergen-Paap	22.44	22.44	22.44	22.44	22.44
	East-Asian regions	1.802*** (0.490)	1.332** (0.572)	3.042*** (0.767)	3.795*** (0.834)	0.725 (0.589)
	<i>p</i> -value of Hansen J statistic	0.76	0.92	0.20	0.12	0.21
	F statistic Kleibergen-Paap	25.92	25.92	25.92	25.92	25.92
4	Non-East-Asian regions	3.291*** (1.041)	2.461** (1.117)	5.449*** (1.653)	6.790*** (1.895)	1.214 (1.097)
	<i>p</i> -value of Hansen J statistic	0.58	0.94	0.16	0.10	0.19
	F statistic Kleibergen-Paap	10.90	10.90	10.90	10.90	10.90

Notes. The IV estimation using xtvreg2 estimator. All specifications include firm-fixed effects and 2-digit ISIC industry-fixed effects. All specifications include the crisis dummy and controls at firm level: TFP, size, foreign-owned dummy and controls at industry level: export-weighted real exchange rates and average tariffs in the export markets. TFP is from an omega prediction using a prodest estimator which resulted from specification in Column 2, Table 5.4. All specifications use instrument variable techniques and use instruments: import-weighted real exchange rates and import tariffs of intermediate inputs. The number of observations for all specifications is 12,523 with 2,901 firms. There are 393 singleton observations. Robust standard errors in parentheses, * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$.

Moreover, grouping the countries based on regions reveals interesting findings.

Specifications in Column 4 in Tables 5.10 and 5.11 provide evidence that the impact of imported inputs on exports to East-Asian countries is more than double, compared to the baseline estimates in Column 1. The results are robust when I use different definitions of source of imports. There are two possible explanations. First, as the gravity-distance hypothesis predicts, the results show that the main destinations of

Indonesian manufacturing exports are neighbouring countries—in the East-Asian region. Tables 5A.2 and 5A.10 in Appendix 5 provide such an indication. Exports to East Asia exceeded 50 percent of the total manufacturing exports in 2012. This statistic implies that there is an intensive trade engagement of Indonesian firms with firms in neighbouring countries. Second, this might also indicate that to export to countries in the East-Asian region, firms need to obtain more inputs by sourcing them from abroad. Thus, importing intermediate inputs increases the firm's capability to access larger markets in the East-Asian region. This suggests that imported inputs help Indonesian firms to connect to regional manufacturing value chains.

Another interesting finding is that imports from non-East Asia have higher effects on export performance (Row 5 of Tables 5.10 and 5.11). This is expected because the non-East-Asian group contains most of the developed countries. Furthermore, as Table 5A.10 in Appendix 5 shows, imports from non-East Asia are mainly from non-GPS sectors; such as food products and beverages (ISIC 15), textiles and garments (ISIC 17 and 18), as well as furniture and other manufactured goods (ISIC 36). Indonesia also exports large numbers of products from these industries, so importing some inputs from foreign countries should positively affect the export performance of these sectors. However, the F statistics of these specifications are relatively small, indicating weak instruments (that is, smaller than 15 percent of the Stock-Yogo critical value for specifications in Table 5.10 and less than 25 percent of the critical value for specifications in Table 5.11).

Table 5.11. Heterogeneous impact of the increase of import values on export by different combinations of source-destination groups of countries

Variable of interest Sources: Ln(Import_values) _{ijt}	1	2	3	4	5
	Outcome variable: Destination: Ln(Ex_values) _{ijt}				
	Total	Developed countries	Developing countries	East-Asian regions	Non-East-Asian regions
1					
Total	0.461*** (0.127)	0.341** (0.147)	0.777*** (0.197)	0.970*** (0.213)	0.185 (0.151)
<i>p</i> -value of Hansen J statistic	0.75	0.93	0.20	0.13	0.21
F statistic Kleibergen-Paap	28.16	28.16	28.16	28.16	28.16
2					
Developed countries	0.757*** (0.280)	0.553** (0.275)	1.306*** (0.459)	1.631*** (0.533)	0.333 (0.261)
<i>p</i> -value of Hansen J statistic	0.97	0.79	0.56	0.52	0.28
F statistic Kleibergen-Paap	6.36	6.36	6.36	6.36	6.36
3					
Developing countries	0.477*** (0.136)	0.349** (0.155)	0.819*** (0.212)	1.022*** (0.233)	0.206 (0.158)
<i>p</i> -value of Hansen J statistic	0.97	0.80	0.36	0.27	0.25
F statistic Kleibergen-Paap	21.70	21.70	21.70	21.70	21.70
4					
East-Asian regions	0.480*** (0.137)	0.351** (0.156)	0.827*** (0.213)	1.032*** (0.234)	0.209 (0.159)
<i>p</i> -value of Hansen J statistic	1.00	0.79	0.38	0.30	0.26
F statistic Kleibergen-Paap	22.63	22.63	22.63	22.63	22.63
5					
Non-East-Asian regions	0.832*** (0.321)	0.622** (0.313)	1.410*** (0.532)	1.765*** (0.627)	0.341 (0.289)
<i>p</i> -value of Hansen J statistic	0.86	0.94	0.43	0.38	0.24
F statistic Kleibergen-Paap	5.04	5.04	5.04	5.04	5.04

Notes. The IV estimation using xtvreg2 estimator. All specifications include firm fixed effects and 2-digit ISIC industry fixed effects. All specifications include the crisis dummy and controls at firm level: TFP, size, foreign owned dummy and controls at industry level: export weighted real exchange rates and average tariffs in the export markets. TFP is from an omega prediction using a prodest estimator which resulted from specifications in Column 2, Table 5.4. All specifications use an instrument variable technique and use instruments: import weighted real exchange rates and import tariffs of intermediate inputs. The number of observation for all specifications is 12,523 with 2,901 firms. There are 393 singleton observations. Robust standard errors in parentheses, * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$.

5.5.4. Robustness checks

This study considers some alternative specifications to test for the robustness of the findings as shown in Table 5.12. I use several specifications of instruments in the IV model. First, I used MFN tariffs to replace the preferential tariffs (Row 1).²³ The results support the main finding, even though the magnitudes are smaller. However, in the

²³ Apart from tariffs, some other policies might also affect imports. They are duty drawbacks and non-tariff barriers (NTB). However, due to the data availability, I cannot run specific tests to check for the impact of these other policies.

first stage regression, it is revealed that the relation between tariffs and imports has an unexpected sign (see Table 5A.11, Appendix 5). An increase in import tariffs increases imports. This might be due to the lack of variations in MFN-bound tariffs and applied MFN tariffs during the period of observations and/or the fact that the government can adjust (increase) an applied tariff as long as it is lower than the bound tariff (see Table 5A.12, Appendix 5). Since firms still need inputs from abroad, an increase in MFN-applied tariffs is still accompanied by an increase in the import of intermediate inputs.

Second, I use only one instrument in the model; it is either the weighted tariffs or the weighted RER (Rows 2 and 3). Results from both specifications confirm the main argument of the impact of imported inputs on exports. Third, I include only firms that are involved in both import and export activities (Row 4). The results also support the main finding, but with larger magnitudes. Fourth, I replaced the industry dummy from a 2-digit ISIC with a 4-digit ISIC and the main argument holds (Row 5). Finally, I run the specifications that include imported inputs in two countries' groups at the same time (see Rows 6 and 7) and all specifications result in insignificant coefficients. This might suggest a substitution effect of imported inputs sourced from different country groups.

Table 5.12. Robustness checks

Checks		Impact of the import variety	Impact of the import value
1	Use MFN Tariffs	1.437*** (0.556)	0.368*** (0.145)
	<i>p</i> -value of Hansen J statistic	0.016	0.020
	F statistic Kleibergen-Paap	19.595	18.829
2	Only use weighted tariffs instrument	1.701*** (0.522)	0.439*** (0.134)
	F statistic Kleibergen-Paap	36.632	44.513
3	Only use weighted RER instrument	1.939*** (0.652)	0.490*** (0.169)
	F statistic Kleibergen-Paap	35.636	33.558
4	Only include firms that do both export and import	3.149*** (0.964)	1.992*** (0.715)
	<i>p</i> -value of Hansen J statistic	0.843	0.583
	F statistic Kleibergen-Paap	9.563	4.320
5	Use industry dummy 4-digit ISIC	1.697*** (0.475)	0.432*** (0.122)
	<i>p</i> -value of Hansen J statistic	0.569	0.500
	F statistic Kleibergen-Paap	25.392	28.604
6	Include both imports from developed and developing countries in one equation.	Devd: -2.269 (7.730)	Devd: 0.296 (9.584)
		Devg: 3.841 (6.323)	Devg: 0.291 (6.000)
	F statistic Kleibergen-Paap	0.215	0.003
7	Include both imports from East-Asian regions and non-East-Asian regions in one equation	EA: 3.568 (7.577)	EA: 0.441 (1.908)
		Non-EA: -3.272 (13.930)	Non-EA: 0.063 (3.305)
	F statistic Kleibergen-Paap	0.094	0.026

Notes. The IV estimation using the xtivreg2 estimator. All specifications include firm-fixed effects and 2-digit ISIC industry fixed effects, except in Row 5. All specifications include the crisis dummy and controls at firm level: TFP, size, foreign-owned dummy and controls at industry level: export weighted real-exchange rates and average tariffs in the export markets. TFP is from an omega prediction using a prodest estimator which resulted from the specifications in Column 2, Table 5.4. Robust standard errors in parentheses, * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$.

5.6. Concluding remarks

This chapter has provided robust evidence of the important role of imported intermediate inputs in firm productivity and export performance. Using imported inputs in production increases productivity; and the effect is larger if the inputs originate from developed countries, suggesting better technology (and quality)

embedded in the inputs. Furthermore, the effect is bigger when the import originates from firms in the East-Asian region, and particularly from those engaged in GPS industries, implying a positive effect on productivity from participating in regional production networks.

Using an instrumental variable strategy, this study finds that the increased use of imported intermediate inputs due to exogenous changes in the costs of purchasing foreign inputs, as proxied by import-weighted tariffs and exchange rates, contributes positively to the export growth of Indonesian firms. Importing more inputs, in terms of value and variety, affects export performance significantly. The effects of the latter on exports are much larger, implying that the main benefits of importing might come from access to broader alternatives of inputs. Additionally, I find that fully domestic-owned firms and firms that do not participate in GPS have clearer effects, suggesting a causality of imported inputs on exports. Further exploration reveals a mechanism through which imported inputs increase the exports of Indonesian firms. Imports from developed countries provide higher contributions to export performance, which might imply a technology/quality channel.

What is the implication of this study on policy debate especially in developing countries? First, this study demonstrates that importing intermediate inputs contributes to productivity and export growth. Second, this study also shows that changes in import costs, namely tariffs and exchange rates, can affect imports of intermediate inputs; and thus export performance. Therefore, this study supports the argument that it is important for there to be a liberalisation of imported input to promote productivity and export growth.

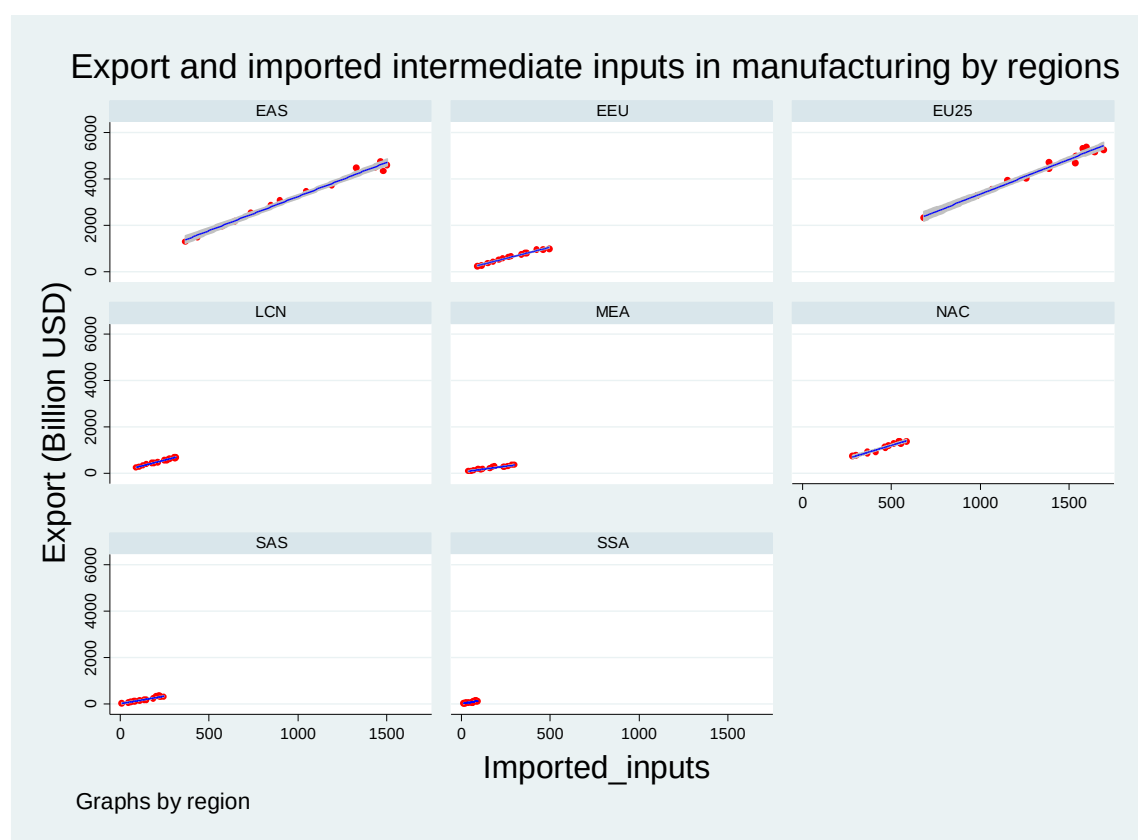
5.A. Appendix 5

Table 5A.1. Exports – imports on intermediate inputs, and tariffs on manufacturing goods, by regions (2002 and 2015)

Region	Manufacturing export (Billion USD) ^a		Import on intermediate inputs for industry (Billion USD) ^b		Tariffs on intermediate inputs ^b	
	2002	2015	2002	2015	2002	2015
East Asia & the Pacific	1,329	4,475	365	1,293	4.5	4.2
Indonesia	40	105	12	55	5.1	5.2
South Asia	221	306	7	54	17.0	11.8
Middle East & North Africa	238	291	40	88	11.6	6.1
Sub-Saharan Africa	66	95	10	34	10.3	8.3
Latin America & Caribbean	278	646	89	261	7.2	6.6
North America	555	1,281	279	763	2.4	6.7
Eastern Europe & Central Asia	357	805	89	242	6.5	5.4
EU 25	1,387	4,705	683	2,326	3.8	

Source and notes. The trade data is from UNCOMTRADE database. Tariff data is from the TRAINS database. Both use standard region classifications from the databases. ^a Data is constructed using ISIC Rev. 3: 2-digit sector 15-36. ^b Data is constructed using BEC classification: intermediate products for industry.

Figure 5A.1. Export and imported intermediate inputs in manufacturing sectors 2002–15, by region



Notes. Both variables use standard region classification from the databases. Export data is constructed using ISIC Rev. 3: 2-digit sector 15–36. Imported inputs data is constructed using BEC classification: intermediate products for industry. EAS: East Asia and Pacific, EEU: Eastern Europe and Central Asia, EU25: European Union 25; LCN: Latin America and Caribbean; MEA: Middle East North Africa; NAC: North America; SAS: South Asia; SSA: Sub-Saharan Africa.

Source. Data collected from the UNCOMTRADE database

Table 5A.2. Top 10 export destinations of Indonesia's manufacturing products, 2012

	Rank by			Number of exporters		Value of Exports	
	Frequency	Firms	Value	Firms	% of total	Exports (Million USD)	% of total
EU	1	1	2	968	45.68	5,182	17.40
Japan	2	2	3	840	39.64	3,702	12.43
USA	3	3	1	777	36.67	5,441	18.27
Singapore	4	4	7	710	33.51	983	3.30
Malaysia	5	5	5	670	31.62	1,226	4.12
China	6	6	4	663	31.29	2,476	8.31
South Korea	7	7	8	561	26.47	842	2.83
Australia	8	8	9	539	25.44	555	1.87
Thailand	9	9	6	537	25.34	1,171	3.93
Hong Kong	10	10	10	441	20.81	542	1.82

Source. Calculated from Customs data

Table 5A.3. Exogenous tariff changes to initial industry characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Changes in input tariffs (2008-2012)							
Employment (2008)	0.023 (0.189)				-0.047 (0.207)			
TFP (2008)		0.305 (1.780)				-2.349 (2.106)		
Wages (2008)			0.105 (0.170)				-0.058 (0.216)	
Exports (2008)				-0.033 (0.034)				-0.018 (0.037)
Constant	-2.411*** (0.840)	-2.687 (2.192)	-3.306** (1.646)	-1.984*** (0.331)	-2.109** (0.911)	0.652 (2.731)	-1.778 (1.901)	-2.140*** (0.715)
Industry 2-digit ISIC	No	No	No	No	Yes	Yes	Yes	Yes
Observations	225	225	225	217	225	225	225	217
R-squared	0.000	0.000	0.002	0.006	0.149	0.154	0.149	0.167

Notes. The table presents the results of regressing changes in input tariffs between 2008 and 2012 at the 5-digit ISIC on industry characteristics in the initial year (2008). Employment (2008), TFP (2008), wages (2008), and exports (2008) are in log form and computed as the average employment, TFP, wages and exports of firms in the 5-digit industry. Input tariffs are constructed from the applied preferential tariffs that are used in the main model. Robust standard errors in parentheses * p<0.10 **p<0.05 ***p<0.01.

Table 5A.4. Constructed weighted tariffs and RER

2-digit ISIC Industry	Import-weighted tariffs	Import-weighted RER	Export-weighted tariffs	Export-weighted RER
15 - Manufacture of food products and beverages	2.5	101.8	8.5	102.4
16 - Manufacture of tobacco products	1.4	116.7	166.5	100.3
17 - Manufacture of textiles	1.2	98.3	7.1	104.3
18 - Manufacture of wearing apparel; dressing and dyeing of fur	3.6	100.6	15.8	104.8
19 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	1.2	105.5	11.1	107.0
20 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.1	96.5	5.0	97.1
21 - Manufacture of paper and paper products	1.6	102.3	3.2	99.2
22 - Publishing, printing and reproduction of recorded media	1.3	100.6	3.4	111.9
23 - Manufacture of coke, refined petroleum products and nuclear fuel	1.7	96.3	2.5	97.8
24 - Manufacture of chemicals and chemical products	1.5	101.6	6.7	101.7
25 - Manufacture of rubber and plastics products	2.7	99.0	7.9	98.8
26 - Manufacture of other non-metallic mineral products	1.1	99.4	6.4	100.4
27 - Manufacture of basic metals	1.0	101.5	2.2	97.7
28 - Manufacture of fabricated metal products, except machinery and equipment	2.0	96.7	4.0	96.8
29 - Manufacture of machinery and equipment n.e.c.	1.3	92.3	4.3	98.4
30 - Manufacture of office, accounting and computing machinery	0.4	87.2	2.0	94.1
31 - Manufacture of electrical machinery and apparatus n.e.c.	1.8	93.6	9.0	95.4
32 - Manufacture of radio, television and communication equipment and apparatus	0.6	94.2	4.9	99.8
33 - Manufacture of medical, precision and optical instruments, watches and clocks	2.1	99.2	2.8	109.7
34 - Manufacture of motor vehicles, trailers and semi-trailers	2.7	89.1	14.3	93.8
35 - Manufacture of other transport equipment	1.6	93.2	11.4	101.0
36 - Manufacture of furniture; manufacturing n.e.c.	2.4	98.5	6.7	101.4

Notes. The data of weighted tariffs and RER are in 5-digit ISIC. The data above is aggregated into 2-digit ISIC and 5-years averaged. The exchange rates are in indexes with 2008 equal to 100.

Table 5A.5. Imported input variation by sectors

2-digit ISIC sector	No. of observations	Imported input variation		2-digit ISIC sector	No. of observations	Imported input variation	
		Mean	Max			Mean	Max
15	2,081	14.4	561	26	510	27.1	621
16	110	36.6	720	27	346	27.7	260
17	1,120	20.6	524	28	840	30.6	1204
18	933	46.6	852	29	440	41.3	739
19	523	27.9	711	30	12	9.1	32
20	1,111	4.7	119	31	295	42.9	588
21	423	22.9	478	32	301	49.3	713
22	134	10.1	95	33	62	83.3	649
23	54	7.9	92	34	416	57.8	588
24	1,230	31.1	585	35	297	52.1	792
25	1,341	16.6	366	36	1,652	13.8	857

Source. Calculated from Customs data

Table 5A.6. Imported input variation by years

Year	Country-product variety (on average)		Product variety (on average)		Country variety (on average)	
	Mean	Max	Mean	Max	Mean	Max
2008	185.8	792	121.5	646	14.1	53
2009	166.2	690	108.6	456	13.0	47
2010	173.1	739	108.4	438	13.7	52
2011	199.7	857	119.9	490	14.7	58
2012	196.8	1204	119.3	544	14.5	49

Source. Calculated from Customs data

Table 5A.7. Sourcing decisions of a firm: An example

Firm X				
ISIC 2-digit sector: 33				
Imported intermediate product (HS 10 digit): 3919109000				
Year	Countries of imports (top 4 countries ^a & the country offering the most expensive input ^b)	Weight (kg)	Price per kg (USD)	Total countries of imports for the specific product
2008	Taiwan	443,443	6.92	16
	USA	61,920	12.14	
	Italy	22,467	4.56	
	Hong Kong	16,419	4.82	
	Mexico ^b	4	236.5	
2009	Taiwan	433,181	7.65	15
	USA	28,646	15.14	
	Japan	11,269	18.5	
	Italy	7,571	4.2	
	South Africa ^b	38	149.71	
2010	Taiwan	397,993	7.78	15
	China	91,780	3.41	
	USA	40,995	15.32	
	Japan	22,938	16.96	
	Singapore ^b	82	41.96	
2011	Taiwan	439,263	7.71	14
	China	224,299	4.65	
	USA	41,924	16.6	
	Hong Kong	40,483	3.67	
	Singapore ^b	779	38.9	
2012	China	298,224	5.55	10
	Taiwan	220,807	8.54	
	USA	54,957	14.91	
	Japan	36,819	21.78	
	Malaysia ^b	2,135	30.14	

Source. Calculated from the Custom data. ^a Top four sources of imported intermediate inputs in terms of volume (weight). ^b Country of imports with the most expensive intermediate input.

Table 5A.8. Resource-based sectors

ISIC classification	
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
21	Manufacture of paper and paper products
23	Manufacture of coke, refined petroleum products and nuclear fuel
2411	Manufacture of basic chemicals, except fertilizers and nitrogen compounds
2430	Manufacture of man-made fibres
2511	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres
2519	Manufacture of other rubber products
26	Manufacture of other non-metallic mineral products
27	Manufacture of basic metals
3610	Manufacture of furniture

Table 5A.9. Definitions of certain regions used in the model

East-Asian Region	Non-East-Asian Region	Developed Countries	Developing Countries
ASEAN countries (except Indonesia)	Other than countries in the East-Asian Region	EU (including the UK)	Other than countries in developed countries group
Japan		USA	
South Korea		Canada	
China		Australia	
Taiwan		New Zealand	
Hong Kong		Japan	
North Korea			
Macau			

Notes. The classification of developed and developing countries uses UN definitions.

Table 5A.10. Manufacturing trades with East-Asian regions and non-East-Asian regions, by GPS classification (2012)

Panel A	Average exports (000 USD)	Export share to East Asia (%)	Export share to non-East Asia (%)
Non-GPS sectors	9,424	35.9	64.1
GPS sectors	12,300	69.3	30.7
Panel B	Average imports (000 USD)	Import share from East Asia (%)	Import share from non- East Asia (%)
Non-GPS sectors	8,847	46.2	53.8
GPS sectors	13,700	94.2	5.8
Panel C	Average import variations (number of items)	Average import variation from East Asia (number of items)	Average import variation from non-East Asia (number of items)
Non-GPS sectors	25.0	17.5	7.5
GPS sectors	53.0	45.2	7.8

Source. Calculated from Customs data

Table 5A.11. First stage results using different definitions of tariff

VARIABLES	1 Import variety	2 Import variety	3 Import variety	4 Import value	5 Import value	6 Import value
Preferential tariffs - Top 10	-0.0223*** (0.00572)			-0.0850*** (0.0210)		
Preferential tariffs - East Asia		-0.0231*** (0.00628)			-0.0818*** (0.0226)	
MFN Tariffs			0.0104** (0.00508)			0.0397** (0.0190)
Constant	1.804*** (0.190)	1.817*** (0.190)	1.821*** (0.188)	8.761*** (0.624)	8.830*** (0.622)	8.824*** (0.620)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes
Crisis dummy	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,916	12,916	12,916	12,916	12,916	12,916
R-squared	0.045	0.045	0.043	0.044	0.043	0.042
Number of firms	3,294	3,294	3,294	3,294	3,294	3,294

Notes. Robust standard errors in parentheses * p<0.10 **p<0.05 ***p<0.01

Table 5A.12. Average imported input tariffs in Indonesia

Year	Preferential tariffs – Top 10	Preferential tariffs – East Asia	MFN Tariffs
2008	2.93	2.81	3.99
2009	2.35	2.26	4.26
2010	2.18	1.89	5.02
2011	2.22	1.92	5.15
2012	0.32	0.32	4.96

Source. Calculated from TRAINS database

Table 5A.13. Global Production Sharing (GPS) industries

Electronics		
3000		Office, accounting and computing machinery
3110		Electric motors, generators and transformers
3120		Electricity distribution and control apparatus
3130		Insulated wire and cable
3140		Accumulators, primary cells and batteries
3210		Electronic valves, tubes, etc.
3313		Industrial process control equipment
Electrical appliances		
2930		Domestic appliances
3150		Lighting equipment and electric lamps
3190		Other electrical equipment
3220		TV/radio transmitters and line communication apparatus
3230		TV and radio receivers and associated goods
2925		Food/beverage/tobacco processing machinery
Automotive		
3410		Motor vehicles
3420		Automobile bodies, trailers and semi-trailers
3430		Parts/accessories for automobiles
3591		Motorcycles
3599		Other transport equipment
Other GPS		
2813		Steam generators
2899		Other fabricated metal products
2911		Engines and turbines (not for transport equip)
2912		Pumps, compressors, taps and valves
2913		Bearings, gears, gearing and driving elements
2914		Ovens, furnaces and furnace burners
2915		Lifting and handing equipment
2919		Other general purpose machinery
2921		Agricultural and forestry machinery
2922		Machine tools
2923		Machinery for metallurgy
2924		Machinery for mining and construction
2926		Machinery for textile, apparel and leather
2929		Other special purpose machinery
3311		Medical, surgical and orthopedic equipment
3312		Measuring/testing/navigating appliances
3320		Optical instruments and photographic equipment
3530		Aircraft and spacecraft parts

Notes. The classification is at the 4-digit level of the International Standard Industrial Classification (ISIC) (Athukorala & Kohpaiboon 2014).

Chapter 6

Conclusions

Indonesia's manufacturing performance had grown fairly fast in the lead up to the Asian financial crisis (AFC) in 1997. The incentives for industries following the oil boom in the 1970s, the government's ability to manage the real exchange rates, and a series of reform packages in the 1980s, such as tariff reduction and fewer restrictions on foreign investments, provided a positive environment for manufacturing firms to grow and internationalise (Hill 1992). Between 1990 and 1996, the manufacturing export growth rate was high at about 20 percent per annum with a share of the total export of more than 50 percent (Basri & Patunru 2012). However, this remarkable performance was interrupted by the crisis, and since then export growth has not achieved its pre-AFC rate.

There are some possible explanations for the lower performance of manufacturing industries during the recent two decades. First, there have been many policy changes during this time in Indonesia. The increased protection for labour (e.g. the 2003 Labour Law) might have had a disincentive effect for labour-intensive manufacturing firms (AIPEG 2016). Policy ambivalence towards globalisation has contributed to a stagnant business performance. Inward-looking and protectionist policies have protected domestic firms from foreign competition (Patunru 2018). Import tariffs have declined significantly, but many forms of non-tariff measures have increased. Another factor that occurred simultaneously was the commodity boom in the 2000s. It reduced incentives for expansion in the manufacturing sectors due to the

appreciation of the real exchange rate. At the same time, international commercial architecture has altered massively. Every country has become more globalised, and interdependencies in the production stages between countries have increased. Competition has been fierce, so countries that are more efficient have benefited. China and other growing economies, such as Vietnam and Bangladesh, which offer comparative advantages with cheaper labour costs, have become the main factories for world production. Supply-side support, such as those associated with supportive business climates, the availability of well-trained workers and efficient infrastructures have become more important. Meanwhile, Indonesia has missed the opportunity to be more engaged in the global market due to its inability to overcome various supply-side challenges (Hill and Pane 2018).

Against this background, this thesis has explored the behaviour of Indonesian firms in international trade and the extent to which their engagement affects productivity. The results of the study shed light on our understanding of Indonesia's relative position in global trade, as well as the impact of changing policy regimes over time.

6.1. Summary

This thesis consists of four papers that investigate the behaviour of Indonesian firms in international trade and how their activities in international trade affects their performance. The first paper (Chapter 2) scrutinises the relationship between export experience and productivity. The results show that firms become more productive as they accumulate more experience in exporting, but this effect lessens as export age increases. The second paper (Chapter 3) examines the channels through which the learning-by-exporting (LBE) mechanism operates, by comparing the learning

experience of Indonesian firms in two different periods associated with the implementation and the removal of the multi-fibre agreement (MFA)—the policy that governed the world trade in garments for 30 years. The results show that the effect of export on productivity is higher after the removal of the MFA or when competition in the world's garment market intensified. This indicates the importance of the 'competition channel' in LBE.

Even though the LBE effects among Indonesian firms were higher after the MFA's abolition, many garment firms that had exported during the MFA period stopped exporting after the intervention was removed. The third paper (Chapter 4) provided a comprehensive analysis to explain why some firms failed and some survived in the more competitive situation. The descriptive analysis shows that Indonesian firms in the clothing industry have been unsuccessful in diversifying their product mix and export destinations in line with the rapidly changing patterns in world demand following the MFA's abolition. The competitiveness of Indonesia's clothing industry has not grown as fast as that of other countries. Moreover, firm-level analysis indicates that export performance in the post-MFA era is associated with higher productivity growth, the ownership of textile production lines and access to complementary intermediate inputs.

The fourth paper (Chapter 5) investigates the impact of increasing imports of intermediate inputs on a firm's productivity and export performance. The results indicate the important role of imported inputs on productivity and a causal relationship between imported inputs and exports. The increasing variety of inputs provides a much higher effect on exports compared to the increasing value of the inputs. Inputs from developed countries have a higher impact on exports, which

suggests that technology and quality have a positive effect. Moreover, the study found that the imported inputs do not have a causal impact on export for firms in industries that typically participate in production networks. This suggests that such firms manage their import–export decisions differently.

6.2. Contributions and policy implications

This thesis has made several contributions. Chapter 2 is the first study that investigates the impact of export experience as a medium of learning within Indonesia. Chapter 3 is the first study that researches the impact of a certain policy on LBE behaviour. It sheds light on the channels of learning, something that has not been explored in previous studies. Moreover, from a methodological point of view, the study shows the importance of measuring total factor productivity (TFP) correctly, particularly in a situation in which a certain policy regime affects prices that could potentially provide opportunities for rent seeking. Chapter 4 provides an in-depth analysis of how a massive change in market conditions could affect the behaviour of firms' in relation to their decision to participate in international trade. This study also explores the strategies for firms in general to adjust to external shocks. Chapter 5 provides evidence of the advantages of opening access to imported inputs to increase a firm's productivity. More importantly, this chapter establishes causality in terms of the positive effects of imported inputs on export performance. It also shows the advantage of imported inputs mainly from access to more input varieties. In addition, interestingly, this is the first study that shows that imported inputs are not relevant as an export booster for firms in production networks.

The policy implications of these studies are clear. The first study indicates productivity improvements as firms engage more in international markets, which

suggests that exporting is good for firms. General macro policies to make exporting easier, such as improving business climates, infrastructure and human resources, as well as simplifying export procedures could help all firms to export. However, export promotion programs that have discriminating effects could mistarget firms. This is because we do not know which firms have the capacity to learn and grow in the export market, and policy-associated export promotions may pick firms that are not able to do so. Export incentives, such as production subsidies, could help firms to start exporting, but these interventions might not have long-lasting effects since many firms quit after several years of exporting.¹

The second study strengthens the policy implications mentioned above. It confirms that competition is essential for productivity improvement. This evidence is straightforward and counters the argument about protecting particular firms so they can compete in global markets. Even though my study focuses on the intervention of the MFA, this finding might be applied to any single country's policy intervention as well as global interventions. Some programs under the World Trade Organization (WTO), such as the Generalised System of Preference (GSP), the Duty Free Quota Free (DFQF), the EU's Everything but Arms (EBA) and the USA's African Growth and Opportunities Act (AGOA), have been implemented to help least developed countries (LDCs) access advanced countries' markets. Some studies have shown the positive effects of these projects in increasing exports from LDCs. But no studies have investigated the effects on firms' productivity. Since these programs are more likely to reduce the level of the competition of firms in accessing the export market, the

¹ According to the Global Trade Alert database, Indonesia has applied production subsidies to certain industries throughout the years.

productivity improvement from doing so might not be optimal. Furthermore, it would be interesting to investigate whether these trade preferences could allow firms to survive in the export market after the programs are abolished. The third study provides insight for policy makers regarding firms' attitudes when there is a massive change in the business environment. We find that not all exporters survived in the foreign markets after the MFA intervention was removed. However, the results also show that some of the export firms were adaptable. Important factors, relevant to their export performance, include productivity and access to intermediate inputs.

The message from this fourth study is obvious. Access to imported intermediate inputs is critical for a firm's productivity and export performance. The policy makers, which often have ambiguous attitudes toward imports, have now more evidence to prove that opening access to imported inputs could promote productivity and export growth. As for Indonesia, even though tariffs on imported inputs have been much reduced, some non-tariff measures (NTMs) have continued to be implemented in recent years.² Removing these NTMs could give more positive effects on firms' performance.

6.3. Limitations and suggestions for further studies

There are some limitations to these studies. First, these studies focus on empirical investigations and do not emphasise building a theoretical framework. Instead, I borrow some established theoretical concepts and test their hypotheses. For example, the relationship between exports and productivity has been established in the excellent paper by Melitz (2003). The foundation of LBE can be found in De Loecker

² The Global Trade Alert database shows that Indonesia imposed a local sourcing measure in 2015 and 2016 for the automotive industry.

(2013). The theoretical framework of relationship between imported intermediate inputs with a firm's productivity and exports can be found in Kasahara and Rodrigue (2008) and Kasahara and Lapham (2013).

Second, this thesis has benefited from Indonesian firm-level data. The manufacturing surveys from which these data come were designed to elicit comprehensive firm-level information. However, many firms do not answer all the questions which results in missing observations, including important information such as capital data, that are needed to estimate productivity. Even though I have employed various empirical strategies to reduce this attrition bias, some measurement errors could not be completely removed. In this regard, comparing the results from the Indonesian cases with those from other countries would be beneficial to confirm the findings of this thesis.

Third, the identification strategies for the studies in this thesis might not be perfect for overcoming all biases. In each separate study, therefore, I explain in detail the econometric methods, potential biases, as well as the strategies I employed to reduce those biases. I hope these provide clear paths for improved empirical methods in future studies.

Some potential further studies have been identified. In relation to the LBE studies, and to check if findings about the importance of competition are still true in different settings (in terms of different interventions), similar strategies, as laid out in Chapter 3, could be applied on other policy shocks or different countries cases could be used. Note that empirical studies to scrutinise the LBE channels are rare. Further exploration to investigate the learning channels should be pursued, given their important policy implications.

The role of imported intermediate inputs leaves a lot of room for further examination. The results in Chapter 5 show that the causal relation between imported inputs and exports does not hold in the case of firms in global production sharing (GPS) sectors. This study defines GPS firms based only on sectoral classifications. A more refined definition might shed more light on the linkages between imported inputs and exports among these firms. Moreover, channels of how imported inputs affect performance could be further explored. If the data is available, future studies could explore input qualities and prices to explain other dimensions of the role of imported intermediate inputs.

Bibliography

- Abernathy, Frederick H, Anthony Volpe & David Weil. 2006. 'The future of the apparel and textile industries: Prospects and choices for public and private actors.' *Environment and Planning A* 38(12): 2207–32, doi: <https://doi.org/10.1068/a38114>.
- Aitken, Brian, Gordon H. Hanson & Ann E. Harrison. 1997. 'Spillovers, foreign investment, and export behavior.' *Journal of International Economics* 43(1): 103–32, doi: [https://doi.org/10.1016/S0022-1996\(96\)01464-X](https://doi.org/10.1016/S0022-1996(96)01464-X).
- Albornoz, Facundo, Héctor F. Calvo Pardo, Gregory Corcos & Emanuel Ornelas. 2012. 'Sequential exporting.' *Journal of International Economics* 88(1): 17–31, doi: <http://dx.doi.org/10.1016/j.jinteco.2012.02.007>.
- Álvarez, Roberto & Ricardo A López. 2005. 'Exporting and performance: Evidence from Chilean plants.' *Canadian Journal of Economics/Revue canadienne d'économie* 38(4): 1384–400, doi: <https://doi.org/10.1080/00220388.2012.720368>.
- Álvarez, Roberto, Hasan Faruq & Ricardo A. López. 2013. 'Is previous export experience important for new exports?' *The Journal of Development Studies* 49(3): 426–41, doi: <http://dx.doi.org/10.1080/00220388.2012.720368>.
- Amador, João & Sónia Cabral. 2008. 'The Portuguese export performance in perspective: A constant market share analysis.' *Banco de Portugal Economic Bulletin*, 201–21.
- Amiti, Mary & Jozef Konings. 2007. 'Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia.' *The American Economic Review* 97(5): 1611–38, doi: <http://dx.doi.org/10.1257/aer.97.5.1611>.
- Anas, Titik. 2012. 'Behind the boom and bust of Indonesian exports.' PhD thesis, The Australian National University.
- Anas, Titik & Dionisius Narjoko. 2018. 'International cooperation and the management of globalisation.' In *Indonesian in the New World: Globalisation, Nationalism and Sovereignty*, edited by Arianto A Patunru, Mari E Pangestu & M Chatib Basri, 267–93. Singapore: ISEAS, Yusof Ishak Institute.
- Antràs, Pol, Teresa C. Fort & Felix Tintelnot. 2017. 'The margins of global sourcing: Theory and evidence from US firms.' *American Economic Review* 107(9): 2514–64, doi: <http://dx.doi.org/10.1257/aer.20141685>.
- Aristei, David, Davide Castellani & Chiara Franco. 2013. 'Firms' exporting and importing activities: Is there a two-way relationship?' *Review of World Economics* 149(1): 55–84, doi: <https://doi.org/10.1007/s10290-012-0137-y>.
- Arrow, K. 1962. 'The economic implications of learning-by-doing.' *Review of Economic Studies* 29(3): 155–73, doi: <https://doi.org/10.2307/2295952>.
- Aswicahyono, Haryo, Kelly Bird & Hal Hill. 2009. 'Making economic policy in weak, democratic, post-crisis states: An Indonesian case study.' *World Development* 37(2): 354–70, doi: <http://dx.doi.org/10.1016/j.worlddev.2008.06.007>.
- Aswicahyono, Haryo, Hal Hill & Dionisius Narjoko. 2010. 'Industrialisation after a deep economic crisis: Indonesia.' *The Journal of Development Studies* 46(6): 1084–108, doi: <http://dx.doi.org/10.1080/00220380903318087>.
- Aswicahyono, Henricus Haryo. 1998. 'Total factor productivity in Indonesian manufacturing, 1975–1993.' PhD thesis, The Australian National University.

- Athukorala, Prema-chandra & Archanun Kohpaiboon. 2014. 'Global production sharing, trade patterns, and industrialization in Southeast Asia.' In *Routledge Handbook of Southeast Asian Economics*, edited by Ian Coxhead, 161–83. London: Routledge.
- Athukorala, Prema-chandra & Raveen Ekanayake. 2018. 'Repositioning in the global apparel value chain in the post-MFA era: Strategic issues and evidence from Sri Lanka.' *Development Policy Review* 36: O247–O269, doi: <https://doi.org/10.1111/dpr.12226>.
- Athukorala, Prema-chandra & Sarath Rajapatirana. 2000a. 'Liberalization and industrial transformation: Lessons from the Sri Lankan experience.' *Economic Development and Cultural Change* 48(3): 543–72, doi: <https://doi.org/10.1086/452610>.
- _____. 2000b. *Liberalization and Industrial Transformation: Sri Lanka in International Perspective*. New York: Oxford University Press.
- Athukorala, Prema-chandra. 2006. 'Post-crisis export performance: The Indonesian experience in regional perspective.' *Bulletin of Indonesian Economic Studies* 42(2): 177–211, doi: <https://doi.org/10.1080/00074910600873658>.
- Audet, Denis. 2007. 'Smooth as silk? A first look at the post MFA textiles and clothing landscape.' *Journal of International Economic Law* 10(2): 267–84, doi: <https://doi.org/10.1093/jiel/jgm003>.
- Australia Indonesia Partnership for Economic Governance (AIPEG). 2016. 'Labour productivity, wage and management issues in labour-intensive industries: A case study of garments and footwear.' Report received by author from Chris Manning.
- Aw, Bee Yan & Amy Ruey-meng Hwang. 1995. 'Productivity and the export market: A firm-level analysis.' *Journal of Development Economics* 47(2): 313–32, doi: [https://doi.org/10.1016/0304-3878\(94\)00062-H](https://doi.org/10.1016/0304-3878(94)00062-H).
- Aw, Bee Yan, Sukkyun Chung & Mark J. Roberts. 2000. 'Productivity and turnover in the export market: Micro-level evidence from the Republic of Korea and Taiwan (China).' *The World Bank Economic Review* 14(1): 65–90, doi: <http://dx.doi.org/10.1093/wber/14.1.65>.
- Balassa, Bela. 1979. 'Export composition and export performance in the industrial countries, 1953–71.' *The Review of Economics and Statistics* 61(4): 604–607, doi: <http://dx.doi.org/10.2307/1935791>.
- Baldwin, John R & Wulong Gu. 2003. 'Export-market participation and productivity performance in Canadian manufacturing.' *Canadian Journal of Economics/Revue canadienne d'économique* 36(3): 634–57, doi: <https://doi.org/10.1111/1540-5982.t01-2-00006>.
- Bas, Maria & Vanessa Strauss-Kahn. 2013. 'Does importing more inputs raise exports? Firm-level evidence from France.' *Review of World Economics* 150(2): 241–75, doi: <http://dx.doi.org/10.1007/s10290-013-0175-0>.
- Bas, Maria & Vanessa Strauss-Kahn. 2015. 'Input-trade liberalization, export prices and quality upgrading.' *Journal of International Economics* 95(2): 250–62, doi: <http://dx.doi.org/10.1016/j.jinteco.2014.12.005>.
- Basri, M Chatib & Arianto A Patunru. 2012. 'How to keep trade policy open: The case of Indonesia.' *Bulletin of Indonesian Economic Studies* 48(2): 191–208, doi: <https://doi.org/10.1080/00074918.2012.694154>.
- Békés, Gábor & Balázs Muraközy. 2012. 'Temporary trade and heterogeneous firms.' *Journal of International Economics* 87(2): 232–46, doi: <http://dx.doi.org/10.1016/j.jinteco.2011.12.007>.

- Bernard, Andrew B & J Bradford Jensen. 1999. 'Exceptional exporter performance: Cause, effect, or both?' *Journal of International Economics* 47: 1–25, doi: [https://doi.org/10.1016/S0022-1996\(98\)00027-0](https://doi.org/10.1016/S0022-1996(98)00027-0).
- _____. 2004. 'Why some firms export.' *Review of Economics and Statistics* 86(2): 561–69, doi: <https://doi.org/10.1162/003465304323031111>.
- Bernard, Andrew B & Joachim Wagner. 1997. 'Exports and success in German manufacturing.' *Weltwirtschaftliches Archiv* 133(1): 134–57, doi: <https://doi.org/10.1007/BF02707680>.
- Bernard, Andrew B, J Bradford Jensen, Stephen J Redding & Peter K Schott. 2007. 'Firms in international trade.' *Journal of Economic Perspectives* 21(3): 105–30, doi: <http://dx.doi.org/10.1257/jep.21.3.105>.
- _____. 'The empirics of firm heterogeneity and international trade.' *Annual Review of Economics* 4(1): 283–313, doi: <http://dx.doi.org/10.1146/annurev-economics-080511-110928>.
- _____. 2018. 'Global firms.' *Journal of Economic Literature* 56(2): 565–619, doi: <http://dx.doi.org/10.1257/jel.20160792>.
- Bernard, Andrew B, Stephen J Redding & Peter K Schott. 2007. 'Comparative advantage and heterogeneous firms.' *The Review of Economic Studies* 74(1): 31–66, doi: <https://doi.org/10.1111/j.1467-937X.2007.00413.x>.
- Bigsten, Arne & Mulu Gebreeyesus. 2009. 'Firm productivity and exports: Evidence from Ethiopian manufacturing.' *Journal of Development Studies* 45(10): 1594–614, doi: <http://dx.doi.org/10.1080/00220380902953058>.
- Blalock, Garrick & Paul J Gertler. 2004. 'Learning from exporting revisited in a less developed setting.' *Journal of Development Economics* 75(2): 397–416, doi: <http://dx.doi.org/10.1016/j.jdeveco.2004.06.004>.
- Brambilla, Irene, Amit K Khandelwal & Peter K Schott. 2010. 'China's experience under the multi-fiber arrangement (MFA) and the agreement on textiles and clothing (ATC).' In *China's Growing Role in World Trade*, edited by Robert C Feenstra & Shang-Jin Wei, 345–87. Chicago: University of Chicago Press.
- Broda, Christian & David E Weinstein. 2006. 'Globalization and the gains from variety.' *The Quarterly Journal of Economics* 121(2): 541–85, doi: <https://doi.org/10.1162/qjec.2006.121.2.541>.
- Cheptea, Angela, Lionel Fontagné & Soledad Zignago. 2014. 'European export performance.' *Review of World Economics* 150(1): 25–58, doi: <https://doi.org/10.1007/s10290-013-0176-z>.
- Clerides, Sofronis K, Saul Lach & James R Tybout. 1998. 'Is learning by exporting important? Micro-dynamic evidence from Colombia, Mexico, and Morocco.' *The Quarterly Journal of Economics* 113(3): 903–47, doi: <http://dx.doi.org/10.1162/003355398555784>.
- Collier, Paul & Anthony J Venables. 2007. 'Rethinking trade preferences: How Africa can diversify its exports.' *World Economy* 30(8): 1326–45, doi: <https://doi.org/10.1111/j.1467-9701.2007.01042.x>.
- Corden, Warner Max. 1984. 'Booming sector and Dutch disease economics: Survey and consolidation.' *Oxford Economic Papers* 36(3): 359–80, doi: <https://doi.org/10.1093/oxfordjournals.oep.a041643>.
- Damijan, Jože P, Jozef Konings & Sašo Polanec. 2014. 'Import churning and export performance of multi-product firms.' *The World Economy* 37(11): 1483–506, doi: <https://doi.org/10.1111/twec.12196>.

- Das, Sanghamitra, Mark J Roberts & James R Tybout. 2007. 'Market entry costs, producer heterogeneity, and export dynamics.' *Econometrica* 75(3): 837–73, doi: <https://doi.org/10.1111/j.1468-0262.2007.00769.x>.
- De Loecker, Jan. 2007. 'Do exports generate higher productivity? Evidence from Slovenia.' *Journal of International Economics* 73(1): 69–98, doi: <http://dx.doi.org/10.1016/j.jinteco.2007.03.003>.
- _____. 2011. 'Product differentiation, multiproduct firms, and estimating the impact of trade liberalization on productivity.' *Econometrica* 79(5): 1407–51, doi: <http://dx.doi.org/10.3982/ECTA7617>.
- _____. 2013. 'Detecting learning by exporting.' *American Economic Journal: Microeconomics* 5(3): 1–21, doi: <https://doi.org/10.1257/mic.5.3.1>.
- De Loecker, Jan, Pinelopi K Goldberg, Amit K Khandelwal & Nina Pavcnik. 2016. 'Prices, markups, and trade reform.' *Econometrica* 84(2): 445–510, doi: <http://dx.doi.org/10.3982/ecta11042>.
- De Loecker, Jan & Frederic Warzynski. 2012. 'Markups and firm-level export status.' *American Economic Review* 102(6): 2437–71, doi: <https://doi.org/10.3982/ECTA11042>.
- Delgado, Miguel A, Jose C Farinas & Sonia Ruano. 2002. 'Firm productivity and export markets: A non-parametric approach.' *Journal of International Economics* 57(2): 397–422.
- Dicken, Peter & Markus Hassler. 2000. 'Organizing the Indonesian clothing industry in the global economy: The role of business networks.' *Environment and Planning A: Economy and Space* 32(2): 263–80, doi: <https://doi.org/10.1068/a31172>.
- Du, Julan, Yi Lu, Zhigang Tao & Linhui Yu. 2012. 'Do domestic and foreign exporters differ in learning by exporting? Evidence from China.' *China Economic Review* 23(2): 296–315, doi: <http://dx.doi.org/10.1016/j.chieco.2011.12.003>.
- Eaton, J, M Eslava, M Kugler & J Tybout. 2008. 'The margins of entry into export markets: Evidence from Colombia.' In *The Organization of Firms in a Global Economy*, edited by E. Helpman, D. Marin & T. Verdier, 231–72. Cambridge, MA: Harvard University Press.
- Ethier, Wilfred J. 1982. 'National and international returns to scale in the modern theory of international trade.' *The American Economic Review* 72(3): 389–405, doi: <http://www.jstor.org/stable/1831539>.
- Evans, Carolyn L, & James Harrigan. 2005. 'Distance, time, and specialization: Lean retailing in general equilibrium.' *American Economic Review* 95(1): 292–313, doi: <https://doi.org/10.1257/0002828053828590>.
- Fan, Haichao, Yao Amber Li & Stephen R Yeaple. 2015. 'Trade liberalization, quality, and export prices.' *The Review of Economics and Statistics* 97(5): 1033–51, doi: http://dx.doi.org/10.1162/REST_a_00524.
- Feenstra, Robert C, Robert Inklaar & Marcel P Timmer. 2015. 'The next generation of the Penn World Table.' *American Economic Review* 105(10): 3150–82, doi: <https://doi.org/10.1257/aer.20130954>.
- Feng, Ling, Zhiyuan Li & Deborah L Swenson. 2016. 'The connection between imported intermediate inputs and exports: Evidence from Chinese firms.' *Journal of International Economics* 101: 86–101, doi: <http://dx.doi.org/10.1016/j.jinteco.2016.03.004>.
- Fernandes, Ana M & Alberto E Isgut. 2015. 'Learning-by-Exporting effects: Are they for real?' *Emerging Markets Finance and Trade* 51(1): 65–89, doi: <https://doi.org/10.1080/1540496X.2015.998073>.

- Fung, Victor K, William K Fung & Yoram Jerry R Wind. 2007. *Competing in a Flat World: Building Enterprises for a Borderless World*. New Jersey: Pearson Prentice Hall.
- Gereffi, Gary. 1999. 'International trade and industrial upgrading in the apparel commodity chain.' *Journal of International Economics* 48(1): 37–70, doi: [https://doi.org/10.1016/S0022-1996\(98\)00075-0](https://doi.org/10.1016/S0022-1996(98)00075-0).
- Gereffi, Gary & Stacey Frederick. 2010. *The Global Apparel Value Chain, Trade and the Crisis: Challenges and Opportunities for Developing Countries*. Policy Research Working Paper, June. Washington, DC: World Bank, doi: <https://doi.org/10.1596/1813-9450-5281>.
- Gilbert, John & Eva Muchová. 2018. 'Export competitiveness of Central and Eastern Europe since the enlargement of the EU.' *International Review of Economics & Finance* 55(May): 78–85, doi: <https://doi.org/10.1016/j.iref.2018.01.008>.
- Girma, Sourafel, Avid Greenaway & Richard Kneller. 2004. 'Does exporting increase productivity? A microeconomic analysis of matched firms.' *Review of International Economics* 12(5): 855–66, doi: <http://dx.doi.org/10.1111/j.1467-9396.2004.00486.x>.
- Gnangnon, Sèna Kimm & Shishir Priyadarshi. 2017. 'The multilateral decision on duty free quota free market access and least developed countries' export performance.' *Economic Analysis and Policy* 56: 86–100, doi: <https://doi.org/10.1016/j.eap.2017.08.003>.
- Goldberg, Pinelopi Koujianou, Amit Kumar Khandelwal, Nina Pavcnik & Petia Topalova. 2010. 'Imported intermediate inputs and domestic product growth: Evidence from India*.' *The Quarterly Journal of Economics* 125(4): 1727–67, doi: <http://dx.doi.org/10.1162/qjec.2010.125.4.1727>.
- Greenaway, David & Richard Kneller. 2007a. 'Industry differences in the effect of export market entry: Learning by exporting?' *Review of World Economics* 143(3): 416–32, doi: <https://doi.org/10.1007/s10290-007-0115-y>.
- _____. 2007b. 'Firm heterogeneity, exporting and foreign direct investment.' *The Economic Journal* 117(517): F134–F161, doi: <https://doi.org/10.1111/j.1468-0297.2007.02018.x>.
- Greenaway, David & Zhihong Yu. 2004. 'Firm-level interactions between exporting and productivity: Industry-specific evidence.' *Review of World Economics* 140(3): 376–92, doi: <https://doi.org/10.1007/BF02665981>.
- Greenaway, David, Joakim Gullstrand & Richard Kneller. 2005. 'Exporting may not always boost firm productivity.' *Review of World Economics* 141(4): 561–82, doi: <https://doi.org/10.1007/s10290-005-0045-5>.
- Greenaway, David, Nuno Sousa & Katharine Wakelin. 2004. 'Do domestic firms learn to export from multinationals?' *European Journal of Political Economy* 20(4): 1027–43, doi: <https://doi.org/10.1016/j.ejpoleco.2003.12.006>.
- Greenaway, David, Richard Kneller & Xufei Zhang. 2012. 'The effect of exchange rates on firm exports and the role of FDI.' *Review of World Economics* 148(3): 425–47, doi: <https://doi.org/10.1007/s10290-012-0129-y>.
- Haidar, Jamal Ibrahim. 2012. 'Trade and productivity: Self-selection or learning-by-exporting in India.' *Economic Modelling* 29(5): 1766–73, doi: <http://dx.doi.org/10.1016/j.econmod.2012.05.005>.
- Halpern, László, Miklós Koren & Adam Szeidl. 2015. 'Imported inputs and productivity.' *American Economic Review* 105(12): 3660–703, doi: <https://www.aeaweb.org/articles?id=10.1257/aer.20150443>.
- Hamilton, Carl. 1985. *Voluntary Export Restraints and Trade Diversion*. Stockholm: Institute for International Economic Studies.

- Harrigan, James & Geoffrey Barrows. 2009. 'Testing the theory of trade policy: Evidence from the abrupt end of the multifiber arrangement.' *The Review of Economics and Statistics* 91(2): 282–94, doi: <https://doi.org/10.1162/rest.91.2.282>.
- Helpman, Elhanan & Paul R Krugman. 1985. *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*. Cambridge, MA: MIT press.
- Hertel, Thomas, Will Martin, Christian F Bach & Betina Dimaranan. 1999. *Growth, Globalization, and Gains from the Uruguay Round*. Policy Research Working Paper, WPS1614. Washington, DC: World Bank.
- Hill, Hal. 1991. 'The emperor's clothes can now be made in Indonesia.' *Bulletin of Indonesian Economic Studies* 27(3): 89–127, doi: <https://doi.org/10.1080/00074919112331336088>.
- _____. 1992. 'Indonesia's textile and garment industries: Developments in an Asian perspective.' Occasional Paper No. 87. Singapore: Institute of Southeast Asian Studies.
- Hill, Hal & Deasy Pane. 2018. 'Indonesia and the global economy: Missed opportunities?' In *Indonesian in the New World: Globalisation, Nationalism and Sovereignty*, edited by Arianto A Patunru, Mari E Pangestu & M Chatib Basri, 267–93. Singapore: ISEAS, Yusof Ishak Institute.
- Hill, Hal & Supbat Suphachalasai. 1992. 'The myth of export pessimism (even) under the MFA: Evidence from Indonesia and Thailand.' *Review of World Economics* 128(2): 310–29, doi: <https://doi.org/10.1007/BF02707549>.
- Hummels, David, Jun Ishii & Kei-Mu Yi. 2001. 'The nature and growth of vertical specialization in world trade.' *Journal of International Economics* 54(1): 75–96, doi: [https://doi.org/10.1016/S0022-1996\(00\)00093-3](https://doi.org/10.1016/S0022-1996(00)00093-3).
- Inui, Tomohiko, Keiko Ito & Daisuke Miyakawa. 2016. 'Export experience, product differentiation and firm survival in export markets.' *Japanese Economic Review* 68(2): 217–31, doi: <https://dx.doi.org/10.1111/jere.12083>.
- Ito, Tadashi & Takahide Aoyagi. 2018. 'Did the least developed countries benefit from duty-free quota-free access to the Japanese market?' *Japan and the World Economy*. In press, doi: <https://doi.org/10.1016/j.japwor.2018.09.002>.
- James, William E, David J Ra, & Peter J Minor. 2003. 'Indonesia's textiles and apparel: The challenges ahead.' *Bulletin of Indonesian Economic Studies* 39(1): 93–103, doi: <http://dx.doi.org/10.1080/00074910302005>.
- Johnson, Robert C & Guillermo Noguera. 2017. 'A portrait of trade in value-added over four decades.' *The Review of Economics and Statistics* 99(5): 896–911, doi: https://dx.doi.org/10.1162/REST_a_00665.
- Jones, Richard M. 2006. *The Apparel Industry*. New Jersey: Wiley-Blackwell.
- Julan, Du, Lu Yi, Tao Zhigang & Yu Linhui. 2012. 'Do domestic and foreign exporters differ in learning by exporting? Evidence from China.' *China Economic Review* 23(2): 296–315, doi: <https://doi.org/10.1016/j.chieco.2011.12.003>.
- Kasahara, Hiroyuki & Beverly Lapham. 2013. 'Productivity and the decision to import and export: Theory and evidence.' *Journal of International Economics* 89(2): 297–316, doi: <https://doi.org/10.1016/j.jinteco.2012.08.005>.
- Kasahara, Hiroyuki & Joel Rodrigue. 2008. 'Does the use of imported intermediates increase productivity? Plant-level evidence.' *Journal of Development Economics* 87(1): 106–18, doi: <https://doi.org/10.1016/j.jdeveco.2007.12.008>.

- Katayama, Hajime, Shihua Lu & James R Tybout. 2009. 'Firm-level productivity studies: Illusions and a solution.' *International Journal of Industrial Organization* 27(3): 403–13, doi: <http://dx.doi.org/10.1016/j.ijindorg.2008.11.002>.
- Keesing, Donald B & Martin Wolf. 1981. 'Questions on international trade in textiles and clothing.' *World Economy* 4(1): 79–102, doi: <https://doi.org/10.1111/j.1467-9701.1981.tb00343.x>.
- Keesing, Donald B & Sanjaya Lall. 1992. 'Marketing manufactured exports from developing countries: Learning sequences and public support.' In *Trade Policy, Industrialization, and Development: New Perspectives*, edited by Gerald K Helleiner, 176–93. Oxford: Clarendon Press.
- Keller, Wolfgang. 2010. 'International trade, foreign direct investment, and technology spillovers.' *Handbooks in Economics* 2: 793–829, doi: [http://dx.doi.org/10.1016/s0169-7218\(10\)02003-4](http://dx.doi.org/10.1016/s0169-7218(10)02003-4).
- Krishna, Kala & Ling Hui Tan. 1998. *Rags and Riches: Implementing Apparel Quotas under the Multi-fibre Arrangement*. Ann Arbor: University of Michigan Press.
- Kropf, Andreas & Philip Sauré. 2014. 'Fixed costs per shipment.' *Journal of International Economics* 92(1): 166–84, doi: <https://doi.org/10.1016/j.jinteco.2013.10.003>.
- Krugman, Paul. 1980. 'Scale economies, product differentiation, and the pattern of trade.' *The American Economic Review* 70(5): 950–59, doi: <https://www.jstor.org/stable/1805774>.
- Krugman, Paul R 1979. 'Increasing returns, monopolistic competition, and international trade.' *Journal of International Economics* 9(4): 469–79, doi: [https://doi.org/10.1016/0022-1996\(79\)90017-5](https://doi.org/10.1016/0022-1996(79)90017-5).
- Leamer, Edward E & Robert Mitchell Stern. 1976. *Quantitative International Economics*. Boston: Allyn and Bacon Inc.
- Levinsohn, James & Amil Petrin. 2003. 'Estimating production functions using inputs to control for unobservables.' *The Review of Economic Studies* 70(2): 317–41, doi: <https://doi.org/10.1111/1467-937X.00246>.
- Markusen, James R. 1989. 'Trade in producer services and in other specialized intermediate inputs.' *The American Economic Review* 79(1): 85–95, doi: <https://www.jstor.org/stable/1804775>.
- Martin, Will. 1999. 'The abolition of the multi-fibre arrangement and its implications for fibre markets.' In *Implications of the Uruguay round agreement for South Asia: The Case of Agriculture*, edited by Benoit Blarel, Garry Pursell & Alberto Valdes, 137–53. New Delhi: Allied Publisher.
- Martins, Pedro S. & Yong Yang. 2009. 'The impact of exporting on firm productivity: A meta-analysis of the learning-by-exporting hypothesis.' *Review of World Economics* 145(3): 431–45, doi: <http://dx.doi.org/10.1007/s10290-009-0021-6>.
- Melitz, Marc J 2003. 'The impact of trade on intra-industry reallocations and aggregate industry productivity.' *Econometrica* 71(6): 1695–725, doi: <http://dx.doi.org/10.1111/1468-0262.00467>.
- Melitz, Marc J & Stephen J Redding. 2014. 'Heterogeneous firms and trade.' In *Handbook of International Economics*, 4th edn, edited by Gita Gopinath, Elhanan Helpman & Kenneth Rogoff, 1–54. Oxford: Elsevier.
- Merkies, AHQM & T van der Meer. 1988. 'A theoretical foundation for constant market share analysis.' *Empirical Economics* 13(2): 65–80, doi: <http://dx.doi.org/10.1007/bf01973315>.

- Mollisi, Vincenzo & Gabriele Rovigatti. 2017. 'Theory and practice of TFP estimation: The control function approach using Stata.' CEIS Working Paper No. 399 15(2), doi: <http://dx.doi.org/10.2139/ssrn.2916753>.
- Narjoko, Dionisius & Raymond Atje. 2007. 'Promoting exports: Some lessons from Indonesian manufacturing.' Asia-Pacific Research and Training Network on Trade Working Paper Series no. 32, February.
- Nordås, Hildegunn Kyvik. 2004. 'The global textile and clothing industry post the agreement on textiles and clothing.' Discussion paper no. 5. Geneva: World Trade Organization.
- Olley, G Steven & Ariel Pakes. 1996. 'The dynamics of productivity in the telecommunications equipment industry.' *Econometrica* 64(6): 1263–97, doi: <http://dx.doi.org/10.2307/2171831>.
- Patunru, Arianto A. 2018. 'Rising economic nationalism in Indonesia.' *Journal of Southeast Asian Economies* 35(3): 335–54, doi: <https://www.jstor.org/stable/26545317>.
- Perry, Patsy, Steve Wood & John Fernie. 2015. 'Corporate social responsibility in garment sourcing networks: Factory management perspectives on ethical trade in Sri Lanka.' *Journal of Business Ethics* 130(3): 737–52, doi: <https://doi.org/10.1007/s10551-014-2252-2>.
- Petrin, A, BP Poi & J Levinsohn. 2004. 'Production function estimation in Stata using inputs to control for unobservables.' *Stata Journal* 4(2): 113–23, doi: <https://doi.org/10.1177/1536867X0400400202>.
- Pierola, Martha Denisse, Ana Margarida Fernandes & Thomas Farole. 2018. 'The role of imports for exporter performance in Peru.' *The World Economy* 41(2): 550–72, doi: <http://dx.doi.org/10.1111/twec.12524>.
- Ranjan, Priya & Jibonayan Raychaudhuri. 2011. 'Self-selection vs learning: Evidence from Indian exporting firms.' *Indian Growth and Development Review* 4(1): 22–37, doi: <https://doi.org/10.1108/1753825111124981>.
- Rho, Youngwoo & Joel Rodrigue. 2015. 'Growing into export markets: The impact of exporting on firm-level investment in Indonesia.' *Review of International Economics* 23(1): 62–85, doi: <https://doi.org/10.1111/roie.12156>.
- Richardson, J David. 1971. 'Some sensitivity tests for a 'constant-market-shares' analysis of export growth.' *The Review of Economics and Statistics* 53(3): 300–04, doi: <https://doi.org/10.2307/1937978>.
- Roberts, Mark J & James R Tybout. 1997. 'The decision to export in Colombia: An empirical model of entry with sunk costs.' *The American Economic Review* 87(4): 545–64, doi: <https://www.jstor.org/stable/2951363>.
- Rodriguez-Pose, Andrés, Vassilis Tselios, Deborah E Winkler & Thomas Farole. 2013. 'Geography and the determinants of firm exports in Indonesia.' *World Development* 44 (April): 225–40, doi: <https://dx.doi.org/10.1016/j.worlddev.2012.12.002>.
- Savchenko, Yevgeniya & Gladys Lopez Acevedo. 2012. *Female Wages in the Apparel Industry Post-MFA: The Cases of Cambodia and Sri Lanka*. Policy Research Working Paper, WPS6061. Washington, DC: World Bank.
- Siba, Eyerusalem & Mulu Gebreeyesus. 2016. 'Learning to export and learning from exporting: The case of Ethiopian manufacturing.' *Journal of African Economies*. 26(1): 1–23, doi: <http://dx.doi.org/10.1093/jae/ejw022>.

- Sjöholm, Fredrik. 2003. 'Which Indonesian firms export? The importance of foreign networks.' *Papers in Regional Science* 82(3): 333–50, doi: <http://dx.doi.org/10.1007/s10110-003-0163-1>.
- Sjöholm, Fredrik & Sadayuki Takii. 2008. 'Foreign networks and exports: Results from Indonesian panel data.' *The Developing Economies* 46(4): 428–46, doi: <http://dx.doi.org/10.1111/j.1746-1049.2008.00072.x>.
- Srinivasan, Thirukodikaval N. 1998. *Developing countries and the multilateral trading system: from the GATT to the Uruguay Round and the future*. New Delhi: Oxford University Press.
- Staritz, Cornelia. 2010. *Making the Cut? Low-income Countries and the Global Clothing Value Chain in a Post-quota and Post-crisis World*. Washington, DC: The World Bank.
- Tewari, Meenu. 2008. 'Varieties of global integration: Navigating institutional legacies and global networks in India's garment industry.' *Competition & Change* 12(1): 49–67, doi: <https://doi.org/10.1179/102452907X264520>.
- Thee, Kian Wie. 2009. 'The development of labour-intensive garment manufacturing in Indonesia.' *Journal of Contemporary Asia* 39(4): 562–78, doi: <http://dx.doi.org/10.1080/00472330903076818>.
- Timoshenko, Olga A. 2015. 'Learning versus sunk costs explanations of export persistence.' *European Economic Review* 79 (October): 113–28, doi: <https://doi.org/10.1016/j.euroecorev.2015.02.006>.
- Tokatli, Nebahat & Ömür Kızılgün. 2009. 'Coping with the changing rules of the game in the global textiles and apparel industries: Evidence from Turkey and Morocco.' *Journal of Economic Geography* 10(2): 209–29, doi: <https://doi.org/10.1093/jeg/lbp033>.
- Trofimenko, Natalia. 2008. 'Learning by exporting: Does it matter where one learns? Evidence from Colombian manufacturing firms.' *Economic Development and Cultural Change* 56(4): 871–94, doi: <https://doi.org/10.1086/588156>.
- Van Biesebroeck, Johannes. 2005. 'Exporting raises productivity in sub-Saharan African manufacturing firms.' *Journal of International Economics* 67(2): 373–91, doi: <https://doi.org/10.1016/j.jinteco.2004.12.002>.
- Wagner, Joachim. 2007. 'Exports and productivity: A survey of the evidence from firm-level data.' *The World Economy* 30(1): 60–82, doi: <https://doi.org/10.1111/j.1467-9701.2007.00872.x>.
- Wells, Louis T, & V'ella Warren. 1979. 'Developing country investors in Indonesia.' *Bulletin of Indonesian Economic Studies* 15(1): 69–84, doi: <https://doi.org/10.1080/00074917912331333461>.
- Yang, Yongzheng, Will Martin & Koji Yanagishima. 1997. 'Evaluating the benefits of abolishing the MFA in the Uruguay Round package.' In *Global Trade Analysis: Modeling and Applications*, edited by Thomas W. Hertel, 253–79. Cambridge: Press Syndicate of the University of Cambridge.
- Yasar, M, R Raciborski & B Poi. 2008. 'Production function estimation in Stata using the Olley and Pakes method.' *Stata Journal* 8(2): 221–31, doi: <https://doi.org/10.1177/1536867X0800800204>.
- Yi, Jingtao & Chengqi Wang. 2012. 'The decision to export: Firm heterogeneity, sunk costs, and spatial concentration.' *International Business Review* 21(5): 766–81, doi: <https://doi.org/10.1016/j.ibusrev.2011.09.001>.