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台灣新南向政策之產業發展機會—以優勢企業為例

The Opportunities under Taiwan's New Southbound Policy —Using Competitive Firms as an Example

Student: Jen-yao, Yu
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摘要

中國大陸致力推動一帶一路，目標著重在全球放貸興建基礎設施，與我國新南向政策透過我優勢與創新產業拓展市場不同，兩岸政策互不干擾，甚至一帶一路鐵公路與高鐵建設完成後，更有利我國產業在新南向國家發展，例如陸企在東協國家架設光纖電纜後，我國可增添智慧裝置，亦可在大眾運輸工具上加裝顯示裝置及物聯網設施。

本研究先以東協及南亞國家為主體，探討其對中國大陸及台灣貿易關係，發現自 2000 年以來，其等對中國大陸機電產品貿易增長迅速，多為中間財，顯示彼此在該領域融入供應鏈漸深，此對我國相關產業經貿與投資恐造成排擠，因台灣重點產業為半導體、車用電子，再加上資通與視聽產品，佔整體出口約 44%。此外，台灣上述產業亦面臨諸多挑戰：韓國三星致力發展晶片設計與製造、美中貿易戰威脅台灣設計大陸組裝而銷往美國之產業、中國大陸等多國政府均斥資培養科技人才、美英日以(色列)在開發 AI 晶片、AI 應用及超級電腦已是全球龍頭等。

此外，我國在全球供應鏈上的加工附加價值漸次提升，主要是因掌握關鍵技術，使我國專業 ODM 產品如晶片等，在全球市佔率約 66%，換言之，國際知名品牌製程中需將產品送到台灣設計與加工，顯示台商產能、成本、交期及與品牌整體系統相容等均受肯定，而受益於產業聚落，此產業生態環境造就其他產業蓬勃發展，如 IC 晶圓 ODM 帶動 IC 封測、設計及設備廠的發展，而主機板與 PC 大廠的技嘉、華擎、仁寶、緯創亦跟進申請許多關鍵專利技術。

本研究最後探討以我國優勢產業尋求新南向國家 22 億人口市場之商機，從電子產品在地化功能、交通工具及製造業升級等方面，找出該等國家需求，並彙整設廠成功台商，作為相關領域上下游廠商前往設廠之參考，另亦建議政府與同業公會以共同研發、舉辦論壇及設立學校等方式，協助我國科技與製程優勢產業往新南向國家發展。

本研究採用描述統計及文獻分析法，從經貿數據等資料找出我優勢產業，再從各類文獻尋求前進新南向市場可行建議，如何發展新南向國家市場作為我國企業避險，同時嘉惠彼此企業。

關鍵字：新南向政策、半導體、電子、工具機、車用電子、工業 4.0

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Abstract

Mainland China is promoting the One Belt and One Road Initiative and its focus is on infrastructure-building, while Taiwan's New Southbound Policy focuses more on helping its industries find business opportunities. Therefore, the OBOR and the New Southbound Policy are not contradicting each other. They could even be complementary. For example, Taiwan's ETC network system could be useful to public transportation in New Southbound countries.

This study is based on the ASEAN and South Asian countries and explores their trade relations with China and Taiwan. It found that since 2000, trade in mechanical and electrical products in China has grown rapidly, mostly in intermediate goods, showing that China and ASEAN are integrated in this field. As the supply chain is getting deeper, China's trade with ASEAN countries may affect Taiwan's business opportunities because Taiwan's key industries were semiconductors, automotive electronics, and ICT products, which accounted for 44% of the total exports. In addition, those Taiwan sectors have faced other external challenges. For example, Samsung puts significant effort in developing new chips; US-China trade friction can impact the products that are ordered or designed in Taiwan, assembled in China and then sold to the US; Britain is developing IPU（Intelligence Processing Unit）; China and Singapore have invested in developing the workforce of semiconductor industries; and Japan, the US and Israel are the world leaders in the development of AI chips, AI applications and supercomputers.

In addition, Taiwan's processing added value in the global supply chain has gradually increased, mainly due to the mastery of key technologies. For example, Taiwan's semiconductor fabrication held around 66% of market share in the world in 2017. Those well-known brands had to send their products to Taiwan to conduct value-added process because foreign buyers highly trusted its capacity, cost, timely delivery, and compatibility. Taiwan's advantage, in turn, benefited the industry clusters. Therefore, Semiconductor fabrication ODM made PCB and PC corporates prosper.

This study further explored the business opportunities of Taiwan's competitive industries, including electronics, transportation and manufacturing upgrades, to seek the market of 2.2 billion people in the New Southbound countries. We tried to identify the industrial needs of these countries and collected some evidences from Taiwanese companies which successfully extended their factories into New Southbound countries. Finally, we provide suggestions for Taiwanese government and business sectors. It is also recommended that the government and the trade associations assist the development of Taiwan's science and technology and process industries to the New Southbound countries through joint research and development, forums and setting up education and training institutions.

This study uses the method of citation analysis to explore China's OBOR and its impact. It uses a descriptive statistics method to find out about trade relations between China and Taiwan, and China and ASEAN countries. Then, it tries to identify Taiwan's competitive industries and business opportunities in New Southbound countries. The suggestions which we come up with should benefit Taiwan's corporates and the New Southbound countries.

Key Words: New Southbound Policy, semiconductor, electronics, machine tools, automotive electronics, industry 4.0

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1. Introduction

Research motivation and background

China's BRI project has been in the spotlight. Its infrastructures-constructing all over the world impacts the geo-economy and gains negative comments continually. For example, CSIS director of reconnecting Asia Project, Jonathan E. Hillman（2018） pointed out that China invested on the infrastructure constructing plans in 34 Asian and European countries, but there were 89% of the constructors belonging to China. On the contrary, among the World Bank's and Asian Development Bank's constructing plans, there were 41% of the constructors coming from local countries, 29% from China and 30% from other countries. It illustrates BRI is not as inclusive as China promotes. However, BRI is not necessarily wrong for a Taiwanese businessperson. For instance, The China-Europe Railways facilitated Foxconn's logistics.

The scope and influence to global economics and trading of BRI are so broad that whether Taiwan joins in or not Taiwan must be affected. It's, therefore, essential to study the impact on Taiwan's trade with ASEAN and South Asian countries from Taiwan's perspective. This research would discuss the trading relations between ASEAN/ South Asia and China/ Taiwan.

I. BRI's brief outline and impact

i. build massive infrastructure globally

Mainland China is constructing infrastructure vigorously around the world in recent years and establishing international institution and organizations to enlarge its status. The projects include a dam in Mekong's upstream, Darwin port in Australia and Gwadar Port in Pakistan. The international organizations include the Silk Road Fund.

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They all impact the global geopolitics, strategies, and also the aspects of the economy, military, and environment.

ii. The primary purpose of BRI is to connect to Europe

In 2013, Xi Jinping proposed "Silk Road Economic Belt" on September in Kazakh, "21st Century Maritime Silk Road" in Jakarta. The Belt connects roads to Europe through central Asia, Russia, West Asia, Persia, Mediterranean, Baltic Sea. The Road connects to Europe through maritime route, including South East Asia, South China Sea, South Asia, Indian Ocean. There are Six Economic Corridors, which are New Eurasian Continental Bridge Economic Corridor, China-Mongolia-Russia Economic Corridor, China-Central Asia-West Asia Economic Corridor, China-Indochina Peninsula Economic Corridor, China-Pakistan Economic Corridor, Bangladesh, India, and Myanmar Economic Corridor. The primary purpose of BRI is to connect Eurasia. Besides, China proposes five connection, which are policy communication, facility connection, trade streamlining, currency flow, and people's heart merging. Chinese bureaucracy works on those areas.

iii. BRI's strategic goal is to facilitate the trade, upgrade Chinese industries, and help the industries go overseas and make Eurasia center on China

There are three strategic purposes for BRI. First, to enhance the communication in between Eurasia, including the roads through road, sea, and the internet (Li, 2017). Second, to improve the Chinses good's market share, guide the Chinese industries to go abroad, and transform the excess capacity to formulate Eurasia regional economic integration (Chuang, 2015). Third, to gain the international trade and financial discourse right and promote the influence of RMB among international currencies (Wu, 2016). In other words, China uses BRI to encourage the cooperation on infrastructure with other countries and make Chinese merchandises streamflow in the world. It also aims to acquire energy and materials to ensure the resources are secured.

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At the same time, it buffers the excess capacity and reduces the unemployment during structural transformation. It can also upgrade the RMB internationalization. Even, China might breakthrough or dodges military besiege by the first Island chain, second Island chain (Qian, 2015). Thus, China builds ports in Djibouti and Gwadar may gain more strategically than the military and economic interests. Besides, Chen (2015) think Xi proposed it one year after becoming a top Chinese leader. First, it could be his most significant political legacy. Second, it would become the new strategy for China's development. Third, it would solve the long-term downgrading growth rate and its problem. Forth, it could develop national facility and infrastructure industries. So, to zoom out and look at BRI could find three international politics: practicing China Dream and the new type of global strategy, balancing the development of maritime and land, breakthrough the limitation geopolitically (Li, 2015).

Cao Wenlian, an official from Chinese National Development and Reform Commission, said in June 2017 that Xi believes BRI is a project promote China and global economy. It aims to bring a new round of globalization 2.0.

iv. China takes it as a platform to help other countries build infrastructure

Nowadays, there are many developing countries lacking electricity and transportation network, so their industries are limited. China offers money and technology and helps the local states and China itself at the same time. Besides, BRI could secure China’s energy and resources supply. Christopher K. Johnson (2016) believed that China used BRI as a measure to further ‘Going Global’ and restructure its economy. BRI symbolize that China enlarges influence overseas and become a leading global power. PRC asks every province to join the huge investment projects. It’s a practical implementation strategy of The Chinese Dream.

Seoul Foreign School Professor Li (2015) said that Chinese industries could benefit from BRI, and take the chance to spend excessive capacity.

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Asian Development Bank reports in 2009 that the needs for infrastructure in Asia from 2010 to 2020 are up to $8 trillion. This figure illustrates Asia's potential for economic development. China uses 10% of its foreign exchange depository as the fund for BRI.

v. US scholars' perspectives on BRI

Sri Lanka took a loan from China to build Hambantota Port and Mattala Rajapaksa International Airport. Originally, Sri Lanka hoped to thrive with them, but eventually, visitors are few. However, Sri Lanka has to pay $1.1 billion in debt. Only interest makes up $23.6 million, equal to 90% income of Sri Lanka. Thus, it gave the control right to China for 99 years trading to get rid of its debt. Locals were protesting. Sri Lanka's scholar Amantha Perera thought the project brightly, but now his dream shatters. He thought his country sold out important treasure. Sri Lanka took a loan to build the Hambantota but lost the port's sovereignty at the same time. Same as Djibouti, Kyrgyzstan, Laos, the Maldives, Mongolia, Montenegro, Pakistan, and Tajikistan (Green, 2018), etc.

Sri Lanka might be just one of many countries' lessons. For example, China lent Pakistan $1.2 billion and put $52 billion to build a highway, energy transportation, electronic facilities, and industrial parks. Also, there is a $46 billion Gwadar Port project. Meanwhile, Pakistan's foreign exchange reserves are less than $20 billion.

Other countries and their loans like China use $6 billion to connect railroad and high way and bridges for Lao and its eight neighboring states. China's building military base in Djibouti, railroad from Mombasa to Nairobi in Kenya, High-Speed Rail from Budapest, Hungary to Belgrade, Serbia. There are more than hundreds of projects are under the BRI structure.

Professor Brahma Chellaney from New Delhi's Center for Policy Research believes that China's projects are so attractive that small countries can not restrict, but

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they take loans like infect with drugs. They then plunged into debt enslavement. It's obviously under China's calculation.

Assistant Professor Eisenman (2017) from the University of Texas at Austin believes that China has no chance to intervene in the local country's policy. In case Sri Lanka expulses Chinese, China would have to protect its port. It's the same scenario the British Empire faced during the colonial period. It led to protest become the reason why the British Empire went down. Cornell University Professor Eswar S. Prasad said one serious problem of those investments is that it goes to the countries which face economic weakness, instability, and corruption.

In sum, US scholars perceive that some countries are under threats of Chinese economist colony. Some even think that BRI repeats the mistakes of the British global colonialism. The colonialism would make all parties lose.

II. Mainland China is still our essential trading partner. New Southbound Policy should take BRI into consideration

Based on the data from Taiwan's Ministry of Economic Affairs, our exports to China and Hong Kong account for up to 41% of total exports. The second large export market in ASEAN which takes up to 18.5%. Therefore, no matter we are planning to cut down the percentage of trading with China or joining in BRI, our policy should take BRI's impact on our businesses into consideration.

Foxconn chairman Terry Gou 2012 said that he set up factories in Brazil, Vietnam, and India. In Brazil, he found that the building efficiency was low. He spent four times more working days than set up factories in Mainland China. Indians self-suicide rate was ten times more than Mainland China, and the average speed in Indian highway was 30 kilometers/ hour. Vietnamese require the same salary standard with Mainlanders, but Vietnamese would sometimes strike without warning. Therefore, he chose Mainland China as his primary investment target.

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i. The influence of BRI to Taiwan's New Southbound Policy: Many countries cast doubt on BRI. For Taiwan, the Cross-Straits relations did influence whether Taiwan could successfully reach a trade deal with other countries. Therefore, whether China would insert clout along with BRI and make Taiwan trading environment exacerbate? Or obstruct Taiwan's New Southbound Policy? We hoped this research would help us know more about the changes and impacts China make to its trading partner along with its BRI.

ii. Leverage language and cultural advantages to conduct research: Generally speaking, Taiwanese enjoy the advantage of studying China's central policies because of Taiwan's language and culture. Then, the research would be published in English to contribute some viewpoints to the international communities. Meanwhile, Taiwan's policymakers could also benefit from this kind of research.

research framework

(1) How BRI as a outer factor shape ASEAN and South Asian trading environment

(2) What're the main trading products between CN/ TW/ New Southbound countries

(3) Research result: electronics are both the main trading products for CN and TW

(4) How can Taiwan cope with BRI

(5) Suggestions to utilize Taiwan's advantages

Research Methods:

I. document analysis

We studied the books, journals, official promotional materials and films that revealed the concepts of BRI and New Southbound Policy. We asked ourselves what sectors benefited from BRI and New Southbound Policy. Therefore, this thesis tried to find out the strengths of Taiwan's business, including ICT, automotive electronics, tool machines, etc., and the key reasons make them prospered. Besides, in this study, we

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collected the needs of New Southbound countries. Hopefully, this research could propose suggestions and practical measures to utilize potential business opportunities in the New Southbound markets.

II. statistical methods

We used statistical methods in this thesis. We collected the trading data from PRC's National Bureau of Statistics and ROC's Ministry of Finance. However, the raw materials were too many, so we used this method to organize and sort them out. In this research, we organized those trading data into tables and figures. We tried to find out the potential business opportunities in ASEAN markets for Taiwanese businesspeople.

III. comparative analysis

We used this method to compare objectives. For example, we found some significances from Taiwan's trades with foreign countries, and also the trading data between China and other countries, particularly with ASEAN/ South Asia countries. Taiwan's public sectors included IC industries, which illustrated that TSMC accounted for 56% of global chip ODM. Taiwan also had some other outstanding industries, including infrastructure systems, automotive components, medical equipment, textiles and footwear, disaster management, and automatic machinery. Then, we compared these figures to realize how Cross-Straits policies compete and cooperate. Hopefully, we could find out the strengths, weakness, opportunities, and threats to Taiwan's industries.

IV. historical method

We sorted out China's economic development theories and its challenges up to present so that we might better understand what problems China wants to solve by BRI. Regarding Taiwan, we had Southbound Policy before, and we passed the guidelines for strengthening the economic and trade cooperation program in Southeast

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Asia in 1994. However, the challenges when invested in ASEAN countries were never too few. The recent financial problems stimulate Taiwan to adopt the New Southbound Policy.

Research scope:

I. timeframe: from Oct. 2013 to Sep. 2018

The thesis sets the period from Oct. 2013 to April 2018 mainly because China proposed BRI in 2013. After collecting and sorting all the data in 2017, it focusses on the possibility and potential extension for Taiwanese business moving to New southbound countries before Sep. 2018.

II. Because of the time limit, the thesis couldn't describe all of the infrastructures but focus on electronics mostly. The complete research briefly describes the trading relations between China and those countries and find out the critical merchandise, which is electronics. Then, it moves to Taiwan's trading structure and finds out our advantage technology, which also lies in electronics. Finally, it will illustrate the critical finding that even Japan and the US have a long time and well-accepted products and brands in new southbound countries, Taiwan still has its strength. So Taiwanese business could seek the possible cooperation with those brands and expand its business territory together.

III. Because of the limits of time and ability, a writer can't help directly interview officials, businesspeople, scholars. Fortunately, there are abundant data written by authoritative sources, which have reputation and credit much higher than a writer. So, those secondary data would be used to compensate for the research.

This research divides into five chapters. The first chapter explains the research motivation and purpose. The second chapter is the literature review, which describes the inclination of the trading structure between ASEAN/ South Asia and China/ Taiwan. The Third chapter is the key findings. It analyzes the trade structure of China

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and Taiwan. It shows that the electronics sectors between Taiwan and the Mainland are more competition than cooperation. Chapter four illustrates the challenges of Taiwan's industries. Finally, the fifth chapter gives suggestions to Taiwanese government and sectors.

2. Literature Review

This chapter would explore the economic and trading relations between ASEAN/ South Asia and China/ Taiwan. It would also illustrate the advantages of Taiwan's firms in New Southbound countries.

2.1. The trading between ASEAN/ India and China/ Taiwan

The economic performance and the domestic consumption expenditure in recent years.

OECD (2018) pointed out that the GDP growth rate of ASEAN in 2017 was 5.1%. The population of this area was $620 million. Its economic scale was $2.6 trillion. It owns excellent investment potentials. Due to the low labor costs, growing internal demand, and the improvement of infrastructures, this area became an area of thriving manufacturing beside China. IMF expected that ASEAN would become the fifth largest economic entity by 2020.

However, the performances of those countries varied. Based on OECD's statistics, in 2017, the growth rate of Singapore was 3.2%, 7.1% for Maynmar, 6.6% for the Philippines, 6.3% for Vietnam, 3.8% for Thailand, 5.5% for Malaysia, and 5.0% for Indonesia. Shown as the following figure and table:

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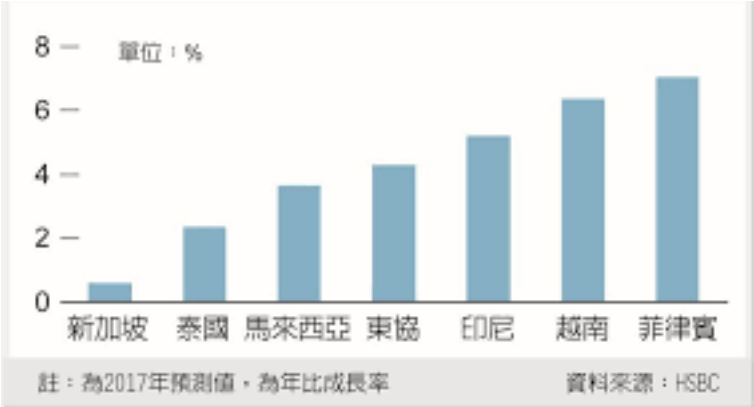
Figure1 ASEAN's consumer spending growth rate



source: HSBC. Economic Daily (2017) made

Table 1 The economic growth rate of ASEAN in 2016-2017

	2016	2017	2018-22 (average)	2011-15 (average)
ASEAN-5 countries				
Indonesia	5.0	5.0	5.4	5.5
Malaysia	4.2	5.5	4.9	5.3
Philippines	6.9	6.6	6.4	5.9
Thailand	3.2	3.8	3.6	2.9
Viet Nam	6.2	6.3	6.2	5.9
Brunei Darussalam and Singapore				
Brunei Darussalam	-2.5	0.0	0.5	-0.1
Singapore	2.0	3.2	2.3	4.1
CLM countries				
Cambodia	6.9	7.1	7.2	7.2
Lao PDR	7.0	6.9	7.1	7.9
Myanmar	5.9	7.2	7.4	7.3
China and India				
China	6.7	6.8	6.2	7.9
India	7.1	6.6	7.3	6.8
Average of ASEAN-10	4.8	5.1	5.2	5.1
Average of Emerging Asia	6.4	6.4	6.3	7.1

source: OECD

From 2018 to 2022, the average growth rate of ASEAN would be around 5.2%. Meanwhile, India's would be 7.3% on average. China's would be 6.2% on average.

Even ASEAN had planned to cut down the trading barrier and build a single market, many companies in ASEAN still faced many restrictions. Capital Economics pointed out that the trading among ASEAN was low and only accounted for about

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20% of their total trading. This percentage is far less than the EU's figure: 60%.

2.2. Trading structure shifting between China and Southern Countries

Some significances are as followed:

I. China is the largest exporting country for electronics. It exported $1.2 trillion, which is 1.6 times of US'. Among which, the automatic data processing worthing $137.4 billion was the highest. The phones worthing $117.1 billion was the second highest.

II. Taiwan's semiconductor fabrication and other electronics exports are facing extreme competition: the development of Chinese corporates are speed, foreign investments in Vietnam and Malaysia look fruitful, Singapore allocates budget to the development and offers preferential policies to FDI.

III. China's largest trading partner in South East Asia and South Asia are Vietnam, Malaysia, Singapore, Thailand, India, and Indonesia. The most significant trading good in 2016 was electronics. It accounted for 49.3% of total trade.

Table 2 China's trading with ASEN in 2016, value and growth rate ($, 100 million, %)

import			**export**		
products	**money**	**growth**	**products**	**money**	**growth**
Electronics	1022.5	8%	Electronics	1239.6	-6%
Agricultural products	147.3	-2.3%	Textile	241.5	6.9%
plastics	67.4	-11%	steel	165.6	7.1%
Coal and lignite	48.0	41.1%	Agricultural products	156.1	10.8%
Crude oil	37.4	134.9%	textile	89.4	-23%
rubbers	33.7	-8.7%	petroleum	79.6	24.3%
Textile	31.7	15.1%	Cultural products	51.4	-6.2%
Synthetic rubber (including latex)	27.9	177.4%	Furniture	40.6	-20.8%
petroleum	25.6	-4.5%	ceramics	39.9	-30.1%

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Liqualized oil	20.5	-23.6%	shoes	38.3	-13.8%

scource： PRC’s customs (2017/1), self-made chart

IV. The significance of the imports from Taiwan, ASEAN, and South Asia

i. The main trading items between China and Taiwan were electronics, among which were the IC products. IC accounts for the largest share of the trade in the Cross-Straits. Each year take up more 50%. The second largest one is automatic data processing equipment, namely computers. The third largest is electronics except for IC, which followed by storage media. Each one of their import from Taiwan was more than $ 1 billion. While the import of cellphone and phone were $ 1 billion separately in 2015, it was $800 million and $50 million in 2016. These figures illustrated that Malaysia and Vietnam influenced the trade of electronics within the Cross-Straits. The main imports from South East Asia and South Asia are electronics, agricultural products, plastics, coal, and rare oil; the principal exports are electronics, textile, steel, agricultural products, and apparel. Regarding individual countries, China imports plastics and rubbers from Thailand, minerals from India and Indonesia, electronics from Vietnam, Malaysia, and Singapore.

ii. The growth of Malaysia’s electronics exports was due to the demand of the Internet application communication equipment and wearing digital gadgets. They were well-received in Singapore, the US, Thailand, German, Japan, and India. The electronics’ exports were over 35.6% of Malaysia’s total exports. Besides, Malaysia has joined the CPTPP; it could enjoy discount tariff. It would be a benefit for its exports on electronics. China was Malaysia’s 2nd largest exporting market, and the largest FDI sourcing country. Gu (2018) said that many institutes expect Malaysian growth would continue. Its GDP expected to be at 5.5% in 2018.

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iii. Generally speaking, Taiwan's electronics were more competent than Malaysia's. Li and Cheng (2018) said that the global economy continues to recover steadily. Significant economies are showing their prosperities. On top of that, the demand for the mobile devices and the consumer electronics remains high. The application of AI, IoT, automobile electronic and biometrics is growing. Those situations made our export value hit a new high in the upper year of 2018. The import and export growth rate were over 2-digits.

Table 3 China's main imports from Taiwan, ASEAN, and South Asia in 2000-2016 (100 million)

year\ money	Electronics / Vietnam	Electronics/ Malaysia	Electronics/ Singapore
2000	0.2	29	28
2001	0.2	36	27
2002	0.4	57	36
2003	0.7	89	57
2004	1.2	119	78
2005	1.5	144	99
2006	2.7	165	103
2007	4	187	104
2008	7	200	102
2009	8	209	90
2010	18	329	128
2011	33	390	138
2012	75	378	134
2013	81	391	136
2014	94	360	132
2015	126	359	128
2016	142	349	119

year\ money	rubbers/ Thai land	minerals/ Indian	minerals/ Indonesia	Electronics/ Philippines

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2000	11	5	11	13
2001	11	7	7	15
2002	13	8	9	28
2003	16	15	13	56
2004	22	46	14	80
2005	24	58	23	116
2006	32	56	23	157
2007	36	91	46	204
2008	46	149	53	175
2009	42	84	57	98
2010	70	125	100	128
2011	101	110	166	132
2012	93	53	175	148
2013	99	30	184	131
2014	90	25	104	144
2015	76	19	70	136
2016	68	22	85	133

Source: UN Comtrade data base (2017)

V. Electronics contain HS 84 and HS 85 in custom categories. Excepting Taiwan, China' imports of HS 85 (Motor, electrics, audio, and video equipment and their accessories) mainly come from 10 countries, which are ROK, Japan, Malaysia, US, Vietnam, German, Philippines, Thailand, Singapore, and Mexican. 5 of them are ASEAN countries. Excepting Taiwan, China's exports go to mainly ten countries, which are Hong Kong, US, KoR, Japan, Netherland, India, German, Vietnam, Singapore, and British. Among which, there are 3 ASEAN or South Asia countries. On the other hand, China's trading with ASEAN and South Asia countries on HS 84 (Nuclear reactors, boilers, machinery, and parts) are increasing almost every year.

The following Figure2 shows that China's importing statistics on HS84 from Thailand, Philippines, Singapore, Malaysia, Vietnam, India, and Indonesia in 2000-2016:

Figure2 China's import from ASEAN and South Asia countries on HS 84 ($100 million)

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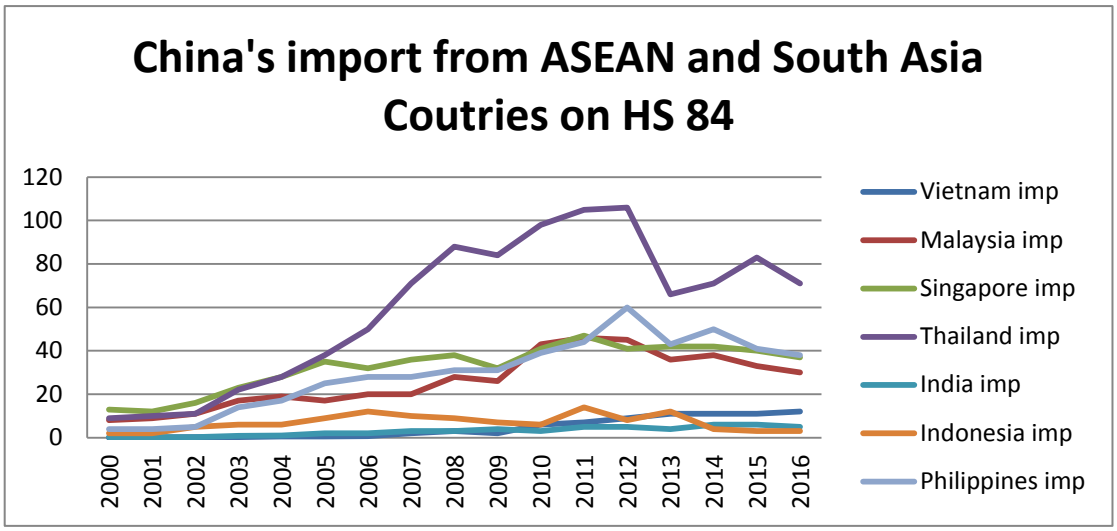
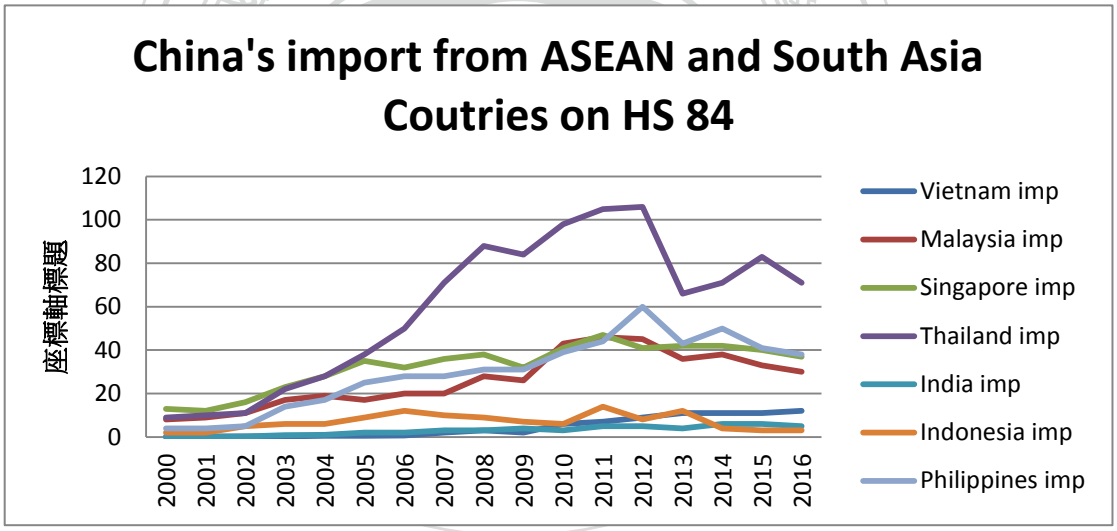


Source: UN Comtrade Database (2017)

China's main exports to India, other leading countries include Singapore, Thailand, Vietnam, Indonesia, Malaysia, and the Philippines were as followed:

Figure3 China's export to ASEAN and South Asia countries on HS 84 ($100 million)



Source: UN Comtrade Database (2017)

Table 4 China's IMEX with from ASEAN and South Asia countries on HS 84 ($100 million)

country / year	Vietnam		Malaysia		Singaport		Thailand		global	
	imp	exp	imp	exp	imp	exp	imp	exp	imp	exp
2000	0.1	1	8	2	13	11	9	5	344	268
2001	0.1	3	9	6	12	11	10	6	405	336
2002	0.2	4	11	13	16	14	11	7	521	508
2003	0.3	4	17	19	23	19	22	10	715	834

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2004	0.5	5	19	23	28	25	28	13	916	1181
2005	0.5	7	17	29	35	30	38	18	963	1497
2006	0.7	10	20	35	32	37	50	23	1091	1866
2007	2	17	20	41	36	48	71	27	1242	2286
2008	3	25	28	45	38	60	88	33	1388	2687
2009	2	26	26	38	32	69	84	31	1237	2360
2010	6	34	43	39	41	69	98	42	1722	3098
2011	7	42	46	41	47	72	105	52	1993	3538
2012	9	41	45	45	41	77	106	68	1820	3759
2013	11	59	36	54	42	82	66	61	1706	3832
2014	11	78	38	50	42	85	71	63	1794	4008
2015	11	68	33	50	40	80	83	86	1570	3643
2016	12	69	30	47	37	78	71	62	1477	3438

country / year	India		Indonesia		Philippines		global	
	imp	exp	imp	exp	imp	exp	imp	exp
2000	0.2	2	2	4	4	1	344	268
2001	0.2	2	2	4	4	2	405	336
2002	0.3	2	5	5	5	2	521	508
2003	0.8	3	6	6	14	3	715	834
2004	1	8	6	9	17	4	916	1181
2005	2	15	9	12	25	5	963	1497
2006	2	27	12	14	28	6	1091	1866
2007	3	42	10	20	28	8	1242	2286
2008	3	70	9	36	31	11	1388	2687
2009	4	76	7	32	31	10	1237	2360
2010	3	97	6	42	39	14	1722	3098
2011	5	123	14	43	44	17	1993	3538
2012	5	111	8	65	60	18	1820	3759
2013	4	102	12	56	43	21	1706	3832
2014	6	101	4	66	50	25	1794	4008
2015	6	102	3	64	41	25	1570	3643
2016	5	104	3	58	38	27	1477	3438

Source: UN Comtrade Database (2017)

China’s main imports from ASEAN and South Asia countries on HS 85 are from

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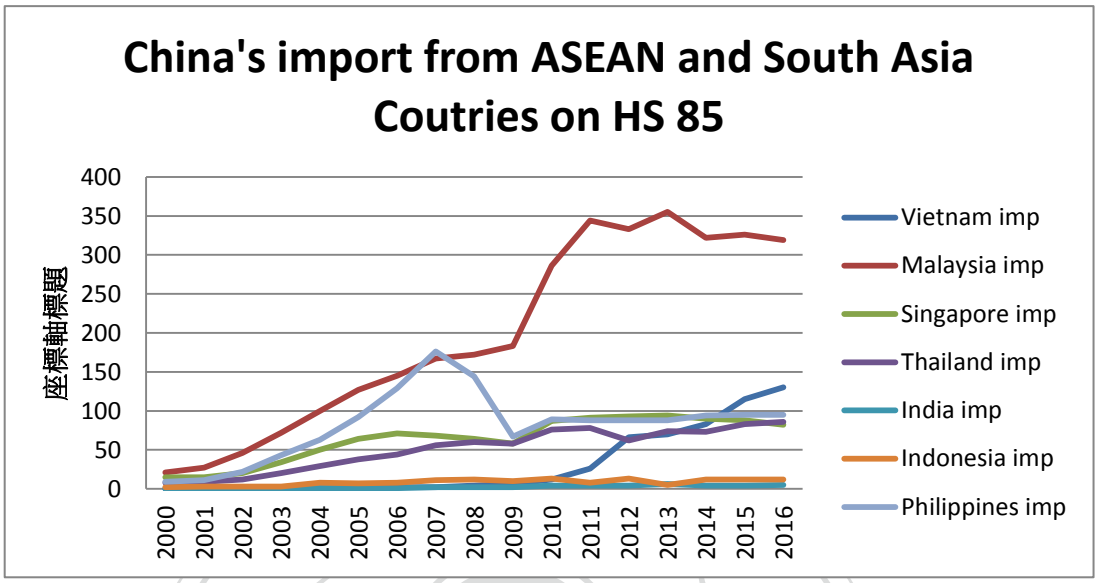
Malaysia, Vietnam, Philippines, Singapore, Thailand, Indonesia, and India

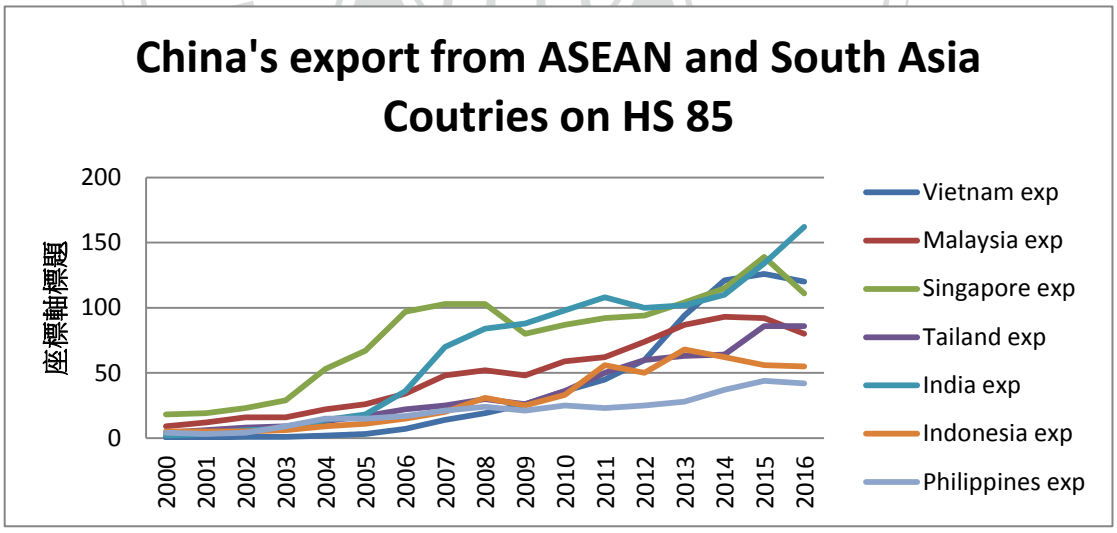
Figure4 China's import from ASEAN and South Asia countries on HS 85 ($100 million)



Source: UN Comtrade Database (2017)

China's main export went to India; other countries included Singapore, Vietnam, Thailand, Malaysia, Indonesia, and the Philippines.

Figure5 China's import from ASEAN and South Asia countries on HS 85 ($100 million)



Source: UN Comtrade Database (2017)

Table 5 China's IMEX with from ASEAN and South Asia countries on HS 84 ($100 million)

country / year	Vietnam		Malaysia		Singapore		Thailand		global	
	imp	exp	imp	exp	imp	exp	imp	exp	imp	exp

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2000	0.1	0.3	21	9	15	18	8	4	507	461
2001	0.1	0.5	27	12	15	19	9	6	559	513
2002	0.2	0.9	46	16	20	23	12	8	732	651
2003	0.4	1	72	16	34	29	20	9	1039	890
2004	0.7	2	100	22	50	53	29	13	1423	1297
2005	1	3	127	26	64	67	38	17	1748	1723
2006	2	7	145	34	71	97	44	22	2190	2275
2007	2	14	167	48	68	103	56	25	2568	3003
2008	4	19	172	52	64	103	60	30	2665	3421
2009	6	26	183	48	58	80	58	26	2438	3011
2010	12	36	286	59	87	87	76	36	3143	3888
2011	26	45	344	62	91	92	78	50	3510	4458
2012	66	60	333	74	93	94	62	60	3815	4873
2013	70	94	355	87	94	104	74	63	4394	5613
2014	83	121	322	93	90	115	73	64	4243	5709
2015	115	126	326	92	88	139	83	86	4287	5943
2016	130	120	319	80	82	111	86	86	4129	5532

country / year	India		Indonesia		Philippines		global	
	imp	exp	imp	exp	imp	exp	imp	exp
2000	0.2	2	2	5	9	4	507	461
2001	0.2	3	3	5	11	3	559	513
2002	0.6	6	3	5	22	4	732	651
2003	0.4	7	3	6	43	9	1039	890
2004	0.8	14	8	9	63	15	1423	1297
2005	1	18	7	11	92	15	1748	1723
2006	1	36	8	15	129	17	2190	2275
2007	2	70	11	20	176	21	2568	3003
2008	2	84	12	31	144	24	2665	3421
2009	2	88	10	25	67	21	2438	3011
2010	4	98	13	33	89	25	3143	3888
2011	4	108	8	56	88	23	3510	4458
2012	4	100	13	50	88	25	3815	4873
2013	6	102	5	68	88	28	4394	5613
2014	4	110	12	62	94	37	4243	5709

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2015	4	134	12	56	95	44	4287	5943
2016	5	162	12	55	95	42	4129	5532

Source: UN Comtrade Database (2017)

Among Taiwan, ASEAN, and South Asia countries, China's main trading partners were Malaysia, Vietnam, Singapore, Thailand, India, Indonesia, Philippines, Pakistan, Myanmar, and Bangladesh in 2015.

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Table 6 China’s trading with ASEAN countries from 1997 to 2016($ 10,000)

Ctry / year	Indonesia		Thailand		Vietnam		Philippines		Malaysia		Singapore		Brunei		Myanmar		Cambodia		Lao	
	exp	imp	exp	imp	exp	imp	exp	imp	exp	imp	exp	imp	exp	imp	exp	imp	exp	imp	exp	imp
1997	184099	267358	150106	201390	107974	35710	133961	32684	192185	249507	432332	446474	3332	0	57012	7341	7569	4501	2293	582
1998	117122	245670	114807	241280	102843	21736	150116	51195	159635	277797	393004	422429	914	1	51886	6204	11369	4818	1783	790
1999	177907	305091	143521	278040	86386	35429	137928	90753	167375	360559	450223	406110	810	0	40653	10168	10433	5579	2216	956
2000	306182	440195	224325	438079	153726	92915	146441	167732	256487	548000	576104	505963	1302	6135	49644	12482	16406	5949	3442	642
2001	283654	388807	233745	471285	180445	101075	162031	194522	322026	620521	579071	512828	1716	14824	49735	13419	20565	3480	5441	746
2002	342645	450835	295735	559960	214838	111589	204224	321716	497421	929630	698422	704656	2102	24181	72475	13689	25156	2455	5431	965
2003	448189	574697	382791	882684	318274	145671	309269	630683	614089	1398641	886377	1048485	3389	31237	91022	16952	29465	2600	9824	1120
2004	625642	721567	580158	1154051	426003	248199	426872	905944	808606	1817474	1268760	1399447	4789	25106	93844	20694	45177	2993	10088	1265
2005	835037	843696	781930	1399189	564390	255284	1663226	1651460	1060635	2009321	468763	1286969	5314	20773	93485	27440	53603	2731	10338	2555
2006	944971	960574	976406	1796243	746336	248608	2318529	1767262	1353707	2357243	573813	1767456	9963	21531	120742	25265	69776	3509	16872	4965
2007	1260133	1239508	1197343	2266469	1189130	322628	749792	2311784	1768927	2869705	2962030	1752368	11268	24608	169970	37814	88293	5107	17794	8592
2008	1719311	1432293	1563635	2565674	1512213	433632	913223	1950474	2145517	3210140	3230581	2017126	13054	8888	197777	64755	109554	3883	26811	13426
2009	1472053	1366823	1328551	2490531	1629765	474753	859059	1194841	1963178	3233592	3005194	1780393	14044	28199	225399	64613	90726	3689	37717	37463
2010	2195357	2079672	1974108	3319594	2310154	698454	1154026	1622197	2380204	5044680	3234723	2472875	36761	66433	347552	96655	134734	9363	48362	60149
2011	2921724	3133738	2569475	3903910	2909014	1111770	1425538	1799166	2788598	6213671	3557013	2813992	74439	56682	482150	167990	231481	18430	47627	82461
2012	3428338	3195070	3119620	3855466	3420811	1623129	1673133	1964413	3652528	5830677	4074187	2853078	125244	37310	567371	129823	270811	21532	93414	78663
2013	3693049	3142426	3271790	3852265	4858630	1689189	1986813	1818181	4593059	6015279	4583187	3006452	170378	8980	733869	285687	340951	36364	172258	101008
2014	3905961	2448525	3428923	3833193	6373001	1990640	2347358	2098413	4635339	5565224	4891117	3082873	174681	18972	936765	1560128	327474	48291	183948	177788
2015	3434197	1988619	3829080	3716875	6601702	2983175	2667079	1896565	4398039	5327733	5194244	2758076	140741	10116	965091	544930	376339	66660	122576	154734
2016	3212613	2141404	3719508	3853234	6110413	3717160	2984267	1739589	3767178	4926964	4451167	2601425	51103	22155	818868	409771	393016	83051	98710	135961

source: China Statistical Yearbook 1999 to China Statistical Yearbook 2017

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Table 7 China’s trading with South Asia countries from 1997 to 2016 ($ 10,000)

Country / year	India		Pakistan		Bengladesh		Sri Lanka		Afghanistan		Bhutan		Nepal		Maldives	
	Exp	imp	exp	imp	exp	imp	exp	Imp	exp	imp	exp	imp	exp	imp	exp	imp
1997	93373	89726	68923	37911	69621	5435	24557	936	3247	61			5808	966	33	0
1998	101660	90570	52376	38900	66068	2647	29279	579	2434	21			6688	522	54	5
1999	116196	82577	58061	39000	70089	1425	25891	918	1668	290			20702	834	85	8
2000	156073	135348	67032	49218	89959	1885	44545	1285	1989	540			19707	714	134	2
2001	189627	169997	81508	58187	95517	1670	38661	1014	1726	16	160	2	14854	463	210	10
2002	267116	227387	124211	55750	106627	3236	33675	1434	1991	8	62	2	10507	528	298	0
2003	334323	425138	185499	57494	133467	3339	50444	1980	2645	61	197	1	12201	535	334	1
2004	593601	767803	246579	59475	190627	5701	69486	2259	5697	95	35	17	16324	823	791	18
2005	893428	976622	342766	83317	240274	7860	93967	3660	5121	151	47	0	18794	850	1693	3
2006	1458130	1027745	423937	100721	309040	9884	110641	3483	10049	19	16	0	25980	828	1540	60
2007	2401146	1461710	578905	110422	334489	11417	138408	4803	16944	238	539	0	38558	1479	2479	28
2008	3158538	2025889	605107	100680	455607	13191	163009	6054	15163	269	846	0	37561	598	3155	142
2009	2965604	1372728	552833	126001	444132	14034	156893	7038	21351	138	412	5	40887	529	4066	13
2010	4091496	2084625	693760	173102	678882	26888	199485	10228	17527	368	159	1	73126	1142	6348	5
2011	5053709	2337115	843971	211862	781057	44864	298872	15289	23001	440	1738	8	118123	1386	9712	14
2012	4767751	1879582	927539	313825	796991	47992	300109	16196	46405	519	1560	1	196816	2952	7649	19
2013	4843241	1697025	1101960	319684	970509	60237	343655	18256	32826	960	1741	1	221089	4325	9741	42
2014	5421742	1635869	1324448	275387	1178227	76111	379280	24827	39356	1737	1112	10	228358	4707	10399	38
2015	5822803	1336855	1644189	247476	1389471	81685	430405	25852	36182	1177	812	35	83271	3200	17265	18
2016	5841534	1176413	1723446	191259	1430223	86940	428833	27344	43129	453	485	13	86627	2241	32094	24

source: China Statistical Yearbook 1999 to China Statistical Yearbook 2017

DOI:10.6814/THE.NCCU.IMAS.013.2018.A07

The top 8 countries of trading between China and Taiwan/ ASEAN countries/ South Asia countries:

The electronics were the most significant trading goods between China and the countries in these areas. In the global scale, US ranked number one regarding the import of electronics from 2005 to 2016. In 2016, the US imported 1.14 trillion and accounted for 51.9% of total imports. In comparison with China's electronics imports accounted for 48.6% of the total imports in the same year. US' electronics imports valued 1.5 times of China's, 4.3 times France's, 5.1 times Japan's. China's imports of electronics worthed 770.9 billion, only second to the US'.

China's exports for electronics accounted for 53.7% of total exports in 2016 which worthed 1.21 trillion. This figure was 1.6 times of US'. Among which, Automatic Data Processing (including computers) worthed $137.4 billion, and phones worthed $117.1 billion. Since 2004, China has been the US' largest importer of electronics.

China's trade with Taiwan in 2014-2016:

The amount of trade between China and Taiwan was $157.6 billion in 2016, which accounted for 4.9% of China's total trade. Taiwan was the seventh most significant trading partners of China's globally. Taiwan was also the largest trading partner compared with ASEAN and South Asia countries.

Regarding the trading on electronics between China and Taiwan, it was declining in recent three years. The main reasons were that China wanted to develop its brand, support companies in China and give benefit to some foreign companies in China. Meanwhile, ASEAN's production of Optics, watches, medicals, chemicals, rubbers, plastics, and primary metals increased, and the imports of these areas declined.

Table 8 The amount of trade between China (+ Hong Kong) and Taiwan ($1,000)

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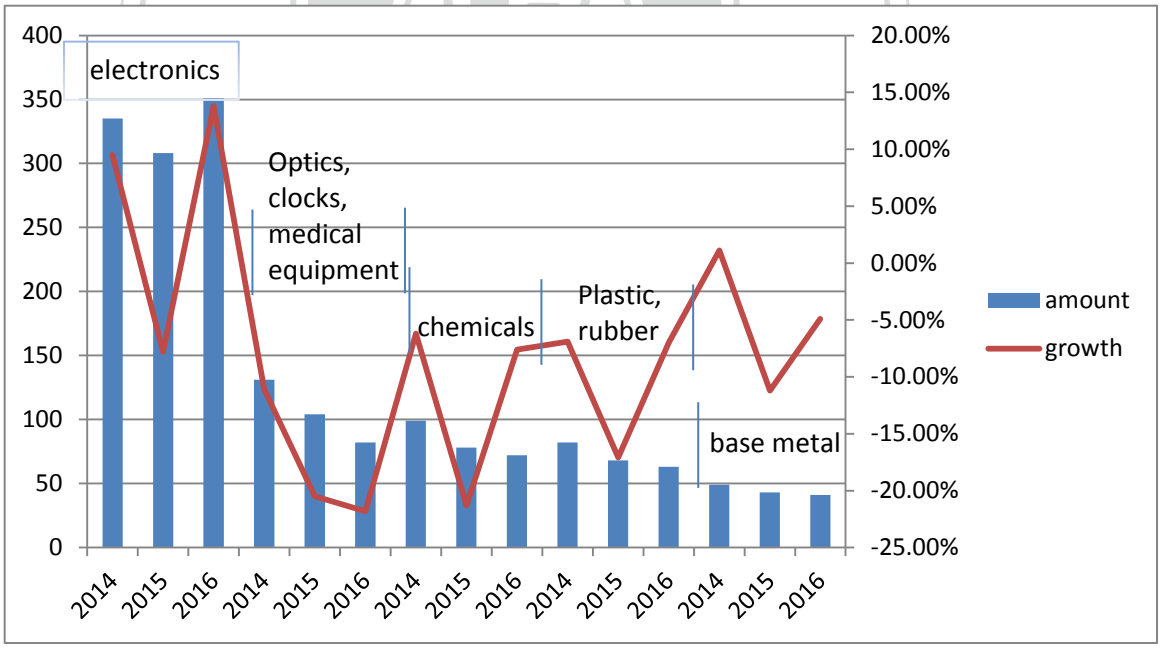
year	China's imp from Taiwan	China's exp to Taiwan	unfavorable balance of trade
2014	84,738,064	49,254,351	35,483,713
2015	73,409,572	45,266,011	28,143,561
2016	73,878,920	43,990,808	29,888,112

year	HK's imp from Taiwan	HK's exp to Taiwan	unfavorable balance of trade	Amount of China+HK trade with Taiwan
2014	43,795,474	1,734,987	42,060,486	179,522,876
2015	39,130,418	1,467,783	37,662,635	159,273,784
2016	38,397,745	1,330,528	37,067,217	157,598,001

source: Ministry of Finance, R.O.C (Taiwan)

Figure6 China's top 5 imports from Taiwan in 2014-2016 ($100 million)



source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Table 9 China's top 5 imports from Taiwan ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	335	9.5%	43.3%

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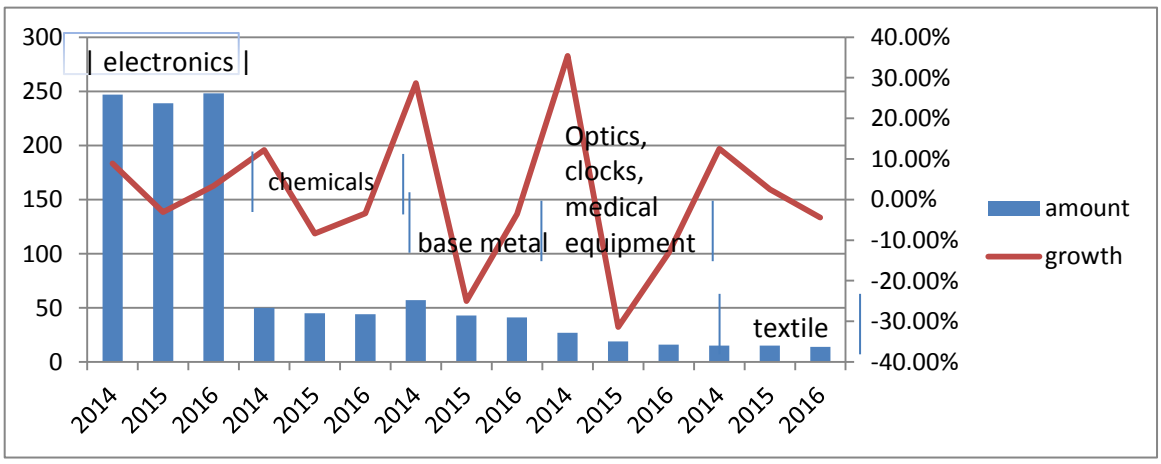
2015	16	84-85	Electronics	308	-7.8%	46%
2016	16	84-85	Electronics	351	13.8%	52.2%
2014	18	90-92	Optics, clocks, medical equipment	131	-11.1%	17.1%
2015	18	90-92	Optics, clocks, medical equipment	104	-20.5%	15.6%
2016	18	90-92	Optics, clocks, medical equipment	82	-21.8%	12.2%
2014	6	28-38	chemicals	99	-6.2%	12.9%
2015	6	28-38	chemicals	78	-21.3%	11.7%
2016	6	28-38	chemicals	72	-7.6%	10.8%
2014	7	39-40	Plastic, rubber	82	-6.9%	10.6%
2015	7	39-40	Plastic, rubber	68	-17.1%	10.1%
2016	7	39-40	Plastic, rubber	63	-7%	9.4%
2014	15	72-83	base metal	49	1.1%	6.4%
2015	15	72-83	base metal	43	-11.2%	6.5%
2016	15	72-83	base metal	41	-4.9%	6.2%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Figure7 China's top 5 exports to Taiwan in 2014-2016 ($100 million)



DOI:10.6814/THE.NCCU.IMAS.013.2018.A07

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Table 10 China's top 5 exports to Taiwan in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	247	8.9%	51.5%
2015	16	84-85	electronics	239	-3.1%	54.3%
2016	16	84-85	electronics	248	3.4%	56.2%
2014	6	28-38	chemicals	50	12.2%	10.3%
2015	6	28-38	chemicals	45	-8.4%	10.3%
2016	6	28-38	chemicals	44	-3.4%	10.0%
2014	15	72-83	base metals	57	28.7%	11.8%
2015	15	72-83	base metals	43	-25%	9.6%
2016	15	72-83	base metals	41	-3.6%	9.3%
2014	18	90-92	Optics, clocks, medical equipment	27	35.4%	5.7%
2015	18	90-92	Optics, clocks, medical equipment	19	-31.4%	4.3%
2016	18	90-92	Optics, clocks, medical equipment	16	-13.1%	3.7%
2014	11	50-63	textile	15	12.5%	3.1%
2015	11	50-63	textile	15	2.5%	3.4%
2016	11	50-63	textile	14	-4.4%	3.3%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Taiwan's largest exporting and importing product to China was integrated circuit, accounting for more than 50% of total trade. Among which, the most significant one is 12 Inch silicon wafer products. Phones and LCD indicators exports to China were over $1 billion in 2015 but decreased to $800 million and $50 million. This figure showed that China's demands of phones and LCD indicators from Taiwan were declining.

Table 11 The main items of China's electronics imported from Taiwan ($1,000)

Item/ year	Semiconductor equipment	phones	Storage media	LCD indicator	Amount of money
2014	732,436	2,096,575	856,658	1,793,232	28,717,448
2015	771,160	1,284,579	974,768	1,462,843	26,365,448
2016	827,316	811,639	1,203,613	57,638	29,477,723

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Item/ year	Electronics except IC	IC	% of IC of total imp	Amount of money
2014	7,334,167	15,473,759	53.88%	28,717,448
2015	6,578,515	14,798,790	56.13%	26,365,448
2016	6,087,381	19,932,329	67.62%	29,477,723

Source: Ministry of Finance, R.O.C. (Taiwan)

China imcreased its phones and LCD indicators' imports from ASEAN countries gradually.

Table 12 The main items of China's electronics exported to Taiwan ($1,000)

Item/ year	Motors and Generators	bateries	phone	Electronics except IC	IC	% of IC of total imp	Amount of money
2014	324,831	276,463	2,284,304	2,623,443	6,623,110	43.63%	15,178,832
2015	436,728	237,315	3,142,034	2,546,022	6,206,426	42.72%	14,528,363
2016	318,460	250,479	2,339,271	2,387,668	6,841,020	47.97%	14,260,238

Source: Ministry of Finance, R.O.C. (Taiwan)

Taiwan's exports of integrated circuits to China increased in 2015. However, the exports to the world declined because the global demand weakened. The orders decreased in emerging markets severely inhibited the sales of electronics. The sales amounts of Taiwan's exports on integrated circuits declined 7.9% in 2015.

The semiconductor fabrication accounted for the most considerable revenue in Taiwan's IC industries. DRAM ranked the second. The direct export rate of IC products was 83%. IC exported $69.5 billion in 2015, which decreased 3.9% from the previous year and accounted for 24.8% of Taiwan' s total exports. Half of the IC exported to China and Hong Kong. 16.6% of IC shipped to Singapore. 10.5% and 9.3% exported to the RoK and Japan. On the other hand, the processors/ controllers （HS 854231） and integrated circuits （HS 854239） sales to Japan increased significantly. The export on these areas increased by 28.6%.

Table 13 Taiwan's IC output/ sales amounts in 2014-2016 ($1,000)

Item/ year	Outpout value

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	MOS dynamic random access memory	IC manufacture (excepting MOS DRAM)	semiconductor fabrication(12 inch)	semiconductor fabrication(8 inch)	semiconductor fabrication(6 inch)
2014	5,206,224	1,288,062	23,659,733	5,600,498	982,174
2015	4,550,328	1,277,715	26,499,924	5,445,247	1,053,204
2016	4,180,156	1,355,125	30,755,296	5,155,583	1,068,176
	Sale value				
Item/ year	MOS dynamic random access memory	IC manufacture (excepting MOS DRAM)	semiconductor fabrication(12 inch)	semiconductor fabrication(8 inch)	semiconductor fabrication(6 inch)
2014	5,230,711	1,376,838	23,277,726	5,910,763	969,338
2015	4,440,246	1,363,285	26,403,528	5,723,603	1,042,495
2016	4,126,123	1,463,259	30,815,030	5,396,326	1,050,711

source: Ministry of Economic Affairs, R.O.C. (2017)

China's trade with Vietnam in 2014-2016:

China published Guideline for the Promotion of the Development of the National Integrated Circuit Industry (《國家積體電路產業發展推進綱要》) in June 2014. The primary purpose was to support local IC design, foundry ODM, and Wafer Probe/ package industries. By the M&A of foreign companies, China wanted to upgrade semiconductor technologies and international competition. So far, its technology level was relatively low. According to IC Insights' statistics in 2016, Chinese companies didn't enter the list of global leading 20 foundries.

China originally imported chips (integrated circuit) mainly from Taiwan. In 2013, the imports from Taiwan accounted for 31% of its total imports. Recently, Taiwanese companies had faced the challenges from Chinese brands. It also invited Intel and many other international foundry companies to invest in local companies. The

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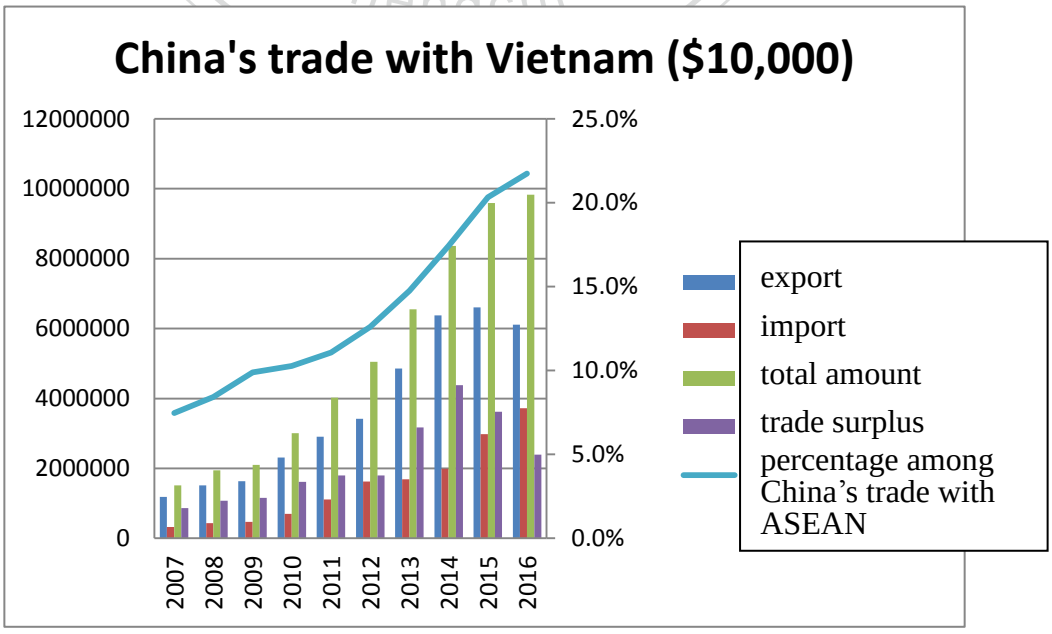
technology advantages of Taiwanese companies would offset.

Besides, The National Development and Reform Commission of the People's Republic of China (NDRC) used administrative sanctions to Qualcomm. This American company later announced that it was willing to help SMIC (中芯國際) build 28-inch nano process technology. It also placed orders of 28-nano chips to China.

Taiwan's integrated circuit's investment in China was still limited. On the other hand, ROK's companies expand in China. ROK dominated the 12-inch integrated circuits foreign factories in China. For example, There were Samsung's 12-inch NAND Flash factories in Xi'an and Hynix's 12-inch foundry factories in Wusih (Wuxi)

China's largest trading partner was Malaysia until 2015. Vietnam became China's biggest trading partner in 2016. Vietnam aims for more exports to China to cut the trade deficit. The amount of China's favorable balance of trade with Vietnam is shrinking. Vietnam's exports to China in the upper year of 2017 grew 42.5%, which was much higher than the imports of 16.8%.

Figure8 China's trade with Vietnam in 2007-2016 ($10,000)



DOI:10.6814/THE.NCCU.IMAS.013.2018.A07

Source:《China Statistical Yearbook 2008》to《China Statistical Yearbook 2017》

Table 14 China's trade with Vietnam, compared with Malaysia (10,000)

IMEX /year	Vietnam export	Malaysia export	Vietnam import	Malaysia import	Vietnam Total trade	Malaysia Total trade	Vietnam China enjoy favourable balance of trade	Malaysia China enjoy favourable balance of trade
2007	1189130	1768927	322628	2869705	1511758	4638632	866502	-1100778
2008	1512213	2145517	433632	3210140	1945845	5355657	1078581	-1064623
2009	1629765	1963178	474753	3233592	2104518	5196770	1155012	-1270414
2010	2310154	2380204	698454	5044680	3008608	7424884	1611700	-2664476
2011	2909014	2788598	1111770	6213671	4020784	9002269	1797244	-3425073
2012	3420811	3652528	1623129	5830677	5043940	9483205	1797682	-2178149
2013	4858630	4593059	1689189	6015279	6547819	10608338	3169441	-1422220
2014	6373001	4635339	1990640	5565224	8363641	10200563	4382361	-929885
2015	6601702	4398039	2983175	5327733	9584877	9725772	3618527	-929694
2016	6110413	3767178	3717160	4926964	9827573	8694142	2393253	-1159786

Source:《China Statistical Yearbook 2008》to《China Statistical Yearbook 2017》

China's trade with Vietnam reached $98.28 billion in 2016, which increased 2.5% from the previous year. China's imports from Vietnam were $37.17 billion. The investment from China reached $1.28 billion, rising 128.3% of the prior year. The accumulated investment worthed $4.98 billion until 2016, which made China Vietnam's eighth largest FDI.

China's top 5 products importing from Vietnam were electronics, cotton, machines, minerals, and shoes; China's top 5 products exporting to Vietnam were electronics, machinery, steel, chemicals, and aluminum.

Figure9 China's top importing products from Vietnam in 2014-2016 ($100 million)

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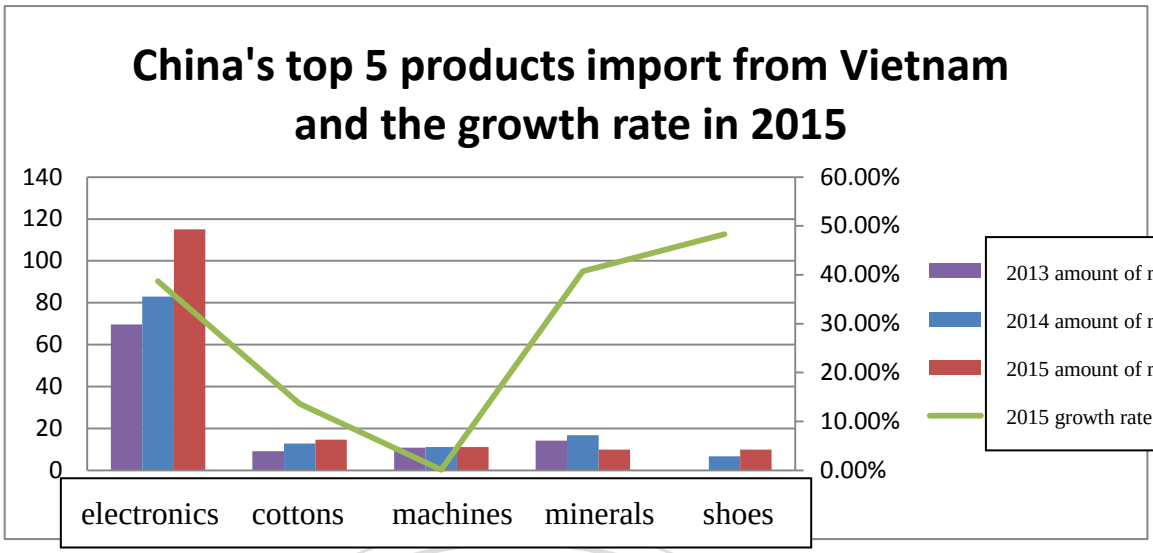


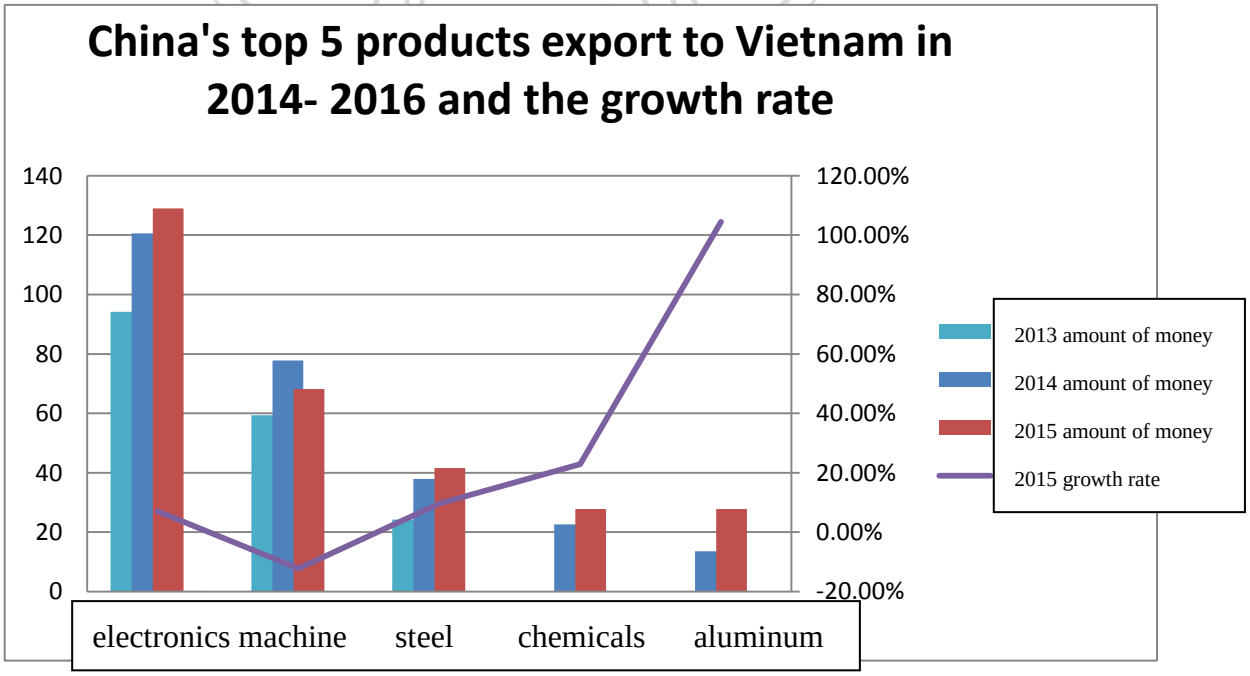
source: Nambo, trend of China's import from Vietnam

Table 15 China's top importing products from Vietnam in 2014-2016 ($100 million)

products\year	2013	2014	2015	Percent of total import	2015 growth
Electronics	69.65	82.94	115.04	48.00%	38.70%
Cottons	9.13	12.82	14.56	6.07%	13.60%
Machines	10.8	11.15	11.16	4.66%	0.10%
Minerals	14.07	7.06	9.93	4.14%	40.70%
shoes	TBC	6.68	9.91	4.13%	48.30%

source: Nambo, trend of China's import from Vietnam

Figure10 China's top 5 exporting products from Vietnam in 2014-2016 ($100 million)



DOI:10.6814/THE.NCCU.IMAS.013.2018.A07

source: Nambo, trend of China's import from Vietnam

Table 16 China's top 5 exporting products to Vietnam in 2014- 2016 and the growth rate in 2015

Product/ year	2013	2014	2015	Percent of total import	2015 growth
Electronics	94.14	120.59	129.03	19.51%	7.00%
Machines	59.34	77.75	68.19	10.31%	-12.30%
Steels	24.26	37.89	41.53	6.28%	9.60%
Chemicals	N/A	22.60	27.78	4.20%	22.90%
aluminum	N/A	13.57	27.76	4.20%	104.50%

source: Nambo, trend of China's import from Vietnam

Vietnam's electronics accounted for 30% of total exports in 2016. Among which, the exports of phones increase 14% to $34.5 billion, which mainly driven by foreign companies. US, China, and Japan were Vietnam's largest exporting market. On the other hand, Vietnam's largest importing sources were China, RoK, and Japan in sequence.

Vietnamese third, second, and first industries accounted for 44%, 39%, and 17% of GDP. Vietnam was raising minimum wages in these at least ten years (2009-2018). In 2016, The minimum monthly payments in Hanoi and Ho Chi Minh City were $166.

TECO in Vietnam pointed out that the foreign companies enjoyed $23.7 billion of a favorable balance of trade in 2016. Those companies' export reached $70.8 billion in the upper year of 2017, which grew 20% compared with the same period of the previous year. It accounted for 72% of Vietnam's exports. The leading foreign companies are from Japan, Singapore, and RoK. For example, Vietnam exported $175.9 billion in 2016, while Samsung (Vietnam) held 22.7% of total exports. The large Foreign companies in Vietnam were Samsung, Nokia, Sony, Canon, and Microsoft.

In conclusion, there was some significance in the trade between China and Vietnam:

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I. Vietnam was the second largest trading partner of China among ASEAN countries in 2015 and became the largest in 2016. Vietnam suffered a trade deficit with China for a long time.

II. Regarding the categories of trading goods, HKTDC pointed out that Vietnam's electronics exports grew rapidly, which ranked no.5 in 2014 on a global scale. In 2016, the electronics exports accounted for 30% of total exports. Its phones exported $34.5 billion, which increased 14% from the previous year. The foreign companies accounted for more than 70% of electronics exports.

China's trade with Malaysia in 2014-2016:

Malaysia's main exports were electronics, minerals, machines, vegetable oil, optical instruments, which in total worthed $126.65 billion and accounted for 66.8% of Malaysia's exports in 2016. Other main imports were rubbers, plastics, chemicals, woods, steel, jury, and furniture.

Malaysia's main imports were electronics, machines, minerals, plastics, transportation, which worthed $46.52 billion, $20.13 billion, $17.36 billion, $6.85 billion, and $5.8 billion and accounted for 57.3% of Malaysia's import in 2016. Other imports were jury, copper, steel, optical instrument, rubber, animal and vegetable oil, chemicals, and aviation.

Malaysia is the second largest trading partner of China in ASEAN. In 2016, the amount of trade worthed $58.11 billion, which decreased by 1.8% from the previous year. Among which, Malaysia' exports to China were $23.76 billion, which decreased by 8.6% and accounted for 12.5% of Malaysia's total exports. Malaysia' imports from China were $34.35 billion, which increased 3.1% and accounted for 20.4% and increased by 1.6%. Malaysia suffered $10.59 billion unfavorable balance of trade.

Because South East Asia had more competitive producing bases for electronics

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other than Malaysia, China's imports of electronics from Malaysia decreased for three years in 2014 to 2016, which dropped from 57.98% to 39.36%. The production costs had increased, and the capabilities became lower than they were before. Therefore, Seagate and Western Digital moved their factories to Thailand. Rubicon Sapphire Technology also closed its factory in central Malaysia.

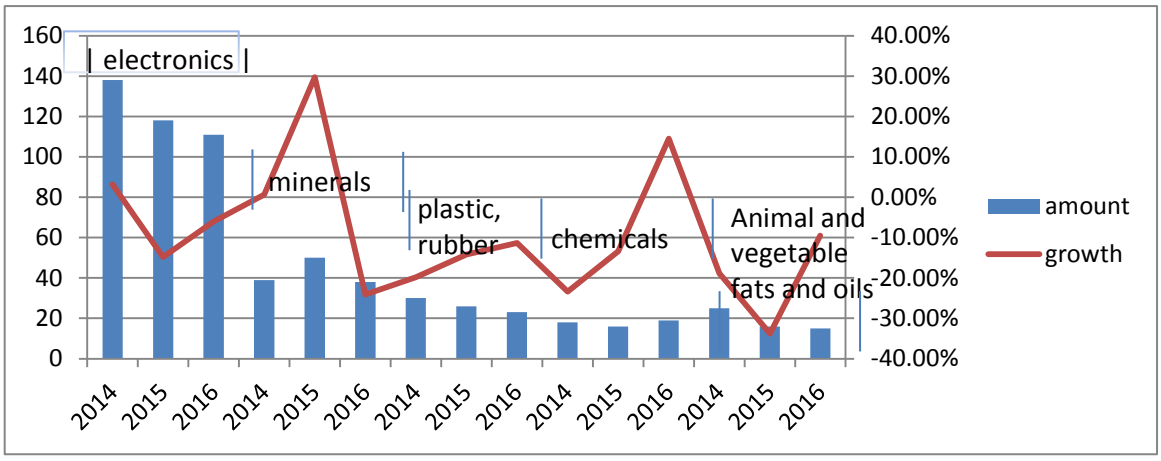
Malaysia imported mainly for semiconductors, circuits, Transistors and vacuum tubes, which it exported mainly for automation, electronic and optical products. Therefore, Malaysia's electronics assembly industries were prosperous.

The exports of chemicals and minerals grew in 2015 and 2016. According to The Chemical Industries Council of Malaysia, Malaysia had abundant oil and gas. Malaysia ranked 14 of proved natural gas reserves globally; ranked 23 in holding petroleum; ranked three among global Liquefied natural gas holders. It produced 20% of global oil chemicals. Malaysian government encouraged oil chemicals and the investment of oil chemicals' downstream products, including descaling agent, cosmetic, and processed foods. Malaysia had more petroleum, natural gas, and minerals than other ASEAN countries. It mainly exported electronics, electrics, and mineral oil. Besides, tropical hardwood exporting to Japan accounted for 60% of the total tropical hardwood exports.

China's textile exports to Malaysia increased by 101% in 2015 and kept growing in 2016. Therefore, the Malaysian government is promoting automated production and processing to reduce the demand for workforce. Malaysian government gives foreign companies tax incentives that 70% of their profits are duty-free.

Figure11 China's top 5 imports from Malaysia in 2014-2016 ($100 million)

DOI:10.6814/THE.NCCU.IMAS.013.2018.A07



source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

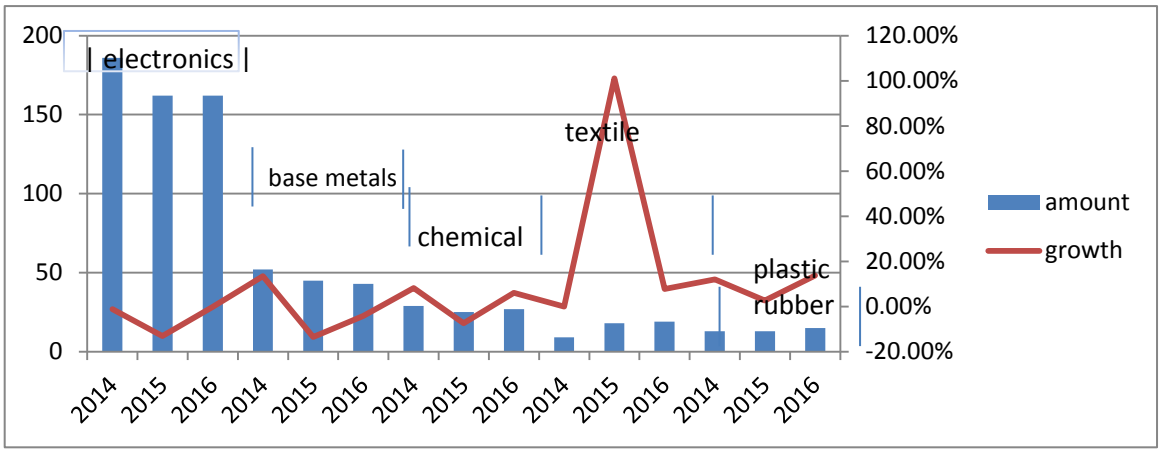
Table 17 China's top 5 imports from Malaysia in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	138	3.2%	57.98%
2015	16	84-85	electronics	118	-14.8%	51.30%
2016	16	84-85	electronics	111	-6.0%	39.36%
2014	5	25-27	minerals	39	0.6%	16.39%
2015	5	25-27	minerals	50	29.7%	21.74%
2016	5	25-27	minerals	38	-24.1%	13.48%
2014	7	39-40	plastic, rubber	30	-19.8%	12.61%
2015	7	39-40	plastic, rubber	26	-14.2%	11.30%
2016	7	39-40	plastic, rubber	23	-11.3%	8.16%
2014	6	28-38	chemicals	18	-23.4%	7.56%
2015	6	28-38	chemicals	16	-13.4%	6.96%
2016	6	28-38	chemicals	19	14.5%	6.74%
2014	3	15	Animal and vegetable fats and oils	25	-18.9%	10.50%
2015	3	15	Animal and vegetable fats and oils	16	-33.8%	6.96%
2016	3	15	Animal and vegetable fats and oils	15	-9.5%	5.32%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Figure12 China's top 5 exports to Malaysia in 2014-2016 ($100 million)

DOI:10.6814/THE.NCCU.IMAS.013.2018.A07



source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Table 18 China's top 5 exports to Malaysia in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	186	-1.1%	52.7%
2015	16	84-85	electronics	162	-13.1%	48.8%
2016	16	84-85	electronics	162	-0.2%	47.1%
2014	15	72-83	base metals	52	13.4%	14.7%
2015	15	72-83	base metals	45	-13.5%	13.6%
2016	15	72-83	base metals	43	-4.2%	12.5%
2014	6	28-38	chemicals	29	8.2%	8.2%
2015	6	28-38	chemicals	25	-7.4%	7.5%
2016	6	28-38	chemicals	27	6.1%	7.8%
2014	11	50-63	textile	9	TBC	2.5%
2015	11	50-63	textile	18	101.1%	5.4%
2016	11	50-63	textile	19	7.8%	5.5%
2014	7	39-40	plastic, rubber	13	12%	3.7%
2015	7	39-40	plastic, rubber	13	2.6%	3.9%
2016	7	39-40	plastic, rubber	15	13.7%	4.4%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

China's trade with Singapore in 2014-2016:

Economic Development Board Singapore pointed out that electronics was the main industry for Singapore's economic growth and accounted for 29% of the added

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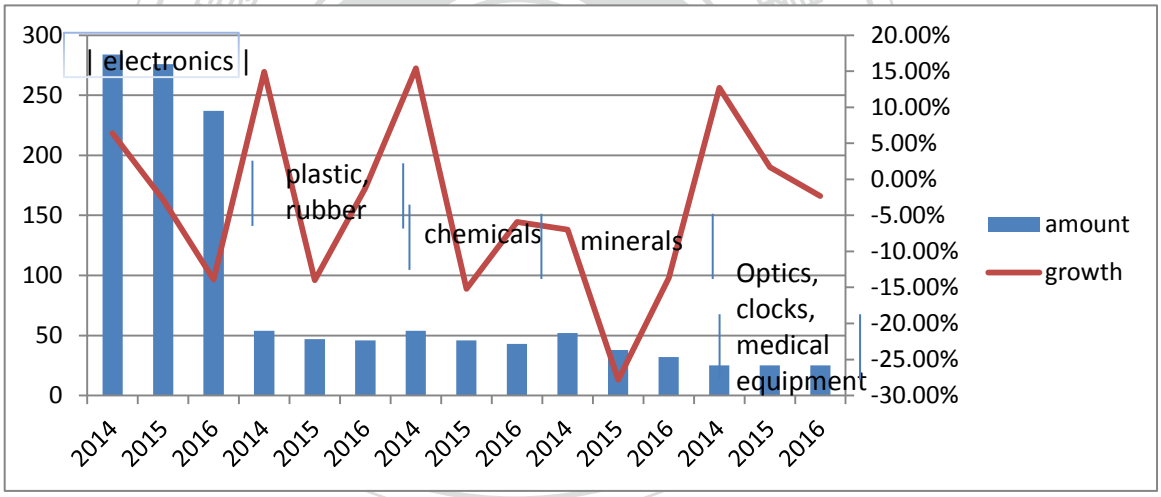
value of the manufacturing industry. Among Singapore's $11.8 billion fixed asset investment in 2014, electronics accounted for 14%. Besides, some employees in the electronics industry were 79,000, which was 18% of total manufacturing industry employees. Precision engineering is the pillar industry for aviation and space, petroleum, and natural gas, medical equipment, and electronics. There were 2,700 precision engineering companies in Singapore. Many companies set their headquarters and development center in Singapore.

Singapore allocated dozen billion of USD to encourage innovation. Micron used this project and invested $4 billion on NAND Flash and increased 1/3 of its production in the second half year of 2016.

Figure13 China's top 5 imports from Singapore in 2014-2016 ($100 million)



source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Table 19 China's top 5 imports from Singapore in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	284	6.4%	55.1%
2015	16	84-85	electronics	276	-2.8%	57.9%
2016	16	84-85	electronics	237	-13.9%	55.4%
2014	7	39-40	plastic, rubber	54	14.9%	10.5%
2015	7	39-40	plastic, rubber	47	-14%	9.9%
2016	7	39-40	plastic, rubber	46	-1.2%	10.7%

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2014	6	28-38	chemicals	54	15.4%	10.5%
2015	6	28-38	chemicals	46	-15.2%	9.6%
2016	6	28-38	chemicals	43	-5.9%	10.0%
2014	5	25-27	minerals	52	-7%	10.1%
2015	5	25-27	minerals	38	-27.8%	8.0%
2016	5	25-27	minerals	32	-13.7%	7.5%
2014	18	90-92	Optics, clocks, medical equipment	25	12.7%	4.9%
2015	18	90-92	Optics, clocks, medical equipment	25	1.7%	5.2%
2016	18	90-92	Optics, clocks, medical equipment	25	-2.3%	5.8%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Figure14 China's top 5 exports to Singapore in 2014-2016 ($100 million)

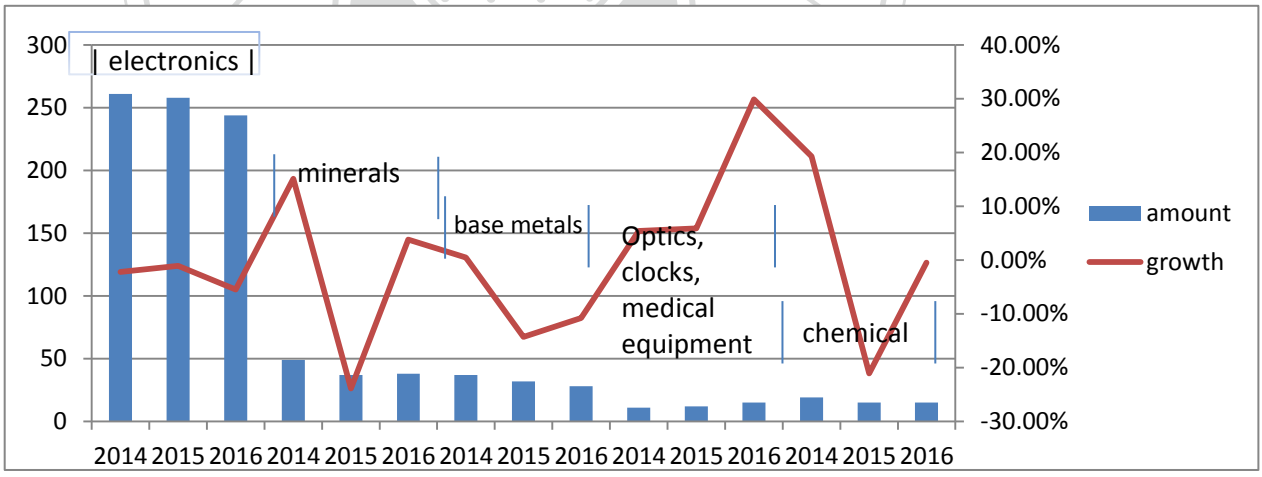

Table 20 China's top 5 exports to Singapore in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	percentage
2014	16	84-85	electronics	261	-2.2%	58.78%
2015	16	84-85	electronics	258	-1.1%	61.28%
2016	16	84-85	electronics	244	-5.5%	60.40%
2014	5	25-27	minerals	49	15.1%	11.04%

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2015	5	25-27	minerals	37	-23.9%	8.79%
2016	5	25-27	minerals	38	3.8%	9.41%
2014	15	72-83	base metals	37	0.5%	8.33%
2015	15	72-83	base metals	32	-14.3%	7.60%
2016	15	72-83	base metals	28	-10.8%	6.93%
2014	18	90-92	Optics, clocks, medical equipment	11	5.4%	2.48%
2015	18	90-92	Optics, clocks, medical equipment	12	5.9%	2.85%
2016	18	90-92	Optics, clocks, medical equipment	15	29.9%	3.71%
2014	6	28-38	chemicals	19	19.3%	4.28%
2015	6	28-38	chemicals	15	-21.1%	3.56%
2016	6	28-38	chemicals	15	-0.5%	3.71%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA。

China's trade with Thailand in 2014-2016:

The electronics, transportation, and 'plastics and rubbers' were the main exports of Thailand. In 2016, its export was $66.9 billion, $29.9 billion and $23.55 billion. These three types of products accounted for 56.3% of Thailand's export. Besides, food & beverage exported for $17.28 billion accounted for 8.1% of total exports.

The electronics, minerals, and base metals were the main imports in 2016, and they worthed $64.77 billion, $25.15 billion, and $24.7 billion. They accounted for 58.6% of total import. Besides, Thailand imported $16.2 billion of chemicals and $13.22 billion in transportation, which accounted for 8.3% and 6.8% of total imports.

Thailand was the fourth largest trading partner of China in ASEAN. In 2016, the trade in goods between Thailand and China worthed $65.84 billion. Among which,

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Thailand exported $23.58 billion to China and imported $42.26 billion from China.

The rubbers and electronics were the two main goods China imported from Thailand in 2016, which worth $6.32 billion and $5.71 billion. These two products accounted for 26.8% and 24.2% of China's imports from Thailand. According to

According to the data from Ministry of Commerce of the People's Republic of China, China's main imports of electronics from Thailand were computers, electronic components, communication equipment, electrical equipment, cars and their essential parts, and consumer electronics products

In 2015, China imported 95.9% more optics, clocks, medical equipment from Thailand compared with the previous year. In 2016, the imports kept increasing by 31.8%.

Figure15 China's top 5 imports from Thailand in 2014-2016 ($100 million)

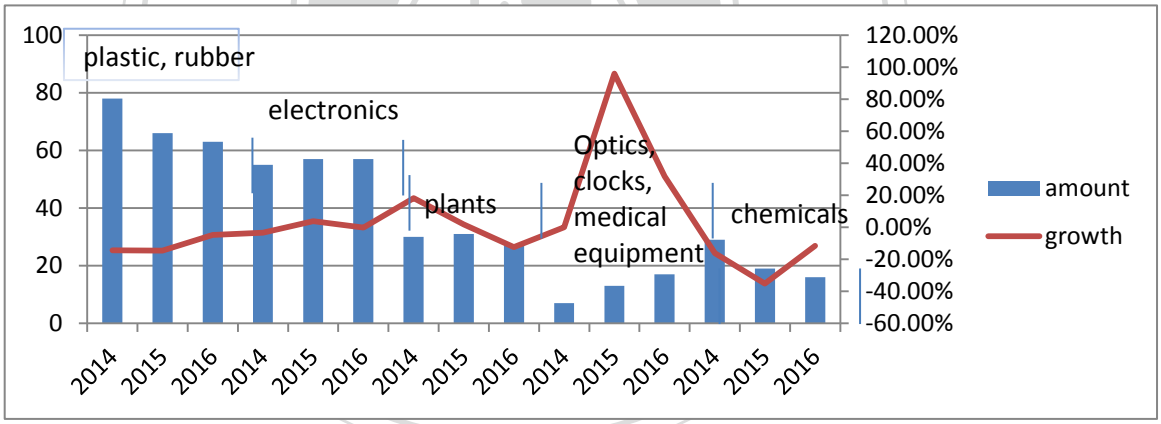

Table 21 China's top 5 imports from Thailand in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	7	39-40	plastic, rubber	78	-14.3%	31.45%
2015	7	39-40	plastic, rubber	66	-14.6%	28.33%
2016	7	39-40	plastic, rubber	63	-4.9%	26.69%
2014	16	84-85	electronics	55	-3.5%	22.18%
2015	16	84-85	electronics	57	3.7%	24.46%
2016	16	84-85	electronics	57	-0.2%	24.15%
2014	2	06-14	plants	30	18.2%	12.10%
2015	2	06-14	Plants	31	1.8%	13.30%

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2016	2	06-14	plants	27	-12.4%	11.44%
2014	18	90-92	Optics, clocks, medical equipment	7	TBC	2.82%
2015	18	90-92	Optics, clocks, medical equipment	13	95.9%	5.58%
2016	18	90-92	Optics, clocks, medical equipment	17	31.8%	7.20%
2014	6	28-38	chemicals	29	-16.1%	11.69%
2015	6	28-38	chemicals	19	-35.1%	8.15%
2016	6	28-38	chemicals	16	-11.5%	6.78%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

China exported $20.08 billion worth of electronics to Thailand in 2016, which held 47.5% of total exports to Thailand. Meanwhile, base metals exported $7.01 billion; chemicals exported $3.4 billion, rubbers/ plastics exported $2.15 billion, and textile exported $1.8 billion.

Figure16 China's top 5 exports to Thailand in 2014-2016 ($100 million)

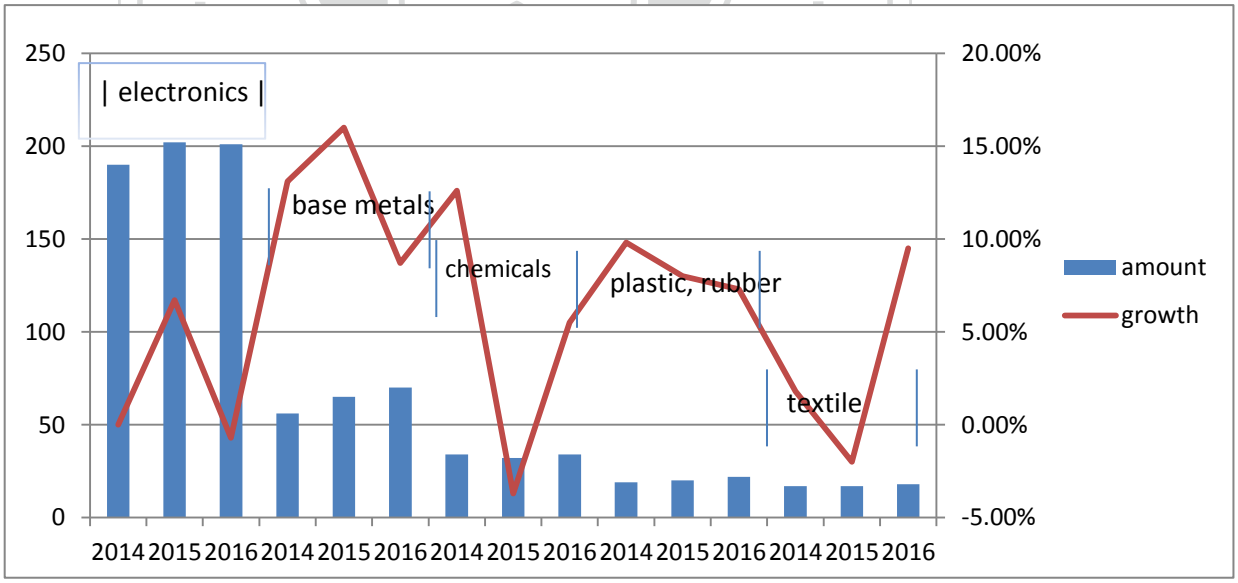

Table 22 China's top 5 exports to Thailand in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	190	0.00%	49.35%
2015	16	84-85	electronics	202	6.70%	49.39%
2016	16	84-85	electronics	201	-0.70%	47.52%

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2014	15	72-83	base metals	56	13.10%	14.55%
2015	15	72-83	base metals	65	16.00%	15.89%
2016	15	72-83	base metals	70	8.70%	16.55%
2014	6	28-38	chemicals	34	12.60%	8.83%
2015	6	28-38	chemicals	32	-3.70%	7.82%
2016	6	28-38	chemicals	34	5.50%	8.04%
2014	7	39-40	plastic, rubber	19	9.80%	4.94%
2015	7	39-40	plastic, rubber	20	8.00%	4.89%
2016	7	39-40	plastic, rubber	22	7.30%	5.20%
2014	11	50-53	textile	17	1.80%	4.42%
2015	11	50-53	textile	17	-2.00%	4.16%
2016	11	50-53	textile	18	9.50%	4.26%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA。

Huang (2016) pointed out that Thailand was the most massive rubbers exporting country globally. It produced 450,000 tons of rubber in 2015 and shipped 370,000 tons, which held 36% of global production. These materials could apply to automotive manufacturing and medical equipment.

China's trade with India in 2014-2016:

India was China's 5th largest trading partner in South Asia and ASEAN countries. It was also China's largest trading partner in South Asia. China was the 17th largest FDI source country in 2016, which moved forward from 35th in 2011. India's top 3 FDI industries were service industry (accounting for $61.4 billion and 18% of total investment), computers (accounting for $26 billion and 8% of total expenditure), and construction industry (accounting for $24.5 billion and 7% of total investment)

On the other hand, the value of trade in goods was $623.59 billion in 2016. Among which, India exported $264.04 billion and imported $359.55 billion worth of products. It suffered $95.5 billion of trade deficit, which decreased by 24.3% from the previous year.

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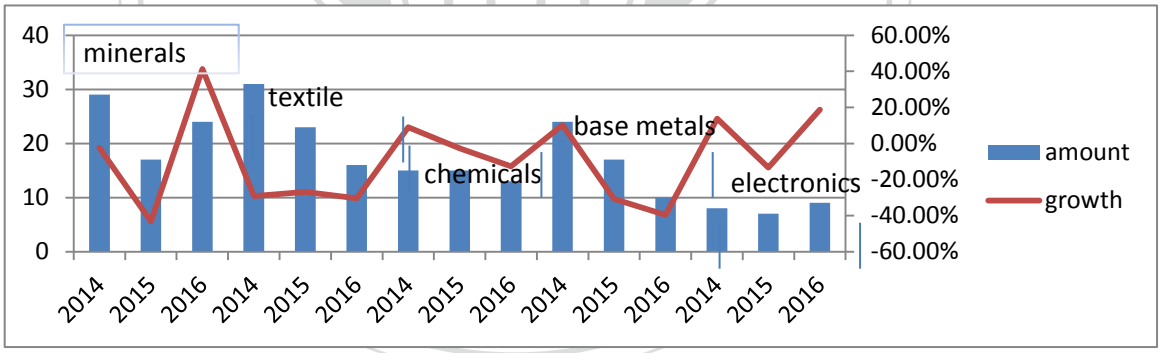
The main exporting products in 2016 were precious metal for $43.24 billion, textile for $35.49 billion, and chemicals for $34.05 billion. The main importing products in 2016 were minerals for $95.05 billion, electronics for $69.57 billion, and precious metal for 48.18 billion.

Regarding trade in goods between India and China in 2016, it valued $69.62 billion. Among which, China exported to India for $60.66 billion; China imported from India for $8.96 billion. China enjoyed a trade surplus for $51.69 billion.

China mainly imported minerals ($2.38 billion), textile ($1.58 billion), and chemicals ($1.26 billion) from India; primarily exported electronics ($31.66 billion), synthetics ($9.31 billion), and base metals ($4.34 billion) to India.

The electronics China exported to India grew about 10% on average annually in 2014-2016. The transportation increased by 47.6% in 2016 from the previous year.

Figure17 China's top 5 imports from India in 2014-2016 ($100 million)



source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Table 23 China's top 5 imports from India in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	5	25-27	minerals	29	-2.4%	21.80%
2015	5	25-27	minerals	17	-43.2%	17.53%
2016	5	25-27	minerals	24	41.3%	26.67%
2014	11	50-63	textile	31	-29.1%	23.31%
2015	11	50-63	textile	23	-26.9%	23.71%
2016	11	50-63	textile	16	-30.5%	17.78%

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2014	6	28-38	chemicals	15	9.0%	11.28%
2015	6	28-38	chemicals	15	-2.7%	15.46%
2016	6	28-38	chemicals	13	-12.6%	14.44%
2014	15	72-83	base metals	24	10.2%	18.05%
2015	15	72-83	base metals	17	-30.8%	17.53%
2016	15	72-83	base metals	10	-39.6%	11.11%
2014	16	84-85	electronics	8	13.8%	6.02%
2015	16	84-85	electronics	7	-13.4%	7.22%
2016	16	84-85	electronics	9	18.8%	10.00%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA。

Figure18 China's top 5 exports to India in 2014-2016 ($100 million)

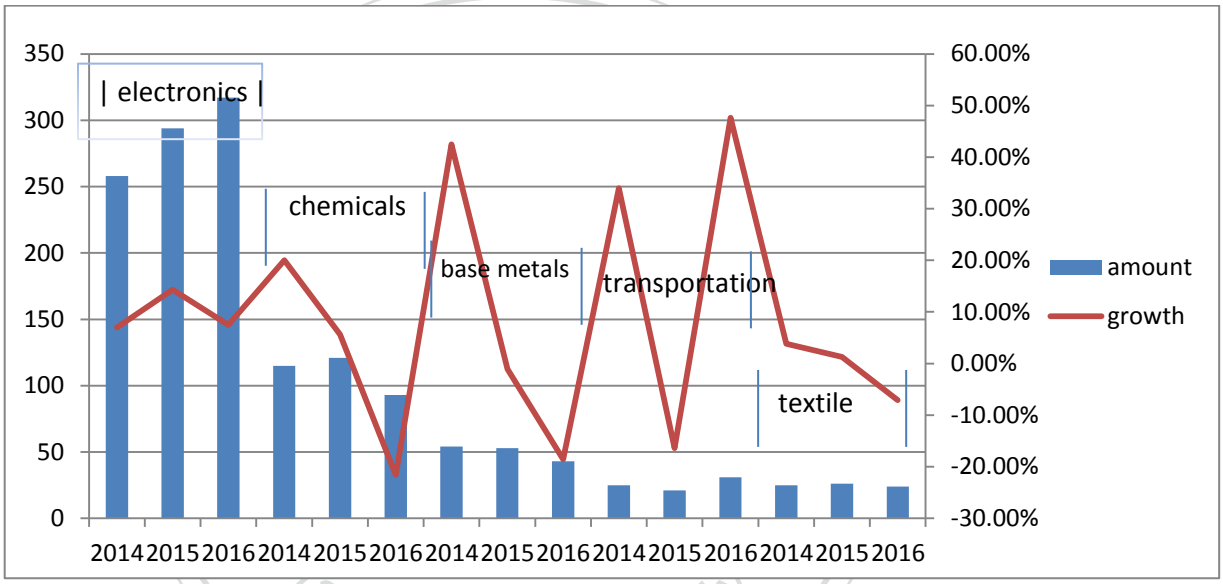

Table 24 China's top 5 exports to India in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	258	7.0%	44.25%
2015	16	84-85	electronics	294	14.3%	48.12%
2016	16	84-85	electronics	317	7.5%	52.22%
2014	6	28-38	chemicals	115	20.0%	19.73%
2015	6	28-38	chemicals	121	5.6%	19.80%
2016	6	28-38	chemicals	93	-21.6%	15.32%
2014	15	72-83	base metals	54	42.5%	9.26%
2015	15	72-83	base metals	53	-1.1%	8.67%
2016	15	72-83	base metals	43	-18.6%	7.08%
2014	17	86-89	Transportation	25	34.0%	4.29%

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2015	17	86-89	Transportation	21	-16.4%	3.44%
2016	17	86-89	Transportation	31	47.6%	5.11%
2014	11	50-63	textile	25	3.8%	4.29%
2015	11	50-63	textile	26	1.3%	4.26%
2016	11	50-63	textile	24	-7.1%	3.95%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

There were some significances in the trading between India and China:

I. economics: According to the Indian Ministry of Finance, India's GDP growth rate was 7.2 percentage from 2016 to 2017. It would keep growing by 6.75% to 7.5% from 2017 to 2018.

II. employment: Ning (2017) pointed out that India's population would surpass China and become the country with the highest population in 2020. The people aged 25-64 would account for 66.2%. About 1 million people entered into labor market every month. However, India's employment rate is declining. According to the World Bank, it went down from 58.1% in 2005 to 52% in 2011. India's unemployment rate reached the highest at 4.43% in 2002, it then went down to 3.41% in 2014. However, in the recent 3 years (2015-2017), it was 3.49%, 3.51%, and 3.52%. In addition, 70% of its labor population was only received primary education. They were unable to serve in the financial and software industry.

Figure19 India's employment rate from 1991 to 2017

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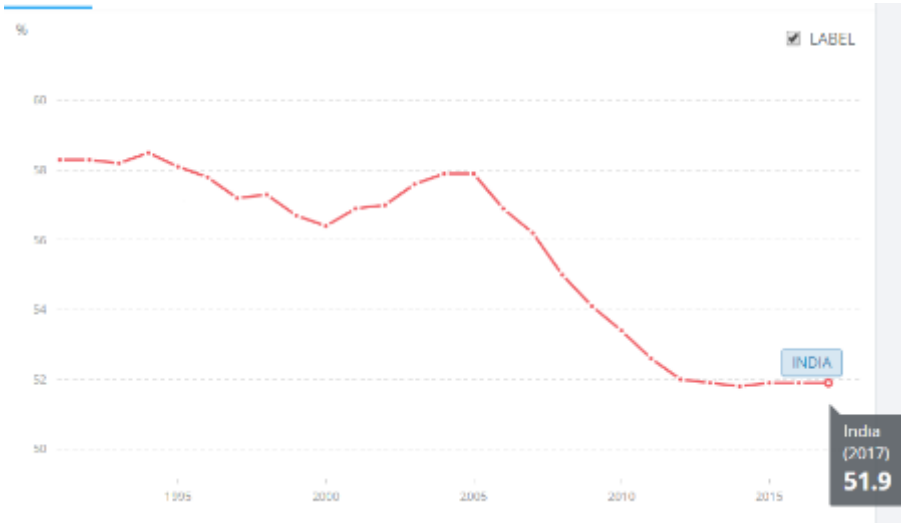

source: World Bank Database, "Employment to population ratio, 15+, total (%) (modeled ILO estimate)"

III. Manufacturing: Ning (2017) illustrated that the manufacturing industry growth rate reached 5.5% and 9.3% in 2015 and 2016. Indian Prime Minister, Narendra Modi's Government, launched the Make in India campaign. It was guided by marketization and liberalization. India tried to open its market and invited FDI. Therefore, the manufacturing industry grew significantly in 2015 and 2016. However, It still faced some challenges, like the supply and demand imbalance in the international market, globalization in reverse, innovative ability delineation, lacking industry and infrastructure.

IV. The trades with China: Although India's main exports were minerals in 2016. It suspended the exports on these products. Besides, the electronics increased 10% in recent three years.

Table 25 The imports and exports of the Indian automotive market

The top 10 exporting country and amount		Growth rate	The top 10 importing country and amount	
Iran	23137	28%	Iran	18120
Bangladesh	11547	1331	US	8039
Mexico	10987	563%	Vietnam	5474

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Chile	5087	64%	Russia	5308
Russia	5034	-5%	Myanmar	4058
Egypt	4455	14%	Egypt	3901
Vietnam	4150	-24%	Chile	3106
Myanmar	3521	-13%	Philippines	2134
US	3098	-61%	Columbia	1942
Philippines	2770	30%	N.Korea	1764

source: Cui (2018)

In 2016, Indonesia was China's sixth largest trading partner in South Asia and ASEAN; China was the largest trading partner of Indonesia. The value of trade grew 11.6% from the previous year. In comparison, Indonesia's trading amounts with other main trading partners decreased. For example, the US fell by 0.6%; Japan decreased by 10.6%; Singapore decreased by 11.1%; India decreased by 13.8%; Malaysia decreased by 7.2% from the previous year.

In 2016, Indonesia's exports to its main trading partners grew. For example, the exports to China rose 11.6%; to the US grew 11.2%; to Japan increased 11.1%; to Singapore grew 7.8%; to India grew 7.0%; to Malaysia grew 4.9%. Those trading partners accounted for 53.6%. Indonesia's imports from China held for 22.7% of total imports; Singapore held for 10.7%, Japan with 9.6%, Thailand with 6.4%, the US for 5.4%, Malaysia with 5.3%. They were in total accounted for 60.1% of total imports China accounted for 22.7% of the total imports; Singapore accounted for 10.7%, Japan for 9.6%, Thailand for6.4%, the US for 5.4%, Malaysia 5.3%.

Indonesia's six trade deficit source countries were China ($14.02 billion), Singapore ($3.3 billion), Thailand ($3.28 billion), Australia ($2.06 billion), Saudi Arabia ($1.39), and Brazil ($1.3 billion).

China exported to Indonesia for $30.8 billion, which accounted for 22.7% of total exports; China imported from Indonesia for $16.79, which accounted for 11.6% of

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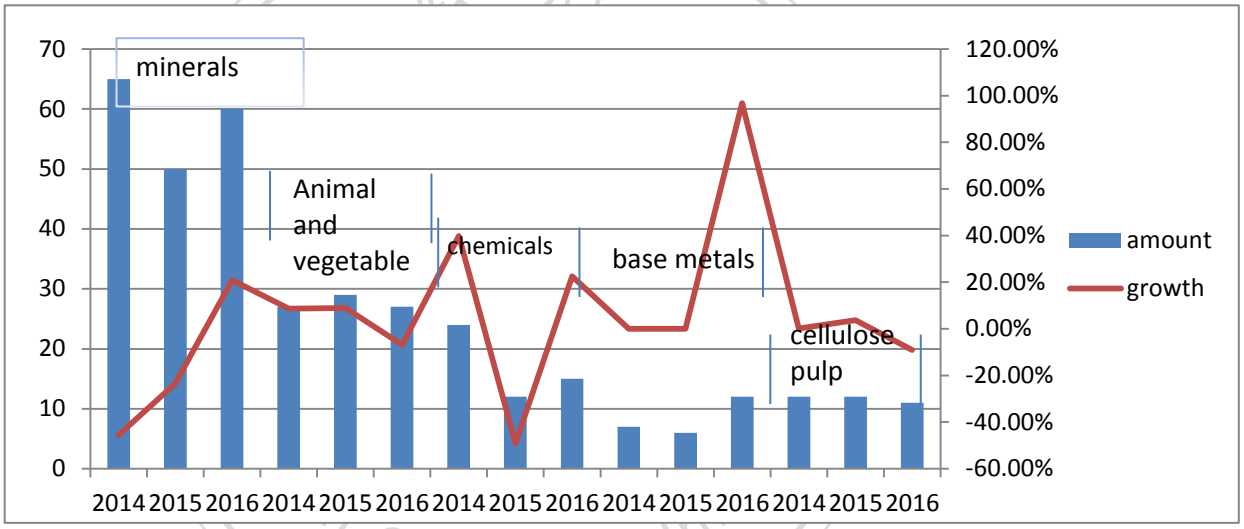
total imports. China had a trade surplus of $14.01 billion.

The top 5 types of goods that China imported from Indonesia were fossil fuels ($5.4 billion), animal/ vegetable oil ($2.74 billion), wood pulp ($0.97 billion), steel ($0.93 billion), woods ($0.83 billion), which accounted for 64.7% of total imports. The significance is that the exports of base metals grew 96.8% in 2016 and reached $1.2 billion. On the other hand, the top 5 types of goods that China exported to Indonesia were machines, electronics, steel, plastics, and chemicals, which accounted for 58.6% of total exports.

Figure20 China's top 5 imports from Indonesia in 2014-2016 ($100 million)



source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA，the data of base metals in 2014 were retrieved from UN Comtrade

Table 26 China's top 5 imports from Indonesia in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	5	25-27	minerals	65	-45.5%	36.93%
2015	5	25-27	minerals	50	-23.5%	33.33%
2016	5	25-27	minerals	60	20.9%	35.71%
2014	3	15	Animal and vegetable fats and oils	27	8.7%	15.34%
2015	3	15	Animal and vegetable fats	29	8.9%	19.33%

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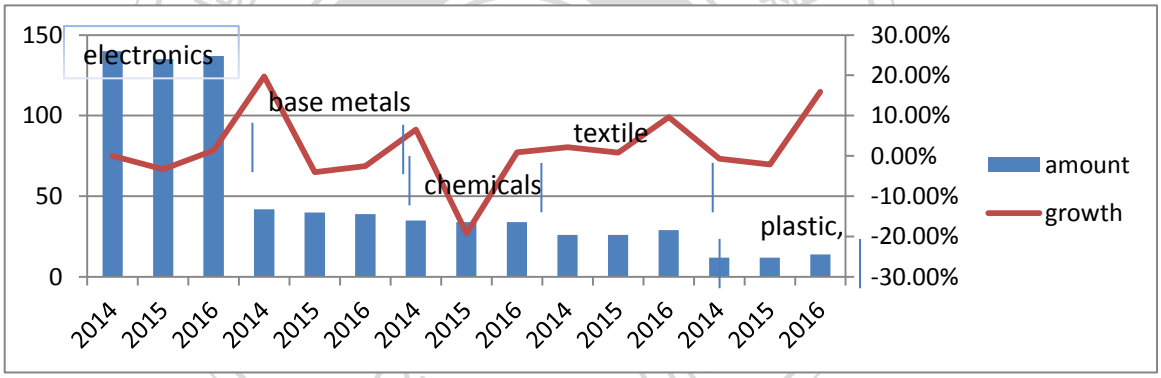
			and oils			
2016	3	15	Animal and vegetable fats and oils	27	-6.8%	16.07%
2014	6	28-38	chemicals	24	39.9%	13.64%
2015	6	28-38	chemicals	12	-49.1%	8.00%
2016	6	28-38	chemicals	15	22.5%	8.93%
2014	15	72-83	base metals	7	N/A	3.98%
2015	15	72-83	base metals	6	N/A	4.00%
2016	15	72-83	base metals	12	96.8%	7.14%
2014	10	47-49	cellulose pulp	12	0.2%	6.82%
2015	10	47-49	cellulose pulp	12	3.7%	8.00%
2016	10	47-49	cellulose pulp	11	-9.1%	6.55%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA，the data of base metals in 2014 were retrieved from UN Comtrade

Figure21 China's top 5 exports to Indonesia in 2014-2016 ($100 million)



source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

Table 27 China's top 5 exports to Indonesia in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	140	0.0%	45.75%
2015	16	84-85	electronics	135	-3.3%	45.92%
2016	16	84-85	electronics	137	1.4%	44.48%
2014	15	72-83	base metals	42	19.7%	13.73%
2015	15	72-83	base metals	40	-4.0%	13.61%
2016	15	72-83	base metals	39	-2.5%	12.66%
2014	6	28-38	chemicals	35	6.5%	11.44%
2015	6	28-38	chemicals	34	-19.2%	11.56%

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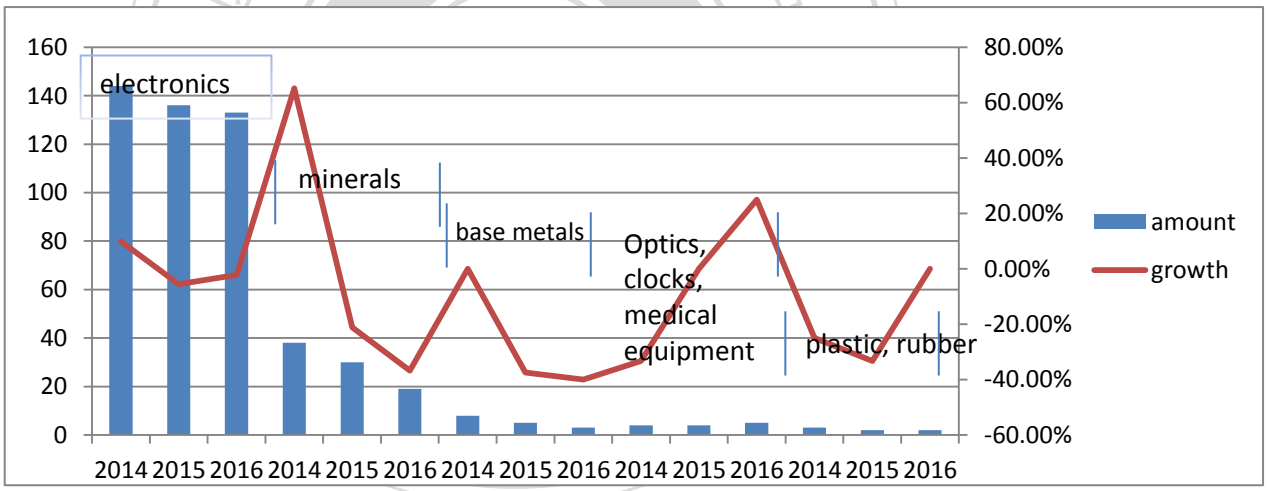
2016	6	28-38	chemicals	34	0.9%	11.04%
2014	11	50-63	textile	26	2.2%	8.50%
2015	11	50-63	textile	26	0.8%	8.84%
2016	11	50-63	textile	29	9.6%	9.42%
2014	7	39-40	plastic, rubber	12	-0.7%	3.92%
2015	7	39-40	plastic, rubber	12	-2.1%	4.08%
2016	7	39-40	plastic, rubber	14	15.9%	4.55%

source: MINISTRY OF COMMERCE, PEOPLE'S REPUBLIC OF CHINA

China's trade with the Philippines in 2014-2016:

Philippines was China's seventh largest trading partner in South Asia and ASEAN countries. China imported $6.37 billion worth of good from the Philippines; China exported $15.57 billion to the Philippines. China had $9.19 billion trade surplus with the Philippines.

Figure22 China's top 5 imports from the Philippines in 2014-2016 ($100 million)



UN Comtrade

Table 28 China's top 5 imports from the Philippines in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	144	9.9%	68.6%
2015	16	84-85	electronics	136	-5.6%	71.6%
2016	16	84-85	electronics	133	-2.2%	76.4%
2014	5	25-27	minerals	38	65.2%	18.1%
2015	5	25-27	minerals	30	-21.1%	15.8%
2016	5	25-27	minerals	19	-36.7%	10.9%

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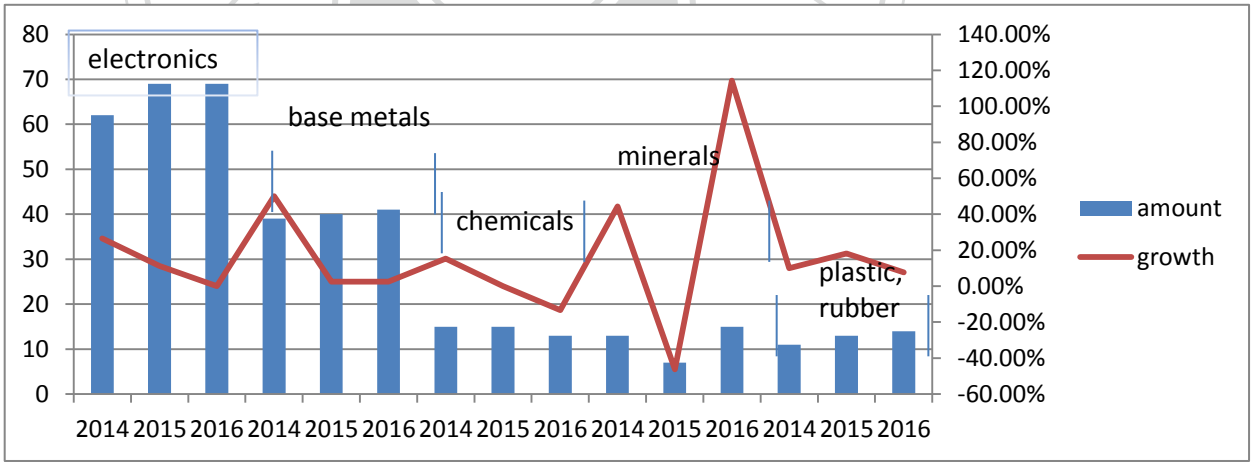
2014	15	72-83	base metals	8	0.0%	3.8%
2015	15	72-83	base metals	5	-37.5%	2.6%
2016	15	72-83	base metals	3	-40.0%	1.7%
2014	18	90-92	Optics, clocks, medical equipment	4	-33.3%	1.9%
2015	18	90-92	Optics, clocks, medical equipment	4	0.0%	2.1%
2016	18	90-92	Optics, clocks, medical equipment	5	25.0%	2.9%
2014	7	39-40	plastic, rubber	3	-25.0%	1.4%
2015	7	39-40	plastic, rubber	2	-33.3%	1.1%
2016	7	39-40	plastic, rubber	2	0.0%	1.1%

UN Comtrade (2017)

Figure23 China's top 5 exports to the Philippines in 2014-2016 ($100 million)



UN Comtrade

Table 29 China's top 5 exports to the Philippines in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	62	26.5%	26.4%
2015	16	84-85	electronics	69	11.3%	25.8%

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2016	16	84-85	electronics	69	0.0%	23.2%
2014	15	72-83	base metals	39	50.0%	16.6%
2015	15	72-83	base metals	40	2.6%	15.0%
2016	15	72-83	base metals	41	2.5%	13.8%
2014	6	28-38	chemicals	15	15.4%	6.4%
2015	6	28-38	chemicals	15	0.0%	5.6%
2016	6	28-38	chemicals	13	-13.3%	4.4%
2014	5	25-27	minerals	13	44.4%	5.5%
2015	5	25-27	minerals	7	-46.2%	2.6%
2016	5	25-27	minerals	15	114.3%	5.0%
2014	7	39-40	plastic, rubber	11	10.0%	4.7%
2015	7	39-40	plastic, rubber	13	18.2%	4.9%
2016	7	39-40	plastic, rubber	14	7.7%	4.7%

source: UN Comtrade (2017)

China's industrial upgrading made qualitative changes in the industries of Cross-Straits/ ASEAN

Wu (2018) commented on the recent report "World Intellectual Property Report 2017: Intangible Capital in Global Value Chains" issued by WIPO. This report mainly analyzed the yields of input of the labor force, tangible capitals and intangible capitals in manufacturing industries. It found that 1/3 of the value of the global sales created by intangible assets, such as their brands, appearance design, and technology. In 2015, Malaysia and Philippines launched "Linking Automotive Components to Global Value Chain Project." They proposed Asia-Pacific's Automotive Supplier Excellence Project" to share their experience of incorporating their industries into Automotive Global Value Chain. The key factors are technologies, innovative abilities, and adoption of international standards.

However, Taiwan's SMEs are small in scale. It's difficult for them to enjoy the benefits of market expansion. The percentage of their exports had dropped from 26.4% of total exports in 1997 to 15.04% in 2016. It showed that the abilities to expand overseas market capabilities of our SME's had been declining. There were at

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least two reasons. First, Taiwan lacked FTA. We couldn't enjoy the preferential tariff duty rate. Second, SME didn't incorporate itself into the global value chain. Especially when in recent years, China's Red Supply Chain had upgraded the value of Chinese products. The restructuring of the worldwide value chain made other countries' participation in global value chains decline. Taiwan's highly dependent on the Chinese market. As China upgraded its value of products, Taiwan's exports to this market could be compressed.

The processing trade data showed that China's industry was labor intensive in 1997-2004

The processing trade meant products were processed in China and then exported to other places to finalize the producing. In 1997-2004, its percentage of processing trade increased 14.4% annually. The total amounts rose from $169.8 billion in 1997 to $549.7 billion in 2004 (Qiang, 2007). It made China's foreign trade increased rapidly. Those data showed that China was a labor-intensive economy in this period.

In recent year, China's trading structure had transformed and upgraded (Cheng, 2016). The turning point included that its percentage of processing trade declined from 41.10% to 32.75% from 2008 to 2014. It further dropped to 30.19% in 2016.

Figure 24 The portion of China's processing trade in recent 20 years

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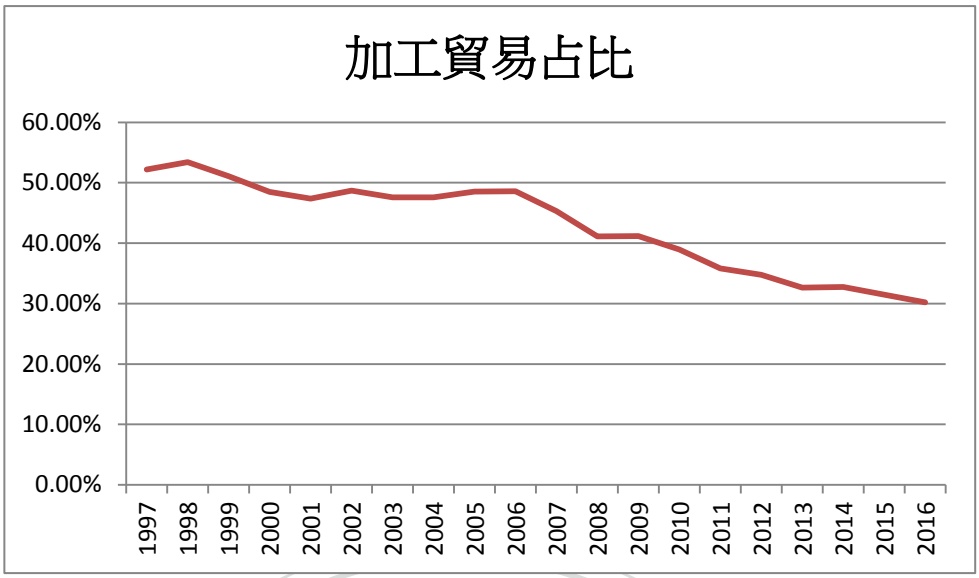

source: China Statistical Yearbook-2016. self-made figure

Table 30 China's economic and trading situation in 1997-2004 ($100 million)

Year / item	1997	1998	1999	2000	2001	2002	2003	2004
GDP	9627	10289	10938	12111	13536	14862	16779	19761
GDP growth rate	9.2%	7.8%	7.7%	8.5%	8.3%	9.09%	10.0%	10.1%
Total foreign trade	3251.6	3239.5	3606.3	4742.9	5096.5	6207.7	8509.9	11547.9
Imports	1423.7	1402.4	1657.0	2250.9	2435.5	2951.7	4127.6	5613.0
Exports	1827.9	1837.1	1949.3	2492.0	2661.0	3256.0	4382.2	5933.2
Processing trade	1698.1	1730.5	1844.6	2302.1	2414.0	3201.3	4047.9	5497.3
Processing trade (%)	52.2%	53.4%	51.1%	48.5%	47.4%	48.7%	47.6%	47.6%
Foreign trade dependence	36.2%	34.2%	36.4%	43.9%	43.3%	48.9%	60.0%	69.8%

source: 1. China Statistical Yearbook-2016. 2. General Administration of Customs of the People's Republic of China (2017). self-made table

Table 31 China's economic and trading situation in 2005-2012 ($100 million)

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Year / item	2005	2006	2007	2008	2009	2010	2011	2012
GDP	22872	32413	39916	47196	51563	61009	78919	87156
GDP growth rate	11.4%	12.7%	14.2%	9.7%	9.4%	10.6%	9.5%	7.9%
Total foreign trade	14219.1	17604.4	21761.8	25632.6	22075.4	29740.0	36418.6	38671.2
import	6599.5	7914.6	9561.2	11325.6	10059.2	13962.5	17434.8	18184.1
General trade import	TBC	TBC	TBC	5,726.8	5338.7	7679.8	10074.6	10,218.2
Processing trade import	TBC	3215	TBC	3,784.0	3223.4	4174.4	4698.0	4,811.7
export	7619.5	9689.8	12200.6	14306.9	12016.1	15777.5	18983.8	20487.1
General trade export	TBC	TBC	TBC	6,625.8	5298.3	7207.3	9171.2	9,880.1
Processing trade export	TBC	5104	TBC	6,751.8	5,869.8	7403.3	8354.2	8,627.8
Processing trade	6905	8319	9860.5	10,535.8	9,093.2	11,577.7	13,052.2	13,439.5
Processing trade (%)	44.2% (48.6%)	48.6%	45.31%	41.10%	41.19%	38.93%	35.84%	34.75%
Foreign trade dependence	62.17%	54.31%	54.52%	54.31%	42.81%	48.75%	46.15%	44.37%

source: 1. China Statistical Yearbook-2016. 2. General Administration of Customs of the People's Republic of China (2017). self-made table

Table 32 China's economic and trading situation in 2013-2016 ($100 million)

year / item	2013 (億美元)	2014 (億美元)	2015 (億美元)	2016 (億美元)
GDP	96007	104882	110602	119443
GDP growth rate	7.8%	7.3%	6.9%	6.7%
Total foreign trade	41589.9	43015.3	39530.3	36855.6
Total import	19499.9	19592.4	16795.6	15879.3
General trade	11,097.2	11,095.1	9,231.9	8,989.5

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import				
Processing trade import	4,969.9	5,243.8	4,470.0	3,967.1
Total export	22090.0	23422.9	22734.6	20976.3
General trade export	10,875.5	12,036.8	12,172.5	11,293.7
Processing trade export	8,608.2	8,843.6	7,977.9	7,158.7
processing trade	13,578.1	14,087.4	12,447.9	11,125.8
Processing trade (%)	32.65%	32.75%	31.49%	30.19%
Foreign trade dependence	43.32%	41.01%	35.74%	30.86%

source: 1. China Statistical Yearbook-2016. 2. General Administration of Customs of the People's Republic of China (2017). self-made table

Chinese enterprises were moving to the development of vertically integrated enterprises. They dedicated to creating international brands and pushing forward its Red Supply Chain would impact Taiwanese and Global industries. Fu (2016) pointed out that the growth rate of Taiwan's exports to China was 0.43% in 2016, but the growth rate of imports from China was 12.8%. The imports of steel, machinery, and electronics proliferated. In the year from 2014 to 2016, Taiwan's trade surplus declined around $2.5 billion. It showed that many Chinese products could sell back to Taiwan. Lin (2016) also pointed out that the cross-straits economic and trade emerged the risk of supply chain reverse. China was absorbing the advantages from western countries and advanced economies. It also supported local enterprises by upgrading their capabilities and shaping their brands. Once they could produce intermediate goods with the same quality as Taiwan's, Taiwan's products would be replaced entirely by China's.

Lenovo (聯想) was a good example. It upgraded its technologies mainly by M&A. It became vertically integrated. Based on TrendForce' s report, its laptop computer

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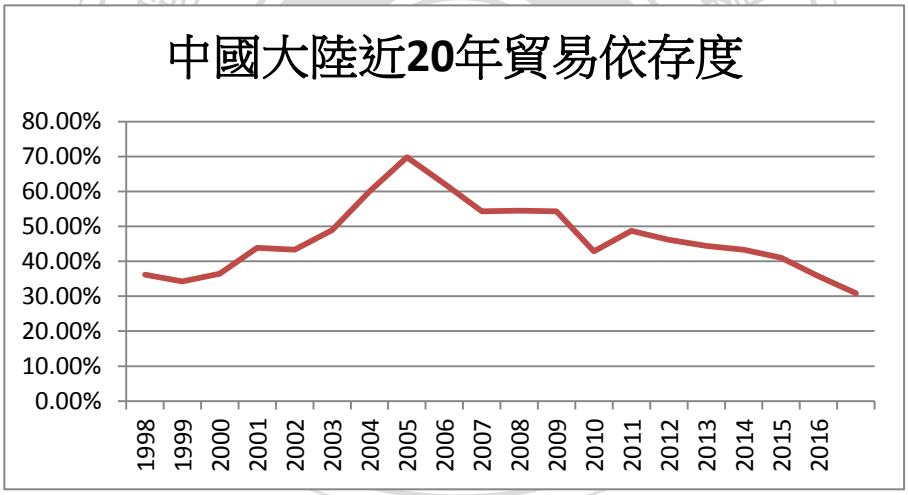
market share was 20% globally and ranked number 2, only second to HP in the second quarter of 2018. Taiwan's Acer and ASUS were number 4 and 5. They accounted for 8% and 7.6% on the global laptop computer market share.

The declining of China's trade dependency showed that its service industries were upgrading

I. The declining of China's trade dependency

China's trade dependency was 69.8% in 2004. It almost declined annually. In 2016, it was 30.86%. It showed that China acquired the necessary equipment and technologies. It could transform into an economy relying on the domestic consumption and 3rd industry.

Figure25 China's trade dependency in 1997-2016



source: 1. China Statistical Yearbook-2016. 2. General Administration of Customs of the People's Republic of China (2017). self-made figure

II. The 3rd industry accounted more on GDP showed China's industry upgraded

The 3rd industry accounted for 34.5% in 1997, 47.3% in 2007, 53.7% in 2015. By the year of 2015 and 2016, it surpassed other two industries.

Table 33 The percentage of China's industry in GDP in 1997 to 2016

industry / year	The percentage in GDP		
	1st (%)	2nd (%)	3rd (%)
1997	6.5	59.1	34.5

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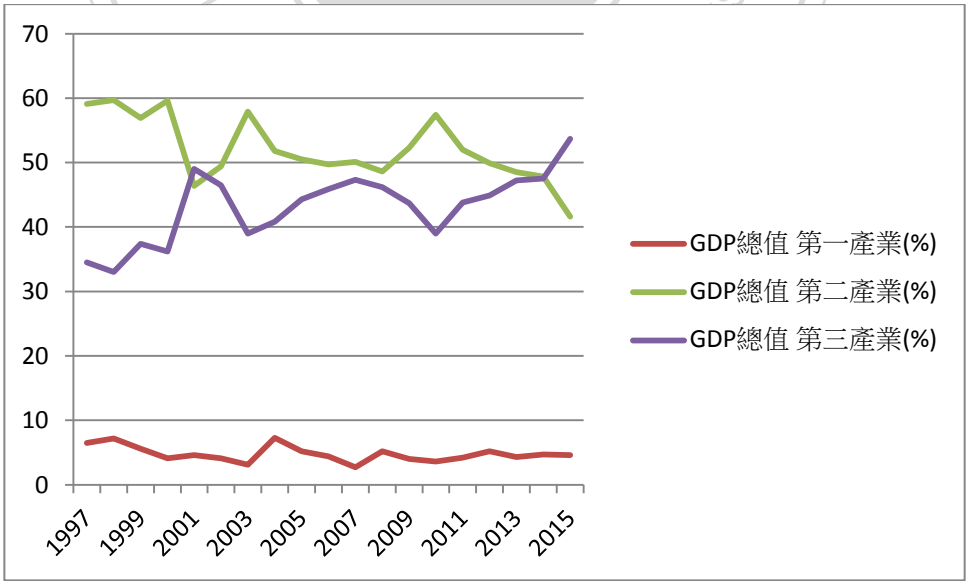
1998	7.2	59.7	33.0
1999	5.6	56.9	37.4
2000	4.1	59.6	36.2
2001	4.6	46.4	49.0
2002	4.1	49.4	46.5
2003	3.1	57.9	39.0
2004	7.3	51.8	40.8
2005	5.2	50.5	44.3
2006	4.4	49.7	45.9
2007	2.7	50.1	47.3
2008	5.2	48.6	46.2
2009	4.0	52.3	43.7
2010	3.6	57.4	39.0
2011	4.2	52.0	43.8
2012	5.2	49.9	44.9
2013	4.3	48.5	47.2
2014	4.7	47.8	47.5
2015	4.6	41.6	53.7
2016	8.6	39.8	51.6

source: China Statistical Yearbook-2016. self-made table

Figure26 The percentage of China's industry in GDP in 1997 to 2016



source: China Statistical Yearbook-2016. self-made figure

China dedicated itself to incorporating itself into the global supply chain

The international survey company, Investopedia, defined TiVA: "Trade in Value

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Added (TiVA) is a statistical method used to estimate the sources of value added when producing goods and services for export and import." Li (2016) also pointed out that this figure helped estimate the adding value by one country. Therefore, WTO and OECD joined together and developed the TiVA database. It used the export value of a product to minus import value and defined the result as Added Value.

China's status in the global industry chain continuously improved in recent years. Based on the analysis of Chen and Hu (2007), the exports of China's intermediate products increased by 20.50% from 1995 to 2004. This figure was higher than the annual growth rate of imports. This result showed that the international specialization had become more specialized. Wu (2015) also noticed that China brought up Global Value Chains (GVCs) in APEC's cooperation agenda. APEC Leaders endorsed the "APEC Strategic Blueprint for Promoting GVCs Development and Cooperation."

China spared no efforts on moving up from the bottom of the Smile Curve. It used the international resources and markets to build the sound production and marketing system globally. Even Apple and Samsung were still competitive in smartphone markets, Huawei, Mi, Oppo, and Vivo held more percentage in high-end smartphone market shares.

WTO calculated the exports of the end products and intermediate products in significant economies in 1995-2011. US and Japan declined around 10 percent in the item of "value added of domestic industry sent to the consumer economy," which showed that their added value of final products tended declination. Their "Domestic VA sent to third economies" and "Foreign VA content of exports" increased 5-10 percent, which showed that they invested more domestically and overseas. Therefore, they participated more in the global value chain.

Base on the same study. China's "domestic VA sent to consumer economy" accounted for 51.3%, which was closed to US' and Japan's. China's "domestic VA

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sent to third economies" increased. These two figures showed that China was both good at making end products and joining the global value chain.

Relatively, Taiwan's industries showed a tendency that they set up factors to add value overseas. It showed that the outflow of Taiwanese manufacturers was getting worse. Besides, the item of "domestic VA sent to consumer economy" held 32.1%, which declined from 53.4% in 1995. It showed that the sales by self-brand accounted less in total sales. On the contrary, Taiwan's "domestic VA sent to third economies" accounted for 24.1%, which showed that our industries incorporated more into the global value chain.

Table 34 The sales percentage in Taiwan, China, US, and Japan's intermediate and end products

country	Taiwan		Mainland China		US		Japan	
年度 / 項目	1995	2011	1995	2011	1995	2011	1995	2011
Domestic VA sent to consumer economy	53.4%	32.1%	56.9%	51.3%	68.4%	59.4%	70.4%	52.2%
Domestic VA sent to third economies	15.8%	24.1%	9.5%	15.6%	19.4%	24.9%	23.8%	32.8%
Foreign VA content of exports	30.6%	43.5%	33.3%	32.1%	11.4%	15.0%	5.6%	14.6%

source: WTO"Trade in value-added and global value chains: statistical profiles" retrieved: https://www.wto.org/english/res_e/statis_e/miwi_e/countryprofiles_e.htm

Regarding China's industry upgrades, Yin, Yuan, and Cheng (2016) pointed out that China's exports were $2.09 trillion in 2011, which accounted for 28.6% in GDP. Its added value was $1.57 trillion. Its intermediate products took up a high percentage, which showed that it was incorporating into global value chain and upgrading its industries.

Figure27 the increase of export for APEC members in 1995-2011

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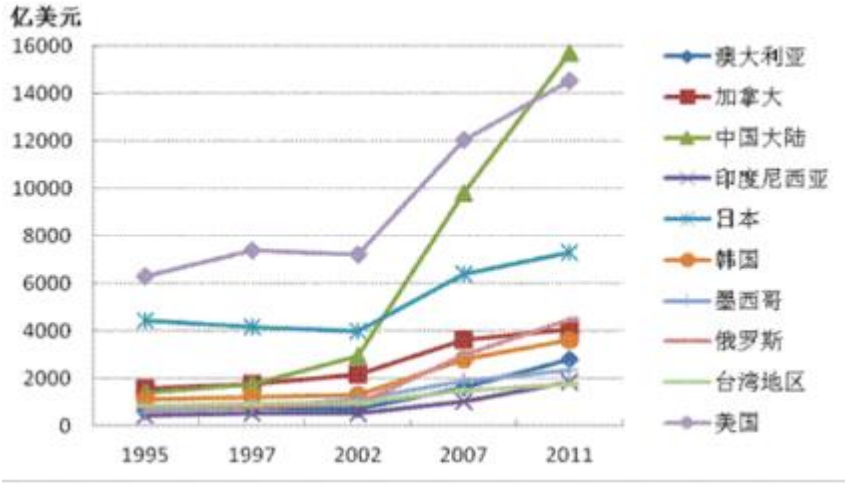

source: Yin, Yuan, and Cheng (2016)

2.3. Taiwan's investment and trade with New Southbound countries

The overall trade with ASEAN and South Asia:

Taiwan's main exports to the world were electronic components, which exported $92.8 billion in 2016. It increased by 8.1% from the previous year. It accounted for 33.1% of total exports. The exports of information, communication, and audiovisual products were $30.1 billion, which was second in place. It decreased 0.9% and accounted for 10.7% of the total exports. The third largest exporting products were primary metals, which amounted $24.5 billion. It fell by 3.7% from the previous year and accounted for 8.8% of the total exports.

Taiwan's main import from the world was minerals. It amounted for $42 billion in 2016. It increased by 9.6% and accounted for 18.2%. The second largest import was electronic components. It amounted for $35.1 billion, which decreased by 15.4%. It accounted for 15.2% of the total imports. The third largest import was machinery, which amounted for $28.6 billion. It increased 19.3% from the previous year and accounted for 12.4% of the total imports.

Taiwan was the six largest trading partner for ASEAN in 2014. The trading

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amounts were around $110 billion. We were the 7th largest foreign investment sourcing country of ASEAN. We were also the 3rd most significant foreign investment sourcing country of Thailand. For Malaysia and Vietnam, we were the 4th largest FDI sourcing country. We invested in ASEAN countries for $3.45 billion in 2016, which was higher than $2.24 billion in 2015.

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Table 35 Taiwan’s investment in ASEAN in the past 47 years ($ million)

cnt / year	Thailand		Malaysia		Philippines		Indonesia		Singapore		Vietnam		Cambodia		total	
	number	amount	number	amount	number	amount	number	amount	number	amount	number	amount	number	amount	number	amount
48-89	1553	10351.76	1786	9225.66	824	982.08	885	12774.15	316	1391.00	614	13662.00	168	427.52	6146	48814.17
90	50	158.69	88	296.58	9	11.99	69	83.85	26	378.30	137	455.70	7	56.97	386	1442.08
91	41	62.93	64	66.29	22	236.35	50	83.18	27	25.76	189	277.00	4	6.83	397	758.34
92	57	338.83	57	163.69	22	47.11	49	117.54	15	26.40	167	321.60	1	1.34	368	1016.51
93	53	268.53	78	109.09	22	29.52	41	68.87	18	822.23	159	469.57	7	16.69	378	1784.50
94	57	417.66	71	113.64	20	25.30	43	133.39	16	97.70	181	453.49	6	15.52	394	1256.70
95	63	284.30	70	110.48	27	38.05	27	218.62	18	806.30	124	231.61	15	50.75	344	1740.11
96	49	247.75	41	118.79	28	444.84	31	51.40	9	1194.11	226	1786.91	13	39.94	397	3883.74
97	47	222.81	32	256.07	18	28.95	46	306.23	14	697.63	138	8657.34	8	21.45	303	10190.48
98	32	155.56	32	209.38	8	4.67	47	118.43	6	36.70	53	1355.73	6	27.16	184	1907.63
99	39	139.57	41	407.76	21	33.38	58	85.40	8	32.70	97	1219.84	18	91.83	282	2010.48
100	40	197.94	23	439.87	23	74.10	94	530.80	12	448.59	64	394.49	22	82.09	278	2167.88
101	58	376.20	13	56.08	2	58.54	75	487.00	19	4498.66	53	196.44	23	97.23	243	5770.15
102	41	230.30	18	39.94	10	70.57	90	306.53	10	158.29	66	414.92	16	85.17	251	1305.72
103	42	101.10	30	197.74	11	67.49	95	1565.42	17	136.77	85	512.42	7	29.12	287	2610.06
104	52	432.00	24	297.00	13	121.28	66	166.68	19	230.03	110	940.40	14	47.25	298	2234.64
105	46	227.73	18	122.19	7	32.82	480	149.10	26	1553.88	216	1327.14	12	40.17	805	3453.03
106(1-6)	19	93.72	12	67.00	3	23.16	330	294.80	7	618.85	805	889.08	4	14.28	1180	2000.89
累計	2339	14307	2498	12297	1090	2330	2576	17541	583	13154	3484	33566	351	1151	12921	94347
累計排名		3		4		N.A.		10		N.A.		4		10		

source：Thailand’s BOI, Malaysia’s MIDA, Philippines’ PSA, Indonesia’s BKPM, ROC’s MOEA made this chart.

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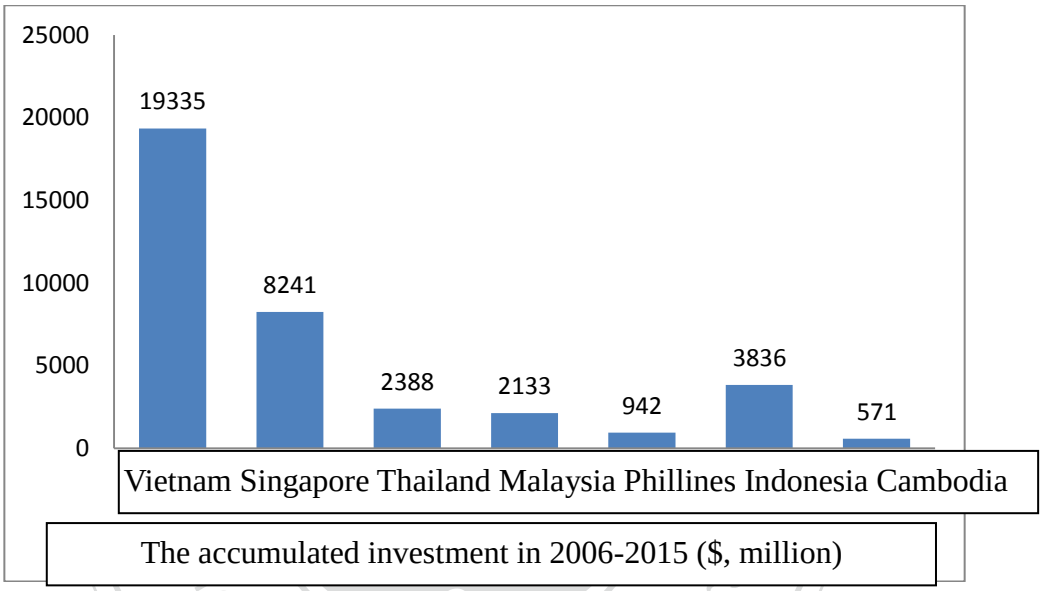
Diao man-peng (2017) pointed out that Taiwan's investment in six countries of ASEAN (Singapore, Malaysia, Thailand, Philippines, Indonesia, and Vietnam) had doubled from $1.2 billion in 2006-2010 to $2.7 billion in 2011-2015. This change was due to the changing environment of China, and the attractive of ASEAN's investment environment. The New Southbound Policy of Tsai's government would also become the momentum to increase the investment.

Figure28 Taiwan's accumulation of investment in ASEAN in 2006-2015 ($/ million)



cource: Huang Yuling (2016)

Table 36 The significances of the trade between Taiwan and ASEAN/ South Asia

Organization/ country	The significances of the trade between Taiwan and ASEAN/ South Asia
ASEAN	The amount of business grew from $54.6 billion in 2005 to $79.3 billion in 2015. ASEAN became Taiwan's 2nd largest trading partner. In 2015, the main exports from Taiwan to ASEAN were electronics. Other leading products were minerals and machines, steels, plastics, chemicals, textiles.
Singapore	In 2015, Singapore imported $23.99 billion worth of goods from Taiwan. It exported $14.04 billion worth of products to Taiwan. These two countries signed the ASTEP in 2013.
Malaysia	In 2016, Malaysia imported $6.28 billion worth of goods from Taiwan. It exported $7.84 billion worth of products to Taiwan. Taiwan's principal investments in Malaysia were electronics,

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	non-metal minerals, and papers. The accumulated amount of money ranked the 4th regarding Malaysia's foreign investments.
Thailand	In 2016, Thailand imported $7.17 billion worth of goods from Taiwan. It exported $3.34 billion worth of products to Taiwan. Taiwan's principal investments in Thailand were electronics, chemicals, and papers. The accumulated amount of money ranked the 3rd regarding Thailand's foreign investments.
Vietnam	In 2016, Vietnam imported $11.22 billion worth of goods from Taiwan. It exported $2.27 billion worth of products to Taiwan. Taiwan's principal investments in Vietnam were textiles, shoes, and foods processing. The accumulated amount of money ranked the 4th regarding Vietnam's foreign investments.
Indonesia	In 2016, Indonesia imported $1.68 billion worth of goods from Taiwan. It exported $2.13 billion worth of products to Taiwan. Taiwan's principal investments in Indonesia were textiles, shoes, and food processing. The accumulated amount of money ranked the 10th regarding Indonesia foreign investments.
Philippines	In January to November 2016, the Philippines imported $4.7 billion worth of goods from Taiwan. It exported $1.86 billion worth of products to Taiwan. Taiwan's principal investments in the Philippines were electronics, trading, and food.
Cambodia	In 2016, Cambodia imported $650 million worth of goods from Taiwan. It exported $77.9 million worth of products to Taiwan. Taiwan's initial investments in Cambodia were real estates and land development.
Laos	In 2016, Laos imported $3.29 million worth of goods from Taiwan. It exported $14.18 million worth of products to Taiwan. Taiwan's initial investments in Cambodia were wood furniture and textile.
Maynmar	In 2016, Maynmar imported $210 million worth of goods from Taiwan. It exported $69.75 million worth of products to Taiwan. Taiwan's initial investments in Myanmar were agriculture, optical instruments, food and drinks, and building materials.
India	In 2016, India imported $2.82 billion worth of goods from Taiwan. It exported $2.12 billion worth of products to Taiwan.

source: Ministry of Economic Affairs, R.O.C.

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Table 37 the amounts of Taiwan's imports in 1997-2016

Country /year	global		SE/ SA		ASEAN		NE Asia		US		Europe		China		South Asia	
	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)
1997	114,421.92	11.775	17,912.35	17.769	13,391.04	19.616	34,045.40	7.555	23,233.35	16.333	21,600.05	7.236	5,949.21	24.137	879.87	18.439
1998	104,661.55	-8.53	16,524.94	-7.746	12,650.40	-5.531	32,669.46	-4.042	19,678.05	-15.303	20,584.21	-4.703	6,103.47	2.593	613.99	-30.218
1999	110,684.87	5.755	18,300.80	10.747	14,477.63	14.444	37,782.77	15.652	19,692.07	0.071	17,583.50	-14.578	6,665.77	9.213	505.6	-17.653
2000	140,004.90	26.49	24,753.15	35.257	20,230.77	39.738	47,544.89	25.837	25,125.35	27.591	19,012.04	8.124	8,455.93	26.856	640.05	26.593
2001	107,965.54	-22.884	20,114.37	-18.74	16,081.89	-20.508	32,664.63	-31.297	18,406.87	-26.74	15,084.50	-20.658	7,999.57	-5.397	595.32	-6.989
2002	113,237.86	4.883	20,511.52	1.974	16,673.61	3.679	35,104.08	7.468	18,255.35	-0.823	14,748.01	-2.231	9,914.36	23.936	656.5	10.276
2003	128,007.46	13.043	21,381.09	4.239	17,540.91	5.202	41,456.90	18.097	16,995.02	-6.904	16,319.04	10.652	12,964.44	30.764	724.58	10.37
2004	168,750.61	31.829	25,229.99	18.001	20,375.75	16.161	55,377.67	33.579	21,780.11	28.156	21,401.17	31.142	19,133.87	47.587	965.63	33.268
2005	182,610.21	8.213	27,380.83	8.525	21,170.27	3.899	59,291.63	7.068	21,170.60	-2.798	21,919.02	2.42	22,235.39	16.21	976.54	1.13
2006	202,694.86	10.999	30,657.08	11.965	23,402.65	10.545	61,283.05	3.359	22,664.19	7.055	21,565.26	-1.614	26,688.45	20.027	1,402.79	43.648
2007	219,248.35	8.167	33,224.47	8.375	23,789.01	1.651	61,094.28	-0.308	26,507.71	16.959	23,712.80	9.958	29,866.60	11.908	2,748.35	95.921
2008	240,444.37	9.668	37,032.43	11.461	25,677.85	7.94	59,675.43	-2.322	26,326.29	-0.684	24,951.62	5.224	32,912.81	10.199	2,512.77	-8.572
2009	174,367.42	-27.481	28,059.59	-24.23	19,834.88	-22.755	46,726.04	-21.7	18,153.64	-31.044	20,230.72	-18.92	25,560.60	-22.338	1,800.87	-28.331
2010	251,232.99	44.083	41,604.82	48.273	28,883.66	45.621	67,975.35	45.476	25,379.09	39.802	26,700.70	31.981	37,591.91	47.07	3,190.77	77.179
2011	281,434.21	12.021	48,081.51	15.567	32,795.79	13.544	70,059.28	3.066	25,758.56	1.495	30,563.69	14.468	45,290.46	20.479	3,649.82	14.387
2012	270,469.19	-3.896	44,434.29	-7.585	31,531.19	-3.856	62,646.17	-10.581	23,603.61	-8.366	29,403.32	-3.797	43,579.10	-3.779	2,925.72	-19.839
2013	269,893.21	-0.213	44,438.60	0.01	32,605.37	3.407	58,929.06	-5.933	25,201.02	6.768	30,630.29	4.173	44,257.78	1.557	3,189.92	9.03
2014	274,021.98	1.53	45,556.91	2.517	34,114.16	4.627	56,482.32	-4.152	27,422.27	8.814	31,362.97	2.392	49,732.43	12.37	3,207.34	0.546
2015	228,615.50	-16.57	37,120.55	-18.518	28,322.80	-16.976	51,726.61	-8.42	26,409.46	-3.693	27,843.41	-11.222	45,625.67	-8.258	2,247.94	-29.913
2016	230,563.59	0.852	36,539.09	-1.566	27,154.14	-4.126	55,271.24	6.853	28,596.89	8.283	30,054.76	7.942	45,326.57	-0.656	2,485.28	10.558

source: Ministry of Economical Affairs of ROC

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Table 38 the amounts of Taiwan’s exports in 1997-2016

Country/ year	global		SE/ SA		ASEAN		NE Asia		US		Europe		China		South Asia	
	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)	amount	Growth (%)
1997	122,077.88	5.295	19,969.04	5.829	16,317.20	5.285	14,056.64	-13.869	29,551.45	9.995	18,414.77	8.678	626.45	0.497	1,530.83	19.755
1998	110,579.61	-9.419	15,188.86	-23.938	11,869.79	-27.256	10,809.31	-23.102	29,376.09	-0.593	19,636.90	6.637	834.65	33.234	1,488.64	-2.756
1999	121,587.87	9.955	17,921.40	17.99	14,292.60	20.411	14,504.89	34.189	30,901.29	5.192	20,319.99	3.479	2,536.80	203.937	1,577.34	5.959
2000	148,316.28	21.983	22,334.75	24.626	18,475.85	29.269	20,506.70	41.378	34,814.30	12.663	23,712.74	16.697	4,217.43	66.25	1,804.35	14.392
2001	122,865.88	-17.16	18,442.30	-17.428	15,358.27	-16.874	16,397.29	-20.039	28,135.95	-19.183	20,009.22	-15.618	4,745.31	12.517	1,513.24	-16.134
2002	130,592.78	6.289	19,746.96	7.074	16,451.44	7.118	16,331.34	-0.402	27,364.88	-2.741	18,823.03	-5.928	9,944.92	109.574	1,481.28	-2.111
2003	144,173.93	10.4	21,998.48	11.402	18,130.95	10.209	17,139.83	4.951	26,553.39	-2.965	20,777.91	10.386	21,416.89	115.355	1,673.06	12.946
2004	174,007.70	20.693	28,802.22	30.928	24,025.66	32.512	19,437.32	13.404	28,750.63	8.275	23,826.90	14.674	34,012.92	58.814	2,102.89	25.692
2005	189,393.13	8.842	32,870.80	14.126	27,363.28	13.892	20,987.81	7.977	29,113.59	1.262	23,648.92	-0.747	40,879.07	20.187	2,654.70	26.24
2006	213,164.33	12.551	36,898.42	12.253	31,192.81	13.995	23,454.17	11.751	32,360.39	11.152	26,146.31	10.56	48,354.08	18.286	2,600.72	-2.033
2007	235,054.72	10.269	43,531.51	17.977	36,300.73	16.375	23,727.28	1.164	32,076.80	-0.876	28,687.88	9.721	58,511.28	21.006	3,453.45	32.788
2008	243,799.35	3.72	47,336.45	8.741	38,926.56	7.234	26,261.45	10.68	30,790.66	-4.01	29,995.77	4.559	63,132.60	7.898	4,291.92	24.279
2009	193,801.19	-20.508	36,895.87	-22.056	30,585.78	-21.427	21,804.43	-16.972	23,552.55	-23.507	22,620.10	-24.589	50,904.42	-19.369	3,662.16	-14.673
2010	261,549.94	34.958	50,579.61	37.087	41,961.45	37.193	28,687.15	31.566	31,465.69	33.598	29,440.11	30.15	72,522.30	42.468	5,016.83	36.991
2011	291,874.18	11.594	61,910.74	22.403	51,541.13	22.83	30,605.88	6.688	36,363.94	15.567	31,305.61	6.337	78,292.28	7.956	6,286.52	25.309
2012	284,182.57	-2.635	65,966.01	6.55	56,546.72	9.712	30,830.73	0.735	32,975.87	-9.317	28,904.94	-7.669	75,959.53	-2.98	5,247.62	-16.526
2013	287,957.86	1.328	68,397.56	3.686	58,768.36	3.929	31,299.47	1.52	32,564.07	-1.249	27,944.28	-3.324	77,197.51	1.63	5,300.24	1.003
2014	296,033.94	2.805	68,922.00	0.767	59,529.48	1.295	32,588.96	4.12	34,866.20	7.07	28,816.48	3.121	77,391.16	0.251	5,380.25	1.509
2015	264,323.75	-10.712	59,236.13	-14.053	50,929.12	-14.447	31,836.90	-2.308	34,248.67	-1.771	25,631.81	-11.052	67,210.90	-13.154	4,684.20	-12.937
2016	256,873.52	-2.819	59,414.91	0.302	51,290.53	0.71	32,338.80	1.576	33,523.08	-2.119	26,277.34	2.518	67,170.59	-0.06	4,614.80	-1.482

source: Ministry of Economical Affairs of ROC

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Taiwan's trade with Singapore in 2014-2016:

Based on TAITRA, the total trade between Taiwan and Singapore was $36.3 billion, recessing 2.55% from the previous year. Among which, Singapore exported $22.2 billion to Taiwan and imported $32.2 billion from Taiwan. The main exports to Taiwan were electronics, machinery, chemistry, and minerals, while the main imports were electronics, minerals, chemistry, primary metal, and machinery. The recent trades for ten years were as followed:

Figure29 Singapore EXP/ IMP to Taiwan in 2006-2016 ($ billion)

Year	import	export	total trade	Trade surplus
2006	15.24	9.48	24.72	-5.75
2007	15.46	9.14	24.60	-6.33
2008	16.39	9.48	25.87	-6.92
2009	12.77	8.66	21.43	-4.11
2010	18.51	12.79	31.30	-5.72
2011	21.73	14.75	36.48	-6.98
2012	25.29	14.45	39.74	-10.84
2013	28.99	15.30	44.29	-13.69
2014	29.97	16.06	46.03	-13.91
2015	23.99	14.03	38.02	-9.95
2016	22.25	14.07	36.32	-8.18

Source: TAITRA

Figure30 Taiwan's main imports from Singapore in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	60	0.02%	71.43%
2015	16	84-85	electronics	53	-12.70%	74.65%
2016	16	84-85	electronics	55	4.10%	73.33%
2014	7	39-40	plastics, rubber	3.02	6.00%	3.60%
2015	7	39-40	plastics, rubber	2.47	-18.28%	3.48%
2016	7	39-40	plastics, rubber	1.98	-20.05%	2.64%

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2014	6	28-38	chemicals	5.87	-3.22%	6.99%
2015	6	28-38	chemicals	5.26	-10.36%	7.41%
2016	6	28-38	chemicals	4.48	-14.94%	5.97%
2014	5	25-27	minerals	5.60	-2.64%	6.67%
2015	5	25-27	minerals	2.15	-61.57%	3.03%
2016	5	25-27	minerals	5.69	164.56%	7.59%
2014	18	90-92	optical, clock, medical	2.91	-21.44%	3.46%
2015	18	90-92	optical, clock, medical	3.59	23.03%	5.06%
2016	18	90-92	optical, clock, medical	3.43	-4.35%	4.57%

Source: Bureau of Foreign Trade.

Figure31 Taiwan's main exports to Singapore in 2014-2016 ($100 million)

year	Custom category	HS Coding	categories	amount	growth	Percentage in total import
2014	16	84-85	electronics	148.45	+8.129%	72.41%
2015	16	84-85	electronics	131.60	-11.351%	76.07%
2016	16	84-85	electronics	124.98	-5.029%	77.15%
2014	5	25-27	minerals	36.80	-3.072%	17.95%
2015	5	25-27	minerals	24.43	-33.620%	14.12%
2016	5	25-27	minerals	19.67	-19.494%	12.14%
2014	15	72-83	basic metal	4.31	-2.857%	2.10%
2015	15	72-83	basic metal	3.50	-18.898%	2.02%
2016	15	72-83	basic metal	2.98	-14.689%	1.84%
2014	18	90-92	optical, clock, medical	1.33	-6.167%	0.65%
2015	18	90-92	optical, clock, medical	1.20	-9.601%	0.69%

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2016	18	90-92	optical, clock, medical	1.72	+42.937%	1.06%
2014	6	28-38	chemicals	6.17	+3.851%	3.01%
2015	6	28-38	chemicals	4.05	-34.262%	2.34%
2016	6	28-38	chemicals	4.45	+9.635%	2.75%

Source: Bureau of Foreign Trade.
https://cus93.trade.gov.tw/FSC3010F/FSC3010F

Taiwan's trade with Vietnam in 2014-2016:

Based on the research of TAITRA, in 2016, The trade between Taiwan and Vietnam were $13.49 billion, which increased 3.2% from the previous year. Among which, Vietnam imported from Taiwan amounted to $11.22 billion which increased by 2.1% of the prior year. What Vietnam exported to Taiwan amounted to $2.27 billion, which increased by 9.0% from the previous year. Vietnam suffered from a trade deficit of $8.94 billion, which rose 0.4% of the prior year.

Vietnam's main imports from Taiwan were textile, machinery, and steel. The significant were electronics and steels, which increased 44.1% and 18.2%. However, machinery decreased 12% from the previous year. Vietnam's main exports to Taiwan were textile, rice, rubbers. Even Taiwan enjoy trade surplus, We created 1.4 million job opportunities. The contribution was too significant to be ignored.

Figure32 Vietnam's main imports from 2014 to 2016 ($ thousand)

rank	items	2016	2015	2014
1	machinery	28,371,938	27,593,978	22,500,445
2	Computers	27,874,205	23,125,305	18,721,834
3	Celephone	10,559,966	10,595,433	8,476,223
4	Textile	10,482,389	10,156,306	1,443,284
5	Steel	8,016,213	7,492,323	7,775,485
6	plastic	6,256,725	5,958,341	6,317,308
7	cloth	5,066,699	5,003,649	4,692,377
8	petroleum	4,944,149	5,341,985	7,665,245

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9	metal	4,806,995	4,236,269	3,433,934
10	plastic	4,396,645	3,761,201	3,160,211
11	chemical	3,793,020	3,415,977	3,217,398
12	automotives	3,549,516	3,027,893	2,145,516
13	feeds	3,461,419	3,391,837	3,252,000
14	Chemical raw materials	3,210,863	3,143,271	3,314,737
15	Steel products	2,957,854	3,810,800	3,226,705
	Total:	174,110,916	165,649,101	148,048,657

Source: TAITRA

Figure33 Vietnam's main exports from 2014 to 2016 ($ thousand)

rank	items	2016	2015	2014
1	celephone	34,317,371	30,176,320	23,606,589
2	textile	23,841,360	22,814,501	20,948,909
3	Computers	18,959,111	15,609,602	11,439,667
4	Shoes	13,000,747	12,010,785	10,340,477
5	Machinery	10,143,767	8,167,677	7,314,193
6	Sea food	7,053,125	6,572,600	7,836,037
7	Wood	6,969,096	6,899,189	6,231,676
8	transportation	6,058,416	5,844,372	5,626,800
9	coffee	3,335,507	2,674,238	3,557,781
10	Case and purse	3,168,587	2,877,768	2,539,161
11	camera	2,958,230	3,025,763	2,220,209
12	Fibers	2,929,567	2,539,890	2,542,758
13	Cashew	2,842,575	2,402,125	1,995,063
14	Vegetable	2,457,665	1,841,790	1,491,109
15	oil	2,357,575	3,720,439	7,229,456
	Total:	176,631,783	162,111,558	150,186,492

Source: TAITRA

Taiwan's trade with Malaysia in 2014-2016:

According to TAITRA, the trade between Taiwan and Malaysia were 1$14.1 billion, which increased by 3.27% from the previous year. Malaysia was Taiwan's number 8 trading partner. Taiwan's exports to Malaysia amounted to $7.82 billion, which increased by 9.55%. Taiwan's imports from Malaysia amounted to $6.27 billion. Taiwan enjoyed $1.53 billion trade surplus. The main exporting products to Malaysia were electronics

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($4.97 billion), which accounted for 56.26%. It was followed by machinery ($ 503 million), and steel ($480 million). The main importing products from Malaysia were electronics ($2.33 billion), which accounted for 40.53%. It was followed by oil and gas ($ 1.32 billion), and optics ($474 million).

Figure34 Malaysia's main imports from 2014 to 2016 ($ million)

rank	items	H.S.CODE	2016	2015	2014
1	Integrated circuit	8542	24,911.5	24,757.3	29,306.90
2	petroleum	2710	11,883.4	14,808.7	22,833.00
3	Diode	8541	3,571.2	3,837.8	4,175.90
4	Celephone	8517	3,494.4	3,791.9	3,824.40
5	Crude Oil	2709	2,817.1	3,385.6	7,729.50
6	Automatic data processor	8471	2,570.3	2,542.1	2,628.30
7	ATM	8473	2,362.5	2,714.7	3,222.00
8	transportation	8708	2,275.1	2,401.5	2,316.50
9	gold	7108	2,208.2	2,841.2	3,216.50
10	viehcle	8703	1,847.2	1,911.1	2,143.80

Source：World Trade Atlas

Figure35 Malaysia's main exports from 2014 to 2016 ($ million)

rank	item	H.S.CODE	2016	2015	2014
1	Integrated circuit	8542	26,623.30	27,245.8	31,032.3
2	gas	2710	11,127.60	10,625.7	18,494.9
3	Palm oil	1511	9,091.40	9,472.1	12,009.1
4	diode	8541	8,293.70	8,027.1	7,873.9
5	patroleum	2711	8,263.90	12,137.7	20,701.2
6	Automatic data processor	8471	7,259.60	7,631.4	8,244.9
7	Crude oil	2709	5,649.60	6,857.6	10,540.3
8	celephone	8517	3,869.30	3,719.4	4,187.4

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9	Accessory	4015	3,215.60	3,379.5	3,313.3
10	ATM	8473	3,126.10	3,839.2	4,508.9

Source: World Trade Atlas

Taiwan's trade with Thailand in 2014-2016:

According to TAITRA, in 2016, Thailand's imports from Taiwan accounted for $7.13 billion, which decreased by 5.3% from the previous year. Taiwan was the sixth largest importing source country. In 2015, Thailand exports to Taiwan accounted for $3.36 billion, which decreased 4.8% from the previous year.

Figure36 Thailand's main imports in 2014-2016 ($ thousand)

rank	item	H.S. code	2016	2015	2014
1	Crude oil	2709(LT)	15,176,029	19,521,182	33,216,455
2	Integrated circuit	8542	9,428,177	9,389,778	9,680,795
3	celephone	8517	6,376,206	6,127,241	5,454,328
4	gold	7108(KG)	5,904,585	7,230,983	6,612,473
5	automotive	8708(KG)	5,860,596	5,319,349	5,312,982
6	Oil	2710(LT)	3,557,141	2,993,177	5,573,107
7	Steel	7326(KG)	3,404,219	3,485,879	2,589,877
8	Gas feul	2711(KG)	3,217,151	5,387,324	6,585,914
9	Automatic data processor	8471	3,109,876	3,438,746	3,560,695
10	aviation	8802(NO)	2,424,429	3,088,894	3,009,612
11	machinery	8473(KG)	2,171,882	2,699,950	3,004,265
12	Motor	8543	1,979,952	1,609,189	1,557,754
13	recorders	8523(NO)	1,954,532	1,935,749	1,958,578
14	switch	8536(KG)	1,900,920	1,863,207	1,871,198
15	pump	8414	1,847,564	1,665,962	1,699,336

Source: TAITRA

Figure37 Thailand's main export in 2014-2016 ($ million)

rank	item	H.S. code	2016	2015	2014
1	automotive	8703	11,695,513	9,548,713	6,519,589
2	Automatic data	8471	10,532,210	11,590,112	12,111,855

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rank	item	H.S. code	2016	2015	2014
	processor				
3	Integrated circuit	8542	7,716,851	7,729,430	7,502,328
4	gold	7108(KG)	7,279,061	3,807,242	2,779,543
5	Component of automotive	8708(KG)	6,969,238	6,836,207	6,788,826
6	truck	8704	6,500,799	8,274,910	10,346,131
7	Air conditioner	8415	4,871,549	4,593,253	4,609,256
8	oil	2710(LT)	4,835,748	6,918,457	9,798,061
9	rubber	4001(KG)	4,444,293	5,056,558	6,021,541
10	rice	1006(KG)	4,401,162	4,612,915	5,438,762
11	tyre	4011(NO)	3,580,788	3,456,714	3,504,443
12	accessory	7113	3,565,956	3,697,417	3,852,351
13	machinery	8473(KG)	3,180,059	3,377,678	3,653,072
14	Ethylene	3901(KG)	3,034,979	3,455,881	4,198,883
15	Printing component	8443	2,972,647	3,024,231	2,550,175

Source: TAITRA

Taiwan's trade with India in 2014-2016:

Based on TAITRA, the trade between Taiwan and India in 2000 was $1.2 billion. It reached $7.5 billion in 2011. It came down to $6 billion from 2012 to 2014 annually.

Then, it's $5 billion in 2016, which increased 4.06% from the previous year. Among which, Taiwan's exports to India accounted for $2.8 billion and imports from India accounted for $2.2 billion. Taiwan enjoyed a trade surplus for $639 million.

Taiwan's main exports to India were fossil fuel and electronics. The main exports in sequence of amounts in 2016 were Halogenated olefin polymer(3904), Polyamide(3908, it usually used in textile, automotive components, carpets, package, Glasses frame, tire, glove, etc.), celephone(8517), machinery(8473), rubber processing machinery(8477), diode(8541), alloy(7225), Polyoxymethylene and Epoxy resin(3907, used in injection molding applications which are made into high-performance engineering components), Peroxyacid(2917, used in making bleaching liquid), phenol(2907, which can be made into in Disinfectant). These top 10 products accounted for $934 billion and held 33.07%

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of total exports to India.

Figure38 India's main imports from 2014 to 2016 ($ million)

rank	item	H.S. code	2016	2015	2014
1	Crude oil	2709	65,922.98	116,442.86	143,638.53
2	gold	7108	31,770.74	34,407.18	28,704.13
3	diamond	7102	16,865.96	20,495.36	22,408.99
4	communications	8517	14,999.36	14,301.49	10,941.62
5	bituminous coal	2701	13,166.50	17,082.24	15,280.58
6	LNG	2711	11,429.81	16,280.92	15,235.31
7	Palm oil	1511	5,787.12	6,367.12	8,508.50
8	Data automatic processor	8471	5,112.43	4,815.84	4,370.21
9	Copper ore	2603	4,037.85	4,665.29	5,538.26
10	Gas and diesel	2710	4,022.73	3,874.38	4,381.65
11	beans	0713	3,954.76	2,825.52	2,127.41
12	Automotive components	8708	3,870.08	3,675.57	3,423.17
13	silver	7106	3,742.74	4,523.51	4,539.88
14	Diammonium hydrogen phosphate(磷酸氫二銨)	3105	3,372.87	2,279.81	1,774.38
15	aviation	8802	3,249.69	3,024.81	2,879.73
16	diode	8541	3,144.58	1,540.07	1,339.42
17	Soy bean	1507	2,954.19	2,113.95	1,366.43
18	cast iron(鑄鐵)	7204	2,824.39	3,329.27	2,746.04
19	Project goods(專案貨品)	9801	2,761.07	3,631.43	4,551.03
20	Polyethylene(聚乙烯)	3901	2,657.15	2,913.62	2,189.18

Source: TAITRA

Figure39 Taiwan's main exports to India from 2015 to 2016 ($)

H.S. code	English name	2015	2016	growth(%)
total		9,471,982,434	9,547,389,194	0.796

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8541	Diodes, transistors and similar semiconductor devices	294,068,855	610,036,755	107.447
6006	Other knitted or crocheted fabrics	486,770,757	482,374,737	-0.903
8542	Electronic integrated circuits	411,183,127	435,779,327	5.982
7208	Flat-rolled products of iron or non-alloy steel	346,316,665	380,224,065	9.791
5407	Woven fabrics of synthetic filament yarn	358,622,428	343,700,388	-4.161
3907	Polyacetals, other polyethers and epoxide resins, in primary forms	255,055,606	246,633,515	-3.302
2710	Petroleum oils and oils obtained from bituminous minerals	483,291,524	208,793,703	-56.798
5903	Textile fabrics impregnated, coated, covered or laminated with plastics	189,226,259	181,547,971	-4.058
9002	Lenses, prisms, mirrors and other optical elements, of any material	172,071,077	167,448,598	-2.686
6004	Knitted or crocheted fabrics	169,767,087	162,167,385	-4.477

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2208	Undenatured ethyl alcohol	172,020,887	161,295,260	-6.235
3903	Polymers of styrene, in primary forms	155,593,722	148,730,107	-4.411
3901	Polymers of ethylene, in primary forms	137,237,415	137,053,148	-0.134
8477	Machinery for working rubber or plastics	122,525,590	136,337,424	11.273
5402	Synthetic filament yarn	152,819,080	131,657,347	-13.848
8529	Parts suitable for use solely or principally with the apparatus of headings 8525 to 8528	16,572,590	119,513,166	621.150
5804	Tulles and other net fabrics	114,317,438	117,084,645	2.421
8534	Printed circuit	144,319,790	108,523,931	-24.803
4805	Other uncoated paper and paperboard, in rolls or sheets	105,809,674	106,950,928	1.079
7207	Semi-finished products of iron or non-alloy steel	4,504,365	91,719,745	1,936.241
3824	Prepared binders for foundry moulds or cores	66,895,343	86,436,656	29.212
5503	Synthetic staple fibres, not carded, combed or otherwise processed for spinning	95,807,841	86,350,328	-9.871

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4002	Synthetic rubber	63,513,253	85,435,622	34.516
3506	Prepared glues and other prepared adhesives	82,947,697	83,841,409	1.077
3902	Polymers of propylene or of other olefins, in primary forms	64,933,545	83,016,466	27.848
7601	Unwrought aluminium	100,427,801	82,563,740	-17.788
8479	Machines and mechanical appliances having individual functions	72,378,929	80,313,554	10.963
3909	Amino-resins, phenolic resins and polyurethanes	70,439,281	76,805,849	9.038
9607	Slide fasteners and parts thereof	73,354,023	73,549,714	0.267
2905	Acyclic alcohols and their halogenated	52,107,817	70,648,176	35.581

Source: TAITRA

Taiwan's trade with Indonesia in 2014-2016:

According to Taiwan's official data, Indonesia was the 16 largest exporting market for Taiwan. Taiwan's main exporting products were gas, steel, textile, integrated circuit, machinery, and chemicals. Taiwan's main imports were coal, natural gas, nickel, and tin. Both sides could mutually assist in trade and economy.

Taiwan's initial investment in Indonesia were textile, shoes, furniture, metal, tire, mineral, trade service, and agriculture. Based on the statistics of Taiwan Indonesia

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business council, there were about 2000 Taiwan's companies invested in Indonesia and about 20000 thousand businessmen. They created almost a million jobs.

Figure40 Taiwan's main imports from 2015-2016 ($)

H.S. code	items	2015	2016	growth(%)
total		5,929,103,956	4,300,211,134	-27.473
2701	Coal	1,533,976,062	1,076,549,455	-29.820
2711	Petroleum gases	1,186,280,336	814,748,017	-31.319
2709	Petroleum oils	274,256,029	313,941,074	14.470
7501	Nickel mattes	164,106,895	143,853,312	-12.342
7112	Waste and scrap of precious metal or of metal clad with precious metal	842,448,853	112,931,410	-86.595
8532	Electrical capacitors	54,796,787	102,770,544	87.548
8001	Unwrought tin	120,373,335	102,459,411	-14.882
4409	Wood	81,307,472	79,764,481	-1.898
4412	Plywood	53,130,917	75,692,602	42.464
4802	Uncoated paper and paperboard	54,184,253	52,141,686	-3.770
4803	Toilet or facial tissue stock	48,196,952	49,916,083	3.567
4001	Natural rubber	48,669,878	47,725,726	-1.940
7403	Refined copper and copper alloys, unwrought	36,624,932	46,176,382	26.079
8708	Parts and accessories of the motor vehicles	30,648,002	40,672,843	32.710
3823	Industrial monocarboxylic fatty acids	31,951,034	38,863,970	21.636
7404	Copper waste and scrap	46,785,804	37,445,845	-19.963

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2710	Petroleum oils and oils obtained from bituminous minerals	77,056,207	35,643,451	-53.744
7201	Pig iron	46,535,507	35,568,941	-23.566
6404	Footwear	23,061,253	34,343,766	48.924
2814	Ammonia	64,253,455	28,148,711	-56.191
9403	furniture	30,009,909	26,624,164	-11.282
8714	Parts and accessories of vehicles	37,908,326	23,867,989	-37.038
0307	Molluscs	23,209,740	22,852,845	-1.538
5504	Artificial staple fibres	19,182,565	21,268,919	10.876
8407	internal combustion piston engines	9,392,253	20,784,547	121.295
8443	printers, copying machines and facsimile machines,	19,960,974	20,205,153	1.223
0901	Coffee	22,761,070	17,864,846	-21.511
8704	Motor vehicles for the transport of goods	18,253,349	17,667,197	-3.211
2402	Cigars	3,910,972	16,482,675	321.447
6402	Other footwear with outer soles and uppers of rubber or plastics	18,924,628	15,408,999	-18.577

Scource: TAITRA

Figure41 Taiwan's main exports to Indonesia from 2015 to 2016 ($)

HS	name	2015	2016	growth(%)
Total	INDONESIA	3,038,314,627	2,746,552,443	-9.603
6006	Other knitted or crocheted	133,705,169	146,333,472	9.445

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	fabrics			
2710	Petroleum oils and oils obtained from bituminous minerals, other than crude	170,759,106	94,936,982	-44.403
5407	Woven fabrics of synthetic filament yarn	89,892,254	86,280,410	-4.018
8477	Machinery for working rubber or plastics	80,532,323	70,944,639	-11.905
5903	Textile fabrics impregnated	60,364,143	58,289,813	-3.436
8542	Electronic integrated circuits	66,297,051	57,520,124	-13.239
0302	Fish, fresh or chilled	49,194,557	53,665,702	9.089
8708	Parts and accessories of the motor vehicles	49,560,679	50,246,255	1.383
7209	Flat-rolled products of iron or non-alloy steel	55,102,426	44,762,952	-18.764
7208	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, hot-rolled, not clad, plated or coated	77,630,160	38,998,311	-49.764

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8714	Parts and accessories of vehicles	37,770,119	38,885,220	2.952
2901	Acyclic hydrocarbons	92,336,223	33,356,456	-63.875
4002	Synthetic rubber and factice derived from oils	34,060,256	33,291,294	-2.258
3903	Polymers of styrene, in primary forms	29,132,254	32,780,521	12.523
5804	Tulles and other net fabrics, not including woven	30,546,535	32,386,623	6.024
2917	Polycarboxylic acids, their anhydrides	10,856,587	31,893,260	193.769
3902	Polymers of propylene or of other olefins	24,050,639	29,301,851	21.834
7225	Flat-rolled products of other alloy steel	32,202,901	28,295,527	-12.134
3506	Prepared glues and other prepared adhesives	22,868,907	26,115,638	14.197
6004	Knitted or crocheted fabrics, of a width exceeding 30 cm	32,506,119	25,896,653	-20.333

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8480	Moulding boxes for metal foundry; mould bases materials, rubber or plastics	31,948,625	25,369,223	-20.594
8473	Parts and accessories (other than covers	17,687,745	25,286,884	42.963
3908	Polyamides in primary forms	24,314,475	25,137,107	3.383
3907	Polyacetals, other polyethers and epoxide resins, in primary forms	22,376,508	24,974,910	11.612
3901	Polymers of ethylene, in primary forms	26,423,953	22,895,371	-13.354
6001	Pile fabrics, including "long pile" fabrics and terry fabrics, knitted or crocheted	25,809,463	22,808,830	-11.626
9899	MISCELLANEOUS	20,484,083	21,428,697	4.611
8479	Machines and mechanical appliances having individual functions	28,440,344	21,035,254	-26.037

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3204	Synthetic organic colouring matter, whether or not chemically defined	21,188,973	20,844,354	-1.626
3926	Other articles of plastics and articles of other materials	18,352,589	20,008,672	9.024

Source: TAITRA

Taiwan's trade with the Philippines in 2014-2016:

Based on Taiwan's custom data, Taiwan and the Philippines' total trade in 2016 were $10.86 billion, which increased 17% from the previous year. Among which, Taiwan's exports to the Philippines were $8.66 billion in 2016, which increased by 16.3% from the previous year. The imports were $2.24 billion, which increased by 20.1% of the prior year. The most significant imports were integrated circuit, which accounted for $1 billion. The automatic data processor and petroleum followed it. The largest exports were petroleum, which accounted for $3.82 billion in 2016. The integrated circuit, aviation followed it.

Figure42 Taiwan's imports from the Philippines from 2015 to 2016 **($)**

H.S. code	item	2015	2016	Growth (%)
sum		1,834,725,296	2,203,871,347	20.120
8542	Electronic integrated circuits	745,192,688	1,001,084,766	34.339
8471	Automatic data processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or	140,289,076	165,536,928	17.997

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	included			
2710	Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils or of oils obtained from bituminous minerals, these oils being the basic constituents of the preparations; waste oils	83,386,679	161,987,083	94.260
8541	Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light-emitting diodes (LED); mounted piezo-electric crystals	56,592,667	63,033,142	11.380
2707	Oils and other products of the distillation of high temperature coal tar; similar products in which the weight of the aromatic constituents exceeds that of the non-aromatic constituents	67,195,433	61,213,494	-8.902
8504	Electrical transformers, static converters (for example, rectifiers) and inductors	29,151,333	55,316,244	89.755
9013	Liquid crystal devices not constituting articles provided for more specifically in other headings; lasers, other than laser diodes; other optical appliances and instruments, not specified or	6,621,976	41,142,923	521.309

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	included elsewhere in this Chapter			
8501	Electric motors and generators (excluding generating sets)	67,258,089	39,505,399	-41.263
2901	Acyclic hydrocarbons	25,285,763	35,172,291	39.099
7403	Refined copper and copper alloys, unwrought	12,664,645	33,873,837	167.468
8473	Parts and accessories (other than covers, carrying cases and the like) suitable for use solely or principally with machines of headings 84.70 to 84.72	47,804,592	30,928,970	-35.301
7408	Copper wire	28,332,174	28,969,351	2.249
8523	Discs, tapes, solid-state non-volatile storage devices, smart cards and other media for the recording of sound or of other phenomena, whether or not recorded, including matrices and masters for the production of discs, but excluding products of Chapter 37	12,214,856	26,433,079	116.401
7404	Copper waste and scrap	23,877,790	24,547,710	2.806
9032	Automatic regulating or controlling instruments and apparatus	36,248,000	21,986,662	-39.344
8536	Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits (for example, switches, relays, fuses, surge suppressors, plugs, sockets, lamp-holders and other connectors, junction boxes), for a voltage not exceeding 1,000 volts;	14,957,966	20,938,415	39.982

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	connectors for optical fibres, optical fibre bundles or cables.			
7204	Ferrous waste and scrap; remelting scrap ingots of iron or steel	14,663,618	19,353,979	31.986
7410	Copper foil (whether or not printed or backed with paper, paperboard, plastics or similar backing materials), of a thickness (excluding any backing) not exceeding 0.15 mm	18,275,215	16,180,526	-11.462
2902	Cyclic hydrocarbons	22,135,652	13,474,903	-39.126
8414	Air or vacuum pumps, air or other gas compressors and fans; ventilating or recycling hoods incorporating a fan,whether or not fitted with filter	12,623,946	12,425,476	-1.572
8443	Printing machinery used for printing by means of plates, cylinders and other printing components of heading 84.42; other printers, copying machines and facsimile machines, whether or not combined; parts and accessories thereof	11,930,864	12,273,610	2.873
8543	Electrical machines and apparatus, having individual functions, not specified or included elsewhere in this Chapter	12,032,334	12,252,370	1.829
9899	MISCELLANEOUS	12,575,385	11,778,163	-6.340

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0306	Crustaceans, whether in shell or not, live, fresh, chilled, frozen, dried, salted or in brine; smoked crustaceans, whether in shell or not, whether or not cooked before or during the smoking process; crustaceans, in shell, cooked by steaming or by boiling in water, whether or not chilled, frozen, dried, salted or in brine; flours, meals and pellets of crustaceans, fit for human consumption.	14,257,891	10,632,247	-25.429
8544	Insulated (including enamelled or anodised) wire, cable (including co-axial cable) and other insulated electric conductors, whether or not fittd with connectors; optical fibre cables, made up of individually sheathed fibres, whether or not assembled with electric conductors or fitted with connectors	14,696,819	10,483,154	-28.671
4202	Trunks, suit-cases, vanity-cases, executive-cases, brief-cases, school satchels, spectacle cases, binocular cases, camera cases, musical instrument cases, gun cases, holsters and similar containers; travelling-bags, insulated food or beverages bags, toilet bags, rucksacks, handbags, shopping-bags, wallets, purses, map-cases, cigarette-cases, tobacco-pouches, tool bags, sports bags, bottle-cases, jewellery boxes, powder-boxes, cutlery cases and similar containers, of leather or of composition leather, of sh	6,887,047	10,115,605	46.879

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4707	Recovered (waste and scrap) paper or paperboard	3,920,496	10,087,699	157.307
9030	Oscilloscopes, spectrum analysers and other instruments and apparatus for measuring or checking electrical quantities, excluding meters of heading 90.28; instruments and apparatus for measuring or detecting alpha, beta, gamma, X-ray, cosmic or other ionising radiations cosmic or other ionising radiations	10,917,688	9,279,284	-15.007
2518	Dolomite, whether or not calcined; dolomite roughly trimmed or merely cut, by sawing or otherwise, into blocks or slabs of a rectangular (including square) shape; agglomerated dolomite (including tarred dolomite)	6,371,965	9,065,141	42.266
0307	Molluscs, whether in shell or not, live, fresh, chilled, frozen, dried, salted or in brine; smoked molluscs, whether in shell or not, whether or not cooked before or during the smoking process; flours, meals and pellets of molluscs, fit for human.	5,800,745	8,341,055	43.793

Source: TAITRA

Figure43 Taiwan's main exports to the Philippines from 2015 to 2016 ($)

H.S. code	items	2015	2016	growth(%)
sum		7,445,139,936	8,659,419,138	16.310

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2710	Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils or of oils obtained from bituminous minerals, these oils being the basic constituents of the preparations; waste oils	2,748,247,192	3,821,575,479	39.055
8542	Electronic integrated circuits	2,035,756,987	2,224,555,506	9.274
8802	Other aircraft (for example, helicopters, aeroplanes); spacecraft (including satellites) and suborbital and spacecraft launch vehicles	7,943	163,809,340	2,062,210.714
8534	Printed circuit	127,880,319	113,891,763	-10.939
8404	Auxiliary plant for use with boilers of heading 84.02 or 84.03 (for example, economisers, super-heaters, soot removers, and gas recoverers); condensers for steam or other vapour power units	243,541,204	95,425,771	-60.817
8902	Fishing vessels; factory ships and other vessels for processing or preserving fishery products	15,460,287	67,550,198	336.927
7208	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, hot-rolled, not clad, plated or coated	47,639,537	65,828,598	38.181

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7407	Copper bars, rods and profiles	60,900,783	55,227,881	-9.315
8708	Parts and accessories of the motor vehicles of headings 87.01 to 87.05	39,701,980	54,233,749	36.602
9030	Oscilloscopes, spectrum analysers and other instruments and apparatus for measuring or checking electrical quantities, excluding meters of heading 90.28; instruments and apparatus for measuring or detecting alpha, beta, gamma, X-ray, cosmic or other ionising radiations cosmic or other ionising radiations	121,856,563	52,220,802	-57.146
7209	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, cold-rolled (cold-reduced), not clad, plated or coated	48,621,728	51,533,373	5.988
6006	Other knitted or crocheted fabrics	65,443,723	50,384,676	-23.011
5407	Woven fabrics of synthetic filament yarn, including woven fabrics obtained from materials of heading 54.04	58,370,983	50,379,370	-13.691
8541	Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light-emitting diodes (LED); mounted	54,305,187	47,240,997	-13.008

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	piezo-electric crystals			
8471	Automatic data processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or included	24,128,555	44,836,831	85.825
8473	Parts and accessories (other than covers, carrying cases and the like) suitable for use solely or principally with machines of headings 84.70 to 84.72	23,433,838	41,257,742	76.061
2523	Portland cement, aluminous cement, slag cement, supersulphate cement and other similar hydraulic cements, whether or not coloured or in the form of clinkers	12,659,210	40,410,463	219.218
3903	Polymers of styrene, in primary forms	37,515,309	36,743,364	-2.058
8517	Telephone sets, including telephones for cellular networks or for other wireless networks; other apparatus for the transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network), other than transmission or	28,021,743	32,683,861	16.638

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	reception apparatus of heading 84.43, 85.25, 85.27 or 85.28			
8504	Electrical transformers, static converters (for example, rectifiers) and inductors	37,450,310	28,376,204	-24.230
8523	Discs, tapes, solid-state non-volatile storage devices, smart cards and other media for the recording of sound or of other phenomena, whether or not recorded, including matrices and masters for the production of discs, but excluding products of Chapter 37	23,773,169	27,534,046	15.820
3907	Polyacetals, other polyethers and epoxide resins, in primary forms; polycarbonates, alkyd resins, polyallyl esters and other polyesters, in primary forms	29,788,876	26,615,611	-10.653
3926	Other articles of plastics and articles of other materials of headings 39.01 to 39.14.	24,526,886	26,210,438	6.864
3920	Other plates, sheets, film, foil and strip, of plastics, non-cellular and not reinforced, laminated, supported or similarly	29,857,642	25,719,162	-13.861

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	combined with other materials			
7326	Other articles of iron or steel	23,925,586	24,563,489	2.666
9013	Liquid crystal devices not constituting articles provided for more specifically in other headings; lasers, other than laser diodes; other optical appliances and instruments, not specified or included elsewhere in this Chapter	28,748,479	24,114,975	-16.117
7318	Screws, bolts, nuts, coach screws, screw hooks, rivets, cotters, cotter-pins, washers (including spring washers) and similar articles, of iron or steel	19,968,646	21,368,999	7.013
8418	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air conditioning machines of heading 84.15	22,214,228	20,512,801	-7.659
8536	Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits (for example, switches, relays, fuses, surge suppressors, plugs, sockets, lamp-holders and other connectors, junction boxes), for a voltage not exceeding 1,000	17,815,066	20,034,982	12.461

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	volts; connectors for optical fibres, optical fibre bundles or cables.			
8477	Machinery for working rubber or plastics or for the manufacture of products from these materials, not specified or included elsewhere in this Chapter	16,461,589	19,882,874	20.783

Source: TAITRA

3. The Development of Taiwan's Advantage Firms in ASEAN/ South Asia

As the above figures show, this study found that Chinese electronics exports became the most dynamic part of trading and grew in high speed since 2000. In 2016, China was the most significant electronics exporter, and its value was 1.6 times compared to the US' electronics exports. The value of Taiwanese electronics exports was also Taiwan's largest part of exports. Among all the electronics, the most valuable one was TSMC's (台積電) 12-inch wafer. TSMC's wafer enjoys over 50% of market share in the world annual. Its main clients are Apple, DARPA (US DoD's R&D for drone), Huawei, Bit Continental (比特大陸), and even TOYOTA.

This chapter starts with TSMC. It explores the upstream and downstream of the wafer's supply chain. Because TSMC has exclusive technology, some of its clients, therefore, set up branches here. TSMC also makes the Taiwanese chip-related companies

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prosperous.

Then, in the second section of this chapter, it describes the needs of some ASEAN and India markets. It also explores the possibility of some Taiwanese companies to set branches in New Southbound countries.

The third and fourth sections are figures collected from global, Chinese, and Taiwanese customary and ministry of finance. Those figures explain the trading and industrial trend in Taiwan and China. Among which, we found China is the largest exporter of electronics. Its most significant part of its trade with some key trading partners was electronics. The most significant portion of the cross-straits trading in goods was electronics. Among which, the integrated circuit is the largest. Among which, the 12-inch wafer was the largest. In the top 10 global semiconductor fabrication plants (semiconductor fabrication), Taiwan had four companies on the list: TSMC, UMC(聯華電子), Powerchip(力晶科技), and Specialty IC Foundry of Choice(世界先進). They in total took market share globally up to 64.1%, 67.2%. In 2017, TSMC was still the largest one (as Table 39).

Table 39 Top 10 semiconductor fabrication plants globally in 2017($, million)

rank	name	Revenue			Market share
		2016	2017	Annual growth rate	
1.	TSMC(台積電)	29437	32020	8.8%	55.9%
2.	GLOBALFOUNDRIES	4999	5407	8.2%	9.4%
3.	UMC(聯華電子)	4587	4898	6.8%	8.5%
4.	Samsung	4284	4398	2.7%	7.7%
5.	SMIC(中芯, China)	2914	3099	6.3%	5.4%
6.	TowerJazz(ISRAEL)	1249	1388	11.1%	2.4%
7.	Powerchip(力晶科技)	870	1038705	18.9%	1.8%
8.	Specialty IC Foundry of Choice(世界先進)	801	817	2.1%	1.4%
9.	Hua Hong Semiconductor (Hong	721	807	12.0%	1.4%

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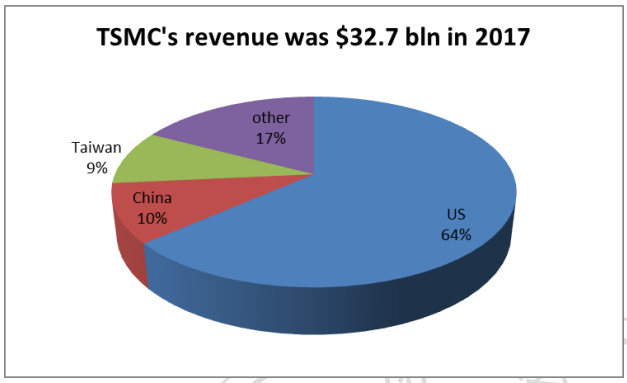
	Kong)				
10.	Dongbu HiTek	666	676	1.5%	1.2%

source: Tuoba Industrial Research Institute (2017/11)

TSMC's revenue in 2017($, billion)



source: Tuoba Industrial Research Institute (2017/11)

The most significant imports to China from the South East, South Asia countries were no electronics at all. For example, the most considerable import from Thailand was rubber. The most massive import from India and Indonesia was mineral. However, electronics were still the largest when looks at the overall trading data. IoT, AI, communication gadgets, and wearable gadgets in recent years drove the need to heighten electronics productivity.

3.1. The supply chain and cooperation opportunities on electronics industries from the Cross-Straits to develop other places

Taiwan's main exports to the world (the statistics were all from June 2017 to May 2018):

1. HS code chapter 85: the electronics and its equipment and components. Taiwan exported these products for $145.7 billion, which accounted for 44% of the total exports.
2. The second largest exports were in HS code chapter 84: the nuclear reactors,

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boilers, and machinery. Taiwan exported these products for $39 billion.

3. The third largest exports were plastics, which amounted to $21.7 billion.
4. The fourth largest exports were optics, which reached $16.7 billion.
5. The fifth largest exports were minerals, which amounted for $11.5 billion.

Table 40 The leading five categories accounted for 71% of total exports.

Period: 2017/06 - 2018/05							
HS code	name	2016/06 2017/05	2017/06 2018/05	rank	percent	growth(%)	amount
total	Global-Continental	293,772.70	330,955.32	---	100	12.657	37,182.62
85	Chapter 85 electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	130,641.41	145,723.72	1	44.031	11.545	15,082.31
84	Chapter 84 nuclear reactors, boilers machinery and machanical appliances; parts thereof	31,798.13	38,960.19	2	11.772	22.524	7,162.05
39	Chapter 39 plastics and articles thereof	18,543.12	21,691.71	3	6.554	16.980	3,148.60
90	Chapter 90 optical, photographic, cinematographic, measuring,	15,585.11	16,656.18	4	5.033	6.872	1,071.08

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	checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof						
27	Chapter 27 mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	10,855.12	11,523.72	5	3.482	6.159	668.60
29	Chapter 29 organic chemicals	8,500.31	10,452.89	6	3.158	22.971	1,952.57
72	Chapter 72 iron and steel	8,757.16	10,234.47	7	3.092	16.870	1,477.31
87	Chapter 87 vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	9,332.74	9,903.87	8	2.993	6.120	571.13
73	Chapter 73 articles of iron or steel	7,028.09	8,170.58	9	2.469	16.256	1,142.49
74	Chapter 74 copper and articles thereof	4,019.96	5,010.21	10	1.514	24.633	990.25
38	Chapter 38 miscellaneous chemical products	3,206.62	3,562.40	11	1.076	11.095	355.77
54	CHAPTER 54 MAN-MADE FILAMENTS; STRIP AND THE LIKE OF MAN-MADE TEXTILE MATERIALS	2,699.65	2,874.22	12	0.868	6.466	174.56

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82	Chapter 82 tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	2,630.90	2,859.88	13	0.864	8.703	228.98
40	Chapter 40 rubber and articles thereof	2,497.97	2,730.89	14	0.825	9.325	232.93
60	CHAPTER 60 KNITTED OR CROCHETED FABRICS	2,565.01	2,535.08	15	0.766	-1.167	-29.93
28	CHAPTER 28 INORGANIC CHEMICALS; ORGANIC OR INORGANIC COMPOUNDS OF PRECIOUS METALS, OF RARE-EARTH METALS, OF RADIOACTIVE ELEMENTS OR OF ISOTOPES	1,700.57	2,326.46	16	0.703	36.805	625.89
95	Chapter 95 toys, games and sports requisites; parts and accessories thereof	2,135.48	2,195.17	17	0.663	2.795	59.69
94	Chapter 94 furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not else where specified or	1,949.76	2,054.01	18	0.621	5.347	104.25

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	included; illuminated signs, illuminated name-plates and the like; prefabricated buildings						
70	Chapter 70 glass and glassware	1,989.26	2,036.22	19	0.615	2.360	46.95
03	Chapter 3 fish and crustaceans, molluscs and other acquatic invertebrates	1,588.87	1,835.14	20	0.554	15.499	246.26
98	Chapter 98 Tariff quota goods	1,681.02	1,779.01	21	0.538	5.829	97.99
83	Chapter 83 miscellaneous articles of base metal	1,613.80	1,683.72	22	0.509	4.333	69.92
48	Chapter 48 paper and paperboard; articles of paper pulp, of paper or of paperboard	1,446.40	1,672.72	23	0.505	15.647	226.32
76	Chapter 76 aluminium and articles thereof	1,438.13	1,612.81	24	0.487	12.146	174.68
32	Chapter 32 tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	1,589.44	1,583.22	25	0.478	-0.391	-6.22
Sub_Total		275,794.05	311,668.49	---	94.172	13.008	35,874.44

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Others		17,978.65	19,286.83	---	5.828	7.276	1,308.18

source: Custom, ROC

If we further analyze the above data by six digitals of HS Code, we could find the five leading exporting products:

1. The first largest were IC products. Taiwan exported $79.2 billion. It accounted for 25% and grew by 16.35%.
2. The 2nd largest were memories (hard disk). Taiwan exported $10.4 billion to the world. It accounted for 3.28% of the total exports and grew by 28.28%.
3. The third largest were engine oil, lubricating oil. Taiwan exported $8.4 billion. It accounted for 2.64% and increased by 9.75%.
4. The fourth largest were information and communication products. Taiwan exported $6.9 billion. It accounted for 2.18% and grew by 19.8%.
5. The fifth largest were optics products. Taiwan exported $6.8 billion. It accounted for 2.13% and increased by 72.27%.

Table 41 Taiwan's exports to the world from June 2016 to May 2017

HS Code	name	2016	2017	rank	percent(%)	growth(%)
amount	Global-Continental	280,317.18	317,244.23	---	100	13.173
854239	Other	68,152.19	79,292.33	1	24.994	16.346
854232	Memories	8,112.23	10,406.12	2	3.280	28.277
271019	Other	7,635.25	8,379.66	3	2.641	9.750
852990	Other	5,776.23	6,919.80	4	2.181	19.798
901380	Other devices, appliances and instruments	3,925.15	6,761.99	5	2.131	72.273
847330	Parts and accessories of the machines of heading 84.71	4,585.08	5,927.89	6	1.869	29.286
853400	Printed circuit	4,925.81	5,544.71	7	1.748	12.564
852351	Solid-state	4,850.94	5,070.74	8	1.598	4.531

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	non-volatile storage devices					
854140	Photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light-emitting diodes (LED)	5,068.88	4,407.09	9	1.389	-13.056
851762	Machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus	2,023.17	2,741.52	10	0.864	35.506
854231	Processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits	1,694.25	2,452.16	11	0.773	44.734
731815	Other screws and bolts, whether or not with their nuts or washers	1,918.19	2,194.28	12	0.692	14.393
390330	Acrylonitrile - butadiene - styrene (ABS) copolymers	1,592.80	2,183.58	13	0.688	37.091
271012	Light oils and	1,845.14	2,027.12	14	0.639	9.863

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	preparations					
851770	Parts	1,695.54	1,962.92	15	0.619	15.769
841112	Of a thrust exceeding 25 kN	1,204.56	1,797.28	16	0.567	49.206
989900	MISCELLANEOUS	1,642.73	1,757.68	17	0.554	6.998
870899	Other	1,683.01	1,755.04	18	0.553	4.280
392690	Other	1,750.75	1,717.52	19	0.541	-1.898
900219	Other	1,488.23	1,686.50	20	0.532	13.323
851712	Telephones for cellular networks or for other wireless networks	1,879.86	1,647.26	21	0.519	-12.373
847130	Portable automatic data processing machines, weighing not more than 10 kg, consisting of at least a central processing unit, a keyboard and a display	1,006.49	1,604.30	22	0.506	59.395
871200	Bicycles and other cycles (including delivery tricycles), not motorised	1,501.23	1,347.71	23	0.425	-10.226
290243	P-xylene	1,057.05	1,310.11	24	0.413	23.941
901390	Parts and accessories	3,470.42	1,286.19	25	0.405	-62.938
Sub_Total		140,485.19	162,181.52	---	51.122	15.444
Others		139,831.99	155,062.71	---	48.878	10.892

source: costum, ROC

From the data collected from the second chapter. Taiwanese semiconductor device fabrication dominates the global market share to the point of 67.2%. So, this section will explain Taiwanese semiconductor device fabrication, mainly related to high-tech, and the upstream and downstream in the ICT industries.

The semiconductor device fabrication and the upstream and downstream:

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The upstream, downstream of wafer production

The wafer is a product to make the chip of ICT of silicon semiconductor. It has 6-inch, 8-inch, and 12-inch, etc. It can produce CPU, for example, the X30 from MediaTek(聯發科), A12 in iPhone, GPU from NVIDIA, FPGA from Xilinx(賽靈思, US), Snapdragon 855 from Qualcomm.

Its downstream is packaging(封測). It applies to computers, phones, AI, solar energy chips, IoT, automotive electronics, fingerprint recognition, machine control unit, and analog IC. The process of wafer fabrication needs machine made by other companies. ASML (Nederland) exclusively produces extreme ultraviolet lithography platform. It tells the quality of chips.

The good yield (良率), purity and evenly matter a lot in wafer production. The bigger the diameter, the higher the technology it requires, and the more CPU can it produces. On the other hand, transistors are the smaller, the better. Then chips could have more semiconductors insides, and chips can compete more effectively and fit the need to make mobile devices thin. According to National Nano Device Laboratories, we have some exclusive chip technology. Few companies can put thousands of million of semiconductors into one chip. Only a few companies can put coding to accelerate its conductivity, to conserve electricity and increase the efficiency.

The smaller nano, the more high-teched wafer is. Because semiconductors are conductive when applies voltage, insulated without electricity. Nano-tech refers to the distance between negative polar and positive polar. The smaller can put more semiconductor into chips. Figure 3 shows one semiconductor (means 0 and 1) and the connection of six semiconductors (mean permutation of 0 and 1).

Figure44 the combination of six semiconductors can mean dozens of the circuit.

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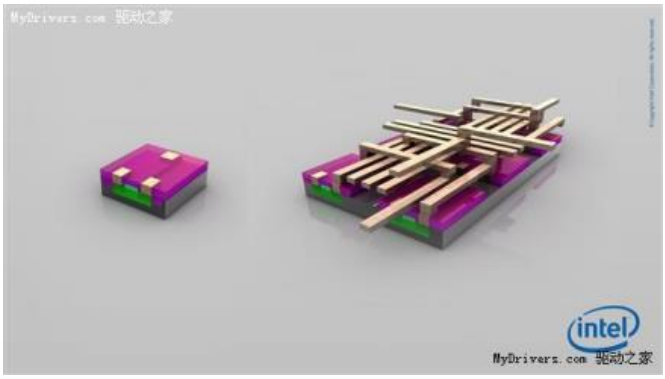
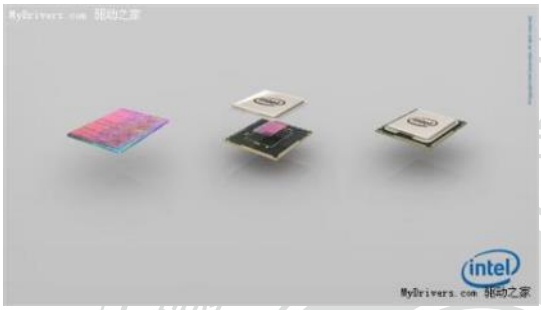


source: Intel

Figure45 million of semiconductors become a chip



source: Intel

TSMC's technology and market share were No. 1 in the world:

TSMC's productivity and technology are well known. Based on Thomson Reuters published Top 100 Global Technology Leaders on January 17, 2018, Taiwan has 13 companies on the list. Japan also has 13 and share the second place in the world. China and the ROK both have three companies. The top 10 in the sequence are Microsoft, Intel, Cisco, IBM, Alphabet, Apple, TSMC(台積電), SAP(Germany), Texas Instruments, and Accenture. TSMC is the only semiconductor fabrication company. Other Taiwanese companies are Acer, ASE Group(日月光), ASUS, LiteOn(光寶科), Nanya Technology Corporation(南亞科), Pegatron(和碩), Powertech(力成), Qisda(佳世達), Quanta(廣達), SPIL(矽品), UMC(聯電), Wistron(緯創). Chinese firms which are included in the list are ZTE(中興通訊), QQ(騰訊), Lenovo(聯想), RoK are LG, Samsung, and SK Hynix(海力士)。

TSMC's(台積電) semiconductor fabrication holds over 50% of market share around the world. According to the Topology Research Institute, because of the soaring

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high-level computers and data centers, the total value of output for semiconductor fabrication is about $57.3 billion in 2017, up 7.1 percentages from 2016. It enjoys a high growth rate of over 5% for five consecutive years.

Table 42 Top semiconductor fabrication company in 2017 and their market share

ranking	company	share	outstandings
1	TSMC(台積電)	55.9%	TSMC had high capacity and annual growth.
2	GLOBALFOUNDRIES（US）	9.4%	Revenue increased 8.2 percentages in 2017
3	UMC(聯電)	8.5%	In Xiamen(廈門), UMC's 12-inch plant had started to produce 14-nano chips in 2017. UMC's revenue in 2017 grew 6.8 percentage.
4	Samsung	7.7%	Its large client was only Qualcomm; the growth had its restraints.
其他	SMIC(中芯國際, China), TowerJazz(Israel）, Huahong Group(華虹, China), Powerchip(力晶)		

source: cnYES.com (2017/10)

TSMC's most significant clients are in the US and China:

TSMC's largest client is APPLE. In total, 63.5% of TSMC's products supplies to US companies, which includes DARPA from DoD, and Nvidia. Excepting the US, TSMC's second largest client is in Asia. 19.9% of TSMC's products catered to Asian companies. Because TSMC makes chips for Huawei's cell phone, other Taiwanese companies benefit from it, as shown in the following Table 43:

Table 43 TSMC makes chips for Huawei and creates industry cluster effect

company	specialty
SPIL(矽品)	Packaging and testing
KYEC(京元電)	Wafer test
Largan(大立光)	Optical element

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TXC(晶技)	sensor
Silitech(閎暉)	Lighting touchpad
Innolux(群創)	panel

source: udn.com (2017/9)

Table 44 Huawei cell phone output volume in 2010-2016(million)

2010	2011	2012	2013	2014	2015	2016
3	20	32	52	75	108	139

《XCF》magazine (2017)

Table 45 the ranking of global top companies' output volume of smartphone

ranking\year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
First place	Samsung	Samsung	Samsung	Samsung	Samsung	Samsung
Second place	Apple	Apple	Apple	Apple	Apple	Apple
Third place	Nokia	Nokia	Lenovo	Lenovo	Huawei	Huawei
Fourth place	BlackBerry	HTC	Huawei	Huawei	Mi	OPPO
Fifth place	HTC	BlackBerry	LG	LG	Lenovo	VIVO

source: IDC, finance sina

In 2018, TSMC produces more by ten nanotech. Its seven nano starts mass production this year. Its products apply to 5G, AI, IoT, High-performance computing. On top of that, Qualcomm, Apple, and Bitmain all place orders to TSMC. This year is better than the last one because Samsung used to get the order from Qualcomm and Apple two years ago. There are still some essential clients: Xilinx' FPGA (可程式邏輯閘陣列, applied on wireless communication), Hisilicon for Huawei' s smartphone, and GPU from NVIDIA

Industry cluster and the role of ASEAN:

I. Apple create industry cluster in Taiwan

In 2017, there are 41 Taiwanese listed companies in Apple's supply chain. There are 340 Chinese companies in Apple's supply chain. In ASEAN, there is no local brand company in Apple's supply chain, but some international companies have a

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manufacturing base in the Philippines, Malaysia, Singapore, Vietnam, Thailand, Indonesia, and India.

Table 46 The 41 Taiwanese listed companies in Apple's supply chain in 2017

category	company		category	company		category	company
semiconductor	ASE TSMC		flexible print circuit board(軟式電路板)	Career (嘉聯益) Interconnect (台郡)		battery	SMP (新普) DynaPack (順達科)
Power supply	AcBel (康舒) Delta (台達電) LiteOn (光寶)		Thermal Module (散熱模組)	AVC (奇鋐) SUNON (建準) Auras (雙鴻)		Lens	GSEO (玉晶光) Largan (大立光) Primaz (致伸)
communication	AzureWave (海華)		Device cases	Catcher (可成)		Wire connectors	正崴
Printed circuit board (PCB)	Zhen Ding (臻鼎) Unimicron (欣興) Unitech (燿華) Tripod tech (健鼎) Compeq (華通)		OEM assembly	Compal (仁寶) Foxconn (鴻海) Wistron (緯創) Pegatron (和碩) Inventec (英業達) Quantatw (廣達)		parts	Yageo (國巨) TXC (晶技) Szs (新日興) Nanya (南亞) Juic (久威)
Acoustic device	Merry (美律)		Display opto electronics back light module	TPK (宸鴻) Radiant (瑞儀)		Packing material	Cheng Loong (正隆)
Periphery	Sunrex (精元), longwell (良維), darfon (達方)						

note 1：highlight companies joined the supply chain since 2017

note 2：Some companies were excluded from the list since 2017: PTOT (白金科技, not

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listed company), AUO (友達), Coretronic (中光電), Coxon (谷崧), Jarlly (兆利)
note 3：branches in Taiwan and part of the supply chain: Texas Instruments (德儀), NXP (恩智浦), Micron Technology (美光), 3M, NOK(Japanese). There were 11 companies in total.
source: Wealth Magazine (2017/5), issue 528, page116-117.

Table 47 Apple's suppliers with branches in South East Asia in 2017

Originate country	name	location
Japanese	Alps	Malaysia
Japanese	Asahi Glass Co., Ltd. (subsidiary of AGC, making glass and Ceramic material	Thailand
Japanese	Dai-Ichi Seiko Co., LTD (一精工株式会社)	singapore
Japanese	Foster Electric Co., Ltd (フォスター電機)	Vietnam
Japanese	Fujikura Ltd. (藤倉)	Thailand, Vietnam
Japanese	Minebea Mitsumi Inc. (ミネベアミツミ株式会社)	Thailand, Philippines
Japanese	Murata Manufacturing Co., Ltd. (村田製作所)	Malaysia, Thailand, Vietnam, Indonesia, Singapore
Japanese	Nidec Corp.	Philippines, Vietnam
Japanese	NOK Corp.	Thailand
Japanese	Panasonic Corp.	Singapore, Indonesia
Japanese	Renesas Electronics Corp.	Malaysia
Japanese	Rohm Co., Ltd.	Malaysia, Philippines, Thailand
Japanese	Sumitomo Electric Industries Ltd. (日本住友電氣工業)	Vietnam, Philippines
Japanese	Taiyo Yuden Co., Ltd. (太陽誘電)	Philippines, Malaysia
Taiwanese	Amkor Technology Inc (艾克爾)	Philippines and Singapore
Taiwanese	Artesyn Embedded Technologies Inc. (雅特生科技)	Philippines, China
Taiwanese	Delta Group (台達電子)	Thailand
Taiwanese	FIT Hon Teng Ltd.(鴻騰)	Vietnam
Taiwanese	Pegatron Corp.(和碩聯合科技)	Singapore
Taiwanese	Sharp Corp. (夏普)	Vietnam
Taiwanese	Wistron Corp.(緯創資通)	India
US	Western Digital Corp. (Hard Disk)	Thailand
US	Seagate Technology LLC (Hard Disk)	Thailand

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US	Skyworks Solutions Inc.	Singapore
US	Apollo Global Management LLC	Singapore, Malaysia, China, and Philippines
US	Intel Corp	Malaysia, Vietnam
US	Kemet Corp.	Vietnam, Thailand, Indonesia
US	Knowles Corp.	Malaysia
US	Koch Industries Inc.	Singapore, Malaysia
US	Maxim Integrated Products Inc.	Philippines
US	Microchip Technology Inc.	Philippines, Thailand
US	ON Semiconductor Corp.	Philippines, Malaysia
US	Qualcomm Inc.	Singapore
Mauritius	Flextronics Sales and Marketing	India
Chinese	GoerTek Inc. (歌爾聲學)	Vietnam
Chinese	Jiangsu Changjiang Electronics (江苏长电)	Singapore
Chinese	Shenzhen YUTO Technology Co., Ltd.(深圳市裕同包裝科技股份有限公司)	Vietnam, India
RoK	LG	Vietnam
	Samsung Electronics Co., Ltd.	Vietnam
German	Infineon Technologies AG (英飛凌)	Malaysia
Finland	Salcomp Plc (phone charger)	India
Swiss	STMicroelectronics N.V.	Singapore, Philippines, Malaysia

source: Apple's "Supply List" (2018)

II. The importance of having exclusive technology

Generally speaking, the brand creates more revenue. But TSMC, which does ODM for international brands, makes more revenue because it has more clients and exclusive technology. Another example is the Korean Samsung. Its smartphone made less income than NAND Flash and OLED last year.

There are still other exclusive technologies. NVIDIA and AMD have GPU, and Powerlogic produces display cooling fans for eSports display card.

Bitcoin benefit Taiwanese tech companies:

TSMC produces Bitmain's ASIC and the packaging and testing for chips processes

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in Taiwan. TSMC makes more revenue by the order than making from Hisilicon's Kirin 970. Bitmain's gross income in 2017 reached $2.27 billion. TSMC gained $1.5 billion by ODM for it, over 2% of total revenue. In the first quarter, TSMC's revenue by ODMing chips for Bitmain reached 10% of the total TSMC's revenue. For the present, Bitmain becomes one of the top 5 clients for TSMC's seven nanochips.

Other Taiwanese companies benefit from this situation. Bitmain' s supplier in Taiwan includes ASE (日月光), ASUS (its display card grew 10-20%), and Msi (微星科技, its displays enjoys 20-25% growth in 2017)

Foxconn's 8K+5G plan:

Foxconn specialized on OEM assembly before. It found the fact that has exclusive technology is essential and stepped on the acquisition road. It has at least 12 subsidiaries now.

Foxconn developed supercomputer in Dec. 2017. This computer ranks 17 in a top supercomputer in the world. It can not only apply to establish AI but also offer to compute as service. Kang (2018) said that Foxconn is the largest electronics OEM Company in the world. It has lots of data to nurture AI to learn and improve its efficiency and yield rate. After Foxconn comes up with a set of the solution, it can sell to other companies. Siemens and GE have a similar project. Foxconn's measures to push the AI project are as following Table 48:

Table 48 Foxconn's 4 strategies to develop AI

Strategy	Outline
Finance	Allocating NT$ 10 billion to establish industrial IoT
Innovation	Cooperating with landing.ai
Infrastructure	Establishing over 10 high-speed calculation centers
restructuring	Restructuring 12 subgroups

source: business weekly (2018/2/12-18)

Foxconn applies supercomputer to biotech and 8K. The period of tumor analysis

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shrinks from 3 months to 47 days; new drug R&D shortens from 10 months to half a month, Ultra-high resolution animation rendering takes ten days initially and becomes 4 seconds.

3.2. Business opportunities in new Southbound countries

Ministry of Finance pointed out in June 2018 that the stability of the international situation helped Taiwan's exports maintain expansion. Some media also said that the Taiwanese government promoted New Southbound policy actively benefited the exports to ASEAN countries. According to MOF, in the first four months in 2018, the exports to ASEAN increased by 17%.

The growth marked the record high of the same period in 6 years. The economic development outlook was good in ASEAN and South Asia. They also benefit from the advantage of the demographic dividend. They were becoming a noticeable emerging market. Taiwan’s economic and trading relations with them were growing. MOF said that in the recent ten years, the growth of Taiwan’s exports to these areas was speedier than the growth of exports to the world. In the first four months of this year, Taiwan’s exports to New Southbound countries amounted for $21.1 billion, which accounted for 21.9% and increased by 15.6% from the same period of the previous year. Among which, the exports to ASEAN were $18.4 billion, which rose 17% and the growth rate marked the highest in 6 years. Because of the trading structures, the semiconductor industries prospered. These products dominated exports. The exports of electronics accounted for 40.8% of total exports. They followed by minerals, which accounted for 13%. Then, primary metal and plastics accounted for 5.7% and 8.4%. The most significant 5 kinds of products accounted for 74% of total exports. On the other hand, the plastics dominated the exports to South Asia. The exporting structure was highly related to the status of local

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countries in the global supply chain.

The main exporting country was Singapore, which accounted for 26%. It followed by the Philippines, Vietnam, and Malaysia. These four countries accounted for 70% of the total exports. In the first four months, the growth rate of exports to the Philippines and Malaysia both increased by more than 30%, which mainly because of the minerals and electronic components. Besides, Taiwan's exports to Thailand increased by 21.5%, which mainly because of electronic components. The exports to Indonesia increased by 15.3% primarily because minerals and machinery. These figures showed that New Southbound countries were becoming Taiwan's main partners beside China.

Regarding the exporting amounts, Taiwan's exports on energy and minerals declined in 2015 and 2014.

Table 49 Taiwan's exports on minerals in 2015

年別	103 年進口			104 年進口			104 與 103 之比較			
量值	數量	價值		數量	價值		數量		價值	
礦物名稱	公噸	萬元	%	公噸	萬元	%	公噸	（%）	萬元	（%）
1.能源礦物	124,031,563	145,942,630	92.5	122,925,112	86,688,304	90.58	-1,106,451	-0.89	-59,254,326	-40.6
2.金屬礦物	26,143,350	8,449,009	5.35	26,435,454	5,674,854	5.93	292,104	1.12	-2,774,155	-32.83
3.工業原料礦物	28,137,285	3,389,202	2.15	28,359,083	3,342,271	3.49	221,798	0.79	-46,931	-1.38
總計	178,312,198	157,780,841	100	177,719,649	95,705,428	100	-592,549	-0.33	-62,075,412	-39.34

source: Mining and Earth Resources Statistics Network (2018/6)

Figure46 the exporting volume of minerals and energy in 2014 and 2015

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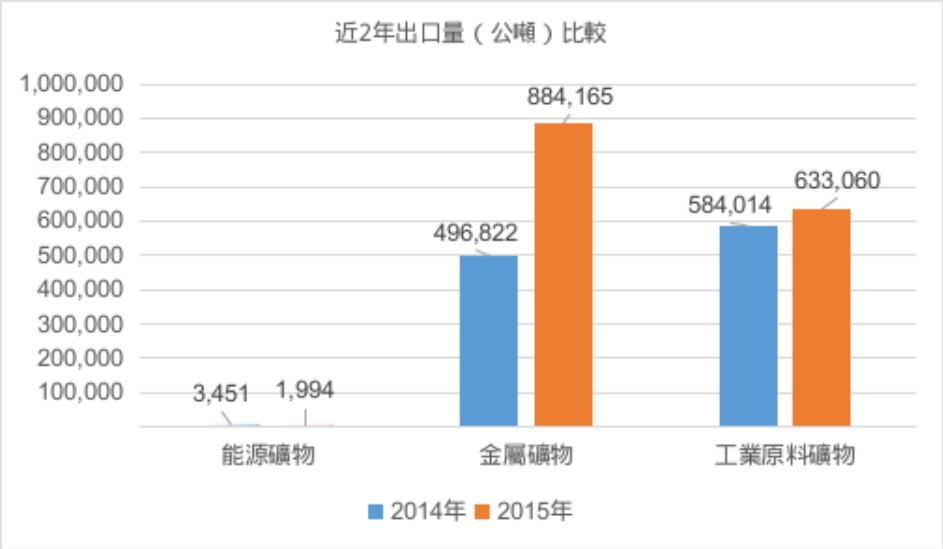
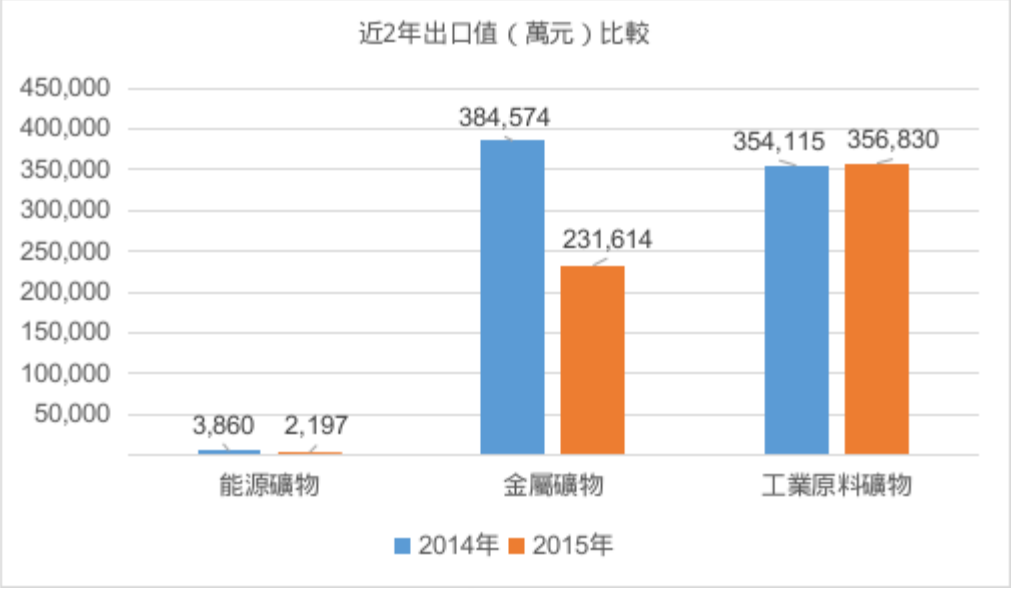


source: Mining and Earth Resources Statistics Network (2018/6)

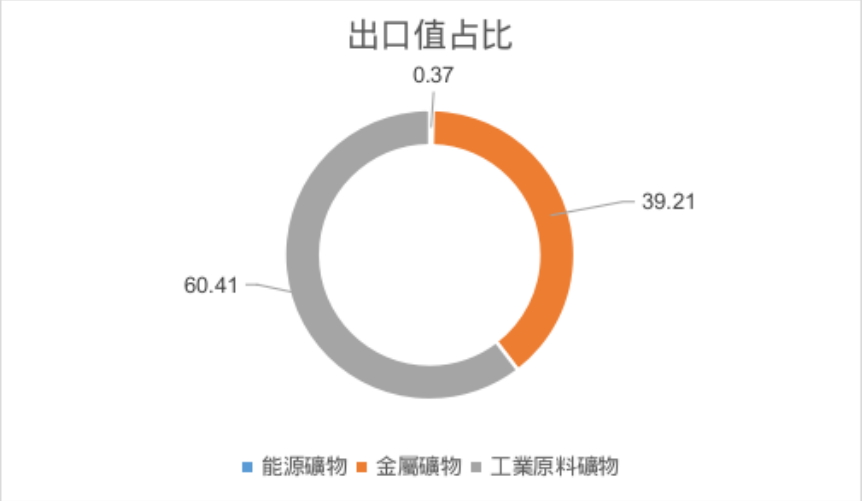
Figure47 the exporting amounts of minerals and energy in 2014 and 2015



source: Mining and Earth Resources Statistics Network (2018/6)

Figure48 the percentage of different kinds of minerals on exporting

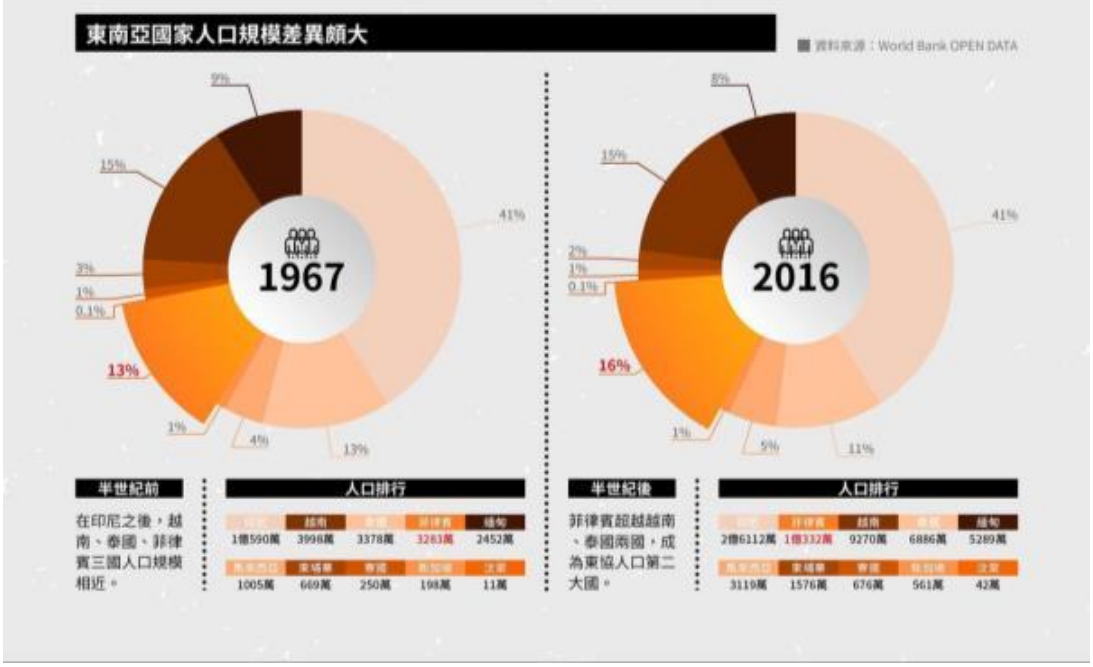
DOI:10.6814/THE.NCCU.IMAS.013.2018.A07



source: Mining and Earth Resources Statistics Network (2018/6)

There were more than 600 million people in ASEAN, and 260 million in Indonesia (Figure49). There were 1.3 billion in India. Because other advanced countries were also putting efforts on R&D in many areas, we might not be able to keep the edge someday in the future. So, Taiwanese companies could seek the opportunity to grow prosperously in South East Asia and South Asia countries.

Figure49 change in popularity from1967 to 2016 in ASEAN's



source: World Bank/ Asean Now

Huang (2018) once suggested using a need-oriented strategy when implementing

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New Southbound policy. Therefore, this section would start with the observation of those countries' markets. Then, it tries to find out the business opportunity.

Market observation:

overall market observation

US promoted the "US First," Japan endorsed US' Indo-Pacific Vision. Wu (2018) pointed out that Japan and India were supporting Asia-Africa Growth Corridor Vision Project. They shaped the Indo-Pacific development outline. Taiwan needed innovative thinking to prevent from being marginalized.

In the period that global protectionism was rising, Taiwan should join regional economic and trade initiatives to support globalization, so not to be marginalized. As Chuang (2017) said, in the context of globalization and the Rise of China, the Cross-Straits should join regional initiatives, such as TPP, RCEP or CPTPP. The trade protectionism would harm global economic development. Therefore, each country should seek cooperation, inclusive growth, and corporate social responsibility. We should promote a new wave of globalization without losers.

Observing on the market demands of ASEAN/ South Asian nations regarding their market demands.

I. Thailand

There were severe floods in Thailand. Japanese NEC (日本電氣) cooperated with Thailand in 2015 on establishing a risk management system. Taiwan also has a similar experience in dealing with natural disasters. We invite ASEAN experts to discuss this issue annual. So, we could find out the opportunity to use the disaster prevention technology in Southbound countries.

Thailand allocates $45 billion to EEC (East Economic Corridor). There are some offers for tech companies, for example, cutting 50% income tax for three years. Besides, Taiwan External Trade Development Council (2018) pointed out that set up factories in

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Thailand can enjoy the low tariff while exporting to many other countries, including Japan, RoK, China, other ASEAN countries.

Thailand has a policy of "Thailand 4.0". They highly value the industries on automobiles, smart electronics, exquisite agriculture, high added value tourism, and new generation foods. Therefore, there would be many business opportunities there.

Primary commodity price and house price are not too high. Green River Wood & Lumber Manufacturing Chairman Xie Ronghui (2018) said that a stand-alone house is around 4 million Thai Baht, equal to the 3-year salary of Taiwanese managers working in Thailand. Yang Kaihong (2018) also said that he's been working in Thailand for over seven years and enjoys a better life with his salary in Thailand.

II. Vietnam

Vietnam exported the most volume of ASEAN's IC products.

Vietnam was said to be a home for motorbikes as it was among the few countries in the world where this vehicle ran countrywide. Currently, motorcycles were still the most convenient means of transportation used by most Vietnamese. Its motorcycles ownership was the second dense by popularity. Bùi (2017) said over 1/3 motorcycles were so old that produced pollution. Its car market was also increasing. Based on the survey, car sales were 157,000 in 2014 rising by 43% compared to the sales in 2013. Its car sales grew 55% in 2015 to 245,000.

BBC (2017/May) reported that superrich (property over 30 million) would grow 174% in Vietnam and it's the fastest growing in the world.

Huang (2016) pointed out that Vietnam is the most substantial Taiwanese foreign investment targeting country in ASEAN. Many of the investment moved from China to Vietnam. Taiwan is the fourth largest foreign investment source country, only less than RoK, Japan, and Singapore. Samsun and Apple have a research center there. However, Vietnam thinks highly on regulations, protection of labor and environmental protection.

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Taiwanese companies have to consider these factors. VEDAN Enterprise Corporation (味丹) and Formosa Plastics (台塑) got fined because of industrial effluents before.

III. Malaysia

Malaysian main export to Taiwan was petroleum, taking up 31.6% and 19.9% in total exports in 2014 and 2015. Secondly, its ICT accounted for 17% and 19.1% during the same year. It means both sides have good trading relations and cooperation on ICT.

In Negeri Selangor, Malaysia sets up Multimedia Super Corridor and welcomes FDI to boost its innovative enterprises. There are dozens of innovative enterprises from Rok, US, Ukraine, Vietnam, Indonesia, Philippines, Singapore, Thailand, and Cambodia now. In 2014, the revenue in Multimedia Super Corridor was $11.66 billion, increasing 11.65% from the year before.

IV. Philippines

Typhoon causes severe disasters usually.

Automobiles sales growth gains momentum in recent years. According to the Ministry of Commerce of PRC (2016), its motorcycle sales were the first place in ASEAN countries in 2016. Taipei Economic and Cultural Office in the Philippines (2017) also said that Philippines motorcycles' popularity hadn't reached half of Vietnam. Philippines' consumer behaviors show how large the market is.

V. Singapore

It welcomes experts overseas to become its citizens.

It promotes the application of digital technologies. Singapore established Smart Nation and Digital Government Group, SNDGG in May 2017 and had three main goals: improving the use of digital technologies. Secondly, it would help integrate ID, payment, and sensor into a digital platform. Third, it would transform public service into a digital basis to improve the quality of public affairs.

VI. Indonesia

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Indonesia is the world's largest archipelago consisting of many thousands of islands. Although the Indonesian government makes efforts to improve logistics, there are still opportunities for further enhancements.

Its logistics between islands still has room for improvement. Its Logistics Performance Index ranked 63 in the world while India ranked 35 in 2016.

VII. Cambodia

The population of Cambodia is around 15 million. There are 100 thousand foreigners in Phnom Penh, among which are 10 thousand Taiwanese. Taiwanese banks have more branches there than any other South East Asian countries. They deal a lot with a housing loan.

Because estate is starting to thrive, there are opportunities for the sales of electronics to get further enhancements. On top of that, transportation has potentials to grow.

However, Zhang (2017) said that the lawlessness or sometimes doesn't base on the rule of law makes the investment risk high. So, it needs more carefulness when signing a contract.

VIII. India

India tries hard to increase renewable energy. The Prime Minister of India, Narendra Damodardas Modi, said in Davos conference (World Economic Forum Annual Meeting) that by 2022, India wants to generate 175 GW of renewable energy. In the last three years, India has already achieved 60 GW or around one-third of this target.

India also wants to popularize electronic cars. So, Huang (2017) said that there are at least 26 Taiwanese companies did a survey there. Thus, the car accessories manufacturers, suppliers, and exporters in Taiwan may find business opportunity there.

Design electronics specifically for locals:

I. computer, communication, and consumer electronics localization

i. Hard disk—TSMC(台積電), UMC(聯電), packaging and testing companies:

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Powertch(力成), SPIL(矽品), memory module manufacturers: transcend(創見), ADATA(威剛), , Innodisk(宜鼎), NAND Flash Memory chips: Silicon Motion Technology(慧榮), PHISON(群聯) etc. have opportunities:

Thailand ranked as the second most massive Hard Disk Drive (HDD) producer in the world after China. But laptop nowadays used more SSD (Solid-State Disk) and SSHD. It's better for Thailand to transform some capacity from producing HHD to produce more SSD and SSHD. Taiwanese Winbond (華邦電子), Walton Advanced Engineering(華東科技), Apacer(宇瞻), SP(廣穎), Panram(品安), Unifosa (商丞), TEAMGROUP(十銓), can seek to set up manufacturing plant there. They could either join the supply China or compete for international orders since the need is changing and Thailand has experienced workers.

ii. LCD TV—AU Optronics Corporations could extend plants with Foxconn

Taiwanese InnoLux (群創)gained the highest revenue in 2017, and the top 4 companies grew 7% compared with the income the year before. Their revenue reached $248.6 billion. It' s the first time to increase after 6-year sequential revenue declines. The flat panel TVs enjoy the prosperity that its demand exceeds supply. But the prospects cannot be optimistic since Chinese capacity of panel factories grows. The price might decrease due to competition. Therefore, this industry could use its technological advantages and establish a complete supply chain in New Southbound countries. In doing so, Taiwanese companies can keep the edge to compete with Mainland China and the world.

Sharp(夏普) will increase the capacity in Thailand to 1 million TV from 500 thousand in 2018. Its products will sell to Cambodia, Lao, Myanmar, Vietnam, and India. Besides, it will sell 8K TV in 2019.

AmTRAN(TV assembly, 瑞軒), AUO and InnoLux(TV panel, 友達與群創), Epistar and Everlight Electronics (LED-backlit, 晶元光電與億光), UMC (聯發科) and

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Novatek Microelectronics (TV chips, 聯詠), Coretronic(中光電) and Radiant Opto-electronics (LED backlight module, 瑞儀), and Chimei(奇美) and BenQ(明基材料) can set up factories in New Southbound countries with Sharp. The upstream and downstream companies in the supply chain of the panel are as Figure50.

Now, AUO, InnoLux, Epistar, and Lextar developed Mini LED and will apply this technology on top performing smartphones. It means Taiwan's display technology is one step higher than before.

Table 50 The upstream and downstream in the supply chain of panel

<table>
<tr><td colspan="2">upstream</td><td colspan="2">Central stream</td><td>Downstream</td></tr>
<tr><td>chemical</td><td>Back-lit</td><td rowspan="3">panel</td><td rowspan="3">Display module</td><td>Laptop</td></tr>
<tr><td>Reticle</td><td>ITO</td><td>Computer</td></tr>
<tr><td>Plastic fram</td><td>Prism Sheet</td><td>Monitor/ Display</td></tr>
<tr><td>Light Guide Plate</td><td>backlight module</td><td colspan="2" rowspan="2">Produce and test</td><td>TV</td></tr>
<tr><td>Driver IC</td><td>parts</td><td>Electronic book</td></tr>
</table>

source: industry value chain information platform(產業價值鏈資訊平台)

iii. computers and phones—Acer, ASUS and peripheral industries

Hua (2017) believed, in recent 2-3 years, Thailand's eSport's market would prosper. Large companies were promoting related products, including computers, laptops, and peripheral gadgets. Those products had high profits. When they got supported, their R&D capabilities were extraordinary. ASUS dominated Indonesian and Thailand's eSport markets. ASUS had a good image in some countries, so ASUS and other peripheral companies could sell their products in other ASEAN countries.

There were many kinds of applications. For example, Acer's StarVR worked with Dubai's companies to build the largest VR theme Park in the world (as Figure50).

Figure50 VR theme park in Dubai

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source: Apple daily (2018/03/07)

ASUS dominated Indonesian eSport laptop market. In the second half year of 2017, it held 64.1% of Indonesian market share. The market share of 16-inch upper-level eSport laptop reaches 81.9%. It opens its eSport hall in Jakarta in May 2018. Besides, in the global market, ASUS also dominates the price over $1,000 eSport computer with its 22% market share. It means ASUS play an essential role in eSport laptop, especially in Indonesia.

Acer benefits from eSport laptop and VR. Its gross margin of first three quarters in 2017 grew 10.7% and reached its new high in 13 years. Some other companies can become their supply chain and move to ASEAN countries together, including MSI(微星), GIGABYTE(技嘉), CHAUN-CHOUNG (超眾), Auras (雙鴻), JENTECH (健策), SUNON (建準), Channel Well (僑威), HEC (偉訓), Chicony Power (群電), FSP Group (全漢), ADATA(威剛), Apacer(宇瞻), Transcend (創見), POWERLOGIC (動力), PRIMAX(致伸), Genius(昆盈), Thermaltake(曜越), AVerMedia (圓剛).

Acer and ASUS's market share ranked the first and second place in the laptop market in Thailand. The above companies can establish factories in Thailand and sell their products to local, and Cambodia and Vietnam, etc.

Table 51 The upstream and downstream in the supply chain of computer

upstream	downstream

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CPU	chips	panel	laptop
display	memory	Mother Board	desktop
PC case	Power supply	Internet card	Thin Client
battery	Thermal module	Input and output module/ interface card	Printer, fax, scanner, Multi-Function printer
Display card	Hard disk	CD player	Industrial computer
disk storage	BIOS	USB drive, Memory card reader	

source: industry value chain information platform(產業價值鏈資訊平台)

Huang (2016) said that mobile devices might replace some laptop business. On the other hand, Thailandese ICT retailer SIS can be the agent for Taiwanese companies.

iv design smartphone and photographer specifically for locals—HTC(宏達電), Genious Electronic Optical (玉晶光), Largan (大立光) and PRIMAX(致伸) have opportunities to extend business. ASUS is operating.

Dai (2016) pointed out that the Chinese smart brand TECNO(from 深圳「傳音控股」) was not popular in China. But that company held a 40% market share in Africa. There were a hundred million using its smartphones. Its mobile phone export volume was the first place in China. The main reason was that it improves the facial recognition for African Americans by collecting locals' photos. It analyzed the relative position of African Americans' eyes and teeth. It used exposure compensation to have better image effects. Furthermore, it allowed four SIM cards.

We could use this principle in New Southbound countries. Some companies can develop customized smartphones and photographers. Genius Electronic Optical (玉晶光), Largan (大立光) and PRIMAX(致伸) are all making a lens for Apple, but only Largan has a large order and high revenue. If HTC (宏達電) considers the factor, it may hold more market share. Besides, Foxconn owns a Nokia now. They design new smartphone and use the lens from Kantatsu (康達智). They are developing functions that can shoot

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photos in dark and shooting portraits against the light. This new smartphone may also have its popularity in New Southbound countries.

Base on IDC's research, the biggest market in ASEAN is Indonesia (29%), Thailand (22%) is the second, and the Philippines (14%) is the third place. According to BMI, Vietnamese cell phone market will grow from $3 billion in 2015 to $4.5 billion in 2020, and the growth rate is 50%. Vietnamese computer market will also expand $0.5 billion in 2015 to $2 billion in 2020.

Taiwan External Trade Development Council (2018) said that Vietnamese highly value brands. The image of Taiwanese electronics is good. As long as the product significantly shows out Taiwanese brand and writes the whole packing with English, local consumers would be attracted. However, if only judging from a smartphone, Taiwanese ones aren't holding high market share. Galaxy's sales are good and contains around 40% market shares. Nokia is approximately 25%, OPPO is 8%, and ASUS is 6%. The sales for flagship smartphones and economic smartphones are right, instead of the middle ones.

Taiwan Surface Mounting Technology (computer/ TV applications, Chinese named 台表科技) thinks that the electronics have high business opportunities in India. India's smartphone shipments grew steadily, and the demands are increasing. We expected that the smartphone assembly would grow, too. Taiwan Surface Mounting Technology has opened factories in India. (as Figure51)

Figure51 Taiwan Surface Mounting Technology's Indian factories

source: Taiwan Surface Mounting Technology

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Some downstream companies already have factories in India. Compal Electronics' (仁寶) factories in India had started its shipments in 2016. Inventec (英業達) set up the Indian operation center in 2015 but seemed to shrink in 2017. Also, Mi' s smartphone held 23.5% of the Indian market share, similar to the first place of Samsung. This situation made FIH Mobile Limited (富智康), Inventec (英業達), UMC (聯發科), AUO (友達, producing display), and NEWMAX(新鉅科, producing optical lens) benefited.

I. disaster prevention/ releasing

When Indonesian forests get fire, Singapore and Malaysia get dangerous smoke. Our smartphone may develop new functions to detect the smoke or to link to the local weather station. Although, NPI (新塾企業) exports face mask making machine to Vietnam and Indonesia, and NCM(權和機械) exports this kind of machinery to India, Indonesia, Malaysia, Singapore, Thailand, the volume of face mask still can' t meet the need. Our industries could use multichannel distribution system to streamline the supply. National Chi Nan University recently developed a watering mist fog prevention system which only costs around $3000. It can detect PM2.5 and sprinkle water automatically. This solution could sell to Singapore and Malaysia etc., especially in some countries with lower population density.

Thailand cooperates with Japan on the disaster relief and response system. Taiwan also has natural disasters frequently. Some high-tech companies have a solution. For example, BlueEyes (藍眼科技) has real-time supervise and control system through video. It can combine high-performance computer and internet to calculate the possible disasters. So, it would offer the data to Disaster Prevention Center. We could seek New Southbound countries to cooperate with our tech companies like BlueEyes.

Transportation:

ASEAN is counted among the largest automobile markets worldwide. In Indonesia and Thailand, there were separately around a million, and 800,000 automobiles and these

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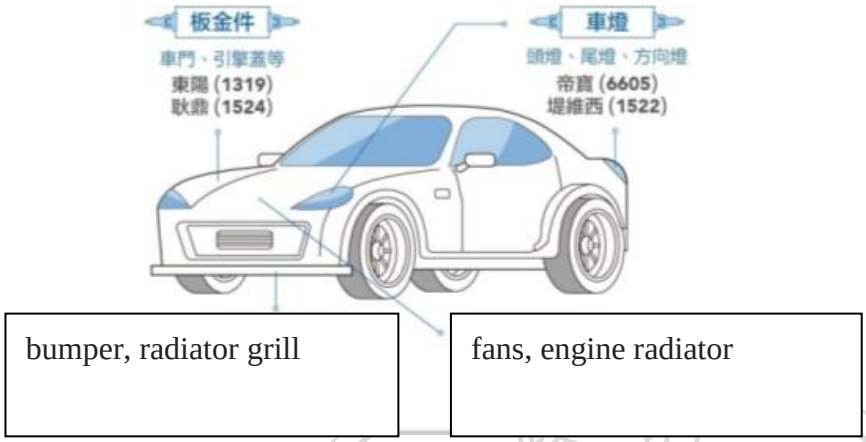
figures are the largest among ASEAN countries. The automobile tariff between ASEAN countries is zero.

Figure52 AM (aftermarket) parts



Source: Ministry of Finance/ Business Weekly(2017/11)

Xiao (2015) said that Taiwanese automotive parts industries mainly produce AM (aftermarket, different from ODM, OEM, or OES). Because they've already had the necessary technologies, they can transform into OEM (Original Equipment Manufacturer) in ASEAN countries.

Recently, we have AM manufacturers, including TYC Brother Industrial (堤維西), DEPO (帝寶), Gordon (耿鼎). The business opportunities are still high. Wu Xianzhong (2017) said that automobiles are the among the largest industries and only second to real estates. The brand-new compact car sales were over 90 million in 2016. The information and electronics technologies create massive momentum for upgrading autos' performance, efficiency, and entertainment features. The automotive electronics can detect the automobile inclination angle, engine speed, fuel injection system, automatic transmission, and tire pressure, etc. There are still other features operating by automotive electronics, including reversing radar, car fingerprint anti-theft system, mobile broadband wireless internet service even on the highway, car multimedia entertainment system, and GPS navigation, etc.

Based on the survey of Taiwan's Industrial Economics and Knowledge Center (IEK),

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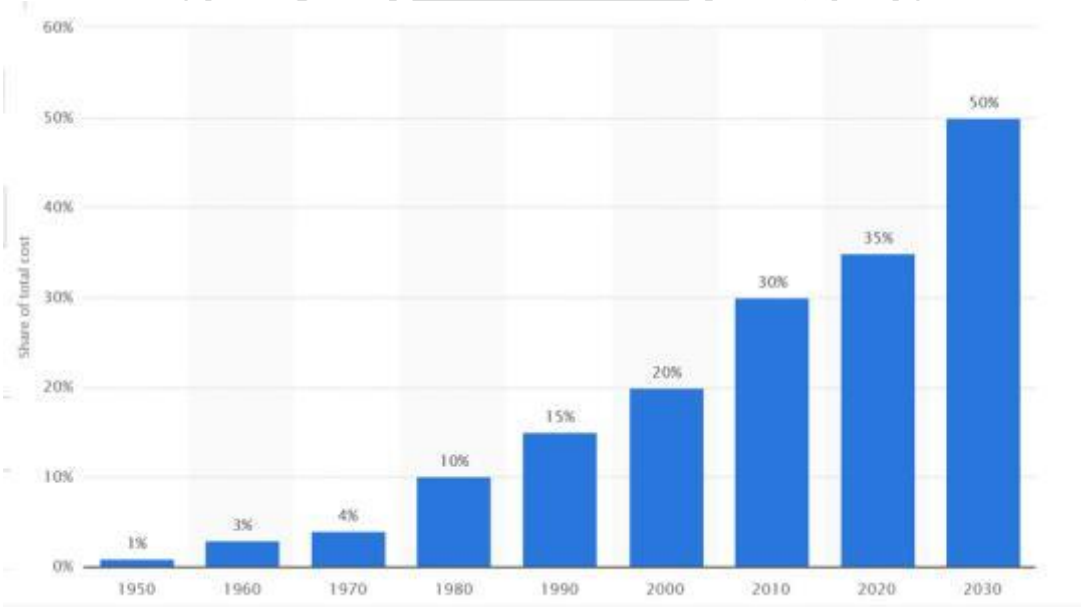
Industrial Technology Research Institute, the global automotive electronics market in 2013 was $167 billion. The global Automotive Electronics Market is expected to reach USD 301 billion by 2019. Because the Chinese government supports local companies, Taiwanese companies are difficult to expand there.

Some of our high-tech companies have the potential to extend their businesses to New Southbound countries. For example, Actron Technology Corporation (朋程科技) holds 51% of the global market share on automotive electronic diodes (the upstream products of the generator). Furthermore, Actron Technology Corporation is developing eco-friendly electronics to support the R&D for more efficient electronics. IEA (International Energy Agency) said that there were some reasons to stimulate automotive electronics to grow, which is (1) the cost of sensors and semiconductors goes down; (2) companies use electronics to increase their competitiveness; (3) the electronics can be applied to improve engine's efficiency; (4) consumers have raised awareness of vehicle safety. The automotive electronics cost worldwide from 1950 to 2030 is as Figure53.

Figure53 Automotive electronics cost as a percentage of total car cost worldwide from 1950 to 2030



source: Statista

Industrial Technology Research Institute (2017) pointed out that Taiwanese ICT

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groups are stepping into automotive electronics by establishing a new subsidiary company or acquisition. For example, LITE-ON (光寶) technology acquired Jianxing Electronics (建興) and developed car CD player and wireless charging. Foxconn (鴻海) purchased ANTEC INTERNATIONAL BUSINESS (安泰) and developed automotive connectors. Foxconn also acquired InnoLux (群創) establish automotive display applications. AUO (友達) is developing automotive panels. TSMC (台積電) is developing a power system. UMC (聯電), Winbond (華邦電子), Macronix (旺宏) and SUNPLUS (凌陽) are having business in the automotive electronics now.

In the sales of Taiwanese automotive electronics, entertainment electronics held up to 54%; engine electronics holds 24%. Taiwanese AM held more than 80% of the supply worldwide. Taiwanese automotive component companies had shown in Table 52.

Table 52 Taiwanese automotive component companies

components	Company name
Smart Airbag	Universal Scientific Industrial Co. (環隆)
AFS flashing light	DAIOKU (大億燈具), TYC Brother Industrial Co. (堤維西), DEPO (帝寶工業)
TPMS (tire-pressure monitoring system)	whetron electronics co., ltd. (輝創電子), Universal Scientific Industrial Co. (環隆電氣), Liteon Automotive (敦揚科技)
Reversing radar	Mobiletron Co.,Ltd. (車王電子), TungThih Electronic Co. (同致電子)
sensor	CYNTEC CO.,LTD. (乾坤科技)
Electric rearview mirror	健生電子 Mobiletron Co.,Ltd. (車王電子)
HUD, head up display	VEGA (維嘉), Taigene (聯城), TungThih Electronic (同致電子)
Information/ communication and portable devices (navigation, PDA & GPS & Navi)	SYSTECH (康訊科技), E-LEAD (怡利電子), Clientron Corp. (公信電子), Xíng yì(行毅科技), Garmin(台灣國際航電), Li Hang Communication (麗航通信), Xinhang Technology (欣航科技), ASMedia Technology Inc. (祥碩科技)
Vehicle Effects and Displays	AUO (友達), InnoLux (群創光電)
Car audio and video entertainment	Princeton Technology Corp. (普誠科技)

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Automotive semiconductor	TSMC (台積電), VIA (威盛電子)
ECU (engine control unit)	Liteon Automotive (敦揚科技)

source: IEK (2011/10)

II. motor vehicle- TungThih Electronic Co. (同致電子), Autoequips(帷享科技), whetron electronics co., ltd. (輝創電子), 健生公司, Novatek Microelectronics Corp. (聯詠電子), Triamp Technology (威普科技), WinwiseTech (慧展科技), Create Electronic Optical(創研光電), Imagic (池盈科技), China Motor Corporation (中華汽車), Rotatech (旭春公司), Utechzone (由田新技)、JET OPTO (凱鋭光電), KYMCO (光陽機車) have business opportunity

The global semiconductor revenue was $270 billion within the automotive electronics segment in 2017. Our automotive electronics and brand car can extend business to New Southbound countries.

i. Thailand—JM-PLUS(加煒電子)、LITE-ON (光寶科技) and Explore Microelectronics (微驅科技) with LED, Huayi Electronics (華億電子) with power supply, WONDERFUL HI-TECH (萬泰科技) with electronic wire and cable, MERRY (美律電子) with acoustic components and headsets, Secutech (中美強科技) with digital cameras had business opportunities

Thailandese automotive manufacturing thrives and has a complete supply chain. It's called Asian Detroit. The third layer (the most upstream) and the second layer account for 1,700 companies. The first layer has around 700 companies (Taiwan External Trade Development Council, 2018). Thailandese companies work with international companies closely. The main assembly and component factories are Japanese. The best-selling car is a light truck with over 55% of total sales. The first passenger cars are compact MPV (multi-purpose vehicle). The 5 top selling brands are Toyota, Isuzu, Honda, Nissan, Mitsubishi. All of them are Japanese companies. They in total held 85% of the total market share. Besides, Tai Wanping and Hong (2012) pointed out that Thailand's companies and international companies develop interdependent relations. Both sides

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benefit.

DELTA was developing the automotive electronics. Because Taiwan held over 80% of the automotive electronics market share, other companies could incorporate themselves into DELTA's supply chain.

Some of our companies have technical advantages; others have already cooperated with Japanese manufacturers can invest in Thailand. For example, JM-PLUS set up branches in Thailand in 2000. This company produces PCB. While there were still other electronic companies had already set up offices in Thailand. The following table names 32 automotive, computer, and home electronics related companies out of 43.

Table 53 32 Taiwanese businesses in Thailand

Company name	**Principal products and services**
Harmony Electronics(Thailand) Co., Ltd.	Quartz Crystal, Crystal Ocillator, Crystal Filter, VC/TCXO
Funart(雅豐)	Resistor
Lite-On Electronics,Inc.(Thailand)	LED Lamp,LED Display,Opto coupler
Merry(美律)	headset
LINETEK(怡富萬)	electronics
TPG Motors & Drives (M) Sdn.Bhd. (臺灣精密齒輪工業股份有限公司泰國廠)	motor
Microtest Technology Ltd.	LCD Meter
Keic Thai Co.,Ltd.	Transformer, Plastic Case,Magnet Wire,Resistors,Capacitors,Cable Wires,ICCoilform, Metal Parts,Packing Materials,Power Supplies,PCB Assembly,Ignition Coils
WONDERFUL HI-TECH (萬泰科技	cables

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Hoppy Industrial(Thailand) Co.,Ltd.	motors
Huayi Electronics (華億電子)	Power Transformers/ power supply
Kinpo Electronics Inc. (泰金寶科技)	Photo-printer, ADSL
G-Shank (鉅祥)	Contact Clip
Ching Cheng Wire Material Co.,Ltd. (Thai)	Power Supply Cord,Power Cable,Cord Set
J.B.T Industrial Co.,Ltd.(今晧實業股份有限公司，泰國廠)	Cable Assembly,Wire Harness,Power Cord,Monitor Cable,Mouse,Cable,SingnalCable,FFC,Fiber Optics,Antenna
Linkworld Electronic (Thailand) Co.,Ltd.	Electronics
Aurotek Corporation (和椿)	Transmission parts
JM-PLUS(加煒電子)	FPC (Flexible Printed Circuit)
Pacific Electric Wire and Cable Co. (太平洋電線電纜股份有限公司泰國廠)	cables
Linkworld Electronic(Thailand) Co.,Ltd.	Computer case
Silicon Application Electronic Co.,Ltd.(新北市中和區同名公司泰國廠)	Passive electronic components
Eastern Seaboard Industrail Estate(元大電子泰國股份有限公司)	speaker
solteam (崧騰企業股份有限公司泰國廠)	AC switch and plug
SYMBIO (THAILAND) CO., LTD.	tape
TATUNG WIRE AND CABLE(THAILAND) CO.LTD.	wire
KOGEN SINGAPORE(Thailand) PTE LTD.(新竹的微驅科技有限公司，在大陸、南韓、日本、美國、	1.New Mitsubishi Semiconductor:Power Module,Hemt,Optical Module,RF Module,PA,Laser diode 2.OPTEX:color STN

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德國、新加坡、馬來西亞、印度均有代理商)	LCD 3.Hamamatsu:laser diode,photo sensor,photo diode 4.SONY battery:li battery 5.SEMTECH:power management IC 6.JVC:TCXO 7.THine:DVI,LVDS 8.碩頡:PZT dual PWM CCFL controller ...等
shenmao (昇貿科技)	solder products
Hung Ta Instrument (Thailand) Co., Ltd.	Automotive inner components
E-Lead Electronic (Thailand) Co., LTD.	Car Electronics: Head Unit Infotainment/ Navigation System, Rear SeatEntertainment System, Car Sensor & Accessories (Head-Up Display(HUD),Digital Instrument Clusters,Internet Of Vehicle App,Adranced DriverAround View Monitoring System(AVM),Forward Collision Warning System(FCWS),Lane Departure Warning System(LDWS),Tire Pressure Monitoring
GKB Security (Thailand) Co., Ltd.	Digital camera
VISTECH Engineering(Thailand)	Switchgear,Motor Control center,Flexible copper braided connector,Flexible copper Laminated connector,Voleage detector & capacitive insulators,Thermostat,Alluminum Alloy Heater,Hygrostat,Energy saving eqipment

source: Taiwan Electrical and Electronic Manufacturers Association (2018)

Besides, Thailand had a long problem of traffic jams, especially in Bangkok. According to the survey of Tomson Reuters and INRIX in recent two years, Thailand's drivers spent 61 hours in rush hour annually. It's the highest figure, following by 47 hours of the second severe countries of Columbia and Indonesia. There were many reasons to cause traffic jams, including too many vehicles, too fewer roads, and urban design mistakes. Most critics were pointing to its traffic light not controlled by computers but by humans. The flood also made up one of the other factors.

Thailand had launched bicycle-sharing systems, hoping that it could alleviate traffic jams a little bit. There were other public transportations, including MRT (around 15-45

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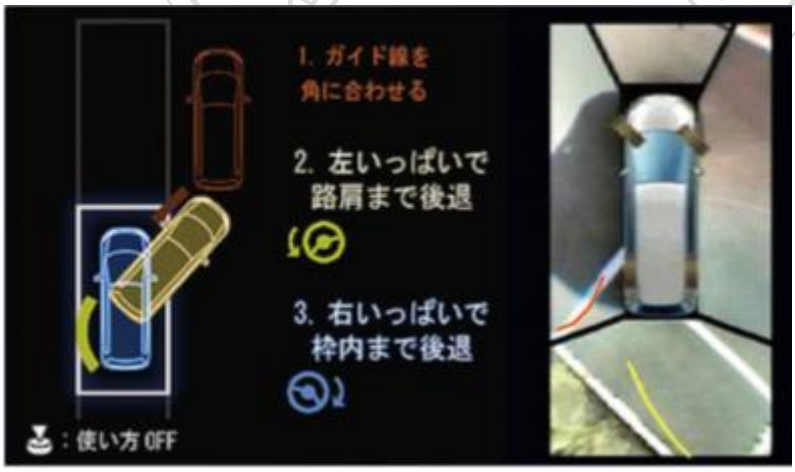
Baht), BTS (about 15-45 Baht), TukTuk car, bus (7 Baht), Taxi (over 30 Baht).

Can a set of a real-time information system for bus based on GPS directly move to Thailand to make its public transportation safer, more reliable, more efficient and more human-oriented. We were hoping this solution can solve Thailand's traffic jams. Like what Xu (2013) said automotive short-range wireless communications develop rapidly. Many of them could apply to the smart transportation system. People could know the bus location in real-time. The government could monitor the operation of the bus. Taiwan could introduce automotive IoT products to Thailand to improve its safety, comfort, and efficiency. To help Thailanders acquire bus' information, our automotive IoT companies could cooperate. TSMC's (台積電) automotive IoT semiconductors, MTK's (聯發科) automotive 4G internet connecting chips, Holtek's (盛群) Bluetooth, HTC's (宏達電) audio/ video systems, Foxconn's IoT operation system, and ASUS' smart tablet. Besides, VIA Technologies (威盛電子) was awarded for it interaction design. It joined Japanese taxi company's IoT HUB360 photo project and was developing AVM (Around View Monitor, as Figure54). It had expanded its business into ASEAN countries.

Figure54 AVM (Around View Monitor)



source: Nissan/ Automotive Reserch & Testing Center (2009)

Taiwan's taxi companies were introducing AVM. This technology is also used in ASEAN countries and Hong Kong and Macao.

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Table 54 Taiwanese automotive IoT companies and specialties

Navigation	**Automotive DRAM**	**Image recognition system**	**collision avoidance system**	**Advanced Parking Guidance System**
Garmin (台灣國際航電), CviLux (瀚荃), Leadtek(麗台)	Winbond Electronics (華邦電), Etron (鈺創)	PixArt Imaging Inc. (原相), ememory (力旺), Holteck (盛群), Sonix Technology Co. (松翰), MEGAWIN (笙泉), Weltrend (偉詮電子)	Alpha Networks Inc. (明泰), WNC (啟碁)	WIESON (驊陞), TUNG THIH ELECTRONIC (同致)
Vehicle Information and Communication System	**Automotive connectors**	**Automotive semiconductor and chips**	**Telecom**	**Parking sensors**
E-LEAD (怡利電子), msi (微星), HTC (宏達電)	FOXLINK (正崴), COXOC CO. (詮欣), Well Shin Technology Co., Ltd. (維熹)	Winbond Electronics (華邦電), TSMC (台積電), Foxconn (鴻海), MediaTek Inc. (聯發科)、SUNPLUS (凌陽)	Chunghwa Telecom (中華電), Far East Tone (遠傳), Taiwanmobile (台灣大)	TUNG THIH ELECTRONIC (同致)、SONIX (松翰), VTC ELECTRONICS CORP. (遠業), Aces (宏致)
Wireless communication	**Automotive panel**	**Tire Pressure Monitor Sensor TPMS**	**Automotive rectifier diodes**	**Lane Departure Warning System**
WNC (啟碁), Alpha Networks	ASUS (華碩)	CUB ELECPARTS	Actron Technology Corporation (朋程),	whetron electronics co.,

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Inc. (明泰), Holtek (盛群), REALTEK (瑞昱), SERCOMM (中磊)	INC (為升), TUNG THIH ELECTRONIC (同致), Orange Electronic TPMS (橙的), Mobiletron Co.,Ltd. (車王電), Liteon Automotive (敦揚), LUHAI INDUSTRIAL CORP. (六暉)	TAIWAN SEMICONDUCTOR CO. (台半)	ltd. (輝創), Chimei (奇美車電)

source: Chen Jianqing (2015/4)

Shi, Xiao (2017) stated that some Taiwanese companies were well-known internationally and sold their products around the world, for example, LiteOn, Garmin, Advantech, Actron, UMC, ASE, Delta, TSMC, Winbond, etc. Besides, Thailand established Electric Vehicle Association Thailand, EVAT in Nov. 2015 and included 168 companies. Thailand's government hoped to promote the industry of electronic cars. Vietnam, Malaysia, and the Philippines have similar policies. Taiwan's ICT were well-known. Therefore, Taiwan had the potential to become a decisive role in the global market of electric cars.

ii. Vietnam

Vietnamese motorcycle market is the fourth largest in the world, which is only smaller than China, India, and Indonesia (Huang, 2016). There are around 45 million registered motorcycles, now, namely, one for two people. Besides, the annual assembly is about 2 million. There are also 15 million motorcycles need to be maintained and repaired (Taiwan External Trade Development Council, 2016). Over one-third of its motorcycles are so old that cause air pollution.

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Taiwanese SYM started to set up branches in Vietnam in 1992. There are more than 250 agents and franchises. SYM has full sales channels and retains No. 5 market share in Vietnam. There are still other Taiwanese upstream companies in Vietnam, including Shihlin electronic and KUNG LONG (廣隆). They produce generators, starters, fuel pumps, wiper, electric motors, engine control unit, switches, ignition coils, and lead-acid battery, etc. KUNG LONG (廣隆) is the only one listed company specialized on the lead-acid battery in Taiwan. It owns a brand named LONG (as Figure55) and in the supply chain of Honda. KUNG LONG's (廣隆) factories in Vietnam are transforming from semi-automatic to automatic in 3 years. It has a well-received brand. OEM (Original Equipment Manufacturer) accounted for 61% of its revenue. (Most Taiwanese companies are AM and OEM's order are more stable.)

Figure55 LONG battery

source: KUNG LONG's official website

The motorcycle sales reached 3.2 million in Vietnam in 2016. In 2016, the top 5 companies by their market shares are Honda (holding around 70% of market share and 1.91 million motorcycles sold), Yamaha (holding around 23.4% and 635 thousand motorcycles sold), Piaggio (Italian brand and 56000 motorcycles sold), Suzuki and SYM. These brands in total sold 3.12 million motorcycles in 2016. Even the sales of Taiwanese

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new scooters keep low, the need for maintenance remains. Besides, KYMCO started to set up branches in Vietnam in 2004. They've been selling electric motorcycles since 2016 (Huang, 2016). Due to air pollution, the Vietnamese government is expected to promote electric scooters and fuel-efficient motorcycles and create business opportunities.

The advertisements and store appearance of SYM and Honda are as followed:

Figure56 SYM's advertisements and store appearance in Vietnam

source: Liu wuhsiung (2016/July)

Figure57 Honda's advertisements and store appearance in Vietnam

source: Jorsindo forum

Regarding component companies, Everphone Industrial CO. (常風工業) supplies vehicle components for Japanese, RoK, and European motor companies, which include Honda. Eurocharm Group (豐祥控股) provides parts for SYM at first. After it sets up branches in 1994 and establishes VPIC1 (越南一精密工業) in 2001, it entered into Toyota Production System in 2008. Its revenue of this business contributes over 50% of its total revenue.

The best two financial ratios of other Taiwanese components in Vietnam are Kenda Tire (建大輪胎) and Cheng Shin Tyre (正新輪胎), which are 6.6 and 5.43. (Taiwan External Trade Development Council, 2016).

The Taipei Economic and Cultural Office, Ho Chi Minh City, said the revenue of

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Honda Vietnam ranked number 3 in all foreign companies, which is only less than Samsung and Vietsovpetro (energy company). It means the market for a motorcycle is enormous.

Regarding auto industries and business environment, Xiao Ruifu said that Vietnamese government centers on auto industries when developing industries. Their goal is to increase the ratio of domestic auto production. Chen (2016) noted that the percentage of the domestic output of the bus is 40% now. But some components require high-tech. Therefore, even the Vietnamese auto company, Xuan Kien, produces thousands of cars annually, there is only one local supplier for battery. There were about 19 Taiwanese automotive component companies in Vietnam.

They mainly produce motorcycle used components; some capacities are for autos. Among which, CXTECH (鎧新科技) is the biggest provider of speaker forged parts worldwide and a supplier of B&W、Harman、Pioneer. In recent year, it gets orders indirectly from Tesla. Automotive speaker parts make over 80% of its revenue. The plastic production in Hải Dương, northern Vietnam, built around 13% of its revenue. CXTECH enhances production equipment automation and efficiency recently. It's also well-known for its cost reduction and quality improvement.

Table 55 Taiwanese automotive companies in Vietnam

Company name	Products
VPIC1 (一精密工業)	Breaker
Just Speial Material Co. (越南)	Inner equipment
Energy System (能量系統)	Wires and lights
GSK(全興)	seater
Yiou Guan (佑冠)	Automotive wiring
KAO MING(高明)	Water tank

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Bade (八德)	spring
Yang Qing (揚慶)	spring
GS BATTERY (杰士)	BATTERY
KUNG LONG (廣隆)	BATTERY
CST Group Limited (中譽)	Wheel frame
uraco holding (優利佳)	O-RING (o 形環油封)
Dazhan (大展)	O-RING (o 形環油封)
Yueqing 越慶	Chair cushion
Jiansheng(建生)	Rear mirror
Sanxing (三興)	Speedometer
Asia (亞洲)	Speaker
Shoen (正圓)	Piston ring
Zhengxing (正興)	Piston ring

source: Chen Bingqi (2016)

Other big auto companies are TOYOTA, Isuzu, Hino Motors. Chen Bingqi (2016) suggested that Taiwanese automotive components providers can cooperate with Japanese companies and better improve the automotive components in Vietnam.

Chih-Young (赤陽工業) for rubbers and tires, Longine Precision Industry Co. (隆基精密工業) for automotive axis, Aok Valve Stem Seals LTD. (金典興企業) for Valve seals, DMS (迪恩斯公司) for tricycle assembly, Zung Sung Enterprise (積順企業) for electronic indicator and lighting controls, Trinity Precise Technology (慶騰精密) for gears, and Zhi Fong Industrial CO. (吉豐導線) for transmission cable are all having business opportunities in Vietnam.

iii. Malaysia

According to the Malaysian Automotive Association, the auto production of 2015 was around 615 thousand, and over 90% was Passenger car. Based on BMI's (Business

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Monitor International) estimation, the yearly output can over 700,000 in 2020.

One thing worth notice is that Nelson Survey shows that consumer confidence index was only 79 in the first quarter in 2016, which the second quarter was 87. Both figures were lower than optimism baseline of 100, which meant that Malaysians willingness to spend was not high.

One thing encouraging is that Malaysian government support domestic companies to develop auto industries. It's the only country having its brands, including Proton since 1983, Perodua since 1994, Inokom since 2002, and MTB is co-founded by Malaysian Drb-Hicom and Japanese ISUZU in 2007. The domestic companies lead the market share (as Figure 58). There are still auto companies taking Malaysia as the gate and platform. There are 76 cars imports, 37 franchises, and more a thousand maintenance factories. The sales of foreign cars were growing.

Figure58 The top 5 companies and their market share

	2012	2013	2014 (e)	2015 (f)	2016 (f)
Perodua	30.1%	31.0%	31.2%	30.9%	32.1%
Proton	22.5%	21.0%	22.1%	22.5%	22.3%
Toyota	16.8%	14.0%	16.9%	17.1%	16.8%
Nissan	5.6%	8.2%	6.2%	5.8%	7.0%
Honda	5.6%	7.0%	6.1%	6.4%	6.5%

source: IEK (2014/09)

Few Malaysian companies specialize in producing machinery and equipment. (Huang, 2016). Therefore, the suitable companies for setting up branches in Malaysia are automotive electronics or component companies. We suggest that companies in these areas can seek cooperation with brand companies or assembly companies. One of the Taiwanese companies is a successful example. FETTA AUTO PART INDUSTRIES (飛達汽車零件) creates its own brand, MARCO, and mainly produce exhaust pipes and crash beams.

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v. Philippines

The popularity of motorcycles is less than half in the Philippines comparing it in Vietnam. Fan Guangyang said that the Philippines try to urge 200,000 Jeepneys (private bus) adopt electronic version. They aim at 20,000 electronic Jeepneys in six years.

The Philippines could have better public transportation and systems. The country is promoting ETC, GPS navigation and car Wi-Fi system. Taiwanese development of Urban Transport System is mature. We have the longest highway toll collection system in the world. We utilize IoT into public transportation industry, and we have FETC (遠通電收) to manage ETC and applying to parking lots. They could seek business opportunities in New Southbound countries. For example, TECO has branches in the Philippines, Vietnam, and is planning to set up branches in India. It's not only provided bus frame and electronic bus chassis but also cooperate with the third biggest motorcycle company, Ropali, to set up factories in Subic Bay to produce 4 plus 1 motorized tricycle. In respond to pollution and flood, TECO emphasizes water-proof, dust-proof and climbing ability.

Founded in 1978, the World Information Technology and Services Alliance (WITSA) is a leading consortium of Information and Communications technology (ICT) industry association members from over 80 countries and economies around the world. Far Eastern Electronic Toll Collection Co. Ltd. (遠通電收) won 2017 WITSA Global ICT Excellence Awards - Private Sector Excellence Award at 2017 World Congress on Information Technology (WCIT). Its eTag ETC system daily processes 14.5 million transactions on average. It's the largest system in the world using RFID technology for the whole nationwide freeway ETC tolling with 935 kilometers. It has over 7 million users in Taiwan. The system has been known in the world arena as one of the most influential Internet of Things (IoT) application moving toward further applications in Smart City. Many countries are sending inquiries in order to learn from the experiences and asking us to help them plan ETC system in their countries. The socio-economic

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benefits of the system and services are remarkable. It not only saves the traveling time but also reduces the carbon emission significantly. FETC deserves the award from every aspect. It is a private concessionaire in Vietnam and the Philippines. It also helps Malaysia plan and design MLFF and expects to turn existing highways into Smart Highway.

Wu Biyi pointed out that FETC helped Vietnam build its first RFID ETC in 2015 (as Figure59). Malaysian transportation officials visited Taiwan's ETC and used it since 2016. Beside electronic toll collection, the eTag system could be used in parking, warning, towed, and transportation management.

Figure59 Far Eastern help Vietnam build the first RFID ETC toll collection system in 2015

source: Far Eastern

vi. Indonesia

Tai (2016) said that, compared to Thailand and Malaysia, Indonesia is the country that earliest noticed the importance of automotive development. However, it doesn't become the Asian Detroit like Thailand or having its brand like Malaysia. It's a country that has the sizeable automotive market but without important technology. It's also a country that is industrialized but without important technology. That's why its automotive

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industry doesn't reach a developed level as it has expected.

Meanwhile, its automotive industry does increase in recent years. It even becomes one of the economic pillars of Indonesia. Japanese automotive companies dominate its market (Wu, 2011). With the rapid growth of the Indonesian economy, public demands for autos are increasing. According to Indonesian Automobile Manufacturers Association, the auto sales in 2017 in Indonesia was over 1 million, which surpassed Thailandese 871,644 in the same year.

Indonesian Automobile Manufacturers Association further explored that there were 12 assembly companies, the linked components companies created more than 300,000 job opportunities. Only the most significant auto group, Astra International Group, employed more than 230,000 people. It produced, assembled and sold cars for several brands, including TOYOTA, Daihatsu, ISUZU, Nissan, Honda, PEUGEOT (Franch), and BMW. Other statistics from Indonesian Automotive Parts & Components Manufacturers Association (GIAMM) showed that there were 138 companies in this association. There were 79 foreign investment companies, among which Japanese were 63, while domestic or co-founded companies are 59. 100% of local companies are few.

Chen (2016) pointed out that the assembly companies in Indonesia mainly produced Japanese autos, over 90%. Among which, TOYOTA was the first place and held a 35% market share. Other popular brands were Daihatsu (15%), MITSUBISHI (14%), SUZUKI, Honda, and ISUZU. The other brands from Europe, the US, and RoK held the remaining 10% market share. There are no Taiwanese assembly companies there.

In the motorcycle assembly and production industry, four companies in total hold over 95% of the market share, which are Honda, YAMAHA, SUZUKI, and Kawasaki. Taiwanese SYM and Chinese Kanzen are holding less than 0.1% of the market share. KYMCO has moved out of Indonesia since 2009. Taiwanese component companies could specialize in highly-technical parts. They might able to fit into Japanese brands'

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supply chain and therefore set up branches in Indonesia. Hopefully, they can provide high-quality auto parts for the consumers in Indonesia.

vii. India

Indian car market could soon be the no.4 worldwide. The top 5 countries in 2017 are China, US, Japan, Germany, and India. India sold 4 million cars in 2017. The main foreign car companies are SUZUKI (held 75% of the market share), and other important companies are VW, Renault S.A., Nissan, Toyota, Honda, Hyundai, and SAIC MOTOR, etc. Recently, it seems to become red oceans, where competitors fight for dominance fiercely. GM's decision to stop selling cars in India in 2017 can view as a warning. Besides, both TATA and Mahindra & Mahindra have showcased their electric cars in Auto Expo 2018. However, the not enough charging infrastructures and the hot weather are restricting factors for EV's market.

Overall, the Indian Market is big, but international companies are long here. Also, Indian companies are developing new technologies. If Taiwanese industries would like to enter into this market, we could seek research cooperations first. For example, Taiwanese and Indian Industrial Technology Research Institutes signed mechanics technology cooperation agreements. In this way, we could further explore the possibility to find business opportunities.

Taiwanese companies with factories in India were Delta India (台達電), China Steel Corporation India PVT. LTD. (中鋼印度), Chuan Shun Electric Company (India) PVT. LTD. (專順電機), Eminent Power Friends Equipment Company Pvt. Ltd. (泰昌電機), and MANLY Silicon Steel PVT. LTD (壯煉企業), etc. Because the Indian government was aiming at transferring diesel cars to electric ones, and DELTA had invested in this area for ten years. The motor control is the heart of electric vehicles. DELTA had offered thousands to European car companies. Hopefully, this product could incorporate into their supply chains.

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Industrial technology upgradation:

This section would introduce ways to upgrade the manufacturing industry, including using Taiwanese machine tools, robotic arms, semi-automatic production, and automatic production line, etc.

Table 56 The AI development policy in Four Asian Tigers

Taiwan	In 5 years starting from 2018, Taiwan would invest $5 billion in the AI innovative research project and build several research bases.
Japan	Japan invested almost $100 million to support 20 institutes to develop AI.
RoK	In March 2016, ROK launched a project to develop AI with around $10 billion.
Singapore	In May 2017, Singapore announced the ALSG Project. It would invest around $1 billion to develop AI.

source: CommonWealth (2017/7)

If we used AI in the manufacturing industry, it could help upgrade traditional manufacturing. AI needs chips. TSMC produced AI chips for Intel, Qualcomm, and NVIDIA. Lin (2018) pointed out that the CAGR, Compound Annual Growth Rate of global AI industries could reach 20% in 2015-2020. It would cover manufacture, financial, retails, transportation, and medicals.

The industrial robot industry can divide into systems integrator, component providers, industrial PC (IPC), and machine manufacturers. Huang Zhonghong (2018) pointed out that Taiwanese systems integrators are MIRLE(盟立), ECON(易控), etc. The components providers are the most in numbers. Their products are Industrial robot control system, and Servo motor, etc. The machine manufacturers are making Cartesian coordinates robot, a selective compliance assembly robot arm (SCARA), multi-chain

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parallel robotic manipulators.

Table 57 Taiwanese companies implementing automatic production

kind	name	Automatic situation
Assembly OEM	Foxconn (鴻海)	Foxconn demonstrated his determination to transform his production into fully automatic production.
Electronics, communications & informations, medical, battery	DELTA Electronics(台達電子)	DELTA Electroincs was vigorously active in automatic production which had SCARA and articulated robot

Chen Duanwu (2018)

Figure60 Taiwanese machine tools

source: CNA (2017/12)

We have lots of cooperation with New Southbound countries.

KENMEC (廣運) has lots of automatic machines selling to China and ASEAN countries. Their products are not limited to the following Figure61.

Figure61 KENMEC's products for logistics, automation, and unmanned transporting

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source: KENMEC's official website

New Wide Enterprise (旭榮集團), on the other hand, sets branches in China, Vietnam, Cambodia, Ethiopia, and Kenya. Dozen hundred related companies keep close relations with it and sell their products collaboratively to the world. New Wide Enterprise (旭榮集團) is a vertically integrated company that produces knit with hundreds of suppliers. It develops up to 3,000 new kinds of textile and rapidly responds to the demand of clients and markets.

Table 58 Taiwan's textile, machinery, automotive industries investment in New Southbound countries in 2006-2015 ($ million)

產業	投資對象	臺灣投資件數				臺灣投資金額			
		2007～2011年	2012～2016年	總件數	占對外（不含大陸）總投資比率	2007～2011年	2012～2016年	總金額	占對外（不含大陸）總投資比率
紡織	越南	2	9	11	33.33	127.74	181.66	309.39	69.82
	印尼	0	1	1	3.03	0	19.10	19.10	4.31
	泰國	1	1	2	6.06	0.39	0.55	0.94	0.21
	印度	0	0	0	0	0.36	0	0.36	0.08
機械設備	印尼	1	7	8	7.84	0.17	55.78	55.94	7.45
	越南	2	3	5	4.90	25.38	17.70	43.08	5.74
	泰國	0	7	7	6.86	3.12	13.54	16.66	2.22
	新加坡	2	3	5	4.90	0.14	2.80	2.94	0.39
	馬來西亞	1	1	2	1.96	0.06	2.29	2.35	0.31
	印度	1	1	2	1.96	0.21	1.50	1.71	0.23
汽車零組件	越南	1	4	5	13.16	35.22	14.48	49.70	43.53
	泰國	1	5	6	15.79	3.70	23.43	27.13	23.76
	印尼	1	3	4	10.53	1.27	5.08	6.35	5.56
	印度	2	1	3	7.89	3.11	2.30	5.40	4.73

source: Gao (2018)

Malaysia, Indonesia, Thailand, India, Vietnam are called MITI-V (manufacturing industry Mighty 5). We could introduce more machine tools to them.

i. Vietnam

Vietnamese government promotes "Buy Vietnamese" activity. There were about 71% of their consumers having confidence with domestic products, based on their survey. The International Institute of Surveying, Brand Finance, publishes Vietnamese top 50 brands since 2015. Their diary company, Vinamilk, won the first place. The following companies

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are Viettel (communications companies), Vinhomes (real estate), PetroVietnam Gas (energy company), FPT (communications company), VietinBank, Vinaphone (communications company), BIDV (bank), Vietcombank. Besides, Vietnam's top internet company, VNG. Those companies provided over 80% of Vietnamese internet services. Also, they were one of the fastest growing brands.

Cai (2017) pointed out that Taiwanese investment projects in Vietnam were around 2,500 projects. The total investment was approximately $31.5 billion and ranked number 4 in foreign investment. The three most substantial FDI inflows into Vietnam were from Japan, Singapore, and RoK. They mainly invested in real estate and service. In contrary, more than 80% of the Taiwanese companies invested in the manufacturing industry.

Therefore, Taiwanese companies could incorporate industrial robot and AI to improve their production quality and efficiency. Huang Yaling (2016) pointed out that Taiwanese invest in Vietnam in many kinds of industries, including textile, shoes, motorcycles, wood furniture, and machines. Most of the investments were in southern Vietnam. On the other hand, Samsung and Apple both set up research centers there. Over 60 % of the expenditures were in manufacturing industries. The second popular industries are electric power and gas. The third popular industry is real estate.

Vietnam and Malaysia are the largest electronics exports countries in ASEAN. Taiwan also has lots of experience in developing electronics. We could bring AI error-detect technologies to other countries. For example, all of the 6,000 machine tools in TSMC (台積電) use AI to detect defects. After Taiwanese automotive production lines use AI, their robotic arms become multitasking. It can save the plant' s space. AI can even take charge of safety security and protection, diagnose and monitor, Processing parameter optimization, accuracy check, and error compensation (Chen, 2017).

European, US, Japanese, Chinese companies are having advanced AI technology. For example, Hara (2017) said that Fujitsu developed Human-Centric AI Zinrai in 2015.

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Since then, Zinrai integrated the Automatic Speech and photo Recognition through deep learning and acquired the high ability for identification. This ability can even utilize on drug development. It can shorten the development time and cost, and foresee the efficacy and side effects of these drugs. Zinrai started to diagnose, hack detecting and facility improvement in 2017.

Volkswagen and NVIDIA showcased their newly developed intelligent vehicle, which integrated AI in January 2018. Beside the applications such as facial recognition, surround perception, it can track and give alerts to drivers.

Ant Group (螞蟻金服) applies AI technologies to explore blockchain technologies to heighten its security. It also streamlines the customer service by using AI to phone service.

Industrial Technology Research Institute (ITRI) spent three years and invented "Prognostic and Health Management Software in Semiconductors (PHM)." The faults, both machines' malfunction and inaccurate monitoring on machines, added up burdens to engineers. PHM can foresee the potential problems that machinery may occur. Its accuracy is over 95%. It gives the engineers time to arrange maintenance schedule.

Some chip suppliers and electronic manufacturing firms are using this software, including Winbond (華邦) and MIC (帆宣). TSMC (台積電) has similar systems.

Figure62 Prognostic and Health Management Software

source: Industrial Technology Research Institute (2017)

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Vietnamese electronics industries develop rapidly. Apple, Samsung, and Foxconn all have their factories. Our electronics supplies can set up branches there.

i. Thailand

Besides automotive sectors, which had earned the name of Detroit of Asia, its second largest industry is the textile industry. Deloitte once pointed out that Thailand's manufacturing industries exported about $167 billion, which was less than India but was more significant than Malaysia, Vietnam, and Indonesia. The main reason was that Thailandese employees were more skillful than Malaysians.

The supply chain is complete in the Thailandese textile industry. Annual exports are around $7 billion. There are more than 1 million employees in this industry. However, its Industrial textiles rely on import, including endurable, strong, light, high-temperature resistant, acid and alkali resistant, etc. Therefore, in this area, Taiwanese companies still have business opportunities. The shoes and leather products create 500,000 job opportunities for Thailand. It ranks within the top number 15 in exports. In 2015, Thailand exported $670 million worth of shoes and leather products. Because Thailand is promoting its minimum salary, the operation costs are higher. Some international brands cut down the orders and increased them in China, Vietnam, and Indonesia. The SMEs in Thailand face a hard time.

The Ministry of Economy developed semi-automatic production in 2016. Some companies had increased capacity and lowered the cost by using it. We recommend some companies to set up branches in Thailand, including PUHU(彪琥鞋業), XING HE INDUSTRY CO. (新賀工業), and the brand F・KNIT (from 輝特). The F・KNIT specializes in almost automatic production lines. Three employees deal with 50 machine tools. Those companies can utilize their technology and Thailand's complete supply chain to continue receiving orders from around the world.

Thailand's furniture industry is close to mature. Due to the global economic setbacks,

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Thailand's exports decrease rapidly. In 2015, the exports fell by 11% compared with the previous year. To meet the needs of modernization of offices and homes, Himelight (鳴周科技) incorporated sensor, motor, and electricity into smart furniture. If it cooperates with Thailand's furniture industry, Thailand's furniture industry could resume its glory in the global market. Besides, the flood is severe in Thailand. Himelight's smart furniture could add the function of flood sensor to give warnings to homeowners and fire departments.

On the other hand, Taiwan's Industrial Development Bureau and TAIWAN WOODWORKING MACHINERY ASSOCIATION complete seven kinds of automatic production lines for wood furniture production (Figure63). They have sold out 30 production lines to Vietnam, China, Australia, and Canada for NTD 34.45 million. It looks promising that these production lines could also sell to Thailand.

Figure63 Industrial Development Bureau: automatic production lines for wood furniture

source: stpi.narl (2016)

Thailand's manufacturing industries have sophisticated techniques to produce electronics, canned food, plastics, jewelry, furniture, toys, and computers. The growth

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rate of the automotive industry was the fastest. One thing worth noticing is that rubber is Thailand's main export. Taiwan's Jian-Quan rubber company completes an automatic production line (Figure64). There were potential business opportunities to sell the production lines to Thailand to benefit each other.

Figure64 Jian-quan rubber company's automatic production line

source: Jian-quan rubber company

There are still some risks when it comes to expanding business in Thailand, which are frequent protests, unstable exchange rate, high loan rates, and lack of workforce.

i. Malaysia

The chief of FOMFEIA (Federation of Malaysian Foundry and Engineering Industries Associations), Chen Baocheng, pointed out that potential investors in Malaysia have to keep the worker issue and rising salary in mind. Low labor intensity and high-tech intensity industries are favorable to invest in Malaysia. According to official data, there were more than 2 million foreign workers in Malaysia in 2015. Among which, Indonesians were 40%, and others came from Nepal, Bangladesh, Myanmar. These data illustrate the short of the workforce situation.

Besides, Quannang's manager, Vincent K.T Chu, believed that Taiwan had advantages of heating equipment, mixers, and meat slicers. Additionally, the manager, Liu Qiuhe at Huafeng machine company in Johor Bahru, Malaysia, said that Taiwan imported pumps, air compressors, and agricultural machinery since 1980 and was well-received. However, some products are produced in Mainland China now.

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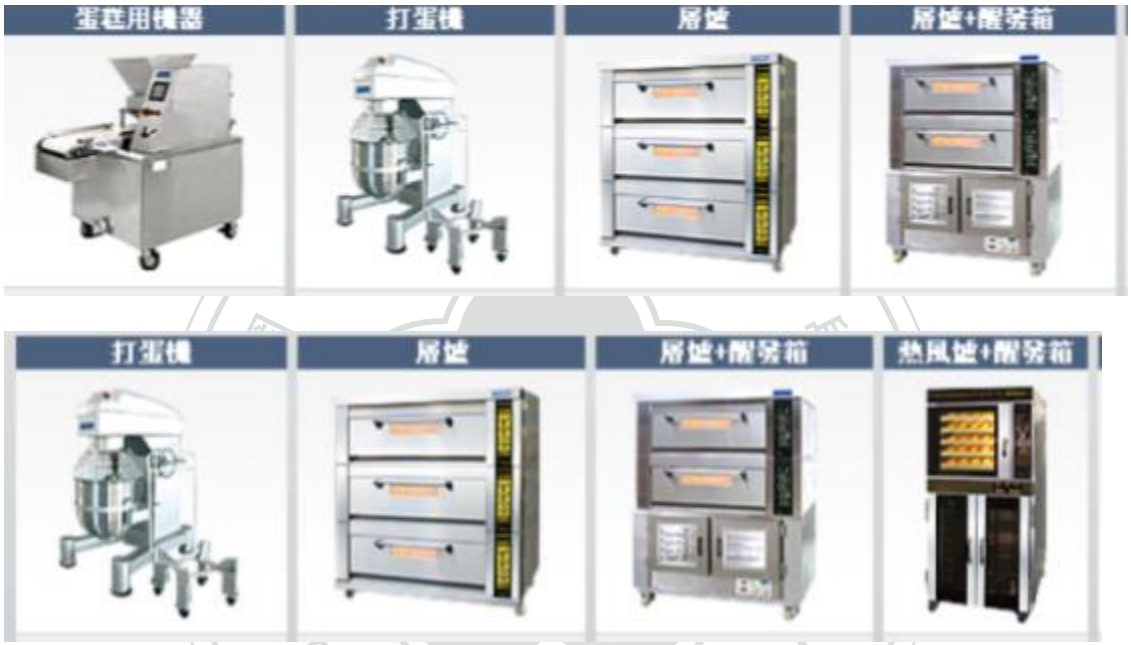
The electronics industries are thriving in Malaysia for in recent 30 years. International companies, DELL, Sony, Intel and BOSCH all have branches here. The country dubbed Eastern Silicon Valley (Huang Yalinn, 2016). Therefore, Taiwanese companies with AI- auxiliary machinery can consider this country and set up branches there, which include food process machines. (Figure65)

Figure65 Sinmag's food process machinery



source: Sinmag's (新麥企業) official website

i. Indonesia

Hong Kong trade development council pointed out that Industries accounted for 40% of Indonesia's GDP. The main imports included machine, electronic equipment, and steel. These figures illustrated the $6 billion high-speed rail project from Jakarta to Bandung.

Taiwan External Trade Development Council's official, Qiu said that Taiwan's machine tool accounted for 11% of Indonesia' total imports. The top 3 machine tools that imported from Taiwan are CNC for 11.44 million, integrated processing machine for 9.97 million, and stamping press.

There were more than a hundred Taiwanese companies expressed their products in expo, including VICTOR TAICHUNG (台中精機), Chin Fong (金豐機器), Lien Chieh

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Hydraulic(連傑油壓), SEYI Pressing Ahead (協易機械), KAFO (高鋒機械), HOTA Industrial MFG (和大工業), Supertec Machinery Inc. (主新德科技), Greenway CNC Lathe Machine (昌勇), HIWIN (上銀), YCM (永進), Honor Seiki (榮田), etc. Indonesian 3 top agents: Jaya Metal, Intermesindo, and OTT all caught this information. So far, Jaya Metal, OTT, First Machinery, and Kawan Lama are agents selling Taiwan's machine tools.

Indonesians spent 53% of their daily expenses on food. It's the 4th largest country by population. By March 2018, it has more than 266 million people. Their average age is 28.3 years old. There is 55.3% of the population living in cities. According to BMI's statistics, the annual compound growth rate growth of Indonesia's food market will be 9.3% annually. Therefore, the demands of food packing machines will increase, too. These kinds of machine rely heavily on imports. In 2016, the total imports reached $720 million. On the other hand, Taiwan's food processing machinery is prosperous. For example, Taiwan has a vegetable cutting machine, powder mixer, sealing machine, automatic filling machine, etc. Lu (2017) pointed out that some companies went to the expo in Indonesia with the Taiwan External Trade Development Council. For example, Tsung Hsing Food Machinery (總興) has sold its food machines (as Figure66) to more than 50 countries.

Figure66 Tsung Hsing Food Machinery's frying machine

source: Tsung Hsing Food Machinery's official website

There were also other companies went to the expo in Indonesia with TETDC, including SAN TUNG Automatic Packing Machines (三統), and Taiyi Food Machinery Co. LTD. (台乙機械) For its vegetable/ meat slicers. Ming Chun Food Machinery had

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got orders from Indonesian companies in the expo.

Taiwan External Trade Development Council (2018) said that Indonesia had abundant crude oil, natural gas, coals, minerals, rubbers, and woods. Its palm oil production was number 1 in the world. However, it contains 17,508 islands. 60% of its logistics rely on shipment and costs are high. Its Logistics Performance Index is worse than any other ASEAN countries, mainly due to customs clearance and transparency.

The Indonesian government is promoting lots of economic revitalization plans for the plastic industry, transportation, textile, steel, machinery, food processing, infrastructure, information and communication, logistics, and banks. Xiao Yupin (2016) pointed out that Sinotech Engineering (中興工程) and CECI (台灣世曦工程顧問) joined Jakatar's MRT project. Sinotech Engineering also built the Cirata hydroelectric power plant, and irrigation systems. Advantech (研華科技) made 180 sets of parking timers, electronic information system showing the next stop's name. Other Taiwanese businesspeople can take into consideration.

Zhou said that President Widodo valued the transportation between islands highly. He plans to build 3,000 boats in a year. Besides, the envoy of the President, Coordinating Minister for Economic Affairs Darmin Nasution visited Taiwan in 2016. He stated that Indonesia needed more boat than ever before. Taiwan had lots of experience in shipbuilding, containers and freighter routes management. Therefore, Taiwanese ship industries can invest in Indonesia. For example, CSBC Corporation (台船) has cooperated with SOECHI GROUP (Indonesian biggest ship group) and SMS Venture on the areas of technical training, vessel design, plant planning, parts procurement.

U-Ming Marine (裕民) provides bulk shipping service. It has 38 ships, which is the biggest company in Taiwan. Its ships account for more than 60% of Taiwan's total ships. It has still other four ships under the building. U-Ming Marine (裕民) cooperated with Indonesian companies before. They could have more cooperation in the future.

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Indonesia's demands for boats are mainly centering on 3500 ton to 5000 tankers and freighters. Taiwanese ships industries can also divide into four categories, which are large, medium and small, yacht, and components. Large ship company is CSBC Corporation (台灣國際造船), mediumship companies are LUNG TEH Shipbuilding CO., LTD. (龍德造船) and San Yang Shipbuilding Company (三陽造船). There are 78 small ship manufacturing and maintenance companies. CSBC Corporation (台灣國際造船) has taken Indonesia's orders.

The medical equipment sales business is also promising. The key importers are GE Healthcare, Pfizer, Siemens, and Philips. Some companies have set up factories in Indonesia, including CIBA Vision and Smith & Nephew. The imports from Taiwan by value were $6 million (Xiao, 2017)

The medical equipment sales business in India:

India has a large population, and the gap between the rich and the poor is vast. Fang Tian-sze (2016) believed that before really being a high power, India needs everything. Its infrastructure is not enough. Business opportunities lie behind drawbacks. India is putting efforts on "Make in India" and hoping foreign investors help upgrade its manufacturing industries.

Taipei Economic and Cultural Center in India (2018) said that the medical equipment sales business has excellent potentials. Its compound annual growth rate was 15%. The imports met 75% of its demands. In the medical equipment area, local industries mainly produced the primary level of goods. Its domestic sectors are Hindustan Syringes & Medical Device(syringe's producer), Opto Circuits (India), Wipro GE Healthcare (monitors). Foreign investing companies are India Medtronic (from Ireland), Karma (康揚 from Taiwan, its products are as of (Figure67), APEX/雅博(from Taiwan), BOBC/柏登(from Taiwan), EMG/上岳(from Taiwan, producing oxygen concentrator) have set up branches in India. Shen Ruiwen (2018) pointed out that Karma Medical has invested in

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India since 2007. It had 350 physical stores and 1,100 franchises. 140 hospitals were selling Karma's products. It held around 40% of the Indian market share. It's a successful case for Taiwanese companies' reference.

Figure67 Karma's (康揚) wheelchairs

source: Karma's official website

As Indians' income increases, their demands for higher medical quality and services are higher. According to the Confederation of Indian Industry's (CII) report, India needed to increase 1.75 numbers of beds to reach the global average, which was three beds for a thousand people. India needed to invest $86 billion to reach the goal. Besides, in rural areas, there were not enough healthcare infrastructure. According to Modi's "Made in India" policy, India would like to promote local products and replace imports.

The medical and healthcare products can divide into four categories. The percentage of imports and local producing: primary level of bandage supplies import for 15%-50%, medium level of portable medical materials import for 45%-90%, upper-Intermediate level of apparatus import for 70%-100%, and advanced level of diagnosis and treatment equipment (50%-80%).

Invest India illustrated that (as Figure68) some India depends heavily on imports for some high-level apparatus, including medical image processing equipment, dentist equipment, high-end electronic diagnosis and treatment equipment, ophthalmic instruments, orthopedic prosthetics, surgical disinfection equipment, etc. It might

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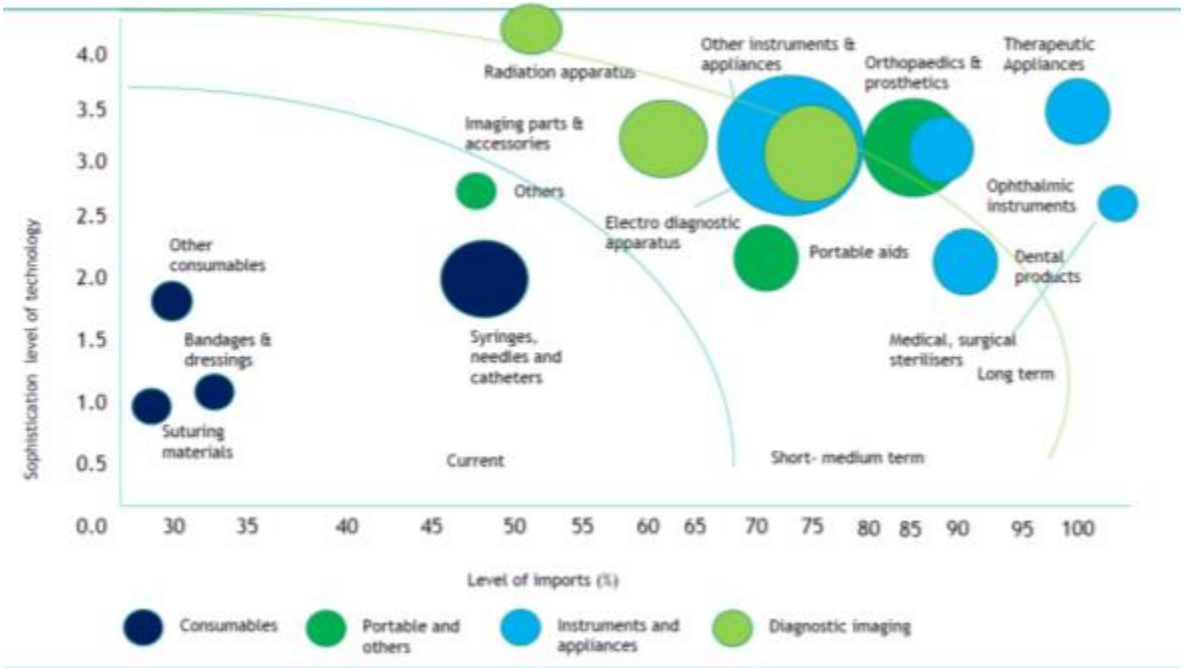
heighten the tariffs of some of these products.

Figure68 India's medical equipment industry's foreign product dependence degree



source: TECO in India

Taking artificial joints, for example, Wang (2016) pointed out that its compound annual growth rate was 26.7%. There were over 65,000 times surgeries in 2010. India's local companies in this area were Wadia Group, GPC Medical (producing bone nail and bone plate), Invicta Meditek (for components), TTK Healthcare (for components), INOR Orthopaedics (for an artificial hip joint), New Life Surgical World (producing bone nail and bone plate).

There are also some well-known international companies in India, including J&J Depuy Synthes (producing artificial bones) and Zimmer Biomet, Smith & Nephew (producing artificial hip joint). Taiwanese United Orthopedic Corporation/ 聯合骨科器材股份有限公司 produces artificial joints. Its product has sold to more than 30 countries and acquired certification. It has its own brand and also does OEM for the well-known artificial spine company, Medtronic Sofamor Danek. United Orthopedic Corporation held 24% of the market share in Taiwan, 36% in China, 18% in the US. It

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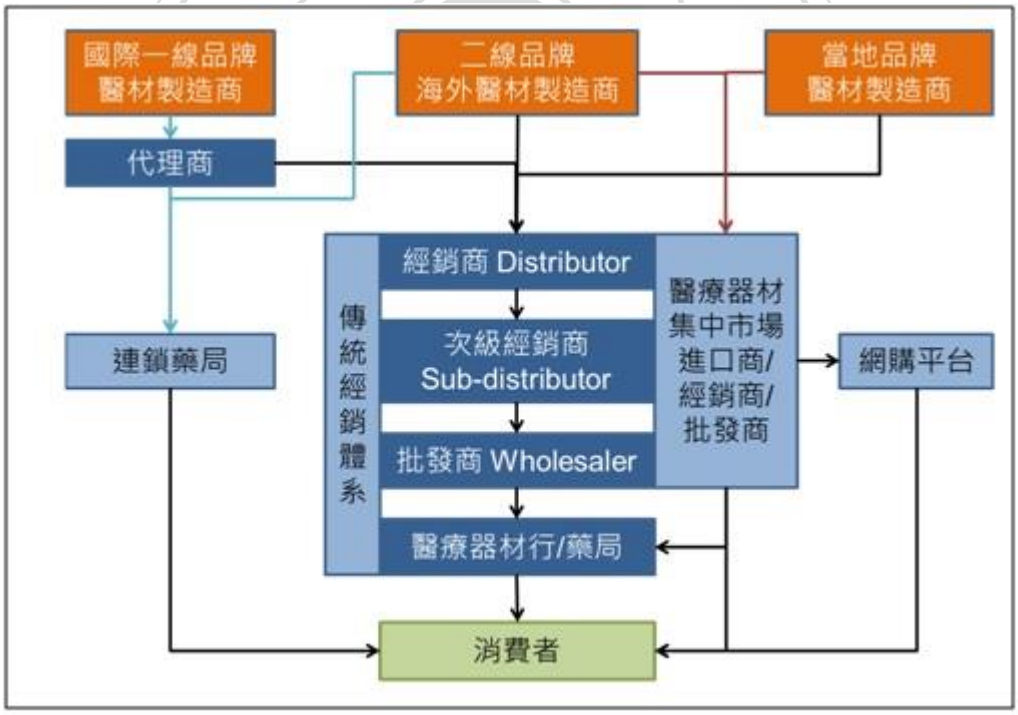
might like to take the Indian market into consideration.

For the market for orthopedic equipment, the first 10 companies accounted for 75.7% of market shares. Among which, spinal products were the highest. Cai (2013) pointed out that in the Indian pharmacy, we could buy the blood glucose monitoring products and electronic thermometers. However, electronic sphygmomanometer could only be bought in larger pharmacy or medical equipment lines. For more professional medical equipment, such as spray therapy device, low-frequency treatment device, mobility aids, wheelchairs, we need to go to larger medical equipment lines. Therefore, to sell medical equipment in India, we need to cooperate with local agents.

Figure69 The medicals sales model in India



source: Tsai, IEK

Shen (2018) suggested that besides local agents, Taiwan's medical equipment companies need to hire Hindo capable people to cultivate customer relations. Wang (2016) pointed out that Indians were highly sensitive to the price. In addition, sales channels were important. Furthermore, Taiwan's companies were good at high quality and R&D. There must be room for Taiwan's products prosper in India.

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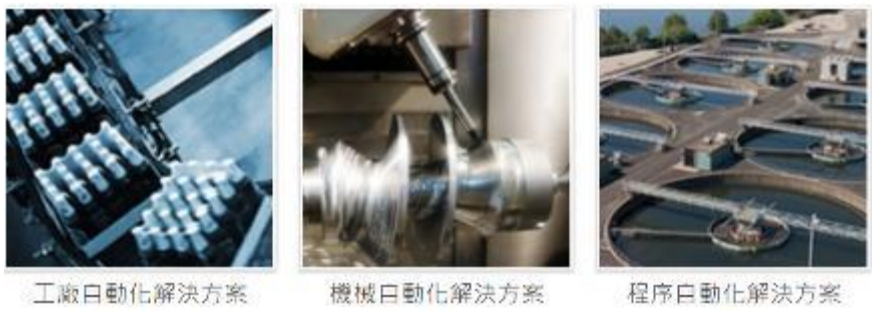
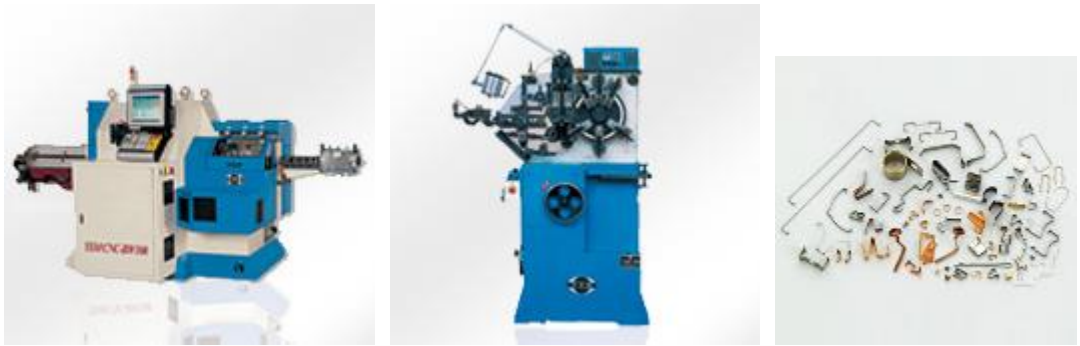
solar power plants in Indian airports:

Figure70 Industrial automation / robotic arm produced by DELTA Electronics



source: DELTA electroincs official website

Figure71 Yisheng Machinery sold in India



source: Yisheng Machinery

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India was developing solar power systems in 90 airports. There were 10 airports underway. The successful bidders were all Advantech's cooperating companies. Advantech's products were PCB, embedded system, monitoring cameras, and the IoT components. Advantech was in GE's, IBM's and Honeywell's supply chains.

Figure72 Advantech's products

source: Advantech's official website

conclusion for the section of business opportunities in new Southbound countries:

There were 2.2 billion people in the New Southbound countries. Many of them were upgrading their manufacturing industry. Taiwan could hedge its industries in the New Southbound countries while facing the rapid rising China and still advanced U.S. and Japan. Even this study only focused on smartphones, automotive electronics, and manufacturing industry, there were still profitable industries like agriculture and Fishery Industry, etc. All of the related companies could learn after the successful companies their outstanding patterns.

AI could apply in manufacturing, financial, retail, and medical treatment, etc. Some companies had introduced this technology to increase their capacity and quality. Because many countries were conducting brand movement while the companies were facing some difficulties like short of manpower. This thesis suggested that they could apply AI, big data, mobile communications, and cloud computing to their factories. By combining these technologies, a company could have a better understanding of the intelligence of materials, the needs of its customers, and the advantage of itself.

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4. The Cross-Straits Competition and Cooperation in ASEAN/ South Asia: the Successful Cases of Taiwan's Firms

The approach of China's "BRI" initiative mainly focused on infrastructure building. China wanted to expand its influence into global markets through its national resources. Then, it also wanted to ensure its import of energy and resources. However, China's BRI had drawn critics.

Taiwan's "New Southbound Policy" was to meet southern countries' need with our outstanding technologies. For example, we joined their programs of building smart cities, manufacturing automation, automotive electronics, and electric car, and upgrading the quality and capacity of the manufacturing industry.

There were no contradictions between the policies of the cross-straits. In addition, Taiwan focused on developing our high techs as strengths and promoted to New Southbound countries. It could ensure our status in global supply chains. As long as we mind confidentiality tightly, retain human capital and keep working on R&D, we could maintain our leading roles in our competitive industries. Besides, the New Southbound Policy could raise our image and trading in involving countries. We could offer those countries assistance with high tech topping Chinese built infrastructure. In this way, the Cross-Straits don't have to contradict to each other on economic development policies but make win-win in New Southbound countries.

Because the first and second sections in this chapter would mention our strength and successful examples in New Southbound countries. We would like to illustrate their common successful business models as following:

I. successful business models

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i. electronic industry – Taiwanese companies offered integrated IoT total solution, formed a joint venture with local companies, transferred technology to meet local needs, offered training courses in local colleges, gave local students opportunities to study and work in Taiwan, cooperated with international companies to build smart cities for local governments.

ii. The components and electronic cars for transportation – Taiwanese companies developed smart motors, customized buses for New Southbound countries, built operation center for taxi fleets, merged themselves into the supply chain of international companies, funded sports teams to boost their brand, used automation tools to improve capacity, promoted eTag to the world.

iii. Medical equipment and materials – To sell this kind of products, we should emphasize the safety. The consumers highly value the brands, quality, and price. Besides, some successful Taiwanese companies suggest that Taiwanese companies could sell their products through local agents. In this way, it would be easier to build a relationship with customers.

iv. Textile and Shoes – Taiwan became important R&D bases for global functional textile (waterproof, fire-proof, knife-proof, and wearable electronic textiles). Taiwan produced 70% of global functional textile. Taiwan also made more than 80% of the clothes for the leading companies. Malaysia lacked manpower. They invited 2 million foreign workers while Taiwan had around 700,000 foreign workers. The Malaysian government was promoting automation in their manufacture industry to cut down the demand for manpower. Meanwhile, they give foreign companies the Profit-free tax incentive. The industry cluster and supply chain of Thailand's textile were complete. Their exports are more than $7 billion annually in recent years. This industry ranks 2nd largest exporter in Thailand and has more than a million employees. In India, the textile exports were $35.49 billion in 2016. It ranked the 2nd

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largest exported in India. Therefore, our textile companies could use their strength in advanced processes and industry clusters to move their production lines to Malaysia, Thailand, and India. For example, New Wide Enterprise has factories in the Cross-Straits, Vietnam, Cambodia, etc. It cooperates with hundreds of satellite companies to quickly respond to clients' needs and demands. They apply big data, intelligent machine, mobile device, cloud computing, AR, and VR in producing and marketing.

v. Disaster management - WaveGIS Technology CO. has IoT flooding sensor and Watergate Contingency Decision-making Auxiliary system. This system was awarded the 2018 Smartcity Innovation Application Award. Because flooding were common problems in Singapore, Malaysia, and Thailand, our government could promote this system to these countries during the Annual Disaster Management Conference. In terms of Indonesian forest wildfire, Blueeyes and Advantech had built a monitor system which could apply to reduce its disaster. Meanwhile, NCNU's (暨南大學) water mist anti-smog system could apply in Singapore, Malaysia, and Indonesia to alleviate their smog problems. FETC's (遠通電收) eTag and WaveGIS' (昕傳科技) GIS could maintain human safety through real-time information. ICP DAS developed boat's VDR, building monitoring system, and water tower water quality sensor. Its chief manager Mr. Chen believed that Thailand, Vietnam, and Malaysia have business opportunities. The local companies there had the intention to use these technologies to upgrade to Industry 4.0. Besides, ICP DAS had the gadget to detect, regulate, and to inform managers of the water level.

vi. Machine Automation – In Charm International Co. set up Formosa training center in Tangerang in Indonesia. They teach Indonesians how to use Taiwan made machines. Now, Taiwan became the second importing country for Indonesian Machines.

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II. The needs of New Southbound countries

The needs in every ASEAN and South Asia country was different but had something in common. Almost all of them were promoting new transportation to cut down the pollution.

Based on IMF, India would be the most rapid growing economy in the world in 2018. In addition, they were launching Smart Cities Missions. Therefore, the business opportunities in India could not be ignored.

TAITRA had ever invited many Indian companies to visit Taiwan. Also, some Taiwanese companies had visited India, too.

Although India's automotive market was huge, international companies had developed prosperously.

In 2015, Indian prime minister Modi proposed Smart Cities strategies. They generated huge business opportunities.

Taiwan's well-known automotive companies were Hota, Delta Electronics, and K. S. TERMINALS INC. They expressed their willingness to supply modern transportation in New Southbound countries.

ASEAN's automotive markets were huge. For example, the car sales in India and Thailand were a million and 800,000 in 2017.

Wu (2017) pointed out that the revenue of the automotive industry ranked number 2, which only second to real estate. The automotive electronics could not only upgrade car's safety, it could also upgrade the entertaining functions.

Philippines' usage rate of locomotive units had not yet reached half of Vietnam's. Taiwan's AM producers could seek to incorporate into the production line of international companies. They could expand their business in this way.

Take TECO for example. It produced the chassis of an electric bus for the Philippines. It also cooperated with the third largest locomotive company, Ropali, to

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set up factories in Subic.

Thailand had prosperous automotive markets and wholly supply chain. It was dubbed with Asia Detroit. The leading five companies in Thailand were Toyota、Isuzu、Honda、Nissan、Mitsubish.

Bangkok, Thailand was a city which suffered from the serious traffic jam. It had set a bike renting system alike ubike. We could promote the VIoT into Thailand.

Vietnam's locomotive market was only second to Mainland China, India, and Indonesia. Namely, it's the fourth largest locomotive market in the world.

Take some successful companies as examples. Everphone Industrial was a long time supplier for Honda. Kenda Rubber Ind. and Cheng Shin Rubber Ind. Co. made profits in ASEAN countries.

There were around 19 Taiwanese automotive components companies in Vietnam. Most of them produced locomotive and car components.

KYMCO sold electronic vehicles in Vietnam starting from 2016. Some satellite companies could join hand with it and move factories into ASEAN.

There was a successful brand company, FETTA AUTO PART INDUSTRIES, in Malaysia. They produced exhaust pipe and anti-collision steel beam.

DELTA Electronics had put efforts on electronic vehicles for 10 years. It could supply the charging and power supply units for international car companies.

Advantech became part of Indian Smart Cities Project, and contributed to power management in airports, railway traffic monitoring, traffic imaging and smart electric grid management.

Advantech also joined the solar power panel building plan in two Indian airports.

In terms of the shipbuilding industry, the Indonesian government sent high-level officials to Taiwan in 2016. They convey the willingness of cooperation

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with Taiwan. CSBC Corporation Taiwan (台船) had sign MOU with two large ship companies to operate on training, design, and factories arrangement.

CSBC Corporation Taiwan also got ships to order from Indonesia.

Taiwan's two largest bike companies had agents in Thailand. But companies in this market competed fiercely. Because of the good images of Giant and MERIDA, we believe they could have big sales in Thailand, Myanmar, Vietnam, Cambodia, and Laos.

The medical equipment was important business opportunities. Indonesia's imports from Taiwan only accounted for 0.7% of their total imports.

Taipei Economic and Cultural Center in India said that the medical equipment sales have potentials in India. The compound annual growth rate expected to reach 15%. 75% of its demands came from imports.

The artificial joint sales in India could have 26.7% in compound annual growth rate. In 2010, there were more than 65000 artificial joint operations conducted in India.

If Taiwan's medical equipment companies wanted to enter India's market, they could hire Indian speaking employees to expand sales. Besides, the consumers may pay high attention to the price and qualities.

Thailand asked help from Japan to solve their flooding problems. Some tech-advanced companies could also seek business opportunities there.

Due to the Forest fire in Indonesia, Singapore and Malaysia sometimes have haze problems. Our smartphone companies could develop critical warning and disaster relief functions for them.

National Chi Nan University had developed a water mist anti-smog system. It could detect PM2.5 and spread the mist automatically.

The Philippines had challenges from Typhoon annually. Taiwan could help

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them build a real-time monitoring system for them.

Thailand was the largest rubbers exporting country. The Taiwanese company, Green River Holding Co., produced particle board with high-tech. In the two kilometer's production line, only dozens of workers there.

The supply chain was sound in Thailand. It exported more than $ 7 billion textile annually. There were more than a million labors in this industry.

The shoes also create around half a million job opportunities in Thailand. Some international companies were moving their order the surrounding countries because. Taiwan's automotive production systems could give some help.

The furniture industry was mature. Taiwan's companies would set up factories there. Taiwan's companies had the advantage of advanced technologies.

The New Wide Enterprise cooperated with satellite companies and responded to clients quickly. It also used high-end tech to upgrade its services.

Industrial robot industry could be divided into system integration, component companies, and industrial PC companies, and assembly companies. Taiwan was prosperous in this area.

The Quannang Machinery manager Vincent K.T Chu noted that Malaysia had high demands on food processing machinery.

Indonesia also had great opportunities for Taiwan's machinery companies. Taiwan's companies could sell products through agents: Jaya Metal, OTT, First Machinery, and Kawan Lama.

Some companies had successfully set up factories in India. For example, Delta India, China Steel Corporation India PVT. LTD., Chuan Shun Electric Company (India) PVT. LTD., Eminent Power Friends Equipment Company Pvt. Ltd., and MANLY Silicon Steel PVT. LTD. They promoted the automotive production.

Sharp had a plan to expand capabilities in Thailand. Some Taiwanese

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companies could take this chance and become Sharp's supply chain.

Thailand's HDD production ranked number 2 in the world. Taiwanese companies could help them upgrade their technologies.

The eSport market was thriving in Thailand. Acer's gross profit margin growth rate reached 10.7% because of eSport laptops and VR. Other satellite companies could join the production, too.

China's Transsion held 40% of Africa's market shares because its function met local's needs. Taiwan's HTC and Foxconn could also design specialized smartphones for people in line with their living habits in ASEAN and South Asia countries.

India had potential in electronics. Some related companies could move to India.

According to IDC, Indonesia own the largest smartphone market in ASEAN. It was followed by Thailand and the Philippines. Besides, based on BMI, Vietnam's smartphone market could grow from $3 billion in 2015 to 4.49 billion in 2020.

TAITRA said that Vietnamese highly valued brand images. Taiwan's image in electronics was great.

In 2017, there are 41 Taiwanese listed companies in Apple's supply chain. There are 340 Chinese companies in Apple's supply chain. In ASEAN, there is no local brand company in Apple's supply chain, but some international companies have a manufacturing base in the Philippines, Malaysia, Singapore, Vietnam, Thailand, Indonesia, and India.

Table 59 The 41 Taiwanese listed companies in Apple's supply chain in 2017

category	company		category	company		category	company
semiconductor	ASE TSMC		flexible print circuit	Career (嘉聯益) Interconnect		battery	SMP (新普) DynaPack

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			board(軟式電路板)	(台郡)			(順達科)
Power supply	AcBel (康舒) Delta (台達電) LiteOn (光寶)		Thermal Module (散熱模組)	AVC (奇鋐) SUNON (建準) Auras (雙鴻)		Lens	GSEO (玉晶光) Largan (大立光) Primaz (致伸)
communication	AzureWave (海華)		Device cases	Catcher (可成)		Wire connectors	正崴
Printed circuit board (PCB)	Zhen Ding (臻鼎) Unimicron (欣興) Unitech (燿華) Tripod tech (健鼎) Compeq (華通)		OEM assembly	Compal (仁寶) Foxconn (鴻海) Wistron (緯創) Pegatron (和碩) Inventec (英業達) Quantatw (廣達)		parts	Yageo (國巨) TXC (晶技) Szs (新日興) Nanya (南亞) Juic (久威)
Acoustic device	Merry (美律)		Display opto electronics back light module	TPK (宸鴻) Radiant (瑞儀)		Packing material	Cheng Loong (正隆)
Periphery	Sunrex (精元), longwell (良維), darfon (達方)						

note 1：highlight companies joins the supply chain since 2017

note 2：outside the list since 2017: PTOT (白金科技, not listed company), AUO (友達), coretronic (中光電), coxon (谷崧), jarlly (兆利)

note 3：branches in Taiwan and part of the supply chain: Texas Instruments (德儀), NXP (恩智浦), Micron Technology (美光), 3M, NOK(Japanese), total 11 companies.

source: Wealth Magazine (2017/5), issue 528, page116-117.

The reason why TSMC could get orders from the US and China is that of its confidential work. Besides, it ODM for clients but have no its own brands. Its clients could relief a bit. We suggested that our government could help Taiwanese companies

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move to New Southbound countries as soon as possible.

4.1. The significances of our high-tech and manufacturing industries

4.1.1. TSMC's foundry ODM accounted for more than 56% of the global market share in 2017. The total foundry ODM in Taiwan accounted for more than 66% of the global market share in 2017. It had the most advanced process and packaging technology. Its machines used AI to detect and monitor the errors, so it could maintain them before really out of order. They used industry 4.0 maturely.

4.1.2. First High-tec enterprise (高技) was the manufacture of PCB. Its clients for industrial computers included Advantech (研華), Portwell (瑞傳), Winmate (融程電). Its clients for automotive electronics included E-LEAD (怡利電), DELTA (台達電), etc. DELTA supplied power supplies for Tesla, GM, Mercedes-Benz, Volkswagen, and First High-tec was its upstream company for PCB. First High-tec's clients for internet communication equipment were Accton (智邦) and Tai Lin (台林)

4.1.3. AUO's revenue last year was over $1 billion. CES in 2018, many international brands were using AUO's panel on their 85-inch 8K television. AUO's products extended to high-class notebooks, automotive entertainments. Wang (2018) pointed out that, AUO and InnoLux (群創) put great efforts on the development of MicroLED and MiniLED. InnoLux had succeeded in publishing and seeking cooperation with automotive assembly plants. It planned to start mass production in 2 years. AUO could supply the solution for integrating software and hardware. Its target products were public information display and integrated touch, etc.

4.1.4. Taiwan's main car IoT companies were TSMC for the semiconductors of Internet of Vehicle, MTK (聯發科) for automotive 4G internet connection chips, SERCOMM (中磊) for vehicle gateway, and Holtek (盛群) for automotive

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Bluetooth, HTC (宏達電) for in-vehicle infotainment system, IVI system, ASUS (華碩) for intelligent transformable panel, Foxconn for IoV operation center, Chunghwa Telecom (中華電) for intelligent driving video service. Besides, VIA Technologies received many awards in Taiwan Digital Signage Awards 2017. Its digital TV wall display made progress in medical and smart cities' system. It joined the Japanese largest taxi company's IoT HUB360 project. It was working on the certification of automotive AVM application. It expanded its clients to ASEAN countries, Hong Kong and Macau.

4.1.5. ICP DAS(泓格科技)offered industry 4.0 solution to the domestic semiconductor, LCD, and fossil fuels companies, including monitoring and automation systems. Besides, its products also included the automatic fire extinction installations and security systems, fishing boat voyage recording equipment systems, etc. CEO Chen Ruiqi (陳瑞煜) believed that traditional industries were more willing to accept industry 4.0 than high-tech companies. When talking to Taiwan's businessmen in ASEAN countries, the second generation was eager to surpass the achievement of their previous generation. Therefore, ICP DAS would have the chance to introduce its products to them. Chen Ruiqi pointed out that Thailand, Vietnam, and Malaysia would have the business opportunities, but the largest market located in Mainland China.

4.1.6. United Orthopedic Corporation created its brand named "United". It accounted for 24% of Taiwan's market share, 36% of China's market share, 18% of US' market share. It sent engineers to participate in seminars. By doing this, engineers could not only expand their business but also did field engineering for doctors.

4.1.7. Actron Technology Corporation accounted for 51% of the global markets for its automotive electronic diots (electric control units).

4.1.8. Everlight produced interior and exterior lighting for cars. Its new 3D car taillights

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passed the certification in EU, Japan, and ROK. It became the fifth largest LED companies in the world.

4.2. The successful cases for investing in New Southbound countries

4.2.1. Advantech enjoyed the highest market share for its industrial computers for 29% in the world. Its products could apply to the electronic data capture in public transportation. It joined some international companies to help India build solar power systems in 10 of its airports.

4.2.2. FETC owned the longest ETC in the world. It cooperated with Advantech and TECO to join the ETC cooperation projects in Vietnam, Malaysia, Philippines, and Indonesia. Its technology had expanded to parking charges, and the warning system that makes car owners to take message automatically while opening the dam's water gates.

4.2.3. CXTech is the largest precision-engineered range of forged spare parts and automotive forged components. It had factories in the Cross-Straits and Vietnam. It improved procedures, quality, and efficiency by automated production.

4.2.4. TECO developed electric tricycle and the electric bus chassis. Its smart IoV electric tricycle could reduce air pollution. It was equipped with a smart service system, so locals could safely and rapidly find taxis through smartphones. The companies' owners could monitor their fleets by TECO's systems. TECO received an award of System Integration Output Award by Taiwan Smart City Solutions Alliance in 2018. It had factories in the Cross-Straits and India. It produced small motors in Vietnam. This would enter the stage of mass production at the end of this year.

Figure73 TECO's electric tricycle in the Philippines

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Source: TECO (2018)

4.2.5. Kung Long created its brand named “LONG”. It could monitor its batteries with sensors on them. Kung Long became the member of Japanese car assembly companies’ supply chain. It held nearly 50% of market share in the AM（after market）. It helps Vietnam establish Telecom Base Station. Even the largest UPS manufactures in the world was Kung Long’s clients.

4.2.6. Kenda created its brand named “KENDA”. Cheng Shin created the brands of “Cheng Shin”, “CST”, “MAXXIS”, and “PRESA”. It placed number 9 in the global tire’s market share. It had factories in the Cross-Straits, Vietnam, Thailand, and Indonesia.

4.2.7. Karma accounted for 40% in the Indian market for its wheelchair accessories. There were still some other Taiwanese companies in India, including APEX (producing hospital bed with support surfaces, respiratory therapies, and medical equipment), BOBC (producing material to maintain Cornea and teeth), and the EMG TECHNOLOGY CO., LTD. (producing “EMG” Surgical Suction Unit)

4.2.8. Eurocharm Group(豐祥) set up factories in Vietnam for more than 20 years ago. It was the largest metal components supplier for motorcycle and car assembly companies. It was also the supplier for Honda, Toyota, Ford, and Vespa, etc.

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4.2.9. Taiwan's textile industry produced more than 70% of the world's functional fabrics (clothing). Taiwan's companies involved in more than 80% of the products of the international 5 leading brands. In 2015, Taiwan had 4,232 textile companies and made $18 billion in revenue. The significant companies included Everest Textile (宏遠，遠東子公司) with its brand "EverSmile". It completed industry 4.0 with the help of Advantech. Everest Textile set up factories in Thailand and Vietnam. There were other companies set up factories in Vietnam, including Eclat (儒鴻), Makalot (聚陽), and Lovetex (國紡).

4.3. The Cross-Straits' business development in New Southbound countries

Taiwan's business development in New Southbound countries with Taiwan's New Southbound Policy

Taiwan had long been engaged with the New Southbound countries in the business aspect. The largest accumulated investment targeting countries in recent 10 years were Vietnam ($19.3 billion), Singapore ($8.2 billion), Indonesia ($3.8 billion), Thailand ($2.4 billion), Malaysia ($2.1 billion), Cambodia ($0.9 billion), and Philippines ($0.6 billion). The signs were as followed:

4.3.1. Vietnam: Taiwanese investments mainly focused on textile, shoes, food processing. Taiwan was the fourth largest foreign investment country, which only behind South Korea, Japan, and Singapore.

4.3.2. Singapore: Taiwan and Singapore signed ASTEP in 2013.

4.3.3. Indonesia: Taiwan invested largely on textile, tire, ICT, steel, and fossil fuel. The well known companies were Pou Chen Corporation (寶成), Ching Luh (清祿製鞋), CSC Group (中鋼公司), ASUS (華碩電腦), Kenda(建大輪胎), Cheng Shin (正新輪胎), Chinatrust Commercial Bank (中國信託銀行), Chang Chun Group

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(長春石化), and Nan Ya Plastics Corporation (南亞塑膠). The accumulated amount of money ranked number 10 locally.

4.3.4. Thailand: Taiwan's business in Thailand mainly focused on electronics, chemistry, and textile. The accumulated money ranked number 3 locally, which only behind Japan and the US.

4.3.5. Malaysia: Taiwan's main investments in Malaysia were in electronic, minerals, paper production. The accumulated money ranked number 4 locally, which only behind Japan, US, and Singapore.

4.3.6. Cambodia: Taiwan's main investments in Cambodia were real estate, agriculture. Successful businesses are Lin Fu-Lin's paper production factory, Sung Hong-Bin's motor maintenance store.

4.3.7. Philippines: Taiwan's main investments in the Philippines were electronics, trade, and grocery.

4.3.8. India: The accumulated money ranked number 40 locally. Taiwan's main investments in India were IT, steel, electronics, machinery.

China's development in ASEAN and South Asia countries with 21st Century Maritime Silk Road

1. infrastructure

   A. Indonesia's Yawon high-speed rail: The length of Jakarta-Bandung High-speed rail was 142 kilometers. It started to build in 2017 and expected to be done in 3 years. The 3-hour drive could instead be reached in 40 minutes.

   B. Thailand's Bangkok - Nakhon Ratchasima Railway: It's part of Trans-Asian Railway. The total length was 252 kilometers. It started to build in December 2017 and was expected to be finished in 2021.

   C. Laos' railroad and hydroelectric plant: The length of the railroad from

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Mohan, Yunnan to Vientiane, Laos was more than 400 kilometers. The amount of investment was $6 billion. It started in 2016 and expected to be finished in 5 years. China invested 70% and Laos invested 30%. Besides, Laos took 120 million in loans from China to build hydropower plants.

D. Myanmar's oil pipeline, ports, and industrial park: The oil pipeline from Kunming, China to Kyaukpyu, Myanmar started to use in April 2017. The total length was 771 kilometers. The pipeline is designed to carry 22 million tons of crude a year. Besides, Kyaukpyu Port and its industrial park finished building in 2017. China acquired 70% of the equity and 75 years right of operation.

E. Hambantota, Sri Lanka, and its Mattala Rajapaksa International Airport: China exempted Sri Lanka's $1.1 billion debt in exchange for the 99 years right of control and 85% of its equity.

F. Gwadar Port: China invested $46 billion to help Pakistan build a highway, railway, power plants, industrial parks, gas pipelines, etc. However, the projects depleted Pakistan's foreign exchange reserves, which was less than $20 billion. Gwadar started to operate in 2016. China took over the operation.

2. technology industry

A. Communication and satellites: China Telecom, China Unicom, Huawei, and ZTE cooperated with Russian companies to build fiber optics for the countries along BRI. Beidou Satellite Navigation system also expanded its information services to foreign countries.

B. Smart City: Ali Cloud cooperated with Malaysia's MDEC and DBKL (Kuala Lumpur's city government). They utilize AI to study the traffic flows to streamline the traffic and transportation. Huawei developed

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solutions for Malaysia's national ICT research center to promote public safety and build High-Speed Broadband Network. They built a camera system in BGCEA (Manila's business center) that could send instant information to prevent criminals.

4.4. The challenges and competition of Taiwan's industries

i. US put sanctions on ZTE influencing Taiwan's business: US stop selling chips and software, including Android system to ZTE. ZTE shut abruptly. Therefore, some of the Taiwanese companies were influenced. Additionally, in the long run, China would use the approaches of business spy and headhunt and would impact Taiwan's human resources.

Table 60 Taiwan's corporates having business with ZTE

company	ZTE's business accounts for its revenue	revenue in 2017
TrueLight(光環)	12%	$0.6 billion
Luxnet Corp. (華星光通)	12%	$0.5 billion
LandMark Optoelectronics Corp. (聯亞光電)	7%	$0.7 billion
Visual Photonics Epitaxy Co. （全新光電）	6%	$7 billion
WIN Semiconductors Corp. （穩懋）	3%	$6.7 billion
Elite Advanced Laser Corporation(聯鈞)	1%-2%	$2.4 billion
Media Tek(聯發科)	0.6%-0.7%	$80 billion

source: Ma (2018)

ii. China sold 94.70 million of TV panels in 2017 and accounted for 36.1% globally, surpassing RoK and became number one in the world. BOE (京東方) and CLP Group (中電集團) were developing new products.

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Taiwan's Innolux and AUO felt the peer pressure.

iii. China's business spy stole the GaAs technology from WIN Semiconductors Corp（穩懋）. It was a technology that spent WIN for 12 years to develop. Lin (2018) pointed out that business spy increased 5 times in 2017. Their main target was TSMC, Novatek, and Micron.

iv. Fujitsu, Ant Financial, etc. were using AI on the recruit, danger detect, etc. the companies of European, US', Japanese and China' were advanced in AI. AT&T, T-Mobile, Sprint, Verizon were joining 5G development. Japanese NTT DoCoMo and Toyota, China's China mobile, and Alibaba, Spanish Telefonica, British's Vodafone, and German BOSCH were all developing 5G. Qualcomm was cooperating with Samsung to develop 5G since 2018. Samsung wanted to surpass TSMC in making chips eagerly.

v. The chips were critical in 5G's and AI's development: US NSA had a report about 5G on January 29th, 2018 and took 5G as a Moon-landing project. The AI was leading the competition on the Internet. It concerned self-driving cars and automation products. Lin Shiyi (2016) pointed out that RoK's and Japan's government were putting $1.5 billion in building 5G. In EU, European Union Agency for Network and Information Security (ENISA) invited experts from the globe to compete for 5 million euros budgets.

vi. In the aspect of Taiwan, Lin Hongda (2018) pointed out that Taiwan was enthusiastic to develop AI. One branch of Quanta Computer, Quanta Cloud Technology cooperated with Intel and set up a telecommunication technology research center. Inventec set up the 5G center, and Nokia developed 5G technology and had its stock price increase by 15%. Taiwanmobile (台灣大), ASUS (華碩), and Quanta Computer (廣達)

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were setting up a Taiwan AI A-Team.

vii. Vietnam: Diao Manpeng (2017) pointed out that 60% of Vietnamese mobile games in 2015-2016 created by China. Pakistan's telecommunication and applications were almost made by China and imported from China.

5. Conclusion and Suggestions

5.1.1. high-tech industry

A. In the erupting trade war between US and China, the US was constraining China's developing on information and communication, robots, aeronautical and space, and Biotechnology and medical equipment. All the above industries were belonging to "Made in China 2025". 41% of Taiwan's export to China was electronics. Therefore, the trade war between the US and China threated the business which was supplied by Taiwan's components, China's assembly, and sold to Europe and the US. Therefore, one suggestion to tech companies is that they could develop solutions. For example, instead of selling products solely, Advantech (研華) cooperated with international companies to build solar power system in India's airports with its industrial computers. ICP DAS （泓格科技） connected to companies and government actions and customized the solutions. Therefore, tech companies could contact potential clients and offer field engineering service.

B. ASUS accounted for number 1 in Indonesia' and Thailand's market share. Taiwan's image was excellent. Even ASUS had vertical integration in

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making computers; other computer peripheral manufacturers could still seek the business opportunities by contacting ASUS and become one of its supply chains.

Figure74 The different efficiency between 4G and 5G

Source: Wealth Magazine (2018/3), issue 550

5.1.2. industry 4.0

A. Taiwan's Industrial Technology Research Institute developed Prognostic and Health Management Software in Semiconductors. It could monitor, predict and visualization of the data. The manager could have a good awareness of the machines' health status. They linked with each other and lowered the error judgment. It acquired the award at the 2017 Global List of Inspiring Innovations. Winbond(華邦電子) and MIC (帆宣) were using this product. This system could introduce to other Taiwanese companies.

B. Indonesia, Thailand, Philippines, and India expected to upgrade their manufactures. Ministry of Economic Affairs could introduce Taiwan's industrial robots to them. Otherwise, the companies could seek business opportunities there.

C. The terms of Malaysia's demands for food machines, Taiwan's famous machine makers were Sinmag (新麥企業), Taiwan Benefit Company (彬台科技), Echung Machinery Co (一中工業). Besides, Uni-President Enterprises Corporation (統一集團) developed semi-automation. It could

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economize workforce and material resource. These companies' products could deal with the problems of rising wages and shortage of workers in Malaysia's food processing industry. Taiwanese companies could offer solutions to them.

D. MOEA had done a lot in assisting Taiwanese companies to sell machinery to Indonesia. They participated in Indonesia's machinery exhibitions for years. Indonesia set up an official liaison office in Ministry of Industry, Indonesia to contact Taiwan on the machinery sales issue. We encourage MOEA to expand the channel of selling machinery. For example, besides the official channel, Chinese National Federation of Industries (中華民國全國工業總會) could contact the central Indonesian agencies, including Jaya Metal, OTT, First Machinery and Kawan Lama.

E. IN CHARM INTERNATIONAL CO., LTD. (印昌國際股份有限公司) set up a school in Indonesia named Taiwan Smart Machinery - Taiwan Machine Tools (福爾摩沙技術中心). It taught Indonesian how to use Taiwan's machinery. It hired Taiwanese teacher. Taiwan's machinery sales ranked number two regarding Indonesian machinery market share. Therefore, MOE (Ministry of Education) could encourage or establish a team to set up schools overseas.

F. Himelight (鳴周科技) combined sensors, motors, and electronic transmission to produce smart furniture. MOEA and TAIWAN WOODWORKING MACHINERY ASSOCIATION (台灣木工機械工業同業公會) cooperated to develop seven kinds of automatic production lines. These lines had sold to Vietnam, China, Australia, and Canada, etc. Thailand was the primary wood and rubber production country in the world. We suggest MOEA could contact Thailand if they are interested in

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the smart furniture and automatic production lines or not.

G. New Wide Enterprise (旭榮集團) using the strategic alliances to cooperated with hundreds of small textile companies. They took orders from international companies and finished the design, productions, and shipping in a short period. Yi jinn(宜進紡織) produced aeronautical and automotive textiles. Lealea (力鵬) was number 2 in the world for its nylon pellets production. In sum, Taiwan's textile industry accounted for more than 70% of the global functional cloth. We had a successful business in Vietnam. Because Malaysia was short of manpower; The textile industry took large proportion on exports in India and Thailand, so we suggest Taiwan Textile Research Institute (紡織產業綜合研究所), Chinese Institute of Textile Engineers (中華民國紡織工程學會), and Taiwan Textile Federation (紡拓會) could expand the scale and level when joining the Techtextil & Texprocess in Frankfurt, Germany. Besides, we could invite more foreign companies to enter Taiwan's International Technical Textiles Symposium. So far, this symposium was the 12th in March 2018. The participating countries were German, Česká, British, Swiss, Japan, Thailand, India, and Taiwan.

5.1.3. reduce disasters by technology

National Science and Technology Center for Disaster Reduction held as International Training Workshop on Natural Disasters Reduction seminars annually. We suggest the government could introduce solutions to the countries that frequently hit by the typhoon. For example, we had the technology of sending a warning through GIS, Public Warning System (PWS), a decision support system for watergate strain.

5.1.4. infrastructure and transportation exports

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A. Thailand had a notorious traffic jam problem. It introduced a bicycle rental system. Other public transportation means were MRT, Tuk Tuk, bus, taxi. We suggest that our VoT (Vehicle IoT) system could export to Thailand. It helps people find the bus in real time. It helps the government monitor the operation of the bus. Besides, FETC (遠通電收) have the technology to help Thailand improve the safety of transportation. Indonesian Logistics Performance Index was low. We recommend Indonesian could use the total solution by using an electronic toll collection system and smart transportation.

B. India and Vietnam were promoting electric cars. They encourage people to use electric vehicles instead of petroleum/ diesel car. DELTA (台達電) was developing components for an electric car, so were other Taiwan's companies. We suggest companies in this field could join DELTA's supply chain. Shi Yuxian (2018) stressed that Taiwan's automotive electric had a specialty in elements' and models' production. They had the capacity of mass production for a critical component, including the Automotive Safety Assistance System, electric vehicle key components, smart light component, tire, VoT, etc. Taiwan had the strength to join in the international markets.

C. Because the Indian government was aiming at transferring diesel cars to electric ones, and DELTA had invested in this area for ten years. The motor control is the heart of electric vehicles. DELTA had offered thousands to European car companies. Hopefully, this product could incorporate into their supply chains. DELTA was developing the automotive electronics. Because Taiwan held over 80% of the global automotive electronics market share, other companies could incorporate

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themselves into DELTA's supply chain.

5.1.5. medical equipment：

A. Taiwan's Ministry of Health and Welfare has regular meeting with counterparts from New Southbound countries. National Health Research Institutes also establishes ASIA-PACIFIC NETWORK FOR ENTEROVIRUS SURVEILLANCE in around 2016 and interact with other countries through this channel. TECO in Indonesia held bilateral medical cooperation seminar in May ninth, 2018. At the workshop, Nila Djuwita Moeloek, Indonesian Minister of Health, applauded Taiwan's quality, system, and mechanism in the Medical area.

B. United Orthopedic Corporation held an International Seminar on Joint Replacement for more than ten years. However, medical equipment involves truth and regulation. We suggested firms could take medical schools as a vehicle to bring business into Taiwan's medical schools first; then they could seek cooperation with other countries.

C. After auxiliary producing company, Qisda, acquired hearing aid producing company, Best-Sound. They shared sales avenues and benefitted mutually. We suggest that no matter M&A or not, companies could share their sales avenues.

D. Shen (2018) suggested that Taiwan's medical equipment and component companies could sell products in India through local agents. They could hire local employees to build a relationship with prospective clients. Besides, Wang Huizhen (2016) reminded that Indians were sensitive with price, agents, and brands so that companies might face difficulties without advertisements.

5.1.6. LED lighting: TAIWAN OPTOELECTRONIC SEMICONDUCTOR INDUSTRY

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ASSOCIATION signed Letter of Intent to show our commitment in the cooperation with Vietnam Lighting Association and QUACERT. Taiwan's representatives joined Taiwan and Vietnam's industries connection forum in 2017. We suggest that this cooperation could extend to Phillippines because it has the biggest shopping centers in Asia. Phillippines must have significant demands on the LED.

5.1.7. In recent years, AI smart electronic auto and ADAS were getting popular. Auto electronics' revenue accounted for 40%-50% in the auto industry. In 2017, the seven most sales brands accounted for 60% of total sales. It's centralized. We suggest companies could raise the reliability and pass the international regulation. Therefore, Taiwan's auto industry could better fit in the international companies' supply chains.

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