Profitability and Marketability Efficiencies of Manufacturers in the Association of Southeast Asian Nations: A Multi-stage Empirical Study

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Abstract

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The Association of Southeast Asian Nations (ASEAN) is developing as an attractive, promising destination for manufacturing operations in Asia. Since the 2015 establishment of ASEAN Economic Community, which aims to become a resilient manufacturing and business centre, it has fostered the growth of manufacturers in ASEAN. The manufacturing sector has contributed extensively to the economic development of ASEAN nations. Notable recent positive statistics report the impressive performance and continuous development of manufacturing in most ASEAN countries. Despite the acknowledged contribution and potential growth of manufacturing in ASEAN nations, the profit-generating and market-value efficiencies of manufacturing enterprises in ASEAN are still debatable.

This study applies the bootstrap two-stage data envelopment analysis (DEA) to investigate the profitability and marketability efficiencies of 899 listed manufacturers in six selected ASEAN countries (ASEAN-6): Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam from 2007 to 2018. The study uses panel-data fractional and Tobit regression models to examine the effects of corporate factors on the listed manufacturers' profitability and marketability efficiencies across the ASEAN-6 countries. Though the fractional regression model is the most advantageous method for fractional response variables, the Tobit regression model is most widely used for evaluating efficiency determinants.

The bootstrap two-stage DEA results show that Indonesian and Singaporean listed manufacturing attains relatively high average profitability efficiency. Conversely, Malaysia, the Philippines, Thailand, and Vietnam listed manufacturers' profitability efficiency has considerable room for improvement. Marketability efficiency levels are significantly lower than profitability efficiency for most ASEAN-6 countries (exception, Malaysia). Singaporean listed manufacturers have the highest marketability efficiency scores, followed by Indonesia, Malaysia, Thailand, the Philippines, and Vietnam listed

manufacturers. The empirical results from the regression models show diverse, significant impacts of corporate financial and non-financial factors on the profitability and marketability efficiencies of the listed firms in the ASEAN-6 countries' manufacturing sector and sub-sectors (high-technology and traditional production sub-sectors).

Keywords: ASEAN, Profitability efficiency, Fractional regression model, Manufacturers, Marketability efficiency, Two-stage data envelopment analysis, Tobit regression model

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The responsibility related to this thesis is mine. Any merit I am glad to share with all the people I mentioned above.

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Abbreviations

AEC	ASEAN Economic Community
ASEAN	Association of Southeast Asian Nations
ASEAN-6	Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam
APT	ASEAN Plus Three (China, Japan, and South Korea)
BCC	Banker, Charnes, and Cooper (1984)
BRICS	Brazil, Russia, India, China, and South Africa
BTRM	Bootstrap truncated regression model
CCR	Charnes, Cooper, and Rhodes (1978)
CRS	Constant returns to scale
DEA	Data envelopment analysis
DMU	Decision-making unit
EPS	Earnings per share
FDH	Free disposal hull
FRM	Fractional regression model
GDP	Gross Domestic Product
GMCI	Global Manufacturing Competitiveness Index
IDN	Indonesia
IFRS	International Financial Reporting Standards
MYS	Malaysia
OECD	The Organization for Economic Co-operation and Development
OLS	Ordinary least squares
PHL	The Philippines
ROA	Return on assets
ROE	Return on equity
S.D.	Standard deviation
SGP	Singapore
THA	Thailand
TRM	Tobit regression model
UAE	United Arab Emirates
The U.S.	The United States
VNM	Vietnam
VRS	Variable returns to scale

Chapter 1

Introduction

1.1 Research rationale

The manufacturing sector plays an increasingly pivotal role in the development of the Association of Southeast Asian Nations (ASEAN). Statistics from The World Bank (2020a) show that manufactured products' contribution to ASEAN total commodities exported increased from 50% in 2010 to over 60% in 2016. With the competitive advantages of low employment costs, large consumer population, better investment policies, and improving infrastructure, ASEAN is considered an attractive destination to reallocate manufacturing operations from China (Vermeulen, 2015; Lim, 2017).

On the last day of 2015, the leaders of 10 ASEAN member states officially celebrated the introduction of a single economic community, the ASEAN Economic Community (AEC). The AEC is oriented to become a manufacturing and trading hub that is resilient and highly integrated into the global economy. Following the AEC's establishment and its provisions, there have been numerous opportunities for regional manufacturers to optimise their profit by attracting more investors, raising more funds and widening their markets.

Corporate profitability and marketability efficiencies are two important measures that reflect firms' operational and financial success. These performance evaluations identify if the firms have been using their existing resources efficiently (Düzakın & Düzakın, 2007). Therefore, understanding the performance efficiency levels of firms will help corporate managers and investors to position their companies competitively and make sound business decisions. Although profitability and marketability efficiencies, as well as the impacts of financial and non-financial characteristics on the companies' performance, are investigated widely for developed markets in the literature, studies on ASEAN markets, however, are limited and incomplete.

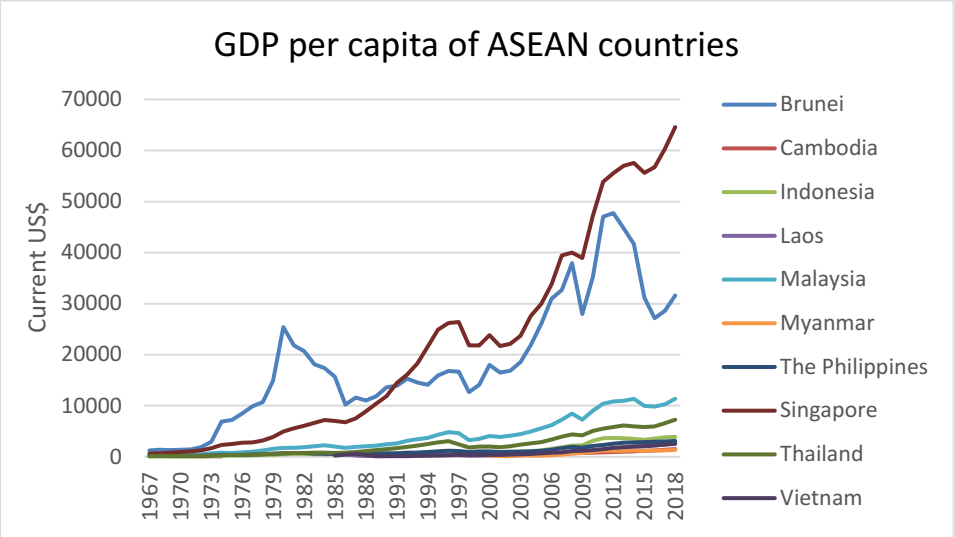
This study assesses manufacturers' profitability and marketability efficiencies in six selected ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam) that account for over 95% of total ASEAN's GDP in 2018 (ASEANstats, 2019a). The study also examines the effects of firms' financial and non-financial characteristics on manufacturers' earnings and marketability efficiency across the six selected ASEAN countries. This study separates manufacturers in each country into manufacturing sub-sectors based on the industries' production characteristics to

compare the efficiency of firms in different manufacturing sub-sectors and identifies the factors that significantly affect their profit and market-value efficiencies.

1.2 ASEAN development and regional opportunities

ASEAN was inaugurated on 8 August 1967 with Indonesia, Malaysia, the Philippines, Singapore and Thailand as the founding members. Brunei officially joined in 1984, Vietnam in 1995, Laos and Myanmar in 1997, and Cambodia in 1999, now comprising the 10 countries in the association.

After over 50 years of operation, ASEAN is one of the most dynamic, integrated and fastest-growing regions in the world. As a part of "Miracle East Asia" (Birdsall et al., 1993; Dixon, 2009), since the 1960s, the 10 ASEAN members have experienced fast economic upturn and enormous growth potential together with high levels of income equality and an increase in the standard of living. The GDP per capita of each ASEAN member has experienced a remarkable upward trend from 1967 to 2018, indicating a significant improvement in living conditions and income of residents in ASEAN countries (see Figure 1.1).



Source: The World Bank (2020b)

Figure 1.1: The GDP per capita of ASEAN countries from 1967 to 2018

Together with economic development, this regional bloc offers a promising consumer market with over 649 million residents, i.e., 8.5% of the world's population in 2018 (see Table 1.1).

Table 1.1: ASEAN countries' basic demographic indicators in 2018

Country	Total area (km^2)	Population (thousands)	Annual population growth (%)	Unemployment rate (%)
Brunei	5,765	442.4	3.0	9.3
Cambodia	181,035	15,981.8	1.7	0.1
Indonesia	1,916,862	265,015.3	1.2	5.3
Laos	236,800	6,887.1	2.0	1.9
Malaysia	331,388	32,385.0	1.1	3.3
Myanmar	676,576	53,625.0	0.4	1.0
The Philippines	300,000	106,598.6	1.6	5.4
Singapore	720	5,638.7	0.5	3.1
Thailand	513,140	67,831.6	0.3	1.1
Vietnam	331,230	94,666.0	1.1	2.2
ASEAN	4,493,516	649,071.5	1.1	

Source: ASEANstats (2019b, 2019c)

With the aim of gathering different state members into one association, the ASEAN Declaration in 1967 agreed on seven common objectives: together promoting the development and growth of Southeast Asian economies, societies, and cultures; ensuring peace and stability in the region; encouraging mutual collaboration and support among member nations in all fields; providing training and assistance professionally; cooperating more effectively in agriculture and industry, expanding trade, improving transport, and enhancing people's standard of living; accelerating regional research; and maintaining close relationships among all ASEAN member nations (ASEAN, 2015).

Another momentous step in ASEAN's development was the official collaboration between ASEAN and China, Japan, and South Korea, the ASEAN Plus Three (APT), since 1997. APT members committed to intensively foster partnerships in East Asia at different levels and in diverse areas, especially in economics, politics, public affairs and others. In 2007, a master plan called "APT Cooperation Work Plan (2007 – 2017)" giving the direction and approaches to enhance APT collaboration was approved (ASEAN, 2017).

In 2007, ASEAN leaders made a milestone decision to establish the ASEAN Community by 2015. In December 2008, the ASEAN Community Council was set up to provide the necessary institutional framework to achieve the ASEAN Community by 2015. The targeted ASEAN Community consists of three pillars: ASEAN Political-Security Community, ASEAN Economic Community, and the ASEAN Socio-Cultural Community (ASEAN, 2015).

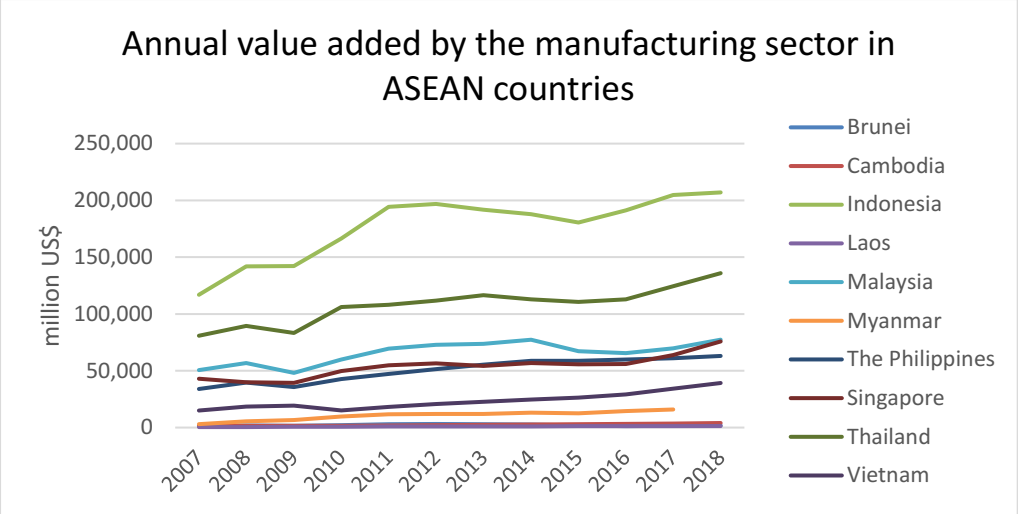
Remarkably, at the end of 2015, leaders of the ASEAN states officially welcomed the ASEAN Economic Community (AEC), which was promoted to become an open, well-positioned manufacturing and trading centre in the region. AEC is more diverse and densely populated than the European Union or North America and is the third-largest society in the world. This market collectively is the third biggest economy in Asia and is the seventh-largest market worldwide. Therefore, AEC is expected to strongly increase income and employment that will enable the region to compete with other economic giants, especially China and India (ASEAN, 2015).

One important constituent element of AEC is the free movement of investment flows (ASEAN, 2015). The investment liberalisation efforts of ASEAN not only establish and enhance the confidence of investors in ASEAN but also promote regional enterprises' growth and development. At the same time, trading business between ASEAN and the Plus Three countries in APT constantly involves and accounts for a significant amount of ASEAN's total trade. For instance, APT trade contributed to one-third of ASEAN's total trade in 2015. The total foreign direct investment (FDI) flow from China, Japan, and South Korea added over one quarter of total FDI in ASEAN in 2015 (ASEAN, 2015). In the context of intra-Southeast Asia and intra-East Asia integration, there is a better chance for ASEAN companies to expand their markets, gain more income and increase firms' market value. The continuing integration is also an opportunity for investors to diversify their portfolios and optimise financial and investment assets.

1.3 The manufacturing sector's contributions to ASEAN economies

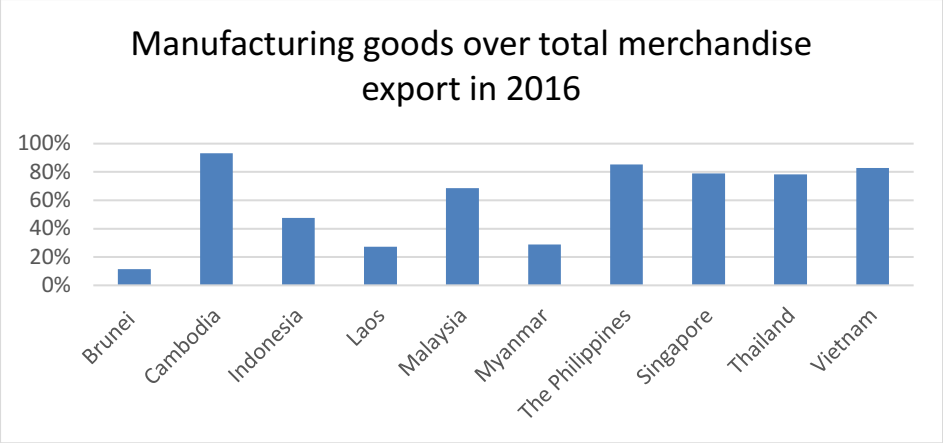
Since 2012, ASEAN economies have undergone many challenges in the context of slower-than-expected post-financial crisis recovery of the global economy (see Figure 1.1). In that status quo, notable positive statistics show favourable outcomes and continuous development of manufacturing in most ASEAN countries (see Figure 1.2). According to Lim (2017), ASEAN countries have drawn attention and won global manufacturers from China because of cheaper costs, huge regional consumption potential, and better infrastructure over time. The manufacturing sector has been one key reason for ASEAN's industrial growth and economic recovery.

In terms of international trade, manufacturing product exports have accounted for the biggest portion (over 60%) of total commodities exported in ASEAN recently (The World Bank, 2020a). Notably, the percentages of manufacturing goods exported in 2016 were all over three quarters of total national exports of Cambodia (93%), the Philippines (85%), Vietnam (83%), Singapore (79%), and Thailand (78%) (see Figure 1.3).



Source: The World Bank (2020c)

Figure 1.2: The annual value added by the manufacturing sector in ASEAN countries from 2007 to 2018 (million US$)



Source: The World Bank (2020a)

Figure 1.3: ASEAN countries' manufacturing product export as percentage of total merchandise export in 2016

1.4 The research problem

Comprising 10 geographically close but culturally distinct countries, ASEAN is a community with diversified religions, languages, politics, and economic development (see Table 1.2). Indonesia is the most populated Muslim country in the world. Singapore is known as the international financial and business centre of the region. Malaysia is a mixture of Indonesia and Singapore with Muslim culture and an international economic environment. Vietnam is becoming an open market economy under the tight control of the government. Thailand has an amicable business environment, although the country is politically unstable and complicated (Domm, 2016).

Table 1.2: The religions, languages, GDP per capita, and world rank in the economic freedom index of ASEAN countries in 2018

Country	Religions[(1)]	Languages[(2)]	GDP per capita[(3)] (in US$)	World rank in economic freedom index[(4)]
Brunei	Islam (67%), Buddhism, Christianity, others	Malay, English	30,645	70
Cambodia	Buddhism (97%), Islam, Christianity, Animism, others	Khmer	1,541	101
Indonesia	Islam (87.18%), Christianity, Hinduism, Buddhism, others	Indonesian	3,930	69
Laos	Buddhism (67%), Animism, Christianity, others	Lao	2,627	138
Malaysia	Islam (60.4%), Buddhism, Christianity, Hinduism, Animism	Malay, English, Chinese, Tamil	11,067	22
Myanmar	Buddhism, Christianity, Islam, Hinduism, various folk religions, atheism, others	Myanmar	1,441	-
The Philippines	Christianity (83%), Islam (11%), Buddhism (2%), Animism (1.25%), others	Filipino, English, Spanish	3,215	61
Singapore	Buddhism, Christianity, Islam, Taoism, Hinduism, others	English, Malay, Mandarin, Tamil	64,567	2
Thailand	Buddhism (93.83%), Islam (4.56%), Christianity (0.8%), Hinduism (0.011%), others (0.079%)	Thai	7,446	53
Vietnam	Vietnamese folk religion (45.3%), Buddhism (16.4%), Christianity (8.2%), Muslim (0.2%), others (0.4%), unaffiliated (29.6%)	Vietnamese	2,546	141

Source: [(1)] Pariona (2018); [(2)] ASEAN (2019); [(3)] ASEANstats (2019b); [(4)] Miller, Kim, and Roberts (2018)

The ASEAN countries' stock markets are also at different development stages. Among the 10 ASEAN nations, Brunei has no stock exchange and the stock markets of Cambodia, Laos, and Myanmar are currently underdeveloped. From 2007 to 2018, the number of stocks listed increased in Indonesia, Thailand, and Vietnam, decreased in Malaysia, and remained stable in the Philippines and Singapore (see Table 1.3).

Table 1.3: The total listed domestic companies of ASEAN countries from 2007 to 2018

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Indonesia	383	396	398	420	440	459	483	506	521	537	566	619
Malaysia	983	972	952	948	932	911	900	895	892	890	890	902
The Philippines	242	244	246	251	251	252	254	260	262	262	264	264
Singapore	472	455	459	461	462	472	479	484	483	479	483	482
Thailand	523	525	535	541	545	558	584	613	639	656	688	704
Vietnam		330	445	634	687	697	678	670	684	696	728	749

Source: The World Bank (2020d)

The political, economic, social, and cultural complexity of each ASEAN country has led to dissimilarities in manufacturers' performance and efficiency. Therefore, to support regional manufacturers in positioning themselves and to help ASEAN governments make sound decisions to boost the development of the manufacturing sector, a comparative analysis of firms' operational and market valuation efficiency across ASEAN countries is urgently needed.

Based on the development of ASEAN stock markets and the availability of data (see Table 1.3), this study focuses on only six ASEAN countries: Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam (hereafter referred to as "ASEAN-6"). The ASEAN-6 countries have contributed nearly 96% of total ASEAN GDP in 2018 (ASEANstats, 2019a). In addition, each of the ASEAN-6 countries has its own manufacturing strengths, concentrations, and weaknesses. Tonby, Ng, and Mancini (2014) report the dominant leading manufacturing industries as well as the government's plan to prioritise manufacturing industries in each ASEAN-6 country (see Table 1.4). Table 1.4 shows that ASEAN-6's new manufacturing plans concentrate on developing higher technology industries.

There are ample studies exploring the profitability and marketability efficiencies of banks and financial institutions worldwide, e.g., Seiford and Zhu's (1999) study on U.S. banks; Tsolas's (2011a) investigation on Greek commercial banks; Shahwan and Hassan's (2013) analysis of UAE banks; and studies by Liu (2011), Lin and Chiu (2013), Zhu, Chen, and White (2014), Fu, Juo, Chiang, Yu, and Huang (2016) and Chao, Hsiung, and Chen (2018) on Taiwan's banks and financial companies. Assessments of profitability and marketability efficiencies are also used for non- financial companies such as Zhu's (2000) estimate of Fortune 500 companies and Lo's (2010) study on the sustainable business of the large U.S. companies. For the manufacturing sector, there are various studies measuring manufacturers' profitability and marketability efficiencies in different manufacturing industries and markets, e.g., Hung and Wang's (2012) study on manufacturers in Taiwan; Lee, Huang, Hsu, and Hung's (2013) evaluation of the profit-generating and market-value efficiency of biotechnology and medical equipment industries in Taiwan; Wang, Hsu, Wang, and Pham's (2017)

profitability and marketability efficiency measurement of the top equipment manufacturing service providers; and Huang's (2018) study of medical manufacturers in Taiwan.

Table 1.4: The dominant manufacturing industries in 2014 and new manufacturing plans in the ASEAN-6 countries

ASEAN country	Dominant manufacturing industries in 2014	Planning prioritised manufacturing industries
Indonesia	- Metal and mineral exploration and production - Automobiles - Plastics and rubbers	Industrial production
Malaysia	- Transport equipment; - Electronic machine	High-tech production
The Philippines	- Mining and metals productions Semiconductor and electronics manufacture	Industrial products
Singapore	- Food, beverage and tobacco - Energy and chemical production	New technology and innovation
Thailand	- Automobile production	Affordable-car production
Vietnam	- Petroleum processing - Chemical production	Industrial and new energy manufacturing

Source: Tonby et al. (2014)

However, the literature on profitability and marketability efficiencies of manufacturers in ASEAN markets is limited and incomplete. No study has investigated the impact of financial and non-financial factors on operational performance and market-value efficiency of manufacturers in ASEAN. This considerable academic gap, together with the establishment of the ASEAN Economic Community in 2015 that promotes the economic development and fortifies the competitiveness of the region, is the motivation and drive for this study.

1.5 Research questions

This study aims to examine the business profitability and marketability efficiencies' scores and determinants of the listed manufacturers in ASEAN-6 markets (Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam). The study seeks to answer six key questions:

(1) What are the profitability efficiency levels of the listed manufacturers in each ASEAN-6 country?

(2) What are the marketability efficiency levels of the listed manufacturers in each ASEAN-6 country?

(3) How do corporate financial and non-financial characteristics affect the listed manufacturers' profitability efficiency in each ASEAN-6 country?

(4) How do corporate financial and non-financial characteristics affect the listed firms' profitability efficiency in each manufacturing sub-sector in each ASEAN-6 country?

(5) How do corporate financial and non-financial characteristics affect the listed manufacturers' marketability efficiency in each ASEAN-6 country?

(6) How do corporate financial and non-financial characteristics affect the listed firms' marketability efficiency in each manufacturing sub-sector in each ASEAN-6 country?

Based on the empirical research results, the study will provide implications and suggestions to ASEAN governments, listed manufacturers, and investors about how to enhance manufacturers' financial performance efficiency and investors' earnings in the context of regional integration and development.

1.6 Research methodology and data collection

1.6.1 Research methodology

To answer the research questions (1) and (2), this study applies bootstrapped two-stage data envelopment analysis (DEA) to measure the listed manufacturers' profitability and marketability efficiency scores in each ASEAN-6 country. Under the DEA method, each firm is considered a decision-making unit (DMU). The process is adapted and modified from Seiford and Zhu's (1999) and Hung and Wang's (2012) studies.

To answer research questions (3), (4), (5), and (6), the study uses a panel-data fractional regression model to investigate the impacts of the listed manufacturers' financial and non-financial characteristics on their profitability and marketability efficiency scores in the manufacturing sector and sub-sectors of ASEAN-6 countries. According to Hoff (2007), Ramalho, Ramalho, and Henriques (2010), and Gallani, Krishnan, and Wooldridge (2015), the fractional regression model is the most advantageous method for continuous dependent variables with values bounded from 0 to 1 (e.g., efficiency scores). This approach takes into account the fractional characteristic of the response variables and disregards the availability of observed frontier values. Additionally, this study applies the panel-data Tobit regression model for censored dependent variables to check the robustness of coefficient estimates from the different regression models. Tobit regression is the most commonly adopted method for DEA efficiency's determinant examination in previous studies (Wolszczak-Derlacz & Parteka, 2011; Singh & Fida, 2015).

Based on regional manufacturing industries' production characteristics and classification adapted from OECD (2011) and Tonby et al. (2014), the study categorises the listed manufacturers of the ASEAN-6 countries into two manufacturing sub-sectors. Sub-sector S1 (high-technology sub-sector) consists of the chemical, pharmaceutical, equipment, machinery, and vehicle manufacturing industries. Sub-sector S2 (traditional production sub-sector) includes other manufacturing industries in the ASEAN-6 nations.

1.6.2 Data collection

This study uses annual data of listed manufacturers in the ASEAN-6 markets over 12 years from 2007 to 2018. The significant development of ASEAN in 2007 was the commitment of 10 ASEAN states to establish the ASEAN Community by 2015. In 2007, the ASEAN leaders collectively agreed on the AEC BluePrint - a comprehensive master plan to achieve the complete establishment of ASEAN Economic Community by 2015 (ASEAN, 2015). Therefore, 2007 is chosen as the start year for the study and 2018, three years after the official establishment of AEC, as the end year for the study. Overall, there are 128 Indonesian firms, 325 Malaysian firms, 50 Philippine firms, 114 Singaporean firms, 180 Thai firms, and 102 Vietnamese firms in the manufacturing sector in this study. The two-stage DEA process's inputs and outputs, as well as the regression models' explanatory variables used in the study, are from Bloomberg, SPEEDA, and the listed manufacturers' financial statements.

1.7 Research contributions

This study is expected to broaden our knowledge of ASEAN manufacturers and corporate efficiencies in various ways. The major contribution of this study is an insightful assessment of the profitability and marketability efficiencies of listed manufacturers in six selected ASEAN countries. Though there is a limited number of studies measuring the profitability efficiency of ASEAN-6 listed manufacturers, the literature has neither evaluated the marketability efficiency nor used the two-stage DEA to simultaneously estimate the profit-generating ability and market-value efficiencies of listed manufacturers in ASEAN-6 countries. In the context of regional economic integration that brings promising opportunities and potential growth for ASEAN-6 listed manufacturers, our study bridges the above research gap with the recent data from 2007 to 2018. The study classifies listed ASEAN-6 manufacturers into two manufacturing sub-sectors for analysis. Thus, this study provides an updated understanding of the efficiency performance of the individual listed manufacturers, specific manufacturing sub-sectors, and the aggregate manufacturing sector of each ASEAN-6 nation.

Secondly, the study contributes to the limited prior two-stage DEA efficiency studies that mostly focus on developed markets. By measuring and analysing efficiencies in the six ASEAN economies,

this study compares the listed manufacturers' efficiencies in three different capital markets: developed, emerging, and frontier markets.

Thirdly, the study provides empirical evidence on the determinants of profitability and marketability efficiencies, which are lacking in the literature. The context of cultural distinctness and economic diversity in ASEAN-6 countries suggests that the influences of different financial and non-financial factors on firm efficiencies are diverse across the ASEAN-6 countries.

Fourthly, this is the first study that tries to combine bootstrap two-stage data envelopment analysis and panel-data fractional regression models, which are considered superior methods over other available approaches to explore firms' efficiency scores and determinant evaluations.

Finally, this study could be a reference source for stakeholders including shareholders, investors, corporate managers, and governments to make appropriate decisions in investing, managing, and enhancing the development of ASEAN manufacturing sectors.

1.8 Thesis structure

This thesis is organised as follows. Chapter 2 discusses previous studies on profitability and marketability efficiencies in different business sectors as well as the impact of financial and non-financial factors on the efficiency levels of firms in various countries and regions worldwide. Chapter 3 provides a background to the bootstrap two-stage DEA technique, fractional and Tobit regression models, followed by the empirical models and data of the study. The empirical results of the profitability and marketability efficiencies' scores and determinants of the listed manufacturers in ASEAN-6 countries are discussed in Chapter 4. Chapter 5 highlights the research findings and concludes with several recommendations for academics, ASEAN-6 policymakers, listed manufacturers, and investors. The chapter ends with a discussion of the study's limitations and suggestions for further research.

Chapter 2

A review of firm performance and efficiency

This chapter presents an overview of firm performance and efficiency in general, as well as corporates' profitability efficiency, marketability efficiency, and their determinants. Section 2.1 summarises the definitions of corporate performance and efficiency from previous studies. Section 2.2 introduces and elucidates primary definitions and applications of firm profitability and marketability efficiencies. Section 2.3 discusses the determinants of firms' efficiency and factors that affect firms' efficiency level. Section 2.4 compiles a literature review of ASEAN countries, regarding profitability and marketability efficiencies and their determinants.

2.1 Firms' performance measurements

2.1.1 The definition and importance of corporate performance measurements

The success of a business is defined by how the firm performs over time (Steffens, Davidsson, & Fitzsimmons, 2009). Researchers have tried to identify appropriate measures of corporate performance. However, there is no specific measurement to evaluate all aspects of firm performance (Snow & Hrebiniak, 1980). According to Neely, Gregory, and Platts (2005), firm performance describes how efficiently and effectively a firm operates, where efficiency reflects internal operation results and effectiveness represents external performance. Thus, a firm's performance measurement can be processed by quantifying both the efficiency and effectiveness of corporate actions.

Assessing performance is essential for the proper management of a firm (Demirbag, Tatoglu, Tekinkus, & Zaim, 2006). Koufopoulos, Zoumbos, Argyropoulou, and Motwani (2008) assert that corporate performance measurement is more important to firms than quantitative and accounting activities in business management. Performance measurement can provide helpful information for managers' supervision, progress reports, motivational and communicational enhancements, and problem identification (Waggoner, Neely, & Kennerley, 1999). In other words, management cannot be improved without measuring results. Therefore, business performance enhancement requires measurement to determine how the use of a firm's resources affect corporate performance (Madu, Kuei, & Jacob, 1996; Sharma & Gadenne, 2002). Wouters and Sportel (2005) report that the performance-measuring topic has been explored extensively since the 1980s when businesses started to deploy and refine their performance measurements and found solutions for the many

challenges that organisations face in a dynamic world. Recently, there has been an increase in the number of studies concentrating on performance measurement systems with multiple perspectives and different evaluation levels (Choong, 2014).

2.1.2 Types of corporate performance measurements

Neely et al. (2005) summarise different measurements of performance and categorise them into four main groups: measurements associating with quality; measurements concerning time; measurements regarding cost; and measurements connecting to flexibility. Specifically, quality-based performance evaluation aims to identify the number of errors generated and the cost to quality. Some measurement methods for quality are the cost of quality model, statistical-procedure controlling model (Deming & Edwards, 1982), and Motorola's six-sigma method (Harry & Lawson, 1992). For measurements associated with time, Stalk (1988) and Drucker (1990) investigate time as an operational advantage and proper measurement for production performance. An example of performance measurement connecting to time is the Just-in-time method (Potts, 1986). The third type of performance measurement is cost-focused measurement, which highly associates with accounting (Garner, 1954). Some of the most commonly adopted cost-focused measurements are DuPont's return on investment, activity-based cost (Cooper & Kaplan, 1988), and the productivity method (the quotient between outputs and inputs – Burgess, 1990). The final performance measure is a flexibility-based measurement, which consists of three dimensions: range, cost and time (Slack, 1983) or range and response (Slack, 1987). According to Slack (1983, 1987), the range reflects how much the production system could be adjusted, whereas the response represents how quickly and economically the system could be modified.

Le (2010) summarises the performance measures of firms from different facets of corporate governance. The author lists numerous indicators of firms' financial and operational performance that can be categorised into three sub-groups: indicators from financial reports (such as returns on assets and investment values, expense over assets, sales over assets, expenses over sales, operating cash flow, cost of capital operation profit, growth in sales, and sales per employee); indicators for stock evaluation (including Tobin-Q, stock returns, dividend rate, price-earnings ratio, abnormal returns, book-to-market ratio, market capitalisation, stock-repurchased amount); and other performance indicators for management (e.g., labour productivity, output per staff, profit per employee).

According to Le (2010), researchers have specially devoted to a performance measurement method that relates the production transformation from inputs to outputs, or technical efficiency, in recent

years. The rationale for the emergence of the technical efficiency method is the accuracy of the method (Hill & Snell, 1989), whereas other traditional methods such as financial indicators or Tobin's Q may be not consistent among different reporting techniques or accounting purposes (Barth, La Mont, Lipton, & Spelke, 2005).

2.1.3 Firm efficiency measurements

According to Daraio and Simar (2007), firm efficiency demonstrates how far from the input-output quantity relationship of a firm is from the best input-output quantity frontier in a group of firms. Koopmans (1951) defines a technically efficient input-output vector as: the only way to raise any output or deduct any input is to reduce some other outputs or increase some other inputs. Koopmans (1951), Farrell (1957), and Charnes, Cooper, Golany, Seiford, and Stutz (1985) define technical efficiency as a practice-related concept that indicates the best observation for firm efficiency is in the reference group or comparison cluster. Technical efficiency thus becomes an effective technique of distinguishing between inefficient and efficient operational units.

In economic and financial management, technical efficiency is developed into various types of firm-specific efficiency. Cost and revenue efficiency measurements are among the essential methods for firm performance evaluation (Farrell, 1957). A vast number of studies have estimated a firm's cost and revenue efficiencies such as Ray and Kim's (1995) study measuring the cost efficiency of U.S. steel manufacturers, Camanho and Dyson's (2005) study on the cost efficiency of U.S. bank branches and Sahoo, Mehdiloozad, and Tone's (2014) publication on the cost, profit, and revenue efficiency of 50 banks in the U.S. Other types of performance efficiency are managerial efficiency (Charnes, Cooper, & Rhodes, 1981; Fizel & D'Itri, 1997), operational efficiency (Saranga, 2009; Yu & Ramanathan, 2009; Eller, Hartley, & Medlock, 2011), and production efficiency (Burki & Terrell, 1998).

2.2 Firm profitability and marketability efficiencies

Among the different types of firm efficiency, profitability efficiency and marketability efficiency are two critical measurements reflecting a firm's operating and financial performance. These performance evaluations identify whether firms are using their existing resources effectively and efficiently (Düzakın & Düzakın, 2007).

2.2.1 Profitability efficiency

According to Hung and Wang (2012), the profitability of a business is defined as the ability to gain income. Therefore, a business's profitability efficiency is an essential measurement for internal

operational results. A most widely-used sector measuring the profitability efficiency of an entity is the banking and financial sector. Ample studies have explored the profitability efficiency of banks and financial institutions, such as Seiford and Zhu's (1999) study of U.S. banks; Tsolas's (2011a) investigation of Greek commercial banks; Shahwan and Hassan's (2013) study of UAE banks; Liu's (2011) analysis of financial holding companies; and studies by Lin and Chiu (2013), Zhu et al. (2014), Fu et al. (2016) and Chao et al. (2018) on Taiwanese banks.

For manufacturing sectors, various studies measure firms' profitability efficiency in both developed and emerging markets. For instance, Chandra, Cooper, Shanling, and Rahman (1998) studied the profitability efficiency of fabric manufacturers in Canada. Düzakın and Düzakın (2007) evaluated the profit-generating efficiency of Turkish industrial enterprises. Erdumlu (2015) applied the DEA method to assess the profit-efficient levels of Turkish textile businesses. Mujaddad and Ahmad (2016) analysed the profit efficiency of manufacturing industries in Pakistan.

Profitability efficiency is also estimated together with other types of firm efficiency in multi-stage analysis. Banks are also the most widely-used business units for multi-stage process analysis. For example, in developed nations, Kirkwood and Nahm (2006) evaluated the profit and service efficiencies of Australian banks. Al Tamimi and Lootah (2007) computed operational and profit efficiency scores of UAE-based commercial banks. Hwang and Kao (2008) assessed the market-value efficiency and profit-generating efficiency of Taiwanese general (non-life) insurance firms. Moradi-Motlagh, Saleh, Abdekhodaee, and Ektesabi (2011) adopted a triple-stage DEA model to examine the risk, income-generating and profit efficiencies of Australian banks. Paradi, Rouatt, and Zhu (2011) estimated the production and profit efficiencies of Canadian bank branches. For emerging markets, Avkiran (2006) developed a double-stage DEA model to measure operating efficiency and profit efficiency of bank branches that provide technology-based banking services in metropolitan Bangkok, Thailand. Avkiran (2006) indicates that it is necessary for bank branches to use IT to improve their profit efficiency. In China, Ariff and Can (2008) quantified the cost and profit efficiency scores of commercial banks between 1995 and 2004 and Zha, Liang, Wu, and Bian (2016) computed the productivity and profitability efficiencies of Chinese commercial banks from 2008 to 2012. For the application of the two-stage DEA method for non-financial companies, Cao and Yang (2011) quantified the market-value efficiency and profit-generating efficiency of Internet firms using a two-stage DEA approach. Using the data in Serrano-Cinca, Fuertes-Callén, and Mar-Molinero (2005), Cao and Yang reveal that all 40 firms are inefficient in both DEA stages. The highest result of the 40 firms' efficiency scores is 0.1153. Cao and Yang (2011) point out that the two-stage DEA method provides

more accurate results and more specific sources of inefficiencies than the traditional single-stage CCR model adopted by Serrano-Cinca et al. (2005).

2.2.2 Marketability efficiency

Marketability efficiency was first introduced as the second DEA stage in the study by Seiford and Zhu (1999). Hung and Wang (2012) define marketability as a firm's ability to trade securities in the market. Thus, marketability efficiency is a critical proxy showing how external investors assess real business value. In the literature, corporates' marketability efficiency levels have been investigated in models that use two-stage DEA process to simultaneously evaluate firms' profit-generating and market-value efficiencies (e.g., Zhu, 2000; Luo, 2003; Lo & Lu, 2006, 2009; Hung & Wang, 2012).

2.2.3 Firm profitability and marketability efficiencies measured by the two-stage DEA method

A network transformation process measuring the profitability and marketability efficiencies of business was first proposed by Seiford and Zhu (1999) together with the introduction of a two-stage (double-stage) DEA approach. Seiford and Zhu evaluated how 55 U.S. commercial banks create income in the first DEA stage and how the market assesses those banks' value in the second DEA stage. In stage 1, employees, total assets and stockholders' equity are the inputs and revenues and profits are the outputs. In the next stage, the two outputs (revenues and profits) of stage 1 become the inputs, and the outputs are firms' market cap, total returns to shareholders, and earnings per share. In each stage, the traditional DEA method is used. Seiford and Zhu (1999) discover that large commercial banks in the U.S. are more profit efficient, whereas small banks get higher scores in marketability efficiency. This indicates that banks' scale may negatively affect their marketability efficiency in the U.S. market. The authors reveal that acquisition has no role in improving the efficiency of merged banks but increases the attention of other unmerged financial institutions.

Following Seiford and Zhu (1999), scholars continued to explore double-stage DEA to quantify the profitability and marketability efficiencies of banks and financial institutions worldwide. Luo (2003) confirms Seiford and Zhu's (1999) results that larger banks achieve lower scores of marketability efficiency in the U.S. The author also shows that the overall technical efficiencies score can predict the failure of the banks. Lo and Lu (2006, 2009) measured the efficiency of Taiwanese financial holding companies and reveal that bigger establishments obtain higher technical-efficiency levels than smaller ones. Lo and Lu (2006) also find that insurance-based companies tend to perform more efficiently than banks or other types of financial institutions. In Greece, Tsolas (2011a) adopted the two-stage DEA process to find no positive binding between banks' profitability and marketability

efficiencies. Nagaraju (2014) applied the two-stage DEA method to compute the profit-generating and market-value efficiency of both public and private banks in India. Recently, Chao et al. (2018) discover that, after applying the International Financial Reporting Standards, Taiwanese banks in financial holding corporations are more profit efficient and banks not in financial holding conglomerates are more marketability efficient.

The two-stage DEA process for profitability and marketability efficiencies are not only used for the banking and financial sector but also for non-financial business sectors. Zhu (2000) estimated earnings and market value efficiency performance for Fortune 500 companies by applying Seiford and Zhu's (1999) two-stage DEA inputs and outputs method. Zhu reports notable findings that firms with the highest revenue may not get the highest profit and market-value efficiency. Most investigated enterprises in the research exhibit the problem of both technical and scale inefficiency. The author also finds that the top-rank companies regarding revenue have to deal with decreasing returns to scale. Using the same technique as Zhu (2000), Lo (2010) creates a profitability and marketability framework for the sustainable business of large U.S. companies. According to the author, the aim of sustainable firms is to generate long-term shareholders' wealth by capturing opportunities and controlling risks in three aspects: economics, environment, and society. By comparing the profit-generating ability and market-value efficiency between sustainable and other firms, Lo shows that sustainable firms are more profit efficient than others, but the statistics are not significant. In contrast, sustainable firms are less market-value efficient than other companies; these findings are statistically significant. Explaining this phenomenon, Lo (2010) suggests that investors hesitate to invest in sustainable firms because of concern about high operating costs that reduce total income. Other researchers adopted the double-stage DEA process to measure profit-generating and market-value efficiency of high-tech firms, e.g., Ho's (2008) study on 69 dot-com firms in the U.S.; Kuo and Yang's (2012) study on 38 integrated circuit design firms in Taiwan; and Wang, Lu, Huang, and Lee's (2013) study on 65 high-tech firms in Taiwan.

In the manufacturing sector, recent studies have investigated the profit-generating ability and market-value efficiencies of manufacturers using the two-stage DEA approach. For instance, Hung and Wang (2012) used Seiford and Zhu's (1999) double-stage DEA approach to compute and compare the profitability and marketability efficiency levels of high-tech and long-established manufacturers in Taiwan. Hung and Wang (2012) report that firm scale positively affects corporate profit efficiency. The authors also reveal that, despite the government's high level of investment in and preferential policies for the high-tech production area, this sector does not perform better than long-established industry in profitability. Therefore, the government should focus on the

development of traditional and experienced firms rather than new high-tech companies. Lee et al. (2013) evaluated the profit-generating and market value efficiency of Taiwan's biotechnology and medical-equipment production industries. The authors reveal that the efficiency performance of medical equipment producers is better than of pharmaceutical companies.

Wang et al. (2017) measured and compared profitability and marketability of top equipment manufacturing service providers (or contract manufacturers). Like Hung and Wang's (2012) conclusion, Wang et al. (2017) show that the firms' efficiency performance depends on their size; smaller companies tend to outperform bigger ones.

Most recently, Huang (2018) applied the double-stage DEA technique to measure the profit-generating ability and market-value efficiency scores of medical manufacturers in Taiwan. The author provides evidence to show that many Taiwanese medical manufacturers have higher profit-generating efficiency scores than market-value efficiency scores. Explaining the high profitability efficiency levels gained by Taiwanese pharmaceutical production firms, Liu, Yang, and Hsieh (2012) and Sheu and Lu (2014) indicate that a considerable portion of Taiwanese medical expenses is covered by the Taiwan National Health Insurance programme, which pays expenses at market price. As a result, Taiwanese pharmaceutical firms do not have to deal with direct competition or price battle in the market. Even though the profitability efficiency of Taiwanese medical manufacturers is currently stable, investors are still worried about the uncertain future with a considerable threat from international pharmaceutical firms that may affect the medical market and Taiwanese medical corporations' market value. Hence, the low valuation by investors produces the low market-value efficiency of Taiwanese medical enterprises.

Table 2.1 lists the inputs and outputs adopted in the previous two-stage DEA studies to investigate profit-generating ability and marketability efficiency scores of the firms.

Table 2.1: The literature using the two-stage DEA process to measure firm profitability and marketability efficiencies

Author(s)	DMUs	Profitability Inputs	Profitability Outputs/ Marketability Inputs	Marketability Outputs
Seiford and Zhu (1999)	55 commercial banks in the U.S.	Assets; number of staff; stockholders' equity	Revenue; profit	Market cap; total return to shareholders; earnings per share (EPS)
Zhu (2000)	Fortune 500 companies	Assets; number of staff; stockholders' equity	Revenue; profit	Market cap; total return to shareholders; EPS
Luo (2003)	245 large banks in the U.S.	Assets; number of staff; stockholders' equity	Revenue; profit	Market cap, EPS, stock price
Lo and Lu (2006)	14 financial holding companies in Taiwan	Assets; number of staff; stockholders' equity	Revenue; profit	Market value, EPS, stock price
Ho (2008)	69 U.S.-listed dot-com firms	Assets; equity; number of staff; operating expenses	Revenue; profit margin; return on assets (ROA); return on equity (ROE)	EPS; market cap; price-to-earnings ratio; book value/market value
Lo and Lu (2009)	14 financial holding companies in Taiwan	Assets; number of staff; stockholders' equity	Revenue; profit	Market cap, EPS
Lo (2010)	Sustainable and other firms in the U.S. S&P 500	Assets; number of staff; equity	Revenue; profit	Market cap, EPS, stock price
Kuo and Yang (2011)	38 integrated circuit (IC) design companies in Taiwan	Equity; debts; number of staff	Revenue; intangible assets	Outstanding shares; market cap
Tsolas (2011a)	13 commercial banks in Athens Stock Exchange	Total interest expense; loan loss provision	Net interest income after loans; loss provision; burden	Market cap
Hung and Wang (2012)	367 manufacturers in Taiwan	Assets; number of staff; manufacturing expense; selling expense; R&D expense	Revenue; profit	EPS; stock price
Lee et al. (2013)	20 biotech-related firms in Taiwan	Number of staff; machinery and equipment expenses; operating costs; assets	Operating revenue; net income	EPS; market value
Nagaraju (2013)	34 public and private banks in India	Assets; equity; number of staff; operating costs	Revenue; profit margin; ROA; ROE	EPS; market value; book value/market value
Shahwan and Hassan (2013)	20 UAE listed banks	Total deposits; total operating cost; debt ratio	ROA; ROE	Price-to-earnings ratio; EPS
Wang et al. (2013)	65 high-tech firms in Taiwan	Assets; employees; number of researchers; R&D expenditure	Sales volume; number of patents	Market value; return on investment
Zhu et al. (2014)	14 Taiwanese banks	Assets; employees; stockholders' equity	Revenue; profit	Market cap, EPS, stock price
Wang et al. (2017)	18 manufacturing service providers	Employees; equity	Revenue; profit	Return on capital; market value
Huang (2018)	64 medical manufacturers in Taiwan	Employee; fixed assets; operating costs	Revenue; product inventory	EPS and market cap
Chao et al. (2018)	19 commercial banks in Taiwan	Depreciation and amortisation expense; operating expense	Revenue from interest; non-interest revenue	Price-to-earnings ratio; price-to-book ratio

2.3 The determinants of firm efficiency performance

Timmer (1971) was the first economist to estimate the effects of firms' factors on corporate efficiency levels. Timmer states that knowing the technical efficiency of an industry is a critical issue, but finding the sources of inefficiency is twice as important. Although there has been a small number of studies evaluating the influences of factors on profit efficiency and no published study has investigated the determinants of marketability efficiency in the literature, many investigations explore the impacts of different factors on firms' technical efficiency. According to the literature, both financial and non-financial characteristics of firms play critical roles in a firm's technical efficiency. The most dominant factors that impact firms' efficiency are firm size, firm age, capital structure, firm liquidity, firm profitability, corporate ownership, and industry characteristics.

2.3.1 Firm age

The first factor that has a significant influence on firm efficiency is age or time of the business operation. However, the association between firm age and corporate efficiency levels is inconclusive. Previous studies such as Timmer (1971), Pitt and Lee (1981), Burki and Terrell (1998), Admassie and Matambalya (2002), Binam, Sylla, Diarra, and Nyambi (2003), Chu and Kalirajan (2011), and Sandvold (2016) show a positive, significant effect of firm age on firm technical efficiency. To explain the co-movement between firm age and firm efficiency, Admassie and Matambalya (2002), based on learn-by-doing theory, argue that businesses gradually gain experience that becomes the corporate competitive advantage. Thus old-established companies become more efficient than newcomers to the industry.

However, a negative association between firm age and efficiency is demonstrated in Binam et al. (2004), Tran, Grafton, and Kompas (2008), and Singh, Goyal, and Sharma (2013). Admassie and Matambalya (2002) point out that the marginal effect of learn-by-doing will gradually reduce when companies mature in their industry. Therefore, the efficiency performance of old companies will be negatively affected, and growing businesses are more likely to acquire and apply new science and technology into their production. According to Singh et al. (2013), new firms can obtain higher efficiency levels than old establishments if the new firms have sound fundamentals, policies, and corporate governance.

Akben-Selcuk (2016) summarises three types of the firm age – performance relationship to explain the mixed results in the literature: (1) learn-by-doing, where the older firms perform better than the younger firms based on their experience; (2) selection effect, which supports the idea that less effective firms are forced to leave the market so old surviving firms attain higher results than the

newcomers; and (3) inertia effects indicate the rigidity of firms after a long operational period that may harm old firms' performance. The other possible reasons for the inconsistent conclusions of the firm age - performance nexus are country-specific elements (Majumdar, 1997) and institutional factors such as entrepreneurship or innovation (Coad, Holm, Krafft, & Quatraro, 2018).

2.3.2 Firm size

Firm size (firm scale) is another a critical factor resulting in different efficiency levels for companies. Timmer (1971) reveals that the number of labourers and the amount of capital, which reflect a firm's scale, are two critical elements that affect corporates' technical efficiency. Badunenko, Fritsch, and Stephan (2006) find that firm size is responsible for a quarter of the efficiency variations among firms when they investigated a large sample of 35,000 companies in the German Cost Structure Census. Nevertheless, the conclusions regarding the relationship between firm size and corporate efficiency are still controversial across different countries and business sectors worldwide.

Schneider (1991) evaluated Austrian companies' efficiency based on firm size. The author reveals that different measures of efficiency generate different results: large enterprises are inclined to be more efficient than smaller ones based on value-added per staff; small businesses are more efficient than the big-scale companies in terms of total residual production and profitability.

Admassie and Matambalya (2002) argue that both too big or too small-sized firms experience management problems that result in lower technical efficiency. In their study, Admassie and Matambalya estimated the corporate efficiency of small and medium businesses in the food, textile and tourism sectors in Tanzania and reveal a positive impact of firm scale on their efficiency level. Admassie and Matambalya's finding agrees with the conclusions in Pitt and Lee's (1981) study of Indonesian weaving companies; Hallberg's (1999) study on small and medium businesses in Bank Group's countries; Alvarez and Crespi's (2003) study on Chilean firms; and Amornkitvikai, Harvie, and Charoenrat's (2010, 2013) estimates for manufacturers in Thailand. Harvie (2002) lists five obstacles that small and medium firms have to address: access to the market, new technology, high-quality human resources, financial funds, and different sources of information. Alvarez and Crespi (2003) discover that larger manufacturing companies in Chile are more efficient than smaller ones because the big-scale companies do not have to overcome the difficulties of the small-scale firms such as financial constraints, lack of effective resources, problems of the economy of scale, and issues emerging from informal contracts with suppliers and customers.

Conversely, Nikaido (2004), Margaritis and Psillaki (2007), Le and Harvie (2010), and AC-Ogbonna (2017) find a negative impact of firm size on firm efficiency. Nikaido (2004), when assessing the

technical efficiency of small-sized businesses in India, explains that, in some cases, small and medium businesses get the support and subsidy from the government and the business association; thus they tend to react as an inverse selection in that they do not extend the scale so they continue to get their subsidy and allowances. On the other hand, Margaritis and Psillaki (2007), in estimating New Zealand firms' efficiencies, suggest that large firms may face a problem of inefficient hierarchical management that reduces firm efficiency. Le and Harvie (2010) reveal that smaller firms in Vietnam are more flexible in diversification of activities and more easily adapt to rapid changes in the economy. AC-Ogbonna (2017) finds a negatively significant influence of firm size on corporate efficiency level after the privatisation of manufacturers in Tanzania.

2.3.3 Firm capital structure

Previous studies acknowledge the crucial role of capital structure on corporate efficiency. Dilling-Hansen, Madsen, and Smith (2003) state that companies with high levels of debt and low solvency face a higher default threat. Since the executives will be discharged from their position if the company goes bankrupt, they have to work harder to manage the company and pursue policies that quickly increase company profits and lessen the chance of bankruptcy. Therefore, a higher level of debt produces a positive effect that diminishes ineffective operations and investments. In this circumstance, however, promising investments that may produce high returns but last too long are also removed from firms' investment portfolios.

The effects of leverage on firms' financial outcomes are still ambiguous. On the one hand, Margaritis and Psillaki (2007) demonstrate a supportive, significant impact of both the linear and quadratic leverage ratio on New Zealand firms' efficiency level. Mok, Yeung, Han, and Li (2007), when evaluating foreign-invested firms in the Chinese toy industry, reveal a positive association between firms' debt level and technical efficiency. Both Margaritis and Psillaki (2007) and Mok et al. (2007) explain their findings based on agency cost theory developed by Jensen and Meckling (1976) concerning the different interests of share-owners and firm managers. According to Jensen and Meckling (1976), firm managers are inclined to maximise their benefits and utility instead of the shareholders' wealth. Using a high leverage level is a way to reduce waste and the misuse of managerial cash flow because high debt produces a liquidity threat (Grossman & Hart, 1982) as well as high burden to generate cash (Jensen, 1986). As a result, increasing leverage reduces agency cost and improves corporate efficiency. Amornkitvikai et al. (2010) agree with Jensen and Meckling's (1976) agency cost theory and indicate a positive association between Thai manufacturers' debts ratios and efficiency. Hamid, Chelansofla, and Hajiha (2014), when assessing the influence of

leverage on the efficiency of listed firms in Tehran, show a positive, significant relationship between firms' total debt over total assets ratio and firms' total efficiency.

On the other hand, Zeitun and Tian (2007) indicate that the debt ratio significantly, adversely affects Jordanian firms' performance in two aspects: accounting and market exposure. Onaolapo and Kajola (2010) show a significant inverse influence of debt levels on Nigerian firms' profitability. This negative association between leverage and firm performance may be because of the existence of debt holder - shareholder conflict (Margaritis & Psillaki, 2007). The conflict becomes severe when default risk arises. Then the default risk results in underinvestment or debt overhang (Myers, 1977). Hence, managers of highly leveraged businesses tend to make risky investments that may badly affect firm performance and efficiency. Cheng and Tzeng (2011) report a reverse effect of leverage on the technical efficiency of firms in chemical, electronic, plastic and textile enterprises in Taiwan. Using the non-interest tax shield hypothesis, the authors argue that the non-interest tax shield (which is 20% in Taiwan applied to investment, R&D expenses, and depreciation) is higher than the interest tax shield in Taiwan. Thus, efficient firms tend to use fewer debts which results in a negative association between firm leverage and efficiency level.

Weill (2008) finds inconsistent results when evaluating the impact of leverage on firms' financial efficiency across seven European countries. The relationship between debt ratio and firm efficiency is negative and significant in Belgium, France, Germany, and Norway; negative but insignificant in Portugal; and positive and significant in Italy and Spain. Weill (2008) suggests that having different legal systems is the main reason for mixed results in the seven European countries. According to Weill (2008), firms in an effective legal system with proper protection for creditors reduce the moral hazard of the manager, thus limiting the adverse effects of leverage on firm efficiency.

2.3.4 Firm liquidity

Empirical studies report conflicting results of the impact of corporate liquidity on firm financial performance. For example, Ferreira and Vilela (2004) and Naoki (2012) conclude that businesses maintaining a high cash level are likely to have a better performance than others. Singh and Fida (2015) and Edjigu (2016) confirm the finding that liquidity is a significantly positive variable explaining firm efficiency. In contrast, Goldar, Renganathan, and Banga (2003) and Amornkitvikai et al. (2010) find an adverse effect of firm liquidity on corporate technical efficiency.

Previous studies demonstrate different points of view on the association between internal finance and firm efficiency. Gertner, Scharfstein, and Stein (1994) and Stein (1997) support the idea that corporate capital is allocated more efficiently through internal finance because internal funding may

boost monitoring incentives while reducing commercial incentives, thus gaining better asset allocation. However, Jensen and Meckling's (1976) agency cost theory claims that internal finance produces agency problems, i.e., with too much cash in hand, managers have the chance to use the money for their own benefit that diminishes the interests of shareholders, especially when the managers do not have external supervision by banks or financial institutions. According to Jensen's (1986) theory regarding agency cost of free cash flow, the rate that companies manage to distort its available funds is typically less than the interest rate on external loans. Therefore, projects paid exclusively from internal cash flow are inclined to be less profitable than investments funded by interest-bearing loans. Since low-liquidity companies are forced to participate in the money market, they engage in investments that are assumed to be more lucrative than average and, therefore, more efficient than investments made by solvent companies. Thus, liquidity restrictions affect business efficiency positively.

2.3.5 Firm profitability

Profitability and efficiency are positively associated as documented in the studies by Dudu and Kilicaslan (2009), Rosman, Wahab, and Zainol (2014), and Singh and Fida (2015). Dudu and Kilicaslan (2009) investigated the relationship between the profitability and efficiency levels of big manufacturing companies in Turkey. The authors show a positive, robust effect of firm profitability on their efficiency level, where profitability is the ratio of profit over output. Like Dudu and Kilicaslan (2009), Rosman et al. (2014) show a significant positive impact of profitability (equal to the ratio of operating profit over total assets) on the efficiency of Islamic banks in the Middle East and Asia. Singh and Fida (2015) demonstrate a significant positive effect of profitability (ROA) on the efficiency of commercial banks in Oman.

For micro-financial institutions in India, Singh et al. (2013) estimate the relationship between profitability (measured by ROA) and targeted institutions' efficiency. However, the result shows an insignificant negative relationship between firm profitability and efficiency level.

2.3.6 Institutional ownership

Institutional ownership is considered another critical element influencing firm technical efficiency. Dong, Lu, and Ma (2018) investigated the effect of institutional ownership on non-financial Chinese listed firms' investment efficiency between 2009 and 2014 and conclude that institutional shareholders enhance corporate investment efficiency. According to Shleifer and Vishny (1986), Huddart (1993), Admati, Pfleiderer, and Zechner (1994), Maug (1998), Noe (2002), and Tsai and Gu (2007), institutional ownership enhances firm performance by alleviating agency issues from

authority split, diminishing information asymmetry, and supporting firms in terms of financing and experience.

2.3.7 Industry characteristics

The literature also demonstrates that industry characteristics significantly affect firm efficiency. Badunenko et al. (2006) made a broad investigation of the efficiency of 35000 companies across 256 industries in Germany and reveal that industry effects account for one-third of efficiency variation among firms. Reiff, Sugár, and Surányi (2002), when estimating the efficiency of manufacturing industries in Hungary, find that efficiency levels vary among industries. The most efficient industries are electricity, paper, and textile manufacturing industries; the most inefficient industries are metal and machinery production; and the industries with average efficiency levels include furniture, chemistry, and food production. Reiff et al. (2002) also discover that disparate levels of concentration (or degree of monopolisation) in different industries are the main reasons explaining efficiency differences between manufacturing industries.

Table 2.2 summarises the main factors affecting firms' efficiency levels in previous studies.

Table 2.2: A summary of factors that affect firms' efficiency levels in the prior literature

Factor	Authors	Relationship with firm efficiency
Firm age	Timmer (1971), Pitt and Lee (1981), Burki and Terrell (1998), Admassie and Matambalya (2002), Binam et al. (2003), Chu and Kalirajan (2011), Sandvold (2016)	Positive and significant
	Binam et al. (2004), Tran et al. (2008), Singh et al. (2013), Admassie and Matambalya (2002)	Negative and significant
Firm size	Admassie and Matambalya (2002), Pitt and Lee (1981), Hallberg (1999), Alvarez and Crespi (2003), Amornkitvikai et al. (2010)	Positive and significant
	Nikaido (2004), Margaritis and Psillaki (2007), Le and Harvie (2010), AC-Ogbonna (2017)	Negative and significant
Firm leverage	Margaritis and Psillaki (2007), Mok et al. (2007), Amornkitvikai et al. (2010), Hamid et al. (2014)	Positive and significant
	Cheng and Tzeng (2011)	Negative and significant
Firm liquidity	Singh and Fida (2015), Edjigu (2016)	Positive and significant
	Goldar et al. (2003), Amornkitvikai et al. (2010)	Negative and significant
Firm profitability	Dudu and Kilicaslan (2009), Rosman et al. (2014), Singh and Fida (2015)	Positive and significant
	Singh et al. (2013)	Negative and insignificant
Institutional ownership	Cao et al. (2018)	Positive and significant
Industry effects	Reiff et al. (2002), Badunenko et al. (2006)	Significant

2.4 Literature regarding profitability and marketability efficiency measurements and the determinants in ASEAN countries

2.4.1 Firm profitability and marketability efficiencies in ASEAN countries

The number of studies measuring the profit efficiency of ASEAN firms is very limited, there is no research evaluating the marketability efficiency of ASEAN enterprises, and no study uses two-stage DEA to estimate the profit-generating ability and market-value efficiencies of firms in ASEAN. Among the studies that investigate profit efficiency, the banking sector is the most popular research subject in ASEAN literature measuring corporate profit efficiency. For example, Bader, Mohamad, Ariff, and Shah (2008) evaluated cost, profit, and revenue efficiency levels of both Islamic and traditional banks in 21 countries, including Malaysia and Indonesia. The authors find no significant variance in overall efficiency scores of Islamic and conventional banks. Chan and Karim (2011) compared the cost and profit efficiency levels between overseas banks from developed countries and non-domestic banks from developing countries that operate in four ASEAN countries: Indonesia, Malaysia, the Philippines, and Thailand. The authors conclude that foreign banks from developed economies achieve higher cost and profit efficiencies than overseas banks from developing economies. Chan and Karim (2011) also discover that non-domestic banks in Malaysia get the top efficiency scores and foreign banks in Indonesia get the lowest efficiency scores. Recently, Nguyen (2018) computed the cost and profit efficiency scores of commercial banks in six ASEAN countries: Cambodia, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. The author reveals that, in general, ASEAN commercial banks obtain high cost-efficiency scores but low profit-efficiency rates. Vietnamese banks achieve the highest cost efficiency scores but the lowest profit efficiency ones; Cambodian banks attain the highest profit efficiency but the lowest cost efficiency.

Regarding studies on bank profit efficiency in each ASEAN country, Pramuka (2011), Al-Farisi and Hendrawan (2012), and Eduardus, Husnan, and Hanafi (2012) assessed the profit efficiency of different types of bank in Indonesia. Pramuka (2011) evaluated the profit efficiency rates of Islamic banks in Indonesia and reveals that the full-fledged Indonesian Islamic banks achieve higher efficiency than the window Islamic banks. Al-Farisi and Hendrawan (2012) compared the profit efficiency of Islamic and conventional banks in Indonesia by applying a distribution-free approach. The results show that Indonesian Islamic banks stand in the top 20% of profit efficiency scores. Eduardus et al. (2012) assessed the profit efficiency of Indonesian banks from 2005 to 2009 by adopting stochastic frontier analysis and find that the Indonesian banks are not profit-efficient.

Kamaruddin, Safab, and Mohd (2008) compared the cost and profit efficiency levels of fully-fledged Islamic banks and window Islamic banks owned by domestic and overseas investors in Malaysia.

Using the DEA method, the study shows that Islamic banks have higher cost efficiency than profit efficiency. Tahir, Bakar, and Haron (2010) focused on measuring the cost- and profit- efficiency scores of domestic and overseas commercial banks in Malaysia during 2000 – 2006 using the stochastic cost and profit frontier approach. The authors find that domestic banks obtain higher cost efficiency rates but lower profit efficiency levels than foreign commercial banks in Malaysia.

Chu and Lim (1998) estimated the cost and profit efficiency levels of listed banks in Singapore from 1992 to 1996. Using the DEA technique, the authors discover that the average cost efficiency scores (95%) are higher than the average profit efficiency scores (83%) of Singaporean listed banks, even though the profit efficiency of Singaporean banks is higher than for the U.S. and Spanish banks. Williams and Intarachote (2002) computed the profit-generating efficiency of Thai domestic and foreign banks from 1990 to 1997. Using stochastic frontier analysis, the authors show that overseas banks from advanced economies tend to be more efficient. Vu and Nahm (2013) measured the profit-generating efficiency of Vietnam banks from 2000 to 2006. The authors reveal that foreign banks in Vietnam whose headquarters are located in Australia, Japan, the U.S., and Europe have higher profit efficiency than Vietnamese banks and foreign banks in Vietnam whose head offices are in Asian countries.

There is a small number of studies that explore the profit efficiency of non-financial firms in ASEAN countries. Rodmanee and Huang (2013) used relational double-stage DEA to assess the production and profit efficiency levels of Thai food and beverage firms in 2011. Based on the empirical results, Rodmanee and Huang (2013) conclude that the overall inefficiency of firms in the Thai food and beverage industry mainly comes from the profit-generating process. Similarly, using relational two-stage DEA to investigate production efficiency and profit efficiency scores of energy firms in Thailand, Wongchai, Hung, and Peng (2012) report that the average production efficiency scores (75.92%) are greater than the average profit efficiency scores (33.76%) of Thai energy firms.

2.4.2 Firm efficiency determinants in ASEAN countries

Scholars have identified the crucial determinants of corporates' technical efficiency level in ASEAN countries. Though some studies identify the determinants of firms' technical efficiency across ASEAN countries, other studies concentrate on factors that affect firms' efficiency performance in each ASEAN country. Several studies have investigated the relationships between financial and non-financial factors on firms' efficiency performance across ASEAN economies. For example, Batra and Tan (2003) investigated the effect of firm size on corporate efficiency in developing countries, such as Malaysia and Indonesia, and find that even though technical efficiency increases with firm size,

some small firms can achieve better efficiency than larger firms. Salleh et al. (2016) assessed the influence of M&A and firm size on the technical efficiency of 264 listed telecommunication enterprises in five ASEAN countries (Malaysia, Singapore, Indonesia, the Philippines, and Thailand) during 2000 - 2011. Salleh et al. (2016) reveal a negatively significant impact of M&A and firm size on corporates' technical efficiency.

Scholars have also analysed the influence of different factors on firms' technical efficiency in each ASEAN country. For instance, Matthews and Ismail (2006) explored the characteristics of efficient banks in Malaysia. The authors discover that the size, instead of profitability or quality of loans, decides the efficiency levels of Malaysian banks. Yadav and Katib (2015) examined the relationships between corporate factors and the efficiency of development finance institutions in Malaysia. The authors show that the ratio of loans over total assets has a significant positive association with firm technical efficiency, whereas profitability, computed as the percentage of non-interest income over total assets, is reversely associated with firm efficiency.

Margono and Sharma (2006) investigated the impacts of different factors on Indonesian manufacturers' technical inefficiency. The authors point out that while ownership affects technical inefficiency of textile companies, firms' scale, ownership, and age have significant impacts on firms' inefficiency in chemical and metal manufacturing sectors.

Eduardus et al. (2012) estimated the effects of bank scale, credit risk, capital assets, market share, and ownership characteristics on Indonesian banks' profit efficiency. The authors show that four factors, bank size, capital assets, ownership, and market shares, play significant roles in Indonesian banks' efficiency. Subandi and Ghozali (2014) find that banks' total assets, capital to risk assets ratio, loan-to-deposit rate, operating costs, and net interest margin have a significant effect on Indonesian banks' technical efficiency. Sufian and Majid (2007) used Tobit regression to test the impact of banks' properties on their efficiency in Singapore. The authors find that, though bank profitability significantly, positively affects Singaporean banks' efficiency score, bad quality loans significantly, negatively influence Singaporean banks' efficiency.

Charoenrat and Harvie (2013) assessed the determinants of the technical efficiency of 3168 small- and medium-sized businesses in Thai manufacturing and exporting industries. The authors discover that a firm's total assets, number of years of operation, level of high-skilled labourers, urban location, and ownership structure significantly affect manufacturing and exporting SMEs in Thailand. Firm size is reversely associated with firm technical inefficiency, and firm age is positively associated with SMEs' inefficiency levels in Udon Thani Province, Thailand. Firms' skilled labourers are

significantly, positively connected with Thai SMEs' technical efficiency. Similarly, municipal location is also positively related to Thai SMEs' technical efficiency, according to good infrastructure and market opportunities as well as human resources.

Several investigations have examined the determinants of the technical efficiency of Vietnam banks and non-financial firms (e.g. Minh & Vinh, 2007; Tran et al., 2008; Le & Harvie, 2010; Pham, Dao, & Reilly, 2010; Vu & Nahm, 2013; Pham & Matsunaga, 2017; Le, Vu, & Nghiem, 2018). Minh and Vinh (2007) analysed the efficiency levels and their determinants of industrial enterprises in Vietnam from 2000 to 2003. Using Tobit regression models, the authors show that only the quality of labour has a positive, significant relationship with firm efficiency. In contrast, other factors, including the ratios of capital, labour, and ownership, have no impact on firm efficiency.

Tran et al. (2008) explored the causes of technical efficiency variation of non-government small- and medium-sized manufacturers in Vietnam's transitional economy in 1996 and 2001. The authors find that using labourers from the family and choosing a central location to do business help Vietnam's manufacturers improve their technical efficiency.

Le and Harvie (2010) identified the critical factors that significantly affect the technical efficiency of small- and medium-sized Vietnamese manufacturers in 2002, 2005, and 2007. The determinants are firm size, firm age, production area, ownership structure, overseas partnership, subcontracting, production modernisation, competition, and government support. Notably, the impacts of firm scale and age on Vietnamese manufacturing SMEs' technical efficiency are negative and significant. Competition had a significant, positive connection with firm efficiency in 2007. Urban location has a negative association with firm efficiency, while the relationship between rural location and technical efficiency is positive because of cheaper rental and labour costs. The authors also find that household and collective-model enterprises are more efficient than other types of non-government firms. Firms with sub-contracting or overseas partners are likely to have lower efficiency because of the inflexible terms of the agreements and contracts. Firms with government support also have lower efficiency scores. Finally, manufacturers, with the application of production innovation and improvements, tend to achieve higher technical efficiency.

Pham et al. (2010) analysed the determinants of the technical efficiency of Vietnamese manufacturers in 2003. The authors report several factors that have positive, significant influence on manufacturers in Vietnam, including the numbers of contract workers; southern location; export-oriented; and trade openness. Other factors such as foreign investment and the proportion of

female labourers, however, negatively, significantly affect manufacturers' technical efficiency in Vietnam.

Vu and Nahm (2013) examined the factors that have significant effects on Vietnamese banks' profit efficiency from 2000 to 2006. The authors show that large scale and good management help Vietnamese banks achieve higher profit efficiency scores. The bad quality of assets and a high percentage of capitalisation reduce banks' profit efficiency. The study also discovers that foreign banks with head offices located in Australia, Europe, Japan, and the U.S. obtain higher efficiency scores than banks with headquarters in Asia.

Pham and Matsunaga (2017) assessed the influence of financial and non-financial factors on the cost efficiency of Vietnamese manufacturers in 2007, 2009, and 2011. The authors report that big-size manufacturers obtain higher efficiency levels than medium and small-scale firms. Government-owned businesses tend to be less efficient than other enterprises, whereas foreign-owned corporations achieve the highest efficiency scores. Pham and Matsunaga (2017) insist that inferior technology, ineffective management programmes and organisational structure, inadequate human and production resources, as well as legal barriers and incompetent business environment, contribute to the inefficiency of Vietnamese manufacturers.

Recently, Le et al. (2018) evaluated the impact of different factors on Vietnamese SMEs' technical efficiency in 2008. The authors find that location plays a substantial role in a firm's efficiency level, that firms situated in the two largest cities of Vietnam, Hanoi and Ho Chi Minh City, have higher efficiency scores than firms in other places. Also, road, rail, and internet access are positively, significantly related to SMEs' efficiency in Vietnam.

In general, the determinants of efficiency performance in ASEAN vary in different countries and studies. The most popular factors affecting ASEAN firms' efficiency levels are the firm size, labour-related characteristics, and corporate ownership. Other factors, such as firm age, location, profitability, and market share, have also been considered and investigated in the ASEAN literature.

2.5 Chapter summary

This chapter reviews the literature on firm performance measurements. Different definitions and methods to investigate firm performance, including quality-, time-, cost-, and flexibility-assessing models, as well as various financial-ratio evaluations relating to internal and external financial activities, are discussed. However, to date, no technique can reflect all parts of firm performance.

Recently, firm technical efficiency measurement, which is a production transformation from inputs to outputs, has emerged as a method that can compare performance among firms and distinguish between inefficient and efficient operational units. There are different types of technical efficiency, such as cost efficiency, managerial efficiency, operational efficiency, profit efficiency, and revenue efficiency.

Profitability and marketability efficiencies are among the most decisive performance measurements that reflect both internal and external financial results of firms. A two-stage DEA process measuring profitability and marketability efficiencies developed by Seiford and Zhu (1999) has been applied by scholars worldwide to both financial and non-financial businesses.

Determining which factors affect firm performance is crucial to a firm's financial success. According to the literature, the most dominant factors that have a significant influence on a firm's efficiency include firm size, firm age, capital structure, firm liquidity, firm profitability, institutional ownership, and industry characteristics.

Previous studies have evaluated the profit efficiency of firms in ASEAN and identified the factors affecting ASEAN firms' technical efficiency. However, no study explores the two-stage profitability and marketability efficiencies of ASEAN non-financial listed enterprises in general and listed manufacturers in particular. There are no studies that examine the impacts of financial and non-financial factors on profit-generating ability and market-value efficiencies of listed manufacturers in ASEAN countries.

Chapter 3

Research data and methodology

Chapter 3 presents the study's methodology, which includes the non-parametric technique to measure firm profitability and marketability efficiencies, and the parametric approach to investigate the determinants of firm efficiencies. Section 3.1 introduces bootstrapped two-stage data envelopment analysis, a non-parametric method to evaluate a firm's efficiency. The section explains in detail the rationale of the DEA technique, incorporates the DEA method's application and outlines the primary and adjusted DEA models. Then a description of the two-stage DEA method is presented. Section 3.2 specifies the panel-data fractional regression model (FRM) and Tobit regression model (TRM) and the parametric methods to assess the influence of financial and non-financial factors on a firm's DEA efficiency scores. This section also discusses the advantages of FRM and the reason for the TRM model. Section 3.3 describes data characteristics, sources, and categorisation.

3.1 A non-parametric method to measure firm profitability and marketability efficiencies

3.1.1 Corporate efficiency measurements

Efficiency measurement of an enterprise using the input-oriented technique was first proposed by Farrell (1957). In that study, Farrell explains corporate efficiency is based on the amount of input and output, where input is expenditure and output is the revenue of the firm. However, Farrell's method cannot handle a collective of inputs and outputs. Since Farrell (1957), corporate efficiency measurements have been developed into parametric and non-parametric frontier techniques to evaluate the efficiency of decision-making units with multi-inputs and multi-outputs. There are several parametric methods to measure corporate efficiency including the stochastic-frontier approach (Aigner, Lovell, & Schmidt, 1977; Battese & Corra, 1977; Meeusen & Van Den Broeck, 1977) and the thick-frontier approach (Berger & Humphrey, 1991). However, the major disadvantages of parametric methods are the necessity for a prior-specified production function (Moradi-Motlagh & Saleh, 2014) and a large-scale sample (Barros, Assaf, & Ibiwoye, 2010). In contrast, non-parametric methods, such as Data Envelopment Analyses (Charnes, Cooper, & Rhodes, 1978) and Free Disposal Hull (Deprins, Simar, & Tulkens, 1984) - a special model option of DEA - do not require a prior-specified functional form for efficiency frontiers and allow a small scale sample (Moradi-Motlagh & Saleh, 2014).

3.1.2 The DEA model description

The primary DEA model was designed by Charnes et al. (1978) based on Farrell's (1957) study. DEA is a linear-scheme approach to assess the comparative efficiency among alike decision-making units that have similar goals and production processes, with homologous outputs and identical inputs under the same market conditions (Golany & Roll, 1989). Each DMU is considered a "black box" (Sexton & Lewis, 2003). This technique creates a frontier group of efficient DMUs and compares them to other inefficient DMUs to assess efficiency. DEA does not depend on a specified functional form for the efficiency frontier and allows multi-inputs and multi-outputs in calculating the efficiency. DEA enables researchers to evaluate the relative efficiency of entities working in a complicated system. In DEA, an efficient unit has a score of 1; indexes of ineffective units are measured by identifying their position relative to the efficiency frontier. For each inefficient unit, DEA provides a set of benchmarks from other units to value of the assessed units comparable. DEA can be analysed by taking apart as a scale-efficient, congestion-efficient, and pure technical-efficient component (Färe, Grabowski, & Grosskopf, 1985). Hence, data generated from DEA are useful for managers to have a clear picture of their performance relative to other units to identify targets and improve the operation of inefficient units.

The DEA method is widely used in the literature to assess comparative efficiency among economic units that have similar production processes, with homologous outputs and the same inputs (Toby, 2006). Tripe (2005) and Ruggiero (2007) suggest that DEA is advantageous because of its strength in dealing with multi-inputs and multi-outputs and its simplicity that requires no specified functional form among inputs and outputs.

The DEA technique consists of three implementation steps: DMU selection, input and output selection, and DEA model selection. When choosing a suitable DEA model, two features need to be considered: type of return to scale (constant or variable) and model orientation (input- or output-oriented). Regarding the return-to-scale modes, constant returns to scale (CRS) of the production function assumes that businesses are changeable and capable of adapting to the optimum scale. Conversely, variable returns to scale (VRS) is used when firms cannot achieve their optimum size because of the lack of perfect competition and financial resources (Casu & Molyneux, 2003). As a result, CRS displays a proportional relationship between inputs and outputs; an increase in inputs will bring about a proportionate increase in outputs. VRS, however, exhibits a disproportionate association between inputs and outputs. Thus, in VRS models, an increment in inputs may lead to a rise, a reduction or no change in outputs (Ward, Kirkley, Pascoe, & Metzner, 2004).

There are two directions in which to estimate DEA models: input orientation and output orientation. The input-oriented technique aims to minimise input quantities at a certain level of outputs. The output-oriented model maximises output quantities at a given level of inputs (Färe et al., 1994). According to Casu and Molyneux (2003), there is no definite choice for the orientation of DEA measurements according to the literature. The orientation option is crucial in later references and decisions. In some cases, the orientation choice is obvious, such as in economic sectors focusing on cost-control when the option is input-oriented (Ferrier & Valdmanis, 1996). Another case of input-oriented option is when a study recognises over-exploited units and tries to reduce the number of inputs (Cook, Tone, & Zhu, 2014). For the output-oriented option, Avilés-Sacoto (2012) investigated the efficiency of a business school attempting to enhance its institutional reputation. In that study, the author focuses on outputs, which are students' jobs and internships after graduation. Therefore, the aim of measuring and improving the performance of a school in the study leads to the choice of output-oriented model (Cook et al., 2014). Generally, the input-oriented approach mostly concentrates on operational and management matters, and the output-oriented approach is related to plan-making and strategy setting (Cullinane, Song, & Wang, 2005).

The free disposal hull (FDH) model (Deprins et al., 1984) is a modified DEA. In the FDH model, the connection drawn from DEA vertices is not contained in the frontier. Whereas DEA concentrates on convex technology, FDH is more flexible with the assumption of non-restricted disposability (Cherchye, Kuosmanen, & Post, 2001). However, FDH is less applicable than DEA because of scepticism about FDH's economic implications (Cherchye, Kuosmanen, & Post, 2000) and the non-linear characteristic of the FDH technique (Cherchye et al., 2001).

3.1.3 DEA primary and bootstrapped models

Primary models

There are two basic and extensively used DEA models in the literature: the CCR model (designed by Charnes, Cooper, & Rhodes, 1978) and the BCC model (proposed by Banker, Charnes, & Cooper, 1984). The CCR model assumes the CRS mode, whereas the BCC model suggests the VRS mode for production functions. Both primary DEA models can involve the multi-inputs and multi-outputs in the transformation.

The CCR model

In the original DEA model introduced by Charnes et al. (1978), technical efficiency, $\hat{\lambda}_i$ is computed by dividing the total value of weighted outputs to the total value of weighted inputs as follows:

$$TE_i = \hat{\lambda}_i\,(x_i \in V_+^u; y_i \in V_+^w) = \frac{w_1 y_{1i} + w_2 y_{2i} + \ldots + w_n y_{ni}}{u_1 x_{1i} + u_2 x_{2i} + \ldots + u_n x_{mi}} = \frac{\sum_{t=1}^{n} w_t y_{ti}}{\sum_{s=1}^{m} u_s x_{si}} \qquad \textbf{(3.1)}$$

where: x, y, u, and w are input, output, input weight, and output weight, respectively; V_+^u, V_+^w are the input and output vectors of production set ϕ accordingly; s and t are quantities of inputs and outputs, respectively; i stands for the i[th] DMU in the analysis: i = 1, 2, 3,…, z; z is the overall number of units.

Equation (3.1) is transformed into a linear non-parametric scheme by Charnes et al. (1978) as:

Max $\lambda = \sum_{t=1}^{n} w_t y_{ti}$ **(3.2)**

s.t. $\sum_{s=1}^{m} u_s x_{si} = 1$

$\sum_{t=1}^{n} w_t y_{ti} - \sum_{s=1}^{m} u_s x_{si} \leq 0$

where: λ is the technical efficiency of i[th] DMU; $w_t \geq 0;\ u_s \geq 0.$

In equation (3.2), Charnes et al. (1978) assume a CRS condition, indicating that a reduction (addition) in inputs brings about an adequate reduction (increase) in outputs.

The BCC method

Banker et al. (1984) developed the BCC model under the assumption of VRS. The technical-efficiency estimates, $\widehat{\varphi_{DEA}}$, of production set ϕ are measured by Daraio and Simar (2007) as follows:

$\widehat{\varphi_{DEA}}(x \in V_+^u; y \in V_+^w)$ = {y ≤ $\sum_{i=1}^{n} \omega_i Y_i$; x ≥ $\sum_{i=1}^{n} \omega_i X_i$ for $\omega_1, \omega_2, \dots, \omega_z$} **(3.3)**

s.t. $\sum_{i=1}^{n} \omega_i = 1; \omega_i \geq 0; i = 1,2, \dots, z$

Equations (3.2) and (3.3) adopt the input-oriented approach, which calculates how to obtain efficiency by controlling the inputs. Halkos and Tzeremes (2010) use the DEA output-oriented approach to calculate technical efficiency level for DMUα (x_α, y_α) as follows:

$\widehat{\lambda_{DEA}}(x_\alpha, y_\alpha)$ = sup { λ | $(x_\alpha, \lambda y_\alpha) \in \widehat{\varphi_{DEA}}$} **(3.4)**

$\widehat{\lambda_{DEA}}(x_\alpha, y_\alpha)$ = max { λ | ∈ $\lambda y_\alpha \leq \sum_{i=1}^{n} \omega_i Y_i$; $x_\alpha \geq \sum_{i=1}^{n} \omega_i X_i$ for $\omega_1, \omega_2, \dots, \omega_z$} **(3.5)**

s.t. $\sum_{i=1}^{n} \omega_i = 1; \omega_i \geq 0; i = 1,2, \dots, z$

Bootstrapped DEA (Simar & Wilson, 1998, 2000)

A significant issue of the DEA approach is the variation between the efficiency frontier estimated from the sample and the real efficiency of the population (Sadjadi & Omrani, 2010). The major reason for this issue is the insufficient scale of a sample that cannot reflect the entire population. In other words, though the correct, efficient frontier is unknown, the firm efficiency score can be calculated based only on the input and output statistics obtained from the sample. Researchers such as Tu and Zhang (1992) and Halkos and Tzeremes (2010) also find it difficult to analyse the DEA

sampling dispersion. The DEA approach does not have room for random errors since it uses a linear-scheme method to investigate the frontier (Assaf & Matawie, 2010). Thus, a DMU's inefficiency measured by the DEA approach is simply a calculation instead of a statistical estimate. According to Banker (1993), DEA results are inconsistent regarding single input and output estimates. To solve the problem of the inconsistent DEA estimator, Gijbels, Mammen, Park, and Simar (1999) proposed a sample-asymptotic distributed method for a single input and output estimate that produces asymptotic bias and standard deviation. For estimates of multiple inputs and outputs, bootstrapping is considered the superior solution to evaluate the sampling-distributed DEA estimators (Simar & Wilson, 1998, 2000).

Bootstrapping is a computer-processing technique to assign precision measurements to statistical estimates. The bootstrap method was proposed by Efron (1979) and has been applied widely in later literature to deal with difficult statistical estimation issues (Xue & Harker, 1999). Generally, the bootstrap method relies on the premise that if there is no hint or understanding of the data creation mechanism that generates the sample observations, then the mechanism could be examined by using the provided sample to create a series of bootstrap samples from measurable parameters (Hawdon, 2003). Specifically, Efron (1979) considers a sample A = (A_1, A_2, A_3,…, A_z) from an unidentified-distribution (U) population. The objective is to estimate the finite-sample dispersion of a number of predefined random variables V (A, U), based on the actual data set α = (α_1, α_2, α_3,…, α_z); α indicates the acknowledged observation of A = (A_1, A_2, A_3,…, A_z).

The basic idea of the bootstrap method is direct and simple. The first stage creates a probability distribution $\widehat{U}$ for the sample, allocating probability $1/_Z$ for every point of data set α = (α_1, α_2, α_3,…, α_z). Note that $\widehat{U}$ is observable and unchanged. In the second stage, $\widehat{U}$ is replaced with a random sample A_n^* drawn from a number of z data: $A_n^* = \alpha_n^*, A_n^* \sim_{ind} \widehat{U}, n = 1,2,3, \dots z$; where $A_n^* = A_1^*, A_2^*, A_3^*, \dots, A_z^*$ is the bootstrapped sample. Thus, the random variables' V (A, U) distribution is estimated by the bootstrapped distribution of $V^* = V(A^*, \widehat{U})$. The idea underlying the bootstrap method is that when A = α, $\widehat{U}$ is the centre of all the likely U's and V^* approaches V. Apparently, when $\widehat{U} = U$, it brings about $V^* = V$.

Simar (1992) was the first scholar to apply the bootstrap method in non-parametric boundary evaluation. According to Grosskopf (1996), bootstrapping has been acknowledged as a strong, effective technique to handle the statistical problems of DEA. Atkinson and Wilson (1995) adopted the bootstrap technique to form the mean confidence interval of DEA efficiency rates. Ferrier and Hirschberg (1999) used the bootstrap method to draw the confidence intervals and measure the

deviations of DEA scores. Simar and Wilson (1998, 2000) used the bootstrap method to assess DEA efficiency sensitivity relative to the estimated boundary variations and achieve bias-corrected estimates for DEA scores.

Based on Simar and Wilson (1998, 2000), Halkos and Tzeremes (2010) incorporated and summarised a process for a series of bootstrapping DEA estimates: $\widehat{\lambda_b^*}(x,y)|b = 1,2,\dots,N$ with a fixed value of (x,y) based on the following steps:

- Step 1: Calculate the DEA estimate $\widehat{\lambda_{VRS}}$ from the primary data.
- Step 2: Use the "rule of thumb" density estimate's bandwidth parameter h (Silverman, 1986): h ≈ 1.06 * σ * $n^{-1/5}$.
- Step 3: Produce $\beta_1^*, \dots, \beta_z^*$ with the substitution from the series: $\widehat{\lambda_1}, \dots, \widehat{\lambda_z}$, $(2 - \widehat{\lambda_1}), \dots, (2 - \widehat{\lambda_z})$.
- Step 4: Use Kernel function (K.) to generate ω_j^*, j = 1,…, z, then calculate $\beta_j^{**} = \beta_j^* + h\omega_j^*$ for each j = 1,…, z.
- Step 5: Calculate $\beta_j^{***} = \overline{\beta^*} + \frac{\beta_j^{**} - \overline{\beta}}{(1 + h^2\sigma_k^2\sigma_\beta^2)^{1/2}}$ for each j = 1,…, z. In this equation, $\overline{\beta^*} = \sum_{j=1}^{z}\beta_j^*/z$; $\sigma_\beta^2 = \sum_{j=1}^{z}(\beta_j^* - \overline{\beta^*})/z$; σ_k^2 is the Kernel density function's variance. Then, $\lambda_j^* = 2 - \beta_j^{***}\ if\ \beta_j^{***} < 1$ and $\lambda_j^* = \beta_j^{***}$ otherwise.
- Step 6: Create the bootstrap sample as: $\widehat{X_z^*}\left(x_j^*, y_j\right)|j = 1,2,\dots,x$ where: $x_j^* = \lambda_j^*\widehat{x^\partial}y_j = \lambda_j^*\widehat{\lambda_j^{-1}}x_j$.
- Step 7: Calculate the DEA efficiency scores $\widehat{\lambda_j^*}$ for every primary sample with the use of X_z^* to get a series of bootstrap estimates.
- Step 8: Rerun N times the process from step 3 to 7 (minimum 2000 repetitions) to produce a series of bootstrap DEA estimates of $\widehat{\lambda_b^*}(x,y)|b = 1,2,\dots,N$.

For panel data that consist of multiple inputs and outputs over several years, Du, Worthington, and Zelenyuk (2018) suggest using the bootstrap DEA approach individually for separate years instead of bootstrapping the pooled data because of the possibility of technology transformation in different periods. Du et al. (2018) provide Monte Carlo proof confirming that the yearly bootstrap DEA results are better and more reliable than the pooled DEA ones when variations among frontiers increase.

It is noteworthy to recognise that bootstrapping is an advantageous method for a small-scale sample because it enhances the confidence intervals and precision of the estimates (Song, Zhang, Liu, & Fisher, 2013). Several investigations have adopted bootstrapping to evaluate the DEA scores of small-scale samples, e.g., Hawdon (2003) with a sample of the gas industry of 33 nations; Tsolas's (2011b) efficiency computation of 15 mines in Illinois; Aldea and Ciobanu's (2011) measure of the energy efficiency of 27 nations in the European Union; and Song et al.'s (2013) assessment of 5 BRICS countries' energy efficiency.

Efron and Tibshirani (1998), Simar and Wilson (2000), and Kneip, Simar, and Wilson (2008, 2011) indicate that the bootstrap method produces more accurate results with a large-scale sample. Chernick (2008) and Zervopoulos, Sklavos, Kanas, and Cheng (2019) insist on the limitation of the bootstrap method when the number of observations is too small. In other words, if the number of samples is insufficient, the resampling process will be implemented with deficient observations that bring about incorrect variability. The small-scale sample also results in untrue DEA efficiency scores for many DMUs (Cooper, Seiford, & Tone, 2007; Perelman & Santín, 2009). Also, inadequate data with few samples or inappropriate quantities of DMUs under the large scale of inputs and outputs cause DEA efficiency scores to be overestimated (Banker, 1993; Smith, 1997; Staat, 2001; Coelli, Rao, O'Donnell, & Battese, 2005; Sherman & Zhu, 2006; Simar & Wilson, 2007; Perelman & Santín, 2009).

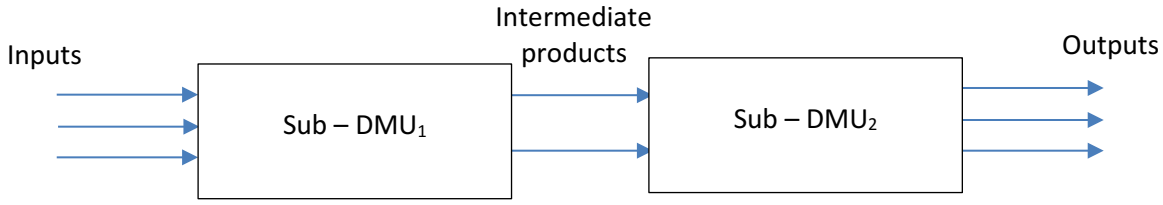
Smith (1997), Zhang and Bartels (1998), Cooper et al. (2007), and Chernick (2008) introduced different ways to estimate the smallest size sample for the bootstrap method. Smith (1997) and Zhang and Bartels (1998) chose 80 and 160, respectively, as the minimum number of observations for the three-variables models. Cooper et al. (2007) constructed a formula that the minimum number of units equals the maximum of {u.v, 3(u+v)}, where u is the input quantity and v is the output quantity. Chernick (2008) proposed 50 as the smallest number of DMUs to use the bootstrapping method to enhance precision and unbiasedness of the estimators.

3.1.4 The two-stage DEA process

The DEA technique is developed into a transformation process with two continuous stages. A two-stage DEA system was first generated by Seiford and Zhu (1999) to measure the profitability and marketability efficiency of U.S. commercial banks. Seiford and Zhu evaluated how 55 U.S. commercial banks create income in the initial DEA stage and how the market assesses the banks' values in the next DEA stage. In stage-1, three inputs (number of staff, amount of assets, and stockholders' equity) and two outputs (revenue and profit) are used. Later, stage-1 outputs (revenue

and profit) become stage-2 inputs. The stage-2 outputs are market value, total returns to investors, and earnings per share. In each stage, Seiford and Zhu (1999) use the traditional DEA method.

In general, there are four separate steps to estimate the two-stage DEA process: (1) DMU selection, (2) input and output selection for each stage (stage-1 outputs are also stage-2 inputs, and sometimes called intermediate products), (3) and (4) the DEA model implementation for stage-1 and stage-2. Sexton and Lewis (2003) illustrated the process by Figure 3.1.



Source: Sexton and Lewis (2003)

Figure 3.1: A general model of the two-stage DEA process

According to Chen, Cook, and Zhu (2010), the two-stage DEA model needs to satisfy three features: first, the DEA model is linear; second, intermediate products must be chosen properly; and third, the model can obtain efficiency scores for each stage and the entire process.

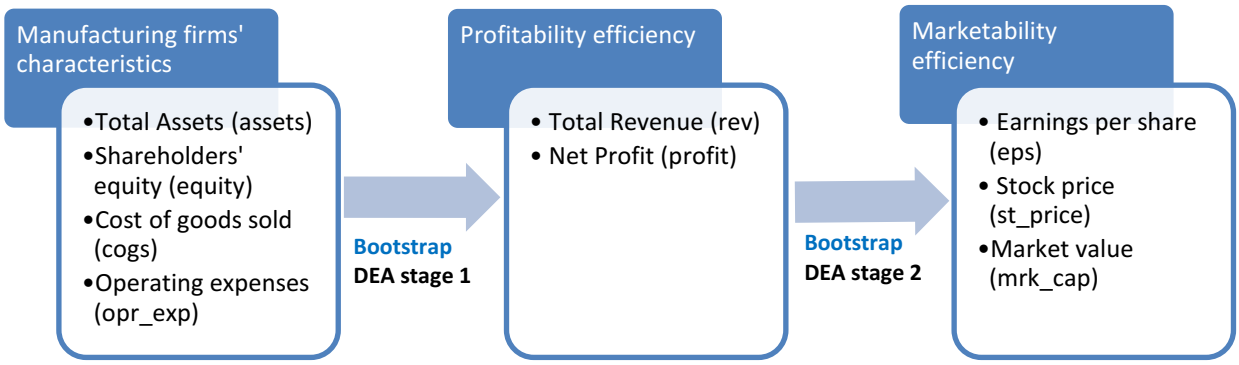
Sexton and Lewis (2003) demonstrate several improvements of the two-stage DEA process compared with the one-stage DEA method. First, the two-stage DEA process can identify the inefficiencies that the one-stage method fails to recognise. Second, among different DMUs with similar efficiency scores, the two-stage process can work out which DMUs are first-stage efficient (inefficient) and which are second-stage efficient (inefficient). Last, and most importantly, the two-stage DEA process helps managers decide which stage in the overall process should be enhanced.

3.1.5 The study's proposed non-parametric method

This study uses the bootstrap two-stage DEA process to measure the profitability and marketability efficiencies of manufacturers in ASEAN-6 countries. The study chooses the output orientation (Färe, Grosskopf, & Lovell, 1994) for the radial DEA model (Charnes et al., 1978) under the assumption of variable returns to scale (Banker et al., 1984) in each stage of the DEA process. The output-based radial DEA evaluation assumes a proportionate increase in outputs with a given level of inputs to obtain the efficiency level and ignores differences among outputs, such as desirable and undesirable outputs (Bi, Liang, & Wu, 2010). Thus, the output-oriented radial DEA model is suitable for the study because it focuses on managing the desirable outcomes of ASEAN-6 manufacturers. This study assumes variable returns to scale for the DEA model since ASEAN-6 manufacturers cannot achieve

their optimum size because of market imperfection (Desker, Caballero-Anthony, & Teng, 2013) with a lack of perfect competition and financial resources (Pham & Matsunaga, 2017).

This study's two-stage DEA process (see Figure 3.2) is adapted and modified from Seiford and Zhu (1999) and Hung and Wang (2012). In each stage of the two-stage DEA process, the bootstrap technique is implemented to calculate corporate technical efficiency.



Source: Two-stage DEA process adapted from Seiford and Zhu (1999) and Hung and Wang (2012).

Figure 3.2: The bootstrap two-stage DEA process to assess the profitability and marketability efficiencies of listed manufacturers in ASEAN-6 countries

All the inputs and outputs in two stages in Figure 3.2 are from the firms' financial statements. Total assets (assets) comprises all assets belonging to each firm. Shareholders' equity (equity) is the total wealth of a firm's shareholders. Cost of goods sold (cogs) represents all firms' direct costs contributing to the products sold. Operating expenses (opr_exp) refers to all expenditure of a firm's operating activities, which includes administrative, general, and selling expenses. Total revenue (rev) is the total value of receipts from selling a firm's products. Net profit (profit) is a firm's actual profit after paying all fees, interests, and taxes. Earnings per share (eps) is the proportion of a firm's net profit assigned to each common share reported in the income statement. Stock price (st_price) represents the price of a single saleable stock on 31 December of the investigated year (Hung & Wang, 2012). Market value (mrk_cap) indicates a firm's total value in the marketplace (Seiford & Zhu, 1999).

3.2 A parametric method to examine the determinants of firms' profitability and marketability efficiencies

3.2.1 The regression models to investigate the determinants of corporate technical efficiency

In the literature, there are several choices of regression models for DEA scores' determinant analysis including the standard linear model, logit or probit model, ordinary least squares model, bootstrap

truncated regression model, Tobit regression model, and fractional regression model. The standard linear regression model and the logit or probit models are no longer used to investigate the determinants of DEA scores in recent studies. Basic linear regression models are inappropriate for two reasons: (1) linear models allow the predicted values, which are the efficiency scores, to be out of the unit interval; and (2) linear models display a constant marginal effect of a unit change in the explanatory variables on the dependent variable, which is not suitable for DEA's efficiency measurement. The logit and probit models are also inappropriate because these binary models accept only two values (0 and 1) for the dependent variables, whereas DEA scores vary between 0 and 1 (Papke & Wooldridge, 1996).

The ordinary least squares (OLS) model of Banker and Natarajan (2008), on the other hand, requires strict conditions to validate the results. For example, the 'noise' accepted in the OLS model should be bounded, and the bounds are unchanged. Further, the model assumes both the explanatory variables and inefficiency processes are uncorrelated with DEA inputs. These restrictive assumptions produce the limited applicability of Banker and Natarajan's (2008) OLS model (Simar & Wilson, 2011).

The bootstrap truncated regression model (BTRM) was introduced by Simar and Wilson (2007) to solve the problem of inference in traditional regression models using DEA scores. According to Simar and Wilson (2007), two problems emerge from the DEA efficiency determinants' traditional regression models: (1) the efficient scores of DMUs measured by DEA are correlated since the efficiency computation of one DMU connects to the data of the other units. Hence, the assumption of independence among the dependent variables of the traditional regression model is violated. (2) In a small-scale sample, there might be a strong connection between the inputs/outputs of DEA models and the explanatory variables of the regression models. By using the bootstrap truncated regression model, the authors replace the faulty estimators with bootstrap estimators to compute standard errors, thus removing the problem of dependency. The BTRM model is also less restrictive than Banker and Natarajan's (2008) OLS model (Simar & Wilson, 2011). However, the bootstrap truncated regression model treats the efficiency scores as truncated dependent variables, whereas the fractional DEA scores are naturally generated from the DEA model.

The Tobit regression model (Tobin, 1958) is a traditional and popular approach to evaluate the impacts of factors on firms' DEA efficiency scores. With the efficiency scores ranging from 0 to 1, TRM is considered a suitable model for intercepted data (Cameron & Trivedi, 2009; Gujarati, 2011). Hoff (2007) indicates that even though TRM is not the only method to examine the determinants of DEA scores, this approach generates reasonable results for most investigations. However, DEA

scores are not intercepted data (McDonald, 2009) and do not take the value 0, whereas TRM takes values from 0 to 1 and treats DEA scores as intercepted dependent variables (Raheli, Rezaei, Jadidi, & Mobtaker, 2017).

The fractional regression model (Papke & Wooldridge, 1996; Ramalho et al., 2010; Ramalho, Ramalho, & Coelho, 2016) has been the preferred method for examining DEA scores' determinants in recent studies. The characteristic of DEA scores is that they are not censored or truncated but a natural result of the DEA approach. FRM can handle the nature of the dependent variable (DEA scores) that takes a value inside the interval (0, 1], regardless of the availability of observed frontier values. In general, FRM can avoid the limitations of the linear and Tobit regression models when using DEA scores as the dependent variables (Ramalho et al., 2010). According to Hoff (2007), Ramalho et al. (2010), and Gallani et al. (2015), FRM is the most advantageous model for continuous data with values bounded from 0 to 1.

With regard to panel data, Ramalho et al. (2016) proposed three fractional regression models: the linear, standard, and exponential fractional regression models. Ramalho et al. (2016) also investigated the advantages and weaknesses of each panel-data fractional regression model with linear panel-data regression model (see Table 3.1).

Table 3.1: The investigation of panel-data regression models proposed by Ramalho et al. (2016)

Criterion	Linear regression model	Linear FRM	Standard FRM	Exponential FRM
Advantages	The simplest model	Takes into account the fractional characteristic of the response variable Applicable to time-differing heterogeneity	Takes into account the fractional characteristic of the response variable	Takes into account the fractional characteristic of the response variable Robust to time-differing heterogeneity Takes into account the value zero of the response variable
Weaknesses	Does not consider the fractional nature of the response	Cannot include 0 and 1 values of response variables	Not applicable to time-varying heterogeneity	Does not allow missing data
Tests performance in the empirical application (Ramalho et al., 2016): Determinants of capital structure	Does not obtain expected results (not support to capital-structure theories)	Obtains expected results (supports capital-structure theories) Robust among different functional forms	Gets inconsistent results among different functional forms Gets unexpected performance (contrary to capital-structure theories)	Obtains expected performance (supports capital-structure theories) Consistent among different estimators

3.2.2 Research proposed parametric method

Based on the assessment of the panel-data linear regression model and three proposed fractional regression models of Ramalho et al. (2016), this study uses linear FRM to examine the determinants of manufacturers' profitability and marketability efficiency scores obtained from the double-stage DEA method. Linear FRM is the most suitable model for this study for the following reasons: (1) it takes into account the fractional characteristic of the response variables; (2) it is applicable for time-differing heterogeneity; and (3) it accepts missing data. The weakness of panel-data linear FRM that it does not accept 0 and 1 values, does not affect this study because of the unbiased estimated DEA scores from the bootstrap method (Simar & Wilson, 1998, 2000) do not include values of 0 and 1. This study uses the panel-data Tobit regression model to check the robustness of the coefficient estimates from different regression models. TRM is a censored regression model most commonly adopted for DEA efficiency determinant examination (Wolszczak-Derlacz & Parteka 2011; Singh & Fida 2015).

Panel-data linear fractional regression model

Ramalho et al. (2016) propose a general panel-data regression model regarding the fractional nature of response variables as follows:

$$y_{it} = G(x_i\theta + \beta_i + \vartheta_{it}) \quad \textbf{(3.6)}$$

where: ϑ_{it} represents the time-differing unrecognised heterogeneity and G(.) is presumed to be a functional specification. Ramalho et al. (2016) then adopt the link function:

$$H(y_{it}) = G(.)^{-1} \quad \textbf{(3.7)}$$

to generate a simple linear-fractional regression model to examine:

$$H(y_{it}) = x_i\theta + \beta_i + \vartheta_{it} \quad \textbf{(3.8)}$$

Ramalho et al. (2016) apply four standard functional specification forms (logit, probit, loglog, and cloglog) to define $H(y_{it})$ (see Table 3.2).

Table 3.2: Specification forms of panel-data linear FRM (Ramalho et al., 2016)

Form of linear FRM	$G(.)$	$H(y_{it})$
Logit	$G(.) = exp(.)/[1 + exp(.)]$	$ln\,[\frac{y_{it}}{1 - y_{it}}]$
Probit	$\varphi(.)$ φ: cumulated normal distribution	$invnor\varphi(y_{it})$ $invnor\ \varphi$: inversely cumulated normal distribution
Loglog	$exp\{-exp\,[-(.)]\}$	$-ln[-ln\,(y_{it})]$
Cloglog	$G(.) = 1 - \frac{exp(.)}{[-exp(.)]}$	$[ln\,(-ln\,(1 - y_{it})]$

Panel-data Tobit regression model

The panel-data Tobit regression model in this study is specified as follows:

$$y_{it} = \delta_i + \theta_i x_{it} + \varepsilon_{it} \quad \textbf{(3.9)}$$

where: y_{it} denotes the censored values, which are the efficiency scores of firm i at time t ($0 \leq y_{it} \leq 1$); x_{it} is the explanatory variables of firm i at time t; ε_{it} is the error term of firm i at time t.

This study adopts random-effects estimation for the panel-data fractional and Tobit regression models because of its ability to deal with time-invariant independent variables in the regression models (Bell & Jones, 2015).

3.2.3 Clarification of the regression models' variables

This study uses the panel-data linear fractional and Tobit regression approaches for two models. The first model examines the determinants of ASEAN-6 listed manufacturers' profitability efficiency in equation (3.10); the second model investigates the factors that affect the listed manufacturers' marketability efficiency in ASEAN-6 countries by equation (3.11). Following Reiff et al. (2002) and Badunenko et al. (2006), who show that industry characteristics affect business efficiency, this study classifies manufacturers into sub-sectors to determine if there is any difference in efficiency and their determinants among the various manufacturing industries.

Based on the literature evaluating the impact of both financial and non-financial factors on firm technical efficiency, this study adopts different explanatory variables for the fractional and Tobit regression models. The independent variables are *firm age* (Pitt & Lee, 1981; Binam et al., 2003; Chu & Kalirajan, 2011); *liquidity* (Goldar et al., 2004; Singh & Fida, 2015; Edjigu, 2016); *number of employees* (Timmer, 1971); *capital structure* (Margaritis & Psillaki, 2007; Mok et al., 2007; Cheng & Tzeng, 2011); *institutional ownership* (Shleifer & Vishny, 1986; Tsai & Gu, 2007; Cao et al., 2018); *industry characteristics* (Reiff et al., 2002; Badunenko et al., 2006); and *firm profitability ratio* (Dudu & Kilicaslan, 2009; Rosman et al., 2014; Singh & Fida, 2015).

The fractional and Tobit regression models in the study are generalised as follows:

$H(PRO\_EF) = f_1 (AGE; CASH; INST; LEV; STAFF; D\_TEC)$ **(3.10)**

$H(MRK\_EF) = f_2 (AGE; CASH; INST; LEV; STAFF; D\_TEC; ROA)$ **(3.11)**

Table 3.3 defines the variables used in equations (3.10) and (3.11):

Table 3.3: Definitions of the variables presented in equations (3.10) and (3.11)

Variable	Definition
H(PRO_EF)	Functional form (FRM-logit, FRM-probit, FRM-loglog, FRM-cloglog; Tobit) of profitability efficiency scores
H(MRK_EF)	Functional form (FRM-logit, FRM-probit, FRM-loglog, FRM-cloglog, Tobit) of marketability efficiency scores
AGE	The number of years that a firm has been listed on the stock market
CASH	Represents liquidity measured by the ratio of cash over total assets
INST	Represents institution-owned shares of a firm
LEV	Represents the capital structure measured by the percentage of total liabilities over total assets
STAFF	The number of corporate employees
D_TEC	A dummy variable equals to 1 if the firm belongs to high-technology sub-sector S1, and 0 otherwise (see Table 3.4 for sub-sector classification).
ROA	Represents profitability ratio, measured by returns on total assets

Note that the explanatory variables in equations (3.10) and (3.11) must be not correlated with the double-stage DEA model's inputs to obtain consistent estimators of the regression models (Banker & Natarajan, 2008). Thus, it is essential to compute a correlation matrix to check the correlated levels between the explanatory variables and the DEA model's inputs before estimating FRM.

3.3 Data collection and categorisation

3.3.1 Data description

The study uses annual data of manufacturers listed on ASEAN-6's stock exchanges from 2007 to 2018. A significant milestone of ASEAN in 2007 was the commitment of 10 ASEAN states to establish the ASEAN Community by 2015. In 2007, ASEAN leaders collectively agreed on the AEC blueprint - a comprehensive master plan to achieve the complete establishment of the ASEAN Economic Community in 2015 (ASEAN, 2015). Therefore, 2007 is chosen as the beginning year of the research period and 2018, three years after the establishment of AEC, as the final year of the investigation period. The two-stage DEA process's inputs and outputs in Figure 3.2, as well as the regression models' explanatory variables in equations (3.10) and (3.11), are from Bloomberg, SPEEDA, and corporate financial statements. As the ASEAN-6 countries have separate national currencies, the study uses financial statement data in million USD for empirical analysis.

3.3.2 Data categorisation

Based on OECD (2011) and Tonby et al.'s (2014) manufacturing categorisation, the study classifies the ASEAN-6 manufacturers into two groups: S1 consists of high-technology production firms, and S2 comprises traditional production firms (see Table 3.4).

Table 3.4: The ASEAN manufacturing sub-sector classification

Sub-sector	Name of sub-sector	List of manufacturing industries
S1	High-technology (high-tech) production	- Aerospace - Chemicals, pharmaceuticals - Computers and office machinery - Radio, TV, and communications equipment - Semiconductor and electrical machinery - Motor vehicles, transportation equipment - Machinery and equipment
S2	Traditional production	- Coke and products from refined petroleum - Food and beverages - Metallic and non-metallic mineral products - Printing and publishing - Rubber and plastic goods - Textiles, leather, and footwear - Wood, paper, recycling goods - Other unclassified manufacturing industries

Source: Manufacturing industries classification adapted from OECD (2011) and Tonby et al. (2014)

3.3.3 Data collection

The DEA technique requires all DMUs to have available data for all inputs and outputs. Hence, data from stock markets, including market value and stock price, must be available from 2007 to 2018. This study uses data of 899 listed manufacturers in ASEAN-6 (Indonesia: 128 firms; Malaysia: 325 firms; the Philippines: 50 firms; Singapore: 114 firms; Thailand: 180 firms; Vietnam: 102 firms) that went public before 31 December 2007 and investigates those firms' efficiency levels during the 12 years of integration. According to Chernick (2008), the smallest number of DMUs to use in bootstrap methods to guarantee the precision and unbiasedness of the estimators is 50. Hence, the total number of DMUs to compute the profitability and marketability efficiency scores for each ASEAN-6 country is sufficient.

The number of the listed manufacturers investigated in each ASEAN-6 country and sub-sector are summarised in Table 3.5. The list of Bloomberg's Equity tickers of the listed manufacturers estimated in each ASEAN-6 country is reported in Appendix Table A.1.

Table 3.5: The number of investigated manufacturers in each ASEAN-6 nation

Manufacturing sub-sector	Indonesia	Malaysia	The Philippines	Singapore	Thailand	Vietnam
S1: High-tech production	29	102	6	54	37	15
S2: Traditional production	99	223	44	60	143	87
Total investigated firms	128	325	50	114	180	102

Source: Data synthesised from Bloomberg

Since all listed manufacturers have similar production attributes and financial goals, with identical inputs and outputs under the same conditions of each ASEAN-6 market, the data satisfy the homogeneity requirement of the DEA technique (Golany & Roll, 1989) to compute the profitability and marketability efficiencies for each ASEAN-6 nation.

3.4 Chapter summary

Chapter 3 describes the non-parametric and parametric methods used in the study. The non-parametric method the study uses is the two-stage DEA process (Seiford & Zhu, 1999) with the adoption of the bootstrap technique in each DEA stage (Simar & Wilson, 1998, 2000) to measure individual listed manufacturer's profitability and marketability efficiency. Since the objectives of the study are to investigate the profit-generating and market-value efficiencies of ASEAN-6 listed manufacturers to improve their performance, the DEA models' directions are output-oriented.

For the parametric approach, the study applies a panel-data fractional regression model and Tobit regression model to examine the impact of corporate financial and non-financial factors on the listed manufacturers' profitability and marketability efficiency obtained from the bootstrap two-stage DEA process above.

Finally, Chapter 3 describes the data collection and categorisation of two different manufacturing sub-sectors (high-tech and traditional) for empirical analysis. A data set of 899 listed manufacturers from the ASEAN-6 countries was collected for empirical investigation; the results are presented in Chapter 4.

Chapter 4

Empirical results

This chapter discusses the empirical findings from the parametric and non-parametric models that estimate the efficiency scores and determinants of manufacturers listed on the ASEAN-6 markets: Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam. The chapter is organised as follows.

Section 4.1 reports the non-parametric bootstrap two-stage DEA process's results that include the profitability efficiency (section 4.1.1) and marketability efficiency (section 4.1.2) of the listed firms in the ASEAN-6 countries' manufacturing sector, high-tech production sub-sector (sub-sector S1), and traditional production sub-sector (sub-sector S2).

Section 4.2 presents the results of the random-effects panel-data fractional regression models (FRM) and Tobit regression models (TRM) that investigate the profitability and marketability efficiency determinants of the listed manufacturers in each ASEAN-6 country's manufacturing sector and two sub-sectors (S1 and S2). Section 4.2.1 summarises the descriptive statistics of the variables used in the empirical analysis. Sections 4.2.2 and 4.2.3 analyse the profitability and marketability efficiency determinants of the ASEAN-6 listed manufacturers, respectively.

4.1. Bootstrap two-stage data envelopment analysis results

4.1.1. The profitability efficiency scores of the ASEAN-6 countries' listed manufacturers

The first stage of the bootstrap two-stage DEA process (see Figure 3.2) generates the profitability efficiency scores of each listed manufacturer in the ASEAN-6 countries during 2007 to 2018 (see Appendix Tables B.1.1 to B.1.6). Table 4.1 displays the average profitability efficiency of listed manufacturers and the two sub-sectors (S1: high-tech production; and S2: traditional production) of the ASEAN-6 countries: Indonesia (IDN), Malaysia (MYS), the Philippines (PHL), Singapore (SGP), Thailand (THA), and Vietnam (VNM) from 2007 to 2018. Table 4.2 shows the results of the t-tests comparing the means of the profitability efficiency scores between sub-sectors S1 and S2 for each ASEAN-6 nation.

Table 4.1: The average profitability efficiency scores of ASEAN-6 countries' listed manufacturers from 2007 to 2018

Country	Sector	Average	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
IDN	All	0.9783	0.9811	0.9812	0.9805	0.9795	0.9776	0.9815	0.9785	0.9823	0.9826	0.9824	0.9702	0.9619
	S1	0.9803	0.9841	0.9809	0.9825	0.9820	0.9819	0.9826	0.9804	0.9838	0.9852	0.9837	0.9730	0.9634
	S2	0.9777	0.9802	0.9813	0.9800	0.9788	0.9763	0.9811	0.9779	0.9818	0.9819	0.9820	0.9694	0.9615
MYS	All	0.7506	0.7518	0.7649	0.7638	0.7567	0.7464	0.7841	0.7648	0.7609	0.7640	0.7189	0.7260	0.7047
	S1	0.7590	0.7654	0.7780	0.7734	0.7570	0.7519	0.7879	0.7641	0.7664	0.7705	0.7332	0.7358	0.7244
	S2	0.7467	0.7456	0.7589	0.7594	0.7566	0.7440	0.7824	0.7651	0.7584	0.7610	0.7123	0.7216	0.6957
PHL	All	0.8805	0.8296	0.8744	0.9003	0.8551	0.9077	0.9133	0.9078	0.8964	0.8838	0.8713	0.9053	0.8214
	S1	0.8755	0.8249	0.8882	0.8827	0.8588	0.8646	0.8998	0.9108	0.8772	0.8772	0.8829	0.9130	0.8264
	S2	0.8812	0.8302	0.8725	0.9027	0.8546	0.9136	0.9151	0.9074	0.8990	0.8846	0.8698	0.9042	0.8207
SGP	All	0.9571	0.9265	0.9771	0.9625	0.9144	0.9789	0.9730	0.9705	0.9541	0.9780	0.9726	0.9473	0.9302
	S1	0.9572	0.9253	0.9778	0.9622	0.9135	0.9787	0.9725	0.9705	0.9561	0.9791	0.9672	0.9500	0.9333
	S2	0.9570	0.9276	0.9764	0.9627	0.9152	0.9791	0.9734	0.9705	0.9523	0.9770	0.9775	0.9449	0.9274
THA	All	0.8280	0.8409	0.8304	0.8285	0.7835	0.8066	0.8569	0.8356	0.8396	0.8017	0.8306	0.8507	0.8304
	S1	0.8429	0.8510	0.8514	0.8309	0.8043	0.8126	0.8696	0.8611	0.8484	0.8199	0.8504	0.8636	0.8514
	S2	0.8241	0.8383	0.8250	0.8279	0.7781	0.8050	0.8536	0.8290	0.8373	0.7971	0.8255	0.8474	0.8250
VNM	All	0.8879	0.9200	0.8748	0.8543	0.8956	0.9046	0.9083	0.9122	0.8947	0.8922	0.8661	0.8706	0.8616
	S1	0.8846	0.9048	0.8672	0.8507	0.8884	0.8802	0.8961	0.8999	0.8961	0.9126	0.8654	0.8836	0.8707
	S2	0.8885	0.9227	0.8761	0.8549	0.8969	0.9088	0.9104	0.9144	0.8944	0.8886	0.8662	0.8684	0.8600

Notes: ASEAN-6 listed manufacturers' profitability efficiency scores measured by the unbiased output-oriented radial bootstrap two-stage DEA model based on the assumption of variable returns to scale. "All" represents the manufacturing sector; "S1" represents high-technology manufacturing sub-sector (sub-sector S1); "S2" represents traditional production sub-sector (sub-sector S2).

Table 4.2: The t-test results of the mean profitability efficiency of sub-sectors S1 and S2

Country	Ho: mean (diff S1, S2) = 0	t-statistic	Pr(T>t)
IDN	Ha: mean (diff S1, S2) ≠ 0	6.063	0.000
	Ha: mean (diff S1, S2) < 0		1.000
	Ha: mean (diff S1, S2) > 0		0.000
MYS	Ha: mean (diff S1, S2) ≠ 0	4.793	0.001
	Ha: mean (diff S1, S2) < 0		1.000
	Ha: mean (diff S1, S2) > 0		0.000
PHL	Ha: mean (diff S1, S2) ≠ 0	-1.059	0.312
	Ha: mean (diff S1, S2) < 0		0.156
	Ha: mean (diff S1, S2) > 0		0.844
SGP	Ha: mean (diff S1, S2) ≠ 0	0.150	0.883
	Ha: mean (diff S1, S2) < 0		0.558
	Ha: mean (diff S1, S2) > 0		0.442
THA	Ha: mean (diff S1, S2) ≠ 0	7.248	0.000
	Ha: mean (diff S1, S2) < 0		1.000
	Ha: mean (diff S1, S2) > 0		0.000
VNM	Ha: mean (diff S1, S2) ≠ 0	-0.888	0.394
	Ha: mean (diff S1, S2) < 0		0.197
	Ha: mean (diff S1, S2) > 0		0.803

On average, Indonesian listed manufacturers achieve the highest profitability efficiency (0.9783), followed by Singapore (0.9571), Vietnam (0.8879), the Philippines (0.8805), and Thailand (0.8280). Malaysia's manufacturers have the lowest profitability efficiency (0.7506) among the ASEAN-6 countries. The average profitability efficiency score for each ASEAN-6 nation shows no improvement over the study period.

The results show that Indonesian listed manufacturers achieve the highest average profitability efficiency among the ASEAN-6 countries during the period 2007 to 2018. The major reason for the high average profitability efficiency of Indonesian manufacturers is the low labour cost that has been relatively flat for the recent 10 years (Deloitte, 2016). Indonesia also possesses abundant raw material (KPMG, 2018), which is beneficial for the manufacturing sectors. Additionally, Indonesian manufacturers achieve high productivity, which results in high profitability efficiency. According to the Global Manufacturing Competitiveness Index (GMCI) (Deloitte, 2016), the productivity growth of the Indonesian manufacturing sector over the 10 years exceeded that of Malaysia, Thailand, and Vietnam. Further, the listed Indonesian manufacturers have a relatively high level of institutional ownership (see Table 4.6), which plays a positive and significant role in the financial success of the listed Indonesian manufacturing firms (Handriani & Robiyanto, 2018; Saputra & Indayani, 2019). The average profitability efficiency score for the Indonesian manufacturing sub-sector S1 is higher than for sub-sector S2 at the 1% significance level for 2007 to 2018 (see Table 4.2), demonstrating that

listed high-tech manufacturers get better profitability efficiency results than the listed traditional manufacturers in Indonesia. According to Amato and Amato (2000), high technology is associated with firms' higher productivity and profitability. Cozza, Malerba, Mancusi, Perani, and Vezzulli (2012) indicate that high-tech firms introducing innovative products can gain superior profitability and growth. Thus, high-tech production firms tend to achieve better profitability efficiency than traditional firms.

The Singapore manufacturing sector, unsurprisingly, also attains a high average profitability efficiency from 2007 to 2018. As reported in the GMCI report (Deloitte, 2016), Singapore is a developed market with a highly-educated labour force, a technology-driven focus, high-quality infrastructure and proper governance that generate a favourable environment for manufacturers to get a high profitability efficiency score. Singapore's high-technology manufacturing sub-sector and traditional production sub-sector achieve similar average profitability scores during the study period (see Table 4.2). Thus, there is no significant difference in profitability efficiency between high-technology and traditional firms in the Singapore manufacturing sector.

The average profitability efficiency of Vietnam's listed manufacturers ranks third among the ASEAN-6 countries. Like Indonesia, Vietnam has a low-cost manufacturing sector with increasing productivity over time. The productivity of Vietnam manufacturers grew 49% in 10 years (2005 – 2015), which outpaced Thailand and Malaysia (Deloitte, 2016). Consequently, the average profitability efficiency of Vietnam listed manufacturers is comparatively higher than Thailand and Malaysia. Table 4.1 shows the profitability efficiency scores of Vietnam listed manufacturers drop from 2007 to 2009, increase from 2010 to 2013, and shrink from 2014 to 2018, reflecting fluctuations of Vietnam's economy and manufacturing sector from 2007 to 2018. The Vietnam economy faced high inflation and slow growth that led to the low profitability of manufacturers during the period 2007 to 2009. From 2010 to 2013, Vietnam's inflation and interest rates were moderate, which brought about the recovery of the manufacturers. From 2014 to 2018, the manufacturers showed signs of slowing down, especially with negative growth in mining (General Statistics Office of Vietnam, 2019). For Vietnam's manufacturing sub-sectors, sub-sector S1 (high-tech manufacturing) has lower profitability efficiency scores than sub-sector S2 (traditional production) in 2007. This result is similar to Le and Harvie's (2010) results that high-tech firms got the lowest average efficiency scores among different manufacturing industries in Vietnam from 2002 to 2007. As explained by Le and Harvie (2010), it was more difficult for high-tech production enterprises than simple manufacturers in Vietnam to achieve best practice during the period 2002-2007. However, the high-tech manufacturing sub-sector achieves better efficiency than the

traditional manufacturing sub-sector from 2015 to 2018, indicating the enhancement of technology applications in the production by Vietnam's listed firms in sub-sector S1. Overall, there is no significant profitability-efficiency difference between high-technology and traditional manufacturing sub-sectors in Vietnam during the study period 2007 to 2018 (see Table 4.2).

For the Philippines listed manufacturers, the average profitability efficiency score of the sector is 0.8805, which indicates potential for profit-generating efficiency improvement of the Philippines' manufacturers. The Philippines manufacturers' profitability efficiency attains the highest scores from 2011 to 2013. That result is consistent with the report of the Philippines Board of Investment (2017) that the Philippines manufacturing sector's growth rate (5.77%) was higher than the average rate of the ASEAN manufacturing sector (4.97%) from 2010 to 2013 because of strong government support to both the Philippines' small and medium manufacturers (Batungbacal, 2016). However, since 2014, the profitability efficiency of the Philippines manufacturers has fluctuated. In 2018, new taxes and rising inflation negatively affected the demand as well as the profitability efficiency of manufacturers in the Philippines (Aw, 2018). For the two manufacturing sub-sectors, the profitability efficiency of the Philippines high-tech manufacturing sub-sector (S1) is not statistically different from the traditional manufacturing sub-sector (S2) from 2008 to 2018 (see Table 4.2).

Ranked fifth among ASEAN-6 countries, the profitability efficiency score of Thai listed manufacturers has not improved since 2007. The Thai high-tech manufacturing sub-sector consistently gets better profitability efficiency results than the traditional manufacturing sub-sector over the sample period. The average profitability efficiency score of the Thai listed high-tech firms is significantly higher at the 1% level than the listed traditional manufacturers (see Table 4.2). This supports the results of Amato and Amato (2000) and Cozza et al. (2012) and demonstrates the positive influence of high technology on firms' productivity, profitability, and financial growth.

The lowest average of the ASEAN-6 profitability efficiency scores is for Malaysia's listed manufacturers, but it is considered acceptable given the unfavourable manufacturing conditions in Malaysia, such as insufficient talent, political instability, and low productivity (Deloitte, 2016). The Malaysian manufacturing sector has recently faced a significant decrease in production, demand, and new business (Zahiid, 2019), resulting in the lowest profitability efficiency score by listed manufacturers in 2018. Comparing the profitability efficiency scores of the two manufacturing sub-sectors, S1 and S2, shows that sub-sector S1 gets significantly better (at the 1% level) profitability efficiency results than sub-sector S2 during 2007 to 2018 (see Table 4.2). These results agree with Amato and Amato's (2000) and Cozza et al.'s (2012) results that high-tech manufacturers get better

financial performance than traditional manufacturers because of higher productivity, profitability, and growth.

4.1.2. The marketability efficiency scores of the ASEAN-6 countries' listed manufacturers

In the second stage of the bootstrap two-stage DEA process, marketability efficiency score of each listed manufacturer in the ASEAN-6 countries is measured annually from 2007 to 2018 (see Appendix Tables B.2.1 to B.2.6). Table 4.3 presents the average marketability efficiency scores of the ASEAN-6 listed manufacturers from 2007 to 2018. The results of the t-tests comparing the means of ASEAN-6 listed manufacturers' profitability and marketability efficiencies (see Table 4.4) indicate the average marketability efficiency is significantly lower than the average profitability efficiency for most ASEAN-6 nations (exception, Malaysia). Table 4.5 reports the t-test results comparing the mean marketability efficiency scores of sub-sectors S1 and S2 of each ASEAN-6 country.

The second bootstrap DEA stage's results in Table 4.3 show that Singapore's listed manufacturers have the highest marketability efficiency score (0.8486) of the ASEAN-6 markets. In contrast, Vietnam's listed manufacturers exhibit the lowest average marketability efficiency score (0.5266). These results reflect the development and accessibility of ASEAN-6 stock markets, where Singapore is classified as a developed capital market, and Vietnam is a frontier market. The other ASEAN-6 markets, Indonesia, Malaysia, the Philippines, and Thailand, are categorised as emerging markets (MSCI, 2019).

The average marketability efficiency score of Singapore's listed manufacturers from 2007 to 2018 is 0.8486. Notably, the marketability efficiency scores of Singapore's manufacturers increase considerably over the 12 years (from 0.6764 in 2007 to 0.9220 in 2018). The listed high-technology businesses (S1) get significantly higher (at 1%) marketability efficiency than the listed traditional production firms (S2) during the study period (see Table 4.5). This reveals that the listed high-technology firms are likely to draw more attention from investors and are priced higher than the listed traditional firms in Singapore's capital market.

Indonesian listed manufacturers' marketability efficiency scores are high from 2007 to 2014 but drop significantly from 2015 to 2018. The market-value efficiency results of Indonesia's listed manufacturers are consistent with the unfavourable conditions of Indonesia's stock market. According to Lubis (2015), the primary reason is the dominance of foreign investors in the market who exited it because of concern about the U.S. central bank's increased interest rate and China's economic slowdown since 2015. The recent U.S. - China trade war and fears of a global economic

downturn have affected foreign investors in the Indonesian market (Indonesia-Investments, 2019). Comparing the two manufacturing sub-sectors, the marketability efficiency scores of sub-sector S1 are higher than sub-sector S2 from 2007 to 2014. However, from 2015 to 2018, the marketability efficiency scores of sub-sector S1 are lower than sub-sector S2. This result demonstrates that the marketability efficiency scores of listed manufacturers in sub-sector S1 are significantly more affected by the stock market than sub-sector S2 when the foreign investors chose to exit Indonesia's capital market. Indonesian listed traditional manufacturers achieve significantly better (at the 5% level) marketability efficiency scores than the high-technology firms during the study period (Table 4.5).

Like profitability efficiency decreases over time, the marketability efficiency scores of Malaysian listed manufacturers reduce sharply, from 0.7934 in 2017 to 0.3819 in 2018. The results are consistent with the drop in the Malaysian stock market in 2018. The drop in firms' values on the Malaysian stock market occurred with the new government that planned to lower public debt in 2018 by tightening fiscal policy. However, it failed to control government inefficiency and corruption (Vishnoi, 2019). For the two manufacturing sub-sectors, S1 and S2, sub-sector S1 achieves significantly higher (at 1%) marketability efficiency results than sub-sector S2 during the study period. These results suggest that listed high-tech manufacturers command higher values in stock markets than the listed traditional firms in Malaysia.

For the Philippines listed manufacturers, the average marketability efficiency scores are relatively low from 2007 to 2010. From 2011 to 2013, government reform effectively enhanced business conditions and reduced corruption in the Philippines, thus increasing foreign investment in the capital market (Deloitte, 2014) and, consequently, increased the marketability efficiency scores of the Philippines listed manufacturers. However, the marketability efficiency scores do not remain at high levels in the following years because of both overseas and domestic uncertainty (Dumlao-Abadilla, 2015). The marketability efficiency scores of the Philippines listed manufacturers improve substantially in 2018 because investors were optimistic about the sustained GDP growth and the prospects of the manufacturing sector (Zialcita, 2018). Comparing the marketability efficiency performance of the two manufacturing sub-sectors, the score of the high-tech sub-sector, S1, is significantly (at 1%) lower than the traditional sub-sector, S2, from 2007 to 2018.

Table 4.3: The average marketability efficiency scores of ASEAN-6 countries' listed manufacturers from 2007 to 2018

Country	Sector	Average	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
IDN	All	0.7807	0.9514	0.8836	0.8519	0.9450	0.8242	0.9551	0.9540	0.9545	0.4860	0.5044	0.5257	0.5322
	S1	0.7760	0.9541	0.8873	0.8522	0.9461	0.8179	0.9576	0.9566	0.9510	0.4677	0.4903	0.5133	0.5131
	S2	0.7820	0.9506	0.8825	0.8518	0.9447	0.8261	0.9544	0.9533	0.9540	0.4914	0.5085	0.5294	0.5377
MYS	All	0.7616	0.8009	0.8073	0.8315	0.8129	0.7821	0.8032	0.7651	0.8170	0.7994	0.7441	0.7934	0.3819
	S1	0.7766	0.8154	0.8165	0.8446	0.8326	0.7963	0.8155	0.7785	0.8303	0.8173	0.7676	0.8115	0.3927
	S2	0.7547	0.7942	0.8031	0.8254	0.8040	0.7755	0.7976	0.7590	0.8110	0.7912	0.7334	0.7851	0.3769
PHL	All	0.7464	0.6077	0.6717	0.7013	0.6588	0.7142	0.8891	0.9119	0.8509	0.8241	0.5640	0.6554	0.9074
	S1	0.7065	0.6383	0.6684	0.6811	0.5748	0.6387	0.8710	0.8980	0.8215	0.8083	0.4188	0.5574	0.9011
	S2	0.7518	0.6036	0.6722	0.7041	0.6702	0.7245	0.8915	0.9138	0.8549	0.8262	0.5837	0.6688	0.9082
SGP	All	0.8486	0.6764	0.7416	0.8950	0.7070	0.8461	0.9084	0.9347	0.8830	0.8882	0.9029	0.8780	0.9220
	S1	0.8545	0.6879	0.7441	0.9031	0.7076	0.8425	0.9154	0.9394	0.8833	0.8979	0.9104	0.8941	0.9279
	S2	0.8433	0.6660	0.7393	0.8877	0.7065	0.8494	0.9021	0.9304	0.8827	0.8795	0.8962	0.8636	0.9167
THA	All	0.7492	0.8238	0.8439	0.7570	0.6325	0.7389	0.6597	0.7363	0.6099	0.7751	0.7574	0.8123	0.8439
	S1	0.7309	0.8194	0.8062	0.7641	0.6534	0.7314	0.6208	0.6441	0.6386	0.7501	0.7462	0.7897	0.8062
	S2	0.7540	0.8249	0.8537	0.7552	0.6271	0.7408	0.6698	0.7601	0.6025	0.7815	0.7602	0.8182	0.8537
VNM	All	0.5266	0.6273	0.4380	0.5503	0.5570	0.5014	0.5173	0.5436	0.5723	0.5310	0.4852	0.5134	0.4830
	S1	0.5532	0.6889	0.4964	0.6353	0.5820	0.5252	0.4861	0.5142	0.5950	0.5011	0.5116	0.5932	0.5098
	S2	0.5221	0.6167	0.4279	0.5356	0.5527	0.4973	0.5227	0.5486	0.5684	0.5362	0.4806	0.4996	0.4784

Notes: ASEAN-6 listed manufacturers' marketability efficiency scores measured by the unbiased output-oriented radial bootstrap two-stage DEA model based on the assumption of variable returns to scales. "All" represents the manufacturing sector; "S1" represents high-technology manufacturing sub-sector (sub-sector S1); "S2" represents traditional production sub-sector (sub-sector S2).

Table 4.4: The t-test results of means of ASEAN-6 manufacturers' profitability and marketability efficiencies

Country	Ho: mean (diff PRO_EF, MRK_EF) = 0	t-statistic	Pr(T>t)
IDN	Ha: mean (diff) ≠ 0	3.413	0.006
	Ha: mean (diff) < 0		0.997
	Ha: mean (diff) > 0		0.003
MYS	Ha: mean (diff) ≠ 0	-0.356	0.729
	Ha: mean (diff) < 0		0.364
	Ha: mean (diff) > 0		0.636
PHL	Ha: mean (diff) ≠ 0	3.848	0.003
	Ha: mean (diff) < 0		0.100
	Ha: mean (diff) > 0		0.001
SGP	Ha: mean (diff) ≠ 0	4.701	0.001
	Ha: mean (diff) < 0		0.999
	Ha: mean (diff) > 0		0.000
THA	Ha: mean (diff) ≠ 0	3.473	0.005
	Ha: mean (diff) < 0		0.997
	Ha: mean (diff) > 0		0.003
VNM	Ha: mean (diff) ≠ 0	30.0257	0.000
	Ha: mean (diff) < 0		1.000
	Ha: mean (diff) > 0		0.000

Notes: "PRO_EF" and "MRK_EF" represent the profitability and marketability efficiencies, respectively.

Table 4.5: The t-test results of marketability efficiency means of sub-sectors S1 and S2

Country	Ho: mean (diff S1, S2) = 0	t-statistic	Pr(T>t)
IDN	Ho: mean (diff S1, S2) > 0	-1.979	0.073
	Ha: mean (diff S1, S2) ≠ 0		0.037
	Ha: mean (diff S1, S2) < 0		0.963
MYS	Ha: mean (diff S1, S2) > 0	12.870	0.000
	Ha: mean (diff S1, S2) ≠ 0		1.000
	Ha: mean (diff S1, S2) < 0		0.000
PHL	Ha: mean (diff S1, S2) > 0	-2.775	0.018
	Ha: mean (diff S1, S2) ≠ 0		0.009
	Ha: mean (diff S1, S2) < 0		0.991
SGP	Ha: mean (diff S1, S2) > 0	3.757	0.003
	Ha: mean (diff S1, S2) ≠ 0		0.998
	Ha: mean (diff S1, S2) < 0		0.002
THA	Ha: mean (diff S1, S2) > 0	-1.973	0.074
	Ha: mean (diff S1, S2) ≠ 0		0.037
	Ha: mean (diff S1, S2) < 0		0.963
VNM	Ha: mean (diff S1, S2) > 0	2.266	0.045
	Ha: mean (diff S1, S2) ≠ 0		0.978
	Ha: mean (diff S1, S2) < 0		0.022

In Thailand, the listed high-tech manufacturers (S1) exhibit significantly lower (at 5%) average marketability efficiency than the listed traditional production enterprises (S2). Thai listed manufacturers marketability efficiency score decreases from 2007 to 2014 (see Table 4.3) because of the country's unstable political climate that affected investors' confidence in the stock markets. From 2014 to 2018, Thai listed manufacturers' marketability efficiency score increases because of better political conditions and increased investment in Thailand's capital market (Theparat, 2019).

For Vietnam, the average marketability efficiency score (0.5266) is significantly lower than the average profitability efficiency score (0.8879) of Vietnam's listed manufacturers. The results display no considerable improvement in the marketability efficiency score for all the manufacturing sector from 2007 to 2018. For the two manufacturing sub-sectors, sub-sector S1 (high-tech) has a significantly higher (at 5%) average marketability efficiency scores than sub-sector S2 (see Table 4.5). These results support Minh and Vinh's (2007) and Le and Harvie's (2010) findings that different manufacturing industries in Vietnam achieve heterogeneous technical efficiency results.

4.2. The panel-data fractional and Tobit regression results

4.2.1. Descriptive statistics

Variable descriptions

Table 4.6 summarises the mean and standard deviation (S.D.) values of the ASEAN-6 listed manufacturers' financial and non-financial characteristics from 2007 to 2018.

Table 4.6: Descriptive statistics of FRM and TRM's explanatory variables

Country	Factor	AGE	CASH	INST	LEV	STAFF	D_TEC	ROA
IDN	Mean	19	8.6	34.58	0.59	4210	0.23	4.64
	S.D.	7	10.84	32.46	0.64	13970	0.42	12.63
MYS	Mean	16	12.4	22.07	0.37	1617	0.31	3.21
	S.D.	10	11.9	23.51	0.21	6409	0.46	14.37
PHL	Mean	33	0.12	33.42	0.44	1656	0.12	-0.4
	S.D.	18	0.16	27.57	0.65	4028	0.33	49.89
SGP	Mean	15	20.33	19.49	0.42	11547	0.47	3.4
	S.D.	9	16.15	26.17	0.35	27923	0.5	41.72
THA	Mean	18	7.69	18.6	0.4	2119	0.21	4.78
	S.D.	9	8.8	20.08	0.27	4514	0.4	9.31
VNM	Mean	7	10.52	17.91	0.44	1319	0.15	8.02
	S.D.	4	10.41	25.68	0.21	2114	0.35	8.5

Table 4.6 shows the Philippines listed manufacturers are the longest listed stocks in the stock markets (33 years) and Vietnam listed manufacturers have the shortest average listed time (7 years) among the ASEAN-6 countries during the study period. The average listing age of the listed

manufacturers in each ASEAN-6 country is calculated by the average values of all observations (from 2007 to 2018) in the panel data. For example, if a firm went public in 2007, the listing age values range from 0 to 11, and the average listed years of that firm is 5.5 years. Since most Vietnam listed manufacturers went public late (from 2001 to 2007), the average listing age of Vietnam listed manufacturers is 7 years for all observations. Indonesia listed manufacturers have the largest proportion of institutional shareholders (34.58%), and Singapore's listed manufacturers have the highest average number of employees (11547 staff). Singapore also has the largest percentage of listed high-technology firms of total manufacturers (47.4%). Table 4.6 displays that Singaporean listed manufacturers maintain the highest level of cash to total assets ratio (20.3%) among the ASEAN-6 countries. Indonesia listed manufacturers, however, have the largest leverage ratio (59.3%) and highest ROA (0.046) among the ASEAN-6 countries.

Correlation matrix

The correlation results of the TRM and FRM variables are significantly low for all ASEAN-6 countries (see Appendix Tables C.1.1 to C.1.6). Hence, there is no strong correlation between the explanatory and dependent variables of the regression model equations (3.10) and (3.11). Following Banker and Natarajan (2008), the study calculates the correlation values of the regression models' explanatory variables and two-stage DEA process inputs to ensure consistent estimators of the regression models. The correlation results are less than 0.8 (see Appendix Tables C.2.1 to C.2.6). Thus, there is no strong correlation among the independent variables of the regression models and the two-stage DEA inputs.

4.2.2. The profitability efficiency determinants of ASEAN-6 countries' listed manufacturers

Profitability efficiency determinants of all the manufacturing sector

Table 4.7 exhibits the random-effects FRM and TRM results of equation (3.10) that examines the effects of corporate factors on the profitability efficiency of the ASEAN-6 listed manufacturers. The FRM and TRM approaches generate consistent, robust results of firms' profitability efficiency determinants. Table 4.7 also demonstrates that different factors have diverse effects on listed manufacturers' profitability efficiency in the ASEAN-6 countries.

Table 4.7: The profitability efficiency determinants of ASEAN-6 countries' listed manufacturers

Functional forms		AGE	CASH	INST	LEV	STAFF	D_TEC
IDN	FRM-logit	-0.058***	0.008***	0.003***	-0.101***	-0.000001	0.035
	FRM-probit	-0.023***	0.003***	0.001***	-0.037***	-0.000001	0.017
	FRM-loglog	-0.058***	0.008***	0.003***	-0.100***	-0.000001	0.034
	FRM-cloglog	-0.014***	0.002***	0.001***	-0.021***	-0.0000004	0.012
	Tobit	-0.001***	0.0001**	0.00003	-0.0007	-0.0000001	0.002
MYS	FRM-logit	-0.012***	0.005***	0.0004	0.073	0.000005**	0.018
	FRM-probit	-0.007***	0.003**	0.0002	0.041	0.000003**	0.009
	FRM-loglog	-0.010***	0.004***	0.0003	0.066	0.000004**	0.019
	FRM-cloglog	-0.007***	0.003**	0.0002	0.036	0.000003**	0.005
	Tobit	-0.002***	0.001***	0.0001	0.012	0.000001*	0.002
PHL	FRM-logit	-0.012**	0.449	-0.002	-0.042*	0.00001	-0.433
	FRM-probit	-0.007**	0.226	-0.001	-0.020	0.000004	-0.230
	FRM-loglog	-0.011*	0.423	-0.002	-0.040*	0.00001	-0.403
	FRM-cloglog	-0.006**	0.178	-0.001	-0.014	0.000004	-0.183
	Tobit	-0.002***	0.049	-0.00002	-0.003	0.000002	-0.044
SGP	FRM-logit	-0.016*	0.004	0.005*	-0.690*	0.000002*	0.189
	FRM-probit	-0.007*	0.002	0.002*	-0.329*	0.000001*	0.083
	FRM-loglog	-0.016*	0.004	0.005*	-0.662*	0.000002*	0.185
	FRM-cloglog	-0.005*	0.001	0.002*	-0.239**	0.000001*	0.056
	Tobit	-0.001***	0.0001	0.0002**	-0.048***	0.0000001	0.008
THA	FRM-logit	0.007*	0.004*	0.003***	0.254**	0.000002	0.138*
	FRM-probit	0.004**	0.002*	0.002***	0.138**	0.000001	0.081*
	FRM-loglog	0.006*	0.004	0.003***	0.232**	0.000002	0.116*
	FRM-cloglog	0.004**	0.002*	0.002***	0.115**	-0.0000003	0.079**
	Tobit	0.001*	0.001**	0.001***	0.037***	-0.0000001	0.025*
VNM	FRM-logit	-0.082***	0.005	0.003***	0.661**	0.00004**	0.018
	FRM-probit	-0.042***	0.003	0.002***	0.342**	0.00002**	0.007
	FRM-loglog	-0.078***	0.004	0.003**	0.620**	0.00004**	0.019
	FRM-cloglog	-0.032***	0.002	0.001***	0.269**	0.00002**	0.003
	Tobit	-0.007***	0.001	0.0003***	0.068***	0.00001**	-0.001

Note: ***, **, * level of statistical significance is equal to 1%, 5% and 10%, respectively

The length of listing (AGE) has a negative, significant impact on the profitability efficiency of Indonesian, Malaysian, and Vietnamese listed manufacturers (at 1%), and on Philippine and Singaporean listed manufacturers (at 10%). These findings support Agarwal and Gort (1996), Tran et al. (2008), and De Figueiredo, Rawley, and Rider (2015) who argue that firms operating for a substantial period may be reluctant to execute organisational changes and innovation, thus progressively lessen corporate efficiency. Singh et al. (2013) indicate that new firms can obtain higher efficiency than old-established firms if the new firms have sound fundamentals, policies and corporate governance. In contrast, Thai listed manufacturers' length of listing has a positive,

significant effect (at 10%) on profitability efficiency. This result supports Admassie and Matambalya's (2002) finding that relies on the learn-by-doing theory to argue that the operational experience of old firms becomes a corporate competitive advantage and makes the old firms more efficient than the newcomers in the market. The inconsistent results of the ASEAN-6 nations confirm that the firm age - efficiency relationship is country-specific (Majumdar, 1997) and depends on institutional factors, such as the characteristics of business start-ups or the advantages of new and experienced firms (Akben-Selcuk, 2016; Coad et al., 2018).

The CASH variable has a positive, significant effect on profitability efficiency of listed manufacturers in Indonesia (at 1%), Malaysia (at 5%), and Thailand (at 10%). These results confirm the conclusions of Gertner et al. (1994) and Stein (1997) that corporate capital is allocated more efficiently through internal finance because internal funding may boost monitoring incentives while reducing commercial incentives, thus yield a better asset allocation and financial result.

Institutional ownership (INST) positively affects the profitability efficiency of Indonesian, Thai, and Vietnamese listed manufacturers at 1% significance, and Singaporean listed manufacturers at the 10% level. These results confirm the influential role of institutional shareholders that mitigate agency problems from authority separation, reduce information asymmetry, and support firms in terms of finance and experience to enhance the firm performance (Shleifer & Vishny 1986; Tsai & Gu, 2007).

The debt level (LEV) negatively, significantly impacts listed manufacturers' profitability efficiency in Indonesia (at 1%) and Singapore (at 10%). These results are consistent with Cheng and Tzeng's (2011) study that reveals the reverse effect of leverage on firm efficiency. In contrast, the debt ratio is significantly, positively (at 5%) associated with the profitability efficiency of Thai and Vietnamese listed manufacturers. The Thai and Vietnamese results are similar to Margaritis and Psillaki's (2007) and Mok et al.'s (2007) studies that show a co-movement between leverage and firm efficiency. The mixed results of the relationship between leverage and firm efficiency in the ASEAN-6 nations can be explained by the different institutional factor (ability to access bank credit) and legal systems (creditor and shareholder protections, and law enforcement effectiveness) in different countries (Weill, 2008). That is, firms more able to access bank credit have better leverage - efficiency relationship. Legal systems that provide proper protection for creditors and shareholders and good law enforcement may reduce the moral hazard of managers, thus lessening the adverse effects of leverage on firm efficiency.

The STAFF factor exhibits a positive, significant (at 5%) impact on the profitability efficiency of Malaysian and Vietnamese listed manufacturers and Singaporean listed manufacturers (at 10%). This finding supports Schneider's (1991) conclusion that large-scale corporations tend to achieve higher efficiency than small-sized firms through value-added per employee.

The industry-effect variable, D_TEC, has a positive association with profitability efficiency of Thai listed manufacturers at the 10% level. This implies that Thai listed high-technology manufacturers obtain higher profitability efficiency than the listed traditional production enterprises. This result supports Klomp and Van Leeuwen's (2001) study that emphasises a positive link between innovation and corporate economic performance.

Profitability efficiency determinants of high-tech manufacturers (sub-sector S1)

Table 4.8 summarises the FRM and TRM results of equation (3.10) on the effect of financial and non-financial factors on profitability efficiency scores of the listed high-tech manufacturers in the ASEAN-6 countries. The results in Table 4.8 show the length of the listing (AGE) negatively, significantly affects Malaysian and Singaporean (at 10%), and Vietnamese (at 5%) listed high-tech manufacturers. This implies that longer listing experience Malaysian, Singaporean, and Vietnamese listed manufacturers have, the lower the profitability efficiency of the firms. According to Agarwal and Gort (1996) and Tran et al. (2008), old-established firms tend to have obsolete knowledge and technology, whereas new firms apply more advanced technology that increases firm efficiency. Another reason is that success and experience gradually create inflexible regulations through organisation and processes that can put firms in procedure-related rigidity and eventually harm their development (Leonard-Barton, 1992; De Figueiredo et al., 2015).

The CASH factor has a positive, significant (ay 1%) effect on Indonesian listed high-tech manufacturers in the four functional forms of FRM and at 10% in the TRM approach. Hence, the higher the cash level firms hold, the greater the profitability efficiency of listed high-tech enterprises in Indonesia. This conclusion is consistent with Singh and Fida (2015) and Edjigu (2016) who demonstrate that liquidity has a significant, positive impact on a firm's efficiency level.

For the INST factor, Singaporean listed high-tech manufacturers profitability efficiency is positively, significantly (at 10%) associated with the level of institutional ownership. This result indicates that institutional shareholders contributed to the profitability efficiency of Singaporean listed high-tech manufacturers during the study period.

Table 4.8: The profitability efficiency determinants of ASEAN-6 countries' listed high-tech manufacturers (sub-sector S1)

Functional forms		AGE	CASH	INST	LEV	STAFF
IDN	FRM-logit	-0.01	0.015***	0.002	0.009	-0.0002***
	FRM-probit	-0.005	0.006***	0.001	0.002	-0.0001***
	FRM-loglog	-0.01	0.015***	0.002	0.009	-0.0002***
	FRM-cloglog	-0.003	0.003***	0.0004	-0.0004	-0.0001***
	Tobit	-0.001***	0.0002*	0.00004	-0.002	-0.00001***
MYS	FRM-logit	-0.013**	0.004	0.002	0.183	0.000003**
	FRM-probit	-0.008**	0.002	0.001	0.108	0.000002**
	FRM-loglog	-0.012**	0.004	0.002	0.158	0.000002**
	FRM-cloglog	-0.007*	0.002	0.001	0.1	0.000001**
	Tobit	-0.002**	0.001	0.001*	0.032	0.000001
PHL	FRM-logit	0.005	-0.982	0.009	-3.2989***	0.0003*
	FRM-probit	0.002	-0.561	0.004	-1.724***	0.0001*
	FRM-loglog	0.005	-0.864	0.008	-3.076***	0.0002*
	FRM-cloglog	0.0003	-0.504	0.003	-1.373***	0.0001*
	Tobit	-0.001	-0.131	0.0002	-0.286**	0.00001
SGP	FRM-logit	-0.017**	0.009*	0.008**	-1.239***	0.00002
	FRM-probit	-0.007*	0.004	0.00***	-0.596***	0.00001
	FRM-loglog	-0.016**	0.008*	0.008***	-1.188***	0.00001
	FRM-cloglog	-0.005*	0.002	0.002**	-0.435***	0.00001
	Tobit	-0.001	0.0001	0.0003*	-0.089***	0.000001
THA	FRM-logit	0.007	0.002	0.00003	0.369	0.000004
	FRM-probit	0.004	0.001	0.0001	0.194	0.000002
	FRM-loglog	0.006	0.002	-0.0001	0.341	0.000004
	FRM-cloglog	0.003	0.0003	0.0003	0.157	0.000002
	Tobit	0.001	-0.0001	0.0001	0.042	0.0000004
VNM	FRM-logit	-0.059**	0.005	0.004	0.488	0.0003*
	FRM-probit	-0.029**	0.003	0.002	0.254	0.0002*
	FRM-loglog	-0.057**	0.005	0.003	0.452	0.0003*
	FRM-cloglog	-0.022**	0.003	0.001	0.205	0.0001*
	Tobit	-0.005**	0.001	0.0003	0.053	0.00004**

Note: ***, **, * indicate level of statistical significance at 1%, 5% and 10%, respectively.

The leverage ratios, however, are adversely, significantly related to listed high-tech manufacturers' profit-generating efficiency in the Philippines (at 5%) and Singapore (at 1%). This finding supports Zeitun and Tian's (2007) study that indicates that the debt ratio negatively affects business financial performance. Hence, the more debt a firm attain, the lower the profitability efficiency performance of the listed high-tech manufacturing enterprises in the Philippines and Singapore.

However, the number of staff (STAFF) displays different impacts on high-tech manufacturers in different countries. The number of employees has a negative relationship with the profit-generating

efficiency of Indonesian listed high-tech manufacturers. This result confirms Margaritis and Psillaki's (2007), Le and Harvie's (2010), and AC-Ogbonna's (2017) findings that there is a negative impact of firm size on corporate efficiency. According to Margaritis and Psillaki (2007), large-scale firms may face the problem of an inefficient hierarchical management system that reduces a firm's efficiency. However, the headcount has a positive impact on the profitability efficiency of Malaysian, Philippine, and Vietnamese high-tech producers. The finding supports Schneider's (1991) study that reveals that large enterprises are inclined to be more efficient than smaller enterprises based on wealth-added per staff member.

Profitability efficiency determinants of traditional manufacturers (sub-sector S2)

Table 4.9 shows the regression results of equation (3.10) for the profitability efficiency determinants of listed traditional manufacturers in ASEAN-6 countries. In general, the impact of corporate factors on listed traditional manufacturers are different from those that affect listed high-tech manufacturers. In particular, the AGE factor has a negative, significant effect on the profit-generating efficiency of the listed traditional manufacturers in most ASEAN-6 countries (exception, Singapore). This result suggests that long-established listed traditional manufacturers in ASEAN-6 countries are inclined to have lower profitability efficiency than newcomers to the market. This finding is similar to Admassie and Matambalya's (2002) results that show that the marginal effect of learn-by-doing will reduce gradually as companies mature in their industry. Therefore, the efficiency performance of old companies will be lower than young ones that are more inclined to acquire and apply updated science and technology in their production.

The level of CASH positively, significantly affects the profitability efficiency of listed traditional manufacturers in Indonesia and Thailand (at 10%), and Malaysia (at 5%). This result is consistent with Singh and Fida's (2015) and Edjigu's (2016) results that cash level is significantly, positively related to corporate efficiency.

Table 4.9 also shows that institutional shareholders have a significant, positive influence on the profit-generating efficiency of Indonesian and Thai listed traditional manufacturers (at 1%) and Vietnamese ones (at 5%). This is consistent with Shleifer and Vishny (1986) and Tsai and Gu (2007), who conclude that institutional ownership enhances firm performance by alleviating agency issues from authority split, diminishing information asymmetry, and supporting firms in terms of financing and experience.

Table 4.9: The profitability efficiency determinants of ASEAN-6 countries' listed traditional manufacturers (sub-sector S2)

Functional forms		AGE	CASH	INST	LEV	STAFF
IDN	FRM-logit	-0.064***	0.007*	0.004***	-0.099***	-0.000001
	FRM-probit	-0.025***	0.003*	0.001***	-0.036***	-0.0000005
	FRM-loglog	-0.063***	0.006*	0.003***	-0.099***	-0.000001
	FRM-cloglog	-0.016***	0.002**	0.001***	-0.020***	-0.0000003
	Tobit	-0.001***	0.0002**	0.00004	-0.0007	-0.0000001
MYS	FRM-logit	-0.013***	0.005**	-0.0004	0.023	0.00001***
	FRM-probit	-0.008***	0.003**	-0.0002	0.012	0.00001***
	FRM-loglog	-0.011***	0.004**	-0.0003	0.023	0.00001***
	FRM-cloglog	-0.007***	0.003**	-0.0002	0.009	0.00001***
	Tobit	-0.002***	0.001***	-0.0001	0.003	0.000002**
PHL	FRM-logit	-0.012**	0.585	-0.003	-0.046*	0.00001
	FRM-probit	-0.007**	0.299	-0.001	-0.0218	0.00001
	FRM-loglog	-0.011**	0.544	-0.003	-0.044*	0.00001
	FRM-cloglog	-0.006**	0.242	-0.001	-0.0161	0.00001
	Tobit	-0.002***	0.068	-0.00001	-0.0033	0.000002
SGP	FRM-logit	-0.013	0.002	0.003	0.13	0.000001
	FRM-probit	-0.006	0.001	0.001	0.07	0.000001
	FRM-loglog	-0.013	0.002	0.003	0.12	0.000001
	FRM-cloglog	-0.005	0.001	0.001	0.05	0.0000004
	Tobit	-0.0001**	0.0002	0.0001	0.01	0.0000001
THA	FRM-logit	0.009*	0.005*	0.004***	0.232*	0.000001
	FRM-probit	0.005*	0.003*	0.002***	0.127*	0.0000001
	FRM-loglog	0.007*	0.00398	0.004***	0.212*	0.000003
	FRM-cloglog	0.005**	0.003**	0.002***	0.1053*	-0.000002
	Tobit	0.001*	0.001**	0.001***	0.035**	-0.0000004
VNM	FRM-logit	-0.088***	0.005	0.003**	0.691**	0.00004**
	FRM-probit	-0.045***	0.003	0.002**	0.357*	0.00002**
	FRM-loglog	-0.083***	0.005	0.003**	0.648**	0.00003*
	FRM-cloglog	-0.035***	0.002	0.001**	0.280*	0.00002**
	Tobit	-0.008***	0.001**	0.0003**	0.070***	0.000004**

Note: ***, **, * indicate the level of statistical significance at 1%, 5% and 10%, respectively

The leverage ratio has diverse impacts on listed traditional manufacturers in the ASEAN-6 countries. The relationship between debt ratio and profitability efficiency of Indonesian listed traditional manufacturers is negative and significant at 1%. This finding is similar to Javed et al. (2015), who reveal a negative impact of leverage on firm efficiency. However, the leverage – profitability efficiency relationship in Thailand and Vietnam is positive and significant at the 10% level. The results for Thailand and Vietnam are consistent with Margaritis and Psillaki (2007) and Mok et al. (2007) who demonstrate a significant positive influence of leverage ratio on corporate efficiency.

The number of staff positively affects the profitability of Malaysian and Vietnamese listed traditional manufacturers at the 5% significance level. This result is similar to the findings of Pham and Matsunaga (2017) who estimated the impact of financial and non-financial factors on the efficiency of Vietnamese manufacturers and report that large-scale manufacturers get higher efficiency scores than medium and small-scale ones.

4.2.3. The marketability efficiency determinants of ASEAN-6 countries' listed manufacturers

Marketability efficiency determinants of all the manufacturing sector

Table 4.10 reports the random-effects FRM and TRM results of equation (3.11) that examines the factors that impact on ASEAN-6 listed manufacturers' marketability efficiency. Like the FRM and TRM results of the profitability efficiency determinants of the ASEAN-6 listed manufacturers (equation (3.10)), the estimates of FRM and TRM with equation (3.11) generate consistent results of the marketability efficiency determinants of listed manufacturers in the ASEAN-6 countries. The signs of the estimated coefficients from equation (3.11) are robust across different regression methods. Table 4.10 also reveals that financial and non-financial factors affect listed manufacturers' marketability efficiency in ASEAN-6 markets differently.

The AGE (length of listing) variable has an adverse, significant effect on marketability efficiency at the 1% level for Indonesian and Malaysian listed manufacturers. According to Loderer and Waelchli (2010) and Loderer, Stulz, and Waelchli (2013), when firms get older, their profitability and growth opportunities tend to decrease because of corporate rigidity, higher managerial costs, obsolete assets, reduction in investment and innovation, larger board size, and expensive CEO payments. As a result, older firms are likely to grow more slowly and gain less market-value efficiency than newcomers to the market. However, the AGE factor is positively associated at 1% with Thai listed manufacturers' marketability efficiency. The result supports Admassie and Matambalya's (2002) conclusion that because of the learn-by-doing effect, experienced senior firms get higher efficiency scores than young enterprises in the industry. The inconsistent results of firm age – marketability efficiency relationships among ASEAN-6 countries support the findings of Majumdar (1997), Akben-Selcuk (2016), and Coad et al. (2018) that the relationship between firm age and firm efficiency varies across countries according to institutional and country-specific factors.

The CASH variable significantly, positively affects (at 1%) the marketability efficiency of Vietnamese listed manufacturers. The possible reasons for the significant impact of holding cash on Vietnamese listed manufacturers' marketability efficiency are low capital market development and the poorly-

protected shareholder rights on Vietnam stock markets (Lien & Holloway, 2014). According to La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000a, 2000b, 2002) and Dittmar, Mahrt-Smith, and Servaes (2003), when investor protection is low in inefficient markets, firms hold cash to pay dividends to enhance the attractiveness of their stock to increase the firm's market value and marketability efficiency.

The debt-ratio (LEV) variable displays a reverse, significant relationship with listed manufacturers' marketability efficiency in Singapore and Vietnam (at 1%), and the Philippines (at 10%). These results support Zeitun and Tian's (2007) conclusion that high debt levels worsen firm performance in two ways: accounting and market exposure. Thus, financially constrained firms become less attractive to investors.

The STAFF variable has a significant positive (at 1%) effect on the marketability efficiency of Malaysian listed manufacturers. This result implies that Malaysian listed manufacturers with large-scale labour resources are likely to attain better marketability efficiency than small-sized enterprises. According to Siahaan (2013), investors are willing to pay a higher price for the big firm because large businesses have higher commitments to continuously enhance corporate financial results.

The industry variable (D_TEC) has a significant positive (at 5%) association with Singaporean listed manufacturers' marketability efficiency. Accordingly, high-technology manufacturers get higher marketability efficiency than traditional production enterprises in Singapore. This result is similar to Hung and Wang (2012) who find that advanced-technology firms outperform long-established ones in marketability efficiency in Taiwan because of the favourable investment policies of the government for high-tech industries.

For the profitability factor, ROA is positive and significantly (at 10%) associated with Indonesian listed manufacturers' marketability efficiency. This result is similar to Rosman et al. (2014) and Singh and Fida (2015) who find a supportive relationship between profitability and firm efficiency. Surprisingly, the relationship between ROA and marketability efficiency of listed manufacturers in Thailand and the Philippines is negative and significant at 1% and 10%, respectively. In other words, based on the level of inputs (sales and profits), profitable firms in Thailand do not achieve adequate levels of outputs (market capitalisation, stock price and earnings per share) as much as less profitable enterprises. A reason could be ignorance of market activity when firms concentrate on making a profit and do not consider raising funds in the capital market. Another reason might be the inefficiency of Thai and Philippine stock markets (Shaik & Maheswaran, 2017) that do not reflect the true value of profitable firms.

Table 4.10: The marketability efficiency determinants of ASEAN-6 countries' listed manufacturers

Functional forms		AGE	CASH	INST	LEV	STAFF	D_TEC	ROA
IDN	FRM-logit	-0.111***	0.004	0.001	-0.017	-0.000005	-0.043	0.012*
	FRM-probit	-0.064***	0.002	0.001	-0.005	-0.000002	-0.026	0.007*
	FRM-loglog	-0.090***	0.003	0.001	-0.019	-0.000004*	-0.033	0.010*
	FRM-cloglog	-0.065***	0.002	0.001	0.001	-0.000002	-0.028	0.006*
	Tobit	-0.062***	-0.001	0.001***	0.011	-0.000001	0.025	0.0003
MYS	FRM-logit	-0.072***	0.0007	0.0004	-0.120	0.00001***	-0.058	0.0001
	FRM-probit	-0.043***	0.0004	0.0003	-0.064	0.00001***	-0.038	0.0001
	FRM-loglog	-0.055***	0.0006	0.0002	-0.109	0.00001***	-0.037	-0.0001
	FRM-cloglog	-0.047***	0.0003	0.0004	-0.055	0.00001***	-0.047	0.0002
	Tobit	-0.017***	0.0001	0.0003	-0.015	0.000003***	-0.022	0.00002
PHL	FRM-logit	0.005	0.485	0.004	-0.383**	0.000008	-0.354	-0.005*
	FRM-probit	0.002	0.304	0.002	-0.214**	0.000006	-0.198	-0.003**
	FRM-loglog	0.005	0.374	0.003	-0.339*	0.000005	-0.302	-0.004*
	FRM-cloglog	0.002	0.312	0.002	-0.189**	0.000007	-0.185	-0.002**
	Tobit	0.0004	0.108	0.001	-0.057*	0.000003	-0.057	-0.001**
SGP	FRM-logit	0.007	0.003	0.002	-0.575***	0.000001	0.330**	-0.002
	FRM-probit	0.004	0.002	0.001	-0.315***	0.000001	0.175**	-0.001
	FRM-loglog	0.007	0.003	0.002	-0.524***	0.000001	0.306**	-0.002
	FRM-cloglog	0.003	0.001	0.001	-0.265***	0.0000005	0.141**	-0.001
	Tobit	0.0004	0.0002	0.0003	-0.077**	0.0000001	0.0358**	-0.0003
THA	FRM-logit	0.039***	-0.0002	-0.004	0.426	-0.00003*	-0.164	-0.071***
	FRM-probit	0.022***	0.00003	-0.002	0.136	-0.00002	-0.067	-0.035***
	FRM-loglog	0.033***	-0.0006	-0.004*	0.449*	-0.00003*	-0.166	-0.067***
	FRM-cloglog	0.021***	0.0004	-0.002	0.045	-0.00001	-0.037	-0.026***
	Tobit	0.006***	0.0001	-0.0004	-0.027	-0.000003	-0.002	-0.007***
VNM	FRM-logit	-0.020	0.010***	-0.0018	-0.751***	0.000001	-0.053	0.004
	FRM-probit	-0.012	0.006***	-0.0011	-0.461***	0.0000002	-0.032	0.003
	FRM-loglog	-0.011	0.008***	-0.0016	-0.527**	0.000001	-0.044	0.003
	FRM-cloglog	-0.018	0.007***	-0.0011	-0.548***	0.0000001	-0.031	0.004
	Tobit	-0.005**	0.002***	-0.0004	-0.165***	-0.000001	-0.011	0.001

Note: ***, **, * indicate the level of statistical significance at 1%, 5% and 10%, respectively.

Marketability efficiency determinants of high-tech manufacturers (sub-sector S1)

Table 4.11 displays the results of the FRM and TRM approaches with equation (3.11) on the marketability efficiency determinants of listed high-tech manufacturers (sub-sector S1) in ASEAN-6 countries.

Table 4.11: The marketability efficiency determinants of ASEAN-6 countries' listed high-tech manufacturers (sub-sector S1)

Functional forms		AGE	CASH	INST	LEV	STAFF	ROA
IDN	FRM-logit	-0.119***	0.019	-0.0011	0.767	-0.0001**	0.015
	FRM-probit	-0.072***	0.01	-0.0005	0.475	-0.0001***	0.009
	FRM-loglog	-0.093***	0.017	-0.0012	0.588	-0.0001**	0.012
	FRM-cloglog	-0.076***	0.008	-0.0003	0.518	-0.0001**	0.009
	Tobit	-0.065***	-0.006***	0.0012**	0.258**	-0.00004***	0.001
MYS	FRM-logit	-0.094***	-0.004	-0.001	-0.015	0.00001***	-0.008*
	FRM-probit	-0.057***	-0.002	-0.0004	0.003	0.00001***	-0.004*
	FRM-loglog	-0.073***	-0.003	-0.001	-0.037	0.00001***	-0.007**
	FRM-cloglog	-0.060***	-0.003	-0.0002	0.025	0.00001***	-0.0036
	Tobit	-0.020***	-0.001	-0.00001	0.012	0.000003***	-0.0011
PHL	FRM-logit	0.059*	1.023	0.009***	0.824	-0.0004	-0.025
	FRM-probit	0.035*	0.534	0.005**	0.582	-0.0002	-0.013
	FRM-loglog	0.050*	1.011	0.007***	0.547	-0.0003	-0.025
	FRM-cloglog	0.0323*	0.369	0.004**	0.702	-0.0002	-0.009
	Tobit	0.011*	0.106	0.001338	0.276	-0.0001	-0.002
SGP	FRM-logit	0.014	0.002	0.0001	-0.647*	0.00001	-0.001
	FRM-probit	0.008	0.001	0.0001	-0.351*	0.00001	-0.0002
	FRM-loglog	0.013	0.002	0.0001	-0.593*	0.00001	-0.001
	FRM-cloglog	0.006	0.001	0.0002	-0.290*	0.00001	-0.00001
	Tobit	0.001	0.001	0.0002	-0.079*	0.000002	0.0001
THA	FRM-logit	0.066***	0.023*	0.005	2.090*	-0.00004**	-0.059***
	FRM-probit	0.08***	0.012*	0.003	1.028*	-0.00002**	-0.030***
	FRM-loglog	0.058***	0.020*	0.005	1.981**	-0.00003**	-0.054***
	FRM-cloglog	0.033***	0.011*	0.003	0.76	-0.00002**	-0.025**
	Tobit	0.0123***	0.003**	0.001	0.217**	-0.00001*	-0.007***
VNM	FRM-logit	0.01	0.003	-0.003	-1.882***	0.0004**	-0.009
	FRM-probit	0.006	0.002	-0.002	-1.158***	0.0002**	-0.005
	FRM-loglog	0.01	0.002	-0.002	-1.440***	0.0003**	-0.009
	FRM-cloglog	0.004	0.002	-0.002	-1.263***	0.0002**	-0.003
	Tobit	0.002	0.001	-0.001	-0.446***	0.0001**	-0.002

Note: ***, **, * indicate the level of statistical significance at 1%, 5% and 10%, respectively.

Table 4.11 shows that the number of years listed on the stock market significantly, adversely (at 1%) affects the market-value efficiency of Indonesian and Malaysian listed high-tech manufacturers. This finding is similar to the studies by Tran et al. (2008) and Singh et al. (2013) that demonstrate a negative influence of the length of operation on firm efficiency. Firm age, however, is positively, significantly associated with the marketability efficiency of high-tech manufacturers in the Philippines (at 10%) and Thailand (at 1%). These results for the Philippines and Thailand agree with previous

studies such as Timmer (1971) and Admassie and Matambalya (2002), and Sandvold (2016) that report a positive association between firm age and corporate efficiency.

The CASH variable has a positive, significant effect (at 10%) on Thai listed high-tech manufacturers' marketability efficiency. As a result, if a listed high-tech manufacturer in Thailand increases its cash level, it will get a higher marketability efficiency score. This result is similar to Gertner et al. (1994) and Stein (1997), whose studies reveal a positive role of internal funding on asset allocation and financial performance.

The INST factor positively, significantly (at 5%) affects marketability efficiency of Philippine listed high-tech manufacturers. Thus, higher levels of institutionally owned shares produce greater marketability efficiency score for listed high-tech manufacturers in the Philippines. This result confirms the findings of Huddart (1993), Admati et al. (1994), Maug (1998), and Noe (2002), who demonstrate that institutional ownership improves corporate performance and value by mitigating agency problems.

The LEV variable shows a negative, significant relationship for Singaporean and Vietnamese listed high-tech manufacturers' marketability efficiency at the 10% and 1% level, respectively. Thus, Singapore and Vietnam listed high-tech manufacturers that maintain higher levels of debt tend to generate lower marketability efficiency. This supports Rayan's (2010) study that shows a negative impact of corporate leverage on firm value.

The number of staff (represents firm size) variable, is negatively associated (at 5%) with Indonesian and Thai listed high-tech manufacturers' marketability efficiency. This result is similar to Le and Harvie's (2010) study that reports a negative impact of firm size on manufacturers' efficiency. On the other hand, firm headcount has a significant positive impact on the market-value efficiency of Malaysian listed high-tech manufacturers at the 1% significance level and Vietnamese ones at the 5% significance. These results for Vietnam and Malaysia support Siahaan's (2014) study that shows the beneficial effect of firm size on enterprise value. According to Siahaan, investors are willing to pay higher prices for large firms since large-scale businesses have a greater commitment to continually improve corporate financial performance.

The profitability variable (ROA) is negatively, significantly (at 5%) related to Thai listed high-tech manufacturers' marketability efficiency. The possible reasons are the irrationality of investors or the ineffectiveness of the Thai stock market (Islam, Watanapalachaikul, & Clark, 2007; Shaik & Maheswaran, 2017) that fails to reflect the true value of profitable businesses.

Marketability efficiency determinants of traditional manufacturers (Sub-sector S2)

Based on the FRM and TRM results from equation (3.11) applied to the traditional production sub-sector, financial and non-financial factors have heterogeneous impacts on listed traditional manufacturers' marketability efficiency in ASEAN-6 countries (see Table 4.12).

Table 4.12: The marketability efficiency determinants of ASEAN-6 countries' listed traditional manufacturers (sub-sector S2)

Functional forms		AGE	CASH	INST	LEV	STAFF	ROA
IDN	FRM-logit	-0.112***	0.002	0.002	-0.02	-0.000004	0.014*
	FRM-probit	-0.064***	0.001	0.001	-0.008	-0.000002	0.008*
	FRM-loglog	-0.091***	0.001	0.002	-0.019	-0.000004*	0.012*
	FRM-cloglog	-0.064***	0.001	0.001	-0.004	-0.000002	0.007*
	Tobit	-0.062***	0.0003	0.001***	0.007	-0.000001	0.00001
MYS	FRM-logit	-0.066***	0.004	0.001	-0.178	0.00002**	0.0012
	FRM-probit	-0.040***	0.002	0.001	-0.1	0.00001**	0.0007
	FRM-loglog	-0.050***	0.003	0.001	-0.15	0.00002**	0.0009
	FRM-cloglog	-0.043***	0.002	0.001	-0.098	0.00001**	0.0007
	Tobit	-0.016***	0.001	0.001	-0.028	0.00001**	0.0002
PHL	FRM-logit	0.004	0.481	0.003	-0.357*	0.00001	-0.004*
	FRM-probit	0.002	0.308	0.002	-0.203**	0.00001	-0.003**
	FRM-loglog	0.004	0.355	0.003	-0.312*	0.00001	-0.0037
	FRM-cloglog	0.001	0.33	0.002	-0.182**	0.00001	-0.002**
	Tobit	0.0002	0.114	0.0005	-0.0558*	0.000003	-0.001**
SGP	FRM-logit	0.004	0.008	0.003	-0.348	0.000001	-0.003
	FRM-probit	0.002	0.004	0.002	-0.202	0.0000004	-0.002
	FRM-loglog	0.004	0.008	0.003	-0.305	0.000001	-0.002
	FRM-cloglog	0.001	0.003	0.002	-0.183	0.0000004	-0.001
	Tobit	-0.0002	0.0003	0.0003	-0.067	0.0000001	-0.001
THA	FRM-logit	0.032***	-0.003	-0.005*	0.344	-0.0001**	-0.073***
	FRM-probit	0.019***	-0.002	-0.002	0.094	-0.00003*	-0.035***
	FRM-loglog	0.027***	-0.003	-0.004*	0.371	-0.0001**	-0.069***
	FRM-cloglog	0.018***	-0.001	-0.002	0.015	-0.00002	-0.027***
	Tobit	0.005***	-0.0004	-0.0004	-0.037	-0.00001*	-0.007***
VNM	FRM-logit	-0.031*	0.011***	-0.002	-0.685**	-0.000001	0.004
	FRM-probit	-0.019*	0.006***	-0.001	-0.421**	-0.000001	0.002
	FRM-loglog	-0.019	0.008***	-0.001	-0.473**	-0.000001	0.002
	FRM-cloglog	-0.025**	0.007***	-0.001	-0.507**	-0.000002	0.003
	Tobit	-0.007***	0.002***	-0.0004	-0.153***	-0.000001	0.001

Note: ***, **, * indicate level of statistical significance at 1%, 5% and 10%, respectively.

The marketability efficiency of listed traditional manufacturers in Indonesia, Malaysia, and Vietnam is negatively affected by the time length of listing on the stock market but at different significance levels. This finding is consistent with Tran et al. (2008) and Singh et al. (2013) whose studies reveal a negative influence of the length of operation on firm efficiency. However, firm age positively affects marketability efficiency of Thai listed traditional manufacturers. Van Stel, Millán, Millán, and Román

(2018) argue that the longer firms operate, the more knowledge and experience they have. As a result, experienced firms get better performance and higher valuation on the market than the younger enterprises.

The ratio of cash to total assets has a positive impact on the marketability efficiency of Vietnamese listed traditional manufacturers at 1% significance. This result confirms the conclusion of Edjigu (2016) that internal sources of funds contribute to the growth and efficiency of businesses.

For the leverage factor, high debt levels result in low market-value efficiency in Philippine and Vietnamese listed traditional manufacturers. According to Edjigu (2016), borrowing may harm corporate efficiency because firms that cannot attain high debt levels tend to keep improving their efficiency to stay in the capital market.

The number of employees positively affects Malaysian listed traditional manufacturers' marketability efficiency, but negatively influences the market-value efficiency of Thai listed traditional producers. These results may indicate a preference of investors for big traditional manufacturers in Malaysia, but smaller traditional production firms in Thailand.

For the profitability factor, ROA has positive influences marketability efficiency of traditional manufacturers in Indonesia at 10% significance. In contrast, the relationship between ROA and marketability efficiency of the listed traditional manufacturers are negative for the Philippines and Thailand at 10% and 1% significance, respectively. These results reaffirm the inefficiencies of the two emerging markets in the Philippines and Thailand (Shaik & Maheswaran, 2017).

4.2.4. Robustness check

The study re-examines the panel-data linear FRM models for equations (3.10) and (3.11) with fixed-effects estimation. The fixed-effects FRM produces comparable results to the random-effects FRM and TRM, confirming the robustness of coefficient estimates of the regression models on the determinants of ASEAN-6 listed manufacturers' profitability efficiency (see Appendix Tables D.1.1 to D.1.3) and marketability efficiency (see Appendix Tables D.2.1 to D.2.3). The fixed-effects Tobit regression models are not investigated due to the bias and inconsistency of the fixed-effects estimators in the non-linear (Tobit) panel-data models (Greene, 2004).

4.3. Chapter summary

This chapter discusses the results of both the parametric and non-parametric approaches to investigate profitability and marketability efficiency and their determinants for listed manufacturers in ASEAN-6 countries. The non-parametric method's results reveal that Indonesian listed manufacturers achieve the highest average profitability efficiency from 2007 to 2018, followed by

Singapore, Vietnam, the Philippines, Thailand, and Malaysia. The average marketability efficiency scores are significantly lower than the profitability efficiency in most ASEAN-6 countries (exception, Malaysia) during the same period. Vietnamese listed manufacturers exhibit the lowest average marketability efficiency, and Singapore listed manufacturers have the highest marketability efficiency. The marketability efficiency results also reflect the development and accessibility of ASEAN-6 stock markets, in which Vietnam is a frontier market, Singapore is a developed capital market, and the other ASEAN markets (Indonesia, Malaysia, the Philippines, and Thailand) are emerging markets.

For the parametric approach, the panel-data linear FRM and TRM demonstrate that corporate financial indicators (cash ratio, leverage ratio and returns on assets) and non-financial factors (firm age, headcount, institutional ownership, and industry characteristics) have significant and diverse impacts on ASEAN-6 listed manufacturers' efficiencies. The regression results also vary within the manufacturing sector, listed high-tech manufacturers, and listed traditional manufacturers in each of the ASEAN-6 countries. The regression results are robust based on the different functional forms of the FRM and TRM approaches. Based on these empirical results, the next chapter identifies appropriate strategies to enhance the efficiency performance of listed manufacturers in the selected ASEAN-6 markets.

Chapter 5

Conclusions and implications

This chapter summarises the key findings, proposes recommendations, and recognises the limitations of the study for other researchers. Section 5.1 recaps the main content of the previous chapters. Section 5.2 answers the research questions based on the empirical results in Chapter 4. Section 5.3 provides the research implications from the empirical results. Finally, section 5.4 discusses the research limitations and suggests directions for future research.

5.1 Study summary

The manufacturing sector plays a crucial role in the economic development of ASEAN countries. Since 2008, ASEAN economies have undergone many challenges in the context of the post-financial-crisis recovery of the global economy. However, notable positive statistics report the impressive performance and continuous development of manufacturing industries in most ASEAN countries.

The establishment of the ASEAN Economic Community in 2015 was an important step to foster the growth of manufacturers in ASEAN since AEC is oriented to become a manufacturing and business hub in Asia (ASEAN, 2015). According to Vermeulen (2015), Southeast Asia is currently considered an attractive and promising destination to which to shift manufacturing operations from China. Though China is facing political and commercial problems, the ASEAN countries are having better economic conditions and lower employment costs. Hence, there are promising opportunities for ASEAN manufacturers to attract new investment, increase profit, and flourish corporate values. To attain these expectations, ASEAN countries should generate a higher competitive advantage, especially through manufacturers' efficiencies.

Comprising 10 geographically close but culturally distinct countries, ASEAN is a community with diversified economic conditions. Even though the diversity of macroeconomic and market developments of ASEAN countries has been investigated in prior studies, differences in corporate efficiencies among ASEAN countries, particularly in manufacturing, are still debatable. With regard to that, this study uses the bootstrap two-stage DEA process to investigate 899 listed manufacturers' profitability and marketability efficiency in six selected ASEAN countries (ASEAN-6): Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam, from 2007 to 2018. Profitability and marketability efficiencies are two essential measurements reflecting whether enterprises use their existing resources effectively and efficiently to make a profit and enlarge firms' market value (Düzakın & Düzakın, 2007). This study uses panel-data fractional and Tobit regression models to examine the effects of corporate factors on listed manufacturers' profitability and marketability

efficiencies across the ASEAN-6 countries. Though the fractional regression model is the most advantageous method for fractional response variables, the Tobit regression model is most commonly used in the literature to evaluate efficiency determinants.

Chapter 1 provides a background of the demographic and economic conditions of ASEAN countries. Based on the importance of the manufacturing sector contribution to the growth of ASEAN economies and the significant gap in ASEAN literature, this study estimates the profitability and marketability efficiencies' scores and determinants of the listed manufacturers in ASEAN-6 countries. According to the regional manufacturing industries' production characteristics, the study categorises manufacturers in the ASEAN-6 countries into the two sub-sectors: high-technology and traditional production for sub-sector analysis.

Chapter 1 also discusses the contributions of the study to current literature. First, this study undertakes an in-depth investigation of the profitability and marketability efficiencies of listed manufacturers in selected ASEAN-6 countries, which is an apparent research gap in the literature. In addition, the study classifies ASEAN-6 listed manufacturers into two manufacturing sub-sectors to provide a better understanding of the efficiency performance of the individual listed manufacturers, the specific manufacturing sub-sectors, and the aggregate manufacturing sector in each ASEAN-6 nation. Secondly, the study contributes to the limited two-stage DEA efficiency studies that mostly focus on developed markets. By measuring and analysing efficiencies in the ASEAN-6 economies, this study compares listed manufacturers efficiencies in three different markets: developed, emerging, and frontier markets. Thirdly, the study provides empirical evidence on the determinants of profitability and marketability efficiencies, which are lacking in the literature. Fourthly, this is the first study to attempt to combine bootstrap two-stage data envelopment analysis and panel-data fractional regression models, which are considered advantageous methods for DEA scores and determinant evaluations in the literature. Lastly, this study provides a reference for stakeholders, including shareholders, investors, corporate managers, and governments to make appropriate decisions in investing, managing, and enhancing the development of ASEAN manufacturing sectors.

Chapter 2 discusses previous studies on profitability and marketability efficiencies in different sectors as well as the impacts of financial and non-financial factors on the efficiency of firms in various countries and regions worldwide. In the literature on ASEAN countries, however, no study has been conducted to assess the profitability and marketability efficiencies and determinants of listed manufacturers. This significant academic gap, together with the establishment of AEC and the reallocation of factories from China to ASEAN, which promotes the economic development and fortifies the manufacturing competitiveness of the region, motivates and drives this study.

Chapter 3 describes the study's methodology, which includes a non-parametric technique to measure firm profitability and marketability efficiency and a parametric approach to investigate the determinants of firm efficiency. The chapter begins by introducing the bootstrap two-stage DEA, a non-parametric method to evaluate ASEAN-6 listed manufacturers' profitability and marketability efficiencies. Next, the chapter specifies the panel-data fractional regression and Tobit regression models and the parametric methods to assess the influence of financial and non-financial factors on ASEAN-6 listed manufacturers' profitability and marketability efficiencies. This chapter also clarifies the study data's characteristics, sources and categorisation.

The empirical results are discussed in Chapter 4. The first section reports the non-parametric bootstrap two-stage DEA's results that include the profitability efficiency and marketability efficiency of listed manufacturers in ASEAN-6 countries' manufacturing sector, high-tech manufacturing sub-sector (sub-sector S1), and traditional manufacturing sub-sector (sub-sector S2). Next, the chapter presents the results of the panel-data fractional and Tobit regression models that investigate the profitability and marketability efficiency determinants of listed manufacturers of the ASEAN-6 countries' manufacturing sectors and two sub-sectors (S1 and S2).

5.2 The major findings

This study evaluates and compares the listed manufacturers' profitability and marketability efficiencies of the ASEAN-6 countries from 2007 to 2018. The bootstrap two-stage DEA results show that Indonesia and Singapore listed manufacturers attain relatively high average profitability efficiency. Conversely, Malaysia, the Philippines, Thailand, and Vietnam listed manufacturers' profitability efficiencies have considerable room for improvement. Marketability efficiencies are significantly less than profitability efficiency for most of the investigated countries (exception, Malaysia). Hence, the ASEAN-6 listed manufacturers should invest in strategies to enhance the value of their firms in the capital markets.

Using the panel-data fractional and Tobit regression models, the study identifies the financial and non-financial factors that affect the listed manufacturers' profitability and marketability efficiencies of each ASEAN-6 country. The cash ratio, institutional ownership, headcount, and technology-application positively affect the ASEAN-6 nations listed manufacturers' profitability and marketability efficiencies at different significance levels. However, the influence of other factors, such as firm age, firm leverage, and ROA on listed manufacturers shows mixed results across the ASEAN-6 countries. The underlying reasons for these different findings could be institutional and country-specific factors (such as firms' managerial start-ups, the level of creditor and shareholder protection, or the level of stock market efficiency).

The study research questions and answers are summarised below.

Question 1: *What are the profitability efficiency levels of the listed manufacturers in each ASEAN-6 country?*

Table 5.1 reports the profitability efficiency ranking and average scores of ASEAN-6 countries' listed firms in the manufacturing sector and sub-sectors for the period 2007 to 2018. The results reveal that Indonesian listed manufacturers achieve the highest profitability efficiency, followed by Singaporean, Vietnamese, Philippine, Thai, and Malaysian manufacturers.

Table 5.1: The profitability efficiency scores and rankings of the ASEAN-6 manufacturing sector and sub-sectors from 2007 to 2018

Rank	Country	Average profitability efficiency score		
		Manufacturing sector	High-technology manufacturing sub-sector	Traditional manufacturing sub-sector
1	Indonesia	0.9783	0.9803	0.9777
2	Singapore	0.9571	0.9572	0.9570
3	Vietnam	0.8879	0.8846	0.8885
4	The Philippines	0.8805	0.8755	0.8812
5	Thailand	0.8280	0.8429	0.8241
6	Malaysia	0.7506	0.7590	0.7467

The average profitability efficiency scores of the listed manufacturers in each of the ASEAN-6 nations show no improvement over time (see Figure 5.1). However, except for Indonesian and Singaporean listed manufacturers that have attained a high average profitability efficiency (> 0.95), the listed manufacturers in Malaysia, the Philippines, Thailand, and Vietnam should enhance their internal operation and financial management to overcome the currently low profitability efficiency.

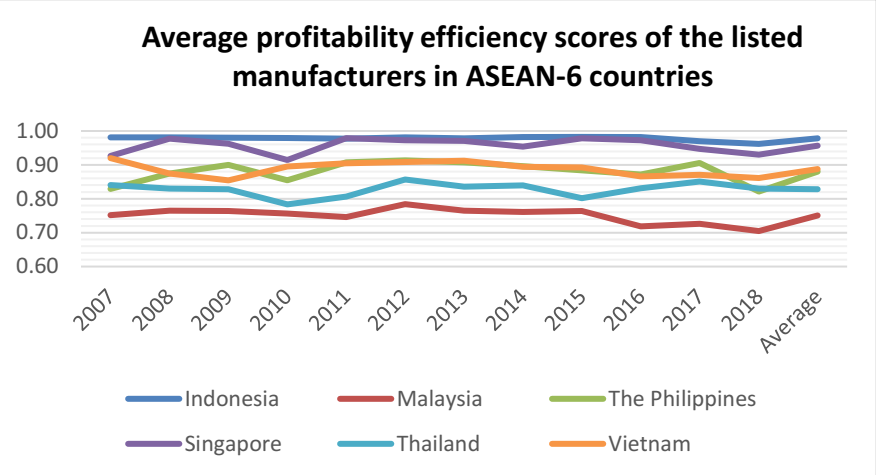


Figure 5.1: The trend of the average profitability efficiency scores of listed manufacturers in ASEAN-6 countries from 2007 to 2018

Question 2: *What are the marketability efficiency levels of the listed manufacturers in each ASEAN-6 country?*

Table 5.2 presents the marketability efficiency scores and rankings of the ASEAN-6 manufacturing sector and sub-sectors from 2007 to 2018.

Table 5.2: The marketability efficiency scores and rankings of ASEAN-6 manufacturing sector and sub-sectors from 2007 to 2018

Rank	Country	Average marketability efficiency score		
		Manufacturing sector	High-technology manufacturing sub-sector	Traditional manufacturing sub-sector
1	Singapore	0.8486	0.8545	0.8433
2	Indonesia	0.7807	0.7760	0.7820
3	Malaysia	0.7616	0.7766	0.7547
4	Thailand	0.7492	0.7309	0.7540
5	The Philippines	0.7464	0.7065	0.7518
6	Vietnam	0.5266	0.5532	0.5221

In general, the marketability efficiency scores are lower than the profitability efficiency ones in all ASEAN-6 nations. The bootstrap two-stage DEA results reveal that Vietnamese listed manufacturers exhibit the lowest average marketability efficiency score, and Singaporean listed manufacturers have the highest marketability efficiency score of the ASEAN-6 markets. These results are relevant to the development and accessibility of ASEAN-6 stock markets, where Vietnam is classified as a frontier market and Singapore as a developed capital market. The other ASEAN markets, Indonesia, Malaysia, the Philippines, and Thailand, are categorised as emerging markets (MSCI, 2019).

The study also finds that marketability efficiencies in the ASEAN-6 countries display different trends during 2007 – 2018 (see Figure 5.2). For example, Indonesian, Malaysian, and Vietnamese listed manufacturers' marketability efficiency decreased from 2007 to 2018. Conversely, Philippine and Singaporean listed manufacturers improved their marketability efficiency over time. Thai listed manufacturers' marketability efficiency, however, decreased from 2007 to 2014 because of the unstable Thai political climate that affected investors' confidence in the stock market. From 2014 to 2018, Thai listed manufacturers' marketability efficiency increased with a better political climate and increased investment in the Thai capital market (Theparat, 2019).

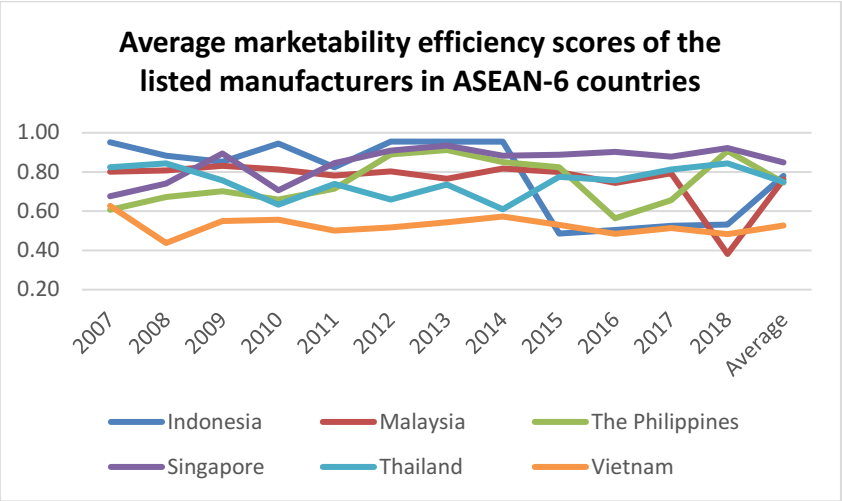


Figure 5.2: The trends in the average marketability efficiency scores of listed manufacturers in ASEAN-6 countries from 2007 to 2018

Question 3: *How do corporate financial and non-financial characteristics affect the listed manufacturers' profitability efficiency in each ASEAN-6 country?*

Using the fractional and Tobit regression models, the study identifies the financial and non-financial factors that affect listed manufacturers profitability efficiency in each ASEAN-6 country (see Table 5.3). The length of listing (AGE) has a negative, significant impact on the profitability efficiency of listed manufacturers in most ASEAN-6 countries (exception, Thailand). The inconsistent results for the ASEAN-6 nations demonstrate that the firm age - efficiency relationship is country-specific (Majumdar, 1997) and depends on institutional factors, such as the characteristics of business start-ups or the advantages of new and experienced firms (Akben-Selcuk, 2016; Coad et al., 2018).

Similarly, the level of debt (LEV) is negatively, significantly related to listed manufacturers' profitability efficiency in Indonesia and Singapore but positively associated with the profitability efficiency of listed manufacturers in Thailand and Vietnam. The non-uniform results of the relationship between leverage and firm efficiency in ASEAN-6 nations can be explained by the different institutional factors (e.g., ability to access bank credit) and legal systems (creditor and shareholder protection, and law enforcement effectiveness) in different countries (Weill, 2008).

Table 5.3: The determinants of manufacturers' profitability efficiency in ASEAN-6 countries

Country	AGE	CASH	INSTIT	LEV	STAFF	TEC_GR	ROA
Indonesia	-	+	+	-			
Malaysia	-	+			+		
The Philippines	-						
Singapore	-		+	-	+		
Thailand	+	+	+	+		+	
Vietnam	-		+	+	+		

Note: '+' represents a positive, significant impact; '-' represents a negative, significant impact.

The three other factors, the level of cash (CASH), institutional ownership (INST), and headcount (STAFF) variables, significantly, positively affect the profitability efficiency of listed manufacturers in ASEAN-6 countries. This result confirms the influential role of internal funds (Gertner et al., 1994), institutional shareholders (Shleifer & Vishny 1986; Tsai & Gu 2007), and large-scale operations (Schneider, 1991) on firm performance and efficiency.

Question 4: *How do corporate financial and non-financial characteristics affect the listed firms' profitability efficiency in each manufacturing sub-sector in each ASEAN-6 country?*

Table 5.4 summarises the results of fractional and Tobit regression models that evaluate the effect of financial and non-financial factors on listed firms' profitability efficiency scores in the ASEAN-6 countries' high-tech (S1) and traditional (S2) manufacturing sub-sectors. In general, Table 5.4 indicates various influences of the factors on the profitability efficiency of listed manufacturers in sub-sectors S1 and S2.

The length of the stock listing (AGE) significantly, negatively affects the profitability efficiency of listed firms in both the high-tech manufacturing sub-sectors of Malaysia, Singapore, and Vietnam and the traditional manufacturing sub-sector of Indonesia, Malaysia the Philippines, and Vietnam. These results indicate the inverse effect of experience and the rigidity of the firms' ability to generate profit in five of the six ASEAN countries (exception, Thailand).

In contrast, the cash level, institutional ownership, and the number of employees are significantly, positively related to the profitability efficiency of listed firms in both the high-tech and traditional manufacturing sub-sectors in the ASEAN-6 countries.

Table 5.4: The profitability efficiency determinants of listed high-tech (sub-sector S1) and traditional manufacturers (sub-sector S2) in ASEAN-6 countries

Profitability efficiency		AGE	CASH	INST	LEV	STAFF
Country	Sub-sector					
Indonesia	S1		+			-
	S2	-	+	+	-	
Malaysia	S1	-				+
	S2	-	+			+
The Philippines	S1				-	+
	S2	-				
Singapore	S1	-		+	-	
	S2					
Thailand	S1					
	S2	+	+	+	+	
Vietnam	S1	-				+
	S2	-		+	+	+

Note: '+' represents a positive, significant impact; '-' represents a negative, significant impact

The LEV variable, however, shows inconsistent results among the manufacturing sub-sectors in different ASEAN-6 countries. These results confirm the contradictory leverage – profitability efficiency relationships of listed manufacturers in ASEAN-6 nations because of different institutional factors and legal systems of the different countries (Weill, 2008).

Question 5: *How do corporate financial and non-financial characteristics affect the listed manufacturers' marketability efficiency in each ASEAN-6 country?*

Table 5.5 displays the results of FRM and TRM models that examine the effects of factors on ASEAN-6 listed manufacturers' marketability efficiency.

Table 5.5: The determinants of manufacturers' marketability efficiency in ASEAN-6 countries

Country	AGE	CASH	INSTIT	LEV	STAFF	TEC_GR	ROA
Indonesia	-						+
Malaysia	-				+		
The Philippines				-			-
Singapore				-		+	
Thailand	+						-
Vietnam		+		-			

Note: '+' represents a positive and significant impact; '-' represents a negative and significant impact.

Table 5.5 shows the length of the listing (AGE) variable has an adverse, significant effect on the marketability efficiency of Indonesian and Malaysian listed manufacturers. However, the AGE factor is positively associated with Thai listed manufacturers' marketability efficiency. These inconsistent results in ASEAN-6 countries confirm the mixed relationship between firm age and efficiency across countries according to institutional and country-specific factors (Majumdar, 1997; Akben-Selcuk, 2016; Coad et al., 2018).

The cash level (CASH), the number of employees (STAFF), industry characteristic (TEC_GR), and profitability (ROA) positively affect the marketability efficiency of listed manufacturers in some countries (Vietnam, Malaysia, Singapore, and Indonesia), indicating the importance of those factors to listed manufacturers' marketability efficiency in specific market conditions.

The profitability factor (ROA) is negatively, significantly related to the marketability efficiency of Thai and Philippine listed manufacturers. There are two possible reasons for this phenomenon: (1) ignorance of market activity when the firms are concentrating on making profits and do not consider raising funds in the capital market; and (2) the inefficiency of Thai and Philippine stock markets (Shaik & Maheswaran, 2017) that do not reflect the true value of profitable firms.

Question 6: *How do corporates' financial and non-financial characteristics affect the listed firms' marketability efficiency in each manufacturing sub-sector in each ASEAN-6 country?*

Based on the fractional and Tobit regression results, the financial and non-financial factors also have heterogeneous impacts on listed high-tech (S1) and traditional (S2) manufacturers' marketability efficiency in the ASEAN-6 countries (see Table 5.6).

Table 5.6: The marketability efficiency determinants of listed high-tech (sub-sector S1) and traditional manufacturers (sub-sector S2) in ASEAN-6 countries

Marketability efficiency		AGE	CASH	INST	LEV	STAFF	ROA
Country	Sub-sector						
Indonesia	S1	-				-	
	S2	-					+
Malaysia	S1	-				+	
	S2	-				+	
The Philippines	S1	+		+			
	S2				-		-
Singapore	S1				-		
	S2						
Thailand	S1	+	+		+	-	-
	S2	+				-	-
Vietnam	S1				-	+	
	S2	-	+		-		

Note: '+' represents a positive, significant impact; '-' represents a negative, significant impact.

According to Table 5.6, most factors (AGE, LEV, STAFF, and ROA) show contrary effects on the marketability efficiency of listed firms in high-tech and traditional manufacturing sub-sector. The CASH variable, nevertheless, has a positive, significant impact on the Thai sub-sector S1 and sub-sector S2 of Vietnam. The institutional (INST) factor affects only listed firms in the Philippines' high-tech manufacturing sector.

5.3 Research implications

Following the research findings, the study identifies several implications for academics, ASEAN-6 listed manufacturers' managers, ASEAN-6 policymakers, and general investors in the market.

5.3.1 Academic implications

There are four academic implications from this study. The first inference is the suitability of the bootstrap two-stage DEA method to measure and analyse the profitability and marketability efficiencies of listed manufacturers across countries provided the number of estimated firms in each country is equal to or larger than 50. This study demonstrates that the profitability and marketability efficiency scores gained from the bootstrap two-stage DEA approach can reflect the productivity and market conditions of listed manufacturers in each ASEAN-6 country.

Another noteworthy indication is the essential role of national economic and market developments in explaining the empirical results of corporate efficiency scores and their determinants. These country-specific conditions are clearly shown in the case of ASEAN-6 nations that have close geography, but distinctive economic conditions, and are experiencing a robust regional and international economic integration.

As discussed in Chapter 4, the study ascertains that the panel-data linear fractional regression and Tobit regression models, which are among the most dominant and advantageous methods for efficiency determinant analysis in the literature, generate robust, consistent results of the impact of factors on listed manufacturers in ASEAN-6 countries. Accordingly, the application of panel-data linear fractional regression and Tobit regression method is relevant for panel-data efficiency analysis.

Finally, this study confirms that the sub-sector classification is helpful to identify the determinants of DEA efficiency scores. As the efficiencies are measured against best practice, investigation of the aggregate manufacturing sector may bring about a single biased frontier for different sub-sectors that have different production processes.

5.3.2 Implications for ASEAN-6 listed manufacturers

Based on the profitability and marketability efficiency scores and ranking of ASEAN-6 countries, this study provides a reference for ASEAN-6 listed manufacturing managers to position their firm competitively in the market and make prudent operating, financing, and management decisions. According to the regression results, the cash ratio, institutional ownership, headcount, and technology-application positively affect ASEAN-6 nations listed manufacturers' profitability and marketability efficiencies at different significance levels. Hence, the study's results suggest that ASEAN-6 nations' listed manufacturers may increase internal funding, attract more institutional shareholders, increase the number of qualified staff, and constantly update information and technology to achieve higher firm efficiency performance.

ASEAN-6 listed manufacturers' managers should design appropriate strategies to improve firm efficiency in their respective country. The study's empirical results recommend several things for listed manufacturers in each ASEAN-6 country to enhance firms' current efficiencies. In Indonesia, the length of the stock listing negatively affects both the profitability and marketability efficiency of the listed manufacturers. The leverage ratio also reduces profitability efficiency. In contrast, a higher level of cash and institutional ownership help enhance profitability efficiency. Therefore, Indonesian listed manufacturers should keep updating information and technology, hold more cash, and attract more institutional shareholders while controlling the debt ratio carefully to enhance their firms' efficiency performance.

For Malaysia, the adverse effect of listing length on profitability and marketability efficiency suggest that Malaysian listed manufacturers should invest more in research and development. Raising cash on hand and increasing the number of qualified staff are alternative strategies for Malaysian listed manufacturers to improve their currently low profitability efficiency.

In the Philippines, the reverse impacts of leverage and ROA on listed manufacturers' marketability efficiency indicate that firms, especially profitable businesses, should reduce debt and place more emphasis on enhancing market attractiveness if they want to raise funds in the stock market.

In the Singapore market, the length of listing and leverage ratios negatively affect listed manufacturers' profitability and marketability efficiency. Conversely, higher levels of institutional ownership and number of employees help Singapore manufacturers enhance profitability efficiency. Thus, Singaporean listed manufacturers may increase their profitability and marketability efficiency by continually updating information and adopting new technology, cutting the debt ratio, attracting institutional investors, and recruiting a reasonable number of highly skilled staff.

In Thailand, because of the positive effects of the cash ratio, institutional ownership, and leverage on profitability efficiency, Thai listed manufacturers may consider increasing cash holdings, institutional ownership, and the debt ratio to attain higher profitability efficiency. However, like the Philippines, profitability is negatively associated with marketability efficiency, so profitable firms should pay more attention to improving market attractiveness because they need to raise funds in the capital market.

Finally, in the Vietnam market, the study's findings indicate that increasing the level of institutional ownership and adding a reasonable number of qualified staff are beneficial for listed manufacturers' profitability efficiency. Vietnam listed manufacturers, however, should decide carefully about the capital structure because increasing the debt ratio could enhance profitability efficiency but diminish marketability efficiency simultaneously.

5.3.3 Implications for ASEAN-6 policymakers

Based on the profitability and marketability efficiency scores, the results imply several policies to assist ASEAN-6 governments in promoting the development of listed manufacturers, in particular, and the entire manufacturing sector, in general. The relatively low profitability efficiency scores of listed manufacturers in some ASEAN-6 countries suggest that the Malaysian, Philippine, Thai, and Vietnamese governments should provide more orientation and support to improve the profit-generating efficiency of listed manufacturers. For example, a government may promote the development of business associations and clusters to facilitate networking and cross-learning among manufacturers to enable them to benefit from collective efficiency. By collaborating in a cluster, firms can cut the costs of new technology and achieve higher efficiency and competitiveness.

Governments may intensify training for listed manufacturers to raise the management, financial, and research and development capability, so that manufacturers can survive, maintain competitiveness, and grow in the market.

Another highlight discovery of this study is the inferior levels of marketability efficiency compared with the profitability efficiency of listed manufacturers in most ASEAN-6 nations. The listed manufacturers in the least developed market (Vietnam) have the lowest average marketability efficiency score, whereas the listed manufacturers in the most developed market (Singapore) achieve the highest average market-value efficiency. These findings imply that the development of a capital market strongly affects the marketability efficiency of the listed manufacturers in ASEAN-6 markets. Therefore, the governments of the less developed markets in the ASEAN-6, including emerging markets (Indonesia, Malaysia, the Philippines, and Thailand) and frontier market (Vietnam), should implement robust policies to improve the efficiency of the capital market to enhance the market-value efficiency of the listed manufacturers. For instance, the Indonesian, Malaysian, Philippine, and Vietnamese stock markets are weak-form inefficient (Loc, Lanjouw, & Lensink, 2010; Guidi & Gupta, 2011; Aumeboonsuke, 2012). The Thai stock market faces a severe insider trading problem (Budsaratragoon, Hillier, & Lhaopadchan, 2012). Thus, these emerging ASEAN nations' policymakers should minimise the information asymmetry problem in the stock market and apply more effective enforcement to improve market efficiency.

In the sub-sector analysis, the results show that Malaysian and Singaporean listed high-tech manufacturers achieve higher profitability and marketability efficiencies than traditional manufacturers. This result suggests that the plan to foster high-tech production in the manufacturing sector of Malaysia and Singapore (Tonby et al., 2014) is appropriate to the favourable situation of the high-tech manufacturing sub-sector of these two nations. Therefore, the Malaysian and Singaporean governments should continue to provide supportive policies to promote the development of high-tech production firms to boost the entire manufacturing sector. In Indonesia, the Philippines, Thailand, and Vietnam, the high-tech manufacturing sub-sector is not superior to the traditional production sub-sector in profitability and marketability efficiencies. Hence, the Indonesian, Philippine, Thai, and Vietnamese governments should support high-tech and traditional production simultaneously for the sustainable development of the manufacturing sector.

5.3.4 Implications for investors

The efficiency level of a firm is a source of information for investors on which to make informed investment decisions. In this study, the profitability and marketability efficiency scores and the determinants of listed firms in the ASEAN-6 manufacturing sector and sub-sectors provide some implications for current and future investors as follows.

First, the marketability efficiencies of listed manufacturers in the ASEAN-6 have room for improvement. As a result, there are opportunities for investors to invest in listed manufacturers in those countries and gain potential returns. For example, in Vietnam stock market, TNG is a promising stock with high profitability efficiencies over time (around 0.92 to 0.98 during the study period), but relatively low marketability efficiencies (from 0.12 to 0.38). This stock is considered a promising stock because of its good financial performance and efficiencies, but the market undervalued the stock. In fact, the investors of TNG stock gained significant returns during COVID-19 (the price of TNG tripled after 10 months since March 2020), because the stock showed good performance during a volatile period, and investors benefited from it. Besides, the marketability efficiencies of ASEAN-6 listed manufacturers fluctuate with the manufacturing development and economic conditions of each country. Therefore, risk-averse investors should choose listed manufacturers in a stable economy such as Singapore, whereas risk-seeking investors may choose riskier but higher-return markets like the Philippines and Thailand.

Secondly, different sub-sectors have different levels of and trends in profitability and marketability efficiencies in each ASEAN-6 country. Investors may invest in manufacturers that increase profitability and marketability efficiency over time. For example, the study's results show that the high-tech listed manufacturing sub-sector in Vietnam has higher profitability and marketability efficiencies than the traditional production sub-sector over the last four recorded years (2015 – 2018). Likewise, the investors can consider investing in under-priced high-tech manufacturers in Thailand, because Thai listed high-tech manufacturers have higher profitability efficiency but lower marketability efficiency than the traditional listed manufacturers.

Lastly, the relationships between corporate financial and non-financial characteristics and efficiencies also have practical implications for investors. The positive, significant impact of cash level, institutional ownership, high-tech application, and the number of employees on listed manufacturers in the ASEAN-6 countries suggests that investors consider these factors when choosing firms in which to invest. The negative effect of ROA on marketability efficiency of listed manufacturers in the Philippines and Thailand suggests a potential return for investors who invest in inefficient markets such as the Philippines and Thailand.

5.4 Limitations and future studies

This study aims to investigate the profitability and marketability efficiency scores and the determinants of listed manufacturers in ASEAN-6 countries. The study tries to contribute to both academic and practical aspects, but there are a few limitations.

The most significant limitation is the exclusion of firms in the least developed ASEAN markets: Brunei, Cambodia, Laos, and Myanmar, because of a lack of data on these nations. As a result, the focus of this study is listed manufacturers in six ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam). In future research, the inclusion of Brunei, Cambodia, Laos, and Myanmar for empirical investigation will fully reflect the marketability and profitability efficiency of listed manufacturers in all ASEAN countries. Accordingly, a comprehensive reference of the operational and market performance of listed manufacturers from the most to the least developed ASEAN markets is provided to support decision-making processes by listed manufacturers' managers, investors and policymakers in ASEAN.

Because of the nature of the DEA technique that requires every decision-making unit to have available data on all inputs and outputs, the ASEAN-6 listed manufacturing firms that lacked required data or went public after 2007 are not included in the analysis. Future research, therefore, may use the parametric stochastic-frontier approach, which takes into account firms with missing data, to evaluate the profitability and marketability efficiencies of all listed ASEAN manufacturers. However, the stochastic-frontier method cannot measure and compare the absolute efficiency of an individual unit (Ondrich & Ruggiero, 2001) and deal with multiple outputs for dependent variables (Theodoridis & Anwar, 2011). For those reasons, the stochastic-frontier technique is out of the scope of this study.

The availability of data is also the primary influence on the choice of the independent variables in the econometric models used in this study. Various factors in the literature are excluded in this study's efficiency analysis such as the firm location (Kalirajan & Shand, 1986; Li & Hu, 2002; Tran et al., 2008), corporate governance quality and characteristics (Zelenyuk & Zheka, 2006; Gill & Biger, 2013), state-ownership level (Lin, Ma, & Su, 2009), research and development activities (Badunenko, Fritsch, & Stephan, 2008), and internationalisation factors (Wagner, 2004). Future research may include these unexplored factors and provide a more comprehensive view of ASEAN listed manufacturers' efficiency determinants.

This study does not account for the impact of 2008 global financial crisis on ASEAN-6 listed manufacturers' efficiencies during the study period. Future research could investigate the influence of the 2008 global financial crisis, which will improve our understanding of ASEAN-6 manufacturers' efficiencies during financial crisis period. Further, an analysis of profitability and marketability efficiencies that covers the COVID-19 pandemic period will significantly improve our knowledge of how the pandemic and unexpected events impact the listed manufacturers' operation and performance of ASEAN-6 countries.

Finally, differences in accounting systems among ASEAN-6 countries and changes in financial reporting standards over the study period might also raise an issue for the adjusted data. For

instance, in 2018, Malaysia, the Philippines, and Singapore have completely adopted the International Financial Reporting Standards (IFRS), whereas Indonesia, Thailand, and Vietnam have started to adopt or have partially adopted IFRS (Joshi & Yapa, 2016; Van, Anh, & Huy, 2018; Wijayana & Gray, 2019). The different levels and conversion processes of IFRS adoption in ASEAN-6 nations may produce variation in profit recognition among listed manufacturers in ASEAN-6 countries over time. Thus, the profitability and marketability efficiencies of listed manufacturers in ASEAN-6 countries may not be consistently scored and ranked. Hence, future research using data of listed manufacturers in ASEAN countries when they ultimately adopt IFRS will resolve this problem and achieve more robust results.

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Appendix A

A list of the investigated ASEAN-6 manufacturers

Appendix A-1 lists Bloomberg's Equity tickers of all the listed manufacturers evaluated in each manufacturing sub-sector (Sub-sector S1: high-technology production and sub-sector S2: traditional production) of ASEAN-6 countries.

Table A.1: List of Bloomberg's equity tickers of the listed manufacturers investigated in the ASEAN-6 countries

Country	Bloomberg's Equity tickers of investigated firms in sub-sector S1	Bloomberg's Equity tickers of investigated firms in sub-sector S2
Indonesia	AUTO; BISI; BRPT; DVLA; FPNI; IKBI; INAF; INCI; JECC; KAEF; KBLI; KBLM; KLBF; LPIN; LTLS; MERK; MRAT; PRAS; PYFA; SCCO; SCPI; SMSM; SRSN; TBMS; TCID; TSPC; UNIC; UNVR; VOKS	AALI; ADES; ADMG; AISA; AKPI; ALKA; ALMI; APLI; ARGO; ARNA; ATPK; BATA; BIMA; BNBR; BRAM; BRNA; BTON; BUDI; BUMI; CEKA; CLPI; CNKO; CNTX; CPIN; CTBN; DLTA; DPNS; EKAD; ENRG; ERTX; ESTI; FASW; FISH; GDYR; GGRM; GJTL; HDTX; IGAR; IKAI; INAI; INDF; INDR; INKP; INRU; INTP; JKSW; JPFA; JPRS; JTPE; KDSI; KIAS; KICI; KKGI; LION; LMPI; LMSH; LSIP; MAIN; MASA; MEDC; MLBI; MLIA; MYOH; MYOR; MYTX; NIPS; OKAS; PBRX; PICO; POLY; PTBA; RDTX; RICY; RMBA; SGRO; SHID; SIMA; SIPD; SKLT; SMAR; SMCB; SMGR; SPMA; SQMI; SSTM; STTP; SUGI; TBLA; TFCO; TGKA; TIRA; TIRT; TKIM; TMPO; TOTO; TRST; ULTJ; UNIT; UNSP
Malaysia	SCT; KTRI; BTEC; SCP; OHB; RGB; ATSY; STRA; NVB; TECF; ELSR; SOLE; CCHB; GENE; ASPO; SC; KONE; MKRMB; MMSV; FDGB; TRIV; VHB; JHMC; SANI; DRB; IOI; IKEN; GKEN; WCE; PMM; SIME; TCM; UMWH; ANC; UNI; CWH; APM; LSTI; COCO; LCTH; IQGH; SA; PER; APBB; AM; AMW; PNE; VSI; MCE; CME; AMT; H&L; WEC; NHF; KHIN; CBP; PIE; GPA; UCHI; HCK; ATEC; ACME; SMIS; UULI; AEM; DBB; EKC; PENT; PJSB; KNMG; YSP; IRET; MB; ADV; CMT; GSCB; KEIN; DOGT; HOV; IMAS; JADI; WAT; UMSN; FFB; WELL; SCW; DLG; EPMB; SAPU; BHIC; AIB; HIL; SALC; JKB; TEX;	TARE; PTB; PPT; OCP; SER; GOCB; TEXC; DAYA; ESC; EDHB; FRCB; GREE; CG; AJI; AMAL; HUAAN; CIH; CAB; CMS; CCM; LDHB; FACI; DLM; PETRONM; FMB; HEIM; HEX; HLI; KS; KJC; PG; MFL; FNH; MIG; LMC; MAG; MUD; MWE; PEP; PMC; ROTH; LLB; HYR; JT; TC; NESZ; SCI; NYL; VCB; HUME; MIEC; WHIT; THR; PAOS; HSI; NWP; MHC; YLAI; KSB; OPB; NTPM; BLDP; CYM; MSB; CSCS; HAVE; MSW; BPP; EVF; GUAN; CAN; PGHB; WSC; PELI; OCM; MIN; YEE; GPB; SSB; UTUS; CBEE; SMELT; BMED; PTG; PCCS; STAR; MTRD; KHEE; KIA; BPAK; APOF; FIMA; AJR; BIG; LATI; YLI; KOMA; YKGI; WHB; TGI; CCK; JMR; AMTK; PAD; ONC; STB; SYF; ALR; LTKM; GFHB; MTI; PHR; LHI; UGB; EURO; TWH; AGG; SPZ; SUCB; OFIH; WEI; TOPG; DNON; SKBS; DGEM; XLH; PWP; LBB; AF; KPB; PW; NCHB; OKAC; SMC; JAYC; KRI; CHB; CYLC; KPG; ASTI; DWL; JOHO; PRG; DOME; PMBT; TOYO; CABC; TPC; DBE; SKOU; ARBB; EKA; G3G; SWS; BTM; PPG; GII; TEKS; CSB; WANG; COLA; EUHO; CTH; TAFI; ARNK; NHR; KFB; EONM; MINE; PARB; TOME; RESI; MESB; SLON; PWRT; NGB; IHB; TOMY; AHBH; TWP; SHH; RALC; QC; MLG; AJY; UPA; RBRX; MILUX; SAND; CFM; CIC; PGF; DPP; MER; PP; KFM; KYM; CEP; HWA; POS;

	KJB; FOR; FIT; KESM; INDU; HWG; SEQB	SNHB; FIHB; LEWE; PMAH; PROL; EKSON; EMI; KPS; APT; LYSA; SCIB; LBA; ANZO; TGL; LAY; PU; KKB; SINM; PRST; LDST; BPKG; REX; RGBH
The Philippines	CIP; EURO; ION; KPH; MVC; PMPC	AB; AEV; APC; AT; BC; BMM; BSC; CA; CAT; DMC; FB; FOOD; FPI; GEO; GSMI; HLCM; IMP; JGS; LC; LFM; LOTO; MACAY; MB; NI; OPM; ORE; OV; PA; PCOR; PHN; PX; RCI; RFM; ROX; SCC; SFI; SMC; STN; T; URC; VITA; VMC; VUL; WIN
Singapore	ASON; AAG; ACC; ACP; ADV; ASA; AEI; AEM; ALLI; AHL; ASL; AVIT; BTL; BKM; BC; CAMS; CHEM; CWM; COS; CREAF; CSE; DT; FEDI; GPI; GBY; GRP; GSSE; HPAR; HOE; MIT; MPM; MTEX; MTEC; MMH; MIYO; NCL; NATC; SUNL; PCI; PBS; PDS; PHL; SNTK; SMM; SIE; STE; SPE; SUTL; TSE; TREK; UMSH; VIB; VCM; YHI	ABT; ADI; ANIK; APOIL; ASMH; BEST; BREAD; BWAY; CASA; CGIG; CMI; CSMS; CWX; DELM; DELFI; DLNG; DSG; ECW; EMSE; EGCL; EIH; ENVH; FABC; FEH; FNN; FUYU; FUJI; YPG; GGR; HANW; HLA; IFAR; INTR; KLW; KODA; LEE; LHT; NLPM; TOYO; NIP; NSL; OSI; OLAM; ORG; PSTAR; PAN; PSL; QAF; SGH; SPH; SLIAN; SUNN; TSP; TECK; TMC; USH; UMS; WIL; YHS; NLH
Thailand	AH; ASIMAR; BAT3K; CPR; CTW; DEMCO; EIC; GYT; HANA; HFT; ILINK; IRC; JCT; KAMART; KCE; KKC; LNE; METCO; OCC; PATO; SNJ; SAT; SCC; SNC; STANLY; SUC; SVI; SWC; TAPAC; TEAM; TKT; TRT; TRU; TSC; UPF; YCI; YUASA	ACC; AFC; AJ; ALUCON; AMARIN; AMC; APURE; BANPU; BCP; BJC; BR; BSBM; CCP; CEN; CFRESH; CHOTI; CIG; CITY; CM; CPF; CPH; CPI; CPL; CSC; CSP; CWT; DCC; DCON; DRT; DTCI; EASON; EE; EPCO; FND; FANCY; GEL; GFPT; GJS; GSTEL; HTC; ICC; IHL; INOX; IRPC; KASET; KSL; KYE; LANNA; LEE; LST; LTX; MALEE; MATI; MBAX; MCS; MILL; MODERN; NEP; NMG; NPK; OGC; PAF; PAP; PB; PDJ; PERM; PK; POST; PRG; PTL; PTT; PTTEP; QCON; RCI; RICH; ROCK; RPC; SALEE; SAM; SAUCE; SAWANG; SCCC; SCP; SEED; SFP; SIAM; SITHAI; ; SMM; SORKON; SPACK; SPC; SPG; SPORT; SSC; SSF; SSI; SSSC; STHAI; STPI; TASCO; TBSP; TC; TCCC; TCJ; TCMC; TFI; TGCI; TGPRO; TH; THIP; TIPCO; TIW; TKS; TMD; TMW; TNL; TNPC; TPA; TPAC; TPCORP; TPIPL; TPP; TR; TRUBB; TSTH; TTI; TTL; TTTM; TU; TVO; TYCN; UBIS; UMI; UP; UPOIC; ; UT; UTP; UVAN; VARO; VNG; VNT; WACOAL; WIIK
Vietnam	DHG; DMC; HAI; IMP; PAC; PLC; POT; PVC; RAL; REE; SAM; SFN; TST; TYA; UNI	ABT; ACL; AGF; ANV; BBC; BBS; BCC; BMP; BPC; BT6; BTS; CAN; CLC; CTB; DAE; DCS; DNP; DPC; DPM; DPR; DRC; DST; DTT; EBS; FMC; GIL; GMC; GTA; HAP; HCC; HEV; HHC; HLY; HNM; HPG; HRC; HT1; HTP; KDC; L10; LAF; LBM; MCP; MEC; NAV; NBC; NHC; NSC; NST; NTP; PNC; S55; SAF; SAP; SAV; SCD; SCJ; SDN; SGC; SGD; SJ1; SMC; SSC; STP; TAC; TCM; TCR; TKU; TNC; TNG; TPC; TPH; TRC; TS4; TSC; TTC; TXM; VCS; VDL; VHC; VID; VIS; VNM; VPK; VTB; VTL; VTS

Appendix B

Profitability and marketability efficiency scores of individual listed manufacturers in ASEAN-6 countries

Appendix B consists of two sections. Section B.1 displays the profitability efficiency scores of each listed manufacturer in each ASEAN-6 country annually from 2007 to 2018. Section B.2 gives the marketability efficiency of individual listed manufacturers in the ASEAN-6 nations from 2007 to 2018. Note that ASEAN-6 listed manufacturers' profitability and marketability efficiencies are measured by the unbiased output-oriented radial bootstrap two-stage DEA model under the assumption of variable returns to scale.

B.1 The profitability efficiency scores of individual listed manufacturers in each ASEAN-6 country

Table B.1.1: Profitability efficiency scores of Indonesia's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	AALI	0.985	0.986	0.985	0.985	0.986	0.987	0.988	0.987	0.959	0.993	0.987	0.945
2	ADES	0.988	0.996	0.997	0.995	0.994	0.995	0.992	0.993	0.994	0.987	0.979	0.974
3	ADMG	0.957	0.956	0.989	0.985	0.988	0.993	0.974	0.986	0.986	0.973	0.972	0.978
4	AISA	0.989	0.990	0.989	0.986	0.976	0.983	0.982	0.978	0.977	0.977	0.900	0.894
5	AKPI	0.972	0.973	0.981	0.982	0.981	0.986	0.986	0.988	0.987	0.988	0.982	0.971
6	ALKA	0.985	0.985	0.984	0.984	0.983	0.986	0.983	0.986	0.986	0.986	0.977	0.972
7	ALMI	0.978	0.983	0.987	0.988	0.988	0.991	0.989	0.988	0.986	0.986	0.984	0.979
8	APLI	0.996	0.995	0.997	0.996	0.994	0.994	0.996	0.998	0.997	0.998	0.988	0.980
9	ARGO	0.971	0.976	0.983	0.984	0.984	0.987	0.994	0.979	0.987	0.971	0.979	0.974
10	ARNA	0.990	0.990	0.989	0.987	0.987	0.993	0.994	0.997	0.992	0.990	0.982	0.964
11	ATPK	0.985	0.993	0.984	0.995	0.994	0.995	0.988	0.989	0.983	0.979	0.974	0.980
12	AUTO	0.956	0.951	0.961	0.970	0.956	0.959	0.953	0.943	0.940	0.947	0.927	0.902
13	BATA	0.994	0.998	0.994	0.991	0.989	0.990	0.987	0.990	0.995	0.987	0.981	0.977
14	BIMA	0.985	0.985	0.985	0.984	0.983	0.986	0.983	0.986	0.987	0.987	0.990	0.987
15	BISI	0.989	0.990	0.987	0.984	0.983	0.987	0.977	0.989	0.994	0.988	0.979	0.957
16	BNBR	0.902	0.891	0.886	0.780	0.840	0.990	0.987	0.986	0.988	0.986	0.978	0.893
17	BRAM	0.970	0.971	0.987	0.987	0.977	0.989	0.983	0.988	0.987	0.990	0.989	0.975
18	BRNA	0.993	0.993	0.992	0.991	0.989	0.993	0.989	0.993	0.989	0.989	0.976	0.974
19	BRPT	0.992	0.985	0.985	0.984	0.983	0.986	0.983	0.986	0.954	0.986	0.977	0.972
20	BTON	0.992	0.985	0.990	0.992	0.983	0.986	0.993	0.996	0.995	0.995	0.992	0.972
21	BUDI	0.979	0.979	0.987	0.981	0.978	0.984	0.984	0.987	0.987	0.987	0.980	0.968
22	BUMI	0.985	0.985	0.986	0.986	0.983	0.985	0.983	0.986	0.986	0.986	0.977	0.986
23	CEKA	0.989	0.991	0.994	0.991	0.994	0.993	0.993	0.993	0.995	0.990	0.987	0.982
24	CLPI	0.996	0.996	0.997	0.996	0.994	0.995	0.996	0.998	0.997	0.998	0.990	0.988
25	CNKO	0.994	0.994	0.991	0.990	0.992	0.991	0.974	0.974	0.959	0.950	0.905	0.916
26	CNTX	0.991	0.989	0.991	0.993	0.994	0.994	0.995	0.997	0.997	0.996	0.987	0.982
27	CPIN	0.985	0.985	0.985	0.984	0.983	0.987	0.986	0.991	0.994	0.986	0.976	0.971
28	CTBN	0.981	0.975	0.982	0.971	0.989	0.985	0.984	0.987	0.985	0.981	0.967	0.944
29	DLTA	0.992	0.991	0.992	0.984	0.982	0.985	0.983	0.986	0.986	0.987	0.977	0.972
30	DPNS	0.996	0.995	0.997	0.997	0.997	0.998	0.998	0.997	0.997	0.997	0.988	0.991
31	DVLA	0.986	0.986	0.986	0.987	0.987	0.987	0.983	0.984	0.990	0.981	0.968	0.961
32	EKAD	0.997	0.997	0.996	0.996	0.994	0.995	0.996	0.997	0.998	0.997	0.988	0.978
33	ENRG	0.975	0.964	0.890	0.963	0.984	0.986	0.984	0.987	0.967	0.952	0.977	0.973
34	ERTX	0.993	0.991	0.993	0.992	0.996	0.995	0.996	0.997	0.997	0.996	0.988	0.985
35	ESTI	0.989	0.991	0.994	0.991	0.991	0.989	0.990	0.992	0.990	0.998	0.987	0.988

36	FASW	0.963	0.966	0.992	0.987	0.970	0.975	0.961	0.983	0.969	0.992	0.991	0.975
37	FISH	0.991	0.986	0.987	0.987	0.985	0.986	0.983	0.987	0.987	0.987	0.978	0.977
38	FPNI	0.992	0.919	0.979	0.959	0.971	0.977	0.981	0.983	0.988	0.988	0.982	0.979
39	GDYR	0.991	0.988	0.991	0.988	0.985	0.989	0.988	0.987	0.989	0.988	0.980	0.958
40	GGRM	0.985	0.985	0.985	0.984	0.983	0.986	0.984	0.986	0.986	0.987	0.977	0.972
41	GJTL	0.928	0.907	0.954	0.955	0.941	0.963	0.927	0.938	0.922	0.948	0.899	0.890
42	HDTX	0.987	0.979	0.989	0.987	0.992	0.992	0.978	0.987	0.974	0.968	0.943	0.977
43	IGAR	0.994	0.993	0.996	0.995	0.996	0.995	0.994	0.995	0.997	0.997	0.991	0.988
44	IKAI	0.993	0.993	0.990	0.987	0.990	0.992	0.993	0.995	0.993	0.990	0.989	0.991
45	IKBI	0.990	0.991	0.994	0.991	0.991	0.992	0.993	0.994	0.994	0.994	0.988	0.976
46	INAF	0.982	0.984	0.984	0.984	0.975	0.979	0.969	0.984	0.988	0.982	0.971	0.950
47	INAI	0.991	0.990	0.991	0.992	0.991	0.995	0.994	0.994	0.993	0.994	0.987	0.978
48	INCI	0.995	0.995	0.996	0.995	0.996	0.996	0.996	0.998	0.998	0.998	0.989	0.987
49	INDF	0.986	0.987	0.987	0.987	0.985	0.987	0.987	0.988	0.991	0.990	0.986	0.984
50	INDR	0.919	0.925	0.968	0.961	0.952	0.956	0.955	0.956	0.969	0.959	0.946	0.969
51	INKP	0.952	0.968	0.794	0.868	0.826	0.837	0.914	0.894	0.940	0.935	0.985	0.973
52	INRU	0.974	0.972	0.976	0.975	0.973	0.981	0.981	0.985	0.984	0.996	0.986	0.962
53	INTP	0.907	0.951	0.995	0.987	0.992	0.988	0.986	0.988	0.987	0.989	0.893	0.880
54	JECC	0.992	0.990	0.992	0.991	0.991	0.994	0.992	0.994	0.992	0.995	0.985	0.976
55	JKSW	0.994	0.986	0.985	0.984	0.983	0.985	0.983	0.986	0.987	0.986	0.977	0.972
56	JPFA	0.980	0.979	0.986	0.934	0.927	0.936	0.955	0.948	0.962	0.986	0.920	0.910
57	JPRS	0.996	0.994	0.996	0.995	0.996	0.995	0.996	0.997	0.996	0.996	0.991	0.992
58	JTPE	0.997	0.997	0.997	0.990	0.995	0.996	0.995	0.997	0.996	0.995	0.988	0.980
59	KAEF	0.974	0.973	0.970	0.972	0.964	0.964	0.956	0.964	0.975	0.956	0.931	0.917
60	KBLI	0.991	0.992	0.993	0.988	0.989	0.993	0.992	0.993	0.994	0.996	0.992	0.970
61	KBLM	0.995	0.994	0.996	0.994	0.995	0.995	0.995	0.996	0.996	0.996	0.989	0.989
62	KDSI	0.990	0.991	0.989	0.989	0.987	0.991	0.990	0.992	0.992	0.990	0.983	0.969
63	KIAS	0.985	0.992	0.991	0.988	0.982	0.989	0.986	0.991	0.981	0.979	0.981	0.975
64	KICI	0.998	0.996	0.997	0.996	0.996	0.995	0.988	0.996	0.995	0.997	0.991	0.990
65	KKGI	0.995	0.997	0.995	0.995	0.986	0.989	0.988	0.990	0.991	0.994	0.991	0.951
66	KLBF	0.963	0.970	0.944	0.961	0.975	0.941	0.931	0.956	0.952	0.951	0.919	0.904
67	LION	0.996	0.996	0.997	0.996	0.997	0.998	0.994	0.995	0.996	0.994	0.984	0.974
68	LMPI	0.989	0.991	0.991	0.988	0.986	0.990	0.990	0.994	0.995	0.995	0.985	0.974
69	LMSH	0.997	0.996	0.998	0.994	0.986	0.995	0.986	0.996	0.996	0.996	0.992	0.992
70	LPIN	0.997	0.997	0.998	0.996	0.996	0.996	0.994	0.995	0.995	0.993	0.994	0.992
71	LSIP	0.990	0.988	0.984	0.987	0.984	0.994	0.983	0.991	0.993	0.989	0.976	0.949
72	LTLS	0.967	0.961	0.945	0.937	0.951	0.955	0.959	0.967	0.969	0.962	0.945	0.937
73	MAIN	0.989	0.991	0.990	0.992	0.989	0.995	0.987	0.975	0.976	0.981	0.965	0.952
74	MASA	0.975	0.966	0.980	0.972	0.946	0.949	0.952	0.963	0.956	0.962	0.942	0.919
75	MEDC	0.985	0.992	0.868	0.867	0.841	0.934	0.921	0.908	0.873	0.991	0.959	0.972
76	MERK	0.986	0.987	0.986	0.993	0.997	0.992	0.993	0.995	0.997	0.991	0.986	0.986
77	MLBI	0.992	0.997	0.986	0.985	0.983	0.985	0.983	0.986	0.986	0.986	0.977	0.971
78	MLIA	0.989	0.986	0.990	0.988	0.940	0.947	0.925	0.965	0.958	0.957	0.949	0.943
79	MRAT	0.995	0.996	0.995	0.993	0.993	0.992	0.991	0.992	0.994	0.992	0.985	0.984
80	MYOH	0.985	0.985	0.984	0.994	0.988	0.992	0.990	0.988	0.987	0.991	0.990	0.979
81	MYOR	0.970	0.964	0.958	0.942	0.938	0.948	0.959	0.948	0.971	0.967	0.949	0.891
82	MYTX	0.960	0.970	0.976	0.969	0.979	0.988	0.987	0.989	0.986	0.987	0.968	0.960
83	NIPS	0.994	0.994	0.995	0.994	0.991	0.994	0.994	0.994	0.992	0.993	0.985	0.975
84	OKAS	0.994	0.989	0.984	0.977	0.976	0.974	0.979	0.976	0.978	0.986	0.986	0.952
85	PBRX	0.987	0.987	0.986	0.986	0.981	0.984	0.983	0.977	0.974	0.970	0.952	0.940
86	PICO	0.994	0.994	0.993	0.993	0.994	0.995	0.996	0.996	0.996	0.997	0.989	0.991
87	POLY	0.986	0.986	0.985	0.985	0.984	0.986	0.984	0.987	0.987	0.987	0.977	0.972
88	PRAS	0.991	0.994	0.992	0.993	0.994	0.995	0.994	0.995	0.994	0.994	0.985	0.989
89	PTBA	0.960	0.990	0.986	0.987	0.987	0.992	0.973	0.975	0.988	0.984	0.978	0.976
90	PYFA	0.986	0.986	0.986	0.985	0.983	0.986	0.984	0.986	0.986	0.991	0.988	0.986
91	RDTX	0.996	0.992	0.985	0.984	0.983	0.986	0.984	0.987	0.987	0.987	0.984	0.973
92	RICY	0.990	0.988	0.988	0.988	0.986	0.989	0.986	0.989	0.992	0.988	0.979	0.961
93	RMBA	0.947	0.945	0.905	0.920	0.920	0.892	0.856	0.848	0.888	0.844	0.885	0.847
94	SCCO	0.982	0.985	0.988	0.991	0.990	0.995	0.993	0.994	0.995	0.997	0.984	0.971
95	SCPI	0.995	0.992	0.995	0.993	0.992	0.992	0.984	0.987	0.995	0.993	0.988	0.978
96	SGRO	0.976	0.978	0.986	0.983	0.975	0.975	0.971	0.984	0.982	0.983	0.956	0.941
97	SHID	0.994	0.997	0.997	0.994	0.987	0.991	0.985	0.987	0.986	0.987	0.977	0.972
98	SIMA	0.996	0.996	0.997	0.984	0.983	0.985	0.983	0.985	0.986	0.986	0.976	0.972

99	SIPD	0.974	0.973	0.980	0.971	0.961	0.961	0.964	0.974	0.969	0.976	0.953	0.954
100	SKLT	0.996	0.996	0.996	0.995	0.993	0.994	0.994	0.995	0.996	0.991	0.985	0.979
101	SMAR	0.971	0.987	0.930	0.987	0.984	0.991	0.954	0.988	0.987	0.990	0.927	0.884
102	SMCB	0.929	0.930	0.942	0.929	0.918	0.945	0.935	0.934	0.922	0.908	0.854	0.864
103	SMGR	0.950	0.989	0.990	0.989	0.991	0.992	0.987	0.991	0.989	0.994	0.880	0.878
104	SMSM	0.987	0.986	0.985	0.987	0.986	0.989	0.993	0.993	0.996	0.994	0.986	0.978
105	SPMA	0.986	0.982	0.987	0.985	0.985	0.989	0.985	0.990	0.986	0.990	0.985	0.967
106	SQMI	0.994	0.986	0.985	0.984	0.996	0.996	0.996	0.997	0.996	0.987	0.977	0.973
107	SRSN	0.994	0.994	0.993	0.992	0.992	0.994	0.995	0.996	0.996	0.995	0.988	0.980
108	SSTM	0.989	0.987	0.991	0.988	0.990	0.993	0.994	0.995	0.995	0.996	0.988	0.992
109	STTP	0.990	0.988	0.992	0.989	0.985	0.990	0.992	0.990	0.993	0.987	0.981	0.962
110	SUGI	0.996	0.995	0.997	0.984	0.983	0.985	0.989	0.994	0.975	0.946	0.975	0.971
111	TBLA	0.961	0.964	0.979	0.961	0.961	0.965	0.961	0.982	0.973	0.977	0.978	0.957
112	TBMS	0.985	0.985	0.985	0.985	0.984	0.986	0.987	0.995	0.987	0.987	0.976	0.972
113	TCID	0.991	0.986	0.985	0.983	0.978	0.978	0.973	0.977	0.998	0.968	0.955	0.943
114	TFCO	0.957	0.967	0.970	0.992	0.985	0.992	0.978	0.989	0.990	0.995	0.981	0.983
115	TGKA	0.985	0.988	0.986	0.989	0.982	0.976	0.978	0.981	0.988	0.988	0.981	0.972
116	TIRA	0.995	0.995	0.995	0.994	0.994	0.995	0.994	0.996	0.997	0.995	0.988	0.984
117	TIRT	0.989	0.987	0.988	0.988	0.988	0.991	0.985	0.994	0.995	0.994	0.986	0.972
118	TKIM	0.907	0.915	0.906	0.894	0.901	0.895	0.905	0.908	0.936	0.921	0.892	0.983
119	TMPO	0.996	0.996	0.996	0.995	0.995	0.996	0.994	0.995	0.996	0.993	0.987	0.983
120	TOTO	0.986	0.986	0.994	0.993	0.991	0.995	0.993	0.996	0.994	0.990	0.988	0.967
121	TRST	0.963	0.970	0.985	0.982	0.980	0.984	0.982	0.983	0.984	0.984	0.980	0.967
122	TSPC	0.959	0.954	0.952	0.954	0.948	0.949	0.939	0.944	0.956	0.942	0.919	0.901
123	ULTJ	0.975	0.982	0.968	0.964	0.964	0.979	0.971	0.978	0.991	0.985	0.960	0.944
124	UNIC	0.954	0.952	0.970	0.969	0.967	0.969	0.979	0.980	0.980	0.990	0.980	0.968
125	UNIT	0.985	0.994	0.996	0.994	0.996	0.994	0.992	0.987	0.987	0.987	0.978	0.973
126	UNSP	0.960	0.949	0.973	0.985	0.949	0.898	0.826	0.939	0.960	0.949	0.874	0.901
127	UNVR	0.986	0.986	0.986	0.985	0.984	0.986	0.984	0.987	0.986	0.987	0.978	0.974
128	VOKS	0.988	0.985	0.985	0.982	0.985	0.990	0.988	0.985	0.991	0.993	0.984	0.961

Table B.1.2: Profitability efficiency scores of Malaysia's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	ACME	0.855	0.822	0.766	0.749	0.537	0.756	0.596	0.860	0.770	0.786	0.817	0.778
2	ADV	0.730	0.745	0.802	0.760	0.714	0.857	0.841	0.787	0.764	0.718	0.753	0.647
3	AEM	0.707	0.684	0.757	0.847	0.830	0.827	0.857	0.737	0.780	0.780	0.752	0.700
4	AF	0.829	0.833	0.857	0.745	0.809	0.849	0.832	0.809	0.803	0.678	0.666	0.674
5	AGG	0.521	0.588	0.668	0.676	0.491	0.532	0.622	0.672	0.612	0.691	0.592	0.543
6	AHBH	0.826	0.851	0.842	0.837	0.826	0.760	0.839	0.841	0.902	0.886	0.895	0.848
7	AIB	0.685	0.683	0.687	0.747	0.687	0.756	0.682	0.737	0.708	0.622	0.824	0.819
8	AJI	0.728	0.663	0.655	0.670	0.628	0.600	0.775	0.770	0.691	0.835	0.718	0.722
9	AJR	0.878	0.879	0.827	0.811	0.854	0.765	0.836	0.798	0.752	0.770	0.736	0.693
10	AJY	0.809	0.806	0.791	0.737	0.783	0.768	0.760	0.726	0.740	0.609	0.591	0.605
11	ALR	0.556	0.699	0.826	0.723	0.783	0.746	0.683	0.671	0.688	0.611	0.634	0.600
12	AM	0.672	0.642	0.623	0.574	0.635	0.723	0.773	0.759	0.747	0.610	0.592	0.864
13	AMAL	0.756	0.787	0.652	0.726	0.705	0.772	0.709	0.684	0.631	0.695	0.827	0.726
14	AMT	0.693	0.753	0.784	0.800	0.776	0.824	0.738	0.804	0.777	0.797	0.804	0.785
15	AMTK	0.715	0.848	0.847	0.873	0.789	0.858	0.814	0.774	0.870	0.816	0.821	0.811
16	AMW	0.845	0.830	0.799	0.816	0.860	0.848	0.853	0.814	0.742	0.775	0.797	0.794
17	ANC	0.746	0.746	0.743	0.730	0.769	0.768	0.742	0.704	0.668	0.685	0.733	0.725
18	ANZO	0.837	0.848	0.863	0.841	0.719	0.851	0.583	0.760	0.767	0.806	0.650	0.626
19	APBB	0.824	0.824	0.769	0.652	0.799	0.841	0.732	0.706	0.663	0.549	0.664	0.490
20	APM	0.784	0.794	0.802	0.853	0.843	0.817	0.764	0.755	0.726	0.575	0.532	0.604
21	APOF	0.802	0.810	0.783	0.684	0.799	0.857	0.838	0.773	0.766	0.610	0.631	0.609
22	APT	0.658	0.792	0.796	0.867	0.599	0.906	0.818	0.894	0.903	0.893	0.888	0.848
23	ARBB	0.709	0.708	0.637	0.600	0.657	0.574	0.703	0.674	0.831	0.684	0.823	0.814
24	ARNK	0.837	0.861	0.846	0.855	0.838	0.884	0.891	0.893	0.853	0.850	0.879	0.862
25	ASPO	0.877	0.916	0.882	0.729	0.625	0.741	0.705	0.719	0.898	0.805	0.703	0.696
26	ASTI	0.833	0.812	0.765	0.807	0.854	0.842	0.790	0.768	0.773	0.678	0.744	0.700
27	ATEC	0.819	0.704	0.702	0.470	0.829	0.839	0.777	0.733	0.699	0.695	0.710	0.751
28	ATSY	0.739	0.854	0.819	0.838	0.820	0.738	0.741	0.821	0.835	0.721	0.721	0.679
29	BHIC	0.834	0.700	0.562	0.494	0.445	0.667	0.523	0.594	0.583	0.827	0.589	0.509
30	BIG	0.651	0.717	0.632	0.707	0.534	0.706	0.855	0.798	0.783	0.790	0.804	0.783
31	BLDP	0.845	0.815	0.810	0.818	0.890	0.891	0.882	0.852	0.815	0.782	0.774	0.791
32	BMED	0.652	0.729	0.649	0.716	0.426	0.429	0.755	0.552	0.660	0.642	0.732	0.720
33	BPAK	0.764	0.790	0.827	0.808	0.863	0.886	0.772	0.767	0.761	0.744	0.697	0.735
34	BPKG	0.867	0.856	0.856	0.893	0.929	0.894	0.899	0.735	0.688	0.720	0.700	0.731
35	BPP	0.817	0.779	0.818	0.823	0.852	0.835	0.827	0.849	0.851	0.768	0.800	0.834
36	BTEC	0.803	0.870	0.873	0.891	0.896	0.884	0.886	0.860	0.852	0.834	0.866	0.805
37	BTM	0.787	0.844	0.857	0.831	0.767	0.854	0.698	0.772	0.871	0.852	0.871	0.825
38	CAB	0.746	0.749	0.755	0.800	0.827	0.915	0.911	0.862	0.847	0.873	0.894	0.822
39	CABC	0.842	0.824	0.766	0.834	0.848	0.819	0.787	0.818	0.803	0.816	0.814	0.797
40	CAN	0.850	0.839	0.824	0.814	0.866	0.859	0.872	0.835	0.860	0.788	0.695	0.712
41	CBEE	0.540	0.587	0.481	0.478	0.496	0.819	0.552	0.786	0.792	0.699	0.749	0.746
42	CBP	0.863	0.827	0.843	0.719	0.772	0.858	0.852	0.711	0.797	0.649	0.571	0.580
43	CCHB	0.879	0.792	0.890	0.906	0.751	0.890	0.859	0.855	0.812	0.747	0.711	0.746
44	CCK	0.781	0.786	0.788	0.852	0.822	0.733	0.719	0.699	0.712	0.673	0.737	0.736
45	CCM	0.788	0.865	0.743	0.771	0.743	0.731	0.711	0.721	0.777	0.524	0.655	0.664
46	CEP	0.745	0.823	0.793	0.728	0.728	0.731	0.739	0.690	0.742	0.674	0.640	0.638
47	CFM	0.745	0.811	0.815	0.811	0.801	0.812	0.739	0.763	0.748	0.782	0.747	0.732
48	CG	0.576	0.701	0.742	0.707	0.656	0.706	0.623	0.813	0.858	0.696	0.817	0.769
49	CHB	0.667	0.611	0.705	0.590	0.743	0.724	0.745	0.711	0.728	0.674	0.683	0.642
50	CIC	0.598	0.760	0.755	0.746	0.787	0.733	0.662	0.716	0.658	0.788	0.830	0.699
51	CIH	0.759	0.758	0.768	0.881	0.828	0.738	0.658	0.804	0.796	0.831	0.826	0.822
52	CME	0.901	0.813	0.819	0.826	0.762	0.850	0.743	0.759	0.642	0.643	0.661	0.617
53	CMS	0.599	0.737	0.742	0.693	0.733	0.839	0.853	0.775	0.859	0.725	0.593	0.675
54	CMT	0.799	0.745	0.705	0.753	0.789	0.853	0.797	0.803	0.829	0.810	0.776	0.810
55	COCO	0.897	0.854	0.845	0.841	0.838	0.863	0.813	0.748	0.710	0.467	0.278	0.267
56	COLA	0.756	0.771	0.853	0.667	0.782	0.789	0.780	0.762	0.831	0.719	0.722	0.706
57	CSB	0.861	0.849	0.865	0.851	0.846	0.951	0.884	0.837	0.925	0.805	0.807	0.748
58	CSCS	0.849	0.880	0.838	0.825	0.875	0.867	0.858	0.767	0.818	0.737	0.809	0.778
59	CTH	0.766	0.814	0.799	0.750	0.819	0.819	0.813	0.766	0.758	0.695	0.723	0.708
60	CWH	0.805	0.741	0.729	0.777	0.843	0.806	0.827	0.794	0.837	0.691	0.718	0.746

61	CYLC	0.684	0.762	0.772	0.741	0.507	0.763	0.703	0.803	0.811	0.774	0.784	0.722
62	CYM	0.669	0.656	0.682	0.648	0.660	0.656	0.696	0.626	0.727	0.668	0.676	0.680
63	DAYA	0.748	0.811	0.777	0.720	0.759	0.703	0.722	0.652	0.834	0.536	0.700	0.732
64	DBB	0.917	0.937	0.951	0.846	0.931	0.944	0.926	0.941	0.846	0.592	0.654	0.675
65	DBE	0.715	0.650	0.747	0.804	0.765	0.762	0.787	0.728	0.600	0.687	0.560	0.553
66	DGEM	0.741	0.770	0.762	0.730	0.830	0.814	0.821	0.819	0.794	0.639	0.673	0.584
67	DLG	0.864	0.885	0.861	0.856	0.851	0.898	0.901	0.880	0.843	0.779	0.828	0.817
68	DLM	0.832	0.775	0.815	0.871	0.867	0.885	0.922	0.835	0.902	0.881	0.857	0.863
69	DNON	0.738	0.679	0.606	0.639	0.694	0.621	0.808	0.769	0.876	0.628	0.708	0.679
70	DOGT	0.766	0.749	0.628	0.528	0.670	0.705	0.722	0.694	0.713	0.665	0.659	0.674
71	DOME	0.744	0.736	0.750	0.750	0.735	0.745	0.914	0.918	0.757	0.819	0.875	0.846
72	DPP	0.810	0.773	0.808	0.822	0.875	0.889	0.890	0.827	0.854	0.784	0.582	0.656
73	DRB	0.694	0.745	0.775	0.803	0.848	0.888	0.884	0.876	0.892	0.828	0.871	0.877
74	DWL	0.660	0.771	0.814	0.845	0.669	0.860	0.530	0.843	0.742	0.724	0.775	0.788
75	EDHB	0.835	0.847	0.844	0.840	0.841	0.909	0.842	0.810	0.820	0.657	0.573	0.396
76	EKA	0.776	0.763	0.766	0.666	0.672	0.716	0.569	0.620	0.683	0.817	0.820	0.810
77	EKC	0.823	0.841	0.813	0.790	0.861	0.877	0.837	0.758	0.747	0.753	0.776	0.792
78	EKSON	0.733	0.724	0.712	0.689	0.776	0.732	0.718	0.958	0.525	0.429	0.378	0.373
79	ELSR	0.874	0.901	0.863	0.849	0.807	0.929	0.934	0.907	0.909	0.902	0.895	0.868
80	EMI	0.754	0.785	0.770	0.788	0.454	0.742	0.787	0.703	0.865	0.750	0.751	0.707
81	EONM	0.750	0.757	0.761	0.631	0.770	0.772	0.560	0.602	0.692	0.677	0.720	0.587
82	EPMB	0.535	0.556	0.733	0.792	0.785	0.778	0.744	0.694	0.724	0.621	0.645	0.517
83	ESC	0.848	0.861	0.885	0.813	0.887	0.891	0.886	0.897	0.908	0.858	0.848	0.793
84	EUHO	0.745	0.733	0.673	0.669	0.738	0.758	0.721	0.726	0.759	0.746	0.710	0.654
85	EURO	0.747	0.782	0.735	0.754	0.818	0.813	0.817	0.731	0.767	0.778	0.780	0.752
86	EVF	0.808	0.752	0.760	0.757	0.726	0.716	0.674	0.694	0.751	0.554	0.538	0.545
87	FACI	0.788	0.629	0.710	0.682	0.564	0.530	0.671	0.615	0.672	0.669	0.654	0.654
88	FDGB	0.833	0.887	0.875	0.836	0.684	0.818	0.706	0.752	0.752	0.699	0.886	0.763
89	FFB	0.681	0.704	0.773	0.706	0.803	0.745	0.760	0.736	0.955	0.591	0.613	0.810
90	FIHB	0.846	0.795	0.845	0.856	0.817	0.761	0.787	0.745	0.755	0.719	0.766	0.755
91	FIMA	0.779	0.886	0.883	0.865	0.896	0.903	0.871	0.777	0.783	0.485	0.498	0.523
92	FIT	0.730	0.649	0.738	0.745	0.873	0.855	0.841	0.726	0.727	0.570	0.547	0.613
93	FMB	0.804	0.894	0.913	0.898	0.942	0.891	0.888	0.782	0.780	0.583	0.621	0.625
94	FNH	0.730	0.746	0.792	0.803	0.839	0.807	0.812	0.801	0.820	0.818	0.826	0.789
95	FOR	0.768	0.776	0.806	0.833	0.824	0.838	0.781	0.688	0.642	0.566	0.772	0.765
96	FRCB	0.716	0.764	0.726	0.697	0.717	0.683	0.740	0.733	0.729	0.619	0.681	0.717
97	G3G	0.701	0.726	0.773	0.722	0.594	0.625	0.752	0.664	0.728	0.685	0.817	0.626
98	GENE	0.895	0.927	0.842	0.819	0.806	0.819	0.786	0.763	0.642	0.682	0.713	0.676
99	GFHB	0.792	0.704	0.514	0.285	0.239	0.714	0.744	0.883	0.803	0.866	0.853	0.810
100	GII	0.782	0.725	0.763	0.781	0.789	0.758	0.798	0.663	0.674	0.612	0.801	0.766
101	GKEN	0.660	0.788	0.818	0.760	0.792	0.806	0.895	0.790	0.812	0.915	0.908	0.783
102	GOCB	0.826	0.822	0.862	0.842	0.831	0.862	0.717	0.845	0.847	0.820	0.823	0.811
103	GPA	0.709	0.754	0.739	0.735	0.685	0.732	0.657	0.645	0.552	0.668	0.680	0.636
104	GPB	0.744	0.769	0.611	0.596	0.689	0.717	0.704	0.815	0.650	0.665	0.741	0.680
105	GREE	0.885	0.904	0.877	0.921	0.880	0.900	0.833	0.807	0.797	0.796	0.822	0.748
106	GSCB	0.893	0.718	0.750	0.853	0.804	0.838	0.903	0.866	0.875	0.869	0.828	0.814
107	GUAN	0.840	0.866	0.819	0.861	0.892	0.818	0.850	0.856	0.841	0.841	0.817	0.634
108	H&L	0.734	0.844	0.786	0.843	0.731	0.857	0.633	0.890	0.882	0.814	0.859	0.799
109	HAVE	0.743	0.760	0.787	0.764	0.793	0.816	0.846	0.760	0.844	0.782	0.823	0.666
110	HCK	0.692	0.791	0.815	0.793	0.740	0.767	0.733	0.871	0.866	0.778	0.866	0.794
111	HEIM	0.785	0.788	0.789	0.811	0.833	0.845	0.872	0.859	0.833	0.780	0.865	0.850
112	HEX	0.667	0.593	0.713	0.594	0.545	0.595	0.585	0.745	0.691	0.642	0.476	0.449
113	HIL	0.679	0.791	0.836	0.690	0.625	0.587	0.607	0.685	0.695	0.647	0.632	0.584
114	HLI	0.826	0.787	0.756	0.741	0.717	0.712	0.714	0.753	0.751	0.651	0.743	0.741
115	HOV	0.639	0.557	0.505	0.481	0.657	0.758	0.808	0.858	0.741	0.617	0.665	0.662
116	HSI	0.719	0.756	0.826	0.803	0.838	0.868	0.907	0.862	0.934	0.838	0.837	0.827
117	HUAAN	0.927	0.859	0.805	0.809	0.869	0.832	0.861	0.849	0.444	0.170	0.868	0.859
118	HUME	0.614	0.789	0.839	0.738	0.806	0.869	0.700	0.806	0.786	0.639	0.617	0.605
119	HWA	0.720	0.718	0.769	0.763	0.738	0.745	0.724	0.719	0.817	0.823	0.816	0.785
120	HWG	0.809	0.668	0.654	0.642	0.680	0.630	0.724	0.623	0.675	0.666	0.694	0.771
121	HYR	0.836	0.846	0.846	0.841	0.829	0.855	0.848	0.845	0.845	0.831	0.825	0.848
122	IHB	0.831	0.467	0.728	0.923	0.585	0.839	0.674	0.599	0.846	0.830	0.843	0.728
123	IKEN	0.667	0.671	0.707	0.538	0.411	0.697	0.350	0.593	0.890	0.775	0.701	0.730

124	IMAS	0.871	0.763	0.819	0.773	0.759	0.830	0.846	0.808	0.743	0.685	0.701	0.637
125	INDU	0.670	0.657	0.765	0.693	0.782	0.724	0.563	0.582	0.718	0.714	0.874	0.859
126	IOI	0.840	0.848	0.846	0.841	0.831	0.856	0.843	0.888	0.860	0.888	0.822	0.812
127	IQGH	0.789	0.689	0.612	0.661	0.716	0.708	0.938	0.883	0.807	0.864	0.758	0.750
128	IRET	0.616	0.740	0.745	0.741	0.774	0.746	0.736	0.605	0.658	0.618	0.633	0.814
129	JADI	0.852	0.834	0.839	0.738	0.724	0.685	0.678	0.594	0.685	0.505	0.571	0.517
130	JAYC	0.602	0.747	0.632	0.645	0.499	0.628	0.613	0.628	0.609	0.614	0.691	0.630
131	JHMC	0.886	0.859	0.811	0.890	0.896	0.867	0.875	0.770	0.824	0.867	0.817	0.815
132	JKB	0.692	0.889	0.824	0.783	0.755	0.808	0.746	0.736	0.678	0.717	0.738	0.696
133	JMR	0.694	0.559	0.585	0.791	0.613	0.840	0.791	0.694	0.841	0.733	0.751	0.728
134	JOHO	0.579	0.666	0.703	0.703	0.508	0.923	0.917	0.621	0.604	0.678	0.604	0.591
135	JT	0.723	0.689	0.688	0.726	0.771	0.664	0.695	0.663	0.696	0.504	0.455	0.458
136	KEIN	0.724	0.747	0.747	0.747	0.774	0.724	0.731	0.715	0.758	0.681	0.687	0.685
137	KESM	0.873	0.845	0.680	0.672	0.654	0.674	0.841	0.839	0.841	0.819	0.819	0.808
138	KFB	0.774	0.828	0.870	0.826	0.840	0.851	0.852	0.842	0.854	0.746	0.705	0.651
139	KFM	0.817	0.802	0.736	0.866	0.747	0.761	0.770	0.816	0.800	0.818	0.823	0.811
140	KHEE	0.669	0.760	0.735	0.760	0.731	0.785	0.811	0.755	0.738	0.667	0.638	0.643
141	KHIN	0.704	0.713	0.743	0.761	0.764	0.782	0.813	0.775	0.766	0.744	0.746	0.741
142	KIA	0.682	0.792	0.748	0.681	0.825	0.791	0.785	0.737	0.759	0.644	0.696	0.686
143	KJB	0.633	0.696	0.695	0.749	0.694	0.713	0.738	0.670	0.718	0.603	0.637	0.643
144	KJC	0.810	0.850	0.823	0.832	0.833	0.869	0.837	0.802	0.804	0.688	0.638	0.660
145	KKB	0.797	0.813	0.962	0.886	0.914	0.792	0.840	0.767	0.824	0.504	0.582	0.695
146	KNMG	0.859	0.768	0.691	0.668	0.658	0.689	0.683	0.682	0.667	0.521	0.413	0.446
147	KOMA	0.723	0.754	0.731	0.716	0.767	0.782	0.714	0.565	0.657	0.561	0.546	0.519
148	KONE	0.803	0.834	0.758	0.657	0.660	0.671	0.804	0.795	0.709	0.673	0.643	0.684
149	KPB	0.765	0.826	0.816	0.850	0.702	0.840	0.606	0.837	0.844	0.816	0.833	0.806
150	KPG	0.601	0.692	0.739	0.814	0.885	0.924	0.867	0.861	0.886	0.842	0.877	0.872
151	KPS	0.820	0.752	0.749	0.816	0.867	0.875	0.861	0.803	0.825	0.790	0.796	0.827
152	KRI	0.695	0.661	0.720	0.766	0.713	0.787	0.882	0.821	0.837	0.810	0.547	0.530
153	KS	0.714	0.768	0.702	0.750	0.688	0.663	0.670	0.653	0.642	0.502	0.510	0.474
154	KSB	0.646	0.657	0.894	0.822	0.676	0.857	0.842	0.701	0.579	0.490	0.713	0.660
155	KTRI	0.851	0.760	0.804	0.497	0.615	0.701	0.870	0.886	0.811	0.810	0.813	0.815
156	KYM	0.666	0.668	0.861	0.753	0.609	0.718	0.702	0.657	0.686	0.694	0.662	0.582
157	LATI	0.806	0.762	0.818	0.797	0.848	0.862	0.878	0.853	0.866	0.748	0.675	0.667
158	LAY	0.677	0.631	0.748	0.780	0.757	0.673	0.715	0.712	0.708	0.685	0.700	0.694
159	LBA	0.827	0.766	0.762	0.743	0.769	0.818	0.786	0.751	0.781	0.676	0.712	0.696
160	LBB	0.738	0.769	0.699	0.683	0.721	0.711	0.731	0.700	0.733	0.315	0.328	0.581
161	LCTH	0.821	0.712	0.722	0.580	0.563	0.762	0.748	0.667	0.704	0.664	0.663	0.612
162	LDHB	0.139	0.571	0.649	0.560	0.572	0.800	0.364	0.640	0.841	0.814	0.822	0.814
163	LDST	0.643	0.636	0.665	0.544	0.599	0.552	0.752	0.639	0.666	0.580	0.696	0.649
164	LEWE	0.662	0.428	0.656	0.326	0.310	0.830	0.522	0.711	0.670	0.584	0.729	0.725
165	LHI	0.756	0.748	0.752	0.857	0.849	0.808	0.786	0.744	0.805	0.764	0.812	0.813
166	LLB	0.749	0.571	0.673	0.656	0.703	0.679	0.679	0.620	0.603	0.637	0.693	0.668
167	LMC	0.719	0.761	0.792	0.716	0.742	0.797	0.803	0.737	0.733	0.674	0.591	0.548
168	LSTI	0.618	0.705	0.848	0.842	0.832	0.930	0.741	0.630	0.662	0.557	0.682	0.691
169	LTKM	0.761	0.792	0.812	0.833	0.846	0.783	0.907	0.922	0.749	0.652	0.627	0.641
170	LYSA	0.758	0.826	0.850	0.804	0.779	0.849	0.857	0.807	0.829	0.770	0.786	0.657
171	MAG	0.694	0.810	0.816	0.825	0.861	0.831	0.904	0.872	0.876	0.796	0.774	0.771
172	MB	0.739	0.804	0.714	0.762	0.489	0.640	0.480	0.670	0.748	0.890	0.765	0.729
173	MCE	0.868	0.711	0.752	0.801	0.640	0.658	0.640	0.751	0.625	0.665	0.721	0.662
174	MER	0.743	0.855	0.865	0.864	0.617	0.866	0.860	0.819	0.836	0.820	0.849	0.764
175	MESB	0.764	0.659	0.772	0.851	0.781	0.890	0.910	0.843	0.803	0.821	0.831	0.817
176	MFL	0.808	0.850	0.831	0.832	0.856	0.820	0.837	0.820	0.754	0.754	0.774	0.759
177	MHC	0.875	0.847	0.853	0.840	0.827	0.892	0.623	0.563	0.629	0.600	0.628	0.594
178	MIEC	0.529	0.488	0.434	0.452	0.453	0.457	0.563	0.649	0.615	0.696	0.653	0.590
179	MIG	0.606	0.721	0.757	0.709	0.774	0.901	0.563	0.787	0.838	0.724	0.778	0.767
180	MILUX	0.732	0.756	0.740	0.624	0.610	0.692	0.665	0.695	0.737	0.719	0.762	0.737
181	MIN	0.760	0.755	0.683	0.611	0.667	0.741	0.681	0.648	0.716	0.602	0.588	0.583
182	MINE	0.733	0.710	0.693	0.820	0.812	0.752	0.768	0.733	0.606	0.501	0.623	0.598
183	MKRMB	0.862	0.851	0.893	0.919	0.894	0.908	0.950	0.922	0.933	0.872	0.836	0.789
184	MLG	0.573	0.744	0.446	0.838	0.825	0.852	0.839	0.867	0.843	0.508	0.749	0.752
185	MMSV	0.813	0.870	0.824	0.879	0.852	0.827	0.888	0.897	0.931	0.909	0.890	0.863
186	MSB	0.803	0.707	0.776	0.737	0.786	0.898	0.838	0.815	0.879	0.801	0.776	0.763

187	MSW	0.856	0.904	0.784	0.815	0.867	0.882	0.891	0.861	0.795	0.785	0.774	0.767
188	MTI	0.785	0.785	0.768	0.833	0.863	0.832	0.822	0.810	0.823	0.855	0.861	0.849
189	MTRD	0.873	0.868	0.818	0.799	0.873	0.862	0.872	0.845	0.829	0.836	0.830	0.892
190	MUD	0.747	0.745	0.685	0.711	0.727	0.733	0.713	0.690	0.706	0.607	0.655	0.658
191	MWE	0.704	0.713	0.755	0.723	0.751	0.801	0.642	0.625	0.649	0.838	0.403	0.394
192	NCHB	0.722	0.634	0.764	0.883	0.574	0.805	0.656	0.868	0.916	0.867	0.824	0.845
193	NESZ	0.778	0.790	0.828	0.851	0.851	0.904	0.885	0.886	0.882	0.834	0.836	0.818
194	NGB	0.826	0.862	0.837	0.827	0.831	0.857	0.814	0.729	0.697	0.600	0.677	0.646
195	NHF	0.744	0.784	0.754	0.696	0.757	0.768	0.759	0.692	0.742	0.636	0.571	0.540
196	NHR	0.756	0.839	0.841	0.769	0.710	0.786	0.769	0.750	0.782	0.700	0.777	0.691
197	NTPM	0.833	0.810	0.926	0.843	0.648	0.706	0.874	0.827	0.768	0.802	0.808	0.781
198	NVB	0.904	0.866	0.900	0.715	0.780	0.805	0.653	0.552	0.626	0.533	0.572	0.538
199	NWP	0.836	0.722	0.536	0.735	0.721	0.813	0.629	0.844	0.806	0.838	0.729	0.656
200	NYL	0.847	0.796	0.791	0.800	0.839	0.827	0.838	0.798	0.766	0.780	0.803	0.795
201	OCM	0.780	0.771	0.749	0.655	0.730	0.754	0.761	0.739	0.740	0.611	0.611	0.624
202	OCP	0.730	0.813	0.820	0.857	0.824	0.862	0.880	0.801	0.829	0.853	0.788	0.893
203	OFIH	0.695	0.763	0.780	0.724	0.788	0.772	0.791	0.760	0.769	0.659	0.682	0.675
204	OHB	0.756	0.853	0.783	0.876	0.930	0.874	0.673	0.691	0.740	0.686	0.686	0.643
205	OKAC	0.685	0.757	0.765	0.766	0.779	0.852	0.890	0.866	0.828	0.773	0.775	0.725
206	ONC	0.722	0.860	0.861	0.862	0.764	0.781	0.687	0.708	0.681	0.658	0.733	0.647
207	OPB	0.733	0.746	0.744	0.766	0.763	0.768	0.754	0.728	0.722	0.670	0.721	0.753
208	PAD	0.905	0.812	0.833	0.861	0.891	0.876	0.910	0.866	0.860	0.861	0.936	0.897
209	PAOS	0.779	0.779	0.731	0.874	0.878	0.905	0.862	0.692	0.687	0.797	0.878	0.879
210	PARB	0.866	0.665	0.644	0.630	0.760	0.676	0.730	0.672	0.640	0.637	0.595	0.573
211	PCCS	0.720	0.672	0.720	0.698	0.723	0.714	0.705	0.656	0.671	0.713	0.739	0.740
212	PELI	0.850	0.899	0.876	0.904	0.898	0.929	0.880	0.888	0.913	0.816	0.841	0.827
213	PENT	0.700	0.561	0.612	0.599	0.710	0.713	0.724	0.744	0.821	0.789	0.754	0.696
214	PEP	0.836	0.848	0.845	0.848	0.619	0.624	0.611	0.623	0.647	0.658	0.638	0.621
215	PER	0.870	0.886	0.894	0.893	0.909	0.902	0.903	0.918	0.878	0.880	0.840	0.846
216	PETRONM	0.836	0.847	0.845	0.841	0.830	0.858	0.848	0.853	0.861	0.819	0.826	0.814
217	PG	0.523	0.519	0.350	0.599	0.559	0.626	0.610	0.853	0.632	0.629	0.802	0.813
218	PGF	0.715	0.782	0.795	0.826	0.660	0.896	0.735	0.713	0.792	0.820	0.737	0.720
219	PGHB	0.846	0.867	0.839	0.726	0.770	0.804	0.799	0.739	0.743	0.548	0.595	0.569
220	PHR	0.833	0.748	0.747	0.748	0.780	0.773	0.757	0.751	0.742	0.759	0.797	0.807
221	PIE	0.656	0.641	0.671	0.629	0.551	0.587	0.785	0.770	0.862	0.697	0.741	0.728
222	PJSB	0.462	0.795	0.820	0.899	0.700	0.740	0.831	0.889	0.843	0.820	0.819	0.808
223	PMAH	0.789	0.795	0.718	0.762	0.834	0.781	0.740	0.837	0.832	0.884	0.883	0.885
224	PMBT	0.823	0.752	0.751	0.764	0.839	0.768	0.759	0.733	0.707	0.705	0.746	0.619
225	PMC	0.552	0.685	0.593	0.479	0.564	0.621	0.567	0.555	0.623	0.483	0.536	0.522
226	PMM	0.705	0.739	0.735	0.745	0.758	0.739	0.729	0.712	0.827	0.666	0.691	0.706
227	PNE	0.711	0.722	0.631	0.722	0.760	0.741	0.702	0.655	0.681	0.726	0.718	0.725
228	POS	0.460	0.792	0.717	0.497	0.526	0.558	0.529	0.512	0.491	0.443	0.479	0.489
229	PP	0.722	0.749	0.753	0.738	0.765	0.751	0.773	0.742	0.773	0.669	0.638	0.610
230	PPG	0.752	0.814	0.806	0.769	0.732	0.781	0.787	0.775	0.726	0.698	0.735	0.642
231	PPT	0.858	0.815	0.852	0.879	0.661	0.858	0.900	0.504	0.304	0.299	0.328	0.322
232	PRG	0.746	0.731	0.746	0.700	0.754	0.762	0.752	0.667	0.720	0.680	0.644	0.565
233	PROL	0.753	0.761	0.735	0.833	0.795	0.749	0.776	0.773	0.723	0.694	0.709	0.615
234	PRST	0.808	0.813	0.767	0.789	0.809	0.830	0.822	0.794	0.799	0.756	0.700	0.690
235	PTB	0.800	0.798	0.770	0.873	0.886	0.913	0.895	0.835	0.851	0.847	0.812	0.745
236	PTG	0.842	0.853	0.854	0.844	0.836	0.857	0.842	0.844	0.845	0.819	0.822	0.812
237	PU	0.770	0.735	0.714	0.761	0.746	0.766	0.716	0.506	0.775	0.810	0.800	0.773
238	PW	0.790	0.751	0.730	0.790	0.811	0.722	0.784	0.706	0.748	0.622	0.643	0.619
239	PWP	0.824	0.728	0.713	0.715	0.735	0.525	0.621	0.659	0.684	0.531	0.582	0.558
240	PWRT	0.774	0.670	0.724	0.713	0.566	0.752	0.853	0.862	0.794	0.851	0.845	0.838
241	QC	0.574	0.671	0.656	0.606	0.714	0.764	0.646	0.639	0.728	0.589	0.560	0.590
242	RALC	0.678	0.732	0.754	0.812	0.804	0.783	0.793	0.762	0.771	0.734	0.741	0.654
243	RBRX	0.837	0.849	0.846	0.841	0.829	0.855	0.571	0.823	0.841	0.746	0.610	0.773
244	RESI	0.768	0.766	0.753	0.709	0.739	0.727	0.704	0.701	0.666	0.686	0.640	0.581
245	REX	0.638	0.608	0.603	0.565	0.479	0.579	0.524	0.523	0.470	0.620	0.570	0.562
246	RGB	0.805	0.774	0.590	0.556	0.679	0.752	0.805	0.771	0.803	0.675	0.725	0.669
247	RGBH	0.609	0.778	0.704	0.818	0.727	0.773	0.841	0.627	0.843	0.819	0.739	0.690
248	ROTH	0.838	0.846	0.846	0.838	0.834	0.853	0.840	0.841	0.841	0.819	0.825	0.818
249	SA	0.662	0.572	0.597	0.580	0.794	0.816	0.755	0.555	0.488	0.685	0.704	0.700

250	SALC	0.626	0.719	0.718	0.699	0.692	0.651	0.471	0.510	0.480	0.525	0.364	0.476
251	SAND	0.767	0.854	0.845	0.840	0.896	0.855	0.793	0.757	0.797	0.847	0.823	0.830
252	SANI	0.803	0.742	0.920	0.659	0.825	0.868	0.739	0.692	0.679	0.672	0.523	0.549
253	SAPU	0.748	0.769	0.763	0.819	0.843	0.759	0.768	0.717	0.719	0.681	0.674	0.671
254	SC	0.747	0.844	0.848	0.881	0.827	0.753	0.714	0.750	0.840	0.845	0.823	0.854
255	SCI	0.790	0.751	0.732	0.755	0.836	0.837	0.827	0.812	0.845	0.743	0.742	0.774
256	SCIB	0.536	0.685	0.718	0.768	0.741	0.753	0.697	0.670	0.740	0.787	0.750	0.623
257	SCP	0.743	0.696	0.741	0.858	0.871	0.727	0.602	0.823	0.871	0.751	0.818	0.813
258	SCT	0.744	0.789	0.816	0.783	0.586	0.838	0.706	0.876	0.894	0.818	0.859	0.695
259	SCW	0.785	0.801	0.828	0.811	0.489	0.774	0.740	0.786	0.868	0.831	0.850	0.814
260	SEQB	0.635	0.682	0.786	0.783	0.870	0.836	0.831	0.804	0.816	0.742	0.738	0.748
261	SER	0.831	0.881	0.896	0.805	0.842	0.864	0.793	0.810	0.871	0.852	0.882	0.814
262	SHH	0.715	0.731	0.745	0.708	0.754	0.744	0.743	0.721	0.778	0.706	0.655	0.626
263	SIME	0.839	0.848	0.848	0.844	0.832	0.857	0.843	0.844	0.843	0.818	0.822	0.812
264	SINM	0.764	0.726	0.725	0.814	0.860	0.795	0.826	0.778	0.700	0.658	0.631	0.600
265	SKBS	0.727	0.758	0.727	0.714	0.712	0.697	0.699	0.699	0.692	0.720	0.747	0.687
266	SKOU	0.758	0.732	0.730	0.786	0.775	0.731	0.717	0.711	0.720	0.776	0.823	0.812
267	SLON	0.807	0.725	0.809	0.745	0.797	0.826	0.816	0.794	0.883	0.825	0.746	0.698
268	SMC	0.676	0.629	0.663	0.652	0.630	0.684	0.667	0.803	0.655	0.708	0.821	0.795
269	SMELT	0.764	0.862	0.687	0.840	0.817	0.860	0.769	0.897	0.853	0.802	0.848	0.817
270	SMIS	0.668	0.747	0.781	0.769	0.736	0.734	0.768	0.719	0.695	0.642	0.654	0.652
271	SNHB	0.688	0.850	0.850	0.933	0.730	0.827	0.809	0.742	0.758	0.667	0.665	0.685
272	SOLE	0.834	0.898	0.902	0.885	0.856	0.850	0.903	0.856	0.886	0.911	0.934	0.802
273	SPZ	0.669	0.699	0.729	0.674	0.566	0.671	0.782	0.811	0.743	0.820	0.542	0.535
274	SSB	0.840	0.891	0.779	0.767	0.842	0.818	0.799	0.770	0.729	0.783	0.852	0.825
275	STAR	0.863	0.862	0.924	0.893	0.899	0.913	0.875	0.914	0.879	0.690	0.655	0.514
276	STB	0.676	0.749	0.781	0.670	0.770	0.945	0.479	0.684	0.636	0.525	0.708	0.259
277	STRA	0.695	0.808	0.822	0.856	0.829	0.854	0.841	0.843	0.843	0.817	0.874	0.702
278	SUCB	0.559	0.594	0.664	0.685	0.609	0.665	0.683	0.607	0.483	0.585	0.650	0.639
279	SWS	0.693	0.689	0.703	0.720	0.725	0.756	0.735	0.704	0.676	0.658	0.688	0.654
280	SYF	0.596	0.695	0.638	0.808	0.706	0.904	0.840	0.817	0.864	0.742	0.741	0.603
281	TAFI	0.803	0.818	0.793	0.782	0.520	0.775	0.868	0.884	0.919	0.747	0.818	0.785
282	TARE	0.796	0.808	0.833	0.761	0.826	0.847	0.819	0.803	0.807	0.776	0.741	0.749
283	TC	0.665	0.793	0.782	0.743	0.779	0.792	0.806	0.789	0.816	0.640	0.590	0.596
284	TCM	0.718	0.770	0.734	0.760	0.758	0.763	0.800	0.754	0.798	0.777	0.714	0.785
285	TECF	0.832	0.764	0.704	0.866	0.748	0.869	0.824	0.882	0.881	0.881	0.843	0.886
286	TEKS	0.620	0.602	0.678	0.646	0.469	0.558	0.682	0.895	0.583	0.612	0.537	0.435
287	TEX	0.674	0.686	0.663	0.696	0.625	0.680	0.746	0.731	0.728	0.722	0.758	0.753
288	TEXC	0.835	0.848	0.917	0.859	0.832	0.889	0.876	0.865	0.874	0.922	0.917	0.826
289	TGI	0.808	0.782	0.758	0.808	0.844	0.827	0.816	0.779	0.799	0.702	0.721	0.713
290	TGL	0.820	0.765	0.796	0.792	0.818	0.822	0.827	0.782	0.794	0.748	0.772	0.734
291	THR	0.943	0.805	0.719	0.699	0.874	0.821	0.840	0.781	0.740	0.810	0.772	0.852
292	TOME	0.737	0.761	0.788	0.764	0.798	0.769	0.715	0.741	0.742	0.724	0.739	0.714
293	TOMY	0.805	0.765	0.826	0.855	0.885	0.914	0.876	0.846	0.861	0.771	0.722	0.625
294	TOPG	0.857	0.874	0.843	0.855	0.856	0.831	0.810	0.751	0.804	0.766	0.773	0.837
295	TOYO	0.745	0.708	0.691	0.749	0.758	0.740	0.673	0.678	0.678	0.583	0.649	0.589
296	TPC	0.648	0.746	0.746	0.742	0.407	0.609	0.844	0.875	0.845	0.818	0.808	0.855
297	TRIV	0.839	0.923	0.924	0.768	0.770	0.583	0.546	0.601	0.549	0.817	0.820	0.858
298	TWH	0.881	0.816	0.847	0.858	0.846	0.884	0.841	0.889	0.843	0.761	0.835	0.850
299	TWP	0.763	0.816	0.770	0.753	0.801	0.793	0.763	0.693	0.730	0.645	0.551	0.527
300	UCHI	0.856	0.879	0.930	0.864	0.782	0.880	0.896	0.892	0.873	0.900	0.857	0.852
301	UGB	0.700	0.820	0.766	0.752	0.840	0.858	0.855	0.799	0.838	0.628	0.658	0.609
302	UMSN	0.775	0.744	0.778	0.777	0.794	0.799	0.800	0.783	0.778	0.764	0.766	0.723
303	UMWH	0.850	0.881	0.876	0.877	0.878	0.881	0.896	0.890	0.860	0.879	0.831	0.807
304	UNI	0.799	0.898	0.900	0.879	0.882	0.927	0.887	0.852	0.850	0.832	0.835	0.830
305	UPA	0.823	0.841	0.790	0.630	0.707	0.758	0.771	0.741	0.702	0.712	0.821	0.633
306	UTUS	0.881	0.660	0.665	0.627	0.631	0.615	0.834	0.911	0.802	0.853	0.861	0.812
307	UULI	0.765	0.838	0.844	0.758	0.824	0.827	0.838	0.823	0.827	0.729	0.655	0.579
308	VCB	0.581	0.716	0.702	0.745	0.697	0.750	0.677	0.555	0.763	0.767	0.718	0.670
309	VHB	0.839	0.879	0.849	0.906	0.875	0.877	0.798	0.896	0.847	0.894	0.845	0.874
310	VSI	0.841	0.855	0.781	0.757	0.822	0.846	0.783	0.779	0.736	0.696	0.780	0.807
311	WANG	0.769	0.770	0.803	0.773	0.805	0.782	0.740	0.680	0.773	0.705	0.689	0.708
312	WAT	0.559	0.784	0.791	0.796	0.668	0.830	0.681	0.738	0.778	0.763	0.878	0.838

313	WCE	0.583	0.701	0.377	0.448	0.202	0.433	0.394	0.876	0.755	0.818	0.737	0.695
314	WEC	0.710	0.790	0.720	0.721	0.710	0.822	0.631	0.690	0.740	0.776	0.849	0.861
315	WEI	0.531	0.505	0.511	0.530	0.441	0.888	0.662	0.868	0.672	0.558	0.552	0.540
316	WELL	0.825	0.836	0.880	0.890	0.961	0.928	0.950	0.941	0.921	0.920	0.932	0.934
317	WHB	0.657	0.741	0.771	0.794	0.510	0.794	0.696	0.810	0.827	0.835	0.848	0.813
318	WHIT	0.752	0.817	0.791	0.771	0.759	0.761	0.786	0.742	0.760	0.559	0.520	0.520
319	WSC	0.781	0.711	0.751	0.708	0.781	0.726	0.697	0.708	0.642	0.571	0.702	0.768
320	XLH	0.764	0.590	0.723	0.713	0.432	0.618	0.567	0.837	0.864	0.823	0.861	0.806
321	YEE	0.615	0.639	0.612	0.605	0.602	0.581	0.671	0.662	0.609	0.654	0.668	0.651
322	YKGI	0.860	0.805	0.770	0.809	0.747	0.798	0.817	0.732	0.771	0.746	0.664	0.496
323	YLAI	0.766	0.802	0.760	0.676	0.749	0.793	0.803	0.750	0.722	0.654	0.641	0.583
324	YLI	0.700	0.738	0.661	0.548	0.693	0.705	0.750	0.643	0.638	0.609	0.558	0.532
325	YSP	0.761	0.822	0.777	0.738	0.792	0.807	0.838	0.816	0.856	0.719	0.702	0.718

Table B.1.3: Profitability efficiency scores of the Philippines' listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	AB	0.891	0.921	0.939	0.952	0.923	0.765	0.971	0.968	0.941	0.914	0.985	0.959
2	AEV	0.922	0.935	0.969	0.911	0.941	0.941	0.959	0.936	0.943	0.919	0.964	0.924
3	APC	0.885	0.909	0.941	0.858	0.951	0.964	0.969	0.972	0.917	0.932	0.974	0.954
4	AT	0.508	0.597	0.789	0.233	0.936	0.926	0.894	0.885	0.648	0.704	0.813	0.395
5	BC	0.885	0.918	0.935	0.910	0.958	0.941	0.663	0.793	0.799	0.631	0.721	0.793
6	BMM	0.968	0.956	0.968	0.925	0.950	0.973	0.976	0.959	0.955	0.971	0.949	0.951
7	BSC	0.814	0.903	0.975	0.948	0.970	0.966	0.973	0.907	0.887	0.882	0.937	0.932
8	CA	0.607	0.940	0.937	0.920	0.952	0.951	0.984	0.952	0.955	0.970	0.991	0.982
9	CAT	0.931	0.847	0.963	0.947	0.975	0.960	0.917	0.930	0.971	0.917	0.958	0.942
10	CIP	0.657	0.897	0.838	0.767	0.775	0.834	0.930	0.806	0.825	0.914	0.933	0.882
11	DMC	0.862	0.941	0.968	0.899	0.974	0.981	0.941	0.966	0.957	0.970	0.978	0.946
12	EURO	0.980	0.870	0.873	0.843	0.812	0.798	0.768	0.801	0.782	0.776	0.772	0.639
13	FB	0.947	0.944	0.939	0.919	0.962	0.959	0.959	0.935	0.927	0.917	0.948	0.882
14	FOOD	0.911	0.956	0.951	0.909	0.827	0.958	0.922	0.938	0.787	0.766	0.879	0.835
15	FPI	0.911	0.876	0.884	0.917	0.904	0.977	0.969	0.914	0.959	0.963	0.982	0.949
16	GEO	0.927	0.925	0.853	0.940	0.935	0.959	0.985	0.799	0.922	0.959	0.932	0.935
17	GSMI	0.827	0.854	0.936	0.918	0.901	0.942	0.977	0.958	0.950	0.939	0.953	0.684
18	HLCM	0.939	0.947	0.942	0.931	0.979	0.956	0.939	0.938	0.927	0.918	0.979	0.963
19	IMP	0.889	0.963	0.935	0.961	0.979	0.980	0.970	0.973	0.974	0.973	0.993	0.954
20	ION	0.810	0.871	0.859	0.878	0.899	0.907	0.916	0.940	0.954	0.820	0.920	0.912
21	JGS	0.920	0.951	0.947	0.874	0.966	0.954	0.968	0.952	0.929	0.947	0.942	0.886
22	KPH	0.959	0.957	0.940	0.964	0.952	0.967	0.977	0.930	0.950	0.963	0.990	0.962
23	LC	0.335	0.372	0.515	0.566	0.837	0.793	0.697	0.507	0.446	0.496	0.541	0.479
24	LFM	0.970	0.911	0.950	0.965	0.951	0.971	0.973	0.919	0.840	0.807	0.848	0.841
25	LOTO	0.878	0.918	0.932	0.907	0.935	0.939	0.936	0.934	0.923	0.913	0.932	0.880
26	MACAY	0.527	0.676	0.845	0.746	0.852	0.858	0.876	0.938	0.931	0.935	0.970	0.607
27	MB	0.780	0.776	0.801	0.788	0.719	0.742	0.716	0.720	0.702	0.642	0.659	0.653
28	MVC	0.744	0.847	0.855	0.819	0.842	0.915	0.921	0.890	0.854	0.884	0.924	0.934
29	NI	0.892	0.919	0.957	0.973	0.985	0.884	0.706	0.845	0.993	0.897	0.983	0.974
30	OPM	0.796	0.906	0.952	0.672	0.856	0.959	0.991	0.830	0.883	0.897	0.927	0.888
31	ORE	0.947	0.916	0.973	0.904	0.805	0.876	0.874	0.952	0.757	0.682	0.667	0.621
32	OV	0.399	0.838	0.899	0.841	0.958	0.917	0.988	0.797	0.768	0.802	0.843	0.722
33	PA	0.886	0.918	0.933	0.904	0.937	0.939	0.931	0.929	0.919	0.908	0.928	0.872
34	PCOR	0.889	0.920	0.936	0.905	0.939	0.942	0.938	0.934	0.926	0.916	0.937	0.881
35	PHN	0.777	0.816	0.802	0.676	0.699	0.706	0.725	0.781	0.716	0.713	0.707	0.644
36	PMPC	0.800	0.887	0.933	0.883	0.907	0.977	0.952	0.895	0.898	0.940	0.938	0.629
37	PX	0.886	0.915	0.932	0.903	0.937	0.941	0.934	0.930	0.921	0.912	0.932	0.877
38	RCI	0.878	0.783	0.781	0.693	0.811	0.866	0.959	0.933	0.809	0.889	0.789	0.919
39	RFM	0.798	0.827	0.907	0.863	0.982	0.973	0.871	0.896	0.924	0.950	0.890	0.589
40	ROX	0.903	0.786	0.798	0.767	0.821	0.827	0.886	0.831	0.737	0.754	0.860	0.577
41	SCC	0.967	0.939	0.978	0.965	0.948	0.943	0.947	0.938	0.929	0.918	0.939	0.887
42	SFI	0.922	0.893	0.907	0.835	0.936	0.962	0.979	0.965	0.957	0.969	0.975	0.956
43	SMC	0.923	0.916	0.932	0.911	0.937	0.940	0.934	0.932	0.925	0.912	0.933	0.879
44	STN	0.546	0.825	0.937	0.907	0.941	0.944	0.939	0.934	0.926	0.917	0.937	0.882
45	T	0.910	0.900	0.656	0.657	0.682	0.640	0.621	0.801	0.893	0.711	0.933	0.880
46	URC	0.900	0.967	0.970	0.961	0.961	0.959	0.942	0.933	0.930	0.930	0.971	0.531
47	VITA	0.769	0.729	0.853	0.769	0.959	0.952	0.802	0.894	0.945	0.917	0.938	0.824
48	VMC	0.888	0.922	0.958	0.910	0.951	0.959	0.935	0.952	0.975	0.879	0.911	0.855
49	VUL	0.732	0.903	0.911	0.834	0.911	0.987	0.949	0.950	0.957	0.839	0.995	0.578
50	WIN	0.886	0.917	0.934	0.905	0.963	0.796	0.937	0.905	0.945	0.972	0.964	0.948

Table B.1.4: Profitability efficiency scores of Singapore's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	AAG	0.955	0.984	0.973	0.961	0.985	0.981	0.980	0.969	0.984	0.980	0.987	0.920
2	ABT	0.951	0.985	0.906	0.769	0.980	0.971	0.926	0.834	0.925	0.956	0.957	0.965
3	ACC	0.904	0.983	0.974	0.893	0.990	0.981	0.970	0.987	0.980	0.980	0.971	0.953
4	ACP	0.961	0.992	0.983	0.915	0.996	0.985	0.979	0.983	0.995	0.993	0.980	0.982
5	ADI	0.890	0.992	0.988	0.944	0.985	0.989	0.987	0.981	0.985	0.983	0.962	0.952
6	ADV	0.943	0.987	0.971	0.940	0.981	0.970	0.966	0.913	0.977	0.976	0.955	0.935
7	AEI	0.874	0.981	0.979	0.922	0.985	0.984	0.981	0.942	0.990	0.987	0.967	0.931
8	AEM	0.930	0.961	0.957	0.874	0.991	0.962	0.962	0.942	0.996	0.993	0.980	0.975
9	AHL	0.874	0.994	0.986	0.932	0.985	0.993	0.972	0.976	0.984	0.987	0.964	0.954
10	ALLI	0.905	0.978	0.966	0.891	0.974	0.954	0.970	0.925	0.980	0.974	0.921	0.928
11	ANIK	0.900	0.979	0.955	0.886	0.978	0.963	0.962	0.945	0.976	0.975	0.959	0.920
12	APOIL	0.978	0.995	0.991	0.963	0.997	0.987	0.991	0.979	0.991	0.990	0.985	0.969
13	ASA	0.950	0.982	0.972	0.942	0.993	0.988	0.985	0.977	0.983	0.979	0.977	0.970
14	ASL	0.958	0.977	0.981	0.951	0.951	0.957	0.893	0.905	0.960	0.848	0.772	0.706
15	ASMH	0.865	0.981	0.939	0.901	0.975	0.963	0.957	0.969	0.985	0.982	0.963	0.953
16	ASON	0.963	0.982	0.969	0.941	0.984	0.981	0.979	0.986	0.986	0.982	0.950	0.919
17	AVIT	0.979	0.992	0.968	0.897	0.974	0.979	0.974	0.984	0.993	0.990	0.990	0.985
18	BC	0.947	0.982	0.972	0.939	0.984	0.981	0.979	0.972	0.994	0.993	0.989	0.981
19	BEST	0.950	0.984	0.976	0.957	0.985	0.986	0.985	0.971	0.985	0.982	0.963	0.953
20	BKM	0.919	0.989	0.968	0.867	0.971	0.953	0.951	0.905	0.978	0.975	0.931	0.871
21	BREAD	0.967	0.986	0.973	0.940	0.984	0.981	0.979	0.968	0.984	0.981	0.961	0.951
22	BTL	0.925	0.992	0.974	0.951	0.982	0.982	0.987	0.972	0.984	0.964	0.961	0.861
23	BWAY	0.966	0.980	0.942	0.945	0.936	0.965	0.930	0.932	0.884	0.962	0.964	0.954
24	CAMS	0.950	0.983	0.974	0.943	0.985	0.982	0.980	0.969	0.986	0.984	0.981	0.957
25	CASA	0.875	0.994	0.984	0.922	0.995	0.992	0.984	0.976	0.993	0.983	0.924	0.948
26	CGIG	0.859	0.984	0.974	0.943	0.985	0.982	0.980	0.970	0.984	0.981	0.962	0.952
27	CHEM	0.886	0.978	0.957	0.901	0.976	0.966	0.973	0.958	0.992	0.988	0.966	0.935
28	CMI	0.907	0.993	0.984	0.870	0.989	0.982	0.981	0.954	0.978	0.988	0.879	0.867
29	COS	0.969	0.925	0.848	0.889	0.912	0.924	0.904	0.889	0.746	0.499	0.966	0.854
30	CREAF	0.863	0.780	0.833	0.784	0.834	0.955	0.891	0.804	0.966	0.933	0.962	0.864
31	CSE	0.959	0.986	0.979	0.965	0.973	0.992	0.984	0.988	0.995	0.974	0.884	0.973
32	CSMS	0.982	0.990	0.969	0.873	0.976	0.969	0.959	0.935	0.973	0.962	0.934	0.886
33	CWM	0.913	0.979	0.958	0.873	0.977	0.960	0.965	0.967	0.991	0.979	0.929	0.902
34	CWX	0.894	0.983	0.973	0.934	0.988	0.986	0.943	0.969	0.967	0.992	0.965	0.956
35	DELFI	0.962	0.992	0.973	0.948	0.961	0.989	0.981	0.977	0.964	0.989	0.915	0.979
36	DELM	0.959	0.995	0.904	0.895	0.957	0.975	0.926	0.969	0.984	0.986	0.980	0.968
37	DLNG	0.949	0.983	0.973	0.943	0.985	0.981	0.980	0.969	0.985	0.983	0.962	0.952
38	DSG	0.978	0.995	0.985	0.967	0.994	0.975	0.992	0.980	0.988	0.985	0.931	0.858
39	DT	0.902	0.992	0.984	0.888	0.988	0.984	0.989	0.982	0.987	0.991	0.963	0.953
40	ECW	0.951	0.998	0.981	0.900	0.982	0.964	0.964	0.917	0.985	0.983	0.967	0.931
41	EGCL	0.867	0.970	0.946	0.866	0.968	0.950	0.947	0.816	0.939	0.954	0.899	0.810
42	EIH	0.961	0.994	0.979	0.981	0.990	0.969	0.934	0.970	0.966	0.966	0.919	0.886
43	EMSE	0.886	0.988	0.984	0.908	0.990	0.969	0.991	0.970	0.987	0.980	0.964	0.953
44	ENVH	0.858	0.843	0.939	0.866	0.986	0.957	0.959	0.936	0.977	0.969	0.907	0.953
45	FABC	0.954	0.989	0.967	0.933	0.985	0.965	0.947	0.954	0.971	0.983	0.951	0.902
46	FEDI	0.878	0.959	0.918	0.801	0.958	0.930	0.971	0.933	0.988	0.984	0.952	0.867
47	FEH	0.969	0.993	0.941	0.903	0.984	0.977	0.956	0.910	0.987	0.969	0.925	0.947
48	FNN	0.958	0.988	0.978	0.945	0.978	0.982	0.980	0.972	0.985	0.975	0.965	0.951
49	FUJI	0.857	0.990	0.990	0.957	0.985	0.981	0.979	0.968	0.984	0.980	0.963	0.954
50	FUYU	0.844	0.891	0.891	0.854	0.953	0.951	0.958	0.930	0.979	0.971	0.923	0.917
51	GBY	0.895	0.983	0.964	0.867	0.977	0.972	0.982	0.945	0.988	0.986	0.982	0.961
52	GGR	0.949	0.983	0.973	0.942	0.985	0.983	0.990	0.984	0.973	0.991	0.984	0.949
53	GPI	0.812	0.893	0.905	0.838	0.927	0.922	0.908	0.930	0.953	0.922	0.859	0.886
54	GRP	0.925	0.996	0.992	0.972	0.998	0.981	0.979	0.973	0.997	0.976	0.964	0.951
55	GSSE	0.950	0.991	0.973	0.919	0.985	0.981	0.979	0.967	0.986	0.994	0.977	0.964
56	HANW	0.865	0.936	0.910	0.853	0.934	0.906	0.915	0.896	0.937	0.951	0.863	0.860
57	HLA	0.981	0.960	0.943	0.962	0.954	0.954	0.960	0.979	0.966	0.953	0.932	0.929
58	HOE	0.888	0.983	0.966	0.870	0.992	0.958	0.940	0.893	0.984	0.943	0.900	0.959
59	HPAR	0.951	0.986	0.946	0.974	0.986	0.983	0.981	0.970	0.984	0.981	0.966	0.953
60	IFAR	0.959	0.983	0.973	0.943	0.985	0.982	0.993	0.974	0.992	0.984	0.877	0.880

61	INTR	0.950	0.994	0.967	0.913	0.982	0.968	0.981	0.982	0.987	0.984	0.977	0.979
62	KLW	0.964	0.991	0.988	0.860	0.994	0.986	0.988	0.946	0.986	0.991	0.951	0.883
63	KODA	0.962	0.989	0.982	0.858	0.984	0.970	0.979	0.977	0.992	0.989	0.986	0.981
64	LEE	0.951	0.983	0.974	0.944	0.985	0.989	0.991	0.937	0.978	0.956	0.890	0.833
65	LHT	0.920	0.993	0.990	0.909	0.998	0.984	0.983	0.956	0.990	0.990	0.985	0.952
66	MIT	0.881	0.986	0.977	0.889	0.995	0.980	0.976	0.979	0.987	0.980	0.984	0.971
67	MIYO	0.907	0.989	0.969	0.903	0.964	0.965	0.979	0.985	0.983	0.981	0.951	0.922
68	MMH	0.970	0.992	0.989	0.972	0.995	0.988	0.989	0.971	0.986	0.983	0.966	0.954
69	MPM	0.967	0.993	0.961	0.942	0.990	0.983	0.983	0.961	0.981	0.956	0.792	0.967
70	MTEC	0.953	0.961	0.922	0.881	0.963	0.935	0.943	0.936	0.981	0.975	0.938	0.919
71	MTEX	0.876	0.978	0.961	0.861	0.975	0.967	0.976	0.961	0.982	0.979	0.960	0.951
72	NATC	0.944	0.988	0.969	0.870	0.981	0.970	0.982	0.941	0.990	0.988	0.958	0.977
73	NCL	0.878	0.985	0.973	0.916	0.985	0.991	0.981	0.977	0.987	0.932	0.965	0.952
74	NIP	0.966	0.987	0.968	0.862	0.977	0.964	0.971	0.968	0.984	0.983	0.965	0.954
75	NLH	0.907	0.977	0.979	0.941	0.984	0.984	0.979	0.985	0.996	0.994	0.987	0.963
76	NLPM	0.929	0.983	0.963	0.922	0.990	0.977	0.987	0.954	0.988	0.982	0.957	0.934
77	NSL	0.864	0.941	0.931	0.868	0.995	0.915	0.923	0.879	0.959	0.985	0.802	0.810
78	OLAM	0.950	0.984	0.973	0.942	0.985	0.981	0.979	0.967	0.984	0.981	0.962	0.952
79	ORG	0.869	0.991	0.984	0.941	0.985	0.981	0.981	0.982	0.971	0.967	0.940	0.884
80	OSI	0.959	0.976	0.955	0.938	0.985	0.981	0.979	0.969	0.983	0.991	0.969	0.892
81	PAN	0.880	0.971	0.927	0.854	0.949	0.966	0.967	0.888	0.962	0.935	0.847	0.970
82	PBS	0.868	0.974	0.934	0.894	0.995	0.960	0.982	0.988	0.987	0.965	0.928	0.893
83	PCI	0.951	0.990	0.959	0.951	0.993	0.974	0.990	0.937	0.990	0.983	0.965	0.963
84	PDS	0.890	0.991	0.982	0.906	0.992	0.990	0.987	0.980	0.990	0.996	0.981	0.970
85	PHL	0.951	0.983	0.986	0.950	0.985	0.982	0.979	0.983	0.989	0.992	0.975	0.953
86	PSL	0.949	0.989	0.985	0.928	0.988	0.976	0.984	0.977	0.988	0.974	0.977	0.968
87	PSTAR	0.951	0.996	0.988	0.960	0.992	0.986	0.990	0.978	0.988	0.990	0.964	0.952
88	QAF	0.955	0.984	0.974	0.944	0.985	0.982	0.980	0.970	0.985	0.984	0.962	0.966
89	SGH	0.973	0.983	0.965	0.927	0.989	0.973	0.975	0.952	0.985	0.985	0.967	0.936
90	SIE	0.951	0.985	0.978	0.944	0.986	0.983	0.980	0.969	0.985	0.982	0.964	0.954
91	SLIAN	0.952	0.993	0.988	0.897	0.994	0.988	0.988	0.981	0.989	0.989	0.980	0.969
92	SMM	0.950	0.984	0.974	0.942	0.986	0.982	0.980	0.969	0.934	0.982	0.890	0.954
93	SNTK	0.931	0.993	0.981	0.950	0.995	0.992	0.977	0.976	0.969	0.993	0.962	0.953
94	SPE	0.941	0.990	0.976	0.914	0.991	0.974	0.988	0.971	0.989	0.989	0.966	0.940
95	SPH	0.951	0.984	0.974	0.944	0.986	0.982	0.981	0.970	0.985	0.982	0.963	0.953
96	STE	0.961	0.990	0.982	0.963	0.985	0.981	0.981	0.971	0.985	0.983	0.971	0.958
97	SUNL	0.900	0.990	0.993	0.895	0.993	0.981	0.986	0.971	0.988	0.980	0.989	0.975
98	SUNN	0.877	0.840	0.905	0.888	0.929	0.951	0.970	0.913	0.995	0.993	0.873	0.884
99	SUTL	0.914	0.994	0.978	0.947	0.986	0.980	0.980	0.971	0.984	0.987	0.934	0.853
100	TECK	0.957	0.982	0.987	0.956	0.988	0.982	0.967	0.968	0.987	0.967	0.943	0.924
101	TMC	0.950	0.983	0.973	0.943	0.986	0.982	0.980	0.970	0.986	0.981	0.987	0.979
102	TOYO	0.898	0.962	0.932	0.864	0.964	0.960	0.974	0.945	0.982	0.969	0.900	0.861
103	TREK	0.964	0.991	0.965	0.871	0.984	0.965	0.977	0.960	0.975	0.984	0.972	0.942
104	TSE	0.927	0.981	0.953	0.927	0.992	0.988	0.986	0.981	0.992	0.991	0.961	0.947
105	TSP	0.881	0.985	0.974	0.896	0.982	0.971	0.980	0.972	0.981	0.987	0.939	0.929
106	UMS	0.923	0.978	0.976	0.954	0.986	0.985	0.985	0.969	0.986	0.974	0.954	0.897
107	UMSH	0.863	0.960	0.910	0.877	0.984	0.953	0.956	0.895	0.990	0.982	0.945	0.849
108	USH	0.950	0.993	0.969	0.871	0.975	0.963	0.959	0.894	0.962	0.979	0.955	0.899
109	VCM	0.951	0.984	0.975	0.945	0.986	0.982	0.980	0.971	0.985	0.980	0.965	0.954
110	VIB	0.968	0.994	0.989	0.946	0.991	0.986	0.989	0.981	0.986	0.991	0.964	0.954
111	WIL	0.950	0.983	0.973	0.943	0.985	0.982	0.980	0.969	0.985	0.980	0.963	0.952
112	YHI	0.980	0.986	0.937	0.974	0.985	0.970	0.947	0.937	0.965	0.960	0.910	0.926
113	YHS	0.860	0.896	0.860	0.870	0.934	0.983	0.959	0.909	0.933	0.941	0.976	0.828
114	YPG	0.915	0.995	0.974	0.966	0.985	0.982	0.975	0.956	0.985	0.981	0.964	0.953

Table B.1.5: Profitability efficiency scores of Thailand's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	ACC	0.424	0.452	0.538	0.505	0.873	0.368	0.889	0.927	0.492	0.672	0.764	0.452
2	AFC	0.792	0.773	0.815	0.797	0.751	0.836	0.816	0.730	0.695	0.792	0.820	0.773
3	AH	0.838	0.864	0.767	0.811	0.784	0.896	0.875	0.851	0.792	0.834	0.875	0.864
4	AJ	0.857	0.823	0.866	0.867	0.841	0.818	0.792	0.787	0.800	0.832	0.838	0.823
5	ALUCON	0.879	0.853	0.937	0.758	0.843	0.901	0.890	0.833	0.796	0.953	0.934	0.853
6	AMARIN	0.861	0.728	0.877	0.758	0.780	0.896	0.865	0.716	0.629	0.706	0.751	0.728
7	AMC	0.896	0.927	0.897	0.841	0.909	0.952	0.936	0.860	0.869	0.904	0.951	0.927
8	APURE	0.894	0.832	0.869	0.758	0.804	0.902	0.828	0.841	0.808	0.873	0.848	0.832
9	ASIMAR	0.816	0.830	0.717	0.746	0.830	0.877	0.912	0.853	0.912	0.865	0.868	0.830
10	BANPU	0.735	0.944	0.884	0.855	0.880	0.906	0.891	0.899	0.870	0.863	0.943	0.944
11	BAT3K	0.896	0.931	0.849	0.802	0.808	0.799	0.857	0.840	0.844	0.828	0.898	0.931
12	BCP	0.904	0.901	0.885	0.861	0.877	0.908	0.892	0.896	0.871	0.888	0.901	0.901
13	BJC	0.838	0.886	0.883	0.855	0.855	0.943	0.933	0.923	0.897	0.811	0.897	0.886
14	BR	0.887	0.835	0.909	0.885	0.879	0.920	0.944	0.939	0.822	0.836	0.887	0.835
15	BSBM	0.912	0.912	0.890	0.635	0.820	0.865	0.899	0.819	0.748	0.915	0.955	0.912
16	CCP	0.915	0.820	0.880	0.837	0.907	0.974	0.944	0.867	0.794	0.814	0.795	0.820
17	CEN	0.800	0.697	0.728	0.596	0.690	0.729	0.696	0.809	0.686	0.717	0.674	0.697
18	CFRESH	0.816	0.897	0.859	0.827	0.794	0.921	0.872	0.934	0.884	0.880	0.921	0.897
19	CHOTI	0.854	0.849	0.902	0.864	0.836	0.939	0.902	0.844	0.806	0.908	0.926	0.849
20	CIG	0.887	0.752	0.665	0.673	0.726	0.775	0.846	0.730	0.750	0.717	0.700	0.752
21	CITY	0.832	0.808	0.892	0.699	0.818	0.898	0.866	0.903	0.903	0.827	0.846	0.808
22	CM	0.808	0.791	0.856	0.729	0.693	0.849	0.813	0.810	0.835	0.886	0.840	0.791
23	CPF	0.910	0.906	0.914	0.880	0.882	0.931	0.933	0.936	0.891	0.889	0.909	0.906
24	CPH	0.785	0.829	0.756	0.668	0.639	0.782	0.719	0.788	0.783	0.790	0.732	0.829
25	CPI	0.883	0.827	0.868	0.818	0.828	0.868	0.850	0.888	0.806	0.830	0.873	0.827
26	CPL	0.802	0.856	0.862	0.854	0.778	0.856	0.870	0.904	0.838	0.792	0.795	0.856
27	CPR	0.781	0.900	0.788	0.755	0.711	0.851	0.825	0.847	0.858	0.896	0.940	0.900
28	CSC	0.810	0.865	0.855	0.766	0.757	0.838	0.844	0.819	0.768	0.872	0.815	0.865
29	CSP	0.910	0.916	0.835	0.862	0.897	0.908	0.900	0.935	0.909	0.907	0.883	0.916
30	CTW	0.886	0.855	0.773	0.804	0.784	0.880	0.846	0.812	0.755	0.836	0.891	0.855
31	CWT	0.721	0.825	0.768	0.717	0.745	0.855	0.753	0.782	0.793	0.791	0.824	0.825
32	DCC	0.923	0.915	0.888	0.880	0.886	0.910	0.897	0.896	0.876	0.904	0.926	0.915
33	DCON	0.774	0.841	0.791	0.775	0.783	0.872	0.899	0.908	0.894	0.852	0.904	0.841
34	DEMCO	0.951	0.761	0.806	0.803	0.853	0.974	0.841	0.790	0.637	0.781	0.812	0.761
35	DRT	0.926	0.921	0.880	0.833	0.852	0.908	0.879	0.838	0.819	0.869	0.945	0.921
36	DTCI	0.882	0.894	0.832	0.793	0.821	0.927	0.934	0.945	0.958	0.885	0.925	0.894
37	EASON	0.887	0.777	0.756	0.743	0.747	0.818	0.815	0.921	0.777	0.811	0.842	0.777
38	EE	0.572	0.889	0.499	0.861	0.876	0.903	0.889	0.893	0.870	0.889	0.900	0.889
39	EIC	0.718	0.813	0.662	0.828	0.724	0.678	0.787	0.536	0.447	0.749	0.584	0.813
40	EPCO	0.894	0.889	0.899	0.730	0.826	0.748	0.765	0.893	0.897	0.710	0.928	0.889
41	FND	0.773	0.751	0.823	0.715	0.749	0.788	0.710	0.705	0.638	0.726	0.713	0.751
42	FANCY	0.701	0.544	0.801	0.641	0.523	0.524	0.445	0.484	0.639	0.608	0.635	0.544
43	GEL	0.846	0.686	0.633	0.626	0.627	0.712	0.673	0.762	0.632	0.769	0.738	0.686
44	GFPT	0.859	0.821	0.915	0.852	0.875	0.872	0.878	0.881	0.799	0.859	0.906	0.821
45	GJS	0.819	0.877	0.568	0.658	0.788	0.606	0.631	0.768	0.670	0.788	0.882	0.877
46	GSTEL	0.900	0.880	0.728	0.727	0.813	0.525	0.459	0.769	0.707	0.813	0.903	0.880
47	GYT	0.743	0.723	0.772	0.673	0.688	0.776	0.801	0.797	0.783	0.826	0.813	0.723
48	HANA	0.909	0.874	0.896	0.866	0.851	0.874	0.829	0.907	0.829	0.871	0.905	0.874
49	HFT	0.806	0.803	0.855	0.769	0.778	0.841	0.880	0.890	0.855	0.876	0.869	0.803
50	HTC	0.870	0.927	0.831	0.749	0.768	0.812	0.783	0.882	0.786	0.833	0.913	0.927
51	ICC	0.792	0.791	0.781	0.745	0.720	0.777	0.825	0.780	0.797	0.895	0.818	0.791
52	IHL	0.893	0.889	0.907	0.892	0.890	0.971	0.915	0.884	0.848	0.905	0.917	0.889
53	ILINK	0.912	0.845	0.885	0.801	0.801	0.888	0.828	0.853	0.845	0.842	0.821	0.845
54	INOX	0.813	0.898	0.716	0.742	0.791	0.857	0.781	0.813	0.730	0.833	0.932	0.898
55	IRC	0.903	0.853	0.891	0.839	0.815	0.907	0.909	0.890	0.850	0.896	0.899	0.853
56	IRPC	0.891	0.889	0.887	0.865	0.898	0.905	0.893	0.893	0.872	0.918	0.902	0.889
57	JCT	0.904	0.827	0.910	0.805	0.772	0.830	0.808	0.933	0.833	0.808	0.823	0.827
58	KAMART	0.494	0.887	0.546	0.573	0.898	0.913	0.905	0.918	0.877	0.892	0.902	0.887
59	KASET	0.917	0.927	0.906	0.837	0.798	0.775	0.873	0.868	0.855	0.889	0.913	0.927
60	KCE	0.873	0.830	0.820	0.842	0.788	0.802	0.880	0.923	0.876	0.889	0.926	0.830

61	KKC	0.893	0.809	0.909	0.887	0.869	0.932	0.941	0.936	0.875	0.852	0.854	0.809
62	KSL	0.842	0.772	0.822	0.728	0.896	0.944	0.833	0.881	0.790	0.825	0.798	0.772
63	KYE	0.827	0.805	0.816	0.799	0.803	0.844	0.817	0.812	0.751	0.805	0.828	0.805
64	LNE	0.892	0.927	0.843	0.836	0.868	0.895	0.885	0.835	0.843	0.850	0.849	0.927
65	LANNA	0.936	0.921	0.889	0.912	0.896	0.929	0.940	0.916	0.826	0.821	0.925	0.921
66	LEE	0.888	0.805	0.868	0.816	0.794	0.874	0.869	0.867	0.812	0.837	0.859	0.805
67	LST	0.890	0.880	0.868	0.840	0.858	0.891	0.871	0.881	0.820	0.850	0.915	0.880
68	LTX	0.832	0.857	0.838	0.746	0.796	0.872	0.840	0.859	0.798	0.827	0.918	0.857
69	MALEE	0.888	0.948	0.910	0.883	0.913	0.904	0.904	0.908	0.901	0.900	0.950	0.948
70	MATI	0.828	0.689	0.780	0.705	0.704	0.733	0.759	0.709	0.617	0.648	0.712	0.689
71	MBAX	0.917	0.909	0.877	0.795	0.872	0.972	0.939	0.959	0.906	0.895	0.948	0.909
72	MCS	0.936	0.934	0.927	0.845	0.792	0.736	0.820	0.785	0.854	0.890	0.958	0.934
73	METCO	0.897	0.858	0.838	0.870	0.841	0.804	0.821	0.904	0.887	0.899	0.915	0.858
74	MILL	0.891	0.886	0.911	0.887	0.887	0.962	0.944	0.840	0.788	0.884	0.932	0.886
75	MODERN	0.782	0.745	0.757	0.751	0.764	0.822	0.825	0.931	0.764	0.692	0.775	0.745
76	NEP	0.544	0.608	0.516	0.349	0.349	0.904	0.479	0.563	0.549	0.599	0.630	0.608
77	NMG	0.938	0.847	0.850	0.823	0.847	0.863	0.756	0.761	0.719	0.505	0.826	0.847
78	NPK	0.887	0.882	0.882	0.859	0.874	0.901	0.889	0.892	0.869	0.891	0.943	0.882
79	OCC	0.894	0.896	0.894	0.896	0.894	0.916	0.911	0.911	0.926	0.915	0.870	0.896
80	OGC	0.759	0.749	0.699	0.682	0.705	0.725	0.727	0.781	0.821	0.780	0.804	0.749
81	PAF	0.875	0.856	0.832	0.625	0.743	0.901	0.889	0.903	0.869	0.886	0.799	0.856
82	PAP	0.848	0.913	0.819	0.795	0.830	0.928	0.938	0.903	0.831	0.889	0.917	0.913
83	PATO	0.946	0.907	0.911	0.904	0.904	0.849	0.909	0.906	0.930	0.920	0.901	0.907
84	PB	0.878	0.896	0.845	0.797	0.822	0.881	0.867	0.863	0.878	0.910	0.911	0.896
85	PDJ	0.829	0.830	0.783	0.760	0.748	0.815	0.727	0.732	0.707	0.694	0.761	0.830
86	PERM	0.849	0.880	0.798	0.847	0.882	0.936	0.910	0.927	0.881	0.887	0.911	0.880
87	PK	0.874	0.866	0.884	0.858	0.873	0.946	0.950	0.905	0.826	0.823	0.909	0.866
88	POST	0.807	0.811	0.751	0.784	0.821	0.881	0.863	0.802	0.728	0.730	0.759	0.811
89	PRG	0.741	0.686	0.770	0.571	0.727	0.589	0.606	0.725	0.721	0.743	0.698	0.686
90	PTL	0.865	0.898	0.877	0.862	0.852	0.787	0.740	0.797	0.806	0.843	0.904	0.898
91	PTT	0.889	0.885	0.883	0.858	0.872	0.901	0.889	0.892	0.869	0.888	0.896	0.885
92	PTTEP	0.889	0.887	0.886	0.860	0.875	0.900	0.890	0.893	0.871	0.888	0.900	0.887
93	QCON	0.887	0.797	0.762	0.670	0.711	0.937	0.853	0.818	0.714	0.705	0.754	0.797
94	RCI	0.755	0.865	0.740	0.750	0.796	0.928	0.837	0.794	0.698	0.773	0.678	0.865
95	RICH	0.899	0.886	0.881	0.859	0.755	0.951	0.898	0.795	0.874	0.889	0.898	0.886
96	ROCK	0.916	0.793	0.817	0.878	0.866	0.833	0.857	0.791	0.789	0.831	0.726	0.793
97	RPC	0.889	0.824	0.885	0.861	0.874	0.917	0.812	0.784	0.751	0.763	0.786	0.824
98	SNJ	0.814	0.832	0.802	0.767	0.762	0.781	0.764	0.750	0.728	0.757	0.820	0.832
99	SALEE	0.778	0.738	0.816	0.777	0.781	0.951	0.948	0.867	0.770	0.794	0.793	0.738
100	SAM	0.876	0.790	0.882	0.787	0.777	0.897	0.830	0.802	0.774	0.832	0.791	0.790
101	SAT	0.909	0.822	0.868	0.787	0.802	0.924	0.872	0.808	0.797	0.845	0.872	0.822
102	SAUCE	0.918	0.910	0.907	0.837	0.863	0.942	0.897	0.884	0.855	0.874	0.908	0.910
103	SAWANG	0.413	0.723	0.711	0.657	0.834	0.759	0.852	0.821	0.795	0.730	0.663	0.723
104	SCC	0.904	0.888	0.891	0.871	0.832	0.915	0.894	0.894	0.869	0.889	0.900	0.888
105	SCCC	0.908	0.942	0.934	0.877	0.919	0.919	0.896	0.894	0.874	0.907	0.963	0.942
106	SCP	0.919	0.864	0.834	0.810	0.865	0.957	0.911	0.893	0.891	0.935	0.907	0.864
107	SEED	0.907	0.957	0.900	0.884	0.894	0.930	0.926	0.918	0.904	0.922	0.958	0.957
108	SFP	0.743	0.728	0.829	0.621	0.794	0.767	0.640	0.759	0.777	0.805	0.867	0.728
109	SIAM	0.813	0.841	0.718	0.741	0.760	0.739	0.616	0.704	0.679	0.679	0.703	0.841
110	SITHAI	0.734	0.837	0.751	0.724	0.761	0.861	0.841	0.835	0.801	0.804	0.831	0.837
111	SMM	0.735	0.651	0.781	0.730	0.737	0.841	0.797	0.793	0.721	0.587	0.749	0.651
112	SNC	0.863	0.891	0.884	0.884	0.874	0.953	0.924	0.925	0.852	0.872	0.930	0.891
113	SORKON	0.893	0.934	0.938	0.854	0.898	0.901	0.886	0.886	0.908	0.868	0.898	0.934
114	SPACK	0.890	0.878	0.901	0.823	0.806	0.868	0.777	0.781	0.803	0.820	0.804	0.878
115	SPC	0.904	0.949	0.906	0.940	0.847	0.903	0.923	0.888	0.848	0.910	0.936	0.949
116	SPG	0.853	0.819	0.936	0.729	0.837	0.899	0.873	0.859	0.848	0.931	0.903	0.819
117	SPORT	0.864	0.883	0.839	0.844	0.846	0.610	0.900	0.838	0.843	0.775	0.922	0.883
118	SSC	0.929	0.826	0.929	0.935	0.849	0.923	0.759	0.791	0.729	0.813	0.811	0.826
119	SSF	0.856	0.862	0.896	0.808	0.855	0.940	0.888	0.885	0.843	0.880	0.894	0.862
120	SSI	0.936	0.887	0.899	0.908	0.812	0.797	0.897	0.935	0.867	0.886	0.899	0.887
121	SSSC	0.921	0.856	0.845	0.844	0.861	0.967	0.933	0.893	0.819	0.916	0.895	0.856
122	STANLY	0.910	0.847	0.904	0.795	0.782	0.946	0.857	0.798	0.758	0.853	0.895	0.847
123	STHAI	0.860	0.615	0.891	0.857	0.873	0.900	0.888	0.892	0.794	0.757	0.601	0.615

124	STPI	0.782	0.427	0.884	0.856	0.748	0.899	0.887	0.892	0.867	0.909	0.232	0.427
125	SUC	0.738	0.742	0.784	0.686	0.731	0.771	0.725	0.734	0.739	0.809	0.820	0.742
126	SVI	0.878	0.888	0.901	0.857	0.947	0.903	0.890	0.759	0.879	0.807	0.869	0.888
127	SWC	0.923	0.900	0.883	0.842	0.839	0.936	0.943	0.960	0.889	0.935	0.923	0.900
128	TAPAC	0.876	0.851	0.863	0.822	0.832	0.922	0.817	0.854	0.832	0.885	0.914	0.851
129	TASCO	0.873	0.888	0.912	0.885	0.899	0.910	0.915	0.891	0.866	0.885	0.938	0.888
130	TBSP	0.884	0.819	0.818	0.761	0.788	0.865	0.801	0.843	0.867	0.885	0.898	0.819
131	TC	0.824	0.926	0.871	0.820	0.779	0.903	0.876	0.912	0.831	0.807	0.930	0.926
132	TCCC	0.910	0.863	0.946	0.913	0.906	0.951	0.897	0.917	0.842	0.895	0.919	0.863
133	TCJ	0.750	0.789	0.701	0.672	0.749	0.827	0.744	0.801	0.768	0.769	0.819	0.789
134	TCMC	0.765	0.946	0.772	0.664	0.525	0.918	0.700	0.811	0.800	0.841	0.905	0.946
135	TEAM	0.906	0.864	0.775	0.805	0.793	0.847	0.804	0.872	0.742	0.795	0.826	0.864
136	TFI	0.925	0.833	0.801	0.765	0.829	0.895	0.862	0.857	0.878	0.828	0.771	0.833
137	TGCI	0.663	0.749	0.799	0.812	0.769	0.796	0.756	0.801	0.784	0.782	0.818	0.749
138	TGPRO	0.942	0.740	0.883	0.856	0.873	0.811	0.744	0.772	0.669	0.735	0.778	0.740
139	TH	0.884	0.887	0.882	0.857	0.872	0.901	0.834	0.756	0.340	0.886	0.902	0.887
140	THIP	0.858	0.899	0.832	0.817	0.811	0.903	0.918	0.903	0.891	0.907	0.925	0.899
141	TIPCO	0.900	0.710	0.793	0.736	0.755	0.820	0.761	0.778	0.912	0.713	0.804	0.710
142	TIW	0.837	0.185	0.887	0.734	0.804	0.772	0.694	0.740	0.638	0.659	0.862	0.185
143	TKS	0.902	0.731	0.915	0.696	0.672	0.757	0.764	0.841	0.770	0.809	0.938	0.731
144	TKT	0.868	0.815	0.790	0.801	0.810	0.942	0.918	0.899	0.852	0.809	0.802	0.815
145	TMD	0.838	0.854	0.866	0.740	0.833	0.881	0.878	0.860	0.834	0.905	0.864	0.854
146	TMW	0.842	0.857	0.788	0.769	0.766	0.857	0.829	0.825	0.786	0.849	0.904	0.857
147	TNL	0.726	0.727	0.745	0.650	0.731	0.782	0.740	0.763	0.741	0.761	0.771	0.727
148	TNPC	0.805	0.847	0.757	0.770	0.776	0.938	0.880	0.804	0.774	0.846	0.842	0.847
149	TPA	0.850	0.820	0.813	0.805	0.805	0.893	0.853	0.857	0.872	0.841	0.896	0.820
150	TPAC	0.929	0.866	0.912	0.838	0.867	0.945	0.927	0.928	0.877	0.856	0.863	0.866
151	TPCORP	0.774	0.740	0.766	0.606	0.720	0.769	0.737	0.809	0.802	0.827	0.772	0.740
152	TPIPL	0.675	0.799	0.752	0.627	0.871	0.720	0.688	0.804	0.708	0.817	0.816	0.799
153	TPP	0.652	0.769	0.693	0.595	0.619	0.783	0.826	0.831	0.777	0.726	0.792	0.769
154	TR	0.888	0.898	0.867	0.780	0.758	0.797	0.649	0.652	0.720	0.892	0.926	0.898
155	TRT	0.913	0.858	0.903	0.774	0.815	0.798	0.868	0.778	0.750	0.815	0.796	0.858
156	TRU	0.686	0.767	0.629	0.621	0.713	0.854	0.807	0.745	0.737	0.751	0.784	0.767
157	TRUBB	0.931	0.877	0.926	0.901	0.897	0.904	0.890	0.916	0.876	0.837	0.905	0.877
158	TSC	0.850	0.882	0.821	0.788	0.753	0.828	0.839	0.806	0.806	0.822	0.873	0.882
159	TSTH	0.950	0.935	0.868	0.816	0.831	0.888	0.889	0.853	0.767	0.830	0.940	0.935
160	TTI	0.818	0.752	0.768	0.764	0.769	0.832	0.842	0.814	0.823	0.831	0.726	0.752
161	TTL	0.691	0.887	0.749	0.622	0.745	0.902	0.519	0.892	0.869	0.887	0.900	0.887
162	TTTM	0.810	0.742	0.820	0.763	0.747	0.824	0.843	0.754	0.727	0.751	0.748	0.742
163	TU	0.951	0.941	0.919	0.886	0.930	0.942	0.916	0.946	0.930	0.926	0.946	0.941
164	TVO	0.895	0.887	0.895	0.925	0.883	0.917	0.936	0.894	0.879	0.886	0.900	0.887
165	TYCN	0.804	0.859	0.572	0.666	0.813	0.821	0.820	0.777	0.721	0.827	0.940	0.859
166	UBIS	0.921	0.894	0.935	0.884	0.925	0.941	0.943	0.909	0.887	0.931	0.920	0.894
167	UMI	0.746	0.773	0.818	0.762	0.792	0.814	0.779	0.698	0.739	0.744	0.787	0.773
168	UP	0.828	0.743	0.731	0.787	0.712	0.857	0.828	0.795	0.802	0.766	0.756	0.743
169	UPF	0.853	0.874	0.922	0.828	0.782	0.885	0.891	0.860	0.886	0.915	0.907	0.874
170	UPOIC	0.892	0.758	0.917	0.765	0.885	0.914	0.887	0.905	0.720	0.877	0.745	0.758
171	UT	0.785	0.763	0.674	0.716	0.664	0.536	0.658	0.739	0.731	0.732	0.732	0.763
172	UTP	0.866	0.887	0.836	0.707	0.818	0.895	0.919	0.867	0.758	0.913	0.928	0.887
173	UVAN	0.892	0.888	0.891	0.902	0.873	0.910	0.919	0.909	0.814	0.889	0.927	0.888
174	VARO	0.910	0.819	0.823	0.705	0.785	0.798	0.751	0.789	0.738	0.819	0.821	0.819
175	VNG	0.782	0.761	0.774	0.801	0.788	0.829	0.758	0.831	0.839	0.866	0.896	0.761
176	VNT	0.821	0.894	0.866	0.773	0.889	0.928	0.813	0.825	0.777	0.838	0.935	0.894
177	WACOAL	0.724	0.748	0.797	0.611	0.734	0.773	0.725	0.771	0.768	0.776	0.814	0.748
178	WIIK	0.710	0.791	0.757	0.613	0.707	0.821	0.814	0.817	0.852	0.852	0.828	0.791
179	YCI	0.786	0.888	0.884	0.859	0.872	0.901	0.888	0.892	0.868	0.889	0.901	0.888
180	YUASA	0.856	0.904	0.907	0.865	0.868	0.887	0.908	0.923	0.897	0.893	0.905	0.904

Table B.1.6: Profitability efficiency scores of Vietnam's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	ABT	0.847	0.919	0.794	0.860	0.954	0.886	0.853	0.860	0.902	0.807	0.769	0.808
2	ACL	0.947	0.931	0.894	0.940	0.970	0.925	0.909	0.844	0.911	0.903	0.917	0.943
3	AGF	0.895	0.882	0.707	0.840	0.912	0.934	0.905	0.883	0.820	0.854	0.837	0.779
4	ANV	0.976	0.863	0.652	0.708	0.735	0.773	0.816	0.795	0.790	0.785	0.857	0.913
5	BBC	0.892	0.779	0.767	0.805	0.856	0.833	0.886	0.880	0.887	0.790	0.797	0.802
6	BBS	0.927	0.879	0.875	0.917	0.944	0.972	0.963	0.950	0.933	0.897	0.903	0.926
7	BCC	0.900	0.885	0.845	0.899	0.980	0.986	0.947	0.922	0.881	0.832	0.807	0.818
8	BMP	0.959	0.935	0.944	0.933	0.970	0.953	0.939	0.940	0.950	0.950	0.927	0.921
9	BPC	0.882	0.920	0.830	0.918	0.935	0.935	0.940	0.911	0.904	0.905	0.928	0.884
10	BT6	0.942	0.905	0.818	0.878	0.926	0.925	0.884	0.817	0.789	0.680	0.696	0.682
11	BTS	0.857	0.853	0.837	0.755	0.941	0.944	0.958	0.878	0.847	0.838	0.873	0.844
12	CAN	0.951	0.943	0.919	0.971	0.955	0.974	0.963	0.965	0.947	0.877	0.868	0.894
13	CLC	0.970	0.954	0.943	0.964	0.966	0.976	0.942	0.937	0.954	0.938	0.953	0.943
14	CTB	0.936	0.816	0.859	0.947	0.932	0.945	0.962	0.891	0.931	0.928	0.885	0.961
15	DAE	0.952	0.836	0.893	0.961	0.968	0.968	0.941	0.948	0.950	0.939	0.949	0.933
16	DCS	0.943	0.741	0.933	0.897	0.824	0.754	0.744	0.918	0.926	0.910	0.694	0.620
17	DHG	0.944	0.914	0.906	0.933	0.940	0.938	0.941	0.930	0.947	0.928	0.900	0.910
18	DMC	0.905	0.907	0.849	0.907	0.913	0.932	0.921	0.931	0.888	0.878	0.909	0.891
19	DNP	0.961	0.874	0.824	0.945	0.945	0.952	0.962	0.945	0.921	0.899	0.777	0.731
20	DPC	0.928	0.822	0.861	0.933	0.945	0.919	0.915	0.912	0.901	0.883	0.905	0.884
21	DPM	0.944	0.916	0.917	0.940	0.932	0.953	0.942	0.870	0.933	0.850	0.796	0.798
22	DPR	0.962	0.934	0.934	0.928	0.934	0.935	0.941	0.934	0.871	0.857	0.919	0.904
23	DRC	0.982	0.951	0.905	0.956	0.945	0.972	0.949	0.941	0.960	0.930	0.864	0.855
24	DST	0.944	0.915	0.903	0.929	0.933	0.936	0.939	0.929	0.818	0.807	0.740	0.908
25	DTT	0.761	0.764	0.724	0.786	0.715	0.668	0.824	0.836	0.823	0.793	0.789	0.738
26	EBS	0.981	0.789	0.771	0.725	0.722	0.798	0.805	0.817	0.837	0.809	0.834	0.839
27	FMC	0.942	0.931	0.886	0.941	0.939	0.976	0.962	0.957	0.965	0.916	0.936	0.936
28	GIL	0.860	0.837	0.773	0.776	0.884	0.909	0.863	0.891	0.887	0.905	0.950	0.916
29	GMC	0.946	0.941	0.870	0.938	0.961	0.963	0.948	0.958	0.956	0.945	0.935	0.961
30	GTA	0.845	0.726	0.784	0.887	0.889	0.933	0.916	0.929	0.889	0.834	0.890	0.887
31	HAI	0.928	0.861	0.795	0.900	0.886	0.889	0.899	0.862	0.768	0.746	0.740	0.641
32	HAP	0.651	0.655	0.674	0.690	0.628	0.717	0.733	0.738	0.739	0.795	0.772	0.771
33	HCC	0.945	0.915	0.904	0.929	0.933	0.935	0.954	0.932	0.928	0.911	0.940	0.923
34	HEV	0.953	0.936	0.905	0.930	0.932	0.935	0.941	0.931	0.930	0.917	0.923	0.927
35	HHC	0.929	0.905	0.886	0.928	0.910	0.930	0.936	0.923	0.913	0.859	0.852	0.861
36	HLY	0.945	0.916	0.905	0.950	0.963	0.905	0.950	0.924	0.979	0.899	0.935	0.830
37	HNM	0.882	0.812	0.797	0.819	0.839	0.767	0.839	0.804	0.833	0.799	0.725	0.791
38	HPG	0.944	0.916	0.905	0.930	0.934	0.936	0.941	0.931	0.925	0.909	0.909	0.904
39	HRC	0.946	0.948	0.813	0.875	0.882	0.815	0.893	0.932	0.930	0.767	0.811	0.736
40	HT1	0.911	0.894	0.857	0.894	0.959	0.971	0.945	0.887	0.960	0.847	0.858	0.861
41	HTP	0.944	0.917	0.907	0.929	0.932	0.936	0.942	0.932	0.931	0.911	0.911	0.904
42	IMP	0.892	0.883	0.824	0.899	0.962	0.919	0.944	0.884	0.974	0.862	0.857	0.879
43	KDC	0.776	0.826	0.891	0.848	0.871	0.965	0.949	0.883	0.927	0.909	0.728	0.704
44	L10	0.901	0.890	0.871	0.939	0.986	0.984	0.980	0.951	0.931	0.913	0.944	0.949
45	LAF	0.974	0.905	0.875	0.944	0.890	0.851	0.951	0.946	0.950	0.926	0.915	0.835
46	LBM	0.823	0.869	0.777	0.829	0.878	0.878	0.881	0.870	0.938	0.946	0.907	0.927
47	MCP	0.919	0.881	0.832	0.906	0.951	0.917	0.927	0.855	0.862	0.896	0.841	0.864
48	MEC	0.935	0.979	0.864	0.934	0.977	0.986	0.942	0.803	0.828	0.794	0.867	0.693
49	NAV	0.961	0.846	0.798	0.867	0.894	0.835	0.856	0.873	0.828	0.664	0.733	0.723
50	NBC	0.962	0.951	0.928	0.933	0.946	0.960	0.956	0.941	0.904	0.867	0.964	0.978
51	NHC	0.943	0.915	0.903	0.927	0.899	0.889	0.921	0.938	0.955	0.929	0.946	0.915
52	NSC	0.923	0.838	0.829	0.917	0.939	0.945	0.965	0.911	0.919	0.898	0.901	0.881
53	NST	0.971	0.918	0.912	0.961	0.972	0.965	0.978	0.916	0.973	0.902	0.902	0.893
54	NTP	0.965	0.941	0.939	0.955	0.976	0.976	0.957	0.913	0.924	0.886	0.865	0.849
55	PAC	0.980	0.953	0.938	0.972	0.948	0.936	0.922	0.930	0.937	0.928	0.924	0.948
56	PLC	0.963	0.953	0.925	0.939	0.960	0.969	0.964	0.949	0.946	0.886	0.904	0.921
57	PNC	0.866	0.839	0.820	0.900	0.943	0.962	0.949	0.932	0.937	0.927	0.912	0.907
58	POT	0.918	0.834	0.762	0.837	0.816	0.813	0.818	0.777	0.928	0.904	0.940	0.939
59	PVC	0.824	0.796	0.720	0.853	0.896	0.983	0.936	0.973	0.924	0.847	0.877	0.829
60	RAL	0.915	0.900	0.829	0.912	0.981	0.979	0.940	0.966	0.941	0.944	0.943	0.941

61	REE	0.830	0.885	0.908	0.826	0.750	0.856	0.942	0.932	0.949	0.913	0.926	0.906
62	S55	0.971	0.827	0.817	0.925	0.937	0.942	0.929	0.897	0.927	0.794	0.951	0.844
63	SAF	0.950	0.917	0.911	0.929	0.937	0.936	0.941	0.930	0.927	0.909	0.911	0.903
64	SAM	0.816	0.905	0.932	0.685	0.593	0.728	0.795	0.842	0.884	0.724	0.734	0.739
65	SAP	0.949	0.900	0.938	0.946	0.922	0.935	0.941	0.931	0.928	0.912	0.912	0.905
66	SAV	0.800	0.820	0.751	0.764	0.784	0.826	0.818	0.818	0.774	0.800	0.837	0.856
67	SCD	0.947	0.900	0.899	0.929	0.900	0.875	0.896	0.865	0.818	0.836	0.766	0.768
68	SCJ	0.949	0.930	0.914	0.894	0.760	0.806	0.930	0.956	0.771	0.689	0.846	0.927
69	SDN	0.965	0.872	0.871	0.957	0.969	0.936	0.941	0.934	0.935	0.917	0.930	0.937
70	SFN	0.947	0.893	0.920	0.956	0.964	0.975	0.974	0.932	0.935	0.916	0.939	0.933
71	SGC	0.946	0.833	0.873	0.907	0.945	0.907	0.932	0.934	0.926	0.936	0.947	0.918
72	SGD	0.974	0.883	0.788	0.852	0.872	0.920	0.887	0.890	0.837	0.852	0.876	0.879
73	SJ1	0.888	0.825	0.753	0.886	0.893	0.920	0.920	0.897	0.893	0.878	0.907	0.915
74	SMC	0.946	0.920	0.908	0.931	0.934	0.936	0.943	0.931	0.928	0.910	0.911	0.905
75	SSC	0.920	0.899	0.892	0.949	0.949	0.937	0.908	0.907	0.865	0.841	0.886	0.905
76	STP	0.910	0.861	0.874	0.862	0.872	0.825	0.899	0.876	0.856	0.848	0.839	0.821
77	TAC	0.948	0.923	0.906	0.930	0.939	0.956	0.944	0.933	0.957	0.911	0.930	0.938
78	TCM	0.971	0.882	0.825	0.947	0.926	0.903	0.941	0.912	0.882	0.879	0.912	0.904
79	TCR	0.920	0.858	0.758	0.843	0.877	0.860	0.858	0.888	0.898	0.819	0.792	0.795
80	TKU	0.896	0.873	0.849	0.906	0.882	0.905	0.944	0.914	0.853	0.890	0.846	0.833
81	TNC	0.902	0.732	0.874	0.878	0.933	0.867	0.955	0.667	0.671	0.914	0.927	0.929
82	TNG	0.960	0.965	0.936	0.945	0.963	0.980	0.980	0.969	0.954	0.923	0.963	0.968
83	TPC	0.743	0.828	0.849	0.846	0.832	0.838	0.890	0.861	0.878	0.817	0.836	0.828
84	TPH	0.937	0.746	0.839	0.885	0.825	0.809	0.797	0.814	0.907	0.908	0.879	0.832
85	TRC	0.960	0.919	0.906	0.951	0.941	0.940	0.942	0.934	0.807	0.794	0.914	0.858
86	TS4	0.839	0.755	0.850	0.874	0.930	0.929	0.905	0.834	0.868	0.868	0.910	0.915
87	TSC	0.946	0.915	0.940	0.934	0.930	0.953	0.914	0.861	0.787	0.712	0.730	0.712
88	TST	0.825	0.790	0.795	0.900	0.896	0.648	0.790	0.790	0.793	0.792	0.837	0.759
89	TTC	0.962	0.881	0.818	0.875	0.933	0.969	0.947	0.932	0.941	0.915	0.910	0.897
90	TXM	0.973	0.835	0.787	0.850	0.908	0.929	0.930	0.938	0.928	0.904	0.877	0.874
91	TYA	0.932	0.837	0.871	0.942	0.951	0.916	0.913	0.926	0.954	0.902	0.915	0.923
92	UNI	0.952	0.697	0.786	0.867	0.747	0.959	0.799	0.817	0.922	0.812	0.908	0.902
93	VCS	0.948	0.902	0.875	0.809	0.769	0.905	0.912	0.939	0.935	0.909	0.909	0.904
94	VDL	0.970	0.949	0.843	0.924	0.962	0.967	0.946	0.942	0.926	0.914	0.945	0.939
95	VHC	0.970	0.950	0.902	0.920	0.960	0.919	0.914	0.913	0.923	0.938	0.917	0.911
96	VID	0.888	0.862	0.836	0.913	0.903	0.878	0.762	0.590	0.560	0.713	0.727	0.785
97	VIS	0.979	0.935	0.904	0.948	0.962	0.972	0.947	0.931	0.897	0.917	0.910	0.930
98	VNM	0.945	0.921	0.905	0.928	0.931	0.935	0.940	0.929	0.926	0.908	0.908	0.901
99	VPK	0.881	0.849	0.839	0.926	0.972	0.950	0.968	0.898	0.857	0.755	0.657	0.564
100	VTB	0.866	0.731	0.739	0.762	0.703	0.787	0.798	0.796	0.799	0.852	0.908	0.853
101	VTL	0.979	0.851	0.853	0.942	0.947	0.954	0.934	0.903	0.951	0.932	0.881	0.857
102	VTS	0.970	0.916	0.903	0.950	0.916	0.837	0.791	0.822	0.793	0.814	0.787	0.753

B.2 Marketability efficiency scores of individual listed manufacturers of each ASEAN-6 country

Table B.2.1: Marketability efficiency scores of Indonesia's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	AALI	0.961	0.924	0.906	0.957	0.875	0.969	0.964	0.972	0.314	0.327	0.357	0.361
2	ADES	0.962	0.904	0.915	0.975	0.853	0.968	0.948	0.952	0.601	0.534	0.578	0.595
3	ADMG	0.949	0.882	0.835	0.932	0.801	0.942	0.948	0.947	0.317	0.331	0.387	0.387
4	AISA	0.949	0.871	0.828	0.940	0.796	0.946	0.951	0.953	0.327	0.328	0.463	0.475
5	AKPI	0.951	0.884	0.841	0.935	0.790	0.959	0.954	0.956	0.330	0.342	0.369	0.350
6	ALKA	0.950	0.882	0.832	0.929	0.810	0.965	0.953	0.955	0.585	0.474	0.370	0.360
7	ALMI	0.952	0.882	0.835	0.936	0.795	0.946	0.952	0.953	0.312	0.311	0.358	0.365
8	APLI	0.940	0.868	0.816	0.964	0.814	0.966	0.971	0.967	0.772	0.739	0.738	0.718
9	ARGO	0.912	0.840	0.818	0.930	0.878	0.941	0.965	0.898	0.612	0.542	0.635	0.628
10	ARNA	0.948	0.880	0.832	0.929	0.787	0.959	0.950	0.952	0.449	0.493	0.461	0.434
11	ATPK	0.962	0.912	0.888	0.974	0.913	0.980	0.954	0.952	0.751	0.768	0.705	0.785
12	AUTO	0.947	0.891	0.849	0.937	0.807	0.935	0.945	0.943	0.338	0.349	0.359	0.358
13	BATA	0.949	0.885	0.832	0.940	0.780	0.963	0.952	0.955	0.497	0.500	0.540	0.547
14	BIMA	0.948	0.856	0.843	0.965	0.866	0.971	0.965	0.970	0.788	0.823	0.836	0.844
15	BISI	0.950	0.872	0.901	0.971	0.775	0.963	0.952	0.954	0.448	0.496	0.445	0.447
16	BNBR	0.953	0.911	0.888	0.958	0.799	0.930	0.964	0.949	0.342	0.697	0.370	0.675
17	BRAM	0.953	0.886	0.841	0.947	0.794	0.966	0.955	0.966	0.304	0.324	0.326	0.345
18	BRNA	0.948	0.879	0.830	0.938	0.783	0.965	0.952	0.958	0.447	0.427	0.501	0.483
19	BRPT	0.961	0.908	0.844	0.926	0.877	0.932	0.925	0.928	0.328	0.344	0.378	0.581
20	BTON	0.961	0.879	0.902	0.978	0.888	0.973	0.983	0.982	0.800	0.836	0.856	0.855
21	BUDI	0.949	0.883	0.837	0.932	0.792	0.949	0.950	0.953	0.302	0.310	0.351	0.354
22	BUMI	0.962	0.891	0.863	0.894	0.797	0.966	0.958	0.964	0.687	0.699	0.706	0.363
23	CEKA	0.951	0.885	0.837	0.931	0.799	0.964	0.956	0.956	0.316	0.319	0.352	0.359
24	CLPI	0.948	0.867	0.826	0.947	0.790	0.967	0.955	0.963	0.622	0.615	0.651	0.607
25	CNKO	0.946	0.863	0.820	0.930	0.789	0.957	0.951	0.954	0.486	0.342	0.764	0.526
26	CNTX	0.806	0.511	0.545	0.901	0.881	0.784	0.977	0.965	0.700	0.688	0.700	0.698
27	CPIN	0.946	0.885	0.844	0.901	0.794	0.909	0.914	0.913	0.382	0.395	0.394	0.528
28	CTBN	0.962	0.883	0.841	0.941	0.804	0.968	0.973	0.965	0.423	0.501	0.644	0.526
29	DLTA	0.951	0.885	0.838	0.956	0.832	0.976	0.968	0.963	0.509	0.539	0.635	0.616
30	DPNS	0.964	0.908	0.912	0.980	0.910	0.976	0.988	0.982	0.817	0.837	0.846	0.844
31	DVLA	0.950	0.880	0.835	0.935	0.788	0.962	0.955	0.955	0.431	0.437	0.470	0.452
32	EKAD	0.948	0.874	0.863	0.968	0.800	0.967	0.957	0.954	0.658	0.644	0.635	0.615
33	ENRG	0.962	0.882	0.889	0.968	0.887	0.940	0.954	0.945	0.345	0.696	0.346	0.345
34	ERTX	0.947	0.863	0.848	0.975	0.827	0.966	0.951	0.954	0.535	0.528	0.536	0.525
35	ESTI	0.948	0.878	0.829	0.937	0.814	0.965	0.948	0.950	0.669	0.687	0.695	0.698
36	FASW	0.950	0.883	0.842	0.933	0.879	0.943	0.943	0.952	0.325	0.316	0.356	0.349
37	FISH	0.952	0.884	0.836	0.938	0.791	0.947	0.953	0.950	0.323	0.317	0.352	0.360
38	FPNI	0.944	0.883	0.840	0.932	0.903	0.941	0.947	0.949	0.323	0.326	0.377	0.366
39	GDYR	0.955	0.881	0.848	0.940	0.794	0.959	0.956	0.953	0.330	0.342	0.363	0.364
40	GGRM	0.963	0.927	0.920	0.957	0.877	0.966	0.964	0.964	0.721	0.714	0.721	0.715
41	GJTL	0.950	0.880	0.851	0.929	0.805	0.936	0.941	0.946	0.331	0.332	0.380	0.411
42	HDTX	0.949	0.878	0.833	0.936	0.804	0.965	0.945	0.952	0.430	0.434	0.617	0.666
43	IGAR	0.949	0.877	0.830	0.942	0.784	0.966	0.952	0.955	0.608	0.566	0.599	0.607
44	IKAI	0.942	0.900	0.903	0.976	0.909	0.982	0.977	0.970	0.818	0.828	0.847	0.717
45	IKBI	0.952	0.888	0.833	0.931	0.801	0.956	0.953	0.955	0.369	0.371	0.383	0.380
46	INAF	0.949	0.883	0.833	0.930	0.793	0.959	0.952	0.954	0.388	0.756	0.770	0.725
47	INAI	0.948	0.880	0.826	0.950	0.785	0.967	0.952	0.956	0.432	0.447	0.537	0.515
48	INCI	0.958	0.897	0.924	0.971	0.911	0.980	0.984	0.985	0.822	0.821	0.788	0.752
49	INDF	0.934	0.891	0.870	0.880	0.807	0.885	0.883	0.880	0.387	0.415	0.412	0.422
50	INDR	0.950	0.889	0.844	0.951	0.791	0.941	0.946	0.947	0.325	0.326	0.368	0.363
51	INKP	0.941	0.905	0.896	0.917	0.827	0.924	0.925	0.926	0.343	0.341	0.397	0.438
52	INRU	0.952	0.882	0.831	0.928	0.862	0.963	0.952	0.954	0.448	0.491	0.407	0.416
53	INTP	0.953	0.902	0.912	0.960	0.843	0.967	0.970	0.970	0.467	0.412	0.465	0.738
54	JECC	0.959	0.881	0.836	0.927	0.796	0.970	0.962	0.960	0.376	0.334	0.344	0.344
55	JKSW	0.946	0.863	0.863	0.978	0.885	0.974	0.980	0.977	0.814	0.780	0.846	0.716
56	JPFA	0.948	0.886	0.843	0.915	0.800	0.921	0.928	0.931	0.337	0.354	0.368	0.382

57	JPRS	0.951	0.884	0.818	0.956	0.785	0.966	0.978	0.964	0.818	0.837	0.793	0.792
58	JTPE	0.964	0.889	0.830	0.944	0.773	0.966	0.951	0.955	0.518	0.482	0.480	0.491
59	KAEF	0.949	0.884	0.835	0.931	0.796	0.944	0.949	0.950	0.323	0.397	0.397	0.439
60	KBLI	0.949	0.883	0.832	0.931	0.790	0.945	0.951	0.953	0.307	0.309	0.343	0.345
61	KBLM	0.949	0.878	0.816	0.943	0.800	0.963	0.953	0.955	0.523	0.515	0.482	0.489
62	KDSI	0.951	0.882	0.833	0.933	0.798	0.964	0.957	0.960	0.375	0.331	0.342	0.347
63	KIAS	0.946	0.911	0.877	0.949	0.836	0.963	0.950	0.952	0.552	0.515	0.601	0.580
64	KICI	0.978	0.918	0.922	0.981	0.918	0.981	0.984	0.983	0.814	0.844	0.851	0.857
65	KKGI	0.969	0.864	0.819	0.944	0.795	0.944	0.950	0.954	0.412	0.457	0.534	0.599
66	KLBF	0.933	0.884	0.846	0.911	0.790	0.935	0.930	0.938	0.385	0.423	0.422	0.524
67	LION	0.944	0.864	0.867	0.972	0.849	0.970	0.966	0.959	0.702	0.707	0.738	0.724
68	LMPI	0.947	0.871	0.823	0.959	0.804	0.966	0.951	0.951	0.689	0.709	0.717	0.702
69	LMSH	0.963	0.885	0.906	0.980	0.856	0.985	0.980	0.975	0.802	0.822	0.802	0.800
70	LPIN	0.988	0.932	0.939	0.984	0.929	0.975	0.979	0.968	0.763	0.774	0.870	0.842
71	LSIP	0.938	0.890	0.833	0.937	0.812	0.952	0.950	0.947	0.364	0.454	0.341	0.401
72	LTLS	0.951	0.889	0.838	0.934	0.795	0.943	0.950	0.952	0.324	0.324	0.348	0.348
73	MAIN	0.949	0.883	0.837	0.936	0.801	0.950	0.953	0.949	0.322	0.327	0.372	0.362
74	MASA	0.949	0.883	0.837	0.931	0.848	0.947	0.949	0.952	0.323	0.331	0.396	0.507
75	MEDC	0.970	0.894	0.869	0.931	0.886	0.937	0.944	0.945	0.348	0.332	0.368	0.696
76	MERK	0.958	0.882	0.834	0.969	0.756	0.978	0.970	0.960	0.445	0.524	0.796	0.627
77	MLBI	0.950	0.888	0.842	0.938	0.766	0.967	0.964	0.965	0.537	0.778	0.688	0.765
78	MLIA	0.962	0.856	0.894	0.941	0.847	0.940	0.930	0.955	0.322	0.327	0.365	0.358
79	MRAT	0.946	0.872	0.823	0.961	0.780	0.969	0.962	0.951	0.699	0.738	0.752	0.780
80	MYOH	0.961	0.911	0.922	0.988	0.868	0.957	0.953	0.955	0.312	0.325	0.341	0.341
81	MYOR	0.947	0.884	0.840	0.922	0.791	0.926	0.934	0.937	0.357	0.388	0.397	0.573
82	MYTX	0.949	0.879	0.833	0.928	0.853	0.959	0.950	0.951	0.346	0.431	0.429	0.373
83	NIPS	0.947	0.877	0.820	0.955	0.796	0.966	0.955	0.955	0.514	0.499	0.522	0.511
84	OKAS	0.978	0.892	0.835	0.932	0.830	0.963	0.950	0.952	0.310	0.429	0.454	0.397
85	PBRX	0.950	0.882	0.834	0.931	0.793	0.945	0.950	0.952	0.328	0.331	0.375	0.374
86	PICO	0.947	0.879	0.831	0.937	0.803	0.967	0.953	0.955	0.601	0.597	0.603	0.603
87	POLY	0.964	0.850	0.862	0.935	0.872	0.936	0.944	0.937	0.320	0.327	0.372	0.346
88	PRAS	0.948	0.873	0.888	0.967	0.831	0.966	0.968	0.950	0.683	0.728	0.750	0.673
89	PTBA	0.948	0.890	0.877	0.958	0.823	0.912	0.938	0.927	0.343	0.355	0.385	0.400
90	PYFA	0.968	0.905	0.901	0.978	0.891	0.977	0.978	0.974	0.791	0.800	0.807	0.803
91	RDTX	0.959	0.889	0.888	0.972	0.876	0.975	0.968	0.975	0.611	0.718	0.667	0.661
92	RICY	0.951	0.876	0.828	0.938	0.803	0.966	0.953	0.956	0.488	0.459	0.407	0.364
93	RMBA	0.947	0.887	0.849	0.927	0.795	0.938	0.940	0.937	0.344	0.528	0.546	0.647
94	SCCO	0.966	0.880	0.835	0.949	0.807	0.989	0.976	0.984	0.307	0.312	0.335	0.335
95	SCPI	0.962	0.911	0.888	0.957	0.877	0.966	0.963	0.964	0.710	0.710	0.727	0.732
96	SGRO	0.951	0.894	0.837	0.941	0.807	0.950	0.952	0.957	0.330	0.355	0.353	0.398
97	SHID	0.965	0.926	0.927	0.957	0.913	0.973	0.976	0.977	0.798	0.776	0.748	0.716
98	SIMA	0.965	0.932	0.921	0.957	0.877	0.965	0.964	0.964	0.686	0.697	0.767	0.806
99	SIPD	0.950	0.884	0.836	0.935	0.799	0.943	0.950	0.953	0.327	0.323	0.410	0.374
100	SKLT	0.944	0.870	0.819	0.964	0.822	0.966	0.951	0.955	0.585	0.557	0.549	0.532
101	SMAR	0.947	0.902	0.854	0.928	0.828	0.938	0.935	0.936	0.338	0.353	0.367	0.401
102	SMCB	0.958	0.887	0.850	0.924	0.798	0.929	0.941	0.943	0.338	0.369	0.555	0.742
103	SMGR	0.919	0.905	0.891	0.937	0.851	0.954	0.947	0.943	0.410	0.396	0.397	0.457
104	SMSM	0.949	0.884	0.836	0.932	0.795	0.944	0.951	0.952	0.409	0.406	0.379	0.376
105	SPMA	0.950	0.881	0.833	0.932	0.793	0.960	0.951	0.955	0.389	0.343	0.355	0.348
106	SQMI	0.968	0.931	0.936	0.978	0.862	0.978	0.973	0.975	0.763	0.749	0.705	0.735
107	SRSN	0.946	0.870	0.817	0.964	0.807	0.965	0.958	0.950	0.657	0.670	0.679	0.664
108	SSTM	0.945	0.872	0.827	0.954	0.862	0.965	0.950	0.951	0.668	0.690	0.738	0.726
109	STTP	0.949	0.880	0.832	0.929	0.796	0.958	0.954	0.955	0.368	0.392	0.390	0.386
110	SUGI	0.976	0.933	0.938	0.958	0.913	0.967	0.964	0.964	0.687	0.697	0.708	0.715
111	TBLA	0.949	0.885	0.840	0.931	0.801	0.942	0.949	0.950	0.326	0.329	0.361	0.358
112	TBMS	0.949	0.878	0.842	0.932	0.796	0.945	0.940	0.956	0.323	0.323	0.354	0.359
113	TCID	0.979	0.884	0.847	0.983	0.771	0.968	0.967	0.968	0.371	0.313	0.363	0.362
114	TFCO	0.943	0.866	0.837	0.932	0.799	0.945	0.949	0.951	0.387	0.431	0.374	0.395
115	TGKA	0.952	0.891	0.837	0.937	0.798	0.946	0.951	0.955	0.320	0.324	0.350	0.355
116	TIRA	0.943	0.861	0.841	0.968	0.837	0.967	0.972	0.969	0.775	0.777	0.793	0.794
117	TIRT	0.948	0.876	0.830	0.935	0.807	0.964	0.945	0.955	0.554	0.556	0.586	0.524
118	TKIM	0.951	0.901	0.847	0.936	0.817	0.942	0.947	0.947	0.328	0.332	0.375	0.376
119	TMPO	0.945	0.875	0.873	0.975	0.838	0.964	0.973	0.965	0.776	0.791	0.775	0.784

120	TOTO	0.948	0.882	0.835	0.930	0.790	0.952	0.950	0.951	0.446	0.471	0.440	0.422
121	TRST	0.949	0.884	0.838	0.933	0.796	0.950	0.951	0.953	0.311	0.335	0.356	0.360
122	TSPC	0.947	0.888	0.842	0.928	0.796	0.946	0.948	0.948	0.333	0.338	0.358	0.362
123	ULTJ	0.949	0.882	0.835	0.930	0.791	0.941	0.951	0.951	0.384	0.422	0.377	0.402
124	UNIC	0.952	0.873	0.835	0.936	0.788	0.945	0.961	0.956	0.312	0.320	0.344	0.347
125	UNIT	0.980	0.923	0.906	0.981	0.911	0.981	0.982	0.982	0.820	0.838	0.851	0.856
126	UNSP	0.962	0.899	0.859	0.970	0.818	0.966	0.857	0.939	0.324	0.391	0.701	0.707
127	UNVR	0.963	0.913	0.890	0.957	0.877	0.966	0.964	0.964	0.688	0.696	0.706	0.712
128	VOKS	0.949	0.883	0.835	0.931	0.794	0.945	0.950	0.953	0.389	0.365	0.361	0.355

Table B.2.2: Marketability efficiency scores of Malaysia's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	ACME	0.825	0.850	0.911	0.879	0.850	0.903	0.852	0.878	0.868	0.892	0.923	0.450
2	ADV	0.807	0.777	0.838	0.764	0.878	0.866	0.866	0.902	0.886	0.894	0.915	0.368
3	AEM	0.836	0.829	0.879	0.895	0.845	0.896	0.857	0.898	0.896	0.878	0.901	0.349
4	AF	0.826	0.849	0.874	0.849	0.738	0.747	0.670	0.758	0.754	0.649	0.734	0.247
5	AGG	0.602	0.741	0.851	0.814	0.844	0.820	0.802	0.894	0.842	0.810	0.835	0.257
6	AHBH	0.820	0.903	0.899	0.948	0.829	0.858	0.909	0.926	0.918	0.935	0.932	0.548
7	AIB	0.840	0.801	0.866	0.827	0.819	0.866	0.819	0.896	0.867	0.758	0.541	0.306
8	AJI	0.894	0.837	0.913	0.874	0.848	0.848	0.835	0.915	0.877	0.828	0.864	0.560
9	AJR	0.627	0.688	0.725	0.600	0.575	0.729	0.673	0.643	0.876	0.464	0.541	0.263
10	AJY	0.793	0.742	0.792	0.751	0.712	0.732	0.708	0.770	0.728	0.678	0.734	0.267
11	ALR	0.835	0.829	0.885	0.846	0.844	0.860	0.791	0.878	0.852	0.734	0.842	0.301
12	AM	0.810	0.784	0.853	0.815	0.773	0.813	0.715	0.809	0.806	0.770	0.816	0.261
13	AMAL	0.839	0.796	0.843	0.819	0.793	0.832	0.815	0.893	0.871	0.872	0.935	0.653
14	AMT	0.799	0.820	0.905	0.922	0.874	0.921	0.858	0.899	0.881	0.885	0.910	0.411
15	AMTK	0.848	0.869	0.876	0.976	0.860	0.923	0.878	0.874	0.893	0.821	0.849	0.648
16	AMW	0.767	0.808	0.806	0.756	0.721	0.651	0.640	0.668	0.641	0.639	0.672	0.318
17	ANC	0.467	0.867	0.759	0.750	0.713	0.714	0.696	0.680	0.670	0.647	0.688	0.289
18	ANZO	0.815	0.854	0.914	0.860	0.889	0.903	0.886	0.903	0.854	0.934	0.937	0.437
19	APBB	0.862	0.823	0.889	0.825	0.821	0.826	0.792	0.870	0.853	0.782	0.900	0.408
20	APM	0.719	0.754	0.707	0.690	0.601	0.600	0.566	0.627	0.630	0.626	0.680	0.297
21	APOF	0.858	0.842	0.908	0.853	0.845	0.887	0.804	0.887	0.858	0.706	0.813	0.345
22	APT	0.855	0.873	0.891	0.911	0.921	0.931	0.845	0.863	0.858	0.822	0.880	0.733
23	ARBB	0.827	0.832	0.837	0.792	0.804	0.726	0.818	0.828	0.900	0.808	0.925	0.551
24	ARNK	0.831	0.793	0.774	0.758	0.750	0.737	0.719	0.770	0.715	0.671	0.736	0.299
25	ASPO	0.836	0.923	0.886	0.886	0.846	0.882	0.825	0.895	0.867	0.864	0.876	0.340
26	ASTI	0.799	0.729	0.797	0.754	0.686	0.695	0.668	0.709	0.701	0.636	0.705	0.265
27	ATEC	0.809	0.790	0.810	0.801	0.757	0.773	0.768	0.880	0.840	0.863	0.845	0.445
28	ATSY	0.812	0.874	0.888	0.925	0.863	0.914	0.884	0.907	0.909	0.928	0.948	0.512
29	BHIC	0.857	0.791	0.824	0.695	0.736	0.853	0.715	0.804	0.888	0.591	0.741	0.652
30	BIG	0.836	0.856	0.812	0.837	0.781	0.851	0.838	0.841	0.878	0.847	0.888	0.407
31	BLDP	0.896	0.934	0.800	0.802	0.802	0.798	0.718	0.717	0.619	0.661	0.728	0.494
32	BMED	0.844	0.905	0.916	0.897	0.823	0.852	0.819	0.865	0.886	0.874	0.930	0.450
33	BPAK	0.851	0.821	0.918	0.857	0.843	0.884	0.796	0.840	0.773	0.658	0.695	0.358
34	BPKG	0.831	0.847	0.894	0.921	0.864	0.895	0.849	0.903	0.886	0.859	0.922	0.362
35	BPP	0.809	0.781	0.851	0.796	0.786	0.813	0.758	0.821	0.785	0.673	0.746	0.290
36	BTEC	0.843	0.909	0.893	0.944	0.842	0.906	0.871	0.895	0.895	0.909	0.921	0.444
37	BTM	0.839	0.901	0.872	0.916	0.818	0.911	0.915	0.874	0.919	0.934	0.940	0.573
38	CAB	0.725	0.755	0.734	0.650	0.610	0.657	0.646	0.631	0.605	0.631	0.636	0.364
39	CABC	0.839	0.803	0.754	0.716	0.721	0.723	0.677	0.703	0.636	0.623	0.617	0.265
40	CAN	0.822	0.785	0.795	0.738	0.721	0.769	0.657	0.680	0.634	0.605	0.664	0.271
41	CBEE	0.810	0.781	0.796	0.755	0.742	0.723	0.726	0.775	0.741	0.683	0.752	0.290
42	CBP	0.773	0.690	0.761	0.762	0.606	0.617	0.521	0.616	0.619	0.536	0.634	0.254
43	CCHB	0.806	0.836	0.889	0.898	0.856	0.892	0.838	0.902	0.874	0.824	0.843	0.326
44	CCK	0.807	0.768	0.764	0.716	0.696	0.708	0.700	0.764	0.709	0.629	0.674	0.258
45	CCM	0.824	0.831	0.760	0.746	0.692	0.693	0.699	0.897	0.880	0.896	0.657	0.335
46	CEP	0.858	0.763	0.899	0.887	0.820	0.841	0.827	0.861	0.815	0.718	0.794	0.323
47	CFM	0.835	0.849	0.917	0.933	0.876	0.907	0.834	0.871	0.860	0.867	0.883	0.517
48	CG	0.842	0.809	0.852	0.754	0.828	0.884	0.817	0.847	0.776	0.646	0.681	0.285
49	CHB	0.839	0.829	0.878	0.875	0.858	0.877	0.803	0.886	0.852	0.768	0.856	0.321
50	CIC	0.844	0.844	0.888	0.895	0.857	0.882	0.830	0.894	0.842	0.872	0.902	0.341
51	CIH	0.827	0.790	0.765	0.862	0.846	0.891	0.803	0.799	0.658	0.648	0.688	0.292
52	CME	0.795	0.874	0.883	0.940	0.852	0.907	0.870	0.895	0.916	0.928	0.949	0.519
53	CMS	0.264	0.647	0.674	0.601	0.464	0.457	0.468	0.567	0.701	0.651	0.574	0.259
54	CMT	0.831	0.803	0.781	0.752	0.761	0.727	0.744	0.824	0.774	0.679	0.710	0.648
55	COCO	0.750	0.722	0.801	0.683	0.497	0.518	0.518	0.595	0.581	0.614	0.848	0.652
56	COLA	0.823	0.810	0.862	0.838	0.789	0.783	0.728	0.801	0.770	0.642	0.752	0.271
57	CSB	0.837	0.838	0.889	0.918	0.851	0.915	0.828	0.890	0.869	0.854	0.904	0.399
58	CSCS	0.668	0.713	0.660	0.599	0.645	0.636	0.644	0.704	0.593	0.582	0.629	0.287
59	CTH	0.830	0.818	0.878	0.828	0.838	0.866	0.795	0.880	0.853	0.759	0.844	0.302
60	CWH	0.759	0.795	0.747	0.681	0.649	0.692	0.671	0.716	0.678	0.611	0.665	0.247

61	CYLC	0.837	0.838	0.891	0.895	0.858	0.893	0.824	0.898	0.874	0.856	0.901	0.388
62	CYM	0.823	0.762	0.834	0.807	0.753	0.770	0.784	0.817	0.839	0.733	0.842	0.328
63	DAYA	0.815	0.762	0.829	0.781	0.717	0.732	0.672	0.817	0.687	0.890	0.823	0.749
64	DBB	0.789	0.798	0.854	0.839	0.770	0.811	0.702	0.791	0.762	0.644	0.666	0.263
65	DBE	0.832	0.805	0.864	0.818	0.830	0.889	0.785	0.899	0.873	0.770	0.882	0.380
66	DGEM	0.824	0.787	0.858	0.815	0.806	0.816	0.768	0.848	0.832	0.695	0.816	0.319
67	DLG	0.761	0.661	0.654	0.744	0.804	0.764	0.853	0.683	0.818	0.583	0.770	0.683
68	DLM	0.883	0.875	0.890	0.881	0.854	0.852	0.835	0.865	0.853	0.818	0.846	0.665
69	DNON	0.833	0.792	0.842	0.824	0.831	0.854	0.728	0.869	0.810	0.707	0.807	0.309
70	DOGT	0.780	0.823	0.837	0.863	0.800	0.839	0.729	0.783	0.723	0.651	0.687	0.296
71	DOME	0.826	0.790	0.816	0.768	0.741	0.735	0.712	0.755	0.721	0.653	0.704	0.292
72	DPP	0.816	0.779	0.807	0.760	0.736	0.752	0.694	0.740	0.717	0.659	0.703	0.314
73	DRB	0.517	0.477	0.498	0.466	0.374	0.419	0.411	0.460	0.854	0.721	0.462	0.279
74	DWL	0.820	0.897	0.897	0.933	0.830	0.855	0.820	0.902	0.896	0.887	0.920	0.685
75	EDHB	0.857	0.865	0.903	0.924	0.854	0.906	0.852	0.880	0.857	0.807	0.924	0.688
76	EKA	0.835	0.794	0.852	0.717	0.817	0.874	0.836	0.865	0.895	0.896	0.946	0.483
77	EKC	0.858	0.867	0.911	0.886	0.862	0.912	0.843	0.888	0.854	0.844	0.899	0.413
78	EKSON	0.782	0.760	0.820	0.767	0.738	0.766	0.753	0.802	0.841	0.727	0.803	0.345
79	ELSR	0.864	0.899	0.878	0.934	0.823	0.921	0.820	0.862	0.890	0.830	0.898	0.706
80	EMI	0.834	0.839	0.890	0.889	0.856	0.878	0.826	0.897	0.875	0.850	0.901	0.346
81	EONM	0.816	0.829	0.857	0.843	0.813	0.850	0.809	0.899	0.862	0.789	0.827	0.298
82	EPMB	0.838	0.794	0.754	0.717	0.711	0.702	0.731	0.762	0.724	0.682	0.716	0.345
83	ESC	0.828	0.907	0.900	0.926	0.852	0.922	0.878	0.894	0.892	0.906	0.931	0.479
84	EUHO	0.817	0.814	0.883	0.851	0.835	0.869	0.817	0.880	0.859	0.819	0.901	0.312
85	EURO	0.880	0.844	0.885	0.801	0.812	0.918	0.865	0.889	0.883	0.881	0.886	0.370
86	EVF	0.614	0.676	0.613	0.544	0.560	0.614	0.842	0.700	0.530	0.554	0.628	0.278
87	FACI	0.836	0.694	0.869	0.755	0.876	0.951	0.874	0.900	0.887	0.912	0.923	0.562
88	FDGB	0.875	0.904	0.904	0.947	0.877	0.945	0.927	0.922	0.858	0.937	0.920	0.651
89	FFB	0.794	0.772	0.743	0.751	0.694	0.654	0.616	0.633	0.607	0.597	0.682	0.252
90	FIHB	0.907	0.847	0.890	0.923	0.867	0.894	0.848	0.900	0.870	0.717	0.830	0.303
91	FIMA	0.760	0.724	0.768	0.730	0.640	0.662	0.631	0.678	0.680	0.634	0.704	0.282
92	FIT	0.824	0.742	0.860	0.789	0.702	0.704	0.649	0.741	0.749	0.693	0.752	0.280
93	FMB	0.786	0.750	0.838	0.844	0.703	0.756	0.644	0.800	0.725	0.650	0.724	0.267
94	FNH	0.756	0.803	0.691	0.555	0.633	0.717	0.723	0.639	0.648	0.653	0.673	0.433
95	FOR	0.816	0.785	0.732	0.707	0.725	0.660	0.675	0.823	0.763	0.690	0.704	0.278
96	FRCB	0.839	0.789	0.844	0.790	0.785	0.823	0.777	0.766	0.786	0.651	0.698	0.270
97	G3G	0.820	0.843	0.875	0.908	0.866	0.913	0.848	0.917	0.904	0.886	0.908	0.726
98	GENE	0.900	0.901	0.957	0.939	0.864	0.895	0.795	0.918	0.867	0.803	0.889	0.374
99	GFHB	0.830	0.831	0.874	0.861	0.847	0.854	0.916	0.903	0.912	0.934	0.943	0.684
100	GII	0.841	0.784	0.847	0.803	0.762	0.795	0.766	0.838	0.814	0.662	0.913	0.367
101	GKEN	0.807	0.802	0.841	0.799	0.765	0.737	0.637	0.738	0.655	0.546	0.692	0.234
102	GOCB	0.822	0.841	0.869	0.816	0.817	0.877	0.893	0.900	0.827	0.701	0.826	0.324
103	GPA	0.829	0.784	0.842	0.811	0.836	0.841	0.811	0.891	0.891	0.799	0.892	0.333
104	GPB	0.837	0.822	0.849	0.893	0.854	0.887	0.822	0.870	0.872	0.858	0.895	0.325
105	GREE	0.793	0.856	0.877	0.917	0.838	0.872	0.833	0.880	0.873	0.900	0.928	0.380
106	GSCB	0.840	0.822	0.844	0.854	0.846	0.884	0.844	0.926	0.862	0.710	0.809	0.317
107	GUAN	0.789	0.785	0.733	0.558	0.482	0.501	0.683	0.706	0.633	0.595	0.572	0.278
108	H&L	0.821	0.874	0.892	0.948	0.876	0.920	0.902	0.932	0.905	0.931	0.945	0.647
109	HAVE	0.821	0.803	0.781	0.725	0.749	0.730	0.696	0.706	0.634	0.560	0.632	0.287
110	HCK	0.827	0.880	0.890	0.934	0.858	0.908	0.832	0.891	0.893	0.859	0.852	0.719
111	HEIM	0.728	0.740	0.714	0.723	0.708	0.725	0.738	0.635	0.605	0.618	0.676	0.362
112	HEX	0.804	0.797	0.848	0.807	0.814	0.851	0.779	0.852	0.832	0.778	0.850	0.379
113	HIL	0.815	0.753	0.835	0.808	0.820	0.884	0.805	0.820	0.814	0.774	0.845	0.249
114	HLI	0.751	0.774	0.626	0.615	0.563	0.543	0.509	0.602	0.579	0.642	0.679	0.354
115	HOV	0.782	0.797	0.879	0.824	0.769	0.781	0.728	0.793	0.792	0.697	0.769	0.295
116	HSI	0.822	0.743	0.781	0.749	0.736	0.718	0.674	0.742	0.761	0.666	0.738	0.301
117	HUAAN	0.596	0.800	0.815	0.704	0.733	0.876	0.665	0.671	0.863	0.818	0.566	0.245
118	HUME	0.756	0.835	0.947	0.845	0.853	0.889	0.842	0.877	0.733	0.674	0.805	0.518
119	HWA	0.821	0.838	0.902	0.871	0.825	0.881	0.828	0.874	0.878	0.858	0.896	0.352
120	HWG	0.838	0.782	0.724	0.808	0.744	0.742	0.746	0.858	0.818	0.714	0.826	0.392
121	HYR	0.686	0.863	0.773	0.798	0.845	0.853	0.835	0.865	0.650	0.574	0.898	0.343
122	IHB	0.819	0.866	0.902	0.959	0.867	0.929	0.896	0.868	0.925	0.917	0.943	0.697
123	IKEN	0.860	0.873	0.884	0.900	0.877	0.919	0.834	0.900	0.854	0.818	0.847	0.692

124	IMAS	0.864	0.837	0.903	0.884	0.860	0.891	0.816	0.903	0.874	0.840	0.875	0.465
125	INDU	0.832	0.822	0.883	0.880	0.862	0.890	0.831	0.844	0.884	0.825	0.875	0.403
126	IOI	0.863	0.873	0.881	0.867	0.874	0.698	0.571	0.864	0.855	0.827	0.740	0.528
127	IQGH	0.840	0.795	0.811	0.772	0.838	0.854	0.798	0.890	0.863	0.699	0.813	0.318
128	IRET	0.823	0.838	0.886	0.847	0.829	0.864	0.801	0.881	0.837	0.696	0.886	0.600
129	JADI	0.806	0.824	0.853	0.836	0.823	0.881	0.813	0.903	0.846	0.838	0.925	0.394
130	JAYC	0.830	0.799	0.839	0.811	0.799	0.816	0.770	0.842	0.802	0.688	0.756	0.313
131	JHMC	0.815	0.869	0.836	0.905	0.849	0.882	0.818	0.899	0.835	0.650	0.788	0.255
132	JKB	0.832	0.800	0.869	0.878	0.842	0.870	0.823	0.879	0.895	0.905	0.941	0.473
133	JMR	0.835	0.841	0.875	0.939	0.839	0.898	0.805	0.888	0.888	0.893	0.911	0.638
134	JOHO	0.841	0.820	0.873	0.846	0.820	0.790	0.733	0.801	0.742	0.635	0.710	0.257
135	JT	0.721	0.796	0.703	0.578	0.542	0.838	0.687	0.687	0.581	0.663	0.769	0.396
136	KEIN	0.841	0.809	0.873	0.829	0.821	0.846	0.782	0.861	0.832	0.703	0.776	0.320
137	KESM	0.950	0.920	0.922	0.883	0.872	0.839	0.788	0.915	0.899	0.774	0.885	0.378
138	KFB	0.819	0.827	0.874	0.861	0.817	0.841	0.758	0.824	0.856	0.790	0.854	0.388
139	KFM	0.853	0.781	0.841	0.871	0.791	0.866	0.844	0.889	0.874	0.821	0.852	0.399
140	KHEE	0.837	0.842	0.907	0.882	0.866	0.897	0.822	0.887	0.850	0.709	0.838	0.309
141	KHIN	0.872	0.851	0.920	0.879	0.845	0.882	0.872	0.919	0.819	0.735	0.755	0.342
142	KIA	0.824	0.853	0.895	0.876	0.887	0.914	0.844	0.922	0.883	0.838	0.883	0.393
143	KJB	0.827	0.751	0.868	0.812	0.807	0.854	0.776	0.878	0.831	0.719	0.830	0.330
144	KJC	0.727	0.703	0.669	0.576	0.523	0.500	0.485	0.537	0.520	0.511	0.573	0.351
145	KKB	0.810	0.823	0.843	0.851	0.743	0.795	0.715	0.807	0.832	0.791	0.790	0.292
146	KNMG	0.858	0.570	0.755	0.672	0.845	0.520	0.631	0.592	0.579	0.850	0.809	0.667
147	KOMA	0.839	0.824	0.873	0.828	0.828	0.849	0.767	0.929	0.872	0.860	0.886	0.418
148	KONE	0.818	0.819	0.877	0.829	0.825	0.863	0.776	0.826	0.819	0.825	0.896	0.280
149	KPB	0.137	0.398	0.890	0.937	0.829	0.911	0.854	0.878	0.851	0.846	0.869	0.658
150	KPG	0.789	0.888	0.895	0.937	0.825	0.817	0.832	0.871	0.832	0.518	0.561	0.238
151	KPS	0.845	0.800	0.810	0.760	0.747	0.721	0.711	0.780	0.732	0.659	0.712	0.306
152	KRI	0.653	0.663	0.649	0.526	0.520	0.477	0.577	0.572	0.818	0.628	0.592	0.367
153	KS	0.705	0.709	0.659	0.684	0.625	0.587	0.596	0.553	0.563	0.546	0.664	0.347
154	KSB	0.630	0.710	0.734	0.903	0.863	0.896	0.462	0.802	0.893	0.818	0.862	0.702
155	KTRI	0.831	0.836	0.884	0.821	0.826	0.858	0.778	0.842	0.842	0.707	0.814	0.290
156	KYM	0.810	0.808	0.940	0.915	0.792	0.871	0.807	0.885	0.859	0.800	0.865	0.294
157	LATI	0.846	0.810	0.757	0.745	0.763	0.750	0.751	0.801	0.751	0.698	0.714	0.348
158	LAY	0.836	0.784	0.763	0.712	0.721	0.757	0.686	0.695	0.683	0.630	0.643	0.246
159	LBA	0.788	0.787	0.784	0.746	0.740	0.731	0.706	0.770	0.741	0.657	0.717	0.310
160	LBB	0.840	0.799	0.860	0.824	0.781	0.785	0.735	0.785	0.734	0.799	0.853	0.293
161	LCTH	0.789	0.741	0.826	0.845	0.840	0.801	0.738	0.842	0.793	0.755	0.836	0.268
162	LDHB	0.729	0.867	0.581	0.914	0.869	0.881	0.746	0.870	0.739	0.838	0.859	0.587
163	LDST	0.837	0.801	0.787	0.806	0.758	0.768	0.760	0.838	0.836	0.696	0.785	0.307
164	LEWE	0.809	0.843	0.843	0.856	0.845	0.906	0.882	0.915	0.921	0.924	0.938	0.518
165	LHI	0.838	0.790	0.839	0.786	0.759	0.759	0.740	0.776	0.707	0.619	0.683	0.268
166	LLB	0.537	0.876	0.601	0.498	0.797	0.798	0.571	0.808	0.478	0.504	0.518	0.257
167	LMC	0.675	0.584	0.643	0.831	0.600	0.699	0.609	0.693	0.768	0.854	0.842	0.642
168	LSTI	0.854	0.828	0.899	0.886	0.860	0.831	0.778	0.879	0.893	0.767	0.820	0.270
169	LTKM	0.835	0.814	0.880	0.844	0.864	0.852	0.760	0.893	0.838	0.696	0.813	0.316
170	LYSA	0.891	0.904	0.955	0.953	0.898	0.961	0.929	0.912	0.896	0.891	0.937	0.550
171	MAG	0.480	0.676	0.584	0.532	0.400	0.469	0.519	0.488	0.497	0.492	0.486	0.337
172	MB	0.846	0.822	0.855	0.800	0.721	0.877	0.820	0.922	0.863	0.833	0.815	0.248
173	MCE	0.861	0.806	0.873	0.913	0.907	0.944	0.923	0.951	0.860	0.812	0.886	0.359
174	MER	0.838	0.871	0.938	0.978	0.920	0.949	0.895	0.933	0.910	0.840	0.954	0.338
175	MESB	0.837	0.830	0.881	0.933	0.857	0.924	0.845	0.902	0.862	0.723	0.808	0.309
176	MFL	0.694	0.704	0.646	0.569	0.551	0.622	0.551	0.569	0.634	0.529	0.588	0.277
177	MHC	0.824	0.948	0.875	0.941	0.827	0.949	0.740	0.800	0.786	0.681	0.739	0.318
178	MIEC	0.824	0.889	0.850	0.807	0.737	0.783	0.837	0.769	0.744	0.534	0.673	0.557
179	MIG	0.728	0.860	0.687	0.723	0.844	0.853	0.492	0.753	0.700	0.754	0.712	0.319
180	MILUX	0.841	0.854	0.903	0.738	0.900	0.857	0.773	0.862	0.873	0.815	0.873	0.356
181	MIN	0.804	0.767	0.835	0.799	0.765	0.774	0.735	0.830	0.776	0.680	0.745	0.285
182	MINE	0.854	0.812	0.866	0.821	0.827	0.854	0.781	0.863	0.882	0.800	0.845	0.309
183	MKRMB	0.855	0.912	0.879	0.934	0.845	0.898	0.855	0.875	0.859	0.863	0.896	0.325
184	MLG	0.605	0.701	0.878	0.861	0.859	0.862	0.844	0.915	0.901	0.803	0.659	0.264
185	MMSV	0.877	0.919	0.892	0.939	0.851	0.927	0.867	0.885	0.886	0.897	0.886	0.385

186	MSB	0.780	0.830	0.759	0.727	0.767	0.714	0.715	0.764	0.701	0.626	0.691	0.282
187	MSW	0.713	0.735	0.766	0.683	0.664	0.649	0.655	0.660	0.726	0.633	0.604	0.303
188	MTI	0.826	0.790	0.792	0.735	0.721	0.694	0.675	0.709	0.654	0.601	0.654	0.285
189	MTRD	0.813	0.860	0.776	0.704	0.705	0.558	0.709	0.685	0.680	0.663	0.708	0.330
190	MUD	0.803	0.722	0.706	0.673	0.624	0.661	0.630	0.649	0.632	0.637	0.640	0.255
191	MWE	0.737	0.767	0.741	0.696	0.669	0.781	0.728	0.796	0.784	0.534	0.743	0.473
192	NCHB	0.760	0.801	0.863	0.970	0.874	0.899	0.833	0.908	0.927	0.940	0.939	0.590
193	NESZ	0.862	0.871	0.875	0.860	0.843	0.861	0.841	0.871	0.855	0.818	0.846	0.648
194	NGB	0.812	0.816	0.876	0.900	0.846	0.868	0.798	0.907	0.901	0.902	0.922	0.448
195	NHF	0.875	0.830	0.895	0.873	0.840	0.874	0.800	0.875	0.859	0.714	0.814	0.325
196	NHR	0.818	0.833	0.880	0.924	0.859	0.896	0.834	0.897	0.886	0.901	0.916	0.397
197	NTPM	0.708	0.675	0.736	0.673	0.604	0.608	0.573	0.657	0.613	0.591	0.644	0.285
198	NVB	0.812	0.782	0.861	0.801	0.727	0.733	0.733	0.887	0.811	0.692	0.754	0.225
199	NWP	0.889	0.926	0.876	0.937	0.868	0.911	0.905	0.932	0.916	0.936	0.944	0.655
200	NYL	0.743	0.781	0.739	0.723	0.689	0.683	0.702	0.675	0.659	0.651	0.697	0.292
201	OCM	0.841	0.797	0.756	0.722	0.783	0.816	0.765	0.839	0.808	0.699	0.715	0.328
202	OCP	0.814	0.944	0.886	0.898	0.853	0.887	0.805	0.883	0.849	0.817	0.852	0.303
203	OFIH	0.828	0.801	0.857	0.809	0.789	0.807	0.745	0.809	0.793	0.673	0.739	0.301
204	OHB	0.825	0.833	0.868	0.836	0.823	0.858	0.835	0.887	0.853	0.809	0.850	0.303
205	OKAC	0.834	0.822	0.872	0.821	0.826	0.851	0.758	0.841	0.815	0.690	0.798	0.251
206	ONC	0.816	0.893	0.890	0.932	0.830	0.898	0.844	0.894	0.889	0.897	0.864	0.318
207	OPB	0.863	0.788	0.874	0.817	0.805	0.839	0.788	0.861	0.831	0.711	0.788	0.325
208	PAD	0.703	0.678	0.669	0.620	0.505	0.512	0.498	0.553	0.494	0.481	0.543	0.259
209	PAOS	0.841	0.790	0.849	0.788	0.763	0.789	0.774	0.894	0.870	0.698	0.751	0.317
210	PARB	0.818	0.803	0.841	0.838	0.839	0.901	0.797	0.919	0.882	0.807	0.873	0.347
211	PCCS	0.838	0.776	0.746	0.728	0.761	0.757	0.743	0.781	0.756	0.697	0.716	0.307
212	PELI	0.730	0.726	0.697	0.584	0.844	0.921	0.720	0.736	0.735	0.663	0.671	0.300
213	PENT	0.829	0.846	0.883	0.852	0.845	0.894	0.818	0.881	0.837	0.697	0.787	0.259
214	PEP	0.640	0.831	0.875	0.860	0.846	0.586	0.698	0.660	0.665	0.623	0.699	0.614
215	PER	0.822	0.808	0.846	0.765	0.747	0.729	0.725	0.781	0.730	0.688	0.726	0.343
216	PETRONM	0.698	0.623	0.737	0.755	0.566	0.576	0.882	0.874	0.600	0.527	0.741	0.324
217	PG	0.800	0.829	0.876	0.877	0.843	0.870	0.813	0.913	0.887	0.846	0.864	0.658
218	PGF	0.821	0.884	0.887	0.933	0.851	0.963	0.852	0.894	0.892	0.919	0.904	0.310
219	PGHB	0.742	0.692	0.713	0.710	0.653	0.585	0.589	0.666	0.672	0.614	0.646	0.231
220	PHR	0.803	0.791	0.797	0.754	0.748	0.736	0.725	0.775	0.718	0.621	0.691	0.255
221	PIE	0.755	0.723	0.808	0.737	0.689	0.708	0.653	0.685	0.628	0.622	0.654	0.271
222	PJSB	0.857	0.869	0.902	0.967	0.848	0.688	0.903	0.922	0.907	0.909	0.909	0.676
223	PMAH	0.370	0.766	0.689	0.587	0.459	0.436	0.645	0.468	0.502	0.411	0.810	0.410
224	PMBT	0.826	0.794	0.840	0.802	0.756	0.790	0.756	0.816	0.749	0.683	0.727	0.345
225	PMC	0.769	0.864	0.796	0.866	0.838	0.852	0.737	0.891	0.851	0.844	0.888	0.329
226	PMM	0.884	0.866	0.900	0.879	0.861	0.865	0.849	0.926	0.903	0.856	0.886	0.561
227	PNE	0.837	0.825	0.868	0.882	0.848	0.886	0.828	0.895	0.869	0.807	0.861	0.323
228	POS	0.827	0.882	0.794	0.546	0.716	0.670	0.837	0.874	0.857	0.677	0.732	0.282
229	PP	0.837	0.793	0.865	0.818	0.815	0.841	0.771	0.854	0.829	0.697	0.810	0.275
230	PPG	0.840	0.840	0.897	0.916	0.862	0.893	0.826	0.900	0.878	0.862	0.890	0.341
231	PPT	0.821	0.834	0.865	0.880	0.840	0.883	0.861	0.856	0.857	0.754	0.849	0.649
232	PRG	0.821	0.819	0.880	0.864	0.843	0.875	0.807	0.883	0.838	0.724	0.822	0.317
233	PROL	0.838	0.799	0.860	0.828	0.810	0.841	0.771	0.830	0.774	0.671	0.745	0.309
234	PRST	0.810	0.787	0.753	0.728	0.744	0.706	0.693	0.732	0.693	0.651	0.694	0.292
235	PTB	0.834	0.848	0.889	0.901	0.856	0.894	0.825	0.900	0.880	0.869	0.914	0.377
236	PTG	0.858	0.862	0.876	0.867	0.844	0.848	0.833	0.863	0.852	0.819	0.854	0.709
237	PU	0.843	0.830	0.787	0.915	0.855	0.895	0.836	0.778	0.880	0.866	0.904	0.350
238	PW	0.836	0.804	0.829	0.803	0.763	0.818	0.760	0.827	0.794	0.686	0.748	0.300
239	PWP	0.749	0.787	0.752	0.727	0.753	0.851	0.819	0.849	0.835	0.686	0.784	0.271
240	PWRT	0.771	0.799	0.839	0.784	0.766	0.729	0.671	0.738	0.725	0.631	0.714	0.330
241	QC	0.832	0.787	0.849	0.867	0.777	0.790	0.727	0.808	0.852	0.665	0.777	0.317
242	RALC	0.728	0.822	0.913	0.843	0.850	0.865	0.815	0.888	0.875	0.791	0.826	0.331
243	RBRX	0.835	0.792	0.800	0.754	0.741	0.739	0.740	0.812	0.780	0.669	0.734	0.542
244	RESI	0.819	0.837	0.879	0.860	0.841	0.881	0.816	0.886	0.871	0.841	0.880	0.320
245	REX	0.836	0.792	0.853	0.824	0.819	0.854	0.777	0.870	0.847	0.749	0.823	0.332
246	RGB	0.741	0.806	0.877	0.910	0.871	0.812	0.768	0.788	0.764	0.638	0.716	0.240
247	RGBH	0.846	0.899	0.879	0.899	0.849	0.886	0.874	0.863	0.936	0.934	0.932	0.436

248	ROTH	0.859	0.864	0.877	0.866	0.862	0.866	0.851	0.875	0.872	0.828	0.811	0.420
249	SA	0.805	0.796	0.755	0.725	0.729	0.706	0.708	0.757	0.737	0.656	0.702	0.313
250	SALC	0.869	0.778	0.743	0.660	0.704	0.737	0.656	0.796	0.872	0.784	0.810	0.284
251	SAND	0.808	0.865	0.898	0.942	0.855	0.906	0.870	0.877	0.886	0.892	0.920	0.567
252	SANI	0.858	0.864	0.877	0.862	0.844	0.853	0.883	0.902	0.887	0.889	0.936	0.469
253	SAPU	0.852	0.818	0.863	0.854	0.842	0.845	0.811	0.869	0.840	0.711	0.803	0.322
254	SC	0.879	0.913	0.886	0.942	0.862	0.938	0.872	0.929	0.929	0.912	0.941	0.582
255	SCI	0.733	0.702	0.701	0.606	0.562	0.547	0.498	0.551	0.530	0.523	0.559	0.306
256	SCIB	0.815	0.833	0.865	0.917	0.857	0.893	0.817	0.882	0.874	0.873	0.891	0.367
257	SCP	0.837	0.881	0.909	0.937	0.848	0.895	0.876	0.917	0.903	0.914	0.927	0.479
258	SCT	0.823	0.884	0.901	0.929	0.854	0.903	0.875	0.905	0.897	0.915	0.919	0.381
259	SCW	0.850	0.870	0.898	0.922	0.850	0.895	0.848	0.896	0.878	0.856	0.896	0.338
260	SEQB	0.763	0.838	0.901	0.836	0.790	0.815	0.798	0.853	0.801	0.674	0.726	0.317
261	SER	0.812	0.856	0.899	0.935	0.857	0.916	0.871	0.905	0.914	0.931	0.935	0.547
262	SHH	0.807	0.812	0.902	0.828	0.816	0.888	0.851	0.926	0.907	0.791	0.772	0.308
263	SIME	0.856	0.863	0.874	0.859	0.843	0.856	0.848	0.869	0.882	0.824	0.482	0.349
264	SINM	0.838	0.787	0.753	0.765	0.778	0.699	0.727	0.799	0.734	0.706	0.782	0.367
265	SKBS	0.855	0.858	0.893	0.910	0.865	0.869	0.834	0.894	0.877	0.866	0.906	0.352
266	SKOU	0.835	0.828	0.876	0.824	0.815	0.875	0.818	0.882	0.856	0.743	0.806	0.294
267	SLON	0.827	0.849	0.887	0.883	0.861	0.890	0.827	0.879	0.841	0.788	0.857	0.300
268	SMC	0.822	0.799	0.857	0.827	0.812	0.853	0.811	0.881	0.823	0.808	0.899	0.392
269	SMELT	0.693	0.926	0.672	0.860	0.595	0.712	0.706	0.731	0.671	0.614	0.686	0.255
270	SMIS	0.829	0.859	0.908	0.901	0.827	0.873	0.824	0.892	0.846	0.736	0.823	0.307
271	SNHB	0.882	0.743	0.833	0.762	0.793	0.831	0.773	0.859	0.825	0.688	0.791	0.305
272	SOLE	0.884	0.910	0.880	0.941	0.843	0.941	0.898	0.896	0.887	0.896	0.921	0.600
273	SPZ	0.830	0.830	0.875	0.821	0.813	0.834	0.762	0.833	0.801	0.682	0.733	0.301
274	SSB	0.606	0.716	0.740	0.742	0.671	0.613	0.660	0.870	0.873	0.538	0.570	0.283
275	STAR	0.661	0.758	0.733	0.673	0.568	0.481	0.448	0.532	0.510	0.579	0.673	0.336
276	STB	0.814	0.844	0.914	0.866	0.843	0.949	0.763	0.867	0.884	0.836	0.914	0.646
277	STRA	0.844	0.919	0.898	0.882	0.842	0.850	0.834	0.862	0.923	0.848	0.835	0.302
278	SUCB	0.643	0.672	0.635	0.551	0.525	0.438	0.513	0.500	0.645	0.556	0.507	0.307
279	SWS	0.842	0.808	0.856	0.820	0.843	0.867	0.805	0.874	0.836	0.706	0.828	0.310
280	SYF	0.853	0.816	0.816	0.811	0.800	0.786	0.737	0.771	0.727	0.607	0.685	0.346
281	TAFI	0.846	0.846	0.894	0.923	0.858	0.899	0.871	0.909	0.906	0.895	0.923	0.507
282	TARE	0.806	0.786	0.880	0.777	0.722	0.735	0.719	0.772	0.739	0.626	0.683	0.264
283	TC	0.851	0.836	0.832	0.920	0.746	0.760	0.736	0.825	0.732	0.666	0.729	0.403
284	TCM	0.680	0.654	0.642	0.589	0.519	0.553	0.525	0.520	0.566	0.737	0.846	0.248
285	TECF	0.812	0.887	0.902	0.934	0.859	0.916	0.882	0.905	0.904	0.925	0.925	0.433
286	TEKS	0.809	0.784	0.850	0.811	0.782	0.824	0.768	0.823	0.757	0.635	0.737	0.459
287	TEX	0.826	0.794	0.747	0.732	0.747	0.475	0.709	0.677	0.666	0.660	0.709	0.340
288	TEXC	0.879	0.921	0.874	0.946	0.848	0.942	0.879	0.903	0.890	0.888	0.926	0.408
289	TGI	0.840	0.802	0.802	0.751	0.762	0.731	0.720	0.728	0.717	0.681	0.708	0.280
290	TGL	0.884	0.886	0.955	0.905	0.900	0.941	0.860	0.920	0.893	0.832	0.894	0.356
291	THR	0.795	0.791	0.832	0.773	0.732	0.720	0.711	0.766	0.687	0.661	0.707	0.279
292	TOME	0.831	0.793	0.833	0.775	0.734	0.712	0.704	0.753	0.721	0.673	0.716	0.317
293	TOMY	0.836	0.779	0.830	0.784	0.775	0.789	0.739	0.832	0.783	0.661	0.782	0.307
294	TOPG	0.671	0.621	0.700	0.542	0.621	0.527	0.521	0.477	0.769	0.533	0.613	0.432
295	TOYO	0.867	0.824	0.901	0.832	0.832	0.882	0.817	0.892	0.871	0.808	0.870	0.343
296	TPC	0.825	0.848	0.886	0.908	0.836	0.883	0.826	0.889	0.866	0.800	0.846	0.308
297	TRIV	0.837	0.884	0.861	0.866	0.831	0.903	0.847	0.915	0.855	0.829	0.879	0.671
298	TWH	0.780	0.579	0.821	0.729	0.751	0.664	0.711	0.756	0.814	0.677	0.749	0.327
299	TWP	0.850	0.802	0.835	0.784	0.753	0.770	0.751	0.818	0.798	0.650	0.720	0.344
300	UCHI	0.767	0.838	0.917	0.910	0.776	0.909	0.737	0.851	0.851	0.810	0.857	0.761
301	UGB	0.834	0.821	0.878	0.822	0.816	0.830	0.767	0.844	0.817	0.699	0.788	0.297
302	UMSN	0.844	0.834	0.894	0.892	0.862	0.899	0.837	0.908	0.885	0.872	0.900	0.372
303	UMWH	0.700	0.533	0.603	0.603	0.519	0.559	0.708	0.523	0.857	0.820	0.859	0.304
304	UNI	0.625	0.746	0.643	0.563	0.637	0.794	0.835	0.554	0.485	0.471	0.528	0.329
305	UPA	0.863	0.837	0.905	0.862	0.848	0.899	0.811	0.903	0.880	0.809	0.935	0.328
306	UTUS	0.819	0.802	0.795	0.760	0.759	0.713	0.707	0.865	0.770	0.629	0.759	0.132
307	UULI	0.818	0.756	0.847	0.819	0.811	0.832	0.759	0.825	0.860	0.697	0.796	0.314
308	VCB	0.793	0.824	0.891	0.896	0.836	0.893	0.824	0.853	0.883	0.864	0.894	0.379
309	VHB	0.892	0.914	0.878	0.945	0.844	0.938	0.837	0.912	0.939	0.920	0.920	0.397
310	VSI	0.635	0.672	0.745	0.662	0.649	0.599	0.589	0.577	0.461	0.484	0.545	0.245

311	WANG	0.836	0.798	0.861	0.809	0.778	0.799	0.775	0.853	0.794	0.684	0.759	0.311
312	WAT	0.806	0.882	0.897	0.935	0.861	0.917	0.873	0.901	0.896	0.896	0.943	0.662
313	WCE	0.859	0.865	0.884	0.862	0.858	0.855	0.838	0.867	0.690	0.605	0.672	0.303
314	WEC	0.822	0.854	0.891	0.910	0.859	0.907	0.859	0.893	0.900	0.909	0.912	0.354
315	WEI	0.830	0.791	0.834	0.798	0.779	0.689	0.756	0.821	0.784	0.689	0.793	0.296
316	WELL	0.803	0.787	0.870	0.842	0.785	0.783	0.735	0.817	0.836	0.777	0.833	0.369
317	WHB	0.781	0.830	0.896	0.931	0.876	0.897	0.870	0.918	0.912	0.935	0.931	0.569
318	WHIT	0.741	0.740	0.754	0.687	0.650	0.662	0.640	0.655	0.646	0.637	0.701	0.400
319	WSC	0.695	0.672	0.628	0.703	0.541	0.573	0.611	0.509	0.649	0.819	0.523	0.236
320	XLH	0.812	0.818	0.884	0.928	0.844	0.841	0.905	0.919	0.922	0.905	0.927	0.623
321	YEE	0.825	0.776	0.752	0.715	0.720	0.685	0.673	0.710	0.649	0.635	0.685	0.281
322	YKGI	0.823	0.802	0.793	0.718	0.785	0.744	0.698	0.802	0.735	0.697	0.755	0.641
323	YLAI	0.825	0.815	0.869	0.829	0.821	0.852	0.774	0.855	0.843	0.744	0.842	0.317
324	YLI	0.840	0.823	0.876	0.690	0.810	0.867	0.796	0.876	0.844	0.795	0.830	0.313
325	YSP	0.867	0.844	0.898	0.837	0.833	0.840	0.770	0.851	0.817	0.681	0.775	0.291

Table B.2.3: Marketability efficiency scores of the Philippines' listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	AB	0.769	0.857	0.811	0.781	0.819	0.925	0.940	0.898	0.879	0.729	0.778	0.935
2	AEV	0.655	0.875	0.692	0.840	0.867	0.924	0.942	0.819	0.777	0.800	0.824	0.951
3	APC	0.579	0.628	0.681	0.441	0.538	0.851	0.942	0.766	0.762	0.891	0.930	0.976
4	AT	0.786	0.688	0.809	0.776	0.876	0.911	0.847	0.839	0.890	0.728	0.777	0.933
5	BC	0.492	0.799	0.764	0.638	0.655	0.917	0.872	0.769	0.764	0.372	0.497	0.904
6	BMM	0.787	0.670	0.518	0.820	0.829	0.934	0.968	0.904	0.882	0.687	0.617	0.718
7	BSC	0.769	0.800	0.921	0.919	0.921	0.976	0.988	0.979	0.980	0.877	0.778	0.978
8	CA	0.766	0.800	0.831	0.836	0.814	0.923	0.944	0.897	0.886	0.758	0.504	0.941
9	CAT	0.576	0.463	0.566	0.457	0.581	0.860	0.914	0.780	0.768	0.381	0.584	0.959
10	CIP	0.763	0.794	0.807	0.774	0.871	0.924	0.940	0.896	0.877	0.728	0.775	0.933
11	DMC	0.467	0.469	0.625	0.657	0.682	0.800	0.822	0.740	0.747	0.625	0.708	0.849
12	EURO	0.413	0.836	0.596	0.466	0.532	0.812	0.848	0.761	0.748	0.374	0.509	0.861
13	FB	0.491	0.418	0.618	0.815	0.816	0.875	0.865	0.825	0.834	0.406	0.659	0.938
14	FOOD	0.485	0.434	0.578	0.444	0.542	0.847	0.893	0.899	0.777	0.422	0.500	0.875
15	FPI	0.810	0.802	0.814	0.926	0.818	0.979	0.992	0.976	0.979	0.933	0.931	0.978
16	GEO	0.771	0.859	0.811	0.905	0.888	0.882	0.983	0.899	0.980	0.931	0.958	0.978
17	GSMI	0.697	0.607	0.683	0.566	0.819	0.925	0.940	0.898	0.691	0.317	0.564	0.947
18	HLCM	0.809	0.779	0.666	0.743	0.680	0.877	0.872	0.761	0.776	0.627	0.608	0.783
19	IMP	0.874	0.798	0.947	0.930	0.929	0.975	0.990	0.974	0.974	0.867	0.926	0.976
20	ION	0.769	0.492	0.588	0.444	0.520	0.860	0.890	0.757	0.749	0.310	0.499	0.888
21	JGS	0.603	0.569	0.687	0.631	0.716	0.924	0.946	0.913	0.879	0.741	0.809	0.907
22	KPH	0.767	0.817	0.924	0.865	0.855	0.933	0.959	0.970	0.954	0.459	0.538	0.943
23	LC	0.772	0.802	0.857	0.522	0.863	0.928	0.973	0.898	0.879	0.733	0.782	0.959
24	LFM	0.427	0.484	0.650	0.549	0.568	0.963	0.957	0.925	0.785	0.717	0.545	0.931
25	LOTO	0.474	0.504	0.549	0.468	0.551	0.855	0.853	0.784	0.762	0.349	0.513	0.887
26	MACAY	0.457	0.599	0.586	0.467	0.546	0.907	0.870	0.868	0.832	0.501	0.587	0.869
27	MB	0.379	0.470	0.568	0.451	0.528	0.828	0.849	0.758	0.741	0.339	0.503	0.897
28	MVC	0.643	0.450	0.574	0.441	0.513	0.848	0.878	0.756	0.740	0.336	0.504	0.892
29	NI	0.783	0.799	0.809	0.924	0.934	0.841	0.939	0.946	0.876	0.821	0.901	0.974
30	OPM	0.682	0.813	0.681	0.436	0.527	0.826	0.891	0.749	0.732	0.320	0.489	0.897
31	ORE	0.769	0.843	0.872	0.931	0.558	0.839	0.846	0.826	0.750	0.408	0.490	0.897
32	OV	0.701	0.738	0.673	0.446	0.532	0.837	0.890	0.756	0.732	0.338	0.508	0.931
33	PA	0.794	0.798	0.827	0.932	0.938	0.978	0.940	0.977	0.970	0.928	0.953	0.977
34	PCOR	0.369	0.800	0.723	0.720	0.642	0.947	0.837	0.722	0.690	0.400	0.554	0.750
35	PHN	0.429	0.589	0.622	0.519	0.539	0.861	0.888	0.821	0.830	0.321	0.505	0.872
36	PMPC	0.476	0.621	0.598	0.459	0.541	0.849	0.873	0.789	0.783	0.307	0.519	0.889
37	PX	0.635	0.808	0.811	0.707	0.899	0.924	0.917	0.785	0.730	0.681	0.623	0.859
38	RCI	0.372	0.731	0.614	0.724	0.798	0.834	0.921	0.858	0.768	0.352	0.556	0.880
39	RFM	0.394	0.394	0.564	0.462	0.540	0.831	0.835	0.770	0.753	0.392	0.508	0.833
40	ROX	0.332	0.576	0.581	0.839	0.855	0.859	0.839	0.806	0.771	0.354	0.529	0.861
41	SCC	0.505	0.786	0.626	0.660	0.750	0.897	0.960	0.939	0.881	0.850	0.867	0.966
42	SFI	0.462	0.502	0.571	0.455	0.598	0.820	0.941	0.901	0.907	0.455	0.502	0.897
43	SMC	0.766	0.801	0.811	0.782	0.853	0.924	0.940	0.858	0.755	0.610	0.870	0.935
44	STN	0.764	0.669	0.812	0.653	0.814	0.924	0.958	0.961	0.909	0.401	0.493	0.917
45	T	0.583	0.569	0.616	0.652	0.806	0.926	0.940	0.818	0.754	0.730	0.776	0.933
46	URC	0.445	0.748	0.736	0.643	0.722	0.924	0.940	0.897	0.877	0.745	0.785	0.936
47	VITA	0.260	0.525	0.592	0.516	0.597	0.858	0.930	0.881	0.746	0.369	0.522	0.869
48	VMC	0.459	0.508	0.591	0.458	0.540	0.824	0.821	0.783	0.762	0.402	0.506	0.833
49	VUL	0.602	0.596	0.706	0.584	0.713	0.841	0.931	0.833	0.973	0.735	0.952	0.937
50	WIN	0.753	0.808	0.909	0.867	0.874	0.925	0.939	0.962	0.965	0.341	0.650	0.941

Table B.2.4: Marketability efficiency scores of Singapore's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	AAG	0.807	0.921	0.946	0.739	0.896	0.952	0.970	0.955	0.940	0.946	0.956	0.963
2	ABT	0.691	0.572	0.892	0.819	0.886	0.944	0.975	0.877	0.919	0.876	0.895	0.937
3	ACC	0.663	0.383	0.911	0.686	0.840	0.948	0.970	0.951	0.919	0.928	0.880	0.920
4	ACP	0.777	0.766	0.924	0.689	0.804	0.950	0.960	0.949	0.926	0.933	0.958	0.955
5	ADI	0.824	0.892	0.932	0.704	0.872	0.955	0.960	0.950	0.940	0.861	0.710	0.867
6	ADV	0.685	0.780	0.914	0.698	0.829	0.902	0.927	0.843	0.852	0.897	0.921	0.946
7	AEI	0.795	0.743	0.970	0.824	0.847	0.976	0.977	0.874	0.944	0.912	0.921	0.958
8	AEM	0.629	0.591	0.928	0.667	0.812	0.925	0.956	0.935	0.913	0.925	0.853	0.888
9	AHL	0.828	0.903	0.959	0.789	0.909	0.931	0.953	0.948	0.949	0.949	0.966	0.964
10	ALLI	0.694	0.609	0.898	0.659	0.833	0.958	0.904	0.847	0.854	0.910	0.906	0.925
11	ANIK	0.685	0.765	0.922	0.691	0.810	0.904	0.936	0.910	0.914	0.929	0.935	0.946
12	APOIL	0.767	0.836	0.905	0.672	0.807	0.892	0.926	0.869	0.880	0.920	0.912	0.941
13	ASA	0.797	0.910	0.953	0.674	0.830	0.957	0.970	0.933	0.950	0.947	0.941	0.964
14	ASL	0.404	0.599	0.755	0.627	0.838	0.855	0.907	0.851	0.847	0.831	0.809	0.942
15	ASMH	0.796	0.837	0.941	0.851	0.856	0.928	0.968	0.916	0.941	0.928	0.944	0.944
16	ASON	0.628	0.489	0.856	0.689	0.835	0.877	0.912	0.850	0.777	0.840	0.826	0.911
17	AVIT	0.688	0.908	0.936	0.671	0.840	0.965	0.953	0.944	0.927	0.951	0.943	0.951
18	BC	0.750	0.550	0.884	0.815	0.789	0.949	0.973	0.756	0.933	0.972	0.962	0.973
19	BEST	0.672	0.745	0.890	0.675	0.799	0.915	0.940	0.870	0.863	0.847	0.856	0.899
20	BKM	0.738	0.677	0.897	0.687	0.832	0.928	0.930	0.842	0.882	0.915	0.922	0.949
21	BREAD	0.652	0.554	0.844	0.654	0.811	0.864	0.912	0.850	0.834	0.861	0.746	0.869
22	BTL	0.672	0.826	0.936	0.838	0.842	0.957	0.926	0.879	0.923	0.926	0.903	0.947
23	BWAY	0.457	0.576	0.750	0.586	0.848	0.846	0.939	0.844	0.907	0.830	0.806	0.889
24	CAMS	0.814	0.911	0.957	0.693	0.881	0.944	0.962	0.956	0.933	0.933	0.931	0.939
25	CASA	0.709	0.926	0.955	0.664	0.834	0.896	0.952	0.949	0.932	0.947	0.924	0.954
26	CGIG	0.799	0.873	0.926	0.787	0.894	0.958	0.969	0.955	0.941	0.956	0.966	0.964
27	CHEM	0.706	0.731	0.905	0.665	0.832	0.907	0.944	0.879	0.927	0.961	0.954	0.962
28	CMI	0.777	0.814	0.910	0.668	0.789	0.939	0.940	0.937	0.936	0.947	0.921	0.898
29	COS	0.801	0.664	0.873	0.768	0.823	0.872	0.919	0.879	0.919	0.928	0.904	0.963
30	CREAF	0.797	0.821	0.924	0.814	0.893	0.851	0.952	0.742	0.964	0.752	0.819	0.778
31	CSE	0.494	0.587	0.787	0.670	0.826	0.836	0.824	0.829	0.842	0.864	0.791	0.875
32	CSMS	0.705	0.722	0.877	0.664	0.811	0.866	0.926	0.846	0.860	0.913	0.909	0.942
33	CWM	0.619	0.755	0.869	0.625	0.812	0.932	0.934	0.846	0.876	0.913	0.903	0.947
34	CWX	0.619	0.916	0.957	0.755	0.894	0.936	0.953	0.915	0.918	0.958	0.964	0.964
35	DELFI	0.530	0.570	0.783	0.722	0.868	0.935	0.952	0.933	0.936	0.843	0.753	0.879
36	DELM	0.420	0.586	0.791	0.673	0.821	0.852	0.910	0.929	0.796	0.853	0.543	0.922
37	DLNG	0.800	0.803	0.935	0.747	0.864	0.931	0.965	0.869	0.616	0.965	0.906	0.943
38	DSG	0.717	0.804	0.878	0.617	0.821	0.869	0.917	0.830	0.859	0.866	0.887	0.924
39	DT	0.679	0.813	0.901	0.673	0.816	0.900	0.939	0.937	0.937	0.947	0.953	0.942
40	ECW	0.737	0.916	0.947	0.691	0.801	0.912	0.934	0.879	0.901	0.928	0.929	0.953
41	EGCL	0.676	0.695	0.904	0.642	0.845	0.888	0.958	0.861	0.831	0.872	0.892	0.924
42	EIH	0.615	0.580	0.851	0.697	0.847	0.897	0.890	0.743	0.850	0.885	0.857	0.918
43	EMSE	0.798	0.834	0.907	0.684	0.816	0.917	0.977	0.966	0.920	0.859	0.961	0.942
44	ENVH	0.649	0.819	0.924	0.658	0.927	0.718	0.920	0.816	0.869	0.894	0.924	0.953
45	FABC	0.730	0.869	0.938	0.724	0.889	0.933	0.896	0.891	0.893	0.909	0.909	0.928
46	FEDI	0.651	0.896	0.865	0.601	0.828	0.981	0.934	0.826	0.879	0.921	0.899	0.945
47	FEH	0.497	0.572	0.876	0.646	0.822	0.852	0.912	0.875	0.849	0.864	0.812	0.866
48	FNN	0.548	0.768	0.848	0.744	0.903	0.936	0.843	0.879	0.768	0.865	0.911	0.809
49	FUJI	0.812	0.860	0.961	0.765	0.898	0.944	0.953	0.941	0.946	0.943	0.952	0.973
50	FUYU	0.794	0.665	0.966	0.662	0.822	0.899	0.918	0.830	0.849	0.854	0.864	0.899
51	GBY	0.680	0.715	0.929	0.677	0.840	0.948	0.942	0.921	0.906	0.928	0.925	0.937
52	GGR	0.717	0.677	0.848	0.763	0.833	0.868	0.874	0.915	0.901	0.842	0.770	0.879
53	GPI	0.488	0.600	0.792	0.649	0.822	0.850	0.968	0.832	0.823	0.866	0.626	0.814
54	GRP	0.765	0.927	0.958	0.683	0.877	0.926	0.967	0.945	0.942	0.762	0.940	0.954
55	GSSE	0.782	0.801	0.910	0.695	0.817	0.903	0.932	0.873	0.922	0.922	0.908	0.932
56	HANW	0.567	0.567	0.804	0.645	0.816	0.947	0.924	0.849	0.845	0.863	0.784	0.866
57	HLA	0.512	0.594	0.783	0.686	0.882	0.934	0.909	0.853	0.791	0.814	0.565	0.855
58	HOE	0.742	0.807	0.916	0.686	0.823	0.915	0.966	0.873	0.887	0.905	0.908	0.924
59	HPAR	0.797	0.821	0.925	0.813	0.893	0.935	0.952	0.914	0.918	0.927	0.904	0.942
60	IFAR	0.569	0.600	0.897	0.840	0.858	0.861	0.880	0.829	0.814	0.852	0.553	0.879

61	INTR	0.492	0.552	0.868	0.676	0.832	0.915	0.939	0.841	0.853	0.896	0.901	0.923
62	KLW	0.751	0.826	0.923	0.709	0.838	0.935	0.958	0.929	0.904	0.934	0.940	0.963
63	KODA	0.729	0.833	0.912	0.686	0.812	0.919	0.937	0.895	0.918	0.951	0.952	0.962
64	LEE	0.472	0.573	0.774	0.615	0.825	0.843	0.904	0.834	0.845	0.864	0.821	0.889
65	LHT	0.797	0.900	0.960	0.677	0.854	0.930	0.946	0.924	0.925	0.956	0.977	0.963
66	MIT	0.792	0.893	0.945	0.683	0.798	0.931	0.955	0.889	0.888	0.934	0.950	0.953
67	MIYO	0.555	0.665	0.890	0.661	0.853	0.930	0.953	0.877	0.910	0.934	0.932	0.946
68	MMH	0.723	0.892	0.921	0.657	0.819	0.905	0.941	0.925	0.926	0.956	0.944	0.940
69	MPM	0.722	0.873	0.914	0.655	0.819	0.836	0.907	0.833	0.871	0.920	0.681	0.915
70	MTEC	0.524	0.621	0.883	0.631	0.830	0.940	0.942	0.851	0.867	0.870	0.883	0.915
71	MTEX	0.763	0.809	0.916	0.699	0.836	0.947	0.938	0.833	0.875	0.913	0.922	0.952
72	NATC	0.677	0.712	0.894	0.666	0.828	0.895	0.939	0.838	0.846	0.863	0.891	0.925
73	NCL	0.754	0.670	0.926	0.859	0.813	0.831	0.853	0.827	0.840	0.924	0.901	0.863
74	NIP	0.541	0.779	0.910	0.680	0.824	0.926	0.945	0.849	0.850	0.887	0.893	0.931
75	NLH	0.787	0.821	0.925	0.822	0.889	0.921	0.950	0.939	0.939	0.948	0.941	0.953
76	NLPM	0.617	0.615	0.895	0.651	0.824	0.861	0.918	0.839	0.860	0.888	0.897	0.914
77	NSL	0.344	0.633	0.796	0.652	0.894	0.869	0.831	0.858	0.806	0.819	0.807	0.897
78	OLAM	0.587	0.671	0.804	0.695	0.841	0.857	0.877	0.894	0.948	0.858	0.718	0.751
79	ORG	0.817	0.913	0.945	0.814	0.875	0.935	0.938	0.866	0.929	0.926	0.925	0.954
80	OSI	0.465	0.558	0.847	0.655	0.809	0.842	0.953	0.916	0.918	0.953	0.943	0.958
81	PAN	0.477	0.589	0.757	0.656	0.829	0.854	0.895	0.835	0.824	0.858	0.733	0.833
82	PBS	0.711	0.747	0.895	0.816	0.819	0.900	0.919	0.846	0.865	0.933	0.917	0.924
83	PCI	0.513	0.553	0.840	0.635	0.829	0.881	0.927	0.848	0.858	0.876	0.829	0.890
84	PDS	0.712	0.874	0.944	0.792	0.916	0.953	0.980	0.961	0.953	0.933	0.915	0.943
85	PHL	0.795	0.817	0.947	0.735	0.893	0.945	0.972	0.954	0.935	0.954	0.903	0.949
86	PSL	0.763	0.856	0.957	0.781	0.896	0.966	0.953	0.918	0.941	0.833	0.925	0.936
87	PSTAR	0.795	0.820	0.925	0.843	0.872	0.924	0.975	0.938	0.915	0.940	0.917	0.932
88	QAF	0.521	0.631	0.711	0.593	0.852	0.858	0.900	0.837	0.821	0.875	0.690	0.854
89	SGH	0.628	0.845	0.911	0.668	0.805	0.905	0.928	0.900	0.914	0.942	0.937	0.950
90	SIE	0.648	0.745	0.923	0.829	0.896	0.955	0.952	0.916	0.923	0.923	0.884	0.794
91	SLIAN	0.739	0.872	0.937	0.675	0.868	0.939	0.949	0.944	0.921	0.936	0.942	0.953
92	SMM	0.753	0.731	0.869	0.817	0.900	0.935	0.965	0.930	0.919	0.861	0.745	0.942
93	SNTK	0.745	0.829	0.931	0.689	0.820	0.887	0.936	0.899	0.945	0.938	0.948	0.953
94	SPE	0.698	0.828	0.904	0.665	0.824	0.893	0.926	0.845	0.865	0.903	0.911	0.932
95	SPH	0.858	0.816	0.924	0.815	0.893	0.935	0.953	0.915	0.917	0.927	0.911	0.950
96	STE	0.669	0.830	0.926	0.826	0.913	0.937	0.953	0.916	0.921	0.928	0.905	0.943
97	SUNL	0.815	0.879	0.909	0.692	0.817	0.936	0.944	0.938	0.932	0.962	0.965	0.962
98	SUNN	0.554	0.615	0.836	0.658	0.848	0.876	0.928	0.858	0.871	0.908	0.740	0.854
99	SUTL	0.569	0.517	0.861	0.649	0.840	0.906	0.924	0.951	0.955	0.957	0.958	0.962
100	TECK	0.592	0.614	0.869	0.644	0.827	0.874	0.917	0.842	0.860	0.864	0.885	0.915
101	TMC	0.777	0.937	0.970	0.762	0.891	0.942	0.968	0.958	0.940	0.950	0.914	0.946
102	TOYO	0.509	0.557	0.821	0.636	0.826	0.854	0.909	0.836	0.853	0.863	0.841	0.902
103	TREK	0.597	0.623	0.901	0.643	0.814	0.944	0.938	0.847	0.838	0.862	0.889	0.953
104	TSE	0.462	0.574	0.856	0.648	0.824	0.843	0.908	0.833	0.851	0.865	0.826	0.888
105	TSP	0.711	0.739	0.890	0.666	0.815	0.877	0.926	0.842	0.868	0.879	0.861	0.908
106	UMS	0.763	0.818	0.920	0.738	0.895	0.933	0.929	0.915	0.954	0.920	0.936	0.950
107	UMSH	0.630	0.746	0.928	0.605	0.822	0.841	0.898	0.822	0.857	0.900	0.883	0.870
108	USH	0.634	0.575	0.905	0.727	0.872	0.940	0.964	0.799	0.781	0.926	0.924	0.947
109	VCM	0.716	0.812	0.929	0.870	0.906	0.937	0.953	0.917	0.920	0.929	0.916	0.944
110	VIB	0.771	0.867	0.954	0.723	0.852	0.938	0.954	0.953	0.864	0.952	0.955	0.959
111	WIL	0.795	0.819	0.923	0.814	0.894	0.934	0.952	0.916	0.919	0.927	0.899	0.941
112	YHI	0.457	0.571	0.787	0.606	0.856	0.857	0.921	0.843	0.854	0.862	0.794	0.878
113	YHS	0.836	0.856	0.926	0.756	0.854	0.891	0.884	0.891	0.823	0.856	0.842	0.890
114	YPG	0.765	0.913	0.974	0.830	0.865	0.935	0.974	0.859	0.934	0.946	0.945	0.951

Table B.2.5: Marketability efficiency scores of Thailand's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	ACC	0.864	0.965	0.935	0.812	0.839	0.771	0.874	0.794	0.950	0.966	0.985	0.965
2	AFC	0.997	0.993	0.907	0.747	0.986	0.874	0.930	0.124	0.994	0.887	0.995	0.993
3	AH	0.626	0.545	0.970	0.449	0.983	0.248	0.426	0.501	0.452	0.479	0.546	0.545
4	AJ	0.650	0.955	0.504	0.559	0.483	0.603	0.983	0.405	0.922	0.767	0.579	0.955
5	ALUCON	0.762	0.866	0.730	0.636	0.615	0.465	0.609	0.695	0.671	0.741	0.919	0.866
6	AMARIN	0.777	0.843	0.700	0.669	0.636	0.531	0.716	0.454	0.996	0.993	0.954	0.843
7	AMC	0.854	0.997	0.681	0.672	0.636	0.513	0.546	0.169	0.998	0.468	0.632	0.997
8	APURE	0.997	0.794	0.851	0.110	0.909	0.748	0.915	0.701	0.734	0.681	0.725	0.794
9	ASIMAR	0.907	0.891	0.980	0.840	0.784	0.738	0.726	0.798	0.765	0.837	0.743	0.891
10	BANPU	0.783	0.595	0.617	0.705	0.561	0.512	0.875	0.724	0.974	0.791	0.598	0.595
11	BAT3K	0.900	0.875	0.687	0.629	0.632	0.901	0.713	0.624	0.677	0.754	0.854	0.875
12	BCP	0.566	0.613	0.515	0.456	0.500	0.360	0.467	0.850	0.478	0.439	0.587	0.613
13	BJC	0.573	0.885	0.469	0.626	0.897	0.827	0.864	0.792	0.695	0.839	0.858	0.885
14	BR	0.679	0.744	0.580	0.447	0.532	0.810	0.708	0.431	0.457	0.639	0.562	0.744
15	BSBM	0.733	0.872	0.745	0.646	0.696	0.979	0.640	0.855	0.998	0.538	0.683	0.872
16	CCP	0.998	0.996	0.992	0.224	0.834	0.513	0.508	0.631	0.811	0.946	0.998	0.996
17	CEN	0.731	0.789	0.723	0.773	0.907	0.969	0.984	0.634	0.997	0.994	0.998	0.789
18	CFRESH	0.929	0.906	0.646	0.647	0.532	0.357	0.987	0.487	0.402	0.544	0.995	0.906
19	CHOTI	0.952	0.947	0.878	0.836	0.826	0.791	0.815	0.646	0.910	0.922	0.885	0.947
20	CIG	0.775	0.995	0.958	0.154	0.988	0.974	0.988	0.738	0.997	0.994	0.997	0.995
21	CITY	0.848	0.889	0.786	0.785	0.780	0.595	0.722	0.760	0.693	0.835	0.807	0.889
22	CM	0.794	0.826	0.681	0.679	0.792	0.577	0.616	0.750	0.691	0.656	0.747	0.826
23	CPF	0.912	0.736	0.502	0.735	0.881	0.522	0.821	0.766	0.545	0.638	0.680	0.736
24	CPH	0.996	0.995	0.932	0.132	0.984	0.967	0.989	0.073	0.836	0.994	0.996	0.995
25	CPI	0.882	0.997	0.669	0.692	0.560	0.797	0.938	0.786	0.998	0.995	0.922	0.997
26	CPL	0.998	0.927	0.697	0.703	0.686	0.808	0.735	0.699	0.852	0.902	0.997	0.927
27	CPR	0.865	0.858	0.862	0.799	0.829	0.721	0.802	0.816	0.845	0.839	0.775	0.858
28	CSC	0.745	0.827	0.600	0.581	0.608	0.529	0.604	0.638	0.587	0.608	0.758	0.827
29	CSP	0.843	0.997	0.920	0.628	0.676	0.618	0.706	0.592	0.998	0.681	0.998	0.997
30	CTW	0.664	0.688	0.527	0.459	0.576	0.357	0.483	0.661	0.997	0.524	0.624	0.688
31	CWT	0.997	0.839	0.989	0.702	0.850	0.681	0.987	0.827	0.833	0.889	0.802	0.839
32	DCC	0.641	0.690	0.594	0.799	0.909	0.548	0.759	0.781	0.901	0.790	0.849	0.690
33	DCON	0.891	0.838	0.060	0.725	0.747	0.612	0.681	0.695	0.743	0.778	0.802	0.838
34	DEMCO	0.705	0.773	0.805	0.674	0.649	0.404	0.526	0.704	0.995	0.949	0.807	0.773
35	DRT	0.700	0.700	0.597	0.635	0.619	0.548	0.725	0.619	0.579	0.579	0.686	0.700
36	DTCI	0.943	0.945	0.826	0.856	0.900	0.869	0.892	0.807	0.891	0.870	0.915	0.945
37	EASON	0.868	0.856	0.814	0.754	0.771	0.634	0.765	0.803	0.810	0.846	0.830	0.856
38	EE	0.869	0.901	0.826	0.746	0.819	0.770	0.812	0.795	0.829	0.821	0.859	0.901
39	EIC	0.886	0.943	0.851	0.833	0.858	0.863	0.837	0.258	0.983	0.978	0.981	0.943
40	EPCO	0.831	0.883	0.769	0.772	0.785	0.749	0.783	0.802	0.869	0.862	0.920	0.883
42	FANCY	0.868	0.988	0.821	0.750	0.949	0.888	0.847	0.821	0.982	0.964	0.995	0.988
41	FND	0.991	0.988	0.846	0.795	0.879	0.810	0.895	0.085	0.984	0.983	0.980	0.988
43	GEL	0.828	0.993	0.988	0.108	0.986	0.547	0.674	0.708	0.699	0.834	0.995	0.993
44	GFPT	0.613	0.630	0.444	0.457	0.559	0.619	0.478	0.517	0.458	0.483	0.541	0.630
45	GJS	0.957	0.997	0.925	0.831	0.968	0.872	0.974	0.525	0.998	0.984	0.487	0.997
46	GSTEL	0.549	0.998	0.958	0.788	0.969	0.909	0.990	0.330	0.998	0.993	0.998	0.998
47	GYT	0.866	0.881	0.827	0.762	0.818	0.780	0.816	0.761	0.832	0.828	0.856	0.881
48	HANA	0.645	0.654	0.481	0.470	0.541	0.362	0.478	0.484	0.649	0.565	0.649	0.654
49	HFT	0.869	0.715	0.709	0.636	0.642	0.547	0.529	0.574	0.586	0.581	0.696	0.715
50	HTC	0.958	0.725	0.816	0.704	0.825	0.642	0.570	0.643	0.715	0.572	0.638	0.725
51	ICC	0.731	0.650	0.690	0.555	0.683	0.348	0.544	0.565	0.538	0.494	0.586	0.650
52	IHL	0.973	0.806	0.798	0.698	0.697	0.550	0.639	0.661	0.639	0.676	0.790	0.806
53	ILINK	0.810	0.702	0.704	0.696	0.697	0.632	0.622	0.674	0.772	0.850	0.934	0.702
54	INOX	0.877	0.566	0.939	0.560	0.818	0.791	0.941	0.654	0.678	0.563	0.676	0.566
55	IRC	0.663	0.685	0.556	0.432	0.594	0.653	0.431	0.482	0.480	0.515	0.654	0.685
56	IRPC	0.588	0.676	0.654	0.796	0.873	0.776	0.831	0.739	0.484	0.466	0.620	0.676
57	JCT	0.892	0.957	0.886	0.831	0.867	0.754	0.829	0.870	0.865	0.874	0.857	0.957
58	KAMART	0.986	0.828	0.966	0.823	0.839	0.756	0.804	0.758	0.822	0.901	0.882	0.828
59	KASET	0.952	0.915	0.886	0.779	0.977	0.965	0.989	0.151	0.835	0.995	0.941	0.915
60	KCE	0.621	0.815	0.607	0.408	0.618	0.325	0.482	0.546	0.905	0.843	0.915	0.815

61	KKC	0.997	0.997	0.911	0.449	0.703	0.527	0.085	0.753	0.545	0.855	0.997	0.997
62	KSL	0.960	0.597	0.908	0.765	0.567	0.337	0.490	0.505	0.549	0.585	0.578	0.597
63	KYE	0.822	0.888	0.878	0.669	0.827	0.591	0.646	0.828	0.773	0.869	0.877	0.888
65	LANNA	0.716	0.553	0.527	0.469	0.492	0.290	0.474	0.505	0.446	0.585	0.550	0.553
66	LEE	0.653	0.833	0.590	0.525	0.496	0.463	0.493	0.549	0.634	0.570	0.684	0.833
64	LNE	0.826	0.802	0.921	0.738	0.707	0.655	0.578	0.603	0.786	0.784	0.775	0.802
67	LST	0.640	0.629	0.536	0.539	0.568	0.470	0.503	0.477	0.442	0.496	0.588	0.629
68	LTX	0.687	0.717	0.578	0.521	0.540	0.644	0.556	0.561	0.474	0.552	0.685	0.717
69	MALEE	0.998	0.994	0.608	0.633	0.509	0.480	0.519	0.526	0.517	0.839	0.849	0.994
70	MATI	0.770	0.898	0.706	0.671	0.718	0.689	0.642	0.276	0.995	0.991	0.765	0.898
71	MBAX	0.830	0.833	0.874	0.062	0.989	0.738	0.917	0.813	0.760	0.811	0.768	0.833
72	MCS	0.687	0.718	0.513	0.647	0.569	0.552	0.551	0.715	0.570	0.488	0.727	0.718
73	METCO	0.909	0.924	0.825	0.737	0.731	0.774	0.840	0.727	0.772	0.707	0.799	0.924
74	MILL	0.698	0.979	0.661	0.646	0.656	0.563	0.992	0.539	0.392	0.487	0.728	0.979
75	MODERN	0.718	0.802	0.607	0.611	0.612	0.547	0.699	0.672	0.585	0.720	0.751	0.802
76	NEP	0.899	0.979	0.967	0.129	0.908	0.540	0.893	0.312	0.990	0.985	0.987	0.979
77	NMG	0.997	0.991	0.990	0.500	0.657	0.563	0.673	0.817	0.896	0.908	0.996	0.991
78	NPK	0.866	0.977	0.832	0.837	0.907	0.872	0.934	0.871	0.941	0.923	0.924	0.977
79	OCC	0.854	0.852	0.752	0.693	0.728	0.654	0.669	0.704	0.773	0.802	0.775	0.852
80	OGC	0.857	0.912	0.825	0.714	0.807	0.817	0.974	0.832	0.744	0.806	0.810	0.912
81	PAF	0.998	0.861	0.992	0.109	0.990	0.984	0.653	0.748	0.686	0.629	0.996	0.861
82	PAP	0.718	0.811	0.643	0.496	0.478	0.453	0.415	0.553	0.998	0.463	0.606	0.811
83	PATO	0.834	0.878	0.729	0.792	0.756	0.726	0.769	0.772	0.775	0.783	0.819	0.878
84	PB	0.691	0.894	0.733	0.656	0.836	0.891	0.892	0.727	0.814	0.775	0.911	0.894
85	PDJ	0.664	0.767	0.557	0.509	0.471	0.381	0.592	0.584	0.997	0.994	0.997	0.767
86	PERM	0.913	0.997	0.992	0.745	0.824	0.752	0.861	0.857	0.998	0.462	0.632	0.997
87	PK	0.998	0.997	0.992	0.624	0.510	0.348	0.994	0.457	0.687	0.808	0.613	0.997
88	POST	0.948	0.988	0.939	0.729	0.798	0.607	0.688	0.629	0.991	0.991	0.996	0.988
89	PRG	0.719	0.943	0.797	0.684	0.680	0.666	0.878	0.791	0.856	0.817	0.912	0.943
90	PTL	0.654	0.530	0.457	0.641	0.522	0.492	0.965	0.536	0.996	0.497	0.529	0.530
91	PTT	0.865	0.881	0.835	0.767	0.817	0.788	0.843	0.753	0.830	0.826	0.857	0.881
92	PTTEP	0.861	0.880	0.826	0.763	0.816	0.774	0.813	0.763	0.830	0.828	0.858	0.880
93	QCON	0.995	0.862	0.946	0.773	0.757	0.612	0.691	0.679	0.918	0.987	0.939	0.862
94	RCI	0.997	0.857	0.990	0.100	0.987	0.970	0.744	0.826	0.994	0.989	0.983	0.857
95	RICH	0.950	0.992	0.884	0.592	0.991	0.986	0.993	0.619	0.998	0.996	0.996	0.992
96	ROCK	0.923	0.947	0.964	0.791	0.956	0.721	0.947	0.121	0.896	0.925	0.978	0.947
97	RPC	0.589	0.997	0.500	0.516	0.550	0.988	0.992	0.237	0.702	0.996	0.998	0.997
99	SALEE	0.924	0.885	0.748	0.761	0.779	0.604	0.765	0.711	0.878	0.921	0.846	0.885
100	SAM	0.996	0.997	0.937	0.771	0.905	0.551	0.601	0.671	0.998	0.860	0.998	0.997
101	SAT	0.673	0.561	0.645	0.558	0.611	0.411	0.432	0.497	0.485	0.487	0.604	0.561
102	SAUCE	0.767	0.869	0.693	0.695	0.718	0.743	0.851	0.787	0.861	0.788	0.859	0.869
103	SAWANG	0.945	0.943	0.897	0.816	0.875	0.824	0.917	0.088	0.981	0.963	0.923	0.943
104	SCC	0.898	0.879	0.857	0.781	0.829	0.782	0.835	0.755	0.835	0.828	0.858	0.879
105	SCCC	0.925	0.856	0.829	0.793	0.842	0.795	0.834	0.758	0.857	0.681	0.923	0.856
106	SCP	0.832	0.787	0.844	0.756	0.672	0.508	0.601	0.691	0.617	0.644	0.754	0.787
107	SEED	0.681	0.917	0.627	0.498	0.563	0.538	0.732	0.709	0.771	0.954	0.998	0.917
108	SFP	0.865	0.957	0.726	0.749	0.761	0.774	0.899	0.794	0.834	0.835	0.954	0.957
109	SIAM	0.668	0.765	0.749	0.398	0.448	0.868	0.989	0.274	0.996	0.994	0.997	0.765
110	SITHAI	0.640	0.822	0.789	0.452	0.476	0.377	0.431	0.494	0.449	0.563	0.877	0.822
111	SMM	0.992	0.975	0.862	0.842	0.896	0.828	0.910	0.129	0.994	0.988	0.992	0.975
112	SNC	0.753	0.626	0.663	0.485	0.578	0.410	0.467	0.493	0.415	0.487	0.590	0.626
98	SNJ	0.692	0.695	0.604	0.484	0.553	0.504	0.531	0.521	0.511	0.496	0.642	0.695
113	SORKON	0.996	0.869	0.883	0.789	0.828	0.713	0.723	0.684	0.734	0.780	0.777	0.869
114	SPACK	0.788	0.879	0.715	0.697	0.740	0.823	0.986	0.150	0.996	0.993	0.997	0.879
115	SPC	0.663	0.583	0.533	0.486	0.563	0.400	0.495	0.536	0.456	0.441	0.569	0.583
116	SPG	0.662	0.763	0.577	0.508	0.537	0.398	0.640	0.795	0.697	0.613	0.742	0.763
117	SPORT	0.997	0.996	0.833	0.748	0.829	0.857	0.925	0.141	0.998	0.995	0.997	0.996
118	SSC	0.683	0.894	0.603	0.589	0.817	0.785	0.813	0.785	0.957	0.825	0.932	0.894
119	SSF	0.758	0.995	0.535	0.740	0.489	0.475	0.991	0.552	0.599	0.662	0.995	0.995
120	SSI	0.674	0.738	0.576	0.481	0.886	0.926	0.956	0.555	0.998	0.996	0.548	0.738
121	SSSC	0.641	0.762	0.658	0.403	0.469	0.350	0.407	0.467	0.558	0.495	0.616	0.762
122	STANLY	0.911	0.792	0.621	0.594	0.679	0.475	0.639	0.634	0.630	0.624	0.793	0.792
123	STHAI	0.994	0.992	0.982	0.162	0.984	0.969	0.984	0.121	0.837	0.133	0.996	0.992

124	STPI	0.984	0.878	0.430	0.629	0.819	0.797	0.870	0.653	0.496	0.561	0.858	0.878
125	SUC	0.648	0.647	0.504	0.451	0.597	0.398	0.524	0.532	0.561	0.501	0.619	0.647
126	SVI	0.636	0.570	0.491	0.441	0.927	0.303	0.452	0.870	0.527	0.440	0.600	0.570
127	SWC	0.848	0.837	0.769	0.729	0.735	0.649	0.655	0.719	0.705	0.714	0.760	0.837
128	TAPAC	0.931	0.857	0.851	0.765	0.803	0.788	0.901	0.813	0.853	0.913	0.855	0.857
129	TASCO	0.655	0.721	0.569	0.464	0.566	0.285	0.412	0.465	0.721	0.463	0.583	0.721
130	TBSP	0.835	0.931	0.831	0.780	0.748	0.702	0.730	0.727	0.827	0.803	0.921	0.931
131	TC	0.998	0.768	0.635	0.754	0.713	0.635	0.993	0.559	0.584	0.996	0.998	0.768
132	TCCC	0.601	0.700	0.469	0.502	0.517	0.305	0.477	0.469	0.558	0.512	0.763	0.700
133	TCJ	0.909	0.924	0.984	0.806	0.846	0.712	0.713	0.749	0.823	0.993	0.863	0.924
134	TCMC	0.879	0.695	0.831	0.789	0.976	0.457	0.897	0.692	0.682	0.614	0.622	0.695
135	TEAM	0.726	0.921	0.986	0.642	0.795	0.844	0.818	0.738	0.997	0.994	0.915	0.921
136	TFI	0.998	0.996	0.991	0.694	0.744	0.953	0.992	0.425	0.898	0.987	0.998	0.996
137	TGCI	0.998	0.929	0.855	0.575	0.647	0.585	0.783	0.659	0.675	0.718	0.820	0.929
138	TGPRO	0.946	0.109	0.990	0.025	0.689	0.661	0.803	0.791	0.995	0.526	0.945	0.109
139	TH	0.865	0.908	0.824	0.751	0.818	0.774	0.815	0.789	0.935	0.938	0.861	0.908
140	THIP	0.873	0.755	0.752	0.746	0.750	0.676	0.631	0.643	0.550	0.614	0.722	0.755
141	TIPCO	0.668	0.986	0.616	0.581	0.449	0.506	0.687	0.706	0.623	0.507	0.694	0.986
142	TIW	0.959	0.883	0.906	0.811	0.835	0.800	0.817	0.385	0.836	0.829	0.878	0.883
143	TKS	0.689	0.802	0.784	0.694	0.716	0.530	0.643	0.694	0.678	0.630	0.806	0.802
144	TKT	0.880	0.995	0.876	0.770	0.989	0.685	0.831	0.857	0.911	0.995	0.997	0.995
145	TMD	0.794	0.833	0.632	0.615	0.645	0.485	0.652	0.659	0.635	0.645	0.759	0.833
146	TMW	0.814	0.863	0.858	0.730	0.906	0.424	0.617	0.659	0.729	0.642	0.817	0.863
147	TNL	0.753	0.811	0.751	0.651	0.591	0.502	0.678	0.665	0.682	0.675	0.769	0.811
148	TNPC	0.944	0.896	0.859	0.817	0.989	0.571	0.578	0.131	0.859	0.890	0.997	0.896
149	TPA	0.820	0.993	0.769	0.732	0.736	0.645	0.856	0.833	0.805	0.791	0.760	0.993
150	TPAC	0.826	0.913	0.714	0.703	0.732	0.645	0.624	0.681	0.723	0.755	0.796	0.913
151	TPCORP	0.721	0.855	0.808	0.740	0.764	0.712	0.802	0.755	0.792	0.623	0.781	0.855
152	TPIPL	0.543	0.885	0.439	0.525	0.432	0.829	0.775	0.626	0.869	0.855	0.863	0.885
153	TPP	0.923	0.941	0.888	0.818	0.947	0.813	0.887	0.828	0.876	0.829	0.895	0.941
154	TR	0.858	0.653	0.807	0.534	0.832	0.868	0.969	0.554	0.475	0.498	0.666	0.653
155	TRT	0.770	0.997	0.588	0.668	0.625	0.830	0.540	0.782	0.997	0.812	0.998	0.997
156	TRU	0.995	0.775	0.979	0.720	0.676	0.481	0.543	0.619	0.682	0.844	0.786	0.775
157	TRUBB	0.961	0.934	0.639	0.530	0.628	0.986	0.995	0.105	0.998	0.996	0.633	0.934
158	TSC	0.715	0.757	0.726	0.596	0.656	0.581	0.582	0.670	0.663	0.683	0.739	0.757
159	TSTH	0.547	0.985	0.825	0.806	0.962	0.953	0.224	0.454	0.625	0.679	0.600	0.985
160	TTI	0.982	0.990	0.947	0.749	0.868	0.963	0.884	0.214	0.922	0.986	0.832	0.990
161	TTL	0.977	0.878	0.883	0.794	0.815	0.770	0.818	0.733	0.832	0.820	0.853	0.878
162	TTTM	0.968	0.945	0.939	0.886	0.915	0.893	0.896	0.875	0.883	0.831	0.945	0.945
163	TU	0.607	0.720	0.450	0.683	0.619	0.551	0.780	0.734	0.565	0.540	0.613	0.720
164	TVO	0.593	0.583	0.490	0.631	0.667	0.343	0.515	0.497	0.468	0.478	0.561	0.583
165	TYCN	0.979	0.996	0.968	0.448	0.553	0.971	0.993	0.821	0.998	0.816	0.627	0.996
166	UBIS	0.866	0.823	0.827	0.797	0.785	0.709	0.723	0.759	0.739	0.774	0.993	0.823
167	UMI	0.998	0.996	0.643	0.543	0.650	0.381	0.938	0.809	0.996	0.743	0.997	0.996
168	UP	0.879	0.972	0.881	0.777	0.806	0.733	0.760	0.800	0.908	0.897	0.893	0.972
169	UPF	0.953	0.964	0.906	0.819	0.903	0.907	0.905	0.887	0.952	0.925	0.941	0.964
170	UPOIC	0.874	0.906	0.764	0.822	0.697	0.551	0.750	0.743	0.995	0.868	0.989	0.906
171	UT	0.929	0.855	0.952	0.872	0.880	0.864	0.187	0.126	0.886	0.870	0.824	0.855
172	UTP	0.866	0.761	0.929	0.702	0.921	0.652	0.547	0.645	0.623	0.742	0.773	0.761
173	UVAN	0.656	0.703	0.654	0.642	0.469	0.401	0.643	0.633	0.730	0.687	0.638	0.703
174	VARO	0.796	0.889	0.764	0.771	0.776	0.978	0.990	0.826	0.996	0.906	0.939	0.889
175	VNG	0.631	0.948	0.727	0.453	0.532	0.506	0.989	0.546	0.737	0.580	0.667	0.948
176	VNT	0.675	0.571	0.496	0.521	0.551	0.410	0.775	0.882	0.467	0.563	0.572	0.571
177	WACOAL	0.691	0.790	0.701	0.656	0.644	0.511	0.737	0.689	0.697	0.669	0.746	0.790
178	WIIK	0.995	0.930	0.823	0.102	0.980	0.965	0.174	0.174	0.751	0.750	0.743	0.930
179	YCI	0.965	0.878	0.826	0.765	0.875	0.772	0.809	0.047	0.918	0.830	0.856	0.878
180	YUASA	0.998	0.816	0.822	0.757	0.677	0.774	0.924	0.127	0.835	0.791	0.729	0.816

Table B.2.6: Marketability efficiency scores of Vietnam's listed manufacturers

No.	Ticker	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	ABT	0.758	0.510	0.784	0.851	0.772	0.779	0.766	0.805	0.805	0.744	0.540	0.764
2	ACL	0.688	0.421	0.359	0.428	0.601	0.651	0.588	0.551	0.337	0.254	0.231	0.569
3	AGF	0.663	0.357	0.629	0.455	0.534	0.508	0.736	0.902	0.736	0.257	0.422	0.247
4	ANV	0.529	0.472	0.729	0.629	0.364	0.647	0.856	0.362	0.795	0.212	0.291	0.302
5	BBC	0.803	0.519	0.598	0.638	0.446	0.621	0.739	0.823	0.759	0.764	0.829	0.677
6	BBS	0.479	0.316	0.472	0.563	0.362	0.383	0.431	0.491	0.502	0.348	0.270	0.277
7	BCC	0.523	0.345	0.415	0.429	0.284	0.228	0.787	0.346	0.265	0.318	0.844	0.186
8	BMP	0.594	0.301	0.680	0.529	0.371	0.414	0.505	0.581	0.714	0.789	0.580	0.459
9	BPC	0.694	0.351	0.445	0.429	0.401	0.439	0.452	0.461	0.526	0.690	0.649	0.370
10	BT6	0.424	0.657	0.514	0.595	0.370	0.363	0.523	0.282	0.299	0.170	0.365	0.252
11	BTS	0.681	0.435	0.485	0.825	0.732	0.764	0.799	0.263	0.317	0.315	0.560	0.210
12	CAN	0.527	0.354	0.323	0.812	0.827	0.811	0.661	0.696	0.681	0.703	0.588	0.748
13	CLC	0.414	0.274	0.334	0.320	0.326	0.329	0.441	0.443	0.486	0.442	0.437	0.472
14	CTB	0.508	0.315	0.352	0.366	0.577	0.480	0.452	0.853	0.684	0.475	0.645	0.513
15	DAE	0.782	0.564	0.590	0.558	0.694	0.724	0.783	0.798	0.785	0.706	0.804	0.742
16	DCS	0.832	0.669	0.374	0.795	0.279	0.725	0.773	0.754	0.325	0.110	0.391	0.778
17	DHG	0.846	0.798	0.636	0.700	0.707	0.695	0.757	0.838	0.464	0.606	0.769	0.639
18	DMC	0.806	0.591	0.770	0.469	0.432	0.395	0.501	0.523	0.508	0.755	0.774	0.749
19	DNP	0.524	0.100	0.318	0.184	0.165	0.185	0.192	0.354	0.281	0.321	0.351	0.597
20	DPC	0.725	0.512	0.577	0.554	0.497	0.703	0.587	0.643	0.779	0.796	0.587	0.792
21	DPM	0.773	0.683	0.729	0.792	0.450	0.586	0.616	0.542	0.388	0.328	0.354	0.434
22	DPR	0.829	0.792	0.774	0.782	0.740	0.754	0.807	0.685	0.589	0.613	0.540	0.546
23	DRC	0.500	0.126	0.361	0.438	0.313	0.379	0.460	0.541	0.470	0.427	0.490	0.456
24	DST	0.769	0.670	0.726	0.732	0.706	0.717	0.453	0.742	0.720	0.721	0.727	0.093
25	DTT	0.869	0.370	0.727	0.778	0.719	0.730	0.534	0.593	0.434	0.237	0.359	0.232
26	EBS	0.639	0.509	0.817	0.520	0.383	0.405	0.435	0.427	0.278	0.235	0.255	0.248
27	FMC	0.511	0.276	0.257	0.256	0.338	0.314	0.328	0.426	0.444	0.354	0.355	0.363
28	GIL	0.483	0.282	0.538	0.549	0.681	0.801	0.596	0.670	0.582	0.539	0.478	0.526
29	GMC	0.398	0.189	0.471	0.391	0.470	0.536	0.596	0.668	0.650	0.491	0.485	0.581
30	GTA	0.593	0.469	0.403	0.304	0.365	0.366	0.442	0.571	0.479	0.318	0.349	0.309
31	HAI	0.441	0.273	0.754	0.474	0.515	0.486	0.403	0.495	0.357	0.196	0.796	0.813
32	HAP	0.569	0.669	0.579	0.375	0.198	0.410	0.403	0.319	0.303	0.142	0.186	0.152
33	HCC	0.429	0.164	0.306	0.596	0.276	0.317	0.321	0.311	0.491	0.548	0.537	0.464
34	HEV	0.782	0.731	0.730	0.736	0.703	0.724	0.735	0.773	0.743	0.729	0.734	0.744
35	HHC	0.616	0.359	0.350	0.565	0.501	0.449	0.449	0.611	0.517	0.511	0.777	0.731
36	HLY	0.789	0.698	0.750	0.794	0.747	0.718	0.749	0.829	0.813	0.758	0.810	0.704
37	HNM	0.530	0.672	0.513	0.732	0.337	0.495	0.646	0.743	0.385	0.177	0.321	0.175
38	HPG	0.526	0.444	0.643	0.827	0.299	0.487	0.401	0.407	0.248	0.301	0.285	0.338
39	HRC	0.793	0.665	0.782	0.829	0.713	0.648	0.738	0.761	0.734	0.715	0.719	0.716
40	HT1	0.907	0.647	0.569	0.760	0.782	0.745	0.748	0.642	0.456	0.412	0.357	0.297
41	HTP	0.799	0.704	0.723	0.621	0.700	0.712	0.723	0.791	0.578	0.693	0.715	0.693
42	IMP	0.856	0.791	0.869	0.776	0.659	0.506	0.590	0.602	0.562	0.725	0.780	0.720
43	KDC	0.856	0.700	0.813	0.803	0.829	0.765	0.845	0.798	0.719	0.840	0.550	0.725
44	L10	0.723	0.365	0.439	0.607	0.345	0.456	0.466	0.530	0.537	0.469	0.464	0.390
45	LAF	0.529	0.254	0.341	0.581	0.824	0.346	0.378	0.531	0.429	0.321	0.297	0.326
46	LBM	0.824	0.460	0.631	0.434	0.391	0.479	0.469	0.473	0.612	0.839	0.698	0.726
47	MCP	0.423	0.284	0.464	0.314	0.507	0.500	0.490	0.509	0.341	0.386	0.481	0.364
48	MEC	0.575	0.363	0.625	0.482	0.277	0.297	0.379	0.242	0.248	0.279	0.123	0.270
49	NAV	0.839	0.327	0.532	0.484	0.395	0.466	0.426	0.277	0.354	0.725	0.220	0.435
50	NBC	0.329	0.231	0.256	0.271	0.293	0.299	0.306	0.383	0.274	0.248	0.242	0.228
51	NHC	0.706	0.699	0.504	0.746	0.746	0.536	0.447	0.838	0.784	0.790	0.783	0.764
52	NSC	0.425	0.358	0.603	0.639	0.532	0.792	0.758	0.796	0.762	0.774	0.794	0.783
53	NST	0.659	0.310	0.342	0.383	0.473	0.432	0.290	0.365	0.630	0.267	0.283	0.336
54	NTP	0.527	0.321	0.580	0.589	0.433	0.396	0.498	0.521	0.512	0.648	0.475	0.450
55	PAC	0.434	0.403	0.674	0.636	0.377	0.341	0.412	0.358	0.531	0.411	0.598	0.456
56	PLC	0.353	0.194	0.291	0.449	0.314	0.346	0.372	0.472	0.454	0.492	0.389	0.258
57	PNC	0.526	0.340	0.371	0.349	0.431	0.381	0.735	0.793	0.788	0.386	0.562	0.747
58	POT	0.602	0.332	0.585	0.534	0.490	0.698	0.518	0.711	0.447	0.381	0.410	0.287
59	PVC	0.871	0.381	0.470	0.572	0.398	0.375	0.446	0.549	0.411	0.698	0.806	0.180
60	RAL	0.829	0.649	0.622	0.628	0.666	0.745	0.808	0.818	0.812	0.751	0.748	0.774

61	REE	0.815	0.713	0.785	0.753	0.554	0.506	0.682	0.840	0.553	0.485	0.418	0.442
62	S55	0.711	0.178	0.404	0.343	0.460	0.439	0.665	0.649	0.720	0.865	0.805	0.626
63	SAF	0.382	0.212	0.270	0.453	0.406	0.533	0.560	0.713	0.841	0.830	0.816	0.714
64	SAM	0.853	0.395	0.777	0.730	0.703	0.485	0.430	0.742	0.875	0.801	0.396	0.401
65	SAP	0.810	0.691	0.746	0.761	0.777	0.712	0.724	0.737	0.719	0.695	0.710	0.698
66	SAV	0.611	0.405	0.863	0.809	0.846	0.342	0.628	0.741	0.654	0.168	0.276	0.240
67	SCD	0.646	0.530	0.567	0.850	0.550	0.491	0.691	0.632	0.814	0.763	0.721	0.555
68	SCJ	0.588	0.378	0.535	0.379	0.232	0.355	0.343	0.360	0.725	0.531	0.123	0.238
69	SDN	0.780	0.799	0.715	0.623	0.703	0.774	0.766	0.783	0.775	0.782	0.774	0.746
70	SFN	0.553	0.306	0.398	0.447	0.465	0.490	0.498	0.622	0.630	0.701	0.761	0.702
71	SGC	0.644	0.386	0.497	0.598	0.760	0.771	0.726	0.834	0.803	0.835	0.831	0.783
72	SGD	0.812	0.445	0.462	0.474	0.319	0.474	0.530	0.461	0.373	0.295	0.314	0.313
73	SJ1	0.400	0.163	0.360	0.287	0.511	0.382	0.439	0.386	0.348	0.314	0.306	0.253
74	SMC	0.456	0.319	0.419	0.411	0.294	0.342	0.416	0.488	0.435	0.597	0.244	0.239
75	SSC	0.740	0.508	0.796	0.686	0.790	0.826	0.764	0.801	0.791	0.596	0.809	0.843
76	STP	0.587	0.351	0.540	0.720	0.359	0.380	0.344	0.739	0.233	0.168	0.169	0.201
77	TAC	0.700	0.572	0.485	0.412	0.783	0.752	0.651	0.616	0.522	0.706	0.520	0.331
78	TCM	0.614	0.305	0.540	0.473	0.306	0.659	0.460	0.471	0.525	0.318	0.337	0.313
79	TCR	0.413	0.230	0.420	0.307	0.254	0.520	0.456	0.787	0.274	0.183	0.251	0.181
80	TKU	0.491	0.422	0.312	0.443	0.534	0.526	0.345	0.323	0.446	0.350	0.304	0.287
81	TNC	0.663	0.552	0.634	0.603	0.807	0.765	0.630	0.694	0.333	0.433	0.599	0.726
82	TNG	0.382	0.124	0.277	0.313	0.178	0.178	0.305	0.366	0.380	0.268	0.259	0.285
83	TPC	0.843	0.427	0.313	0.392	0.344	0.402	0.405	0.432	0.269	0.237	0.287	0.265
84	TPH	0.701	0.730	0.610	0.709	0.742	0.419	0.432	0.534	0.776	0.495	0.508	0.704
85	TRC	0.794	0.758	0.793	0.763	0.747	0.754	0.808	0.832	0.478	0.560	0.731	0.672
86	TS4	0.565	0.302	0.783	0.617	0.374	0.403	0.438	0.407	0.316	0.775	0.192	0.135
87	TSC	0.477	0.339	0.327	0.251	0.244	0.186	0.288	0.467	0.728	0.263	0.787	0.451
88	TST	0.747	0.444	0.590	0.588	0.718	0.349	0.283	0.296	0.246	0.217	0.230	0.264
89	TTC	0.605	0.291	0.721	0.730	0.149	0.295	0.461	0.482	0.632	0.561	0.558	0.415
90	TXM	0.835	0.345	0.725	0.430	0.219	0.212	0.280	0.366	0.392	0.264	0.259	0.298
91	TYA	0.768	0.639	0.682	0.219	0.183	0.209	0.294	0.325	0.326	0.308	0.297	0.270
92	UNI	0.557	0.536	0.627	0.756	0.698	0.665	0.722	0.736	0.341	0.147	0.725	0.692
93	VCS	0.500	0.389	0.658	0.354	0.483	0.417	0.443	0.232	0.361	0.599	0.784	0.599
94	VDL	0.338	0.135	0.302	0.312	0.267	0.377	0.392	0.612	0.655	0.582	0.497	0.357
95	VHC	0.505	0.312	0.572	0.477	0.365	0.358	0.450	0.627	0.446	0.474	0.319	0.827
96	VID	0.543	0.248	0.376	0.420	0.552	0.364	0.239	0.359	0.272	0.191	0.408	0.159
97	VIS	0.669	0.408	0.710	0.652	0.624	0.758	0.753	0.518	0.751	0.423	0.806	0.697
98	VNM	0.792	0.714	0.735	0.738	0.703	0.715	0.724	0.742	0.718	0.701	0.721	0.716
99	VPK	0.354	0.218	0.306	0.234	0.238	0.485	0.482	0.329	0.353	0.198	0.344	0.686
100	VTB	0.565	0.461	0.406	0.446	0.359	0.416	0.496	0.393	0.405	0.314	0.382	0.292
101	VTL	0.389	0.268	0.411	0.833	0.743	0.769	0.780	0.520	0.462	0.320	0.839	0.781
102	VTS	0.551	0.710	0.778	0.767	0.739	0.729	0.681	0.505	0.559	0.523	0.689	0.693

Appendix C

Correlation matrices of the regression models' dependent variables, independent variables, and DEA inputs

Appendix C reports the correlation values of the regression models' dependent and independent variables of the listed manufacturers in each ASEAN-6 country (section B.1), as well as the correlation results of the regression models' independent variables and two-stage DEA inputs of the listed manufacturers in each ASEAN-6 country (section B.2).

C.1 Correlation matrices of the regression models' variables of the listed manufacturers in ASEAN-6 countries

Table C.1.1: Correlation matrix of the regression models' variables for Indonesia's listed manufacturers

IDN	AGE	CASH	INST	LEV	STAFF	D_TEC	ROA	PRO_EF	MRK_EF
AGE	1								
CASH	0.06	1							
INST	0.07	0.00	1						
LEV	-0.04	-0.19	-0.01	1					
STAFF	0.03	0.08	0.05	-0.04	1				
D_TEC	0.04	0.13	0.02	-0.13	-0.07	1			
ROA	0.14	0.35	0.09	-0.43	0.05	0.15	1		
PRO_EF	-0.12	0.06	0.02	-0.03	-0.09	0.05	0.16	1	
MRK_EF	-0.28	0.04	-0.02	-0.01	-0.05	-0.02	0.04	0.17	1

Table C.1.2: Correlation matrix of the regression models' variables for Malaysia's listed manufacturers

MYS	AGE	CASH	INST	LEV	STAFF	D_TEC	ROA	PRO_EF	MRK_EF
AGE	1								
CASH	0.10	1							
INST	0.32	0.05	1						
LEV	0.07	-0.31	-0.06	1					
STAFF	0.09	-0.03	0.17	0.12	1				
D_TEC	-0.22	0.16	-0.03	-0.09	0.07	1			
ROA	0.17	0.19	0.16	-0.20	0.01	0.01	1		
PRO_EF	-0.05	0.13	0.04	-0.01	0.08	0.08	0.32	1	
MRK_EF	-0.24	0.00	-0.16	-0.08	-0.06	0.07	-0.06	0.11	1

Table C.1.3: Correlation matrix of the regression models' variables for the Philippines' listed manufacturers

PHL	AGE	CASH	INST	LEV	STAFF	D_TEC	ROA	PRO_EF	MRK_EF
AGE	1								
CASH	0.04	1							
INST	0.22	0.09	1						
LEV	0.05	0.33	0.11	1					
STAFF	0.11	-0.10	0.11	0.02	1				
D_TEC	-0.24	0.06	0.08	-0.10	-0.13	1			
ROA	-0.12	-0.33	-0.08	-0.90	0.06	0.04	1		
PRO_EF	-0.23	0.13	0.04	0.02	0.09	-0.01	0.04	1	
MRK_EF	0.11	0.07	0.10	0.06	0.08	-0.10	-0.11	0.09	1

Table C.1.4: Correlation matrix of the regression models' variables for Singapore's listed manufacturers

SGP	AGE	CASH	INST	LEV	STAFF	D_TEC	ROA	PRO_EF	MRK_EF
AGE	1.00								
CASH	0.15	1.00							
INST	0.07	-0.29	1.00						
LEV	-0.24	-0.36	0.05	1.00					
STAFF	-0.11	-0.29	0.27	0.24	1.00				
D_TEC	-0.02	0.18	-0.25	-0.08	-0.25	1.00			
ROA	0.05	0.04	0.10	-0.40	0.00	0.10	1.00		
PRO_EF	-0.17	0.01	0.13	-0.16	0.09	0.05	0.11	1.00	
MRK_EF	0.04	0.11	0.00	-0.19	-0.04	0.17	0.03	0.50	1.00

Table C.1.5: Correlation matrix of the regression models' variables for Thailand's listed manufacturers

THA	AGE	CASH	INST	LEV	STAFF	D_TEC	ROA	PRO_EF	MRK_EF
AGE	1.00								
CASH	-0.04	1.00							
INST	0.11	0.04	1.00						
LEV	-0.12	-0.33	0.03	1.00					
STAFF	0.23	-0.04	0.30	0.13	1.00				
D_TEC	-0.06	0.12	-0.09	-0.01	0.13	1.00			
ROA	-0.05	0.21	0.07	-0.36	0.04	0.08	1.00		
PRO_EF	-0.06	0.04	0.14	0.20	0.12	0.09	0.37	1.00	
MRK_EF	0.11	-0.08	-0.08	0.05	-0.02	-0.06	-0.36	-0.20	1.00

Table C.1.6: Correlation matrix of the regression models' variables for Vietnam's listed manufacturers

VNM	AGE	CASH	INST	LEV	STAFF	D_TEC	ROA	PRO_EF	MRK_EF
AGE	1.00								
CASH	-0.06	1.00							
INST	0.10	0.06	1.00						
LEV	-0.06	-0.35	-0.04	1.00					
STAFF	0.00	-0.09	0.13	0.18	1.00				
D_TEC	0.05	0.05	0.19	-0.12	-0.11	1.00			
ROA	-0.10	0.30	0.22	-0.34	0.18	0.04	1.00		
PRO_EF	-0.24	0.11	0.10	0.20	0.14	-0.03	0.36	1.00	
MRK_EF	0.03	0.20	-0.04	-0.33	-0.05	-0.01	0.24	0.08	1.00

C.2 Correlation matrices of the regression models' variables and two-stage DEA inputs of the listed manufacturers in ASEAN-6 countries

Table C.2.1: Correlation matrix of the regression models' variables and two-stage DEA inputs for Indonesia's listed manufacturers

IDN	Two-stage DEA inputs					
Variables	assets	equity	cogs	opr_ex	sales	profit
AGE	0.10	0.08	0.12	0.16	0.13	0.08
CASH	0.00	0.11	-0.02	0.09	0.02	0.15
INST	0.05	0.06	0.06	0.16	0.09	0.12
LEV	-0.01	-0.19	-0.03	-0.05	-0.04	-0.13
STAFF	0.36	0.40	0.42	0.39	0.42	0.22
D_TEC	-0.11	-0.06	-0.04	0.06	-0.03	0.03
ROA	0.01	0.16	0.10	0.23	0.16	0.49

Table C.2.2: Correlation matrix of the regression models' variables and two-stage DEA inputs of Malaysia's listed manufacturers

MYS	Two-stage DEA inputs					
Variables	assets	equity	cogs	opr_ex	sales	profit
AGE	0.09	0.11	0.22	0.02	0.22	0.17
CASH	-0.03	-0.03	-0.06	-0.05	-0.06	0.01
INST	0.31	0.32	0.28	0.18	0.30	0.34
LEV	0.15	0.05	0.17	0.06	0.16	0.04
STAFF	0.78	0.78	0.72	0.70	0.73	0.51
D_TEC	0.10	0.06	0.04	0.07	0.04	0.02
ROA	0.03	0.06	0.08	0.01	0.10	0.28

Table C.2.3: Correlation matrix of the regression models' variables and two-stage DEA inputs of the Philippines' listed manufacturers

PHL	Two-stage DEA inputs					
Variables	assets	equity	cogs	opr_ex	sales	profit
AGE	0.17	0.13	0.13	0.11	0.13	-0.01
CASH	-0.06	-0.06	-0.04	-0.04	-0.04	-0.01
INST	0.10	0.09	0.04	0.04	0.04	0.02
LEV	0.05	0.04	0.05	0.03	0.05	0.02
STAFF	0.82	0.87	0.66	0.75	0.70	0.69
D_TEC	-0.14	-0.16	-0.13	-0.15	-0.14	-0.18
ROA	0.04	0.05	0.04	0.05	0.04	0.09

Table C.2.4: Correlation matrix of the regression models' variables and two-stage DEA inputs for Singapore's listed manufacturers

SGP	Two-stage DEA inputs					
Variables	assets	equity	cogs	opr_ex	sales	profit
AGE	-0.088	-0.034	-0.125	-0.138	-0.127	-0.052
CASH	-0.274	-0.299	-0.221	-0.362	-0.232	-0.238
INST	0.121	0.142	0.088	0.198	0.101	0.160
LEV	0.320	0.226	0.323	0.343	0.329	0.198
STAFF	0.653	0.677	0.618	0.622	0.624	0.519
D_TEC	-0.215	-0.223	-0.213	-0.249	-0.216	-0.124
ROA	0.018	0.034	0.004	0.034	0.008	0.134

Table C.2.5: Correlation matrix of the regression models' variables and two-stage DEA inputs for Thailand's listed manufacturers

THA	Two-stage DEA inputs					
Variables	assets	equity	cogs	opr_ex	sales	profit
AGE	0.006	0.004	-0.036	0.062	-0.029	0.022
CASH	0.007	0.017	0.001	0.016	0.004	0.029
INST	0.363	0.357	0.301	0.391	0.317	0.331
LEV	0.104	0.064	0.090	0.113	0.092	0.035
STAFF	0.538	0.518	0.462	0.546	0.480	0.573
D_TEC	-0.036	-0.032	-0.031	-0.030	-0.032	0.010
ROA	-0.006	0.005	-0.001	-0.007	0.002	0.106

Table C.2.6: Correlation matrix of the regression models' variables and two-stage DEA inputs for Vietnam's listed manufacturers

VNM	Two-stage DEA inputs					
Variables	assets	equity	cogs	opr_ex	sales	profit
AGE	0.093	0.126	0.053	0.124	0.072	0.100
CASH	-0.008	0.055	0.004	0.016	0.008	0.046
INST	0.250	0.280	0.248	0.252	0.265	0.261
LEV	0.021	-0.113	0.091	-0.078	0.035	-0.125
STAFF	0.697	0.650	0.665	0.382	0.644	0.554
D_TEC	-0.013	0.007	-0.039	-0.013	-0.039	-0.035
ROA	0.278	0.369	0.285	0.359	0.339	0.496

Appendix D

Fixed-effects fractional regression results of the profitability and marketability efficiency determinants of ASEAN-6 countries' listed manufacturers

Appendix D exhibits the fixed-effects FRM results of equations (3.10) and (3.11) that examines the effects of corporate factors on the profitability efficiency (section D.1) and marketability efficiency (section D.2), respectively, of the ASEAN-6 listed firms in the manufacturing sector, sub-sectors S1 (high-tech production), and sub-sector S2 (traditional production).

D.1 Fixed-effects FRM results of the profitability efficiency determinants of ASEAN-6 countries' listed manufacturers

Table D.1.1: Fixed-effects FRM results of the profitability efficiency determinants of ASEAN-6 countries' listed manufacturers

Functional forms		AGE	CASH	INST	LEV	STAFF
IDN	FRM-logit	-0.075***	0.007***	0.004***	-0.091**	-0.0000009
	FRM-probit	-0.030***	0.003***	0.001***	-0.033**	-0.0000004
	FRM-loglog	-0.074***	0.007***	0.004***	-0.090***	-0.0000009
	FRM-cloglog	-0.018***	0.002***	0.001***	-0.018**	-0.0000003
MYS	FRM-logit	-0.039***	0.004**	0.002*	-0.001	0.000001
	FRM-probit	-0.023***	0.002**	0.001*	-0.002	0.0000004
	FRM-loglog	-0.034***	0.003**	0.001	0.001	0.000001
	FRM-cloglog	-0.021***	0.002**	0.001*	-0.004	0.0000003
PHL	FRM-logit	-0.058***	0.206	-0.005	-0.018	-0.000002
	FRM-probit	-0.031***	0.098	-0.002	-0.008	0.00000001
	FRM-loglog	-0.053***	0.202	-0.005*	-0.018	-0.000002
	FRM-cloglog	-0.025***	0.067	-0.002	-0.004	0.0000003
SGP	FRM-logit	-0.017	0.003	0.007**	-0.758**	0.000001
	FRM-probit	-0.007	0.002	0.003**	-0.374**	0.000001
	FRM-loglog	-0.017	0.003	0.006**	-0.722**	0.000001
	FRM-cloglog	-0.005	0.001	0.002**	-0.279***	0.0000004
THA	FRM-logit	0.028***	0.005*	0.002*	0.089	-0.00001
	FRM-probit	0.015***	0.003**	0.001*	0.047	-0.000007
	FRM-loglog	0.025***	0.004*	0.002*	0.081	-0.000008
	FRM-cloglog	0.013***	0.003**	0.001*	0.039	-0.000008
VNM	FRM-logit	-0.090***	0.003	0.004***	0.572***	0.00006**
	FRM-probit	-0.046***	0.002	0.002***	0.302***	0.00003**
	FRM-loglog	-0.085***	0.003	0.004***	0.532***	0.00005**
	FRM-cloglog	-0.035***	0.001	0.001***	0.242***	0.00003**

Note: ***, **, * level of statistical significance is equal to 1%, 5% and 10%, respectively

Table D.1.2: Fixed-effects FRM results of the profitability efficiency determinants of ASEAN-6 countries' listed high-tech manufacturers (sub-sector S1)

Functional forms		AGE	CASH	INST	LEV	STAFF
IDN	FRM-logit	-0.058	0.014**	0.004	-0.209	-0.00003
	FRM-probit	-0.024	0.005**	0.002	-0.086	-0.00002
	FRM-loglog	-0.058	0.014**	0.004	-0.206	-0.00003
	FRM-cloglog	-0.015	0.003**	0.001	-0.055	-0.00002
MYS	FRM-logit	-0.026**	0.002*	0.004	0.183	0.000001
	FRM-probit	-0.015**	0.001*	0.002	0.105	0.0000003
	FRM-loglog	-0.023***	0.002	0.003	0.159	0.0000005
	FRM-cloglog	-0.014**	0.001**	0.002	0.096	0.0000002
PHL	FRM-logit	0.013	0.077	-0.014	0.661	0.00018
	FRM-probit	0.0002	0.041	-0.009*	0.304	0.00011
	FRM-loglog	0.017	0.076	-0.012	0.657	0.00016
	FRM-cloglog	-0.005	0.029	-0.008**	0.197	0.00010
SGP	FRM-logit	-0.017	0.005	0.007	-1.387***	0.00004
	FRM-probit	-0.007	0.002	0.003	-0.672***	0.00002
	FRM-loglog	-0.017	0.005	0.007	-1.329***	0.00004
	FRM-cloglog	-0.004	0.001	0.002	-0.493***	0.00001
THA	FRM-logit	0.016	0.003	-0.0003	0.306	0.00002
	FRM-probit	0.009	0.001	-0.0001	0.151	0.00001
	FRM-loglog	0.014	0.003	-0.0004	0.294	0.00002
	FRM-cloglog	0.008	0.0005	0.00002	0.110	0.000005
VNM	FRM-logit	-0.066***	-0.003	0.003	0.378	0.001
	FRM-probit	-0.032***	-0.001	0.002	0.182	0.0003
	FRM-loglog	-0.063***	-0.003	0.003	0.357	0.001
	FRM-cloglog	-0.024**	-0.00004	0.001	0.139	0.0003

Note: ***, **, * level of statistical significance is equal to 1%, 5% and 10%, respectively

Table D.1.3: Fixed-effects FRM results of the profitability efficiency determinants of ASEAN-6 countries' listed traditional manufacturers (sub-sector S2)

Functional forms		AGE	CASH	INST	LEV	STAFF
IDN	FRM-logit	-0.078***	0.006*	0.004***	-0.088**	-0.000001
	FRM-probit	-0.031***	0.002*	0.001***	-0.031**	-0.0000004
	FRM-loglog	-0.077***	0.006*	0.004***	-0.088**	-0.000001
	FRM-cloglog	-0.019***	0.002*	0.001***	-0.018*	-0.0000003
MYS	FRM-logit	-0.045***	0.005**	0.001	-0.045	0.000005
	FRM-probit	-0.026***	0.003**	0.0005	-0.027	0.000003
	FRM-loglog	-0.038***	0.004**	0.001	-0.037	0.000003
	FRM-cloglog	-0.025***	0.003**	0.0004	-0.028	0.000003
PHL	FRM-logit	-0.077***	0.188	-0.003	-0.013	0.000005
	FRM-probit	-0.040***	0.086	-0.001	-0.005	0.000003
	FRM-loglog	-0.071***	0.187	-0.003	-0.014	0.000004
	FRM-cloglog	-0.033***	0.055	-0.001	-0.002	0.000003
SGP	FRM-logit	-0.011	0.005	0.006*	0.750	-0.000001
	FRM-probit	-0.005	0.002	0.003*	0.334	-0.000001
	FRM-loglog	-0.011	0.004	0.006*	0.733	-0.000001
	FRM-cloglog	-0.004	0.002	0.002*	0.225	-0.0000003
THA	FRM-logit	0.031***	0.006**	0.003**	0.059	-0.000015
	FRM-probit	0.017***	0.003**	0.002**	0.032	-0.000009
	FRM-loglog	0.028***	0.005*	0.003**	0.053	-0.000011
	FRM-cloglog	0.015***	0.003**	0.001*	0.028	-0.00001
VNM	FRM-logit	-0.098***	0.004	0.004***	0.562**	0.00006**
	FRM-probit	-0.050***	0.002	0.002***	0.298**	0.00003**
	FRM-loglog	-0.092***	0.004	0.003***	0.523**	0.00006**
	FRM-cloglog	-0.039***	0.002	0.001***	0.239**	0.00003**

Note: ***, **, * level of statistical significance is equal to 1%, 5% and 10%, respectively

D.2 Fixed-effects FRM results of the marketability efficiency determinants of ASEAN-6 countries' listed manufacturers

Table D.2.1: Fixed-effects FRM results of the marketability efficiency determinants of ASEAN-6 countries' listed manufacturers

Functional forms		AGE	CASH	INST	LEV	STAFF	ROA
IDN	FRM-logit	-0.441***	-0.010*	0.012***	0.026	-0.000004*	-0.001
	FRM-probit	-0.247***	-0.006*	0.006***	0.022	-0.000002*	-0.001
	FRM-loglog	-0.383***	-0.009*	0.010***	0.013	-0.000004*	-0.001
	FRM-cloglog	-0.228***	-0.005*	0.006***	0.030	-0.000002	-0.001
MYS	FRM-logit	-0.171***	0.001	0.008***	-0.280*	0.000018***	-0.003
	FRM-probit	-0.102***	0.001	0.005***	-0.163*	0.000011***	-0.002
	FRM-loglog	-0.135***	0.001	0.007***	-0.234**	0.000014***	-0.002
	FRM-cloglog	-0.107***	0.001	0.005***	-0.159*	0.000010***	-0.002
PHL	FRM-logit	-0.001	0.600	0.006	-0.279	0.000033	-0.002
	FRM-probit	-0.002	0.406	0.003	-0.167	0.000021	-0.001
	FRM-loglog	0.001	0.438	0.006	-0.240	0.000027	-0.002
	FRM-cloglog	-0.004	0.455	0.003	-0.156	0.000021	-0.001
SGP	FRM-logit	0.088***	0.003	0.007***	-0.671*	-0.000001	-0.001
	FRM-probit	0.047***	0.001	0.004***	-0.367*	-0.000001	-0.001
	FRM-loglog	0.082***	0.003	0.006***	-0.614*	-0.000001	-0.001
	FRM-cloglog	0.037***	0.001	0.004***	-0.306*	-0.000001	-0.001
THA	FRM-logit	0.148***	0.006	-0.004	0.449	-0.00006	-0.060***
	FRM-probit	0.076***	0.003	-0.002	0.151	-0.00003	-0.029***
	FRM-loglog	0.132***	0.005	-0.004	0.475	-0.00005	-0.057***
	FRM-cloglog	0.067***	0.002	-0.002	0.053	-0.00002	-0.022***
VNM	FRM-logit	-0.031***	0.011***	-0.001	-0.397	0.000014	-0.001
	FRM-probit	-0.019***	0.007***	-0.001	-0.244	0.000007	-0.0003
	FRM-loglog	-0.018**	0.009***	-0.001	-0.243	0.000009	-0.001
	FRM-cloglog	-0.027***	0.008***	-0.001	-0.325	0.000010	-0.0002

Note: ***, **, * level of statistical significance is equal to 1%, 5% and 10%, respectively

Table D.2.2: Fixed-effects FRM results of the marketability efficiency determinants of ASEAN-6 countries' listed high-tech manufacturers (sub-sector S1)

Functional forms		AGE	CASH	INST	LEV	STAFF	ROA
IDN	FRM-logit	-0.460***	-0.040	0.011***	0.612	-0.00010	0.003
	FRM-probit	-0.257***	-0.023	0.006***	0.468	-0.00008	0.002
	FRM-loglog	-0.399***	-0.033	0.010***	0.301	-0.00006	0.001
	FRM-cloglog	-0.236***	-0.023	0.005***	0.658	-0.0001	0.003
MYS	FRM-logit	-0.175***	-0.008*	0.009***	-0.406	0.00002***	-0.010**
	FRM-probit	-0.105***	-0.005*	0.006***	-0.237	0.00001***	-0.006*
	FRM-loglog	-0.138***	-0.006*	0.007***	-0.336	0.00001***	-0.009*
	FRM-cloglog	-0.110***	-0.005*	0.006***	-0.234	0.00001***	-0.005
PHL	FRM-logit	-0.045	1.601	-0.022	-0.949	0.00042	-0.036
	FRM-probit	-0.025	0.819	-0.012	-0.411	0.00025	-0.018
	FRM-loglog	-0.037	1.604	-0.020	-1.022	0.00033	-0.034
	FRM-cloglog	-0.025	0.540	-0.011	-0.181	0.00026	-0.013
SGP	FRM-logit	0.106***	-0.007	0.001	-1.340**	0.00004	-0.005
	FRM-probit	0.056***	-0.004	0.001	-0.726**	0.00002	-0.003
	FRM-loglog	0.098***	-0.007	0.001	-1.229**	0.00003	-0.005
	FRM-cloglog	0.046***	-0.003	0.001	-0.602**	0.00002	-0.002
THA	FRM-logit	0.166***	0.023*	0.013	3.309***	-0.00005	-0.056***
	FRM-probit	0.086***	0.012**	0.007*	1.634***	-0.00003	-0.029***
	FRM-loglog	0.149***	0.021*	0.011	3.067***	-0.00005	-0.051***
	FRM-cloglog	0.074***	0.011**	0.007*	1.309***	-0.00002	-0.024***
VNM	FRM-logit	0.033**	0.022*	-0.003	0.232	-0.00025	-0.012
	FRM-probit	0.021**	0.014*	-0.002	0.146	-0.00017	-0.007
	FRM-loglog	0.031**	0.017*	-0.002	0.177	-0.00022	-0.011
	FRM-cloglog	0.017**	0.016*	-0.002	0.158	-0.00015	-0.006

Note: ***, **, * level of statistical significance is equal to 1%, 5% and 10%, respectively

Table D.2.3: Fixed-effects FRM results of the marketability efficiency determinants of ASEAN-6 countries' listed traditional manufacturers (sub-sector S2)

Functional forms		AGE	CASH	INST	LEV	STAFF	ROA
IDN	FRM-logit	-0.437***	-0.003	0.012***	0.015	-0.000005*	-0.002
	FRM-probit	-0.245***	-0.001	0.006***	0.013	-0.000002*	-0.001
	FRM-loglog	-0.379***	-0.003	0.011***	0.008	-0.000004*	-0.001
	FRM-cloglog	-0.225***	-0.0001	0.006***	0.017	-0.000002*	-0.002
MYS	FRM-logit	-0.171***	0.006*	0.008***	-0.255	0.000136**	-0.002
	FRM-probit	-0.103***	0.004*	0.005***	-0.148	0.000080**	-0.001
	FRM-loglog	-0.135***	0.005**	0.007***	-0.213	0.000111**	-0.001
	FRM-cloglog	-0.107***	0.004*	0.005***	-0.144	0.000080**	-0.001
PHL	FRM-logit	-0.007	0.620	0.008*	-0.255	0.000033	-0.002
	FRM-probit	-0.005	0.429	0.004*	-0.158	0.000021	-0.001
	FRM-loglog	-0.004	0.430	0.007*	-0.211	0.000027	-0.002
	FRM-cloglog	-0.007	0.502	0.004*	-0.156	0.000021	-0.001
SGP	FRM-logit	0.080***	0.011*	0.009***	0.135	-0.000002	0.001
	FRM-probit	0.042***	0.006*	0.005***	0.073	-0.000001	0.000
	FRM-loglog	0.074***	0.010*	0.008***	0.123	-0.000002	0.001
	FRM-cloglog	0.034***	0.004*	0.004***	0.062	-0.000001	0.0003
THA	FRM-logit	0.144***	0.003	-0.005	0.329	-0.00005	-0.060***
	FRM-probit	0.075***	0.001	-0.003	0.093	-0.00003	-0.029***
	FRM-loglog	0.129***	0.003	-0.005	0.361	-0.00005	-0.057***
	FRM-cloglog	0.065***	0.001	-0.003*	0.011	-0.000024	-0.022***
VNM	FRM-logit	-0.043***	0.011***	-0.001	-0.484	0.000019	-0.001
	FRM-probit	-0.026***	0.006**	-0.001	-0.296	0.000011	-0.0005
	FRM-loglog	-0.026***	0.008***	-0.001	-0.294	0.000013	-0.001
	FRM-cloglog	-0.034***	0.007**	-0.0005	-0.398*	0.000013	-0.001

Note: ***, **, * level of statistical significance is equal to 1%, 5% and 10%, respectively