East Asian Growth

Master's Thesis

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Date: 04-06-2021

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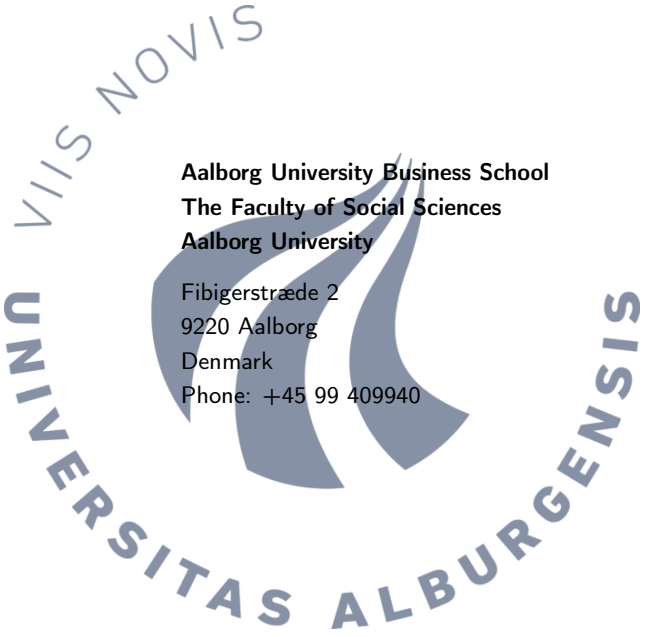

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AALBORG UNIVERSITET
STUDENTERRAPPORT

Fifth year on
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Title:

East Asian Growth

Project:

Master's Thesis

Project Deadline:

04-06-2021

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Date of exam:

17-06-2021

Abstract:

Throughout this project we will attempt to investigate whether or not commercial proximity with the US has any influence on the growth of East Asian economies in the latter half of the 20th century. The approach to this will be twofold, first off we will attempt to construct an OLS model on panel data from East Asian countries in the period from 1972 to 1990 trying to investigate the relationship between growth and trade with the US. The second approach will look at the East Asian region from a commercial perspective, with a focus on the electronics industry. We will take a look at how this industry has evolved differently in different countries, and how foreign investment has impacted the economic growth.

Page count: 37
Character count: 60248
Project delivered: 04-06-2021

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Introduction

The aftermath of the Second World War permanently changed the geopolitical landscape. The years following the war saw two global superpowers rise to power, namely the capitalistic US and the communist Soviet Union and a new global conflict emerged: The Cold War. An observable phenomenon following the war was that countries aligned with the US, generally saw much larger prosperity than those aligned with the Soviet Union. Despite the fall of the Soviet Union and the end of the Cold War in 1991, this disparity in prosperity is still clearly visible today. This begs the question; Why? Numerous reasons for this disparity have been given over the years, from the US aided reconstruction of the western aligned countries to the superiority of the capitalistic system over that of the communists. A common explanation for this rapid growth following the war is the theory of convergence growth, meaning a country that is technologically inferior will experience a period of rapid growth, as it adapts to and utilizes new technology. However this is not always the case, in East Asia a vast disparity in growth rates between the countries of the region could be observed. Japan caught up to the US immensely quickly, and countries like South Korea and Taiwan somewhat slower. Some countries, like Cambodia and Bangladesh, seemingly never managed to catch up at all. The explanations for this are many-fold and and ranges from everything from the presence of a landed elite to the amount of human capital of the populace (Booth, 1999). Unlike in Europe, the divide between US-aligned countries and Soviet-aligned countries was much less clear in Asia, though the experience in Europe seem to strongly indicate that being US-aligned is very beneficial to a country's growth, which leads us to the following problem statement:

Can the disparity in economic growth of East Asian countries be explained by their commercial proximity to the US?

In order to answer the problem statement, our approach will be twofold. We will make use of an OLS model constructed on panel data inspired by Verspagen's convergence growth model (Verspagen, 1991). For this model we will attempt to investigate the relationship between trade with the US and the subject country's ability to catch up to the US. As a variable for trade we have In order to do this we will be be using the values for export and

import between the subject country and the US in the period from 1972 to 1990 as variables for trade and a further variable for gross capital formation to provide an exogenous rate of growth. Our second approach will make use of theory on global value chains and supplier selection in order to find the most important criteria for foreign investors. We will then be taking a closer look at import and export composition of specific countries in the region, in order to see how they have changed throughout the time period.

We hope that this paper will add to the literature on the subject of economic growth in countries, and how it is impacted by proximity to a technologically superior country. Hopefully this paper will shed light on a relatively unexplored area of research, in how proximity to the US specifically, may have an impact on the economic growth of South East Asian countries. The paper is structured as follows; chapter 1 will present the OLS model, and the results as follows as well as discuss in which aspects the model might be lacking. For chapter 2 will present the Global Value Chains and will take a closer look at the electronics industry in the time period. We will furthermore be taking a closer look at the dynamics of individual countries. For chapter 3 will then contrast and compare the findings of these two approaches, and we will comment on possible correlations, and which factors have a bigger impact on the economic growth of the subject country. The fourth and final chapter will be the conclusion of the paper where we will present our findings and how they answer the problem statement outlined above.

Methodology

Throughout this paper, we will be utilizing two different approaches to answering the problem statement. Though the approach is different, methodologically they are quite similar. Our ontological assumption is that proximity to the US has a clear and marked effect on the subject country's growth which the first approach will attempt to prove through an OLS regression using panel data from East Asian countries in the period 1972 to 1990. As such this is a quantitative approach where we will be making use of a deductive analysis as our hypothesis is based on existing theory and is trying to verify said hypothesis. The second analysis will similarly be using a quantitative deductive approach making use of theory on the subject of global value chains, total cost of ownership, supplier selection and the smiling curve.

Putting these analyses into the four paradigms set up by Burrell and Morgan, we clearly find ourselves in the functionalistic approach. The functionalistic approach is characterized by an objective approach, researching the subject while maintaining the status quo. This approach also condones the use of hypotheses, which is how we will answer the problem statement. The paper will be focused on analysing how the countries economic growth varied depending on different circumstances, and seeing if we can find causality between foreign investment from, and trade with the US, and economic growth (Burrell and Morgan, 1979).

The empirical data used for both analyses is gathered from a variety of sources. Measures for exports and imports to and from the US are taken from the International Monetary Fund (IMF), values for GDP as well as capital formation are from the World Bank's World Development Indicators and US import and export trade compositions for electronics with East Asia are from the World Trade Organization (WTO).

Source criticism

The data used for this paper is taken from a variety of sources, most notably the IMF, WTO and the World Bank. Each of them are internationally recognized organisations with highly reliable databases commonly used for empirical analysis, as such we find them to be the ideal source of data for this paper. However, it should be mentioned that the World Bank's World Development Indicators are lacking any statistics regarding Taiwan which makes running a regression on Taiwan to be highly problematic.

One key piece of literature for this paper is Bart Verspagen's *A New Empirical Approach to Catching Up or Falling Behind* which describes Verspagen's attempt at establishing a convergence growth model. Verspagen is a professor of the Macroeconomics of Innovation and New Technologies and the current director of UNU-MERIT (The United Nations University - Maastrict Economic and Social Research Institute on Innovation and Technology) and as such the subject matter is firmly within his field of expertise. However, it should be mentioned that the relevant paper was written very early in his career, though we still consider it a highly reliable and valuable source (United Nations University, ND).

Furthermore, we have used Dieter Ernst's *International production networks and changing trade patterns in East Asia: The case of the electronics industry.* Ernst is a senior at the Centre for International Governance Innovation (CIGI), where he is a key figure when researching the challenges for global governance. He mainly works on finding out what adjustments are needed and importantly how to cope with an increasingly complex web of global corporate networks, and what that requires from a governance perspective. Prior to being with CIGI he was previously a professor of international business at the Copenhagen Business School, and also has a Ph.D. in economics from the University of Bremen (Centre for International Governance Innovation (CIGI), ND). As a very esteemed professor, that specifically works with a lot of the key areas that we are researching, we believe Ernst to be a good credible source of information.

In order to understand the requirements for a supplier, and the criteria companies are looking at when choosing a supplier, we have looked at Ruth Banomyong's *ADBI Working Paper Series: Supply Chain Dynamics in Asia.* He received his Ph.D. in International Logistics

in 2001 from the Logistics & Operations Management Section (LOMS) at Cardiff Business School (UK). This Ph.D. was enough to win him the James Cooper Cup 2001, for the best Ph.D. dissertation (Aerotropolis Institute China, ND). Currently Banomyong is considered a leading logistics development expert in South East Asia, and has developed a cost-time distance model, which is used by a multitude of agencies such as The Economic and Social Commission for Asia and the Pacific (ESCAP), United Nations Conference on Trade and Development (UNCTAD), as well as the World Bank (British Council: Thailand, ND). As one of the leading experts on logistics development, we consider Banomyong to be a reliable source on this subject, and thus we deem his works on supply chain dynamics in Asia to be a critical source of information for this paper.

CHAPTER 1

Convergence Growth Model

1.1 Convergence Growth

Following the Second World War, a large spike in productivity growth was observed amongst most western countries. This spike in growth is commonly attributed (though not exclusively) to the large amount of underutilized technology suddenly available. This gave birth to the convergence growth hypothesis, that the productivity of countries tend to converge towards the leading country as the follower countries start adopting and utilizing the technology of the leader, in the aftermath of the second world war this technology leader would be the US. This is known as the technology spillover effect. This also has another implication, namely that the lower the productivity of the follower country is, the higher the growth spike will be as any newly utilized technology would have a proportionally larger effect on the country's productivity. Along the same lines this spillover effect will have diminishing effect as the technology of the follower country becomes modernized. However, relative technology level between the follower and the leader is not the only determining factor. Social capability is a term Abramovitz (1986) uses to describe societal characteristics that may or may not have a hindering effect on the country's ability to catch up. It may be aspects such as education level as well as political, commercial, industrial and financial institutions amongst other things (Abramovitz, 1986). The interaction between social capability and technology gap between follower and leader would then determine the country's ability to catch up.

Verspagen took this convergence theory a step further and constructed a model to showcase the effect and explain why some countries are able to catch up while others fall further behind (Verspagen, 1991). What causes some countries to fall further behind is attributed to what Abramovitz calls social capability, the country's ability to adapt to and assimilate the new knowledge. Much of what Verspagen has outlined in his model is used for this analysis as well. Verspagen sets up two countries, the North and the South respectively. It

is assumed that the North is more technologically advanced than the South and that we as such can observe the knowledge spillover to the South. He defines the technology gap as such:

$$G = ln(\frac{K_n}{K_s}) \tag{1.1}$$

Where G is the technology gap and K is the stock of knowledge in the North or the South, as denoted by the subscript. Taking the logarithm of the gap makes it so that in case the knowledge stock between the countries is equal, the tech gap will take a value of 0 and indeed be negative should the South ever overtake the North. The growth of the knowledge stock is defined as:

$$\frac{\dot{K}_n}{K_n} = \beta_n \tag{1.2}$$

and for the South as:

$$\frac{\dot{K}_s}{K_s} = \beta_s + S \tag{1.3}$$

Where $\dot{K}$ is a time derivative of the knowledge stock, β is the exogenous rate of growth and S is the spillover effect which only affects the South as the North is considered the technology leader. He further specifies the knowledge spillover as:

$$S = aGe^{\frac{-G}{\delta}} \tag{1.4}$$

Where $0 < a \leq 1$ which with G is proportional to the technology gap and the learning capability $e^{\frac{-G}{\delta}}$ is a function of both the technological distance and intrinsic learning capability (what Abramovitz calls social capability). The intrinsic learning capability cannot be equal to or less than zero. He formulates three models of increasing complexity.

$$\dot{G} = c_1 + a_1 G_0 + \sigma_1 \tag{1.5}$$

$$\dot{G} = c_2 + bP + a_2 G_0 + dE + \sigma_2 \tag{1.6}$$

$$\dot{G} = \beta_1 + \beta_f P + \alpha G_0 e^{\delta \frac{G_0}{E}} + \sigma_3 \tag{1.7}$$

Where c, a, b, d, α, β and δ are parameters to be estimated, G_0 is the initial value for the technology gap, P is the exogenous rate of growth and E is a vector of variables affecting the intrinsic learning capability (specifically enrollment in secondary and tertiary education as well as level of infrastructure). Verspagen finds that this spillover effect doesn't happen automatically and indeed if a country is technologically far behind and with an insufficient ability to assimilate knowledge it will fall further behind, while countries who are only moderately behind will have a much easier time catching up (Verspagen, 1991).

Of course, the model isn't perfect and there are some assumptions made that are not necessarily realistic. For example, it is assumed that the North will remain the technology leader indefinitely and that it is impossible for the South to overtake the North technologically. Another flaw is that the model does not account for the time lag between variables. In reality there is some delay between the variables, knowledge does not diffuse instantly nor does investment into social capability have an immediate effect. As heavy inspiration for the model of this paper is drawn from Verspagen and Abramovitz, some of these same defects may carry over as discussed later.

1.2 The Model

1.2.1 Data

The subject countries consists of the East Asian economies excluding China (which we consider too large to be comparable with the rest of the East Asian countries) as well as North Korea, Taiwan, Laos, Cambodia, Myanmar (then Burma), Brunei and Vietnam who for a variety of reason have data too poor to construct a model from. As a result the subject countries are Japan, South Korea, Hong Kong, Thailand, Malaysia, Singapore, Phillipines, Indonesia and Bangladesh. The timeframe used ranges from 1972 to 1990, starting in 1972 with the formation of Bangladesh to ensure a balanced panel data set and ending in 1990 because at that point it doesn't really make sense to consider convergence as the primary growth driver for some countries (Japan especially).
Like Verspagen's model the dependent variable of the OLS model used here is tech gap which is defined in the same way as outlined in equation 1.1 however with the knowledge stock being defined by the GDP per capita instead. For the independent variables, we have chosen gross capital formation as well as import and export with the US. The export and imports (specifically with the US) are measured as a percentage of the GDP trend. This is done so as to avoid fluctuations in exports and imports stemming from changes in GDP rather than changes in exports and imports. Furthermore, by measuring it as a percentage of GDP, we're able to exclude the increasing income affecting the value (known as the income effect). The investments (or gross capital formation) is measured as percentage of GDP.

Levin Lin Chu test

Before constructing the model, the panel data needs to be tested for stationarity, and if neccesary, adjusted to take the presence of a unit root into account. For performing this test, the method outlined by Levin et al. (2002) has been utilized. The results are as follows:

Table 1.1: P-values for the Levin Lin Chu test

Variable	P-value
Tech Gap	0.015
Export	0.958
Import	0.012
Investments	∼0.000

The null-hypothesis for the Levin-Lin-Chu test is that the variable is non-stationary. The test strongly rejects the null hypothesis for investments at any significance level meaning that the variable is considered stationary. For export however, we are unable to reject the null hypothesis at any significance level. For both tech gap and import we are able to reject the null hypothesis at the 5% significance level but not so at the 1% level. To account for the presence of a unit root, the first difference of the variables is taken so as to turn the data stationary.

Hypotheses

One thing to keep in mind before outlining the hypotheses is that the dependent variable is an indicator of the distance in technological level between the subject country and the technology leader (the US). As such the parameters taking on a negative value would indicate a decrease in the technological distance between the subject country and the US meaning growth in the subject relative to the US.

With that in mind this is the expected results of the model:

- The parameter for investments is expected to a negative value. Investments is a common driver of growth and as such it follows that countries with a higher percentage of investments should be further ahead technologically and closer to that of the US.
- Exports and imports to and from the US is the indicator for commercial proximity with the technology leader. They're expected to take a negative value, but likely with severe diminishing returns as too high values of export and import will make domestic business unable to compete.

The Model

Recalling that the Levin Lin Chu test indicated the presence of a unit root, the models are constructed with the first difference of the variables taken (so as the make them stationary). The models are as seen in tables 1.2 1.3 and 1.4

Table 1.2: Model depicting convergence growth amongst East Asian countries

	Dependent variable:
	G
P	0.043^{***}
	(0.012)
I(P^2)	-0.001^{***}
	(0.0002)
Ex	-4.678^{***}
	(1.173)
I(Ex^2)	12.278^{***}
	(3.580)
I	-9.199^{***}
	(1.362)
I(I^2)	18.811^{***}
	(3.389)
Constant	-0.025^{***}
	(0.008)
Observations	162
R^2	0.420
Adjusted R^2	0.397
F Statistic	18.691^{***} (df = 6; 155)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 1.3: Poorer East Asian Countries

	Dependent variable:
	GP
PP	0.038**
	(0.017)
I(PP^2)	−0.001**
	(0.0003)
ExP	−7.123**
	(2.834)
I(ExP^2)	23.788
	(16.076)
IP	−16.359***
	(3.219)
I(IP^2)	85.046***
	(30.628)
Constant	0.002
	(0.012)
Observations	90
R^2	0.510
Adjusted R^2	0.475
F Statistic	14.408*** (df = 6; 83)
Note:	*p<0.1; **p<0.05; ***p<0.01

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Table 1.4: Richer East Asian Countries

	Dependent variable:
	GR
PR	−0.005
	(0.023)
I(PR^2)	−0.0002
	(0.0003)
ExR	−2.269
	(1.653)
I(ExR^2)	6.453
	(4.113)
IR	−5.172***
	(1.757)
I(IR^2)	9.292**
	(4.092)
Constant	−0.053***
	(0.009)
Observations	72
R^2	0.453
Adjusted R^2	0.403
F Statistic	8.980*** (df = 6; 65)
Note:	*p<0.1; **p<0.05; ***p<0.01

For the sake of clarity the relationship between each of the three variables and Tech Gap has been visualized in figures 1.1, 1.2 and 1.3.

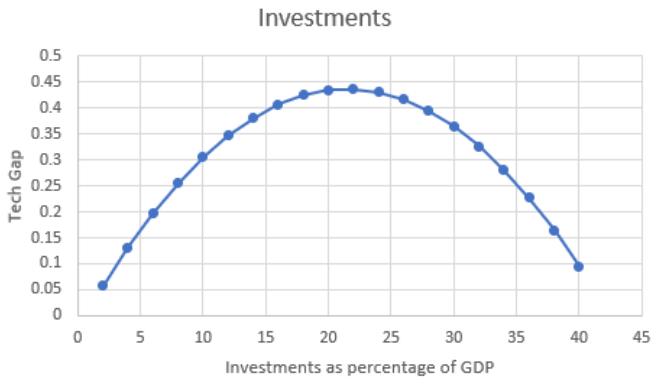

Figure 1.1: Relationship between investments and tech gap

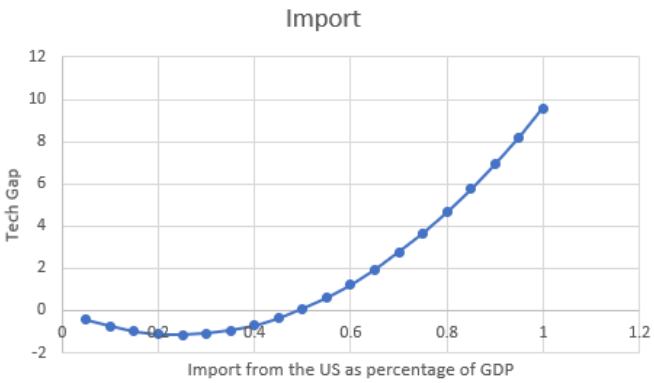

Figure 1.2: Relationship between import and tech gap

Figure 1.3: Relationship between export and tech gap

As can clearly be seen from table 1.2, both exports and imports with the US (EX and I respectively) have significant impact on the technological distance between the US and the subject country. However, the model also indicates that the initial exports and imports are the most important and that further exports and imports beyond the initial level have severe diminishing returns and will eventually turn negative.

One explanation for this could be that only small amounts of American technology is necessary for the diffusion of knowledge to take place. A very significant contribution to this result is also likely that too much trade with the US will make domestic business unable to compete, thus making them unable to flourish and hampering growth. Trade with the US is seemingly beneficial in very small amounts and very harmful as trade grows.

Another thing that stands out is that investments (P) takes a positive value. This indicates that higher levels of capital formation will result in the subject country falling further behind the US. However, a very significant increasing effect from investments can also be observed and beyond roughly 20% the curve starts dipping again.

Table 1.3 and 1.4 shows the same model but with the dataset seperated into two catagories. Table 1.3 is for the poorer East Asian countries (namely Bangladesh, Philippines, Indonesia, Thailand and Malaysia) while table 1.4 is for the richer countries (Japan, South Korea, Hong Kong and Singapore). The first thing that jumps out when observing these models is that the variables are much less significant than those in table 1.2, especially so for table 1.4. This is as expected as at this point the pool of observations is getting very small. It should also be noted that these models suffer from some of the same defects which will be covered in section 1.2.1. Looking at table 1.3 it seems that the importance of exports and imports is much higher than in the original model. It should also be mentioned that for this model, the significance of the diminishing returns on exports is very low. The opposite can be observed in table 1.4 where the importance of exports and imports is much lower than in the original model and that only imports are deemed significant.

Flaws and defects

As mentioned earlier the models does not consider potential time lags that might be appropriate, the effects of investments wouldn't be immediate for example. As such it can be expected to skew the results somewhat, but not to a significant degree. A much larger defect of the model is the assumption that there is only one technology leader, that knowledge only flows from the technology leader to follower countries and that the technology leader is unable to change. These are problematic for a variety of reasons. To address the latter, it is assumed that he US will remain the technology leader indefinitely, though in reality

(and indeed by the measure used in this paper) it can easily be argued that Japan overtakes the US as the technology leader in the mid 1980s, meaning that we're effectively assuming that Japan is importing technology from a technologically inferior nation. The first and second point that the technology spillover effect only happens from the technology leader to the follower country is unrealistic, as there's nothing preventing a technologically inferior country from importing technology from any country more technologically advanced. For East Asian countries this primarily means Japan, but also Canada and Europe to a lesser extend and for the really technologically inferior countries also South Korea, Hong Kong, Taiwan and Singapore. As such it follows that using only trade with the US as a measure might be inappropriate.

CHAPTER 2

Suppliers

In order to answer the problem statement, we have decided to take a look at the electronics market. We have chosen this market, due to the electronics industry being the largest export market in South and East Asia in the 1980's. The electronics industry has since seen a massive expansion when it comes to production by foreign firms, thus being a major export as well as import in most developed countries (The World Bank, United Nations Conference on Trade and Development (UNCTAD), ND). In this context Japan, although it being geographically located in East Asia, is already a much more developed country than most other Asian countries, and thus the country plays a big part in the investments of other Asian countries (Ernst and Guerrieri, 1998). The role of Japan in the electronics industry in the region was fairly large up until the late 1960's compared to the United States. Initially companies in Japan mainly used this as an attempt to tariff jump, as their own market was highly protected by tariffs. Due to these circumstances, Japan's role in the development of the rest of Asia, can't be understated. In this paper we have decided to focus primarily on the relation to the west, with an emphasis on the United States, as they are a major economic power, that was investing a lot in the Asian region in that time period.

2.1 Global Value Chains

In order to properly analyse the supplier relation between East Asia and the west and Japan, we will start off by looking at the global value chain. The global value chain takes root in Porter's value chain, as displayed in figure 2.1.

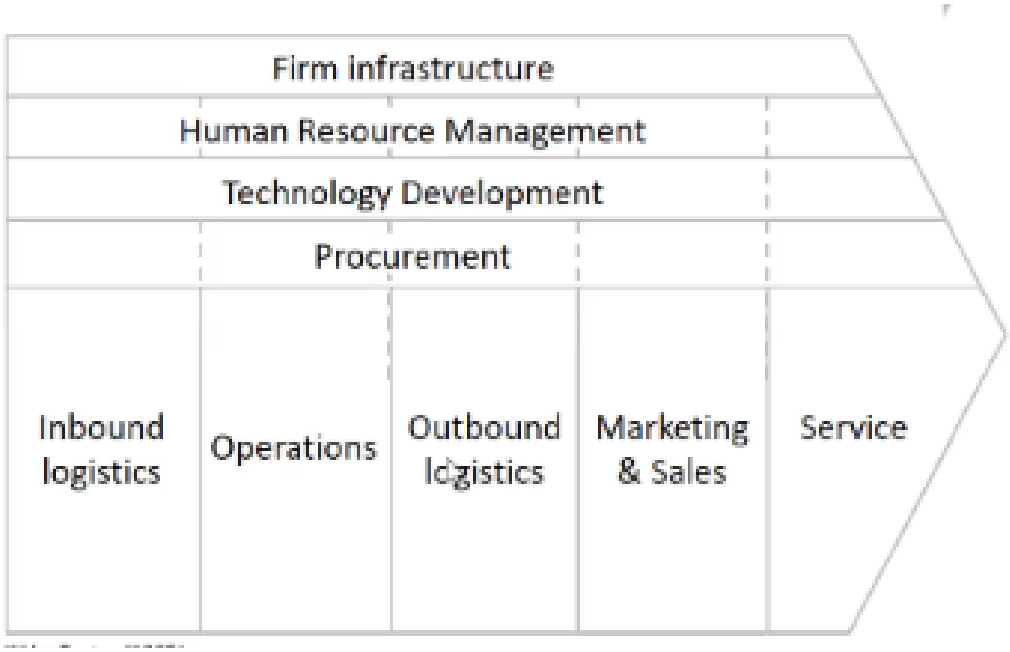

Figure 2.1: Porter's Value Chain

This value chain, as shown in figure 2.1 serves as a visual representation of the activities that create value in a given firm. The bottom five parameters are what would be described as primary activities, from extracting the raw materials to selling the finished product and providing the service for the customer. The four activities above, is categorised as the support activities, those are the activities that do not directly make value by themselves, but are instead there to support the primary activities, and allow them to run smoothly. If we look back to the start of the 1990's, at that point it was very few companies, if any, that spanned the entirety of the value chains primary activities by themselves. Often companies will focus on the part of the value chain that they can excel in, and then outsource the parts where they don't excel, by not producing themselves, and instead buy from other companies (John K. Shank, 1992). In this paper we will primarily be focusing on the first parts of the value chain, as that is the parts of the value chain that the East Asian countries have primarily played a part in, when cooperating with western companies. The Global Value Chain (GVC), as opposed to just a value chain, is when the value chain spans over multiple countries. It is a difference that emphasise tariffs, as you are trading goods and raw materials

across borders. Since the early 1990's the production have seen a rapid globalisation. This is primarily driven by the transport costs going down, as well as global communication technology (Hauge, 2020). This has impacted the structure of the production, especially in the developing economies in Asia, towards one taking advantage of the globalization of the world. That includes trading with countries in both Europa and the Americas, especially the United States (Hauge, 2020). Focusing on a global value chain model, also means moving away from the Import Substitution Industrialisation that was previously predominant for most developing countries in South and East Asia. During this period of time, there was a big emphasis on domestic supply chains, which could take decades to properly develop. Through global value chains, countries were able to focus on producing the things they were good at, and then export the produced goods to other countries. Due to this, it was possible to grow in a rapid fashion compared to previously. In order to accommodate a complete global value chain perspective, a country has a few key factors that must be present.

1. The industrial policy should focus on vertical specialisation, moving from a state of developing entire domestic structures, to more specialised, often higher-valued work.

2. It is important to remove high barriers when it comes to trading, but import and export, thus making it easier to establish the global value chains.

3. Instead of focusing on competing with international corporations through domestically developed industries, there should be a focus on negotiations with these corporations, and an attempt to link up the value chains when beneficial (Hauge, 2020).

Making use of these factors, it should be possible to increase the trade with foreign corporations, and thereby increasing productivity by mostly producing the goods the country is well suited for. In order to properly understand the Global Value Chain, we also have to look at some of the criticisms that comes with it. In order to highlight these, we will be focusing on the developmentalist perspective. The developmentalist perspective in essence a very traditional way of economic thinking. The primary objective is to develop the economy by developing the productive capabilities of a country through industrialisation, with the state playing a major role in this process. This also brings us to Import Substitution Industrialisation (ISI) and Export-oriented Industrialization (EOI). Traditionally a country adopting the developmentalist perspective, has focused on building the production in the country, and utilizing an ISI approach. This is typically a more closed off approach, where the primary goal is to focus on ones own country and keeping out foreign goods by making use of tariffs and trade barriers. A country can start out with a developmentalist approach, focusing on their own production, which can be an important aspect of a country's growth

strategy. As they are able to protect their domestic production while it is still developing, it helps avoid being exploited by larger nations (Hauge, 2020). Once the production is at a sufficient level, the country can then start to open up and adopt parts of EOI and later the Global Value Chain perspective. This highlights some of the issues found with the global value chain perspective, as a completely free market for foreign companies, might completely hinder the countries growth, due to excessive import, which the local industry might not be able to compete with (Hauge, 2020). That is not to be said that every developing country should completely close off, but it is important for the government to regulate the market if they wish to increase local businesses. In the 1960s, ISI was the primary method of growth in developing countries in both Latin America and Eastern European developing countries, but the industrialisation process shifted more towards an EOI approach, particularly by the Four Asian tigers in the 1970s. After the success seen by these countries EOI became the most used approach for developing countries (Hauge, 2020).

2.1.1 Supply chain dynamics

When researching the global value chains, it is important to discuss the dynamics of supply chains the Asian region, as they might vary significantly compared to western supplier relations. Furthermore, due to the nature of having a supply chain on a global scale, it is important that there is cooperation between the trading nations. Generally Asian producers are known for a high quality of products with a lesser cost, but even with such qualities, there are other factors to take into consideration when discussing Asian suppliers, namely:

1. Cost of transportation
2. Time
3. Safety
4. Uncertainties

(Banomyong, 2010)

Cost of transportation

Probably the most important factor of this decision, would be the actual cost of the goods in addition to the cost of transportation. For a country such as the US, this would have to make financial sense, taking into consideration that the product would have to be shipped across the pacific ocean. Furthermore it can be hard to make up the cost, as it is not always possible to clearly quantify every element. Here we differentiate between the direct costs, which are the ones directly attributed to the transportation of goods, and indirect costs,

which can be described as an expenditure that cannot directly be attributed to a single service. This would come across as financial costs, which could be from mismanagement in the port that gets used, thus making the operation less efficient, or additional unforeseen costs. Indirect costs can also manifest as "consequential costs", due to lost sale if the goods are delayed (Banomyong, 2010).

Time

Another important factor when dealing with Asian suppliers is the sheer amount of time it takes for a product to reach retailer. While the goods are being transported, that is money that the company have bound to those goods, meaning it cannot be invested elsewhere. A reduction here would therefore reduce the overall cost and time that the company has money bound in the shipment. Financial cost is a huge factor in this regard, and in order to keep financial costs down, companies also opt into the Just In Time (JIT) principle. Of course this would also make the operation very tight, as any delay could seriously hurt the company monetarily (Banomyong, 2010).

Safety

Safety of the goods is an important aspect as well, as any loss or damage, will result in both monetary expenditure as well as delays, due to the JIT principle. This would have much the same consequences as the time factor explained in the previous section (Banomyong, 2010).

Uncertainties

There can be certain uncertainties, especially when dealing with foreign governments, as well as new trading partners which can be cause of concern if not properly researched. Rules and regulations might vary depending on the country, and suppliers might have varying other concerns with the production, which could prove disadvantageous for the buyer(Banomyong, 2010).

2.1.2 Transportation

From these observations, we can see that it is very important for the buying company to take these considerations into account before choosing a supplier. The development of a supply chain has three major parts, the traders, the foreign company and the government. Better organization between supplier and buyer, can also help the supply chain as as whole, and would increase the overall efficiency for both parts. If we look at a more grand scale, it is the role of governments to provide and guarantee the level of service needed for the logistical activities to be competitive. Therefore as a country looking to increase export

and become more attractive for foreign investors, it can be very beneficial to provide an environment that can guarantee the service that would be required of a foreign company. A better integrated supply chain would also be able to benefit the government as it is a way of gaining knowledge and update procedures and regulations (Banomyong, 2010).

All in all, the dynamics of a supply chain in a foreign country, or even in the case of the US, a foreign continent, comes with a handful of areas that needs to be thought through. Both the cost of transportation as well as the transportation time are paramount to whether or not this implementation would be a good addition as a supplier. Furthermore there can be issues with the firms along the supply chain, as the behavior is usually individualistic, thinking of their own firm rather than the supply chain as a whole (Banomyong, 2010). This brings us onto the topic of logistics service providers. A logistic provider is a third party which manages the logistical parts of a supply chain, this may include, warehouse management, order fulfillment as well as shipping orders. Especially freight forwarders are seen as very valuable when it comes supply management in Asia, as a vast majority of wares, especially those going to the US, are transported by cargo ships. Logistics providers that are based in Asia can therefore be a huge asset, as they are already familiar with the processes of shipping in Asia. This would lessen some of the aforementioned risks as well, as the logistics provider could possibly provide a certain safety of the goods, which a foreign based company might not be able to.

Smiling curve

In conjunction with global value chains, we will also take a look at what is referred to as a "smiling curve". This theory was first presented by Stan Shih in 1992 and has since been developed upon by other theorists such as Mudambi with his "smile of value creation" in 2008 (Shin et al., 2012). The theory builds on the value chain, and is a representation of where the value is generated. The general premise is that the value-added is larger both upstream (research and development and design) and downstream (marketing and retail), with manufacturing and assembly would be of fairly low value. The parts of the global value chain that add more perceived value, and would often also be the more technologically advanced part of the value chain. Therefore, if a firm is placed in either end of the smiling curve, it would generally be able to reap better profits than a firm that primarily does the assembly (Shin et al., 2012).

2.1.3 Supplier selection

When it comes to supplier selection, there is multiple different ways of going about the selection process. For the reasons outlined in section 2.1.1, this is arguably even more difficult when doing this selection process in a foreign country. With companies adapting the JIT strategy, as well as a value-added focus, it is important to be careful when selecting suppliers, as the relationship will have to be closer than previously, and companies are a lot more dependant on precise arrivals of the right amounts of goods (Bhutta and Huq, 2002). A company is generally going to want the highest quality, and the highest functionality for the lowest price. In order to illustrate this we will be using the FPQ model.

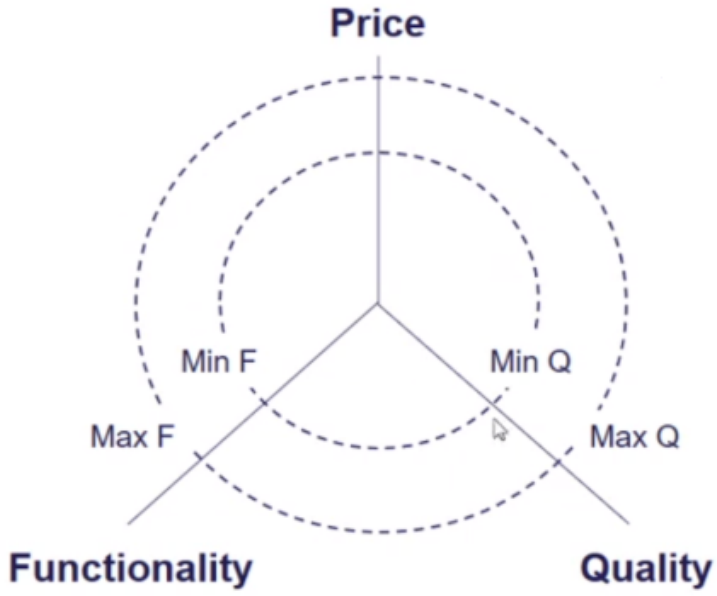

Figure 2.2: FPQ trade-off

FPQ model

The FPQ model consists of three dimensions, Functionality, Price as well as Quality. As a general rule, whenever you increase quality or functionality, the price will go up, and a product with too high quality and/or functionality could find itself with insufficient customers willing to pay that price for the product. At the same time, the quality and/or functionality could be too low, with a low price. A customer will be expecting both a minimum of quality as well as functionality, if the customer sees the product is severely lacking for the purpose needed in comparison to competitors, it will also struggle with insufficient customers, even despite the lower price. Therefore it is a trade off in how much a company should invest in both functionality and quality, and that should accurately reflect in the price in order

to give the best result. The most important thing when considering the FPQ trade-off is the need to be competitive on at least one of the three parameters (Creese, 2000). In order to effectively compare suppliers so a company can make an informed decision, they need to take both the direct costs as well as the indirect costs into account. Direct costs are relatively straight forward, as that would be the direct costs of the product, the labor and the transportation. When it comes to the indirect costs, those can be a lot harder to both access and compare between suppliers. In order to determine this cost, it is possible to make use of the total cost of ownership model (TCO) (Bhutta and Huq, 2002).

Total Cost of Ownership

The total cost of ownership model, is a way of looking beyond purchase price, and include a multitude of other purchase-related costs that are not directly attributed. It gives the company a way of comparing different suppliers from a monetary point of view. It can be seen as a purchasing tool, with a philosophy that is aimed at understanding the cost of buying a specific product from a supplier. TCO can happen on three different levels, the strategic, tactical and operational level. Most often TCO is applied on the the operational and the tactical level, with a few key differences. If we are looking at the operational level, we look at the individual supplier. If used in this way, the buying company might be wanting to evaluate the suppliers performance, and that way try to better the value gained from having that supplier. On the tactical level, which is the one we will be operating on, the purpose is most often to redesign and make the supply chain more cost efficient as a whole (Hurkens et al., 2006).

As a positive, this approach has the advantage of providing a clear quantitative evaluation of the total purchasing cost of each supplier, and can be a very beneficial tool in this regard. Unfortunately it is not without downsides. As it is a very extensive and complex model, it needs a lot of tracking and maintenance cost data in order to give an accurate breakdown. It can also be very situation specific, as it is not every time a purchasing decision would need to be made that it would even be worth it to consider making this model from a cost perspective (Bhutta and Huq, 2002). While this model is fairly good for making informed supplier selection, it also comes with some constraints in the amount of information needed for the model. Therefore we have deemed that it would be difficult to set up a TCO model without having specific suppliers with all the information given on cost of transportation, delivery time, and other non-direct costs of the current time period.

2.2 Analysis

2.2.1 Electronics industry

The electronics industry, is the biggest single industry in South East Asia as a whole (The World Bank, United Nations Conference on Trade and Development (UNCTAD), ND). Therefore it is only natural that an industry of this magnitude would have a significant impact when it comes to the development of South and Eastern Asian countries. In the latter part of the 20th century, South-East Asia experienced a momentous expansion of the electronics industry, primarily fueled by foreign electronic firms, primarily from Japan and the US. The initial focus of investment was primarily in the North-Eastern Asian region, being South Korea, Taiwan and Hong Kong, with a later surge of investments in countries such as Singapore, Malaysia and Thailand (Ernst and Guerrieri, 1998). South Korea, Taiwan, Hong Kong and Singapore, are what we would categorize as the Asian newly industrialized economies (NIE), whereas both Malaysia and Thailand are both part of the Association of South-East Asian Nations (ASEAN). It is important to note that Singapore, due to its geographical location, and rapid growth in economy, are a part of both groups (Kreinin and Plummer, 1994). Both the NIE's as well as the ASEAN countries has seen a rapid growth in share of export from 1970 to 1990. But even with both groups having seen a rapid development, there is a difference in the composition of the exports. Where NIE's have been exporting higher tech finished products, the ASEAN countries have been used as more of a basic manufacturing platform, throughout that time period (Ernst and Guerrieri, 1998). We have seen an increase in "internationalization", particularly from the ASEAN countries of South East Asia throughout the 1980's, which had led to drastic changes in their policies, such as finances, trade and investments. Furthermore the change also brought rapid changes in export composition over the course of the 1980's to mid 1990's, with the ASEAN countries exporting more basic manufacturing. This change is export composition, happened in conjunction with the countries moving up the economic development ladder, as they were developing and thus rearranging the internal ranking of their industries. Often this would mean going from lower technological basic manufacturing, towards production with a higher technological requirement (Kreinin and Plummer, 1994).

In order to compare the relative development of each of these countries, we will be taking a closer look at the product composition of the electronics components traded with the US. By looking at both the import and export, we should hopefully get a similar pattern for countries of the same development.

If we look at the countries in the initial surge of investments, there is a tendency of heavy import of consumer electronics from the US in the 1980 and 1985.

	USA % composition of exports						USA % composition of imports				
Taiwan	1980	1985	1988	1990	1993		1980	1985	1988	1990	1993
Electronic data processing	23.6	27.2	20.9	20.7	17.7		1.7	8.8	15.6	52.1	61.9
Office equipment	1.3	1	0.6	0.7	0.5		3.5	3.4	4.3	3.7	2.5
Telecommunication	17	8.4	6.8	13.5	4		2.1	5.5	4.7	3.6	2.8
Electronic components	17.7	31.5	35.8	39.9	55.9		11.9	9.5	11.9	13.1	17.5
Consumer electronics	12.3	5.9	8.1	7.1	9		56.9	30.1	19.8	11.8	5.6
Household appliances	4.9	3.3	12.1	7.5	1.8		3.5	6.4	7.4	7.9	5
Other electronics	23.2	22.7	15.7	10.6	11		20.4	36.2	36.2	7.7	4.6
Total electronics trade	100	100	100	100	100		100	100	100	100	100

Figure 2.3: Import and export composition of Taiwan (WTO, nd)

Taiwan has seen a large shift in export to the US, as in 1980 they were exporting 56.9% percent consumer electronics as well as 20.4% other electronics and 11.9% of electronic components, with other categories such as electronic data processing being fairly low at only 1.7%. Over the course of the 1980's this shifted more towards other electronics going, going away from consumer electronics and then in the 1990's a rapid development of electronic data processing. At the same time we also see a slight increase in the export of electronic components, ending up at 17.5% in 1993. On the import side of things, Taiwan started off with a somewhat balanced import of 23.6% electronic data processing, and Other electronics being at 23.2%, as the two largest areas of import, with telecommunication, electronic components and consumer electronics accounting for a sizable amount each as well. This then shifted more towards electronic components over the time period, moving away from Telecommunication and other electronics. On top of that, there has been a slight decrease in both electronic data processing as well as consumer electronics, thus having electronic components account for more than half of the total import, at 55.9%.

	USA % composition of exports						USA % composition of imports				
South korea	1980	1985	1988	1990	1993		1980	1985	1988	1990	1993
Electronic data processing	21.6	17.7	26.7	31.7	23		3	1.9	4.4	23.5	30.6
Office equipment	1.5	0.9	1.1	2	0.7		2.5	2.1	2.1	1.6	0.8
Telecommunication	10.5	11.8	5.5	6.6	5.1		0.6	4.4	4.4	3.3	1.7
Electronic components	37.7	52.9	48.8	47.2	50.3		33.5	21.4	25.5	33.3	35.6
Consumer electronics	2.7	2.5	2.9	3.9	6.4		52	37.7	30.7	26	21.9
Household appliances	0.6	0.4	0.7	1.3	1.8		2.8	11.6	9.6	6.6	4.6
Other electronics	25.4	13.8	14.3	7.2	12.8		5.5	20.9	23.4	5.8	4.8
Total electronics trade	100	100	100	100	100		100	100	100	100	100

Figure 2.4: Import and export composition of South Korea (WTO, nd)

South Korea has seen similar trajectory, with consumer electronics being a large part of their export in the early 1980's. Different from Taiwan though, is that electronic components

has steadily been a moderate part of their export throughout this time period, starting out at 33.5% with a slight decline from the mid 1980's to the early 1990, where it dipped down to 21.4% and then back up to 35.6% in 1993. Furthermore, it is interesting to note that South Korea also has retained a part of their consumer electronics, whereas Taiwan has completely moved over to a majority of electronic data processing, with a bit of electronic components as well. South Korea's import structure had a larger emphasis on electronic components than Taiwan as early as 1980, accounting for 37.7% of import, with there being almost no consumer electronics imported in comparison. Electronic data processing had some shifts over the period, starting at 21.6%, reduced slightly in 1985, and then increased in the late 1980's with a sizeable decrease in 1993, thus ending up on 23%. Other electronics has seen a steady decline over the period, starting out on 25.4%, but decreasing to 12.8% in 1993.

	USA % composition of exports						USA % composition of imports				
Hong kong	1980	1985	1988	1990	1993		1980	1985	1988	1990	1993
Electronic data processing	59.1	49.3	33.9	29.5	29.8		15.9	23	15.6	31.2	35.4
Office equipment	3.3	2.5	1.3	1.7	1.2		7	2	5.1	5.1	4.3
Telecommunication	3.4	3.8	6.8	3.6	3.3		0.3	4.4	6.7	3.5	3.2
Electronic components	19.6	26.7	35.7	49.2	49.1		11	6.5	9.3	11.8	23.6
Consumer electronics	5.4	5.9	7	8.1	8		47.4	41.6	33.8	30.6	23.1
Household appliances	1.9	0.9	1	1.3	1		15.2	13.8	9.5	6.7	3.5
Other electronics	7.3	10.9	14.4	6.6	7.7		3.3	8.8	20	11.1	7
Total electronics trade	100	100	100	100	100		100	100	100	100	100

Figure 2.5: Import and export composition of Hong Kong (WTO, nd)

Hong Kong too has some similarities to both South Korea as well as Taiwan. Already from the 1980's there was a large export of consumer electronics at 47.4%, with electronic data processing at 15.9% and electronic components at 11%. Interestingly, Hong Kong also had a decent amount of export of household appliances in this time period. Moving towards the 1990's, we then see the export structure to the US gradually move more towards electronic data processing and electronic components, and lessening both consumer electronics as well as household appliances. In 1993 this leaves them in a similar place as South Korea's export structure. As for import, there has been a big focus on importing electronic data processing at 59.1% in 1980, with electronic components at 19.6% and the rest of the import categories being relatively insignificant. Over the course of the 1980's and start of 1990's, we see a shift from a majority of electronic data processing, to a majority of electronic components, with electronic data processing dropping to 29.8% and electronic components increasing to 49.1%.

Overall this shows that even though these 3 different countries in the first surge of investments, didn't have the same import structure initially, but they all gradually moved towards

a similar import structure by the 1990's. As for export Taiwan is a bit of an outlier with a much bigger focus on electronic data processing, and almost no consumer electronics. The other two countries have a similar composition, with South Korea having slightly more electronic components than Hong Kong, and Hong Kong having slightly more electronic data processing.

If we then look at the second surge of investments we get a different picture in both the import and the export structure. Focusing on the export structure of Singapore, Malaysia and Thailand, we see a much larger emphasis on the export of electronic components.

	USA % composition of exports						USA % composition of imports				
Singapore	1980	1985	1988	1990	1993		1980	1985	1988	1990	1993
Electronic data processing	24.7	39.6	47.9	33.8	31.1		0.7	34.8	46	61.9	71.7
Office equipment	5.1	2.3	1.2	1.8	0.8		3.4	1.8	2	1.9	1.4
Telecommunication	2.7	1.4	1.2	2.1	1.8		0.3	1	3.7	1.4	0.4
Electronic components	43.2	42.9	31.5	41.6	51.4		52.8	24.9	18.9	16.6	14.8
Consumer electronics	4.9	2.2	9.1	16.1	11.6		16.5	14.8	11.3	9.7	7.3
Household appliances	5.5	0.8	0.6	0.8	0.5		4.8	6.1	2.2	1.5	1.1
Other electronics	13.9	10.7	8.4	3.8	2.8		21.4	16.6	15.9	7.2	3.3
Total electronics trade	100	100	100	100	100		100	100	100	100	100

Figure 2.6: Import and export composition of Singapore (WTO, nd)

	USA % composition of exports						USA % composition of imports				
Malaysia	1980	1985	1988	1990	1993		1980	1985	1988	1990	1993
Electronic data processing	4.4	3.1	2.9	5.5	8.3		0.1	2.6	0.5	5.2	19.6
Office equipment	1	0.1	0.1	0.3	0.1		0	0	0.1	1.3	1.4
Telecommunication	1.5	0.7	1	0.8	1.4		0	0.9	0.6	6.6	4.1
Electronic components	87.1	92.8	93.7	90.9	83		93.5	80.4	75.1	53	38
Consumer electronics	1.2	0.3	0.2	0.5	3.4		0.9	8.5	15.5	27.3	30.9
Household appliances	0.8	0.1	0.1	0.2	0.1		0	1	0.2	0.1	0.8
Other electronics	3.9	2.9	2.1	1.8	3.5		5.4	6.7	7.9	6.5	5
Total electronics trade	100	100	100	100	100		100	100	100	100	100

Figure 2.7: Import and export composition of Malaysia (WTO, nd)

	USA % composition of exports						USA % composition of imports				
Thailand	1980	1985	1988	1990	1993		1980	1985	1988	1990	1993
Electronic data processing	14.3	12.8	8.5	12.5	20.1		0	3	38.9	32.4	41.5
Office equipment	3.7	2.4	0.3	0.8	0.3		0	0.1	0	1.6	6.2
Telecommunication	4.2	1.4	2.7	1.8	4.1		0	0.2	0.5	7.3	9.3
Electronic components	43.3	63.6	79.9	67.1	52.1		99.8	83.4	51.2	24.8	17.1
Consumer electronics	3.1	2	0.8	9.1	13.4		0.2	0.2	2.5	23.3	16.5
Household appliances	4.2	0.5	0.6	0.7	1.3		0	0.1	3.4	7.6	6.1
Other electronics	27.2	17.3	7.3	7.9	8.7		0	13	3.6	3	3.3
Total electronics trade	100	100	100	100	100		100	100	100	100	100

Figure 2.8: Import and export composition of Thailand (WTO, nd)

Of these three, Singapore differentiates itself, in that the import of electronic data processing is notably higher than the other two countries. Comparatively Malaysia has much less import of anything other than electronic components, which accounts for 87.1% of the entire import in 1980. In 1993 this number has shifted to 83% for Malaysia, with a few more percentages of electronic data processing, which went from 4.4% to 8.3%. Thailand on the other hand, has a similar import of electronic components to Singapore, but a much higher import of other electronics at 27.2% in 1980, which then declined to 8.7% in 1993. This meant a rise in the import of electronic components as well as consumer electronics and electronic data processing. Overall Singapore has a very similar import composition at both the start and the end of the priod, as well as Malaysia. Thailand has somewhat changed the import over the period. On the export side we see a much larger development, and this is also where we get to see the impact of the surge of investments. If we start at Singapore, the export of electronic components, was at 52.8% in 1980, with 16.5% going to consumer electronics and 21.4% at other electronics, with almost no electronics data processing. Already in 1985, the electronic processing export raised from 0.7% to 34.8%, which is a massive increase in export. This rise in electronic data processing export mainly shifted from the electronic components, as well as a bit from other electronics. This trend would then continue up until 1993, where the export composition was primarily electronic data processing at a whopping 71.7%, with electronic components sitting at 14.8% and other electronics having fallen from 21.4% to 3.3% Both Malaysia and Thailand started out with a similar export structure in 1980, with 93.5% of Malaysias export going to electronic components, and an astounding 99.8% of Thailands, going to electronic components as well. Over the course of the 1980's both of these countries gradually shift away from electronic components and more into electronic data processing as well as consumer electronics. By 1993 Malaysia had seen a significant decrease in electronic components, as it only made up 38% of the total electronics export. In turn electronic data processing was up to 19.6% and consumer electronics up to 30.9%. Similarly Thailand saw a vast decrease in export of electronic components, going from the previous 99.8% down to 17.1%, with the big export in 1993 being electronic data processing at 41.5%. Thailand also saw an increase in consumer electronics like Malaysia, ending up at 16.5%. As a result, it seems like Singapore developed away from mostly exporting electronic components quicker than the other two countries. Furthermore Singapore had a much bigger export of electronic data processing in 1993, making it a outlier in that regard, as both Thailand and Malaysia has a bigger export of electronic components as well as consumer electronics.

Implication on the countries growth

As we see these countries shift their export in a very similar manner, having a high export of electronic components as well as consumer electronics and then shifting more towards electronic data processing. This shift is largely influenced by an expansion of export-oriented value chains by US computer firms in Asia. It is important to note that a fair few of these value chains are consisting of US companies, creating subsidiaries in these East Asian countries, and then exporting back to the US. In a similar manner Japanese firms also developed into other countries, with South korean and Taiwanese firms seeing a vastly improved competitiveness compared to previously (Ernst and Guerrieri, 1998).

Smiling Curve

If we take a look at the electronics industry when it comes to the value-added curve, then it can definitely be described as a smiling shape. Both the upstream activities, such as component suppliers, as well as the downstream activities are both adding a lot more value than the system assembly firms, which would be located in the middle of the curve (Shin et al., 2012). The system assembly firms can be divided into Original Design Manufacturers (ODM's), which is the company that originally designed the component, and component manufacturers (CM's), which is other companies hired by the ODM to produce the component for them. There can be a multitude of reasons for assembly being done by a different company, usually due to operating costs. This would give us the following smiling curve:
The upstream activities can further be divided into active components and passive components. The passive component is the components that consumes energy, but does not provide power, whereas the active components both consumes energy and has a power output because of it. The active components are things such as visual displays, and hard drives. The passives components can be described more as the backbone of the device. They don't inherently add a lot of perceived value, but are necessary for the active components to function. The passive components can also be described as standardized, as manufacturers don't have to do a lot of innovation in order to produce them (Shin et al., 2012). According to Mudambi (2008), the smiling curve has been correct when looking at which type of economy that does a specific part of the smiling curve. The advanced countries such as the US and Japan, will generally have the higher value activities, such as active components as well as most downstream activities. In comparison, emerging economies, such as South Korea, Taiwan and the rest of South-East Asia, have generally been used as producers of more standardized components, and thus doing the lower value activities.

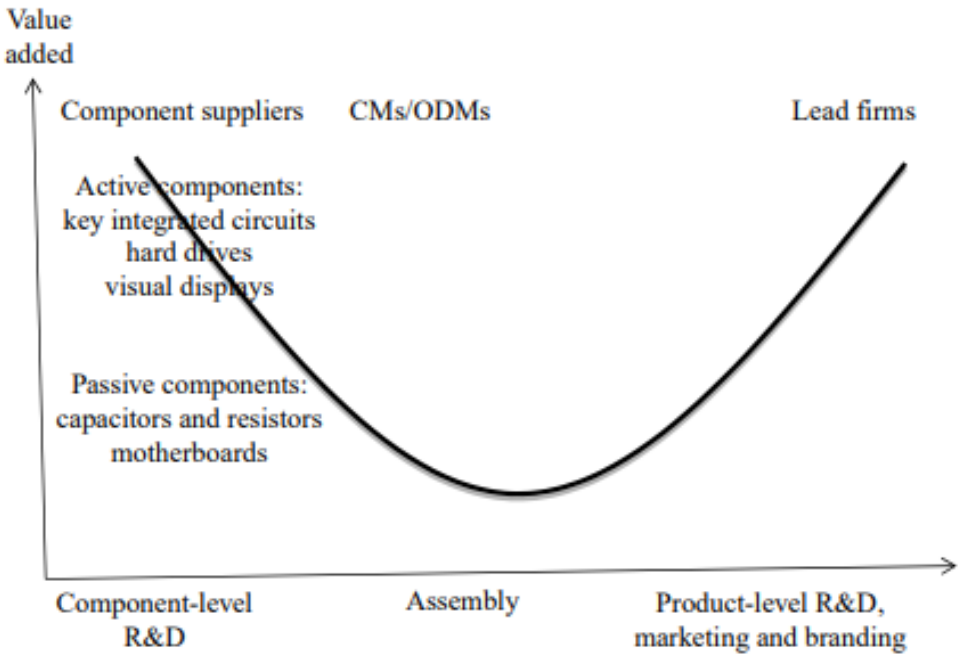

Figure 2.9: Smiling curve

2.2.2 Singapore

If we focus our attention to Singapore, we previously categorised it as one of the countries in the second wave of investments, that we would be looking at. But looking at Singapore, it differentiates itself quite a bit from both Malaysia and Thailand in regards to trade composition. Singapore proved itself to have a good infrastructure and support industries which would prove vital in the early 80's. This infrastructure was in place due to a few circumstances, previously Singapore had already had a good governing policy which helped the local industries. These industries were mainly in place due to their previous camera and optical equipment industry. This advantage has made Singapore a very attractive place to produce components, for international value chains (Ernst and Guerrieri, 1998). With the concerns of both cost of transportation, time and especially security, having a country with a well developed infrastructure that is able to support the already established industry of US value chains, can be very beneficial, and is very likely the reason why Singapore as a country saw a quicker increase in trade balance favoring export to the US. While Singapore might have lost this advantage they had prior to the 90's, there is still quite a few investments happening in the country when it comes to electronic data processing. In order to understand how Singapore has stayed competitive, even if they don't have the same advantages compared to the other countries in their region, we need to look at the labour

force. With the accumulated knowledge, they seem to be more efficient due to specializing specifically in the disk drive industry (Ernst and Guerrieri, 1998). This specialization then resulted in Singapore being a dominant country in the South East Asia for the production of disc drives already from 1985. A more specialized workforce would likely make for a much more attractive place to have that specific production, as there might be fewer errors and possibly a lower cost of the product. The ties with the US was definitely strengthened throughout this entire process, and a large part of the booming export in this time period has been due to involvement from US companies investing in Singapore. If we go back to the smiling curve, we also see that with Singapore producing a large amount of hard drives, they also derive a bigger part of the value in the value chain, as hard drives is what we would describe as an active component. By moving from lower to higher value production, it also allows Singapore a bigger. This means that it is likely that their increase in specialization has made the country richer as a whole, due to attracting foreign investment from the US.

2.2.3 Malaysia

If we shift our attention to Malaysia, it is definitely a country with a big concentration of components. Not only was the export heavily dominated by electronic components in the early 1980's, but the import as well. This indicates that Malaysia was mostly utilized as an assembly location, quite possibly due to low labour cost. That would put Malaysia in the middle of the smiling curve, meaning that the activities at this point in time in the electronics industry, was not the most valuable part of the value chain. The fact that Malaysia was occupying this part of the value chain, being the local assembly, the country wasn't able to reap the benefits in the same way as Singapore was. But throughout the 1980's, Malaysia saw a similar shift in the export patterns. Due to a shift in Japanese consumer electronics manufacturing, where a lot of production was moved from Japan to Malaysia, that production area has rapidly increased in importance (Ernst and Guerrieri, 1998).

2.2.4 Taiwan

Another interesting country to look at would be Taiwan. Taiwan being a former Japanese colony, has had close ties with both Japan as well as the US. The large jump in the export of electronic data processing, up to almost 55%, can be attributed to Taiwan having a large amount of foreign firms from these two countries. This was done through placing parts of US and Japanese firms in Taiwan, and thereby developing production of the electronic industry in the country. Because of this Taiwan achieved a certain specialization when it came to the electronic data processing market, as it dominated most of the export from

the country at that point in time. After the heavy involvement from both the US and the Japanese, the Taiwanese domestic firms were able to pick up on the methods and learn from the foreign firms, coupled with the workforce being specialized in the creation of electronic hardware products. It is worth noting that even though Taiwan has achieved this specialization, they don't produce the components themselves, but instead rely on a large amount of imports for the actual material components. But where Taiwan is differentiating itself from Malaysia is that they are mostly producing the finished products whereas Malaysia also had a significantly higher export of electronic components (Ernst and Guerrieri, 1998).

CHAPTER 3

Discussion

Looking at the econometric panel data models made in chapter 1 there is a clear indication of the effect of trade with the technology leader, the US. As expected, the models seems to indicate that a small amount of trade with the US is beneficial but the rather large diminishing returns make it detrimental at higher values. Furthermore it is worth noting that as expected the effect of import is somewhat larger than that of export, which logically makes sense at that allows for easier diffusion of knowledge within the follower country. However, as the model follows the assumptions made by Abramovitz (1986) and does not allow for knowledge spillover to happen from anyone but the technology leader, there is a chance that the models are somewhat misspecified, and that the estimations are biased. The assumptions made by Abramovitz are that there is only one technology leader, that the position of technology leader is unable to change and that technology spillovers only happens from the technology leader to the follower countries. The realism of these assumptions are very questionable though, as there is no logical reason why knowledge diffusion could not happen from another country than the technology leader, and historically that is likely to have happened. The largest trading partner of East Asia in this time period wasn't the US but Japan. Japan during this period was technologically far ahead of its peers in the region and it seems likely that the majority of the knowledge diffusion happened from Japan rather than from the US. As such a more optimal choice for technology leader might have been Japan. According to the model, the variable for exogenous growth, investments, seem to widen the technology gap between the subject country and the US at lower levels and only at very high levels of investments will it yield benefits. This is a very surprising result and might have a variety of causes, it might be that the aforementioned misspecification has caused this variable to become biased, it is also possible that this behaviour is because the model doesn't consider time lags, as investments made one year should not have immediate observable effects on the economy and the benefits would only be visible at a later date.

Whatever the case the effect of investments on growth is a well documented fact within the literature and it seems unlikely that it should not be the case here (Booth, 1999; Petri, 1993; Martin and McKibbin, 1999). If we look at specific countries in South Korea as well as Taiwan, they are both former Japanese colonies, which means they naturally have ties with Japan. Therefore, if we go back and look at the waves of investment, that might very well be a reason as to why those are two of the countries that had a quicker surge in economic growth. Prior to the heavy US involvement in East Asia, Japan was the primary driving factor in the growth of both Taiwan and South Korea, as Japan moved parts of their production to those countries, and thereby helped develop their domestic firms. Looking at the second wave of investments being most of South East Asia, which would include Malaysia, Thailand and a few other countries, the growth happened a few years later than the countries that saw the first wave of investment. Interestingly enough an outlier in this regard would be Singapore. While Singapore did not have the investment happen as early as Taiwan and South Korea, it saw a massive surge once foreign investors took an interest in the country. In order to find the reason for Singapore's quicker surge of development, we would most likely have to look at Singapore historically as an important trade port. Already before the war, Singapore was considered an important military dockyard (McIntyre, 1979), which probably laid the groundwork for the infrastructure that would later help commercial trade. Later on, the surge of US investments and outsourcing of certain parts of the production, and thereby the value chain, would occur. This is when other countries, such as Malaysia and Thailand really started growing as well, but unlike the previous countries, these would initially only be used for lower value assembly, and the change into higher value production was slower (Kreinin and Plummer, 1994). Nonetheless, it still added a lot of value to the countries, and most definitely helped the country develop and grow. A general trend we see in all these countries is specialization. Each country had involvement from the US and/or Japan in the form of foreign companies, and was able to learn from those foreign firms in order to improve the domestic production. A country such as Taiwan really took advantage of this whole process, and became market leaders in certain products such as the manufacturing of disc drives (Ernst and Guerrieri, 1998; Shin et al., 2012). As we concluded in our model based upon Verspagen's convergence growth model, we see a strong indication that low amounts of trade is very beneficial to the growth of a country, but at higher values it becomes detrimental due to foreign companies crowding out domestic businesses. Logically this makes sense as it would not take a multitude of products to be produced, for the subject country to be able to copy the technology, and for the knowledge to diffuse. This is backed by the results of the export composition analysis, as we can conclude that domestic firms were able to draw upon the foreign firms placed in their country, and then later develop

their own domestic markets. Another very significant conclusion that has been drawn from the export comparison, is that the ability to attract foreign investors is largely dependent on investments made to the country in regards to infrastructure. This is especially important as a countries infrastructure and government policies are compared to close and/or neighboring countries, in order for foreign investors to choose the optimal location for a subsidiary. In opposition to that, table 1.2 seem to indicate that investments have very little effect on a country's growth or indeed might be detrimental. However as previously mentioned, this fact might stem from some form of misspecification that is causing the variable to be biased, and as such should not be taken as hard evidence that this is indeed the case. Observing tables 1.3 and 1.4 it seems like the poorer East Asian countries are much more sensitive to the presence of foreign trade, this makes sense as the poorest countries have the worst conditions for competition with firms from richer countries. However it should be mentioned that that the estimators (especially for export) are much less significant than in table 1.2. This makes sense as the sample size is getting rather small at this point and this erodes the confidence we are able to put in the estimations.

CHAPTER 4

Conclusion

The disparity in economic growth in East and South-East Asia, is definitely impacted by the proximity to a technologically more advanced country, and much economic growth has been derived from subsidiaries of foreign firms in the developing countries, however it is not the only factor. Other factors would include the presence of human capital as well as the infrastructure of the country, as that would make for a better trading partner. Without the necessary infrastructure and governing policies, it might be difficult for a country to attract foreign investors, which is a factor that would seem to greatly impact the development of the domestic industries. This has led to certain countries such as Taiwan's and Singapore's electronics industries becoming heavily specialized, and thus reaping the economic benefits of being market leaders in their respective areas. The human capital and infrastructure is also a necessity for the knowledge spillover to take place, as without the infrastructure and a sufficiently well educated population, the country will be unable to utilize the modern technology and fall further behind as a result. Table 1.2 seemingly indicates that some amount of trade between the US and the East Asian countries is beneficial to the country, but excess amounts of it is very detrimental due to domestic firms being incapable of competing with foreign firms. One should keep in mind though that the model is based on several assumptions that might not be the most realistic, most notably that the knowledge spillover effect can only happen from the one technology leader who remains the technology leader indefinitely. In reality Japan might have been a better fit for technology leader in the region rather than the US as much more trade happened between Japan and the subject countries than with the US and because Japan was very technologically advanced, even for the time. We can therefore conclude that the proximity to the US is a factor in explaining the growth differential, but it is far from the only factor and might not be the most important.

Bibliography

(n.d). World trade organization. https://data.wto.org/. Accessed: 2021-3-16.

Abramovitz, M. (1986). *Catching Up, Forging Ahead, and Falling Behind. The Journal of Economic History*, 46(2):385–406.

Aerotropolis Institute China (N.D.). *Ruth Banomyong, PhD*. Retrieved from https://www.aicthink.com/en/services/expert/detail/id/108.html. Accessed: 2021/05/19.

Banomyong, R. (2010). Supply chain dynamics in asia. Working Paper 184, Thammasat University - Faculty of Commerce and Accountancy, Bangkok.

Bhutta, K. S. and Huq, F. (2002). Supplier selection problem: a comparison of the total cost of ownership and analytic hierarchy process approaches. *Supply Chain Management: an international journal*.

Booth, A. (1999). Initial conditions and miraculous growth: why is south east asia different from taiwan and south korea? *World Development*, 27(2):301–321.

British Council: Thailand (N.D.). *Dr.Ruth Banomyong*. Retrieved from https://www.britishcouncil.or.th/en/drruth-banomyong. Accessed: 2021/05/19.

Burrell, G. and Morgan, G. (1979). *Sociological paradigms and organisational analysis*. Taylor and Francis, Oxfordshire, UK, 1st edition.

Centre for International Governance Innovation (CIGI) (N.D.). *Dieter Ernst*. Retrieved from https://www.cigionline.org/person/dieter-ernst. Accessed: 2021/05/19.

Creese, R. C. (2000). Cost management in lean manufacturing enterprises. *AACE International Transactions*, page C5A.

Ernst, D. and Guerrieri, P. (1998). International production networks and changing trade patterns in east asia: The case of the electronics industry. *Oxford Development Studies*, 26(2):191–212.

Hauge, J. (2020). Industrial policy in the era of global value chains: Towards a developmentalist framework drawing on the industrialisation experiences of south korea and taiwan. *The World Economy*, 43(8):2070–2092.

Hurkens, K., van der Valk, W., and Wynstra, F. (2006). Total cost of ownership in the services sector: a case study. *Journal of Supply Chain Management*, 42(1):27–37.

John K. Shank, V. G. (1992). Strategic cost management: The value chain perspective. *Journal of Management Accounting Research*, 4(Fall).

Kreinin, M. E. and Plummer, M. G. (1994). Structural change and regional integration in east asia. *International Economic Journal*, 8(2):1–12.

Martin, W. and McKibbin, W. (1999). *The East Asian crisis: investigating causes and policy responses*. The World Bank.

McIntyre, W. D. (1979). *The rise and fall of the Singapore Naval Base, 1919-1942*. Macmillan.

Petri, P. A. (1993). *The Lessons of East Asia: Common Foundations of East Asian Success*. The World Bank.

Shin, N., Kraemer, K. L., and Dedrick, J. (2012). Value capture in the global electronics industry: Empirical evidence for the "smiling curve" concept. *Industry and Innovation*, 19(2):89–107.

The World Bank, United Nations Conference on Trade and Development (UNCTAD) (N.D.). *Wolrd Integrated Trade Solution*. Retrieved from `https://wits.worldbank.org/Default.aspx?lang=en`. Accessed: 2021/03/12.

United Nations University (N.D.). *Verspagen, Bart*. Retrieved from `https://unu.edu/experts/verspagen-bart.html#profile`. Accessed: 2021/05/19.

Verspagen, B. (1991). *A New Emperical Approach to Catching Up or Falling Behind. Structural Change and Economic Dynamics*, 2(2):359–380.