

Structural Change in Taiwanese Manufacturing Foreign Direct Investment in the 21st Century[†]

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Abstract: Taiwan has overcome its limitation of having a small-sized domestic market by targeting the world market through export-oriented industrialization and specializing in the OEM/ODM manufacturing of information and communications technology (ICT) products. However, after entering the 21st century, Taiwanese companies are facing such difficulties as rising costs in China associated with its economic development and the breakout of the US-China trade friction. Thus, structural change has occurred in Taiwanese manufacturing FDI in the 21st Century, such as return investment back in Taiwan and investment in countries other than China. In addition, Taiwanese companies are trying to enter new fields, such as starting their own brands or entering the medical equipment field. These examples illustrate how Taiwanese companies have tried to overcome difficult situations.

Keywords: Taiwan, OEM/ODM, foreign direct investment, return investment, US-China trade friction

JEL Classification Numbers: F23, O14, O53

1. Introduction

Taiwan has overcome the difficulty of a small-sized domestic market by targeting the world market and by specializing in the OEM/ODM¹ manufacturing of ICT products. This has given Taiwan an important presence in the world economy. That is, the economic development of Taiwan was achieved by opening itself to the benefits of trade liberalization or globalization.

However, after entering the 21st century, Taiwan is struggling to develop a new way under the situation, such as rising costs in China associated with the China's economic development and the breakout of US-China trade friction.

This study aims to analyze the new strategies of Taiwanese companies in the 21st century by observing the structural change in Taiwanese manufacturing foreign direct investment from the view point of international management study.

The structure of the paper is as follows. Section 2 briefly outlines the evolution of Taiwan's economic development based on the promotion of the export-oriented model, growth in the global production network, declining growth caused by the collapse of the IT bubble, and the general trend of Taiwan's outward FDI. Section 3 outlines major challenges that Taiwanese manufacturing multinationals are currently facing, such as rising labor costs and stricter environmental restrictions in China. In Section 4,

we selectively provide a few case studies of countries which Taiwanese companies have chosen as alternative locations for their manufacturing FDI. We particularly focus on the cases of return investment in domestic industrial districts in Taiwan, US, Europe, India, and Southeast Asian countries other than China. Section 5 presents the new development of Taiwanese ICT manufacturers which try to avoid only depending on the contract manufacturing of ICT products and instead try to develop their own brands in IoT products or medical equipment. In the Conclusion section, we summarize the major findings of this paper.

2. Taiwan's progress in the international economy

Taiwan is a small country with a small-sized domestic market and a lack of natural resources. However, it employed the export-oriented industrialization and specialized in the OEM/ODM manufacturing of ICT products from the 1990s and has developed in connection with the world market.

Thus, it cannot avoid being affected by big waves in the international economy and policy changes of large countries. That is, it is easily influenced by incidents overseas, like recessions in main target markets or policy changes of large countries.

2.1 Economic development due to export-oriented industrialization

The 10 NICS countries which achieved economic development in the 1960s are Spain, Portugal, Greece, Former Yugoslavia, Brazil, Mexico, Hong Kong, Korea, Taiwan, and Singapore (OECD, 1979).

Among them, some continued their economic development by employing an export-oriented policy. These include Hong Kong, Korea, Taiwan, and Singapore.

These four countries, which were called NIES, or in some cases Asian NIES, have small populations and are not endowed with natural resources; however, they achieved drastic economic development by connecting to the world market.

2.2 Growth in the global production network

In the 1990s, the manufacturing process of ICT products, such as the notebook computer, was outsourced from major firms in developed countries to the contract manufacturers in developing countries. As a result, the whole production process of the products divided into several processes located in geographically dispersed locations, some outside the physical boundaries of the firm and some outside of national borders.

This phenomenon was defined by various scholars, but here we employ the term "global production network" and its definition by Ernst and Kim (2002, p. 1417) "concentrated dispersion of the value chain across the boundaries of the firm and national borders, with a parallel process of integrating hierarchical layers of network participants."

During this change in the international economy, Taiwanese companies gained the important roles as the supplier of the ICT industry. Taiwanese companies have enhanced the capability by being incorporated in

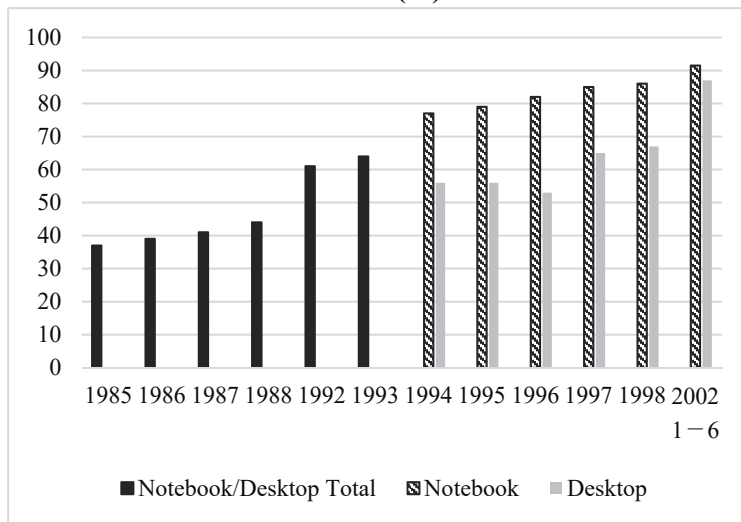
Table 1. The share of computer imports by country in the US in 1999 (%)

Country	Percentage
Taiwan	25.89
Mexico	23.45
Japan	12.35
Korea	10.90
Singapore	8.52
China	3.78
Canada	3.30
UK	2.87
Malaysia	1.61
Others	7.33

Source: US Census Bureau 1999, Foreign Trade Statistics

<http://www.census.gov/foreign-trade/statistics/product/enduse/imports/index.html>.

Figure 1. The changes in the ratio of OEM/ODM in personal computer production in Taiwan between 1985-2002 (%)



Source: 1985-1988: Industrial Development Bureau, Ministry of Economic Affairs (1988) p.167.

1992-1993: Taiwan Institute for Economic Research (1994) p. 183.

1994-1995: Taiwan Institute for Economic Research (1996) pp. 175-176.

1996-1998: Koryu, No. 622, June 30, 2000, p. 24.

2002: Directorate General of Budget, Accounting and Statistics, Executive Yuan, <http://www.dgbas.gov.tw/dgbas03/bs3/report/N910808.htm>.

the global production network (Nakahara, 2004), they demonstrate their presence in the world economy as the backroom boys who provide ICT products such as the personal computer through ODM business.

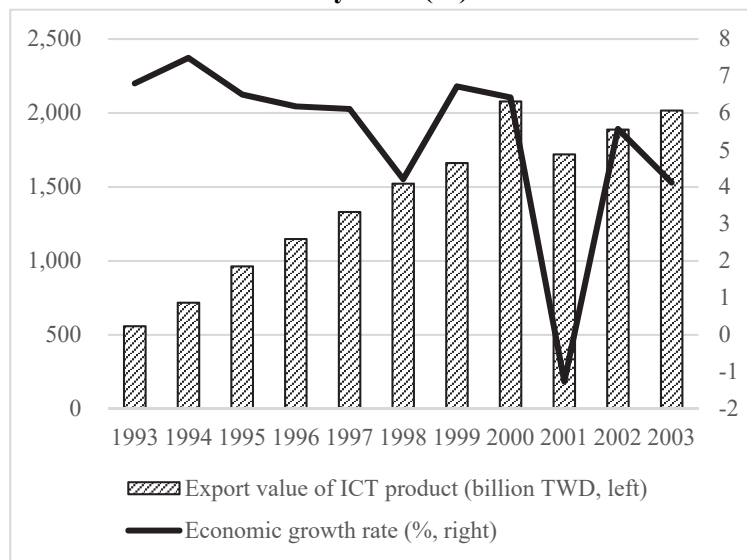
Table 1 shows the share of computer imports by country in the US in 1999. Taiwan is the highest, at 25.89%.

Figure 1 shows the change in the ratio of OEM/ODM in personal computer production in Taiwan. It shows a very high ratio and Taiwanese companies devoted themselves as the supplier of brand firms in the developed countries, without having their own brand.

2.3 Declining growth caused by the collapse of the IT bubble

However, such growth in connection to the world economy cannot avoid being influenced by the movement of the international economy and the economic status or policy changes of large countries.

Figure 2. The changes in economic growth rate and export value of ICT product in Taiwan in the 1990s and early 2000s (%)



Source: Economic growth rate: National Statistics R.O.C. (Taiwan)
<https://www.stat.gov.tw/ct.asp?xItem=37407&CtNode=3564&mp=4>.
 Export value of ICT product: Department of Statistics, Ministry of Economic Affairs
<https://dmz26.moea.gov.tw/GMWeb/investigate/InvestigateDA.aspx>

The collapse of the IT bubble in 2000 was exactly the incident which exposed this risk. In 2000, the IT bubble collapsed and caused a serious depression in the US. Therefore, the economy of Asian countries which exported ICT products to the US also became depressed. First, Korea and Taiwan experienced a depression in the 4th quarter (Oct-Dec) of 2000, then Singapore, Thailand, and Malaysia followed.

Figure 2 shows the changes in economic growth rate and export value of ICT product in Taiwan in the 1990s and early 2000s. It shows that Taiwan was influenced by the collapse of the IT bubble and experienced a sharp decline in 2001, just after the collapse of IT bubble².

2.4 General trend of outward FDI of Taiwan

Taiwanese outward foreign direct investment grew rapidly from the late 1980s to the early 1990s. In this period, the main destinations were in Southeast Asia. In the early 1990s, due to factors such as the falling of the Taiwanese stock market, the rise of international oil prices, and the formal approval to Taiwanese companies to invest in China in 1992, the main destination became China.

Then, after the investment of high-technology products such as notebook computers in China was approved in 2002, the amount of the investment in China exceeded the total amount of the investment in other regions and the trend had continued until 2015. However, in 2016, the total amount of the investment in other regions exceeded the amount of the investment in China because of the rising cost and stricter environmental restrictions in China that we will discuss later, and the gap continues to expand until now.

Table 2. Taiwanese Companies listed in Fortune Global 500 (2019)

Rank	Company	Revenue (100 million USD)
23	Hon Hai	175,617.00
259	Pegatron	44,453.30
365	Quanta	34,102.60
363	Taiwan Semiconductor Manufacturing (TSMC)	34,218.20
390	Compal	32,102.80
394	CPC	31,928.60
424	Wistron	29,509.50
455	Cathay Life Insurance	27,180.40
471	Fubon Financial Holding	26,276.50
492	Formosa Petrochemical	25,462.80

Source: Fortune Global 500 <http://fortune.com/global500/>.

Examining the volume of investment from 1952 to 2018 for regions other than China, it can be seen that these investments are concentrated in the Caribbean British territories (32.28%) and the United States (12.54%). In addition, Southeast Asian countries such as Singapore, Vietnam, Thailand, and Malaysia are also listed as Taiwan’s investment destinations.

“Electronic component manufacturing” and “computer, electronic product, or optical product manufacturing” are the top two industries in terms of investment by Taiwanese companies in China, accounting for 18.47% and 13.56%, respectively. As for investment destinations other than China, “finance and insurance” accounts for 48.25%, and after that, “electronic components manufacturing” followed by “wholesale and retail,” with investment ratios being, respectively, 11.77% and 7.17%³.

Table 2 shows Taiwanese Companies listed in Fortune Global 500 (2019). Among ten companies listed here, six companies, such as Hon Hai, Pegatron, Quanta, TSMC, Compal, and Wistron, are “electronic component manufacturing” or “computer, electronic product, or optical product manufacturing.” That is, the multinationals from Taiwan mostly belong to manufacturing in these fields.

3. Changes of the international economy in the 21st century

As we have seen above, Taiwanese companies developed by connecting to the world market. However, after entering the 21st century, they are struggling to develop a new method given the current economic situation, such as rising costs in China associated with China’s economic development and the occurrence of US-China trade friction.

Table 3. The changes to the minimum wage per month in the various cities in China where Taiwanese companies had subsidiaries in the 2010s (CNY)

Year	Guangzhou	Dongguan	Shenzhen
2010	1,100	920	1,100
2011	1,300	1,100	1,320
2013	1,550	1,310	1,600
2015	1,895	1,510	2,030
2018 (July 1)	2,100	1,720	2,200

Note: 1 CNY (Chinese yuan) = 0.14 USD (US dollar, as of Sep. 23, 2019).

Source: MUFG Bank <http://www.bk.mufg.jp/report/chi200403/318080101.pdf>.

3.1 Rising cost in China associated with the economic development of China

China became the second economy in the world in 2010, exceeding Japan. Associated with this economic development, costs in China increased drastically.

Table 3 shows the changes to the minimum wage per month in various cities in China where Taiwanese companies had subsidiaries in the 2010s. We can see, beginning in 2010, that the minimum wage of each city has doubled or more.

With costs rising in China, Taiwanese companies began to decrease the size of their factories in China or withdraw from China beginning from about 2013 or 2014 (*Wealth Magazine*, Jan. 26, 2017, pp. 98-100).

In addition, the burden of social insurance in China, five different types of insurance and contributions to the mandatory housing fund (nursing insurance, unemployment insurance, health insurance, public wound insurance, growth insurance, and public housing reserve) is one of the reasons for the rising costs in China. According to research undertaken by the National Development and Reform Commission of the Chinese government, the share of these five insurance in the total personnel expenses is 39.25%, ranking 13th out of 173 countries.

It is also said that the personnel expenses for one employee in China is almost equal to one and a half employees in Thailand, two and a half in the Philippines, and three and a half in Indonesia⁴.

3.2 Stricter environmental restrictions in China

The Chinese government has increased environmental restrictions in order to reduce pollution. Among the regulations, there are some which are strict, which makes the conditions on foreign companies more severe.

Thus, foreign companies in China are becoming forced to pay more for environmental regulations increasing manufacturing costs.

One Taiwanese company says that Kunshan, where a lot of Taiwanese companies locate factories, has some of the most severe environmental regulations. Every company suffers from the high cost of regulations. One Taiwanese company in Kunshan were forced to pay 1,000 CNY to abide by the regulation for industrial drainage, which caused the company to withdraw from Kunshan when it could not afford the cost (*Global Views*, Oct. 2018, p. 52).

3.3 National particularism (my country first principle), trade protectionism, and the breakout of US-China trade friction

Starting in the 2000s, triggered by the inauguration of the US president Trump, there comes the surge of national particularism (my country first principle), and an increase in trade protectionism. Then, in 2018, US-China trade friction increased. Both countries increased tariffs on the other, with the US imposing tariffs targeting high technology goods.

The increased trade restrictions became a large obstacle for Taiwanese companies that manufacture in China and then export to the US.

For example, Kunshan is the city where many Taiwanese companies agglomerate, as 70% of total manufacturing value is made by Taiwanese companies. Taiwanese companies export 95% of products, of which 60-70% are exported to the US. There are several companies which even export 100% of goods to the United States (*Global Views*, Oct. 2018, pp. 50-51).

There are many companies whose stocks have fallen because of the US-China trade friction. For example, Enocon, a company of Hon Hai group that manufactures the industrial computer, is a typical Taiwanese company that manufactures in China, in Shenzhen and Tongguan. The stock price of Enocon fell 45% during the period of Apr-Oct 2018, as stockholders feared that its cost would rise because of the US-China trade friction. Other companies of Hon Hai group that rely on China heavily are facing the same situation (*Commonwealth*, Oct. 10, 2018, pp. 50-52).

4. Taiwanese companies with these changes in the 21st century

With these changes in the 21st century, how do Taiwanese companies fare? They undertake return investment back to Taiwan, investment in the US, Europe, India, and Southeast Asia⁵. Since the early 2000s, the investment destination of Taiwanese manufacturers has focused on China, but the destinations have diversified in the 21st century. We will see the details below.

4.1 Return investment to Taiwan

First of all, we will see the return investment to Taiwan.

a. The incentive to return investment back to Taiwan and Taiwanese companies who do the return investment

Since September 2006, the Taiwanese government has encouraged overseas Taiwanese businesses to return and invest in Taiwan to stimulate the Taiwanese economy, increase domestic job opportunities and boost new domestic investment.

The first incentive to return investment is the expansion of the foreign labor employment quota. In Taiwan, the foreign labor employment quota as a ratio to the total number of the company's total employees is specified as between 10-35%, according to the industry⁶. However, the companies that return to Taiwan can expand the quota up to 40% of total employees⁷.

The second incentive is exemption from taxation of foreign labor employment. The employers of foreign laborers are taxed the "Foreign Worker Employment Stability Fee." It is 2,000 TWD⁸ for a month in the general manufacturing industry⁹, however, Taiwanese investors returning from overseas were permitted to be exempt from the Foreign Worker Employment Stability Fee for five years.

In response to the incentives, the number of companies who have returned to Taiwan has increased.

Aside from the incentives, companies began to return to Taiwan in response to the US-China trade friction which broke out in 2018. Return investment of 61 companies, totaling 3,100 billion TWD has already been approved to come back to Taiwan (*The Journalist*, May 30-Jun. 5, 2019, p.53).

For example, Advantec which is located in Kunshan is thinking of returning to Taiwan. Though most products manufactured in Kunshan are for the Chinese market, there are some for the US market. They are thinking to relocate the manufacture of these products back to Taiwan (*Commonwealth*, Oct. 10, 2018, pp. 50-52).

The punitive duties of the US to China include server¹⁰. Thus, Wistron has already started manufacturing server and IoT related products in Hsinchu, Taiwan (*United Daily News*, Dec. 3, 2018). Inventec expanded the manufacturing line of motherboards for servers for the US in Taoyuan factory, based on the request of some customers (*Commonwealth*, Oct. 24, 2018, pp. 86-88)¹¹. Quanta, which is a large server manufacturer, is thinking of relocating the manufacturing of motherboards for servers from China to Taiwan (*DIGITIMES Research*, Aug. 7, 2018).

The Taiwanese government is thinking of issuing preferential tax treatment to Taiwanese companies which return to Taiwan from China in response to the US-China trade friction (*Economic Times*, Oct. 29, 2018).

b. Difficulties of return investment

However, even though Taiwanese companies are considering the return investment back to Taiwan, it is not easy, as there are a lot of obstacles.

First, there is a severe labor shortage in Taiwan¹². From the mid-1980s, Taiwan has suffered from a serious labor shortage, partly due to the popularization of higher education and because foreign laborers, who have been introduced to fill the shortage, face language barriers that impede their ability to complete more difficult tasks (*Global Views*, Oct. 2018, p. 52; Nakahara, 2017).

Thus, even though Taiwanese companies attempt to return to Taiwan from China to establish or expand the current factory there, it is difficult to find all the necessary laborers for the new/expanded manufacturing line.

Table 4 shows the labor shortages rates in Taiwan. It shows 2.70% in all industries and manufacturing is 2.77%, higher than any other industry.

Table 4. Labor shortages rates in Taiwan (as of August, 2018)

Industry	Shortage rate (%)
All industries	2.70
Secondary industry	2.74
Manufacturing	2.77
Service industry	2.67

Note: Shortage rate means the unfilled openings divided by the all openings.

Source: Directorate General of Budget, Accounting, and Statistics of Executive Yuan,

<https://www.dgbas.gov.tw/public/Data/812271620144J95JF4Q.pdf>.

Table 5. Number and percentage of labor shortage by educational attainment (as of August, 2018)

Educational attainment	Number of labor shortage (number of people)	Percentage (%)
Junior high or less	8,567	4.0
Senior high	66,979	31.3
Vocational	27,477	12.9
University or more	54,617	25.5
Any worker	56,127	26.3

Source: Directorate General of Budget, Accounting, and Statistics of Executive Yuan,

<https://www.dgbas.gov.tw/public/Data/812271620144J95JF4Q.pdf>.

Additionally, Table 5 shows the number and percentage of labor shortage by educational attainment. According to the table, among all unfilled openings, openings which require educational attainment of senior high school is the highest, at 31.3%. Workers with a senior high education seem to be in charge of unskilled labor in factories, thus the labor shortage of this tier is most severe.

That is, even though the companies want to return investment to Taiwan, it seems to be difficult to fill all necessary workers in the factory.

Second, there is a problem with the supply chain. As a certain period has passed since many Taiwanese companies relocated to China around 2000, the supply chain in Taiwan has become limited (*Global Views*, Oct. 2018, p. 51). In particular, the supply chain for notebook computers or mobile phones has become well-established in China, which Taiwanese companies have utilized. Thus, it is difficult for Taiwanese companies to start production in Taiwan immediately after relocating due to supply chain constraints (*Global Views*, Jan. 2019, p. 66).

Third, for some products, relocating the manufacturing facility is difficult. For example, as the industrial computer is usually made by small lot production of many products and cannot be massed produced, relocating the manufacturing line is quite difficult (*Commonwealth*, Oct. 10, 2018, pp. 50-52).

c. Re-development of industrial districts within Taiwan

Despite the difficulties listed above, the Taiwanese companies who are thinking of returning to Taiwan are redeveloping industrial districts in Taiwan.

The first example of redevelopment is of the industrial district in Taoyuan city, located in a suburb of Taipei city. The company which returns to Taiwan tends to expand the existing manufacturing facility, rather than establishing a brand-new facility. For example, the companies which originally had factories in Taoyuan, such as Inventec, Pegatron, and Compal expanded the manufacturing capability of their Taoyuan factory. Compal, whose headquarters are located in Taoyuan, is looking for a new manufacturing site. According to the real estate company Hsinyi, the total money spent on acquiring physical space by companies relocating between Jan-Sep 2018 was 2,902 million TWD, with Taoyuan coming in as number one, receiving 1,265 million TWD for development. According to Hsinyi, because commodity price rate in Taoyuan is cheaper than Taipei, and there are various kind of industrial sites, companies prefer Taoyuan than Hsinchu where the science park¹³ locates¹⁴.

The second example of redevelopment is evident in the industrial district in Kaohsiung. According to the Economic Development Bureau of Kaohsiung City Government, after the outbreak of the US-China trade friction, many Taiwanese companies came to Kaohsiung to look for an industrial site. In October 2018, 56 companies applied to purchase land in Ho Fa Industrial Park¹⁵, the new industrial district that was created at the end of 2016. The applications would cover 65% of the entire park (*Commonwealth*, Oct. 24, 2018, pp. 86-88).

4.2 Investment in the US

On the other hand, there are some companies that chose to invest in the US. Hon Hai invests 100 billion USD to establish the LCD factory in Wisconsin. It will be the sixth generation LCD factory. Hon Hai received a subsidy of 30 billion USD from the Wisconsin state government (*Economic Times*, Sep. 20, 2017). Hon Hai also purchased the building for the R&D of smart city near its Wisconsin factory site (*The Nikkei*, Oct. 5, 2018).

4.3 Investment in Europe

On the other hand, some Taiwanese companies have starting locating in the Czech Republic.

The first Taiwanese company which invested in the Czech Republic was Pegatron, which invested in 2002. Most Taiwanese companies invested in the Czech Republic are ICT or electronic companies. These sites are not for the markets of Western Europe, but for factories or marketing offices for Eastern Europe¹⁶.

Most Taiwanese companies invested in the Czech Republic are located in southeastern city of Brno, the second largest city in the country. Companies have chosen Brno because the cost there is lower than the capital city Prague; there is enough young talent because it has 13-14 universities, such as the Central European Institute of Technology (CEITEC); international trade fairs and exhibitions are often held in Brno, with one million visitors every year; and it is the strategic center of Central Europe and the center of the ICT industry.

Moreover, as Brno is located near the center of Europe, it is accessible to every market in Europe. Additionally, people can commute to Brno from Slovakia, thus it utilizes the labor market of Slovakia. In the Czech Republic, there is a severe labor shortage as the birth rate in 1990s was low. However, given that the Czech and Slovakian language is 98% similar, if the company locates in Brno, it can utilize the labor market in Slovakia without a language barrier¹⁷.

According to the Economic Division of the Taipei Economic and Cultural Office in Prague, the cost to locate the subsidiary in the Czech Republic is not cheap. However, if the overseas branch is only located in the US there is risk. Thus, Taiwanese companies which try to target European market tend to locate at Czech where they can reach to Eastern European market¹⁸.

Next, we are going to see the advantages and disadvantages of the Czech Republic. The main advantage is that the Czech Republic is located in the center of Europe, thus it is near to every market in Europe¹⁹. On the other hand, the disadvantage is that there are no free trade agreements (FTAs) between Taiwan and the Czech Republic, thus there is no preferential treatment. However, the advantages outweigh the disadvantages²⁰.

According to the Economic Division of Taipei Economic and Cultural Office in Prague, Taiwanese companies which locate to the Czech Republic are faring well²¹.

4.4 Investment in India

Taiwanese companies have started investing in India. We will see this below.

a. Governmental approach by Taiwanese government and Indian government

Since 2016 President Tsai Ing-wen of Taiwan has promoted “The New Southbound Policy.” The policy calls for the development of comprehensive relations with ASEAN, South Asia, Australia and New Zealand while promoting regional exchanges and collaborations²². Based on this policy, the Taiwanese government recommends companies in Taiwan to redirect focus to India or Southeast Asia rather than China.

Among the destination countries listed in the New Southbound Policy, the country most favored for investment by Taiwanese companies is India, as many Taiwanese companies have begun investing there.

The Taiwanese government created an institution, TAITRA (Taiwan External Trade Development Council), in several countries in order to promote inward/outward foreign direct investment (FDI)²³. The Taiwanese government also set up TAITRA in New Delhi, Chennai, Mumbai, and Kolkata in 2017²⁴. In Bengaluru, instead of TAITRA, it set up CDC Development India, which plays a similar role as TAITRA²⁵. These institutions focus on promoting investment in India, such as the Taiwan Expo in India in 2018²⁶.

Moreover, in 2017, the Taiwanese government established the “Taiwan Desk” in Taipei Economic and Cultural Center in India,²⁷ providing consultation services about tax and laws in India, providing consultation services about tax and laws in India, in order for Taiwanese companies to easily invest in India²⁸.

From India’s side, Prime Minister Modi has promoted the “Act East Policy” since 2015. In addition, India encourages Taiwanese manufacturers investment, according to the “Make In India” policy, which promotes the manufacturing industry and tries to invite foreign manufactures (*Nikkei Business*, Oct. 31, 2016, p.54). This policy is meant to develop the manufacturing industry which lags behind the ICT service industry, which is already developed.

For the Indian government, which advocates for policies that promote the manufacturing industry, the New Southbound Policy promoted by Taiwan, in which the ICT manufacturing industry is well developed, is highly welcome. Thus India tries to actively invite Taiwanese companies under the “Make in India” policy.

The Indian government created the Taiwanese branch of the India Electronics and Semiconductor Association in 2017 in an attempt to promote cooperation with Taiwan (*Commercial Times*, Aug. 21, 2017). Its purposes are to invite Taiwanese companies to India and to cooperate with Taiwanese human resources in the field of research and development of IC²⁹.

The cooperation between the Taiwanese government and the Indian government is strengthening. In July 2018, Hsinchu Science Park, Central Taiwan Science Park³⁰, and Karnataka state government in India agreed to establish the science park in Karnataka state. The science park, which is going to be built at Karnataka state, is meant to promote the cooperation between Taiwan and India in the fields of artificial intelligence and robotics³¹. Karnataka state includes Bengaluru, which is the center of ICT industry in India, thus establishing a science park here may invite R&D investment from Taiwan³².

The management of the India Electronics and Semiconductor Association often visit Taiwan to discuss the possibility of cooperation in the field of future technologies such as IoT or smart cities. In the near future, they will establish R&D (including product development) in these fields in India and Taiwan. In the near future, they will establish R&D (including product development) in these fields in India and Taiwan³³.

The cooperation between Taiwan and India in the field of smart cities is demonstrated by the annual exhibition, “Smart City Asia India,” held in Bengaluru by TAITRA since 2017. The purpose of this expo is to integrate the hardware technology of Taiwan and software technology of India in order to promote fields that require software technology, such as IoT or smart cities³⁴.

From India’s perspective, the integration of their own software technology and the hardware technology of Taiwan is preferable. Thus, matching both aims, the cooperation has been promoted.

The exchange of human resources is also promoted. The Taiwanese government has actively invited foreign talent in order to supplement the shortage of science and engineering human resources and to incorporate the foreign advanced technology (Nakahara, 2017), thus it also invites Indian students. To address the policy, the Indian government has established a Chinese language center at the Indian Institute of Technology (IIT) Bhilai in August 2018 under the cooperation with National Chin-Yi University of Technology in Taichung in order that Indian students can easily go to Taiwan³⁵. This is the milestone of exchange of human resources between Taiwan and India from now on³⁶.

As we have seen above, the expectation of Taiwan and the expectation of India match, thus the countries have proceeded to cooperate. As Taiwan tries to break away from a China-only investment strategy, they have tried to cooperate with countries in Southeast Asia and South Asia, with specific interest in utilizing India’s software technology. India is interested in inviting foreign investment in order to develop the deterred manufacturing industries and utilize Taiwan’s hardware technology.

b. Investment environment in India

While twenty thousand companies from Taiwan have invested in ASEAN countries, only 106 companies have invested in India as of May, 2018. This may be because there are few scheduled flights between Taiwan and India and the risk of investment is still considered to be large (*The Journalist*, May 10-16, 2018, pp. 45-46).

However, recently, India has elevated its image as an investment destination. In 2019, India ranked number 77, a drastic increase from number 100 in the previous year, in “Doing Business 2019,” which indicates the world investment environment ranking issued by the World Bank³⁷.

In addition to the above, in 2018, the Indian government exempted the tariffs of 35 mobile phone components such as lithium batteries, data transfer cables, and optical fibers, totaling approximately 65.91 million USD in 2017. This will be very advantageous for the manufacturing of mobile phone in India for Taiwanese companies (*Economic Times*, Oct. 18, 2018).

c. Taiwanese companies' investment in India

In response to the approaches by the Taiwanese government and the Indian government, and the increasing attraction of India as the destination of investment, Taiwanese companies are now actively investing in India.

For example, Wistron established iPhone factories in New Delhi and Bengaluru in 2016 and 2017. Hon Hai also invests in India. In 2017, Hon Hai manufactured 100 million iPhones in India. Until 2020, it will invest 55 billion f in Jawaharlal Nehru Port Trust (JNPT) Special Economic Zone in the state of Maharashtra (*The Economic Times*, Jul. 15, 2018). An executive of Hon Hai located in India says that "We choose India as the priority investment destination. We will accelerate investment plan and activities in India" (*Commercial Times*, Jun. 5, 2017).

According to the Taipei Economic and Cultural Center in India and the India Electronics and Semiconductor Association, the reason Taiwanese companies invest in India is the domestic market. Compared to the domestic market in China, which is almost saturated, the domestic market in India is now under saturated³⁸. The Taipei Economic and Cultural Center in India says that if the investment is aimed at low labor costs, the investment will be directed toward Cambodia, Vietnam or Myanmar, not to India³⁹. Additionally, the advantage of India is that there are a lot of highly skilled laborers compared to Vietnam or Bangladesh⁴⁰.

On the other hand, according to the Taipei Economic and Cultural Center in India, the difficulties of Taiwanese companies in India are related to ambiguous laws and that it is difficult to judge who is the designated person who holds power when it comes to business dealings⁴¹.

Additionally, the percentage of small and medium-sized enterprises is large in Taiwan. As such companies have less strength, it is difficult for them to endure in India until it can make a profit⁴². In the case of Japanese companies, which have invested heavily in India, they can share information on India, like useful accountants or lawyers in India, or the reputation of local companies, among the network of Japanese companies. But as Taiwan has fewer companies invested in India, it is difficult to get the appropriate information on accountant, lawyer, and local companies. And, unlike the US or UK, there is no Indian community in Taiwan, increasing the difficulty of Taiwanese companies investing in India.

Taiwanese people tend to hurry in doing business like Chinese people, however, Indian people tend to be slow in all aspects; they conduct discussions or make decisions slowly. This is the large cultural gap which Taiwanese companies that invest in India face, and it is difficult for Taiwanese people to get accustomed to it⁴³.

However, under such difficulties, the investment in India by Taiwanese companies has been increased, as Table 6 shows.

Next, Table 7 shows the changes of amount of trade between Taiwan and India. It also shows it is getting increased year by year.

4.5 Investment in Southeast Asia

In the latter half of 1980, many Taiwanese companies invested in Southeast Asia. After investment in China was permitted in the 1990s, the investment destination of Taiwanese companies changed to China. However, after the US-China trade friction occurred in 2018, Southeast Asian countries have gained attention as an investment destination.

Table 6. The changes of direct investment in India from Taiwan (New investment)

Year	Number of Case	Amount (thousand USD)
1991	1	1,201
1992	1	1,000
1993	1	3,811
1994	0	80
1995	1	1,640
1996	0	0
1997	0	0
1998	0	1,072
1999	1	437
2000	1	115
2001	3	3,114
2002	1	2,520
2003	1	923
2004	1	880
2005	3	1,914
2006	8	4,296
2007	5	7,738
2008	1	16,250
2009	1	3,160
2010	3	3,620
2011	2	67,051
2012	3	20,931
2013	7	65,042
2014	3	33,486
2015	7	72,164
2016	8	14,940
2017	8	30,559
2018	21	361,224

Source: Department of Investment Services, Ministry of Economic Affairs

https://www.moeaic.gov.tw/news.view?do=data&id=1398&lang=ch&type=business_amn.

However, the destination countries have changed from Thailand and Malaysia in the 1980s to Vietnam, the Philippines, and Indonesia. We will examine this in the following chapter.

Table 7. Changes in the amount of trade between Taiwan and India (thousand USD)

Year	Export	Import
2001	642,185	494,684
2002	668,785	552,622
2003	790,886	626,010
2004	1,117,495	863,745
2005	1,615,188	860,652
2006	1,507,554	1,247,022
2007	2,422,212	2,539,038
2008	3,081,939	2,340,477
2009	2,572,290	1,625,062
2010	3,688,249	2,863,390
2011	4,504,681	3,149,399
2012	3,452,187	2,629,266
2013	3,517,186	2,758,360
2014	3,491,071	2,529,521
2015	3,020,959	1,910,416
2016	2,819,155	2,185,980
2017	3,281,316	3,055,346
2018	3,771,080	3,258,495

Source: Ministry of Finance

<http://web02.mof.gov.tw/njswww/WebProxy.aspx?sys=100&funid=defjsptgl>.

a. Vietnam

After the breakout of the US-China trade war, some Taiwanese companies have relocated from China to Vietnam. In Taiwan, some press has reported that Vietnam is the largest beneficiary of the US-China trade friction (*Global Views*, Jan. 2019, p. 67).

The advantage of Vietnam for Taiwanese companies is that it is connected by land with Southern China where a lot of Taiwanese companies locate their manufacturing sites. It takes 16 hours by land to transport from Shenzhen to the border between China and Vietnam, and it takes another 4.5 hours from the border to Hanoi or Bacninh, the northern industrial districts in Vietnam.

In 2007, when Vietnam entered WTO, Mr. Terry Gou, the founder of Hon Hai noticed this land transportation opportunity and purchased the land at Bacninh, a suburb of Hanoi, to connect the supply chain by connecting the manufacturing facility of southern China and northern Vietnam. However, facing the 2008 financial crisis, the plan was suspended. Twelve years have passed since then, and the outbreak of US-China trade friction has seen the plan resume with Hon Hai establishing the factory in Bacninh. Compal also established factory in Vinh Phuc, the suburb of Hanoi.

These newly established production facilities of Taiwanese companies in northern Vietnam import components or semi-finished products from southern China or Taiwan and only do assembly because the supply chain of components is not well-established in Vietnam as of now.

According to the Taiwanese carrier which connects the transportation from southern China to northern Vietnam for Taiwanese companies, recently, these transportations have increased drastically especially in relation to the electronics industry. Additionally, they say that the supply chain of the electronics industry has expanded to include Vietnam or to move to Vietnam (*Commonwealth*, Jan. 2, 2019, p. 78)⁴⁴. The supply chain in Vietnam is not well established but can easily be connected to China (*The Journalist*, Jun. 13-19, 2019, p.49).

A company of electrical components, Diptronics, originally based on Zhuhai, Guangdong province in China, which was the manufacturing site for the export to the US. However, because of the labor shortage and rising costs in China, it established subsidiary in Hungyen, near Hanoi in 2015. Then, after the outbreak of US-China trade friction, the electronics components became subject to a 25% tariff. Thus, as the clients in the US asked it to manufacture in Vietnam, it expanded manufacturing lines in the warehouse of the subsidiary in Hungyen (*Commonwealth*, Jan. 2, 2019, pp. 76-77).

The manufacturing cost in Vietnam is higher compared to the conventional cost in China, however, it is lower than the cost after the increased tariff by the US-China trade friction (*Economic Times*, Jan. 30, 2019). The quality of labor in Vietnam is lower compared to China as of now. However, according to the Taiwanese companies located in Bacninh, even if it were not been for the outbreak of the US-China trade friction, it would have moved to Vietnam because of the severe labor shortage in China (*Commonwealth*, Jan. 2, 2019, pp. 70-76).

As we have seen above, the new supply chain connecting southern China and northern Vietnam has gradually taken shape because of the labor shortage and rising costs in China; however, it is now a larger focus due to the outbreak of the US-China trade friction.

As a result, the GDP growth rate of Vietnam between April and June 2019 increased by 6.7% over the same period of the previous year, and export to the US in the first half of 2019 increased 27% over the same period of the previous year. This is because many manufacturing sites moved from China in response to the US-China trade friction (*The Nikkei*, Jun. 29, 2019).

However, there are some problems in Vietnam, such as rising costs and a labor shortage. For example, the minimum wage in Vietnam increased 5% from 2018 to 2019, and it is difficult to hire employees at the minimum wage. Additionally, the cost of land in the industrial district in northern Vietnam increased 30% from 2018 to 2019 and the cost of office buildings in Ho Chi Minh city increased to the same rate as in Taipei (*The Journalist*, Jun. 13-19, 2019, p.49). As for the labor shortage, though the population of Vietnam is about four times that of Taiwan, the labor shortage is severe and it is difficult to fill the demand (*Global Views*, Jan. 2019, p.68).

b. The Philippines

Subic Bay industrial park was developed by the Philippines government after the withdraw of the US military bases in the country in 1992⁴⁵. In 1994, in response to the Southbound Policy promoted by the President of Taiwan, Li Teng-hui, more than 300 Taiwanese companies, such as Acer, invested in the industrial park. However, as China appeared as the leader in manufacturing, this Subic Bay industrial park was ruined.

Then, the outbreak of US-China trade friction restarted the potential of the once-ruined Subic Bay industrial park. Wistron manufactured most PCs in Chengdu and Chongqing, Sichuan province in China, but moved the manufacturing line to the factory in Subic Bay which recently resumed operations after being closed for eight years. It restarted manufacturing in May 2019 and is expected to manufacture 10 million PC per year. This is in response to requests by the customer, Hewlett Packard. Wistron hired 2500 employees in December 2018 (*Commonwealth*, Jan. 2, 2019, pp. 82-83; *United Daily News*, Dec. 3, 2018).

The Subic Bay production facility became the second largest facility of Wistron after its production facility in China.

The activity by the Taiwanese companies triggered by the US-China trade friction has given an opportunity to revive the once-ruined industrial park in Asia.

c. Indonesia

Some Taiwanese companies try to invest in Indonesia. Pegatron invests in Batam Island in Indonesia, and started manufacturing in January 2019 (*Global Views*, Jan. 2019, p. 66). As Batam Island is located close to Singapore, it has the advantage to import the components and export the products. The components can be carried from nearby regions of Indonesia or Thailand (*Economic Times*, Jan. 27, 2019).

4.6 Industries which are difficult to move from China

As we have seen above, because of the rising cost in China and the US-China trade friction, many companies already moved from China, or are considering to move from China; however, there are some industries which are difficult to move, such as notebook computer, mobile phone, and industrial computer industries.

As for the notebook computer and mobile phone industries, the supply chain in China is very mature. Regarding the mobile phone industry, China is the largest market in the world (*Global Views*, Jan. 2019, p. 66). As we have seen before, the industrial computer is not made by mass production but small lot production of many kinds of product, thus it is a large obstacle to move the production facilities (*Commonwealth*, Oct.10, 2018, pp. 50-52).

4.7 Changes of destination of investment by Taiwanese companies

Changes of destination of investment by Taiwanese companies until now are described in Table 8. We can see that Taiwanese companies have shifted the destination of investment according to the environment which surrounds them at that time.

Table 8. Destination change of Taiwanese companies

Wave	Period	Main reasons	Main investment destination
The first wave	1986-	Rising of TWD	Southeast Asia (Thailand, Malaysia, etc.)
The second wave	1990-	Approval of China-Taiwan economic relationship	China
The third wave	2008-	Enforcement of labor law in China	Southeast Asia
The fourth wave	2018-	US-China trade friction	India, Southeast Asia (Vietnam, Indonesia, etc.)

Source: Author, referring to *Global Views*, Jan. 2019, p. 66.

5. Expansion to own brand, IoT appliances, and medical equipment

On the other hand, Taiwanese ICT manufacturers try to avoid only depending on the contract manufacturing of ICT products and to develop their own brand in IoT products or medical equipment.

5.1 Own brand development in the field of IoT

The first example of new product development is the development of the IoT (Internet of Things) home appliances. For example, Hon Hai established their own brand of IoT home electronic appliances in 2015.

The brand is “Square X” and was developed in conjunction with the GIXIA group, whose president is Mr. Jung-Ya Hsieh, the top designer in Taiwan. Hon Hai invested 70% of the total capital. The background of the establishment of Square X involved lengthy research (from 2013) by Mr. Hsieh, along with seven other members including ICT analysts, engineers, and graphic designers, to enable Hon Hai to break away from the contract manufacturing market. Square X observes the trend of the compactification of the living space due to worldwide urbanization. So far, it has developed wall-hanging home electronic appliances.

The IoT home electronic field is considered to be an appropriate field for Hon Hai to enter their own brand into business, because if an EMS company starts its own brand, it should be able to compete with the clients of EMS company (*Nikkei Design*, Jul. 2016, pp. 7-12)⁴⁶.

Generally, it is said that pursuing contract manufacturing and an own brand strategy simultaneously and achieving success in both is quite difficult. By analyzing Acer’s failure by pursuing both, Yang and Cheng (2003) concluded that companies cannot manage these two operations simultaneously. IoT home electronic appliances, however, is quite a new field, and cannot compete with established clients. It is therefore an appropriate field for Hon Hai to start its own brand business.

5.2 Entering medical equipment field

On the other hand, Taiwanese ICT companies entered the field of medical equipment recently. Table 9 presents examples.

As we have seen above, Taiwanese companies whose main field was contract manufacturing of ICT hardware entered the field of medical equipment. This is a large paradigm shift for these companies. However, this shift is based on the extension of the existing strategies of Taiwanese companies which is being flexible and changing the destination or field of investment.

Table 9. Taiwanese companies' activity in the medical equipment field

Company	Activity
Inventec	manufacturing body fat scale, sphygmomanometer
Pegatron	manufacturing contact lens
Compal	developing smart medical system cooperating with Chang Gung Hospital
Quanta	developing medical platform with MIT, US
Hon Hai	manufacturing genetic testing device with BGI, China

Source: *Commercial Times*, May 23, 2014, *Economic Times*, Mar. 3, 2017, Sep. 21, 2017, *United Daily News*, Aug. 29, 2016.

5.3 Background of the expansion to the medical equipment field

The expansion of Taiwanese ICT manufacturers to the medical equipment field is a result of being encouraged to do so by the Taiwanese government.

In 2017, the Taiwanese government's Ministry of Science and Technology established the "Factory of Intelligent Additive Manufacturing Medical Devices" as the base location where 3D printers are applied to medical technology in the Southern Taiwan Science Park⁴⁷. The Minister of Science and Technology announced that the ministry will invest at least 6 billion TWD for the development of 3D printing technology (*United Daily News*, Dec. 25, 2018).

6. Conclusion

Now, we will summarize the paper.

Taiwan has overcome its limitation of having a small-sized domestic market by targeting the world market through export-oriented industrialization and specializing in the OEM/ODM manufacturing of ICT products. This helped to establish a significant presence in the world economy. It can be said that the economic development of Taiwan can be achieved by relishing the merit of trade liberalization or globalization.

However, after entering the 21st century, Taiwanese companies are facing difficulties such as, rising costs in China associated with its economic development and the breakout of the US-China trade friction.

That is, Taiwan's success model (a small country with small domestic market and without the endowment of national resources has developed by connecting with world market) reveals the weakness of being influenced by the conditions of large countries (such as rising costs in China) or policies of large countries (rising tariffs of US and China).

Thus, Taiwanese companies are trying to develop new and flexible ways by taking several actions, including the structural change of foreign direct investment. The structural changes include the return investment to Taiwan, and investment in the US, India, Southeast Asia, the Czech Republic, etc. (i.e., investment in countries other than China). Another action taken by Taiwanese companies is entering new fields, such as starting their own brands or entering the medical equipment field. These examples illustrate how Taiwanese companies have tried to overcome difficult situations.

A small country with a small domestic market and without the endowment of national resources may only achieve economic development by connecting to the world market. Therefore, companies in Taiwan will take the model, even though they are affected by big waves in the international economy or policy changes of large countries. They may change their strategy to find a new way.

† I am grateful to the Joint Usage and Research Center of the Institute of Economic Research, Kyoto University, for the financial support for this article.

Notes

¹ OEM stands for Original Equipment Manufacturing, and ODM stands for Original Design Manufacturing or Original Development Manufacturing.

² However, exports of Taiwan soon recovered in 2002 as the demand for ICT products in the developing countries soon recovered, and thus the economic growth rate of Taiwan also recovered.

³ Investment Commission, Ministry of Economic Affairs, file:///C:/Users/PC20190527001/Downloads/%E6%9C%9F%E6%9C%AB%E5%A0%B1%E5%91%8A+%E9%99%84%E8%A1%A8.pdf

⁴ Chinanet http://japanese.china.org.cn/business/txt/2016-08/30/content_39193239.htm.

⁵ The reasons why we focus on these destinations are as follows. First, investment for a manufacturing plant in the US, where the cost is high, has not often been seen for a while, and investment in the US by a Taiwanese manufacturer may imply that the investment destination of manufacturers in the 21st century is varying, including developed countries. Also, it implies the change of the global production network by Ernst and Kim (2002), which in turn implies the production tends to be located in developing countries such as China. Second, the reason why we focus on the Czech Republic is the country is a completely new destination for Taiwanese manufacturers, and it is also new from the point of view that the investments in this country are sometimes market-seeking investment. Third, the reason we focus on India is it has the second largest population next to China, and the Indian government tries to develop manufacturing, which had been deterred in the country. Thus, the country has a possibility to become the location of manufacturing next to China in the 21st century. Fourth, Southeast Asia was the first destination of FDI for Taiwanese manufacturers, but the investment in this region has not been very high after investment in China was approved. However, some Taiwanese manufacturers returned to

Southeast Asia in the 21st century. These changes of investment destination by Taiwanese manufacturers listed above may imply the end of the period that China is the exclusive destination for Taiwanese manufacturers, and the investment destination is now varying.

⁶ Ministry of Labor <http://english.homeinfo/7040/7815/?cprint=pt>.

⁷ Ministry of Labor <http://english.mol.gov.tw/homeinfo/7040/7815/?cprint=pt> Accessed October 3, 2016.

⁸ 1 TWD (new Taiwan dollar) = 0.032 USD (as of Oct. 9, 2019).

⁹ Workforce Development Agency <http://feeqry.wda.gov.tw/feeweb/note.html>.

¹⁰ Financial Times <https://www.ft.com/content/7697243a-9479-11e8-b67b-b8205561c3fe>.

¹¹ Inventec will also enhance manufacturing line in Mexico (*Commonwealth*, Oct. 24, 2018, pp. 86-88).

¹² Generally, in Taiwan, it is said that there are “five shortages”, that is, land shortage, labor shortage, water shortage, electricity shortage, and human resource shortage. Among them, labor shortage is said to be the most severe (*Global Views*, Oct. 2018, p. 51).

¹³ Hsinchu Science Park was built by the Taiwanese government in 1980s to imitate Silicon Valley in the US, for the purpose of attracting foreign companies with advanced technologies and of taking in people returning home from overseas.

¹⁴ Bloomberg <https://www.bloomberg.com/news/articles/2018-11-26/underdog-city-is-reborn-as-china-u-s-trade-spat-escalates>.

¹⁵ Ho Fa Industrial Park <http://www.kcghofa.com.tw/index.php?lang=1>

¹⁶ Interview with Economic Division, Taipei Economic and Cultural Office, Prague, Czech Republic (practical Embassy of Taiwan in Czech, Aug. 2, 2017).

¹⁷ However, after the Czech Republic and Slovakia achieve economic development, Taiwanese companies may move away from the Czech Republic and then move to Poland. This is because in the Czech Republic and Slovakia, the average education level is getting higher, while in Lodz, the major industrial city in Poland, the salary is lower than Brno and there is enough labor as the population in Poland is large (Interview with Economic Division, Taipei Economic and Cultural Office, Prague, Czech Republic Aug. 2, 2017).

¹⁸ Interview with Economic Division, Taipei Economic and Cultural Office, Prague, Czech Republic (Aug. 2, 2017).

¹⁹ Interview with a person who once worked at Czech subsidiary of Taiwanese companies (Aug. 6, 2018).

²⁰ Interview with Economic Division, Taipei Economic and Cultural Office, Prague, Czech Republic (Aug. 2, 2017).

²¹ People in the Czech Republic are very friendly, have a cooperative attitude toward Taiwan, and both countries have very similar histories, experiences, and have been tossed by neighboring superpower countries (Interview with Economic Division, Taipei Economic and Cultural Office, Prague, Czech Republic, Aug. 2, 2017).

²² The New Southbound Policy is a major element in Taiwan’s external economic strategy that calls for developing comprehensive, mutually beneficial relations with countries in the Association of Southeast Asian Nations and South Asia, Australia and New Zealand (New Southbound Policy Portal <https://english.ey.gov.tw/nsp/cp.aspx?n=FBD7C9498452B308>).

²³ The article of interview with Deputy director of TAITRA’s exhibition department (*Entrepreneur India* <https://www.entrepreneur.com/article/289037>).

²⁴ TAITRA https://taipei.taiwantrade.com/flash/big/unitList.jsp?lang=zh_TW#ASIA_I.

²⁵ Interview with Jetro Bengaluru (Aug. 8, 2018).

²⁶ Taiwan News <https://www.taiwannews.com.tw/en/news/3334773>.

- ²⁷ It is the practical Embassy of Taiwan in India.
- ²⁸ Taipei Economic and Cultural Center in India <https://www.roc-taiwan.org/in/post/4063.html>.
- ²⁹ Interview with India Electronics and Semiconductor Association (Aug. 7, 2018).
- ³⁰ Central Taiwan Science Park is a branch of Hsinchu Science Park.
- ³¹ Focus Taiwan <http://focustaiwan.tw/search/201807100036.aspx?q=karnataka>.
- ³² Interview with Jetro Bengaluru (Aug. 8, 2018).
- ³³ Interview with India Electronics and Semiconductor Association (Aug. 7, 2018).
- ³⁴ Smart City Asia https://www.smartasia.com/en_US/news/info.html?id=45B2438C784B717E.
- ³⁵ Interview with India Electronics and Semiconductor Association (Aug. 7, 2018), IIT Bhilai https://www.iitbhilai.ac.in/index.php?pid=ncut_iitbhilai, National Chin-Yi University of Technology, https://www.ncut.edu.tw/oia/new2/news_down.php?sn=704.
- ³⁶ In the summer of 2018, 20 Indian students went to universities in Taiwan for the short program which has just started (Interview with India Electronics and Semiconductor Association, Aug. 7, 2018).
- ³⁷ World Bank <http://www.doingbusiness.org/en/rankings>.
- ³⁸ Interview with Economic Division, Taipei Economic and Cultural Center in India (Aug. 6, 2018), with India Electronics and Semiconductor Association (Aug. 7, 2018).
- ³⁹ Interview with Economic Division, Taipei Economic and Cultural Center in India (Aug. 6, 2018).
- ⁴⁰ Interview with India Electronics and Semiconductor Association (Aug. 7, 2018).
- ⁴¹ On the other hand, in Cambodia or Myanmar, the deals go well if the key person agrees (Interview with Economic Division, Taipei Economic and Cultural Center in India, Aug. 6, 2018).
- ⁴² Interview with Economic Division, Taipei Economic and Cultural Center in India (Aug. 6, 2018).
- ⁴³ Interview with India Electronics and Semiconductor Association (Aug. 7, 2018).
- ⁴⁴ The reason transportation by land is chosen is because it is faster than by sea and it is cheaper than by air (*Commonwealth*, Jan. 2, 2019, p. 78).
- ⁴⁵ Subic Bay Metropolitan Authority <http://www.sbma.com/about-us/brief-history>.
- ⁴⁶ In March of 2016, Mr. Gou went to see Sharp's Yao factory (located in Yao city, Osaka prefecture) which is the manufacturing site of home electronic appliances (*The Nikkei*, Mar. 5, 2016), and simultaneously attended a meeting regarding home electronic appliances at the subsidiary at Thailand (*Weekly Toyokeizai*, Mar. 19, 2016, p.38) in preparation for the M&A of Sharp in June 2016. These articles show that Mr. Gou was interested in the home electronic appliance market. Hon Hai seems to be interested in cooperation with Sharp in the development of home electronic appliances (*Nikkei Design*, Jul. 2016, pp.7-12).
- ⁴⁷ Factory of Intelligent Additive Manufacturing Medical Device <https://foiam.iti.org.tw/foiam-mims-pr/>.

References

- Commercial Times*, May 23, 2014, Jun. 5, 2017, Aug. 21, 2017.
- Commonwealth*, Vol. 658, Oct. 10, 2018, Vol. 659, Oct. 24, 2018, Vol. 664, Jan. 2, 2019.
- DIGITIMES Research, Aug. 7, 2018.
- Economic Times*, Mar. 3, 2017, Sep. 20, 2017, Sep. 21, 2017, Oct. 18, 2018, Oct. 29, 2018, Jan. 27, 2019, Jan. 30, 2019.

- Ernst, Dieter and Kim, Linsu (2002) "Global production networks, knowledge diffusion, and local capability formation," *Research Policy*, Vol.31, No.8-9, pp. 1417-1429.
- Global Views*, Oct. 2018, Jan. 2019.
- Industrial Development Bureau, Ministry of Economic Affairs (1988) *Annals of Industrial Development, Republic of China 1988* (in Chinese).
- Koryu*, No. 622, Jun. 30, 2000.
- Nakahara, Yumiko (2004) Technology transfer from multinationals to Taiwanese companies through OEM/ODM in personal computer industry, *Annals of the Society for Industrial Studies*, Vol.19, pp. 79-89 (in Japanese).
- Nakahara, Yumiko (2017) *International Labor Mobility to and from Taiwan*, Singapore: Springer.
- Nikkei Business*, Oct. 31, 2016.
- Nikkei Design*, Jul. 2016.
- Organization for Economic Co-operation and Development (OECD) (1979), *The Impact of the Newly Industrializing Countries on Production and Trade in Manufactures*, Paris: OECD Publications and Information Centre.
- Taiwan Institute for Economic Research (1994) *Annals of Information Technology Industry 1994* (in Chinese).
- Taiwan Institute for Economic Research (1996) *Annals of Information Technology Industry 1996* (in Chinese).
- The Economic Times*, Jul. 15, 2018.
- The Journalist*, Vol. 1627, May 10-16, 2018, Vol. 1682, May 30-Jun. 5, 2019, Vol. 1684, Jun. 13-19, 2019.
- The Nikkei*, Mar. 5, 2016, Oct. 5, 2018, Jun. 29, 2019.
- United Daily News*, Aug. 29, 2016, Dec. 3, 2018, Dec. 25, 2018.
- Wealth Magazine*, Vol. 521, Jan. 26, 2017.
- Weekly Toyokeizai*, Mar. 19, 2016.
- Yang, Alan H. (2018) "Unpacking Taiwan's Presence in Southeast Asia: The International Socialization of the New Southbound Policy," *Issues & Studies*, Vol. 54, No. 1, pp. 1840003-1-1840003-30.
- Yang, Chyan and Shuwen Cheng (2003) "Myths of OBM and OEM: A Case of ACER," *Chung Hua Journal of Management*, Vol. 4, No. 1, p.89-100 (in Chinese).