Liner Shipping Connectivity and International Trade in Southeast Asia

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การเชื่อมโยงการขนส่งมีบทบาทสำคัญในการตรวจสอบว่าประเทศจะสามารถที่จะเข้าสู่ตลาดโลก สายการจัดส่งสินค้าซึ่งเป็นตัวกลางของการขนส่งทางเรือในการนำเข้าและส่งออกทั้งสินค้า และผลิตภัณฑ์กึ่งสำเร็จเป็นส่วนสำคัญของการทำการค้าระหว่างประเทศ ดัชนีการเชื่อมต่อการเชื่อมโยงเป็นหนึ่งในตัวชี้วัดพื้นฐานที่นิยมใช้เทียบเคียงเพื่อดูว่าประเทศมีการเชื่อมต่อกับการค้าในระดับสากล ใน LSCI นี้ประกอบไปด้วย 5 องค์ประกอบได้แก่ จำนวนเรือ, ความจุสินค้า, ขนาดเรือ, จำนวนของการบริการการจัดส่งสินค้า, และบริษัทที่ปรับใช้ท่าเรือคอนเทนเนอร์ของประเทศ การวิจัยนี้มีวัตถุประสงค์เพื่อวิเคราะห์ผลกระทบของปัจจัยของการเชื่อมโยงการขนส่งและทางเดียวที่จะทำให้เกิดการปรับปรุงการเชื่อมโยงการขนส่งโดยเฉพาะอย่างยิ่งในหกประเทศในแถบเอเชียตะวันออกเฉียงใต้ ได้แก่, อินโดนีเซีย, มาเลเซีย, ฟิลิปปินส์, สิงคโปร์, ไทย และเวียดนาม สถิติเชิงพรรณนา และการวิเคราะห์ความสัมพันธ์ และข้อมูลแผง (PanelData)ถูกนำมาใช้ในการวิเคราะห์ความสัมพันธ์ วิทยานิพนธ์ฉบับนี้พบว่ากำลังการผลิตของพอร์ตที่จะรับเรือที่มีผลกระทบอย่างมีนัยสำคัญขนาดใหญ่ที่สุดในการปรับปรุงการเชื่อมต่อในภูมิภาค ที่จะดึงดูดบริษัทที่จะปรับใช้เรือที่ใหญ่ที่สุดที่จะได้รับการเสริมโดยการปรับปรุงในกำลังการผลิตที่สามารถตอบสนองปริมา ณ ที่คาดว่าจะ, มีความหลากหลายของการบริการ, และการประมวลผลความเร็วตอบสนองที่ดีของพอร์ต

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Liner connectivity plays an important role as a determinant in how a country is able to gain access to world markets. Liner shipping as the medium of seaborne transport for import and export of manufactured and semi-manufactured goods, plays a significant part in international trade. Liner Shipping Connectivity Index (LSCI) is one of the most common benchmark to see how well connected a country in global trade. It consists of five components, namely the number of ships, carrying capacity, ship size, services provided, and the number of companies that deploy container ships calling a country's ports. This paper aims to tally from the most to the least which LSCI component contributes in improving the shipping connectivity with the most impact, in six Maritime South-East Asian countries, i.e., Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam. By descriptive statistics, correlation analysis, and panel data, this paper finds that the country port's capacity to accept larger ship size provides the most significant impact towards the improvement of the connectivity in the region. To attract companies to deploy largest ship, the improvement needs to be complemented with the capacity that can meet the expected volume, offering a variety of service, and good turnaround speed at the country's port.

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1 INTROUCTION

1.1 Background

The ocean covers approximately 71 per cent of the Earth's surface. Looking at its importance, not only does it contains 97 per cent of the Earth's water, throughout the history it is the main medium of trade. As the medium for economic development, it has been well accepted that maritime transport and seaports have played the most prominent role in prosperity throughout history; from the Phoenicians 5th to 4th century B.C. (Aubet, 2001), Srivijaya Kingdom in 7th century A.D. (Shaffer, 2015), the Venetians in the Middle Ages (Lane, 1973), to the British Empire in the nineteenth century (Tracy, 1993).

Maritime transport has been for centuries the main prerequisite for trade between nations and regions, and has played an important role in creating economic development and prosperity. Maritime transport plays a key role as an economic driver and continues to be the dominant mode for long-distance transport, as it is a crucial medium for distribution of goods throughout the whole supply chain, from raw material to end-user consumption and everything in between. With globalization and containerization the necessity has become even higher, as trade through maritime transport ensures the security and continuity supply of energy, food and commodities.

Only a few countries can secure those three previously mentioned items. Even if they can, it is no longer economically viable for them to become the best at producing them without thinking about the advantage of imports, with a goal to get the best value for money, and exports to improve their economy, then to send away excess capacity at market competitive price (Krugman et al., 2011). In addition, to turn the wheels, the maritime industry itself is an important source of direct and indirect employment, as well

as related value-added businesses. Wealth in countries has considered to be derived from specialization of economic activities. Commodities that a country specializes in, can be traded for commodities that would be locally too expensive, inadequate to meet domestic demand or simply inexistent.

International trade is playing an important role towards the region's economy, where its development would support the maritime logistics development. With this linkage, logistics would grow accordingly with the economic development, and reversibly the economic development would also potentially influence the logistics industry. It is generally accepted that more than 90 per cent of world trade is carried by sea. The share percentage of world trade stays the same no matter what estimates that is used, either including or not trade within Customs Unions, taking into account door-to-door transport or just a shipment segment until the border, or counting seaborne cargo units uses tons or ton-miles (Hoffmann, 2012). Throughout the last century, the shipping industry has consistently seen a general trend of increases in total international trade volume (IMO, 2012). Container ports play a major, if not an indispensable part in global shipping networks where the structure between ports and its networks are closely related to each other (Wilmsmeier et al., 2006). The role of containerization transported over the sea has been even further placed its ultimate importance. Through containers goods are to be packed once from the origin, moved over very long distances, and would be transported by variety of transport nodes, crossing straits, canals, seas, and oceans (Levinson, 2008).

It is also well accepted that suppressing corruption as one of the main cause of inefficiency, is one of the main if not on top of every country's agenda. Quashing it plays a vital part in a country's economy. A better transparency and convenience in doing business would also play a part in the improvement and the growth of towards economic development. Adding logistics and maritime indicator towards the idea of better economy and reducing inefficiencies would be an interesting study to look into.

Therefore intuitively, when looking at the extremes, countries with good transparency and clear regulations would be in a good economic situation, while countries without would not (Gupta et al., 2011).

On top of the most common economic indicator of prosperity, like the Gross Domestic Product (GDP) and its proportion of what maritime trade contributes to it; the maritime liner shipping connectivity of a country is commonly indicated with well-accepted index presented in Liner Shipping Connectivity Index (LSCI). This thesis will look into five components of LSCI to identify which among the connectivity components contributes the most impact towards the improvement of international trade, in Association of Southeast Asian Nations (ASEAN) countries, specifically for Maritime Southeast Asian countries, namely: Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam[1].

As one of the major economic force, ASEAN is certainly an important region in the world. This region is indeed a very big market, with a total population of approximately 625 million, or about 9 per cent of the world's population. This amount is greater than the population of the European Union (EU), amounting to around 500 million, and about twice that of the United States (US). ASEAN consumer's purchasing power is still relatively low when compared that of the EU or the US. Total GDP for the whole of ASEAN countries is only about 40 per cent of the GDP of Japan and only about 14 per cent of US's GDP. Nevertheless, with high growth ASEAN will become increasingly important player in the world's economy.

If Logistics Performance Index (LPI) is a result of a perception survey of logistics operators on the ground (global freight forwarders and express carriers) providing feedback on the countries they do business with, LSCI aims at capturing and benchmarking a country's level of integration into global liner shipping networks. In the

[1] Considering the majority of ASEAN economy mostly played by six of those Maritime ASEAN countries, hereinafter in this thesis when Author mentions ASEAN, it will only cover those countries.

same manner if Economic, Political, Infrastructural and Competence (EPIC) aspect scores is a mixed research combining other existing indicators (including LPI) identifying at which quantile a country is placed in combination with a field research, LSCI is a unique index on a country's profile at point in time and at a reporting date (concretely: done annually every May) where shipping schedule assigned a certain vessel capacity.

A country's access to world markets depends on its seaborne transport connectivity, especially with regards to the metrics of liner shipping services for the import and export of manufactured and semi-manufactured goods (Hoffmann, 2012). The cost of maritime transport is very competitive compared with land and airborne transport, and the increase to the total product cost incurred by shipping represents only a few per cent. Negative aspects of seaborne transport include longer transport time as a result of relatively low ship speed, congestion in harbors resulting in time delays, as well as less efficient integration with other forms of transport and distribution.

This thesis will try to answer main research question on which indicator can provide the most significant impact, on already-existing LSCI indicators, towards the improvement of ASEAN country's economic growth and trade volume in a form of container traffic. In addition, this thesis will try to present a more indicative recommendation to policy makers on which logistics connectivity initiatives needs to be invested first; will present some necessary proposals to develop a programme for building the region's logistics industry; and will recommend some insights for further research.

1.2 Research Gap

Shipping services as a *derivation* from the performance of maritime transportation and seaborne trade is largely dependent on the developments in the world economy and international trade (UNCTAD, 2014). Previous research on logistics situations in certain countries only present uses of LPI and LSCI as aggregate indicators. This research will

instead try to show how in some cases those indicators gives advantage to developed maritime countries and with geographical advantage (e.g. Malaysia and Singapore), while at the same time they have lack of relevance to other ASEAN countries (e.g. Indonesia, Philippines, Thailand, and Vietnam), where the latter has many ports, with several metropolitan areas, and quite a large population.

There is yet an available a focused research ASEAN's liner shipping connectivity, and even more specifically, its relationship with other performance indicators. This research will try to identify based on the liner connectivity indicators, which among the transport investments that needs to be prioritized first to improve shipping connectivity and to become more competitive in the international trade arena.

1.3 Research Methodology

This study covers into four main phases. First is a comprehensive literature review of journal articles in dealing with logistics indexes, international trade, and the ASEAN's logistics and geopolitical landscape. Second is a presentation of descriptive statistics on LSCI components, along with LSCI's benchmark with other already-available logistics indexes. Third is an analysis to determine the relationship between the LSCI logistics components with other international trade activity indicators, along with an in-depth panel data analysis. Finally, the fourth will cover an analysis on the findings of ASEAN's maritime situation, as to whether the indexes are indicative to the region and to find which among the available components brings the most impact. The schema of the research is displayed in Figure 1.1.

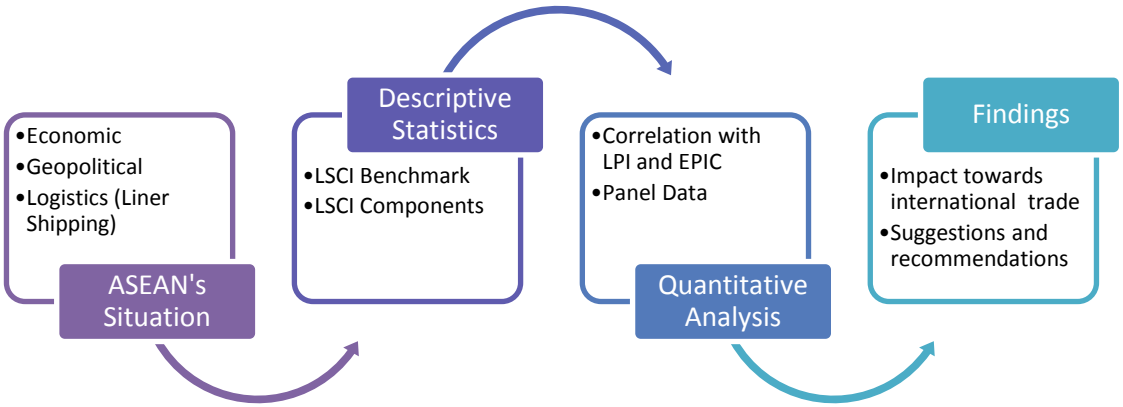

Figure 1.1 Research Schema

This thesis is organized as follows. It begins with literature review, covered in Chapter 2; this chapter explains some of the already available logistics indicators, namely: LPI and EPIC, while at the same time cover in more depth the LSCI and its components which will be further used for descriptive and econometric analysis. Chapter 3 covers a brief snapshot of the region and its economic and geopolitical situation, within which also touches upon the maritime logistics sector. Chapter 4 presents, visualizes and explains the descriptive statistics; also will benchmark ASEAN Logistics Indicators against the world's. Chapter 5 is concerned with quantitative analysis, performing a correlation between LSCI and LPI, and LSCI and EPIC; and then conducting an econometric analysis based on the LSCI components. Finally, chapter 6 contains concluding remarks, analyzing the implications of ASEAN's position as a relevant, institutionally organized actor in global economic affairs.

1.4 Research Questions

From the background and methodology aforementioned, this thesis will try to answer the following research questions:

- Which among the LSCI components has the most impact towards the improvement of international trade for ASEAN?
- How is the state of the liner shipping business in ASEAN relative to the whole world?
- Are the available connectivity and performance indexes represents a proper benchmark of the ASEAN's logistics situation?
- What are the action recommendations and prioritization in order to have the ASEAN country's liner shipping business improve and stay competitive?

1.5 Research Objectives

The objectives of this research are as follows:

- To provide an overview and characterize the liner shipping industry in ASEAN, then to verify as to whether the actual maritime business situation supports the growth of the region's international trade.
- To introduce and propose ideas to improve liner shipping industry as a main driver for international trade. Those ideas in the form of identified factors, whereby the factors can then be derived into action plan recommendations.
- To benchmark the current situation of the World's maritime shipping business to the one in ASEAN countries; and to verify as to whether the existing connectivity index provides a good indicator for the region.
- To identify which among the already-existing logistics connectivity indicators presented in LSCI has the most impact towards the improvement of international trade.
- To find more specific factors beyond the existing LSCI components, especially in relation to the unique characteristics of the region,
- To present a more indicative recommendation to on which logistics connectivity initiatives needs to be invested first; and to present proposals for decision-making entities to develop a programme for building the region's logistics industry.

1.6 Research Scope

With the current unitized cargo type convention, the categories of goods have been classified on their handling characteristics. At the top is the distinction of bulk and general cargo. Bulk cargo is divided into its molecular structure; i.e. liquid (e.g. oil), gases (e.g. Liquefied natural gas [LNG]), and dry bulks which further divided into powder (e.g. flour and dry chemicals), grains (e.g. wheat and corn), and small chunks (e.g. coal and ores). The rest can be classified of general cargo, which is usually in a form of semi-manufactured/neo-bulk goods (e.g. steel coil and paper rolls), manufactured goods (e.g. machines and cars), and unitized cargo that travels using containers (Molland, 2011; Stopford, 2009).

Dry cargoes are increasingly being loaded into containers, used by manufacturers who wishes to take advantage of lower freight rates by liner operators (Hoffmann, Valentine, et al., 2014). Containers also have a *niche* position where it specializes in carrying manufactured goods and high-value bulk commodities. Containers can even accommodate temperature sensitive agricultural and food products. The scope of this research will only cover liner shipping where the ships sail according to a predefined route and schedule; and where the cargoes move via containers.

Southeast Asian countries formed a legal and institutional framework for political and economic cooperation called ASEAN (ASEAN, 2008). Among those ASEAN members six countries are considered major maritime player. Considering the majority of ASEAN economy mostly played by those maritime ASEAN countries, hereinafter this research only covers those Southeast Asian countries.

Narrowing down a research from including the whole member countries to then only cover several has been done before. Previous research from Cheong and Suthiwartnarueput (2015) improved they analysis by aggregating five major ASEAN countries running simulation scenarios to find the relationship between the expansion of

trade volumes from forming trading blocs covering only five main ASEAN maritime countries. Their simulation result was more conclusive if ASEAN countries are aggregated as “ASEAN-5”, which are Indonesia, Malaysia, Philippines, Singapore, and Thailand; which coincidentally happen to be the five founding members of ASEAN. This research adds one more country to complete the six maritime Southeast Asian countries: Vietnam.

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1.7 Potential Contribution

Understanding the dynamics of how a region’s connectivity within the global liner shipping networks remains an interesting challenge for researchers and policy makers alike. The potential contribution to the research community is to show some unique characteristics of maritime industry in ASEAN, especially in relation to the potential growth of both transshipment activities and the actual international trade in exchange of goods. This research will provide systematic and academically proven recommendation to support ASEAN’s liner shipping business.

With the existing data, the research will also try to find the antecedents and causes to meet research objectives. As an academic contribution to find this relationship, panel data analysis from a more detailed indicator of LSCI is used. Despite its advantages, panel data is relatively unique in the Supply Chain Management and Maritime Economics field. Although ASEAN’s logistics industry has been often been used as an object for research, there is yet an available research that specifically address the connectivity part of the logistics industry in the region. With its unique geographical position and increasingly stong economic cooperation, there are factors that can be looked into in further detail.

This research is expected to provide recommendation for managers and policy makers to take more justifiable actions which in turn will improve the international trade volume and economic growth in the region. The findings of this research on ASEAN liner

shipping can also provide some valuable input for other regional economic groups especially where the country group members are mainly developing countries, or where group members cover very different economic level and different transport geography profile.

2 LITERATURE REVIEW

This chapter is concerned with a comprehensive literature review. First, it deals with background theory and factors that can potentially be applied to this research. Second, definitions of maritime industry and economic activity are defined. Third, relevant literatures on the usage of logistics indexes and proposals on finding alternative of those indexes are discussed. Finally, case studies and research papers on ASEAN's logistics and maritime sector are reviewed.

LSCI and LPI, in their different approaches aim to provide information about a country's trade competitiveness in the area of transport and logistics. Literature reviews on logistics indexes will further be separated into two, as most non-case study researches does not use both indexes in one paper. An introduction to supply-chain EPIC aspect scores will subsequently be presented.

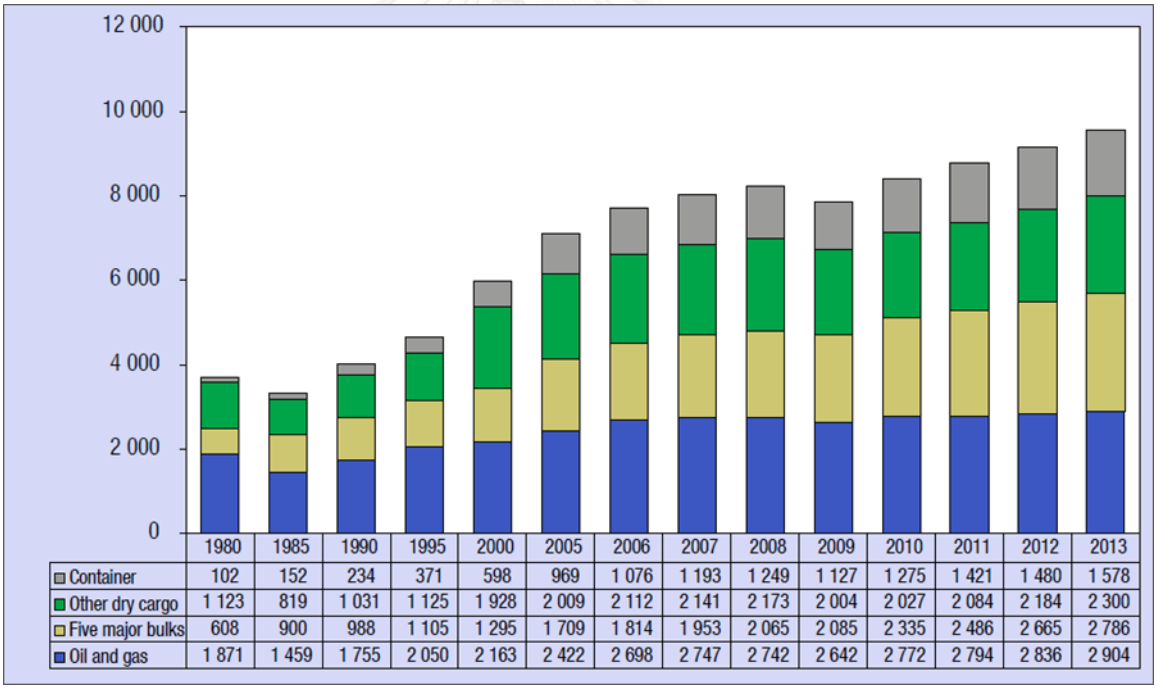
2.1 Maritime Industry

Maritime industry was dominated by the European Empires during the time where the maritime trade reached its peak in the late nineteenth and early twentieth century. Notteboom (2013) further argued that prior colonial status has large and significant effects on bilateral trade, similar to what conventional trade routes that is currently available at present. It was further found that though these maritime power increased their trade volume by lowering transaction costs, instituting preferential trade arrangements, formed customs union, and by establishing trade policies that promoted trade within their network (Mitchener & Weidenmier, 2008). This preferential in-network trade that was argued by Mitchener and Weidenmier (2008) however, only covers European countries during the *Age of Sail* era and early 20th century.

With the rapidly expanding world trade, the traditional multi-purpose general-cargo liner became increasingly labor and cost intensive. A system was required to accommodate

the needs of physical distribution, which would offer convenience, speed and above all low cost. Using the system, goods are able to be delivered almost everywhere using a standardized carrying unit, compatible with both sea and land legs of transportation. As a result, it was expected to be that all costly and complicated transshipment operations at seaports would be minimized.

The whole process resulted in the development and introduction of containers, a standard box, filled with commodities, detachable from its carrying vehicle, and as easy to carry by sea as by air, road and rail. Containerization is a type of innovation in the port in realizing efficiencies. Ports with container handling capabilities most likely have a higher and more consistent growth in the long run (Fan et al., 2011).



	1980	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013
Container	102	152	234	371	598	969	1 076	1 193	1 249	1 127	1 275	1 421	1 480	1 578
Other dry cargo	1 123	819	1 031	1 125	1 928	2 009	2 112	2 141	2 173	2 004	2 027	2 084	2 184	2 300
Five major bulks	608	900	988	1 105	1 295	1 709	1 814	1 953	2 065	2 085	2 335	2 486	2 665	2 786
Oil and gas	1 871	1 459	1 755	2 050	2 163	2 422	2 698	2 747	2 742	2 642	2 772	2 794	2 836	2 904

Figure 2.1 International seaborne trade, by year (in millions of tonnes loaded)

(Source: UNCTAD Review of Maritime Transport 2014)

As two World Wars have passed, and starting in the beginning of 1960s, global container trade enjoyed an annual average increase of about 4 per cent per year. Trade via container shipping, as one of the vehicle of maritime industry (UNCTAD, 2014), IMO

(2012) further noted that liner shipping covers 16 per cent of the total world trade. With this liner shipping, ever larger vessel sizes, and the level of competition on a given trade route, have also been found to be closely related to lower transport costs (Hummels, 2007; Wilmsmeier & Hoffmann, 2008). Furthermore, despite the lack of speed, in comparison with air cargo, maritime trade has the advantage for catering consumers who does not want to add premiums towards fast delivery and consumers who are very sensitive to prices (Hummels & Schaur, 2013).

More recent finding in maritime logistics suggested that the economic crises that mainly occurred in 2008 and 2009 has significantly affected the maritime industry. As shown Figure 2.1, the United Nations Conference on Trade and Development (UNCTAD) in its annual flagship report further reported that total trade volume dropped from 8.2 billion tonnes in 2008 to 7.8 billion in 2009. As an international and capital intensive business, the liner shipping industry was greatly affected by this decline in trade volume (Song & Panayides, 2012). One of the solutions to address this issue is the move from investing heavily on capital intensive facilities and projects to regional cooperation. This cooperation was self-initiated by companies, or initiated by concerned countries to recover from the downturn. The problems could include oversupply of weight capacity, sudden drop in demand, and lack of ability of companies to recover from disruption causes the decline in freight volumes (Lee et al., 2011).

2.2 Economic Activity and Indicators

UNCTAD Maritime Transport determined that shipping services is “derived” from the performance of maritime transportation and seaborne trade, where it is largely dependent on the developments of the world’s economy and overall international trade (UNCTAD, 2014). This derivation however, has yet shown the in what way, and what formula this demand is derived. Over the years, starting in about 1997 the world’s merchandise trade has grown about twice as fast as the world’s GDP. This is quite possibly as a result of the multiplier effect, from among others, globalization, technology

that improves port efficiency, transshipment, and increased trade in intermediate goods. This multiplier effect is also caused by free trade agreement in tandem in tandem with regional economic blocks, which is already in place between Korea and ASEAN (Lee et al., 2013), South-South trade (Lee & Lee, 2012), and between China and Africa (Lee, 2015).

GDP is usually a good start to be used as an indicator of economic activity, as a demand driver and performance indicator for freight transport. In further detail however, GDP was found not the best indicator because in each of its composition of Consumption, Investment, Government Spending, and Trade Balance changes over time. Researchers and think tanks proposed an alternative benchmark using a detailed approach in analyzing impact of transport development within a region. The basis of this decision are the globalization of the world economy, decoupling of freight and trade routes, and the ever changing business behavior driven by short-term/time-based competition (Jong et al., 2013). Those three main causes however, have yet to be proven quite conclusively.

Van de Voorde and Meersman (2013) further supported the argument where GDP is not precise enough in the long run to be used as an indicator of growth in relation to freight transport. On one hand, it is by virtue of the changes in the composition of GDP; e.g. investment heavy, consumption heavy, or positive/negative trade balance. While on the other hand, the type of the economic development presented in GDP changes over time, e.g. investment to boost certain sectors of industry, social programmes for the country's citizens, or programmes to stimulate employment. The domain of their research only covers EU countries, where significant part of the freight transport traffic goes via land (i.e. road, rail, and pipeline). It will be interesting to see if the model can be propagated to include the rest of the world showing intercontinental transport, or even focused on a specific region.

Docherty and MacKinnon (2014) also argued that transport and economic development is a two-way symbiosis where each influences the other; where the economic development will create demand for improved transport which will, at one point, support further economic growth. Direct relationship toward GDP needs to be interpreted carefully, as it needs to be understood more broadly in the wider economic perspective, i.e. social and environmental impacts of transport (Shaw et al., 2009).

As a comparison, some researchers still uses GDP as it is, like the one that was done by Valentine et al. (2013). GDP is still quite a valid indicator if it is seen from the bird's eye view in terms of growth change volatility. As displayed Figure 2.2 trade elasticity in exports, since 1971 to 2010 is about 2.5 times the size of GDP (UNCTAD, 2014). From their finding, it shows that GDP can still be used to analyze the overall trade. However, in spite of similar trend with different magnitude, it still would be interesting to see a more specific component GDP as a candidate to be used as a benchmark to dampen the shocks.

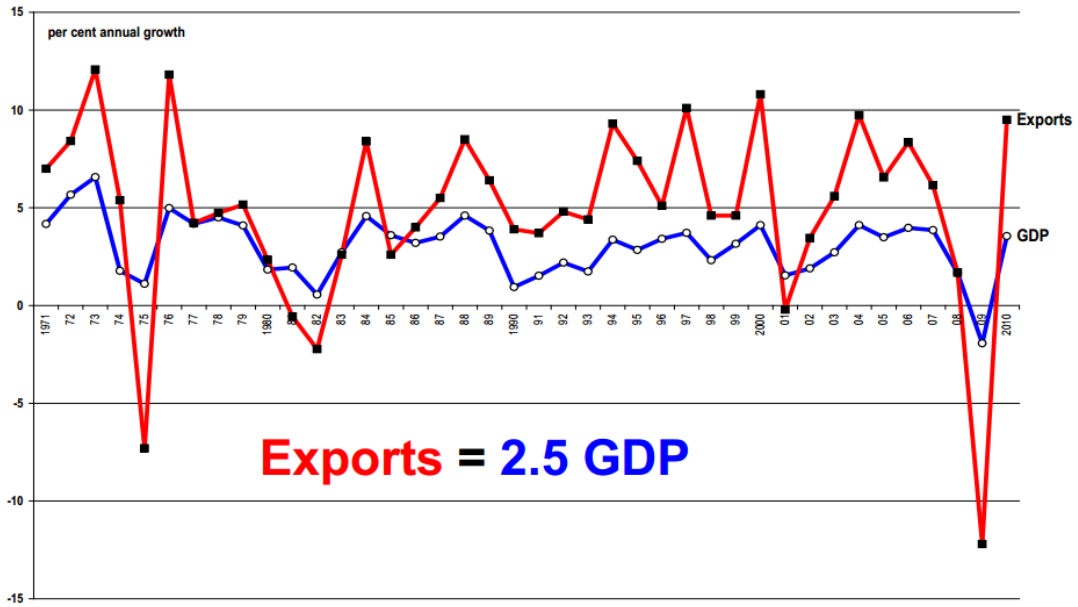


Figure 2.2 Export (solid square data points) and GDP (hollow round data points) annual growth (Source: Data from World Bank and UNCTAD)

The new maritime transport models were found between 2002 and 2012, which includes transshipments, storage and sourcing and optimization of shipment size (Jong et al., 2013). Data sharing plays a very important role especially in logistics planning. This data sharing is a derived consequence of the aggregation of freight transport data. This data can go beyond merely an indicator or descriptive statistics where it can also be used for modelling production/supply-chain, and integration of local with international freight transport model.

The planning and investment in logistics infrastructure projects, less developed countries, particularly, would need to consider specific issues that may contribute tangible impact of such investment towards their economic growth (Banister & Berechman, 2001). One of the considerations is that any investment in transportation infrastructure projects must be within the coverage framework of local, national, and even regional networks. In particular, port infrastructure development in Asia has driven to capture and cater container cargoes (Lee & Cullinane, 2005; Lee & Flynn, 2011), which contributes to the improvement of LSCI.

In another paper, Banister and Berechman (2000) argued that economic growth must occur at a network level rather than at a project level. While the final consideration is to prioritize objectives where the benefits must be related to transport, no double counting in should take place in measuring transportation benefits. There exists a functional relationship between transportation benefits and potential economic growth. They also found that while in developed countries the findings are a little bit different. Developed countries with well-connected and high-quality transport infrastructure networks, investment in infrastructure alone will not on its own merit have a significant effect on economic growth (Banister & Berechman, 2001). In other words, further investment in transport is only a complementary programme to further advance their economic development. In most cases, to address lack of funding situations, developed countries launch capital-intensive projects using public-private partnerships, while developing

countries rely on policies and strategies introduced directly from, or even endowments given by their central government (Cullinane et al., 2005). It is highly important, particularly in developing countries, that the central government introduce policies that seek to maximize efficiency with a goal in mind to achieve competitive advantage in the respective country's port as compared to other country within regional proximity (Demirel et al., 2012).

Knowledge of a country's strenghs and weaknesses in its port infrastructure and shipping industry is an important requirement for governments because it can help them either (a) focus its attention on key factors in order to shift their weaknesses relative to their competitors or trading partners (Lee et al., 2014), or (b) not be too involved and only act as a facilitator (Tongzon & Heng, 2005). Based on the findings of previous research regarding transport and economic impact, when the panel data analysis is presented in this thesis at the subsequent chapter, the approach in improving maritime industry will potentially be different from developed countries (a complementarity value acting as a supporting role) and developing countries (a necessary requirement for meeting underlying conditions) (Banister & Berechman, 2001).

Research by Banister and Berechman (2001) further suggested that in order to meet the underlying conditions, developing economies should invest ahead in high-capacity ports and adequate transport infrastructure to meet future and justifiable trade capacity. To develop international trade connectivity, developing economies should continue to invest significant resources in developing efficient logistics infrastructure and integrated/multi-modal transport in order to avoid cost-prohibitive transport cost. This high transport cost is the price tag businesses put in place to sustain margins, to cover for delays, high risk of loss and damages leading to high insurance premiums, where in turn affects the overall trade and development (Clark et al., 2004; Gallup et al., 1999). A case study for ASEAN will further analyze quantitatively whether the region's maritime

logistics infrastructure investment has an impact towards economic development making use available logistics indicators as dependent variables.

2.3 Logistics Performance Index

The World Bank introduced LPI as a comprehensive index to measure the logistics and supply chain performance of a country. The index is a result of a perception survey of logistics operators providing feedback on the countries they do business with, where it takes a broad spectrum and multi-dimensional approach to trade logistics (Arvis et al., 2014). These LPI surveys have been conducted four times, in 2007, 2010, 2012, and 2014. The fourth and latest report used a comprehensive data source covering 160 countries, where 1,000 logistics professionals worldwide took part.

LPI functions as a tool to compare performance across countries and identify country's key challenges. The international part of LPI is based on logistics professionals' assessments of the situation and environment in dealing with certain trading partners across six core dimensions of logistics performance. Once the data is collected a weighted average is then calculated. As per Word Bank's guidelines, the six core dimensions on which the survey respondents provide their scores are as follows:

1) Customs: the efficiency of customs and border clearance.
2) Infrastructure: the quality of trade and transport infrastructure.
3) International shipments: the ease of arranging competitively priced shipments.
4) Service quality: the competence and quality of logistics services including trucking, forwarding, and customs brokerage.
5) Tracking and tracing: the ability to track and trace consignments.
6) Timeliness: the frequency with which shipments reach consignees within scheduled or expected delivery times.

2.4 Liner Shipping Connectivity Index

Large and fast container ships, along with the provision of sophisticated port handling as facilitated international trade growth since the beginning of container ship era in 1956 (Levinson, 2008). Liner shipping networks carrying containers has facilitated globalization processes and associated globalized production processes. Efficient ports that accepts and processes these container ships is an essential component of efficient liner shipping that facilitates the connection to the rest of the world (Asteris et al., 2012).

Logistics connectivity is one of the key elements to economic growth and is a medium to close the gap of inequality (Carpenter & McGillivray, 2013). It is created through physical infrastructure and mutual trade relations. Physical infrastructure development is an important requirement in promoting connectivity, but does not in itself will, or does not directly stipulate economic impact.

The economic impact will happen when infrastructure and trade relations can be fostered. The impact will be greater if accompanied by the ease of the transportation, clear document processing requirements, reliable electronic payment systems, single window systems for cross borders, and also supported by the quality/availability of adequate human resources.

LSCI captures how well countries are connected to global liner shipping networks (Wilmsmeier et al., 2011). Most overseas trade in semi-finished and manufactured goods is moved in containerized shipping services, in which case the LSCI provides an annual update on a country's connection to global networks of such services (UNCTAD, 2014). The higher the LSCI, the more ease a country can access a high-frequency maritime trade route and can make the most advantage of the available capacity of the global maritime container freight transport system.

LSCI takes a snapshot of country's level of integration into the existing liner shipping network by measuring its liner shipping connectivity. LSCI can be considered a proxy of the accessibility to global trade (Rodrigue, 2010). It means that countries with good index can more conveniently access a high capacity and frequency global maritime freight transport system and thus more effectively actively participate to international trade. LSCI can also be considered as a measure of connectivity to maritime shipping and as a measure of trade facilitation (Rodrigue & Slack, 2013), as it reflects strategies of container shipping lines seeking to maximize revenue through optimal market coverage (Cullinane & Khanna, 2000; Rodrigue, 2010).

The LSCI assesses a country's position within such global networks, both with regards to changes over time, and in comparison to other countries. It is calculated as the weighted average of five core components: (1) number of vessels assigned to liner services, (2) combined container carrying capacity of those vessels, (3) number of services offered by companies, (4) number of companies that provide liner shipping services calling the country's ports, and (5) the largest vessel size. The data are derived from Containerisation International Online[2] and Lloyds List Intelligence.

The component can be further explained, as follows:

1) The total number of ships that are deployed from/to country's ports. This component could directly indicate a high frequency of services or plenty of berths available at ports. The more ships passes through a country implies a better connectivity.
2) The total container carrying capacity of the ships that provide services from/to country's ports, measured in in Twenty-foot Equivalent Units (TEU)[3]. The count will

[2] As of 2013, Containerisation International Online is part of the Lloyd's List Intelligence

[3] TEU is a standard unit of measurement that quantifies the number of containers based on one twenty-foot container. It is a very common unit of measure in maritime transport. One TEU equals to one twenty-foot container; one forty-foot container equals to two TEU. This unit is regularly used to

be the full capacity of the ship itself. Therefore, it does not necessarily make full use of this capacity, a larger total TEU capacity is likely to imply more available space, and an opportunity value to do more trade by shipping more cargo-filled containers, or schedule at a lowest rate possible when ships has ample available capacity, attracting more container cargoes to ship at the best price.

3) The number of companies that provide services from/to a country's ports. The companies does not necessarily owned by the respective country. In most instances, a country's trade is mostly moved by foreign companies, and all major liner shipping carriers do business by transporting other countries' imports and exports. The more carriers compete for trade in a country, the more choices exporters/importers have and the less freight rates will be charged.
4) The number of services that connect a country's ports. This component is an indicator of efficiency on how goods travel via liner shipping, particularly on how containers can travel with the least connection possible, shipped to final destination possibly even without the need for transshipments.
5) The largest ship that is deployed from/to a country's port, measured in TEU. This component is used as an indicator of economies of scale and infrastructure. In order to attract the largest ship to dock, ports need to provide adequate equipment, such as cranes, sufficient draft and access channels.

Cognizant to the calculation of LSCI, one might find that this index only focuses on liner shipping and it is somewhat arbitrary in aggregating component statistics without any weighting. Unlike LPI, LSCI bases itself on hard numbers to reflect trade competitiveness which does not vary according to a each and every respondent's feedback, the corresponding economic cycle, or changing perceptions (Hoffmann, Van Hoogenhuizen, et al., 2014). LSCI is a measure of the strength of the link between two

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measure the capacity of container ships and the storage capacity of a container terminal in liner shipping.

points and the strength of that one point linking to the rest of the world, where one country is considered one point.

If LPI takes the sample data from respondents where he/she can be different from one survey year to another, LSCI sample always available in a record book and not being dependent on respondents where we survey statistic is obtained. The broad range of issues during a survey season and potential survey data subjectivity makes it also more difficult for the LPI to be reproduced consistently on a regular basis. In addition, the challenge of collecting survey data and processing them to cover the world sample makes it difficult for LPI to publish results annually. The advantage of LSCI is its underlying data, where it is taken from hard and actual data covering the reported deployment of each and every container ship at a given point in time. This methodology allows for comparisons over time in a more consistent manner.

There could be other alternative and more comprehensive ways of introducing an index to measure shipping connectivity. Hoffmann (2012) suggested an idea in a form of more detailed information on actual frequencies or to incorporate information on the connections themselves, i.e. with the number of other countries that one country connected through direct services. As of the time that paper was introduced, when the comprehensive measures were taken into account, the final result in terms of countries' rankings or trends over time did not really change.

Recognizing that LSCI treats each country of concern as if it were a single location and the entire rest of the world a single trading partner, Bartholdi et al. (2014) proposed an alternative index which is called Container Port Connectivity Index (CPCI). Instead of scoring a country, they computed CPCI with a score for each port that reflects the strength of its connectivity to other ports within the network. CPCI consists of two components, one that reflects how well connected the port is for imports and the other for exports. CPCI complements LSCI by using ports instead of countries as a research

statistic. In other words, they complemented LSCI by using actual already-existing ports in a geographical map instead of a country as a research statistic. They have also improved LSCI by computing not just on the immediate liner service to a port, but also on the scores of the immediate neighbors, the scores of the neighbors of those neighbors, and so it continues.

2.5 EPIC Score

Regions can be presented on the basis of their supply chain situation from their economic, political, infrastructural and competence aspects. The EPIC framework identifies key characteristics of countries a region, to measure and assess the level of maturity with respect to its ability to support and sustain supply chain activities (Srinivasan & Stank, 2014). The scoring is on per country basis, where subsequently Srinivasan and Stank (2014) analyzes the supply chain situation within a region.

Economic dimension assesses the economic output and the potential of the country and its ability to attract foreign direct investment. Political dimension measures the ease of doing business, burden of bureaucracy, corruption, tariffs barriers, and intellectual property. Infrastructure dimension tracks indicators to support supply chains in a country specifically in physical infrastructure, energy, and telecommunications aspects. Competence dimension look into human aspects and their related aspects of the logistics industry that exist in a country, it covers labor productivity, availability of skillsets, and education level.

Table 2.1 describes sources of EPIC variables (second column) and identifies the data sources (third column) used to assess these variables. This data is further assessed for its ability to provide insights on making decisions. The supply chain decision areas in which variable can be used is shown in the fourth column of the table.

Table 2.1 Supply Chain decision uses for EPIC variables

[Source: Data collection from Srinivasan and Stank (2014)]

Dimension	Key Variables	Data Source	Supply Chain Network Design
Economy	GDP and GDP Growth Rate	World Factbook	Retail store location, Supply node
	Population Size	World Factbook	Retail store location, Sales channel
	Foreign Direct Investment	UNCTAD FDI Attraction Index	Manufacturing and logistics location
	Exchange Rate & CPI	World Factbook	Manufacturing and logistics location
	Balance of Trade	WTO	Sourcing & Manufacturing location
Politics	Ease of Doing Business	EDBI & Worldwide Governance	Retail, supply node, & manufacturing
	Legal & Regulatory	WGI	Retail, supply node, & manufacturing
	Risk of Political Stability	Economist Political Instability Index	Retail, supply node, & manufacturing
	Intellectual Property Rights	IPR Index	R&D center, e-commerce, product
Infrastructure	Transportation	WEF Global Competitiveness	Logistics network design
	Utility Infrastructure	WEF GCI	Sourcing, manufacturing & logistics
	Telco & Connectivity	World Factbook	Sourcing, manufacturing, and logistics
Competence	Labor Relations	WEF GCI	Sourcing, manufacturing and logistics
	Education Level	WEF GCI	R&D center, manufacturing & logistics
	Logistics Competence	World Bank LPI	Sourcing, manufacturing and logistics
	Customs & Security	World Bank LPI	Sourcing, manufacturing & logistics

The 2014 EPIC scores for ASEAN countries are shown in Table 2.2. The scores are based on the quartile position, i.e. A, B, C, and D, on every country's ranking in their respective EPIC dimension's key variables. Each quartile is divided into three segments, except for top quartile where there is only two. Thus the possible scores are, A, A- for the 1st quartile; B+, B, B- for the 2nd quartile; C+, C, C- for the 3rd quartile; and finally D, D-, F for the 4th quartile.

The result from ASEAN region may be different from one country to another. For example, in one country the competence dimension where service level and improvement of skill-sets may be placed in a higher priority, while in another, the political dimension where speed of customs clearance, or the economic dimension where attracting foreign investment may be more important.

Table 2.2 EPIC Assessments for ASEAN Countries

[Source: Analysis from Srinivasan and Stank (2014)]

Country	Economy	Politics	Infrastructure	Competence	Overall
Indonesia	A-	C-	C-	B-	C+
Malaysia	B+	B	B+	A-	B+
Philippines	B+	D+	D+	B-	C+
Singapore	B	A	A	A	A-
Thailand	B+	C+	B	B	B
Vietnam	B+	C+	D+	C+	C+

2.6 ASEAN's Liner Shipping Industry

This last literature review reviews researches that use ASEAN as a case study, specifically in relation to maritime industry, international trade, and logistics.

We know that since its inception in December 2015, ASEAN Economic Community (AEC) has played a cooperative role between countries of ASEAN to transform themselves into a unified economic force, both as a market and as a production base (Petri et al., 2012). AEC has a vision to make ASEAN as a region with an economy that is competitive with more equitable economic growth among member countries, and better integrate with global markets. To achieve this vision, ASEAN member countries have agreed to reduce the restrictions on the movement of goods, services, investment, and skilled labor.

ASEAN countries have promoted AEC, along with their extra-regional format, such as ASEAN+3 (plus Japan, China, and Republic of Korea), and ASEAN+6 (ASEAN+3 plus India, Australia and New Zealand). With this various regional and extra-regional initiatives, ASEAN countries' efforts can be commended positively. With AEC, this regional cooperation can now be deemed to be close in achieving deeper economic

integration, within themselves and its closest trading partners (Kawai & Wignaraja, 2007).

Most recent research has found that ASEAN-driven regionalism, more specifically, in each of the countries' logistics and connectivity is the most urgent agenda item (Cheong & Suthiwartnarueput, 2015). Good connectivity and efficient logistics is a critical prerequisite in order to realize economic gains from ASEAN's trading blocks, as explained in AEC's blueprint. Adequate port infrastructure, non-congested logistics networks, seamless intermodal facilities and non-cost-prohibitive transportation cost plays a part towards effectivess of ASEAN country's port as key gateway to the regions international trade (Brooks, 2010).

Previous research has been attempted in comparing port performance in ASEAN by using cluster analysis. ASEAN ports were found to have higher levels of efficiency in the functioning and utilization of advanced port facilities such as: cranes, berths and storage areas (Tongzon & Ganesalingam, 1994). On another perspective however, Tongzon and Ganesalingam (1994) have found lack of efficiency in terms of human resource related and soft skills performance, such as: timeliness, labor and tugboat utilization. Port charges in ASEAN ports are also found to be relatively more expensive than other economic regions (Tongzon, 2009).

Furthermore, UNESCAP (2013) conducted an empirical study on trade costs where it used LSCI as one of the indicators. It concluded that 25 per cent of changes in non-tariff policy-related or non-government-imposed trade costs can be explained by LSCI. The ESCAP study further found that the exporting country's LSCI had a higher correlation with the trade costs than the importing country's LSCI.

Tongzon and Cheong (2013) further proposed measures to improve ASEAN's competitiveness in logistics industries and identified underlying factors that either

supports or hinder their implementation. From their qualitative survey using questionnaires and interviews with of logistics firms and government agencies in the region, it was found that the implementation to improve the region's competitiveness has been quite low. They highlighted that the main cause was due to a perception gap between the respective governments and private sector logistics firms. They further encouraged that these gaps need to be addressed by embarking on a dialog; and argued that the lack of it would hinder the competitiveness of the ASEAN country's logistics industry.

The performance of the ASEAN economies in terms of overall international trade has generally performed surprisingly well. The principal contribution is the economic expansion, in terms of business and shipping connectivity, which was mainly occurred as a consequence of domestic consumption. The region's expanding middle-class population, gradual movement from low-to-middle, then middle-to-high income, and the growing number of people freed from the poverty is becoming a trend (Beeson, 2015). Overall, becoming a region classified as middle-income economy at the first place is no small feat.

3 ECONOMIC AND GEOPOLITICAL SITUATION IN ASEAN

This chapter analyzes the economic and geopolitical situation in ASEAN. It starts with ASEAN's geopolitical background, especially on how this organization comes about. It is followed by the description of the region's economic situation, in terms of its significance in the world market and its economic resilience during the most recent global crisis. The last two parts of this chapter explains ASEAN's logistics situation and liner shipping profile.

3.1 Geopolitical Situation

Generalizing about a group of countries as diverse background like Southeast Asia is interesting but difficult at best. A region that is almost synonymous with economic failure almost two decades ago and in some cases: was then experienced turbulent political turmoil is now considered to be the most stable and one of the few bright spots in the global economic arena (Beeson, 2015). While some countries and economic regions still face series of mini-crises post 2008 that has yet to be resolved decisively, ASEAN countries addressed them pretty quickly. The key challenge of ASEAN economies would be to see whether their positive turnaround experience track record in facing difficulties and their economic resilience ability as one of the actors of the global international trade can be sustained.

Ever since ASEAN's inception in 1967, it has frequently faced by economic and political forces, of which it has little control of them. Its inception was mainly political. Therefore, it could be quite a challenge to say anything conclusive about the future prospects of the region considering its history. Nevertheless, we can still see some of the changes and reforms that have occurred since the last devastating crises occurred almost two decades ago in 1997, how the economy grows along the way, and see how the regions able to withstand another one like it eleven years later, in 2008.

In almost every aspect ASEAN is highly heterogeneous. Politically, from fully-fledged democracies in Indonesia and the Philippines, “semi-democracies” in Malaysia, Singapore and Thailand, and the only non-founding ASEAN member covered in this thesis, the “communist” regime in Vietnam. Alongside this political “diversity”, each and every ASEAN country has vastly different level of economic development. Ranging from Singapore, which is among the top GDP per capita in the world, middle-income countries like Malaysia and Thailand, to Indonesia, Philippines and Vietnam, still considered to be positioned inside and still working their way out of the “middle-income-trap” (Lee & Narjoko, 2015). Both political and economic aspects combined, ironically the fully-fledged democracies of Indonesia and Philippines are still placed at the lower-tier of the per capita GDP, where democracy seems to have made harder to implement domestic policy and to get up to speed with the growth rate of other ASEAN countries.

This different position might rapidly change in the future. The changes in connectivity will occur between nations around the Mekong River with the opening of a number of land accesses among others linking Myanmar, Thailand, Cambodia, Laos and Vietnam. The land access will bring many changes will affect the connectivity and rapid economic growth in these countries. Countries around the Mekong establish cooperation agreements called Greater Mekong Sub-region (GMS). Logistics connectivity are divided into economic corridors and seemed to give quite a lot of positive expectations for the smooth circulation of goods between these countries. Special economic zones are also being developed within the GMS vicinity. Ports will be connected overland by Thailand, Cambodia, and Vietnam. While the ports themselves will have a planned depth of approximately 20 meters, able to receive very large ships (Kunaka & Carruthers, 2014). Its strategic position will easily attract many shipping companies to load and unload there, rather than going around via Singapore or Malaysia. If this really becomes a reality, Atlantic Ocean bound vessels that pass through the Malacca Strait could be drastically reduced. In other words, the dominance of the port of Singapore as a major transshipment port of Southeast Asia could be affected.

In order to improve connectivity between ASEAN countries, various initiatives have been launched. One of them is by making strategic plans of connectivity the member countries of ASEAN. Some major ports such as Laem Chabang, Thailand; Tanjung Priok, Tanjung Perak, Indonesia; Ho Chi Minh City, Da Nang; Vietnam; Port Klang, Tanjung Pelepas, Malaysia; Manila, Philippines; and Singapore port are key ports tied into knots of an integrated maritime connectivity.

3.2 Economic Situation

In spite of the variety of background, it is quite possible to make a generic observation to help explain how these countries respond the economic turmoil and sustain growth. The economic development has arguably occurred within a wider geopolitical context, driven by the forces outside the region. Even in some cases, those external powers would have a major say on the course of both the political direction and economic development. The most visible impact of an economic turmoil is the downfall of Suharto regime in Indonesia. Using post World War II as a “reset-button”, the industrialization of ASEAN started comparatively late relative to its East Asian standards, dominated by Japan and other “newly-industrialized” countries of Northeast Asia namely: Republic of Korea and China. Those three major maritime shipping players are characterized by moderate to strong growth representing an ever-larger share in global container traffic volumes.

One of the main learning of the monetary crises that occurred in 1998 is the lack of institutions able to manage crises of that magnitude (Acemoglu et al., 2005). The Asian financial crisis affected negatively maritime transport and industry negatively. One successful economic resilience case is found in the Korean maritime case (Lee, 1999; Ryu & Lee, 2002). Responding to the crisis, ASEAN countries sought refuge to external Washington D.C. based institutions, namely: The US Federal Government, The World Bank, and International Monetary Fund. Situation changed about eleven years later. The

region's resilience towards the crises was contributed by both the strong trade and monetary partnership with China, and the transformation of the position of ASEAN economies to keep significantly larger reserves, and to respond by using them. Previous research even found that the result of the axis move from Washington to Beijing acted as a new potential center for future growth (Ba, 2014).

The relative strength and resilience of the economies in the region was considered to play an effective role in stimulating ASEAN's domestic economies, especially in facing potentially another downturn driven by external forces. ASEAN is now economically crises resistant, with much healthier reserves and less reliance on releasing government bonds for sale to strong powers (Chin & Helleiner, 2008; Plummer & Click, 2005). In comparison their trade counterparts out west, ASEAN government institutions has a broader mandate and plays a greater role in stimulating their own economies as well as expanding its maritime infrastructure (Shepherd & Wilson, 2009).

Shown by the size of exports, ASEAN might be found to be overly reliant on external markets which arguably contributing to the imbalances and political friction. ASEAN economies are continuously attracting growing amounts of foreign investment which feeds towards a quite high-level economic growth. ASEAN is in control to decide on what regional action it wants to take, however the overall international trade strategy it wants take are highly dependent on the dynamics of its main trading partners, mainly led by its Northeast Asian countries trade counterparts. Although somewhat yet fully-inconclusive along with the limitation of the quantitative analysis, it is quite apparent that ASEAN's maritime logistics development is quite remarkable, while it still remains quite dependent on key export markets highly sensitive to economic recession.

With the industrialization of ASEAN economies, it thus remains an especially vulnerable region to shifts in global consumer sentiment. Industrialization aside, ASEAN countries still rely on the trade of agricultural and mineral commodities. Natural disasters and

volatility of commodity prices provides a strong case to weigh importance of social resilience and political stability, particularly to the region's ability to feed and to provide basic infrastructure for a rapidly growing population.

3.3 Logistics Situation

The "image" of the region is an important influence on making investment decisions, a number of surveys and benchmarks has been attempted to measure the trading partners logistics perception towards a country, where LPI and LSCI are the two most popular ones. ASEAN countries received a high variance score in both LPI and LSCI which somewhat indicates the inherent limits of trying to generalize about the region as a whole.

According World Bank's LPI, out of the 160 countries surveyed. ASEAN's LPI fairly differs from one country to another. Certain countries have much higher scores to the other countries. The LPI scores are scattered from the top (very good) to the bottom (very bad). Rating World Bank survey in 2014 put Singapore is ranked 5th, while the five other countries in the middle, Malaysia (25), Thailand (35), Vietnam (48), Indonesia (53), and the Philippines (57). If one can synthesize, the main problem that deters business investment is the endemic and seemingly inescapable corruption (Widjaja, 2012).

The connectivity between ASEAN countries are still facing challenges, despite the opportunity it might offer. One is the export/import process is still very complicated in some of the member countries. According to the 2014 World Bank report in carrying out the import process, Singapore only needs 3 documents, while Indonesia needs 4. The processing time showed quite a big difference, Singapore can complete the process in 6 days, while Indonesia needs 17 days (Lee & Lam, 2015; Piesse, 2015). The cost is of course also varied and more or less reflected by the complexity of the process. The issue of complicated cross-border goods inspection, the classification of items that are

yet standardized, as well as some special requirements imposed in each member country are the problems that are still existent (Clark et al., 2004).

Ports in ASEAN are found to be able to fulfil their role of a regional transport hub. As a consequence, not only taking the advantage of transport geography of Southeast Asia, it is also contributed by the good level of economic development where it has brought about an environment that facilitates business activities, including transport as a medium and as an enabler. In this case, World Bank's LPI reveals that ASEAN offers good conditions for maritime transport in par if not better than other regions or economic groups. By global comparison of the LPI, which operates on a scale from 1 to 5; looking at the score alone, ASEAN countries belong to the first and middle tier. The 2014 LSCI and LPI scores and rankings for ASEAN countries are presented in Table 3.1.

Table 3.1 ASEAN's LPI (2014) and LSCI (2015) scores and its world rank

(Source: Data from the World Bank and UNCTAD)

Country	LPI	LPI (world rank)	LSCI	LSCI (world rank)
Singapore	4.004	4	117.13	3
Malaysia	3.590	25	110.58	5
Thailand	3.430	35	46.36	31
Vietnam	3.155	48	44.43	29
Indonesia	3.082	53	26.98	46
Philippines	3.004	57	18.27	63

Continuing the discussion on the irony of a full-fledged democracy in Indonesia and the Philippines, there are still serious tasks to address head-on the politics of patronage and cronyism, whereby the government's ability are in doubt to be able to commit towards solving it. Pressure from think-tanks and civil societies to decentralize governance have actually contributed to the problem instead of solving it. In addition, according to Beeson (2015), those pressures further undermine the effectiveness of central

governments development and reform initiatives. The other pressing problem in ASEAN; similar to LPI, excluding Singapore and Malaysia, is the region's logistics infrastructure. Despite relatively higher levels of investment in logistics and transport, the recent development contains deficiencies which might threaten future developments of the countries in the region (Goh & Ang, 2000).

3.4 Liner Shipping

Liner shipping is a ship carrying cargo and passengers which operates on a fixed schedule. As mentioned in the research scope, in this study, liner shipping only covers cargoes that travel via containers. With containers travelling via global liner shipping network, even small importers and exporters from far away countries can trade with each-other, which was before would not have been possible as their individual trade transaction would not economically justify chartering a ship to transport a small amount of goods travelling from point A to point B.

Understanding liner shipping connectivity in is quite important. Tighter cooperation between countries in a region will allow policy makers promote competitive service to its business users. When efficiency gains take place, good liner connectivity could potentially reduce costs of shipping, as a consequence, it will play a part in enhancing country's trade volume. When trade volume increases further improvements of core and value-added services will take place, thus those improvements will result in country's and region's competitiveness (Jiang et al., 2015).

Port infrastructure investment plays a crucual role in the development of liner shipping networks, where the risk of lagged or late provisioning of developing one would move ports towards being out of the world's main liner shipping network (Wilmsmeier & Notteboom, 2011). Overseas goods unloaded at Tanjung Priok, Indonesia, for example, are shipped on a large vessel to Singapore, or Tanjung Pelepas, Malaysia first, where some of the cargo are then reloaded on a smaller ship setting sail to Bangkok; or on a

global stage, Chinese export goods depart from Ningbo, make a transshipment in Port Klang in Malaysia, on its way to arrive at their destination port in Dubai, United Arab Emirates. The advantage of liner shipping is its harmonized coordination with various ports. In a healthy market situation, liner ships will still run its voyage even if the cargo is far from full as the revenue optimization of shippers and port operators was done at the planning stage.

Liner shipping schedule adapts according to cargo traffic trend and taking full consideration the optimal carrying capacity throughout the overall shipping line. UNCTAD (2014) finds that high-frequency and predictable liner service determines the connectivity to overseas markets. With this, country's product is known, which then leads to competitiveness and even becoming a main actor in global markets. The geographical map of ASEAN along with its latest LSCI index is displayed in Figure 3.1.

Not only liner shipping is important to shipping lines, it contributes to the constellation of liner shipping networks and ports within the network. Port location, attractiveness, and its variety of services become indicators of competitiveness of trade (Ojala & Hoffmann, 2010). Development of containerized transport through shipping network goes hand-in-hand to the development of its overall shipping networks.

The logistics connectivity will contribute to the wider region of Southeast Asia. ASEAN has committed to build a more integrated and prosperous community. In gearing up for AEC, the members have prepared a range of strategic measures to promote domestic industrial growth. These measures are aligned with the implementation of the four pillars of AEC: single market of production base, high competitiveness, equal economic growth, and integration with the global economy (Wei-Yen, 2007). Logistics infrastructure will then in turn create added value, expand the capacity of the economy and create employment. In addition, considerable potential for investment is supported by the onset of rising foreign demand for exports.

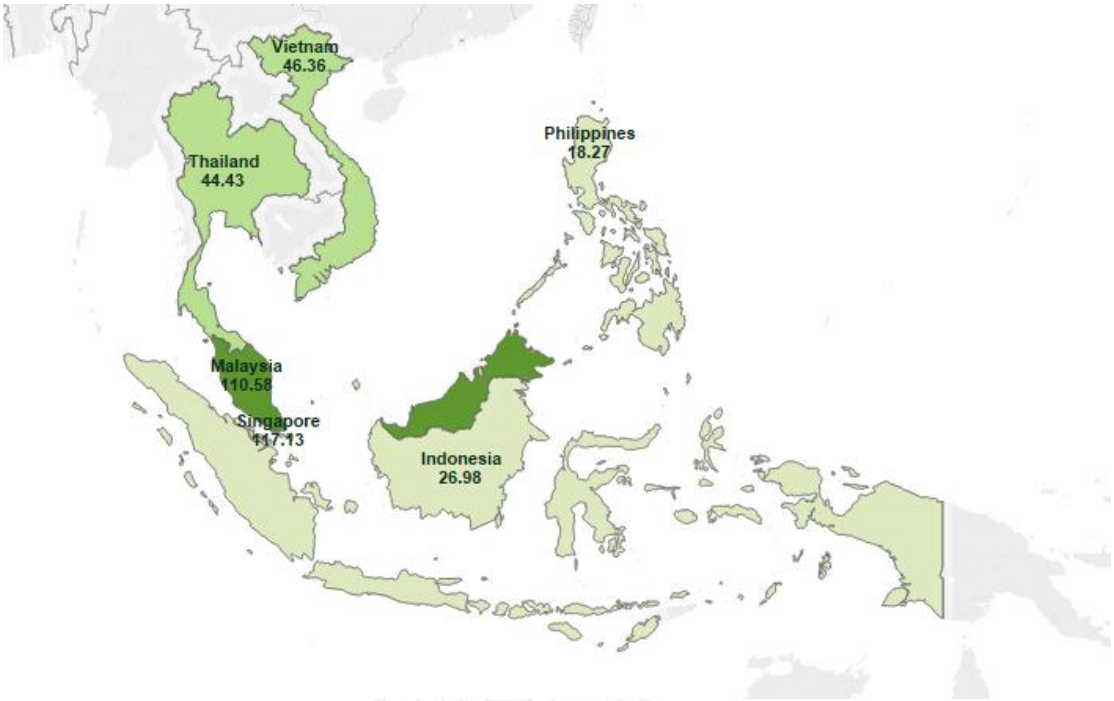

Figure 3.1 Map of ASEAN and the LSCI Score for 2015

(Source: Author's Compilation, Data source: from the World Bank and UNCTAD)

Strengthening logistics connectivity fits perfectly with the Master Plan on ASEAN connectivity which facilitates the deepening and widening of the production and distribution networks. Equally important, enhanced connectivity narrows development gaps in ASEAN and leads to increased opportunities for greater investment, trade, growth and employment. Furthermore, deeper intra-regional economic linkages and human interactions within ASEAN will contribute towards the success of AEC, which will reinforce centrality of ASEAN in regional cooperation and integration. ASEAN would therefore continues its course to become a region of progress, prosperity, peace and stability.

4 DESCRIPTIVE STATISTICS

Transport connectivity is one of the main determinants for countries to access world market, where it can have access to liner shipping services to import and export goods. This descriptive statistics chapter will cover the dynamics of LSCI throughout the years and discuss in more detail the five LSCI components[4].

In ASEAN, Singapore leads the LSCI connectivity index, alongside Malaysia almost immediately under it. As shown in Figure 4.1, both "upper-tier" countries are placed with a considerable gap to the rest of ASEAN countries with index score of Singapore and Malaysia, reaching beyong 100 starting in 2009 and 2014, respectively. Presumably, one could infer that countries that are actively involved in trade, especially in transshipment of finished and semi-finished goods have the highest index values. Both Malaysia and Singapore are export-oriented and service-oriented economies, placed as a gateway for passing-through as a geographic *hinge joint* between the Pacific and Indian Ocean. In addition, these countries are also a *sweet spot* for transshipment activities.

Furthermore explained from the literature review in chapter 2, the current version of the LSCI is generated from five components, namely: (1) the number of ships that national and international liner shipping companies assign to liner services from and to the country; (2) the total container carrying capacity of the ships in TEU; (3) the number of companies that deploy container ships on service calling to and from a country's ports;

[4] Access of detailed data was taken from a limited-term subscription of Lloyd's List Intelligence (published by Informa) then being cross-verified with the data given through a kind assistance from UNCTAD's Trade Logistics Branch. As advised by the publisher, the detailed LSCI data in this descriptive statistics chapter will only be presented in a graphical format without clearly mentioning the actual raw data.

(4) the number of liner shipping services offered by the companies; and (5) the maximum vessel size in maximum TEU capacity (UNCTAD, 2014).

A country's index is generated for each of the five components; country's value is divided by the maximum value of that component in 2004. In 2004, the index generated the value 100 for the country with the highest average index, throughout all the five components in 2004. Then for each country in 2004, the average of the five components is calculated. For years thereinafter, the average is then divided by the maximum average for 2004, then multiplied by 100.

When building up the LSCI component numbers from the dataset, China always ranks number one for every component item every year since its inception in 2004, except for the liner companies component, when it was led by European Union (EU) countries, from 2004 to 2010. In 2004, liner companies component was led by the United Kingdom, 2005 to 2009 led by the Netherlands, and 2010 led by Belgium.

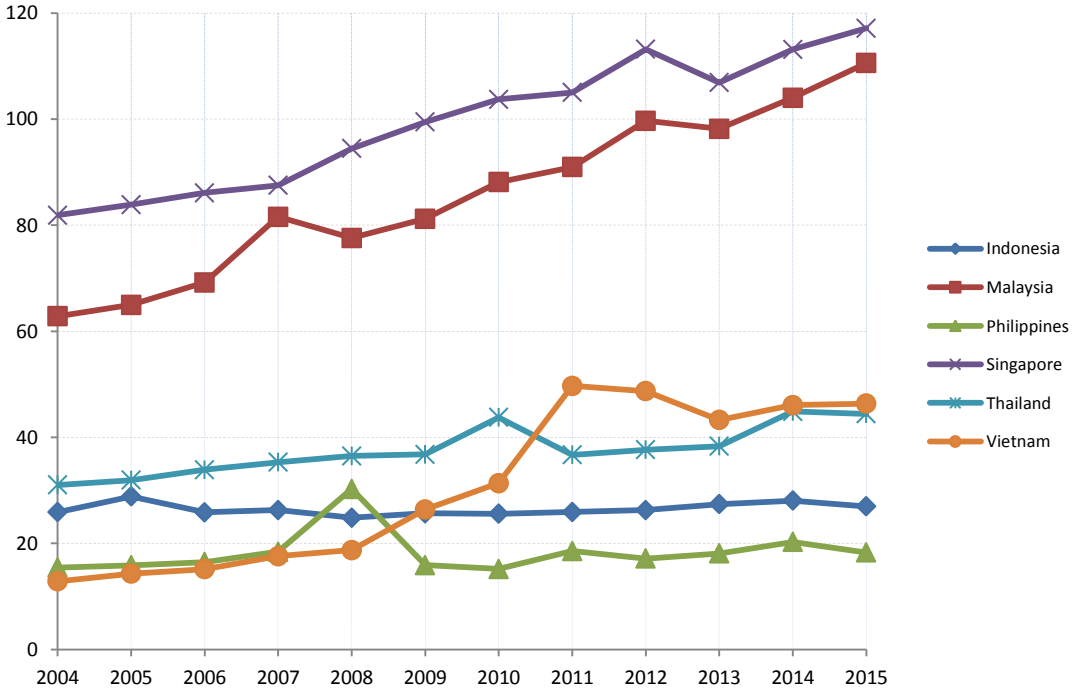

Figure 4.1 LSCI Index (Data source: UNCTAD)

Figure 4.1 further depicts the development of the ASEAN countries LSCI. When taking a closer look at the figure, the evolution of rankings of ASEAN tends to stay the same since 2011. From highest score to the lowest: Singapore, Malaysia, Vietnam, Thailand, Indonesia, and the Philippines. Over the years since 2004, Vietnam showed a significant growth during the period from 2008 to 2011. Thailand showed growth albeit small, while Indonesia and the Philippines tend to stay stagnant throughout the twelve LSCI reporting years.

Singapore continues to lead almost without experiencing any impact from the economic crisis in 2008-2009 which elsewhere caused a short downturn in most export-oriented economies. Malaysia is the best performer in terms of improvement, entering the world's top ten in 2006, and reached the fifth place in 2014. Singapore consistently continues to lead the LSCI ranking in ASEAN as the world's major shipping player, followed closely by Malaysia.

If a straight line is drawn between 2015 counting down to 2004 from overall LSCI score shown in Figure 4.1; Singapore, Malaysia and Vietnam countries quite considerably increased their LSCI scores, Thailand shows a slow increase, while Philippines and Indonesia tends to stay stagnant or even, to some extent, decline with very low gradient and still have quite much to catch up on.

Figure 4.2 further depicts the rank evolution of ASEAN countries' LSCI rank, which suggests a similar finding, Singapore and Malaysia sustains leadership in rank over the years while Vietnam showed notable improvement between 2008 to 2011, Thailand declines in a low gradient, while Indonesia and Vietnam gradually declines quite significantly.

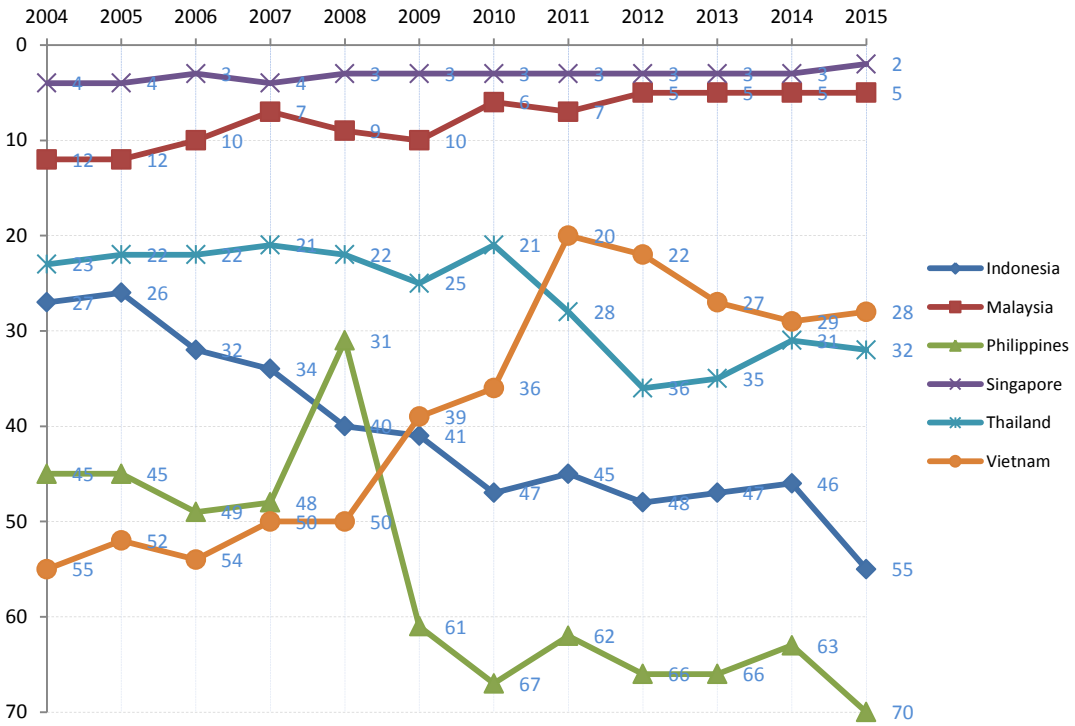

Figure 4.2 LSCI rank progression (Data Source: Lloyd's List and UNCTAD)

Based on this overall index, one can interpret that liner companies are considered to relatively less likely to set sail and provide services to and from seaports in Indonesia and Philippines as their national trade volume are relatively lower and low level of development makes it less attractive for transshipment and transit cargo. Despite its population advantage, potentially attractive geographic location and growing economy, the trade volume of the two countries would need to be improved to attract more frequent shipping routes.

A comparison of the World's trend in LSCI index in comparison to ASEAN is available in Figure 4.3. The figure depicts the development of the 5 components of the LSCI. On average (i.e. the statistical mean of the 159 countries covered by the LSCI), the ship size component has increased by 124 per cent between 2004 and 2015. While for ASEAN countries, it has reached 115 per cent. In 2014, the reported maximum ship size is 18,270 TEU (Maersk's Triple E class), while in 2015 it increased to 19,224 TEU (MSC Oscar).

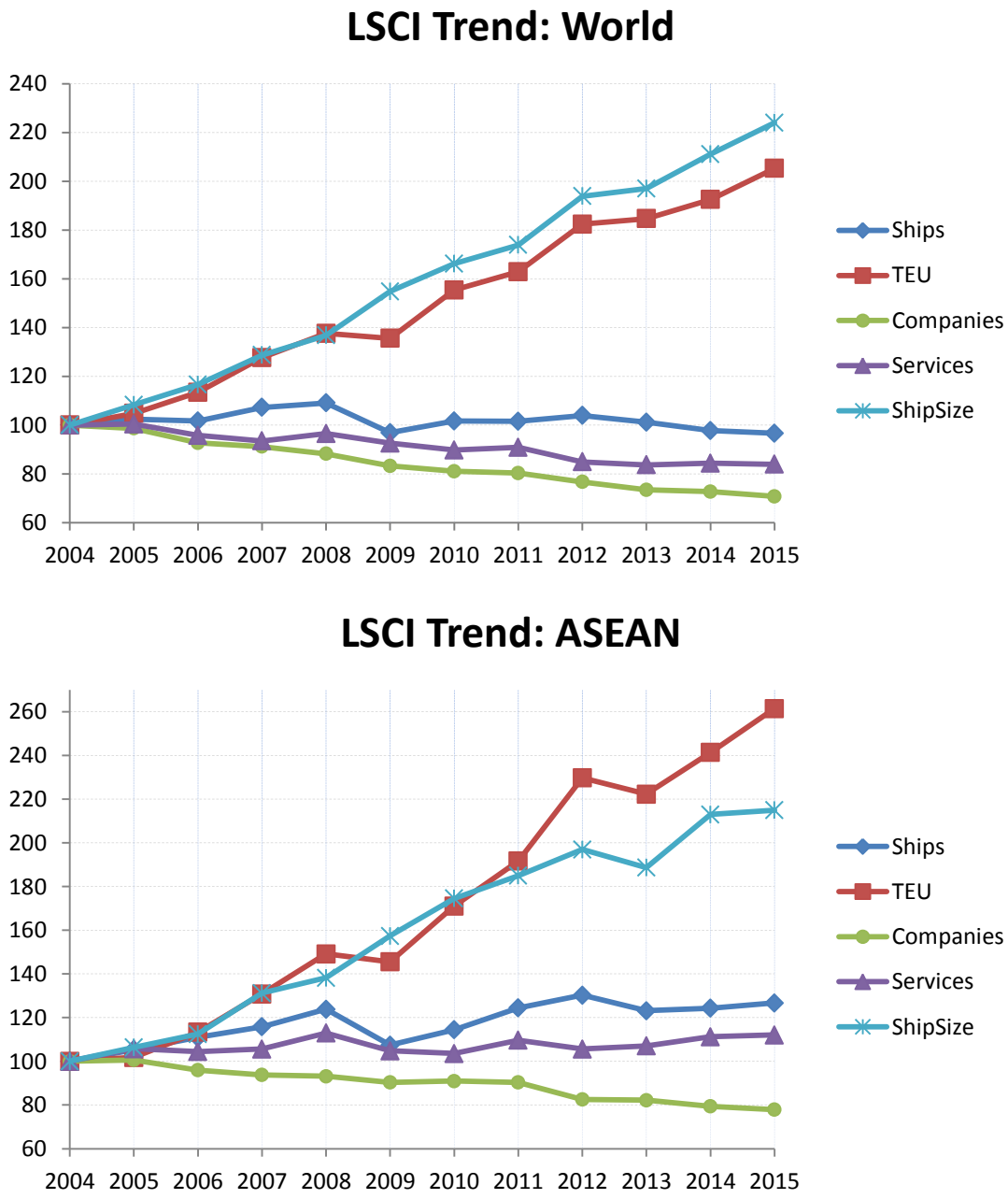

Figure 4.3 Comparison on LSCI Trend between the World and ASEAN

(Data Source: Lloyd's List and UNCTAD)

The chart also illustrates the impact of the economic crisis of 2009 when many ships were idle or decommissioned, thus shows a decline in the number of ships component in both trend graphs. Another trend that can be observed is the continued process of

concentration on the global shipping line service offerings. The world's average number of services per country has decreased by 17 per cent between 2004 and 2015. While for ASEAN countries, in contrast, it experienced a slight increase by 12 per cent.

Overall, similar to the economic conditions explained in the previous chapter, from the LSCI index, this region shows resilience and continues to show growth in economy overall, more specifically in trade connectivity. The falling global demand that impacted the global GDP in 2008, from the LSCI view, did not impact ASEAN countries, where growth is still sustained since then to the present. It can be seen in Figure 4.1 and even more visible in Figure 4.3, that particular to ASEAN countries, the growth of trade in terms of shipping capacity surpasses the number of maximum ship size indicator and number of ships and services tend to stay stagnant or shows little growth instead of declining, while number of companies tends to decline slowly.

4.1 Number of Ships

The rapid growth of container ship fleet especially the trend towards the use of large ships, and the growth of the number of containers and container terminals are all consequences of expanding international trade volume (Carranza, 2008). Unlike other subsequent LSCI indicators, only this number-of-ships component, where it tends to increase gradually during the period of 2005-2008 and 2010-2015, then experienced a quite significant decline of ship number in 2008. This decline possibly caused by the global economic crisis. This especially can be seen in both Malaysia and Singapore. The financial crisis of 2008-2009 was immediately followed by the decline in global merchandise trade, reaching up to 25 per cent within one year. The main factor behind the decline was the drop in the consumption of durable goods (e.g. appliances, cars and furniture) since consumers are able to make by with whatever they currently own thus postponing these types of purchases as they are uncertain about the future (Rodrigue, 2013).

As ship sizes increases and companies aim at seizing economies of scale by acquiring larger ships, the number of ships shipping liners own tends to stay the same by ways keeping the same ship count in their fleet. The trends are showing to have fewer companies in individual markets, and the average number companies that provide services between country's ports has been gradually decreasing (Valentine et al., 2013). As shown in Figure 4.4, this component also shows a flat line (gradient=0) characteristic, despite the growth of the LSCI across all ASEAN countries. The growth are actually supported by other indicators which will be further analyzed herein, like the liner carrying capacity and the maximum ship size where it has more dynamics throughout the fifteen reporting years.

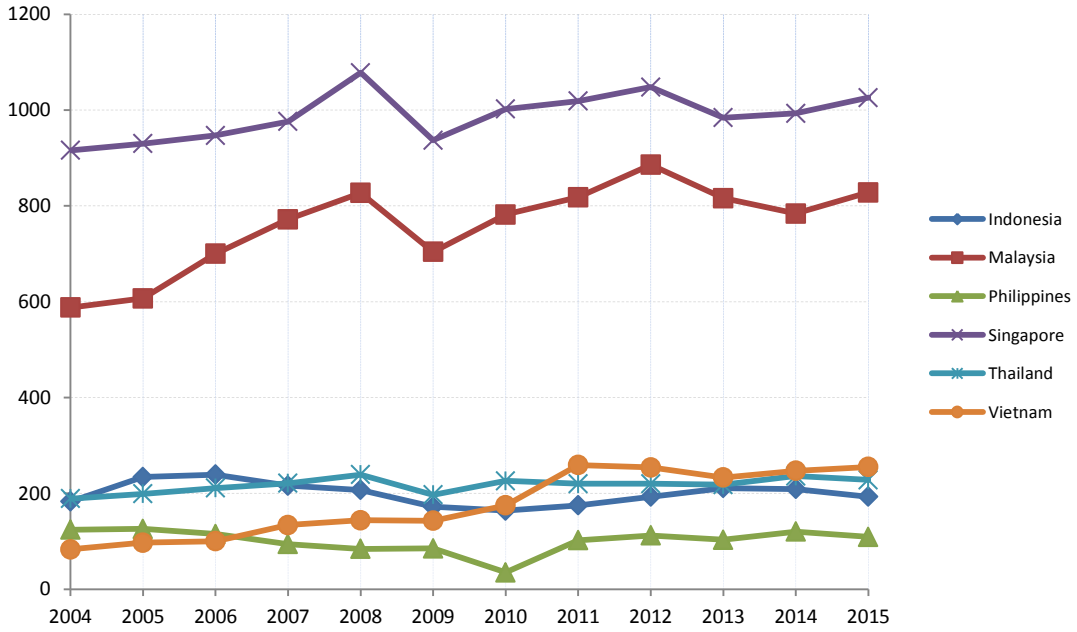

Figure 4.4 Number of Ships

(Source: Author's Compilation, Data Source: Lloyd's List)

4.2 Liner Shipping Capacity

Higher carrying capacity is a driver for catering the increasingly growing global trade. It improves economies of scale, at the same time offers better value for money in helping to reduce costs. With the rapidly growing seaborne trade, the current challenge is to

provide sufficient and reasonably-priced shipping capacity with the suitable port infrastructure whenever actual exchange of goods occurs (Asteris et al., 2012); or if trade occurs between countries, whenever export and import transactions takes place. With new ship technologies, larger and heavier ship would not, in linear, reduce the speed of transport. Instead, the slowing down of ships for better fuel economy is more driven by business pressure to cut costs during the period high oil prices, from 2010 to early 2015 (Notteboom & Vernimmen, 2009).

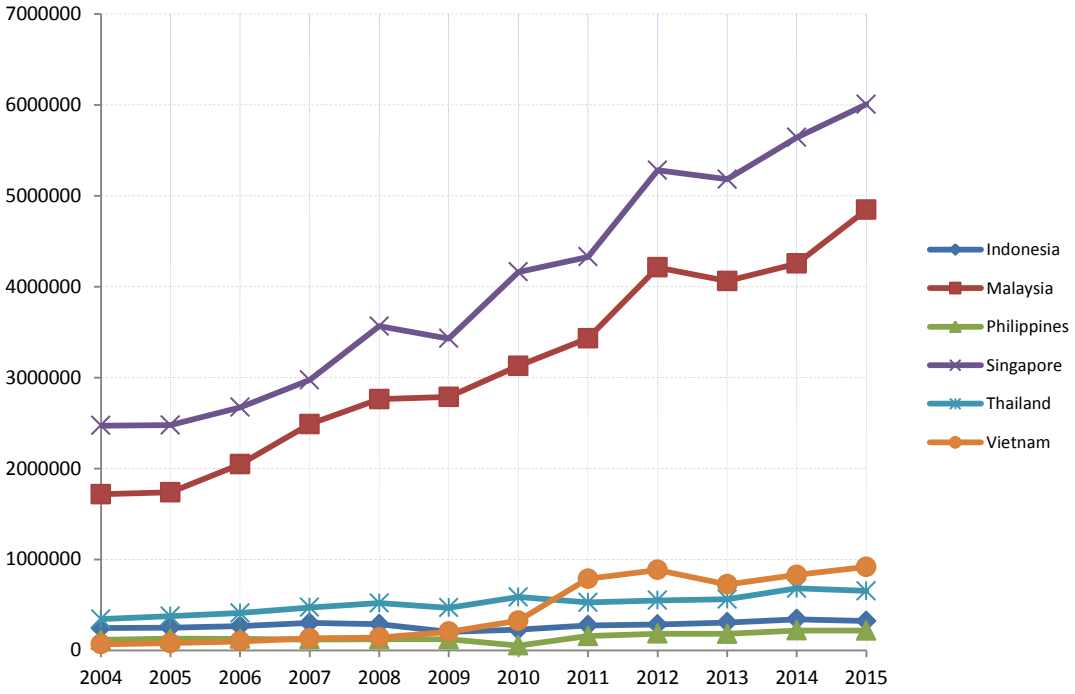

Figure 4.5 Liner Shipping Capacity, in TEU

(Source: Author's Compilation, Data Source: Lloyd's List)

As shown in Figure 4.5, Singapore and Malaysia leave other ASEAN countries behind, placing them with the most significant gap relative to other countries in the region. Both countries have carrying capacity in millions of TEU in magnitude, while the rest of the countries are in hundreds of thousands. The carrying capacity of Malaysia and Singapore, not only as a result of being able to accommodate large containers, but also the multiplier effect of their ability to handle large capacity of containers passing through

their ports. Overall, as shown in both Figure 4.3 (LSCI Trend) and Figure 4.5 (liner shipping capacity), this liner shipping capacity component is the main growth driver of ASEAN country's LSCI index.

The improvement of liner shipping capacity component requires efforts in various aspects. The move requires coordination of all stakeholders. One of them is the improvement of ports. Port should be directed to become world-class, high productivity, with fast dwelling-time. Good practices ports can be replicated in other countries as the standard to create efficiencies especially during planning and implementation phase in building ports or improving existing one. Difficult and unnecessary bureaucracy in launching capital projects should be avoided.

Increased productivity can be done by improving human resources to become more skillful and better-equipped. Building a new pier is not the final solution; instead, the main goal is to increase the efficiency of ports. One-stop service integration or *single-window* is perceived to be able to suppress the long wait at the ports. These initiatives definitely require the involvement of various stakeholders. In addition, it should be equipped with transparent and consistent standard operating procedures.

4.3 Number of Liner Companies

Looking at overall components, ship carrying capacity and ship size calling to a countries' port tend to increase; while the number of ships and number of services remain stagnant. Since the reporting year of 2004 until the recent numbers in 2015, major carriers have now covered practically all regions, thus consolidation among them leads to a reduction of overall number of companies per country. There is declining tendency of this component globally and also in ASEAN. As shown in Figure 4.3, for the whole world, it declines dramatically: 29 per cent; while for ASEAN it declines 23 per cent. As shown in Figure 4.6, the number of liner companies overall shows a declining tendency. This might be caused by a couple of reasons.

First, is the nature of scoring of the LSCI itself. The index is built based on the reference highest LSCI score, in this case is China. As mentioned in the beginning of this chapter, China leads for every component except for the liner companies, where during the first seven years it was predominantly lead Western European countries. The declining tendency on China's score in the number of liner companies component therefore reflects ASEAN's LSCI components as well. The competitiveness between countries to improve connectivity tends to compete in volume of trade and shipping traffic, while this liner companies component tend to show a declining trend.

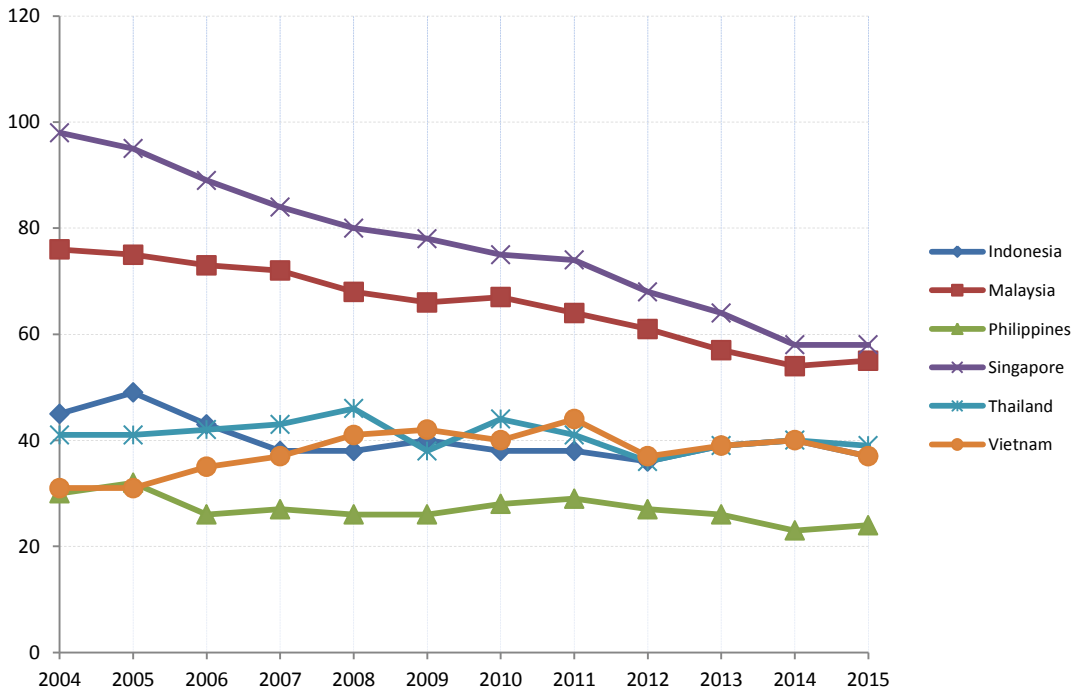

Figure 4.6 Number of Liner Companies

(Source: Author's Compilation, Data Source: Lloyd's List)

Second, the decrease might be caused by the nature of the service amongst the companies provide that is somewhat homogenous; where consequently their competitive options are restricted. In relation to maximum ship size component, larger ships require larger companies, which often mean that smaller players are pressured

out of the market, either naturally or by force; which as a consequence, would lead to less competition.

When leading or dominant companies expand, shipping liners tend to acquire part or the whole portion of other companies share within the industry. They opt to perform mergers and acquisitions in order to obtain a larger market share, to secure growth and to benefit from scale advantages. This mergers and acquisitions in liner shipping is also related to gaining instant access to markets and distribution networks, obtaining access to new technologies or diversifying their asset base (Notteboom, 2013).

This declining trend of shipping companies might need extra attention as it may lead to oligopolistic market structure. In the short run, it may lead towards lower costs as a result of economy of scale and healthy competition. In the long run however, it may lead to cost increase as shippers have less choice with whom they do business with. Along the way, bargaining position is passed on from clients to service providers (Hoffmann, 2012).

4.4 Logistics Services

With the growth of international trade, shipping companies and freight forwarders often set up its companies overseas, in this case, setting up shop in respective ASEAN countries. Through these networks of “logistics-bases”, partnership, consolidation, and intermodal transport are developed. One of the example routes is between China and ASEAN, then extended to Pacific-bound North America or Indian Ocean - Mediterranean Sea –bound Europe. Transport service establishes its base according to demand, which intuitively create a connected transport network. With this apparent geographical advantage, ASEAN countries can take full advantage of the existing and continuously growing seaborne trade route potential.

The number of services in ASEAN, as displayed in Figure 4.7, shows that over time it remains stagnant. This might indicate that the shipping services have already established their ground well before the LSCI index was introduced in 2004. Vietnam showed little growth starting from 2006 to 2011. While for Singapore and Malaysia in particular, there were significant reductions of shipping services starting in 2008, possibly relates to North American and European companies trying to downsize their business in their country of incorporation caused by the global crises, or at least to stay focus on their service specialization instead of expanding their offering to new lines or new types of services.

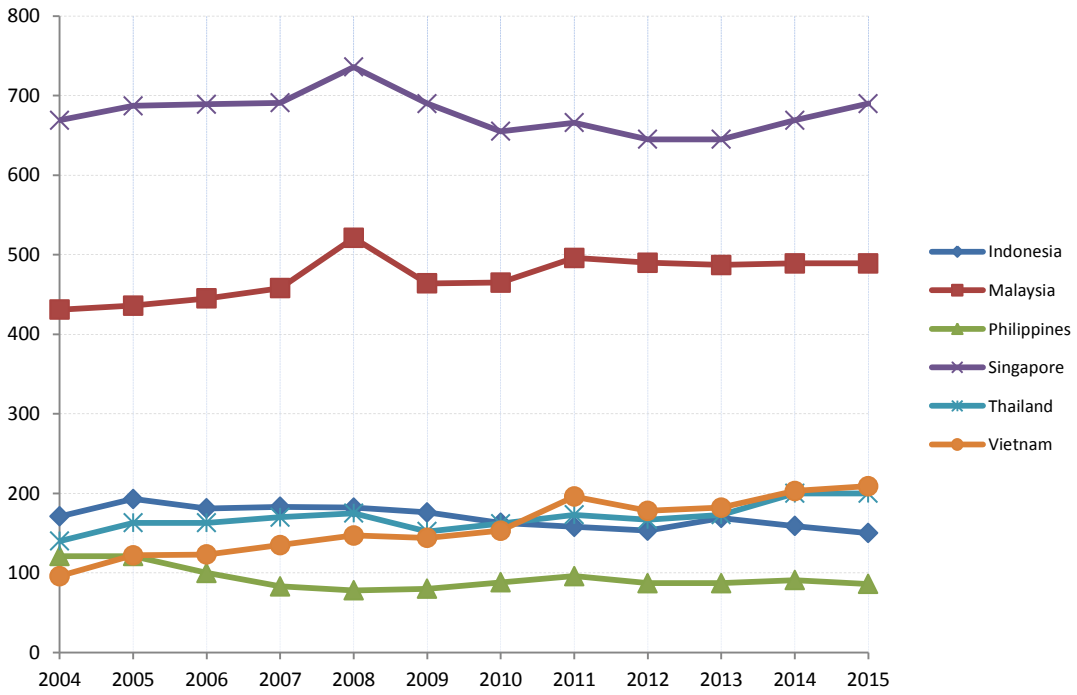

Figure 4.7 Number of Services

(Source: Author's Compilation, Data Source: Lloyd's List)

4.5 Maximum Ship Size

Investment delays or state budget austerity may be imposed by governments as it can cause the postponement in provisioning infrastructure for having ports being able to handle large vessels. Despite the healthy balance that most ASEAN countries have

during the 2008 crises, they moved cautiously from investing in big projects. Figure 4.8 shows a big difference on how Malaysia and Singapore had been able to attract and to handle super large ships while the rest of ASEAN countries had not.

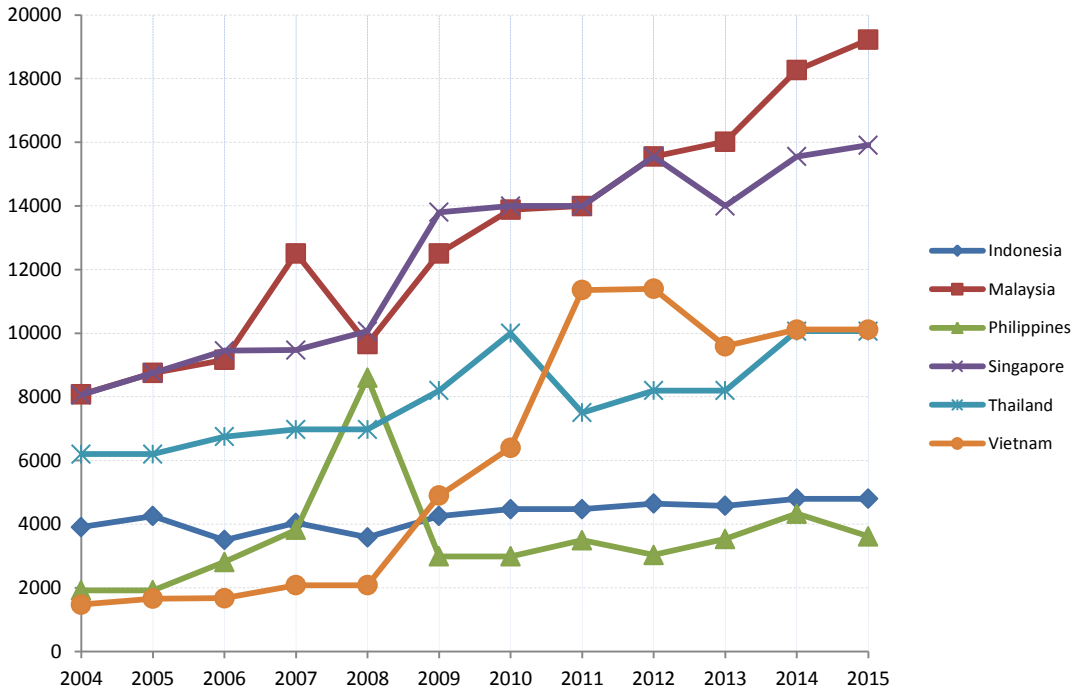

Figure 4.8 Maximum Ship Size (Source: Author's Compilation, Data Source: Lloyd's List)

To become more economically viable, at least the country's main ports must be capable to accommodate large vessels. Preparation of ports should be planned to meet the conditions for decades to come. Small-scale ports make expensive logistics costs. Logistics costs will go down if the ship can always be loaded round-trip, outbound and inbound. Loading cargo one-way will definitely increase prices (Notteboom & Vernimmen, 2009). Container ships tend to be faster than most general cargo ships, with speeds up to 30 knots (Wang & Meng, 2012). Large ships can use only the largest ports, as these ships are fitted out to unload and load containers the ship itself does not need such handling gear. Smaller ships are used on routes for which the large ships would be uneconomic, and to distribute containers from the large ports to smaller ports. That is, they can be used as feeder ships. Since the smaller ports may not have suitable

handling gear, the ships themselves load and offload their own cargoes using the built-in equipment (Molland, 2011).

This ship size component shows Malaysia is leading Singapore, where both flagship Malaysian ports, namely Port Klang and Tanjung Pelepas are progressively gaining market share (Notteboom & Yap, 2012). Tanjung Pelepas port was found to have qualities of (1) outstanding location, (2) good accessibility, and (3) advanced integrated Information and Communications Technology (ICT) systems. Research has found that those three criteria are key requirements in port competitiveness (Subhan & Abdul Ghani, 2008). ICT systems can be built and used to shorten customs clearance, reduce physical paperwork, and eliminate duplication of clearance procedures (Gekara & Chhetri, 2013). Furthermore, it supports finding from Notteboom and Yap (2012), where first, the competition was between Singapore and Port Klang, of which then it is followed by competition between Singapore and Tanjung Pelepas.

From the TEU capacity, it shows that through factual data, the 18,270 ship capacity is the Mærsk Mc-Kinney Møller ship, which is the lead ship of Maersk's Triple E class, while the 19,224 TEU ship is the MSC Oscar ship that docked that port starting in 2014 and 2015, respectively (Martín-Alcalde et al., 2015). This Malaysian superiority in ship size is also related to Maersk Line move of its transshipment hub from Singapore to Tanjung Pelepas (Knowler, 2014).

Well-organized and high-performing ports need to find a balance on size of the ships and the efficiency of its ports. One port may have been dredged to be able to handle large ships but the speed of loading and unloading may be slow, possibly due to overcapacity or lack of supporting infrastructure and hinterland connectivity. On another perspective, a country may have a highly efficient port with adequate supporting infrastructure, but it does not have the business to attract the volume of a large ship to dock at the respective ports.

One aspect can be highlighted as the Figure 4.8 shown. Since 2004, Indonesia's capacity on the size of ship is in a standstill if not slipping back relative to its neighboring countries. Despite having the same access to the Malacca strait, Indonesia's ship capacity are comparably far behind within a large gap to Singapore and Malaysia where the two countries show continuous improvement. Much of Indonesia's problem of this comparative "retardation" is probably attributed to lack of port infrastructure development and lack of commitment in building supporting infrastructure to reduce congestion and to reduce dwelling time to speed-up of the flow of goods beyond the physical port itself in order to support the overall maritime supply chain (Srinivasan & Stank, 2014).

Competition among ASEAN member countries related to seaports is a problem that must be addressed in AEC. The competition between the port of Singapore and neighboring ports that is currently scratching the surface could become more apparent after AEC. When the port of Kuala Tanjung, Indonesia managed to become an international hub, the competitive landscape port in Southeast Asia could enter a new era (Faisal, 2015).

As the largest country in ASEAN, Indonesia certainly plays a very central role. Approximately 38 per cent of the population of ASEAN is Indonesian. On the strength of economy context, Indonesia's GDP reached 36 per cent of the total GDP of ASEAN. That is, slightly below the average per capita ASEAN countries. This position makes Indonesia is very strategic, but also a challenge for the government to increase the GDP per capita to be above the average of ASEAN.

In order to make a more balanced logistics flow where more than 57 per cent of Indonesia's population live in a small island Java is a tough challenge (Poppele et al., 1999). The concept of sea-highway could potentially be one of the important

breakthroughs. If the concept materializes, the sea-highway connects seven major ports from Belawan at the west, to Sorong two time zones to the east, then connected with dozens of smaller ports (Faisal, 2015).

5 QUANTITATIVE ANALYSIS

The main objective of this chapter is to answer a research question of which among the LSCI connectivity indicators that matters the most. In other words, which indicator has the most impact towards international trade and container port traffic. This quantitative analysis in this chapter is divided into two parts. The first two parts is to perform correlation analysis of LSCI components with LPI indicators and EPIC aspect scores. Subsequently, an econometric analysis will be done using LSCI components, in a form of panel data to find a relationship with a well-accepted dependent variable. Furthermore, the validity of the panel data and the time series nature part of the model will be subjected to further statistical tests. The chapter concludes with summary of quantitave findings.

5.1 Quantitative Research Limitations

The analysis will only covers a limited period of time, thus it does not cover the whole liner shipping history that was started in 1955 at the maiden voyage of *Ideal-X* container ship, or even 1980 when the international trade via container ships started to continuously grow (Peters, 2001). LSCI data are available annually from 2004 to 2015; while LPI were only surveyed four times, in 2007, 2010, 2012 and 2014. Finally, data collection to obtain EPIC scores was only done once in 2014. Other research limitation exists as a result of the quantitative nature and secondary nature of data source used for this study which might limit the specificity and generalizability of findings beyond the ASEAN context. Conceptually, it is also worth noting that the LPI covers a broad range of trade logistics issues including tramp shipping and cross border land-based trade, while the LSCI is limited to liner shipping.

LPI dimension and LSCI component scores intersect pretty nicely. The LSCI covers 159 coastal countries and territories, while the LPI is generated for 160 countries and economies, including land-locked countries. There are 120 countries available as data

points where LPI and LSCI data intersect. It so happens that all the six maritime Southeast Asian countries have both their LPI and LCI scores.

5.2 Correlation Analysis with LPI

How the index is built between LPI and LSCI vary quite differently. Scoring of the LSCI does not directly parameterize any judgement or any perception on a country's ports or shipping, especially in terms of the ease of doing business. This judgement and perception are built upon a research on country's logistics performance in correlation to how companies being surveyed. LPI measures a country's logistics performance, encompassing 160 countries in 2014 when it was surveyed for a fourth time. The World Bank considers it as "a broad-based, multi-dimensional approach to trade logistics". The LPI covers end-to-end supply chain, based on a survey of logistics professional worldwide from freight forwarders to carriers. It is a valuable tool to compare logistics performance in a particular country and to identify challenges within those countries. When it was surveyed internationally, LPI is based on logistics professionals' perception of a country's logistics environment when they do business with selected trading partners in a particular country during a certain reporting period.

LPI is aggregated as a weighted average from the six core components of logistics performance. The six core dimensions of LPI as responded by the logistics professionals are Customs, Infrastructure, International Shipments, Logistics Competence, Tracking and Tracing, and Timeliness.

Making use of LPI results may require extra caution as it may indicate a tendency towards a fewer, smaller-sized, and less-capacity ships being deployed by fewer services and by fewer companies (Ojala & Hoffmann, 2010). This lower level of deployment might also be the result of a country's geographical position, trade volumes; or business attractiveness towards liner shipping companies. While for LSCI, in this case: the number of companies indicator, could imply a finding whereby: less efficient

ports with lack of infrastructure will be perceived less attractive, thus deter traders, exporters and shipping companies to do business in that country. This judgement and perception on country's performance can be further looked into to see whether there is a correlation with companies who were being surveyed in generating the LPI.

Using the same manner with the research already conducted by Ojala and Hoffmann (2010), Table 5.1 displays the Pearson correlation coefficients between the five LSCI and six LPI components.

Table 5.1 Pearson correlation coefficients between LPI and LSCI components
(Source: Author's calculation with data source form the World Bank and UNCTAD)

			LSCI Components					LPI Components					
	LPI	LSCI	ships	teu	comps	services	shipsize	cust	infr	itrn	logs	time	trac
LPI	1												
LSCI	0.879	1											
number of ships	0.901	0.976	1										
ship capacity (teu)	0.861	0.977	0.963	1									
liner companies	0.858	0.874	0.927	0.805	1								
number of services	0.926	0.958	0.990	0.947	0.931	1							
maximum ship size	0.747	0.938	0.844	0.881	0.731	0.806	1						
customs	0.963	0.867	0.893	0.870	0.817	0.913	0.723	1					
infrastructure	0.980	0.895	0.904	0.868	0.858	0.927	0.784	0.945	1				
intl. shipments	0.948	0.831	0.844	0.815	0.785	0.868	0.718	0.906	0.895	1			
logistics quality	0.977	0.831	0.873	0.825	0.833	0.895	0.673	0.950	0.959	0.897	1		
timeliness	0.922	0.809	0.814	0.764	0.832	0.845	0.712	0.828	0.891	0.857	0.864	1	
tracking & tracing	0.970	0.816	0.847	0.795	0.819	0.877	0.678	0.901	0.937	0.918	0.953	0.891	1

LPI was benchmarked with the five components of the LSCI, whereby the dimensions and components of both indexes were already described in detail in Chapter 2. The overall correlation between the two is 0.879. Among the different components, the LPI infrastructure component is particularly highly correlated with the number of ships and the number of services component, scoring .904 and .927 respectively. It comes to no surprise that shipping companies' decision to provide services and deploy good

number of ships to a country is closely related to to the goodness and the availability of maritime transport infrastructure.

This strong positive correlation as shown in Table 5.1 would in general mean that the components included in the LPI will also likely lead to a higher LSCI. Where the other way around, LSCI components lead to an improved logistics performance, as per captured in the perception survey data that was used to generate the LPI.

Among the different components, the LPI *infrastructure* component in particular, is highly correlated with almost all LSCI components with coefficients of above 0.85, except for LSCI *maximum ship size* where the correlation is 0.784, which is still quite good. The explanation of this could be that a company's decision to provide services to/from a country's ports using its largest ships is closely related to that country's maritime transport infrastructure. This same finding would be almost the same if we were to use the whole world as a sample. Economies of scale and scope are important factors in shipping, and thus it can be expected that higher trade volumes will also lead to more frequent and less costly shipping services which in turn would also improve the country's LPI.

One unique finding using the ASEAN sample is the strong correlation coefficient between the total number of ships in LSCI and infrastructure in LPI (correlation coefficient = .904). This indicates the variety of aspect of physical infrastructure is required to improve connectivity, like port efficiency or ship turnaround time. Maximum ship size scores less in relation to LPI's infrastructure (correlation coefficient = .784) might indicate both the attractiveness of the country's port being able to accommodate a good amount of container capacity, with a not so high requirement to dredging and widening the port to accept super large ships.

High and positive correlation should not be confused with direct causality (Wooldridge & Imbens, 2008). The strong correlation result yielded as per Table 5.1 should be interpreted with care and should be supported with other quantitative models. In this thesis the correlation analysis will then be supported by linear regression and panel data analysis. The scatter plot and linear regression line graph using ASEAN dataset is shown in Figure 5.1, which yields an Ordinary Least Squares formula:

$$LPI = .5376\ (lnLSCI) + 1.284$$

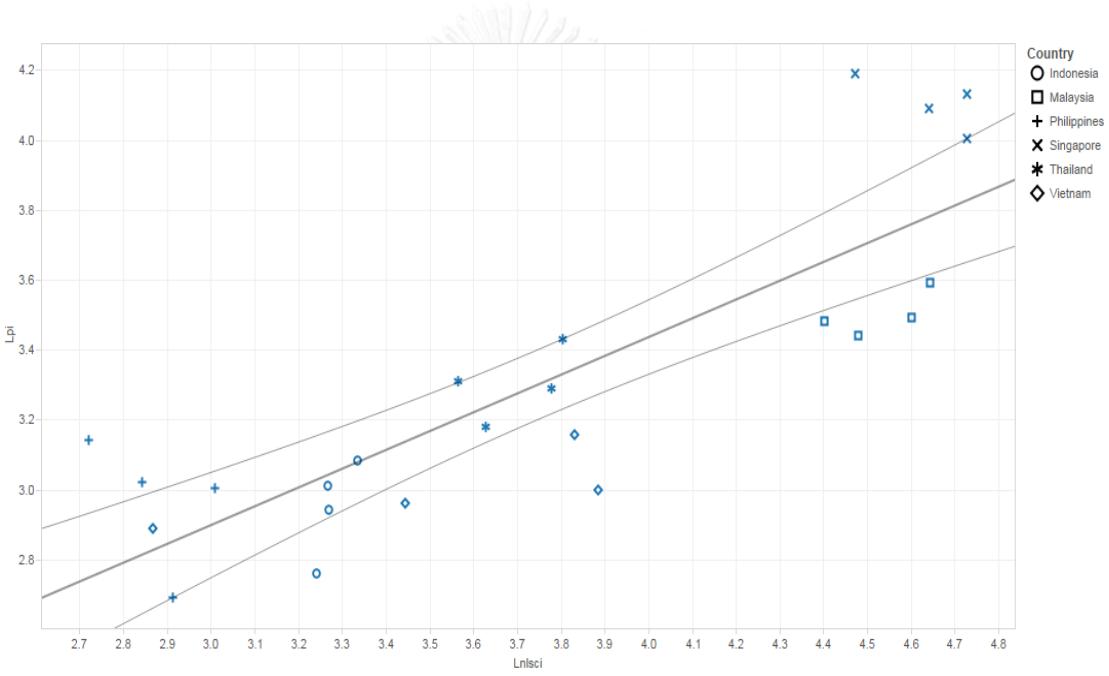

Figure 5.1 Relationship between LSCI and LPI

(Source: Author's Calculation, Data Source: The World Bank)

The LSCI scale is first transformed into natural logarithm (*lnLSCI*) considering the exponential nature of LSCI index growth, while LPI's growth is linear and has a maximum score of 5. The R-squared and Adjusted R-squared coefficients of the models are 0.7161 and 0.7032, respectively.

In comparison with Hoffmann (2012), covering the World's dataset using two LPI and LSCI reporting year of 2007 and 2010, where it yields a formula:

$$LPI = .4097\ (lnLSCI) + \ 1.7493$$

It shows that ASEAN's coefficient of LPI in relation to LSCI is higher by .1279 percentage points. This shows ASEAN's potential and supports the idea for it to always take a close look on its LPI and LSCI logistics indexes.

As it shows in this correlation analysis and the regression model, building and improving infrastructure to attain a good connectivity has the most impact towards the bottom-line of actually increasing trade volume. Many countries in the world make efforts in pursuit of prosperity for their people, and ASEAN countries are no exception. One of the ways to do so is by constructing container ports and lining major trading ports along the region (Cho, 2014), as it was found to be an engine of prosperity. However, it is quite challenging to have sufficient container traffic passing through country's ports to justify a hefty upfront investment. Notwithstanding building infrastructure, strategies need to be introduced to attain the forecasted or expected traffic volumes.

A better port infrastructure might improve efficiency however it comes at a cost beyond building the infrastructure itself. A good infrastructure may potentially increase port charges, as it might be found to offer more convenience. The burden of charges, as a consequence, will be borne by the shipping companies. While privatization of ports may lead to investments, investors are only interested if there is a potential for profit. If investment policies not regulated, the increased transport cost will need to be covered by shipping companies then be passed on to consumers at least to sustain margins (Hoffmann, 2012).

The development of the logistics industry is directed to the development of global supply chain. Infrastructure development should be selective, especially those that

encourage investment and overcoming barriers to well-spread and convenient distribution of goods, as well as having great potential in performing well in the long run. With complicated, slow bureaucracy and unnecessarily strict accountability, infrastructure development would be faster if it were to be executed in a form of a public-private partnership arrangement involving state-owned and/or private enterprises. Further analysis on balancing public-private partnership for ASEAN countries would need to be done on this regard.

5.3 Correlation Analysis with EPIC Score

Scoring of the LSCI does not directly parameterize any judgement or a specific economic or a political situation, even though LSCI might be considered a derived result. For example, the number of companies in a country might be closely related to the ease of doing business or its certainty in processing customs clearance, or the number of ships might be correlated to the skillsets in the country to operate equipment for fast and predictable container turnaround time. This relationship can be further researched to see the correlation between country's LSCI components and its EPIC scores.

Table 5.2 EPIC score conversion for ASEAN Countries

[Source: Author's conversion based on analysis from (Srinivasan & Stank, 2014)]

Country	Economy	Politics	Infrastructure	Competence	Overall
Indonesia	3.67	1.67	1.67	2.67	2.33
Malaysia	3.33	3	3.33	3.67	3.33
Philippines	3.33	1.33	1.33	2.67	2.33
Singapore	3	4	4	4	3.67
Thailand	3.67	2.67	3	3	3
Vietnam	3.33	2.33	1.33	2.33	2.33

The EPIC score "college-style" grading which was displayed in Table 2.2, are first converted into a numerical format (Warren, 1971), as depicted in Table 5.2. The scoring

conversions that was done are using the following convention: A=4, B=3, C=2, D=1, (+) = add .33; (-) = substract .33 (Milton et al., 1986). Those numbers will then be processed to correlation against the LSCI components. Table 5.3 displays the Pearson correlation coefficients between the four components of the EPIC scores and the five components of LSCI; both using 2014 scores and components.

Table 5.3 Pearson Correlation Coefficient between LSCI and EPIC

[Source: Author's Calculation, Data Source: UNCTAD and Srinivasan and Stank (2014)]

			LSCI Components					EPIC Scores			
	EPIC	LSCI	ships	teu	companies	services	shipsize	econ	pol	infra	compt
EPIC	1										
LSCI	0.823	1									
Ships	0.895	0.983	1								
TEU	0.877	0.981	0.998	1							
Companies	0.836	0.921	0.902	0.877	1						
Services	0.878	0.979	0.996	0.993	0.914	1					
Shipsize	0.646	0.950	0.878	0.876	0.875	0.871	1				
Economics	-0.352	-0.679	-0.679	-0.712	-0.453	-0.710	-0.608	1			
Politics	0.884	0.852	0.882	0.855	0.954	0.906	0.723	-0.470	1		
Infrastructure	0.994	0.761	0.841	0.818	0.807	0.823	0.576	-0.254	0.867	1	
Competence	0.974	0.834	0.909	0.904	0.758	0.881	0.655	-0.445	0.793	0.952	1

As presented in the table, the overall correlation coefficient between LSCI and EPIC is 0.823. This quite high coefficient on a bird's-eye view level indicates a very tight correlation between the two.

Looking further into the correlation table, among different components correlating with the EPIC scores, the "soft-skills" or human competences are highly correlated LSCI components. Related to this human competence, two even reach more than 0.9, for LSCI's number of ships (correlation coefficient = .909) and ship capacity components (correlation coefficient = .904), respectively. This shows how the country's local workforce is an important factor. The skills required and training/education that attracts people to be trained differ from one country to another and so does the performance

objectives. In one country, improvement of service level may be the requirement for success; in this case middle management or operations manager skills are demanded. While in another; efficient management and transparency may be key; in this case government officials or top management with wealth of experience taking critical decisions may be required first.

Another aspect that yields a high correlation in EPIC scores is the *Political* dimension in correlation with LSCI's *companies* (correlation coefficient = .954) and *services* (correlation coefficient = .906) components, where it also scores more than 0.85 across all the five LSCI components. Politics is particularly important in the initial implementation phase, when shipping companies create a new or update their liner shipping route. Initial planning can encounter issues such as licensing and compliance, that might be required by the destination country. Furthermore, understanding the geopolitical background of the country and the region from its historic and legal framework are among the important if not the most challenging factors that must be addressed upfront.

One might argue that the correlation result may be quite inconclusive considering the limited amount of data; as the EPIC assessment has only been done once, while LSCI has been done twelve times. The most uninterpretable finding from the correlation table is when seeing the Economics dimension in EPIC where all coefficients are negative against LSCI components. Looking closer at the descriptive data for EPIC (Table 2.1 and score conversion in Table 5.2), it can be seen that ASEAN's EPIC scores are pretty good and quite uniform in nature, with all scores are B and above.

With the data given, it indicates that high EPIC score will likely lead to a higher LSCI; reversibly, the better LSCI component scores will lead to an improved supply chain performance. The scatter plot and regression line graph for 2014's EPIC and LSCI is shown in Figure 5.2, which yields an Ordinary Least Square formula:

$$EPIC = 0.6336\ (lnLSCI) + 0.3659$$

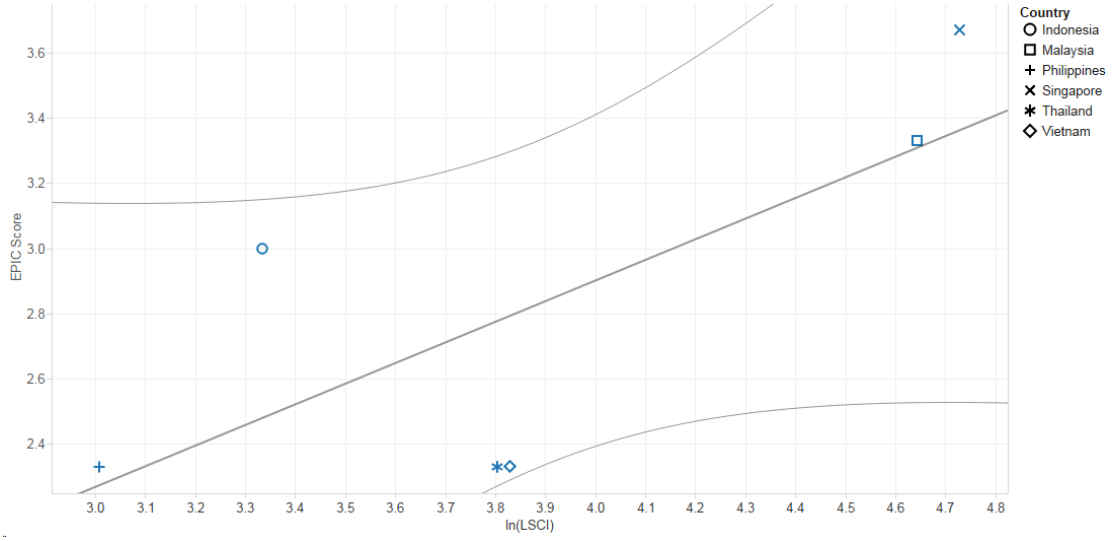

Figure 5.2 Relationship between EPIC scores and LSCI

[Source: Author's Calculation, Data Source: UNCTAD and Srinivasan and Stank (2014)]

The LSCI scale is first transformed into natural logarithm (*lnLSCI*) considering the exponential nature of the growth relative to EPIC, where the growth and range of the latter is linear and has a specific range (from score = 0, up to score = 4). The R-squared and Adjusted R-squared coefficients of the models are 0.8021 and 0.7527, respectively.

The regression model strengthens the finding of the correlation matrix that there is a close relationsip between ASEAN's EPIC score and LSCI index. The result of the regression however, needs to be interpreted carefully considering the very limited amount of data by only running EPIC scores and LSCI components in 2014 covering only six observations, i.e. one observation for each ASEAN country. The result of the regression can only be used in combination of other factors and further findings in this quantitative analysis chapter.

5.4 Panel Data Analysis

This part will show an empirical evidence on key logistics connectivity component indicators that has the most impact on international trade. As shown in the descriptive statistics, performance indicators vary widely from one LSCI component to another. Therefore, highly specialized and carefully chosen indicators are required to measure each country's maritime connectivity.

All the ASEAN country's LSCI component will be processed against a dependent variable: the international trade volume. As the data spans between countries over a certain period of time a panel data would be appropriate to analyze the logistics connectivity situation. In addition, combining time-series of cross-section observations, panel data offers "more informative" data, more variability, less collinearity among variables, more degrees of freedom and more efficiency (Clark et al., 2004). A panel data analysis that was done for Latin American Countries (Wilmsmeier & Martinez-Zarzoso, 2010) and for analyzing various Logistics Indicators in ASEAN (Reza, 2014) can be used to model liner shipping connectivity data, also in this thesis for ASEAN countries.

In this study, international trade is parameterized using Container Port Traffic (CPT). CPT measures the flow of containers of a country, measured in TEUs. The data are available in Containerisation International Yearbook and aggregated in World Bank's World Development Indicators database. The data 2004 to 2014 are taken from the aforementioned data source, while the data for 2015 are taken from statistics taken from the port authorities or the statistical office of the respective ASEAN countries.

The CPT statistics for ASEAN traffic is displayed in Figure 5.3. The base reasoning of choosing CPT is because it gives some indication on the dynamics of international trade growth, particularly in shipping activities of a country. It is worth to note that the statistic

includes empty units, and transshipment container traffic is counted as two lifts at the intermediate port (off-load and on-load) (Notteboom, 2012).

Despite being a good candidate as a dependent variable, when traffic is transshipment, one might argue that much of the economic benefit goes to the terminal operator and ancillary services for ships and containers rather than to the country at large. In addition, using this dependent variable, on one hand one might assume that the international trade volume using container is found to be quite generic; while on the other hand, it is worth to note that on the actual business side however, liner shipper operator carries the freight irrelevant that is inside the box, as the transport cost tends to stay the same (Sánchez et al., 2003).

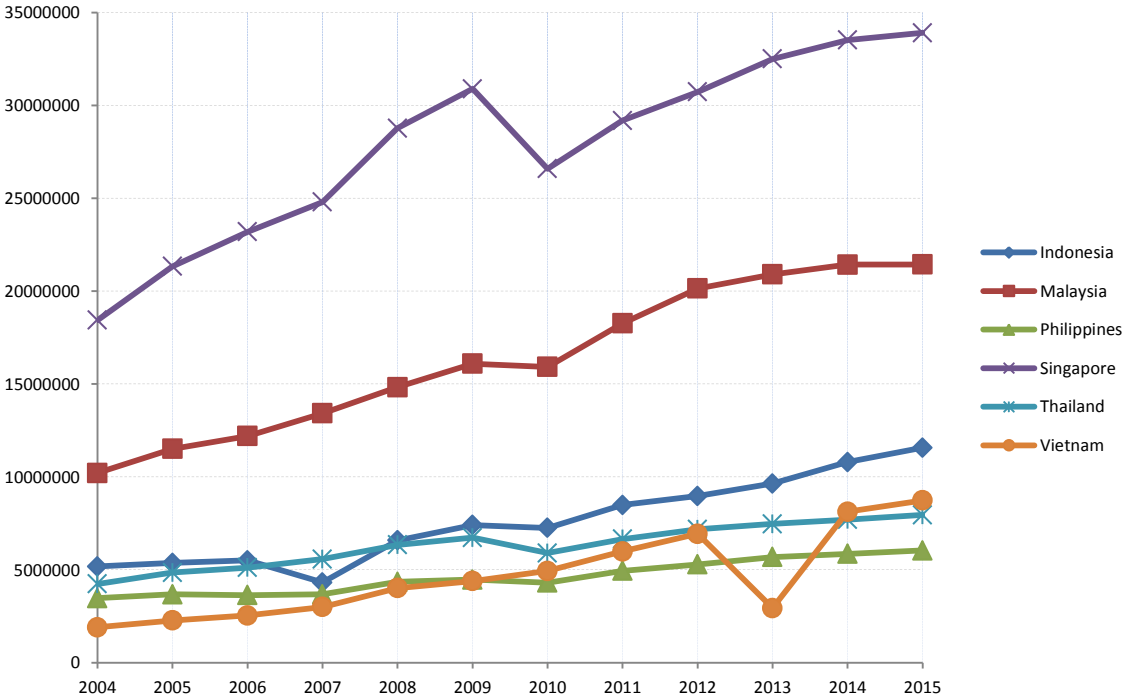

Figure 5.3 Container Port Traffic, in TEU

(Data Source: Lloyd's List Intelligence and the World Bank)

In this analysis, right-hand side LSCI components will be measured against CPT as left-hand side dependent variable[5]. The CPT is first transformed into natural logarithm (*lnCPT*) considering the exponential nature of the growth. A generic linear panel data model using can be presented based on the following form:

$$lnCPT_{it} = \beta_0 + \beta_1 SHIPS_{it} + \beta_2 TEU_{it} + \beta_3 COMPANIES_{it} + \beta_4 SERVICES_{it} + \beta_5 SHIPSIZE_{it} + \varepsilon_{it}$$

Where *SHIPS* is the number of ships assigned to liner services to and from the country; *TEU* is the total container-carrying capacity of those ships (in TEU); *COMPANIES* is the number of companies that deploy container ships calling a country's ports; *SERVICES* the number of services offered by the companies; and *SHIPSIZE* the maximum ship size in maximum TEU capacity. The dependent variable and all independent variable are structured in panel data where i represents country, at t represents time (per year). The methods of representing the error-term ε will vary according to the type or the panel data that is being analyzed.

Ordinary Least Squares (OLS) is used as a benchmark, while the main analysis will use panel data methods using Fixed Effects (FE) and Random Effects (RE). RE models are used in the analysis of hierarchical or panel data as a benchmark, and when there is no assumption on FE (i.e. no individual effects) across the countries being studied (Wooldridge, 2012). The error term in RE is considered random, combined in every country i at reporting year t.

All of the signs and significance are expected to be positive; except for β_3, the number of companies component, as the coefficient of expected to be negative based on the descriptive analysis at the previous chapter, where companies has a tendency to converge within a region where they are able to manage or to govern at one place. The results summary for OLS, FE, RE is displayed in Table 5.4. The coefficients are

[5] We are allowed to do research from the raw data then publish the panel data results, however, as advised by the publisher, the LSCI raw data themselves cannot be published.

presented with its level of significance, while the standard errors are available below each parameter in brackets.

Table 5.4 Panel Data Coefficients, analyzing LSCI components and CPT

(Source: Author's Calculation, Data Source: Lloyds List Intelligence and UNCTAD)

	OLS	FE	RE	FE(ASEAN-2)	FE(ASEAN-4)
SHIPS	1.274	.981	2.008	.556	-2.467
	(1.462)	(1.265)	(1.391)	(.402)	(3.352)
TEU	-.360	-.598	-.783	-.295	7.006**
	(.551)	(.489)	(.514)	(.208)	(3.099)
COMPANIES	-1.205	-1.514	-2.315**	-1.673**	.276
	(1.118)	(1.201)	(1.106)	(.550)	(2.081)
SERVICES	2.016	1.744	2.264*	1.738***	-2.184
	(1.274)	(1.543)	(1.217)	(.544)	(3.016)
SHIPSIZE	.297*	.618***	.396***	.350***	.048
	(.141)	(.138)	(.134)	(.071)	(.299)
Adjusted R^2	0.867	0.847	0.872	0.882	0.122
Observations	72	72	72	24	48

*** Indicates significance level at 1%

** Indicates significance level at 5%

* Indicates significance level at 10%

To compare between RE and FE from the panel data model, a Hausman test is launched; where the null hypothesis is to support RE, i.e. difference in coefficients not systematic. The test yields a χ^2 result of 30.27 with a p-value of .0001 which is much lower than .05, to reject the null hypothesis supporting the FE result. From the FE model, it can be seen that, there is a good positive relationship where, a unit increase in *SHIPSIZE* component, it will lead to an improvement of .618 of lnCPT, *ceteris paribus*. Statistical results also suggest a good fit for FE, with an Adjusted R-squared of 0.847. From results, it confirms our expectation that a country's port infrastructure in terms of

being able to accept large size of ships relates positively towards higher container traffic.

To further analyze, we can divide the group into ASEAN-2 (Malaysia and Singapore), both are highly advanced in logistics connectivity, and ASEAN-4 (Indonesia, Philippines, Thailand, and Vietnam). After running the analysis with this partition, ASEAN-2 groups show a statistical significance on *SHIPSIZE*, *COMPANIES*, and *SERVICES* variables; while for ASEAN-4 there is a positive relationship, with statistical significance, of 7.006 at the *TEU* variable.

With the confirmed negative coefficient of *COMPANIES* variable shows that possibly with improvement of ICT, better transparency and the actual execution of mergers and acquisitions, there is lack of necessity to (1) open a base office at those ASEAN-2 countries, (2) shippers tend to stay with the company they regularly do business with, or (3) exporters tend to use trustworthy local inland operator services on a long-term contract basis.

The result also presented a positive coefficient of ship container carrying capacity (independent variable: *TEU*): 7.006 for ASEAN-4. This *TEU* indicator result shows that there is still a great potential for ASEAN-4 countries to perform as a potential transshipment hub and most importantly to improve the volume of trade. This can also be considered an opportunity for them to improve their overall logistics infrastructure in order to increase container TEU traffic.

5.5 Statistical Testing

For this panel data model, further statistical test is performed to determine which among models best represents the situation. FE by design is best suited in analyzing the impact of variables that vary over time. FE removes the effect of those time-invariant

characteristics so we can assess the net effect of the predictors on the outcome variable.

After the FE model is chosen, to confirm that there are no heteroscedasticity, i.e. to check if the variance is unequal across the range of values, an additional testing needs be launched. After running the test, this model shows that there is a presence of heteroscedasticity where the standard errors are pretty dispersed. The test yields a χ^2 result of 26.1 with a p-value of .0001 which is much lower than .05. This can also be caused by the lack of observations available as it only covers six countries. Figure 5.1 at the front of this chapter shows that the data points still tends to show that there is a trend towards positive relationship if the data is processed using pooled regression.

Further the model is tested to see an existence of serial correlation, i.e. to check if the error terms from adjacent one reporting year to another are correlated (Drukker, 2003). The test in this context will use Wooldridge test for autocorrelation in panel data. Serial correlation causes the standard errors of the coefficients to be smaller than they actually are and a pretty high R^2. After running the test, it was found that χ^2 result of 2.391 with a p-value of 1.827 which is much higher than .05. Thus no serial correlation exists in the model.

Finally, the model is tested for panel data unit root. To check the causality relations, a unit root test was run to check the stationarity of each series, i.e. to check if the mean and variance of left and right hand side variables tend to stay the same over time. It was then found that all the variables are stationary; except for ship capacity where it is non-stationary, which may indicate that the *TEU* independent variable and *CPT* dependent variable tend to grow at a similar pace. The FE result for the six ASEAN countries supports the increase of ship size being more statistically significant than the ship TEU capacity, hence the *TEU* coefficient at the time-series perspective of the model is not statistically significant.

5.6 Summary of Quantitative Findings

The result of panel data analysis strengthens the presentation of the descriptive statistics and the findings from correlation analysis, where improvement of infrastructure plays a crucial part in every ASEAN countries. Although the finding of the panel data for the whole six ASEAN country only recommends the improvement of port to accept the demand of the larger ship sizes docking its port and to increase container volumes, it can also be complemented with a recommendation where a company's decision deploy largest ship is closely related to meeting the expected trade volume, good variety of service, and quick ship turnaround speed a country's port can offer.

It is clear that the port's capacity to accept for container capacity provide the most significant impact for ASEAN-4 countries. For ASEAN-4 (coefficient = 7.006), country's capacity to accept and process more containers is placed at the first priority, while for ASEAN-2 it is placed third. This indicates that the actual importance on improving port capacity and liner shipping's physical infrastructure to support the capacity, *ceteris paribus*, in ASEAN-4 countries is much higher than the ASEAN-2. Therefore, ASEAN-4 countries must make building them a top priority. Table 5.5 summarizes the prioritization of the impact of LSCI components.

The first priority differs from ASEAN-2 and ASEAN-4. For ASEAN-2, improving and attracting liner shipping services in the country takes precedence. Considering the challenges on the saturated nature of number of service component, Singapore and Malaysia shoud innovate their service offerings on top of competing on cost between them in order to increase container port traffic volumes. One literature from Wee Kwan Tan and Hilmola (2012), suggested to explore new vaulue added services, such as (1) consolidate raw materials, packaging, labeling of products at the hub, or (2) combine air and seaborne services into one package offering depending on the product demand.

Table 5.5 Prioritization of LSCI Components

(Source: Author's calculations from the panel data results)

	ASEAN-2 (Malaysia and Singapore)	ASEAN-4 (Indonesia, Malaysia, Philippines, Thailand)
First	Services (innovate to increase service offerings)	Improve Liner TEU Capacity
Second	Accept Larger Ship Size (with supporting infrastructure)	Accept Larger Ship Size (with supporting infrastructure)
Third	Improve Liner TEU Capacity	Services (add more value-added service offerings)

With regards to ASEAN-4, as shown from the panel data result, improving ship capacity volume is placed at first priority. Faster customs clearance, and building better hinterland connectivity, are some other supporting factors to be considered, in order to increase the ship TEU traffic passing the countries. In order to participate in a more globalized production processes, ASEAN-4 countries needs to build and to rely on a transparent and reliable containerized shipping services.

Apart from major regional economic power, many logistics connectivity problems still facing ASEAN countries. The domestic connectivity of intermodal transport in ASEAN-4 countries, both at sea and on land, it still required plenty of infrastructure improvement (Bhattacharyay, 2009). With AEC, the potential dispersion of population and the well-spread-out level of economic activity as it becomes more equal or balanced among the regions and population centers.

On top of having a superior and modern infrastructure, country with high LSCI index can also manage business processes quickly and efficiently, making their ports as a service

agent, and has good relations with the world-class shipping companies and other international port operators around the world. Operations at the port almost always involve the governments as the key stakeholders. In order to become world-class, ports need to be supported by a government that is clean, strong, skilled in continuously find ways to simplify bureaucracy and is an *agent of change*.

There are some things that really need to get the government's attention in this regard. To spread the economic centers in order to reduce imbalances between regions, there should be a concept to build economic centers through a formation of an economic corridor, inside the respective ASEAN countries, between countries under the AEC umbrella, and through cooperation with ASEAN countries as a unified region and its major trading partner.

Special incentives should be given to investors who want to open a business in a region that can bring a major impact in accelerating development of area. In other words, the formation of ASEAN's logistics system must be multifaceted and cross-sectoral making the best efforts to consider all aspects. The imminent challenge would be to only let the centers of population and economy is concentrated in a few regions like the Malacca Strait. To address ASEAN's logistics problems and challenges, the infrastructure and human development needs to be spread out as much as possible.

In summary, we introduced the thesis of logistics connectivity as an essential indicator in the growth structure of international trade in ASEAN. We argue that our quantitative model, albeit imperfect should consider both correlation and panel data analysis pertaining to analyzing logistics connectivity and international trade. Descriptive models is quite eye-catching, however it further requires quantitative analysis to prevent yet conclusive or ambiguous outcomes. Given how important logistics connectivity to the success of the region, developing a quantitative model to extract insights, in this case: prioritization, shall be put in place to support the findings of practitioners and already-

existing researches, particularly in the Logistics Management, Transport Geography and Maritime Economics community.

6 CONCLUSION

This thesis has analyzed the liner shipping connectivity and its relation with international trade in ASEAN. This research has answered the main research question on which LSCI indicator can provide the most significant impact towards international trade, i.e. the port's capacity to accept larger ship size overall provide the most significant impact. While for the second question on the prioritization, the approach for Malaysia and Singapore given their world-class liner shipping infrastructure is different than the one for Indonesia, Philippines, Thailand and Vietnam. To sustain its class and ranking, Malaysia and Singapore, will need to improve and innovate to add the number of liner shipping service offerings. While for the rest, improvement on the supporting liner shipping infrastructure, with a goal in mind to increase container carrying capacity will be the first ones that needs to be taken into account.

This study has offered perspective and findings on ASEAN's liner shipping connectivity. ASEAN's role in maritime transport shown by the LSCI, presents how well their ports are internationally connected. ASEAN's overall good rating on LSCI reflects not only a commendable regional and global connection of its seaports, it also indicates to the fact that their harbors have proven performance and have great potential to further serve as *hinge joints* between other regional harbors and as a connection to the rest of the world. On the economic rankings it can be seen the change dynamics in the economic, logistics, and more specifically in the LSCI rankings throughout the last twelve reporting years.

As shown from the graphs in the descriptive statistics chapter, the logistics development of Singapore and Malaysia is considered world-class, while the rest are significantly placed at the lower tier. It would be implausible that the remaining four countries are a market for consumer goods that benefit the world's developed economies, despite the importance and significance of domestic consumption with its highly commendable

economic resilience. These consumer-based economies, as a consequence, are highly sensitive towards the shifts in the market conditions and the government policies elsewhere around the world.

On the original premise of heterogeneity, a diverse range of domestic, historical, and geopolitical factors continue to influence economic outcomes in the region. It is quite difficult to make a generalized observation of this diverse group. At best we can group it into ASEAN-2, where they are highly advanced in maritime logistics, and ASEAN-4 where despite its high economic growth, their liner shipping infrastructure development potential still remains to be seen. In spite of this, ASEAN has experienced and continues to experience impressive economic growth given the previously-discussed overwhelming diversity and potential maritime connectivity advantages and challenges.

The research findings can be complemented with other information beyond the ports and container shipping. The analysis in this thesis were only conducted on a country level of container ports within a specific region. For an emerging market like ASEAN, this study is only *a kick-start* to further explore container transportation in the region. Some a previous research done in the EU (Van de Voorde & Meersman, 2013), Latin America (Wilmsmeier & Hoffmann, 2008), and Asia Pacific (UNESCAP, 2013) countries can be used as a reference. Alternatively, comparative research between countries or between regions can also be undertaken. Furthermore, in order to obtain deeper insights, future research could take into account a more specific port-level competition or even cooperation within ASEAN.

Further research could investigate the full extent that ASEAN's maritime logistics, in particular, on how it evolves with changing strategic positioning and regional needs. Taking a closer look on country-level LSCI or a pair of country-level data analyzing bilateral trade to study possible determinants of international trade flows could also be done. Rampant corruption, growing inequality, climate change and environmental

problems are some of the main challenges of most of ASEAN countries, where further research can also be done on this regard touching upon the Maritime Logistics field of knowledge. Environmental challenges like climate change poses significant threat towards the sustainability of the region's economic growth, especially in its efforts the eradicate poverty, and sustaining overall long-term prosperity.

Is has yet been an active discussion or research on how the relationship between population distribution, economic activity, and logistical problems. If there is, in plenty of cases, the general population, particularly shippers and exporters, blames the lack of infrastructure and the slow process of building it as the cause of the high logistics costs. No matter how good the infrastructure, if the population and economic activity does not make the most out of the available infrastructure or if the port development is highly concentrated in one or several region, it will remain quite a challenge to create a holistic ASEAN maritime logistics system that is also reliable and efficient. It is hoped that this research inspires more in-depth empirical studies or a more targeted qualitative research on the impacts liner shipping connectivity in the maritime industry.

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