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A study of strategy of Small Economies facing the Transition of large Economies Industrial Structure

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C H R O N I C L E	Abstract
	Taiwan economy has always been export-oriented, creating tightly-linked industrial chains between cross-straits companies tightly. Understanding the influence of transforming industrial patterns of major economic entities would be critical for long-term cooperative small economic entities (countries or regions) in the periphery. The author of this paper has thus analyzed the influences and impacts of Mainland China's Twelfth Five Year Plan on Taiwan economics by input-output table. Impacts to cross-strait business chain were then assessed using the model of Mainland Chinese export substitution of Taiwanese counterparts. The results of this study show that under the trend of industrial restructuring in mainland China, the impact on Taiwan's GDP is about 0.65%. At the same time affect the distribution of labor market in our country, we must do as soon as possible

Introduction

Initially, Taiwan's business investments in Mainland China were made due to advantages in cheaper production costs for labor-intensive consumer goods. Most high-end material and component manufacturing businesses, however, were retained in Taiwan. This has led to Mainland Chinese dependence on Taiwanese exports. Cross-straits industry value chain was that of a vertical cooperation structure as well. Since then, high-end product manufacturing sectors began to demand access to the Mainland Chinese market and started transferring their technology and funds over to Mainland China to create new production lines. Such developments allowed Mainland China to acquire a more comprehensive industrial value chain. It is not that of a simple vertical cooperation as Taiwanese businesses preferred manufacturing low-end products in Mainland China while retaining high-end and customized production lines in Taiwan. Development of cooperative

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models between Mainland China and Taiwan thus began to take on an increasingly horizontal model.Recently, cross-straits cooperation and regional economies have both become increasingly complex due to advancements in industrial technologies, solidifying of industry value chains, and changing domestic demand policy. Mainland China's Twelfth Five Year Plan (2011-2015) has the main objectives of revising the country's industrial structure through enlarging domestic demand, developing new strategic industries, and developing its own service industry.

With the support of the Central and local governments in mainland China, mainland China has successfully industrialized and gradually moved towards market creation requires a powerful "mercantilist" state(Fortier and Wen, 2016). The role of Mainland China is gradually moving away from being the world's factory to becoming the world's leading market. Previous focus on export growth patterns shall be shifted to emphasize export quality and enhancing domestic demand patterns by employing economic reforms. In general, Mainland China's Twelfth Five Year Plan has the objectives of upgrading 7 new strategic industries, consumer goods industry, and service industry through improving labor productivity, raising energy efficiency, expanding consumer demand, and transforming the service industry in order to achieve the official goals of stimulating stable economic developments. The Mainland Chinese government would support these industries using tax policies, financial support, and scientific advancements. Total output value of these new strategic industries is expected to reach 8% of GDP in 2015 and 20% of GDP in 2020. According to the Twelfth Five Year Plan, the biggest priority would be developing the service industries, which are further categorized into the production

type and livelihood type. Developments in service industries would stimulate and create linkages with advanced manufacturing and services diversification. Mainland Chinese industrial optimization goals would be to increase output values of the service industry by 4% of the GDP[*]. This study aims to understand Mainland Chinese industrial upgrades and transformation and their impacts to cross-strait economic relations. especailly on industrial trade as well as changes to cross-strait industrial specialization and roles and then elaborate strategy for industry development.

Literature Review- Mainland China's indusrtrial economics development

Mainland China has several advantages that include high savings rate, large population, recent introduction of foreign capital and technology, large capital accumulation, high export volume, and official support for further economic development. However, there are certain problems caused by long-term resource allocation inefficiencies, excessive state control, and introduction of certain industries and technologies. Some of these economic development worries in Mainland China include excessive growth of energy-intensive industries which have led to over-exploitation of natural resources and environmental pollution as well as worsening social inequality and unbalanced regional developments. Zhang, Chen, and Gary H. Jefferson (2009) pointed out that Mainland China's productivity was raised by revising industry structures and relocation. Although the policy effect is obvious, Gan and Zheng (2009) elaborated that structural dividends would diminish after

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[*] National Development and Reform Commission of the People's Republic of China, <Outline for the 12th Five-Year Plan of the National Economic and Social Development of the People's Republic of China

policy implementation. Globalization and the restructuring of China's industrial structure has affected the allocation of labor force and stimulate labor productivity (Valli and Saccone, 2015), (Mallick, 2017). In the future, mainland China will consider the domestic industrial production capacity and the global industrial value chain in the future, carry out industrial restructuring(Guo and Li, 2016), it would be necessary to discuss the factors that stimulate Mainland Chinese industrial structure transformation and the impacts of such transformation on Taiwan's industry and economy. With regard to the factors that stimulate industry structure change, Wang and Lien (2006) analyzed industrial structure transformations in Southeast Asia and categorized various factors into groups such as natural condition, system and decision, supply, demand, and foreign. To understand which of these factors would stimulate industrial structure transformations in Mainland China, this study would elaborate various industrial characteristics and national sentiments. According to Li and Lu (2007), Mainland China's manufacturing leadership policy on industrial reform have yet to generate structural dividends as labor and capital have not been assigned to high productivity industries as well as due to inefficiencies in industrial resource allocation. This means that early reforms have not yet achieved effective allocation of Mainland China's total factor productivity. Prior to the Eleventh Five Years Plan (2006-2010), Mainland Chinese policies were to attract foreign investment and technology to upgrade its industries by offering cheaper land, labor and other policy support measures. Li and Zhang (2008) also pointed out that direct investments constitute a more uncertain factor in developing countries or economies in transition when compared to developed countries. Although Mainland China's total factor productivity has yet to be optimally configured and lack comprehensive fiscal support, foreign investments and technologies allowed the country to become the world's factory (Zhou and Zhang, 2008).

Government-led industrial and economic developments have successfully developed Chinese economy. For Mainland Chinese economic development in the 21st century, the effect from industrial restructuring would be considered lower compared to the benefits gained from upgrading of industrial technology (Liu and Zhang, 2008). In essence, Mainland China's market-oriented economic system could be used to reduce the negative impact of market fluctuations. Scholars such as Lu and Zeng (2008) have investigated the impact of economic fluctuations on regional economic growth for different markets in China as well as the range of any differences observed. Recently, acceleration of industrial restructuring, the slowdown of economic growth and the economic growth driven by innovation have become the current economic characteristics of mainland China and the risks to business operations have also risen(Chen, 2013)..

In general, Mainland China's initial reforms and heavy industry-oriented policies misplaced. Although post-1978 reform policies created a vast number of employment opportunities, improved life quality, and alleviated poverty (Miaojie Yu, 2012), these advancements have been achieved at certain costs. Mainland China was able to maintain high economic growths, but Joseph Casey, Katherine Koleski (2011) considered that factors such as lower domestic consumption, social and economic equality, and rising labor costs would eventually limit future economic development. As a result, the official position in Mainland China has shifted towards encouraging consumption,

developing service-oriented and high value-added manufacturing industries, and encourage energy efficiency. Whether or not the Twelfth Five Year Plan is capable of achieving effective transformation of Mainland Chinese economy is still being debated. Louis Kuijs (2012), for example, mentioned that besides adjusting the industry structure, there is still room for political and institutional improvements.

Research methods
Triangular trade model
This study has constructed a triangular trade model based on the vertical specialization trade theory. Trade practices and activities center on importing intermediate goods to generate value-added export products for manufacturing processes that involve two or more stages, the concept is similar to the Strait industrial division (Chen, 2002). This study employed definitions used by Hummels, Rapoport and Yi (1998) as well as Hummels, Ishii and Yi (2001), where vertical specialization trade division is defined as a type of trade pattern where a country imports goods or services from another as an intermediate good and export the final product after domestic manufacturing.

This study would also measure the trade contribution as a result of Mainland China's import of Taiwan's intermediate goods under the current extent of vertical specialization. The author thus employed to the formula utilized by Hummels, Ishii and Yi (2001):

$$VS_i = (\frac{M_i}{Y_i})X_i$$

M_i represents the value of importing the intermediate fiscal, Y_i represents the domestic output, X_i represents export, (M_i / Y_i) represents the ratio of importing the intermediate good to the domestic output

The authors then used the method employed by Chen (2002). The input-output table was used to estimate the value generated by importing intermediate goods as well as the export value generated by the vertical specialization trade scheme. and assumed that imported intermediate goods would be used for domestic multi-stage manufacturing as well as the ripple effect.

$$VS_i^M = A^M(I - A^D)^{-1}x$$

A^M represents the imported coefficient matrix (n×n)

x represents the export vector (n×1)

Of which, A^M is the (n×n) imported coefficient matrix, while x is the export vector of the (n×1) matrix. A^M Every element a_{ij} in the matrix represents import investments from sector i needed by sector j. I is the unit matrix. A^D is the producer's investment coefficient matrix. $(I - A^D)^{-1}$ is the industry ripple effect expressed in the input-output table. This reflects the effects caused by the circulation of imported intermediate goods, and also takes into consideration the intermediate investments of imports and the indirect use of the resulting manufactured products on exported goods.

This study shall employ the following formula to estimate the Taiwanese trade indicators resulting from the vertical specialization of imported intermediate goods in Mainland China. The first, estimate the economic ripple effect and value generated by imported intermediate goods from Taiwan

$$Y_j = (I - A)^{-1}M_i^T \qquad \textbf{(Equation)}$$

Of which, M_i^T is (n×1) Taiwan's export to Mainland China and represents Mainland Chinese i industry's import value of Taiwanese intermediate goods. A is the producer's investment coefficient matrix (n×n) shown in the Mainland

Chinese input- output table. Y_j is the production value generated by the j industry of Mainland China resulting from intermediate goods exported by Taiwan to Mainland China and is inclusive of the ripple effect. The Mainland Chinese 2007 input- output table has created 135 industrial categories. Hence, this research shall also calculate intermediate goods and production values for each of these 135 categories, with i and j being 1, 2, ..., 135.

The second, calculate the export values resulting from direct or indirect use of intermediate goods imported from Taiwan.

$$X_j = d_j Y_j \qquad \textbf{(Equation)}$$

Of which, d_j is the export-output ratio of Mainland China's j industry resulting from the use intermediate goods imported from Taiwan, and shall represent the relative proportion of the exported output value in each industry. X_j represents the final monetary sum used in the export stemming from the production value generated by j industry of Mainland China in using intermediate goods imported from Taiwan, inclusive of the ripple effects. This study was able to acquire d_j from a total of 26 industries. Thus, at this phase of the research, the sums from the aforementioned 135 industries were first distributed among the 26 industry categories before calculating the export values.

$$VS_j^T = \frac{M_j^T}{Y_j} X_j \qquad \textbf{(Equation)}$$

Of which, VS_j^T represents the investments needed for importing Taiwanese intermediate goods per unit value of exported products from every industry of Mainland China, and symbolizes the contribution towards vertical specialization of j industry in Mainland China stemming from the use of Taiwanese imports.

Investments made by Taiwanese entrepreneurs in Mainland China or other countries may stimulate the export of raw materials, components, parts, and other intermediate goods from Taiwan. However, overseas investment activities also meant that part of the production base would be transferred to other countries or Mainland China. First, this estimation formula is constructed upon changes to the market share instead of monetary value of the export. The formula shall consider changes to the relative advantages of competing countries. If a specific country is unable to sustain its market share despite having a constantly growing export value, it would mean that the said country's products have lower competitiveness in new markets.Second, this study assumes that countries with reducing market share would be substituted by countries with increasing market share. The extent of this substitution will be calculated using a ratio based upon relative changes to the country's market share.Third, this study assumes that intensive competition exists between East Asian countries, and that any market share lost by an East Asian country is first substituted by other East Asian countries, and the remaining shares substituted by other countries.

This study therefore proposes the following substitution model and estimation equations based upon the aforementioned assumptions:

$$\Delta T_{2il} = U_{ilm} \times M_i \qquad \textbf{(Equation 1)}$$

$$Rij = \Delta Sij \qquad , \Delta Sij \geqq 0$$
$$\quad = 0 \qquad , \Delta Sij < 0$$
$$Tij = \Delta Sij \qquad , \Delta Sij < 0$$
$$\quad = 0 \qquad , \Delta Sij \geqq 0$$
$$U_i = Min\{|\Sigma_j Rij| \ , \ |\Sigma_j Tij|\}$$
$$U_{ilm} = U_i \times \frac{R_{il}}{\sum_j R_{ij}} \times \frac{T_{im}}{\sum_j T_{ij}} \ , (\Sigma_j Ri \geqq 0 \ , \ \Sigma_j Ti < 0)$$

Of which,

ΔT_{il}	:	substitution value of m country's i product by l, one of the 11 East Asian countries.
M_i	:	Total imports of i product for the current year in market K.
ΔSij	:	Changes to market share compared to the previous year of i product of j, a country from the 11 East Asian countries. $\Delta Sij \geqq 0$ indicates that product i of country j has achieved market expansion in the previous
$\Sigma_j Rij$	:	Represents the total increase of market share of the 11 East Asian countries in market K. In other words, this figure represents the total expansion of
$\Sigma_j Tij$	:	Represents the total loss of market share of the 11 East Asian countries in market K. have lost shares in market K.
U_i	:	Overall substitution of i product of the 11 East Asian countries or country substitution ratio. In other words, this figure represents whether the 11 East Asian countries, as a group, have
U_{ilm}	:	Substitution ratio of m country's i product by l, one of the 11 East Asian countries. Since the assumption is that the 11 East Asian countries will first replace each other, this calculation method can be used to estimate

Empirical research and analysis

Simulating the impact to Taiwanese industries as a result of Mainland China's industrial structure adjustments during the Twelfth Five-Year period.

Although the overall industrial value has been reduced by 870.041 billion RMB, increases in value-added industries were expected to increase overall GDP by 3.62% for a value of 2.1 trillion RMB. It

was found that the affected industries would undergo indirect impacts between 2.6 to 7.7 trillion RMB that causes overall GDP to dec-rease by 0.81% for a value of 480.39 billion RMB, Taiwan shall benefit from Mainland Chinese investments in information and communication services. Taiwanese information and electronic industry is expected to grow by NT$ 100.31 billion which would cancel out the negative impacts experienced in other industries, allowing overall Taiwanese GDP to increase by 0.65%.

Since Mainland China's Twelfth Five-Year Plan called for restricting high pollution, high labor, and high cost industries, Taiwan's industries are expected to suffer from a loss of NT$ 177.053 billion as a result as well, with petrochemicals (loss of NT$ 92.222 billion, or 0.05% GDP), refined petroleum products (loss of NT$ 19.75 billion, or 0.02% GDP), synthetic and glass fiber textile products (loss of NT$ 12.0 billion, or 0.01% GDP), synthetic fibers (loss of NT$ 16.457 billion, or 0.01% GDP), and primary iron and steel products (loss of NT$ 13.548 billion, or 0.01% GDP) being the most severely impacted sectors.

Insert Table 1 here

Also, since the Mainland Chinese government has greatly encouraged the development of information and communication services and industries, the policy was expected to increase the country's demands for information and communication hardware and software at the user end as well as expanding Taiwan's semiconductor industry (growth of NT$ 140.548 billion, or 0.27% GDP), the optoelectronics and components industry (growth of NT$ 169.353 billion, or 0.22% GDP), and sectors dealing in other electronic parts (growth of NT$ 71.39 billion, or 0.12% GDP).

Financial intermediation services are expected to benefit from Mainland Chinese investment policies in the

financial and insurance sectors, and is expected to expand Taiwan's relevant industries by NT$ 5.299 billion for a 0.03% increase in GDP.

Using the perspective of industrial substitution to investigate and analyze the impact to Cross-Straits economy resulting from Mainland China's adjustments to its industrial structure

There are two major indicators for relative competitiveness between Taiwanese and Mainland Chinese industries. One being the Relative Substitution Indicator and the second being the Mainland China Import and Export Bias Indicator. These two indicators could be used to observe relative changes as well as growths or declines of Taiwanese and Mainland Chinese industries in the global market.

The first step is to estimate the monetary value of Taiwanese products substituted by Mainland Chinese counterparts. Market share studies showed that Taiwanese products losing market shares were not entirely substituted by Mainland Chinese products. Due to the large number of competitors from around the world, data on market share changes alone is insufficient in deducing the exact nature of product substitution. However, trade tapes stored in various archives would provide more accurate answers. According to detailed information from these trade tapes, many product categories are only exported by a small number of countries. Any gain or loss in market share could be considered a zero-sums game to a certain extent.

The following equation is used to estimate the monetary value of Taiwanese products substituted by Mainland Chinese counterparts:

$$sum1 = \sum_{\Delta X_i > 0} \Delta X_i$$ represents the sum of market share increases and national market

share increases. $$sum2 = abs\left(\sum_{\Delta X_i < 0} \Delta X_i \right)$$ represents the absolute value of the total loss of market share and national market share.

$sum = \min(sum1, sum2) \times m$, where m is the monetary value of the imported product, while sum represents the monetary value of products substituted by the country which has gained the market share.

$$\frac{\Delta X_1}{sum1} \cdot \frac{|\Delta X_t|}{sum2} \cdot sum$$ is the monetary value of Taiwanese products substituted by Mainland Chinese counterparts.

In the case of Taiwan versus Mainland China, the monetary values of Taiwanese products substituted by Mainland Chinese counterparts and vice versa can be calculated in order to acquire the relative substitution indicator. Further observations on the annual trends of each product category are elaborated below:

Relative substitution index = (Monetary value of Mainland Chinese substitution of Taiwanese products – Monetary value of Taiwanese substation of Mainland Chinese products) / (Monetary value of Mainland Chinese substitution of Taiwanese products + Monetary value of Taiwanese substation of Mainland Chinese products) x 100%

Positive values indicate that Mainland Chinese products have substituted those of Taiwan on the global market. Negative values meant that Taiwanese products have substituted those of Mainland China. The subsequent Twelfth Five-Year Plan of Mainland China aims to promote emerging industries which may also lead to substitution of Taiwanese industrial sectors such as medicine, mechanical industries, and integrated circuits (IC). Further analysis is provided in the following.

During the Eleventh Five-Year Plan, the relative substitution indicator came down to 70% in 2005, and dropping further to 24.80% in 2009. This figure showed signs of increasing again to 27.36% in 2010. The most drastic changes in substitution relationships were observed in the four industrial sectors of petroleum and coal products manufacturing (-188.61%), rubber products manufacturing (-141.09%), metal products manufacturing (-98.79%), and electrical equipment manufacturing (-70.35%). Of which, the first three sectors have indicated increased monetary value of Taiwanese substitution of Mainland Chinese products, indicating Taiwan's acquisition of substitution niches as a result of Mainland China's suppression of high pollution, high labor, and high cost industries according to the industrial optimization measures of Mainland China's Eleventh Five-Year Plan.

The relative substitution indicator of the manufacturing sector was 34.14% in 2011, an increase of 6.55% compared to the 27.59% for 2010. In 2011, manufacturing industries with relative substitution indicators greater than 60% include beverages (79.34%), wearing apparel and clothing accessories (67.39%), wood and bamboo products (66.37%), electronic parts and components (63.94%), and motor vehicles and parts (88.35%). In terms of monetary value, Mainland Chinese substitution of Taiwanese products on the global market far exceeds that of Taiwanese substitution of Mainland Chinese products. In these industries, wearing apparel and clothing accessories as well as wood and bamboo products are considered downstream industries, while electronic parts and components as well as motor vehicles and parts are considered more upstream industries.

When compared to 2010, Cross-Straits relative substitution indicators that

changed from negative to positive included the industries of petroleum and coal products manufacturing (-95.84% ➔46.33%), rubber products (-46.39% ➔45.64%), basic metals (-7.80% ➔12.45%), and other manufacturing (-27.13% ➔9.18%). For these industries, Taiwanese products started off substituting those manufactured by Mainland China. Gradually, the monetary value of Mainland Chinese substitution of Taiwanese products grew and became higher than that of Taiwanese substitution of Mainland Chinese products. In the same year (2011), Cross-Straits relative substitution indicators that changed from positive to negative occurred for chemical materials industry (6.63% ➔-7.24%) and electrical equipment (15.83% ➔-9.54%).

For pharmaceuticals and fabricated metal products, time series data showed that Cross-Straits relative substitution indicators have remained positive in the past and only reached a negative value during 2010 to 2011. This meant that Mainland Chinese products had been substituting those of Taiwan on the global market in the past. However, the monetary value of Taiwanese substitution of Mainland Chinese products grew drastically in the last two years, while Mainland Chinese substitution of Taiwanese products dropped significantly. This observation indicates that Taiwan maintained significant technological and quality advantages in these two industries which allowed them to reduce the substitution of Mainland Chinese products.

For the Mainland Chinese import and export bias indicator, increases in Mainland Chinese production and import substitution capacities would indicate corresponding growth in Mainland Chinese production volumes in this specific industry or reduced reliance on imports. If Mainland China is able of sustaining such developments and trends in this industry, it will be able to

strengthen the industry's comparative advantage in the future. The following Mainland Chinese import and export bias indicators can be acquired:

Mainland Chinese import-export bias index = (Export value of Mainland Chinese products – Import value of Mainland Chinese products) / (Export value of Mainland Chinese products + Import value of Mainland Chinese products) x 100%

Positive values would indicate that Mainland China is export-oriented for this industry. Negative values would indicate that Mainland China is import-oriented for this industry.

In 2011, overall economy and industrial developments in Mainland China indicate an export-oriented industry with an export bias index of 5.63%. Manufacturing sectors also showed an export-oriented trends with an export bias index of 20.31%. For secondary industries, most maintained export bias trends. High export biased industries (that exceed 50%) include textiles mills (68.89%), wearing apparel and clothing accessories (95.19%), leather, fur, and related products (73.58%), fabricated metal products (51.19%), computers, electronic, and optical products (51.79%), other transport equipment and parts (53.56%), furniture (90.90%), and other manufacturing industries (80.28%).

Data showed that such Mainland Chinese industries have either increased production capacity to increase export, or have reduced its reliance on the imports of such products. Assuming that other conditions remain the same, if Mainland China maintains such development trends, these industries will have improved comparative advantages in the future.

These industries tend to be upstream manufacturing, and includes pulp and paper products (-36.11%), petroleum and coal products manufacturing (-23.23%), chemical materials (-29.36%), chemical products (-14.38%), basic metals (-22.65%), electronic parts and components (-30.92%), and motor vehicles and parts (-17.12%). With the exception of petroleum and coal products manufacturing, absolute values of import/export bias indexes of all other industries have shown signs of shrinking. These observations showed that while Mainland Chinese dependence on petroleum and coal products manufacturing has continued to grow, the country is heading towards gradual import substitution and improving its self-reliance in these sectors. This include beverages (4.44% ➔-2.71%), wood and bamboo products (0.97% ➔-7.61%), and pharmaceuticals (10.52% ➔-0.68%). Personal income also grew with the Mainland Chinese economy, leading to growing demands for consumer goods. Whether this trend will continue would need further investigations. Observations of the import-export bias indicator show increased reliance on imports for chemical materials and chemical products industries. During the Twelfth Five-Year Plan, Mainland China gradually increased the phasing out of low-end production capacities, which led to increased imports of low-end products. This may seem beneficial for the exports of Taiwan's three major industries. However, Taiwan's three major industries have already switched its production focus to high-end products during recent years, leading to disadvantages in the substitution of mid- and low-end products. Also, Mainland China has made strong efforts to promote its pharmaceutical industry which would lead to short-term increase in the reliance of imported pharmaceuticals that is beneficial for Taiwan. However, this may lead to risks of substitution on the long-term. Mainland China is also strongly committed to its machinery and equipment manufacturing. In 2006, Mainland China managed to turn from import bias to export bias in this industrial sector. Substitution

of Taiwanese products on the global market, however, have seemed to weaken, suggesting that products from Mainland China and Taiwan are complementary with each other. Hence, data from the machinery and equipment industry still indicates significant growth opportunities for Taiwanese machinery and equipment manufacturing sector if corresponding technologies are able to grow, advance, and strengthen complementary relationships and supply chain between Mainland China and Taiwan

Insert Table 2 here

Finally, we can shall refer to the substitution and bias indicators mentioned in the previous sections and perform a cross-over analysis by dividing the industries into 4 types . Descriptions are provided in the following:

Type I: Mainland Chinese industries are not sufficient in supporting domestic demands and is thus reliant on foreign imports, and that Taiwanese products are substituting Mainland Chinese counterparts in the global market.

Type II: Mainland China is export biased for Type II products. However, since Taiwanese products have differentiated advantages (in terms of technique and quality), they are able to substitute Mainland Chinese counterparts in the global market and occupy a higher market share.

Type III : Although Mainland Chinese products are substituting their Taiwanese counterparts in the global market, the Type III industries of Mainland China are unable to satisfy its domestic demands, which meant that the country is still reliant on foreign imports for these products.

TypeIV : Mainland Chinese production capacities have achieved export growth, with products are substituting Taiwanese counterparts in the global market. This indicates that these Taiwanese industry sectors are relatively weaker.

Conclusions and recommended policies

Research results show that Taiwan's overall GDP shall increase by 0.645% due to policy objectives of Mainland China's Twelfth Five-Year Plan. For various industries, since Mainland China is suppressing the developments of high pollution, high cost, and high labor industries, it would subsequently affect Taiwan's chemical, consumer goods, and metal machinery industries. On the other hand, Mainland China hopes that its Twelfth Five-Year Plan and policies will greatly improve the information and communication services industry in order to improve the people's quality of life. This would indirectly lead to the development of Taiwan's information, electronics, and service industries.

In order to respond to the effects of Mainland Chinese industrial structure adjustments, future development strategies for Taiwan's Type 1 industries should be guided by the fact that these Taiwanese industries have comparative advantages in technology and global brand image, allowing the Type 1 industry products to substitute Mainland Chinese counterparts in the global market while creating potential opportunities in developing the Mainland Chinese market. Future strategies for Taiwan's Type 1 industries may include creating Cross-Straits strategic partnerships, employing technological advantages to maintain Taiwan's leading position in Cross-Straits vertical specialization for Type 1 industries, and securing global market opportunities created by Mainland Chinese industrial transformation while managing Taiwan's strategic positioning in the Mainland Chinese market.

Despite the fact that Mainland China is export biased for Type II industries, Taiwanese products still command comparative advantages and are able to substitute Mainland Chinese products in the global market. Future development

strategies for Type II industries in Taiwan would be to strengthen marketing capabilities and create other international markets to secure first-mover advantages and maintain Taiwan's international competitiveness in Type II industries.

For Type III industries, Taiwanese products are at a risk of being substituted by their Mainland Chinese counterparts in the global market. However, Mainland Chinese products are still unable to fully satisfy its enormous domestic demand. Hence, future development strategies for Taiwan's Type III industries would be to employ major brands in leading industrial chain integration and referencing the demands and characteristics of the Mainland Chinese market to provide diverse and differentiated products at competitive costs to secure shares from Mainland China's domestic markets.

As a result of changes to Cross-Straits specialization for Taiwan's Type IV industries, Taiwanese products face strong competition and high substitution risks from their Mainland Chinese counterparts. Hence, future development strategies for Type IV industries in Taiwan should be to adopt differentiation strategies and strengthen national brand name (Made in Taiwan). When expanding targeted overseas markets and defining product positioning, care shall be taken to differentiate Taiwanese products from the Mainland Chinese counterparts in order to reduce the threat posed by Mainland China to Taiwan's Type IV industries.

Additionally, policies and measures such as the Information Management Project of Industrial Talent Training of the Ministry of Economic Affairs and the ITRI College of the Industrial Technology Research Institute have established various vocational courses and certification systems to direct Taiwan's labor force towards more competitive industries and reduce the impact caused by Mainland China's industrial structure adjustments.

According to the Manufacturing and related services monthly report which Ministry of Economic Affairs commissioned Taiwan Institute of Economic Research illustrate that number of employed personnel for Type I industries enjoyed a compound growth rate of 1.44% from 2006 to 2014, Type II industries have a compound employment growth rate of 0.81% from 2006 to 2014. It is worthy to note that Type III industries enjoyed an compound employment growth rate of up to 1.4% from 2006 to 2014, of which chemical products (1.01%), basic metal (2.26%), and electronic parts and components (1.88%) enjoyed very high growths in the number of people employed. Although Mainland Chinese products are gradually substituting their Taiwanese counterparts, Mainland China has remained an importer for products for Type III industries. Hence, Type III products in Taiwan would not be threatened with substitution in the short term. However, there are still long-term risks of oversupply of labor in these industries. Finally, certain manufacturing industries of Type IV industries managed to increase their employment, such as food manufacturing (6.01%), rubber products (1%), machinery and equipment (2.08%), and other transport equipment and parts (1.62%). Excessive growth in employees in such industries generate concerns over the development of Type IV industries. Future Productivity 4.0 developments in Taiwan may first prioritize Type III industries. Smart Factory models may be introduced to Type IV industries with excessive employees in order to drive production line automation and other improvements to solve the issue of excessive labor costs.

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