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Reassessing the Economic Scale and the Impacts of Tax Relief on an Emerging Industry in Taiwan

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Abstract

This study is to reveal the development roles of the sports industry in Taiwan and to reassess the gross domestic sport product by using the input-output table from the Directorate General of Budget, Accounting and Statistics and the Industry and Service Census data. The computable general equilibrium model is also introduced to simulate and then to explore the economic effects of tax relief for sports manufacturing and sports services industries. The results indicate that if the government expects to facilitate the development of the whole industry and enhance the overall economic effect through tax relief in the sports industry, the sports industry policy can be gradually oriented to encourage private investment in the sports industry and stimulate the non-governmental consumption tendency of sports services, rather than taking government expenditure as the main support for the development of sports services. The findings would provide the direction of policy recommendations for the sports industry and further serve as a reference when the government discusses and formulates policies for fostering the sports industry in the future.

Keywords: Sports industry, input-output (IO) table, economic effects, tax relief, computable general equilibrium (CGE).

1. Introduction

As an emerging industry, Taiwan's sports industry will inevitably face the trend of global competition. In the future, how the sports industry can adapt to and identify industry development trends, enhance its added value and achieve the policy-based vision for Taiwan's sports industry under the circumstance of increasing public demand for athletic activities will depend on the close cooperation and efforts of the industry, government and universities (see Sports Administration, Ministry of Education, SAME [37]). As the sports industry has high added value and is suitable for development in Taiwan, in order to facilitate the public sector and sports industry investors to actively invest in capital, technology and talent cultivation, it is necessary to first reveal the scale and output value of the sports industry, understand the status of latest developments of Taiwan's sports industry, and evaluate the effects of the tax relief policy for the sports

industry on other related industries and the overall economy so as to help the government to foster the development of industrial policy for the sports industry.

Although the overall development of sports industry in Taiwan is booming, basic investigation and research of the sports industry still need to be strengthened. In particular, the current Standard Industry Classification (SIC) promulgated by the Directorate General of Budget, Accounting and Statistics (DGBAS) has not classified sports as a standalone industry, which makes it difficult to highlight the level of contribution of the sport industry to the overall economic system by aggregated statistical information required for the development of industrial policy. In addition, most of the sports industry categories concluded in Taiwan's Sports Industry Development Regulations are core industries, and the contents and scopes of its peripheral or horizontal industries are not clearly provided. This method of classification is not consistent with the SIC promulgated by the DGBAS. In the absence of a classification system comparable to that of DGBAS, the contents and scope of so-called sports industry categories cannot be clearly presented, so it is naturally also difficult to assess the output value and employment numbers of the sports industry and the economic effects on other related industries through the sports industry database.

Therefore, the objective of this study is to explore the characteristics of Taiwan's sports industry from the perspective of industry analysis. Firstly, the categories of Taiwan's sports industry will be identified and the input-output (IO) table of the sports industry will be re-compiled to estimate the gross domestic sport product (hereafter, GDSP). Then, this study simulates the effects of the tax relief policy for the sports industry on the economic system and its related industries through introducing computable general equilibrium (hereafter, CGE) model in order to serve as a reference for policy formulation and private investment and further lay a solid foundation for development of the sports industry.

The remainder of the paper will proceed as follows. Section 2 explains the literature relating to the area. Section 3 presents both the scopes and classifications of sports industry that are used as well as the methodology employed. Section 4 addresses the characteristics of the sports industry and economic effects of tax relief for sports industry, while Section 5 discusses these findings and then draws conclusions and suggestions.

2. Literature Review

In the past, research on the impact of output value of the sports industry on the economy has received plenty of attention from advanced countries. However, the majority of existing studies have focused on evaluation of the economic value of urban development brought by the construction of sports facilities (see Coates and Humphreys [8]; Johnson, Groothuis, and Whitehead [23]; Johnson, Mondello, and Whitehead [24]); evaluation of the intangible benefits of sports teams (see Owen [33]) or evaluation of the economic benefits of sports events. For example: Andersson, Rustad, and Solberg [1] used the contingent valuation method to estimate the value of World Cup Figure Skating Championships in Norway and found that residents yearned for a diverse social life rather than

the economic value brought by the Championships. Likewise, based on analysis of the total economic value of sports events using the non-market valuation technique, Barget and Gouguet [5] pointed out that sports events may produce both positive and negative external effects, and suggested that these external effects should be internalized during evaluation of the value of sports events and that the real net social utility should also be measured. By calculating Portuguese citizens' willingness-to-pay for the Euro 2004 Soccer Championships, Barros [6] found that it was lower than the expected total cost, so he believed that the Euro Soccer Championships was not an ideal public good. West [42] used the logistic regression model to estimate the relationship between salary and team performance in the Twins baseball team, and Hakes and Sauer [19] used the IO model to estimate the efficiency of the Oakland Athletics. However, the regression model used in such two studies may only be used to consider the one-way causal relationship between economic variables rather than analyze and simulate more realistic and comprehensive industrial economic behaviors under optimal behaviors and resource constraints.

In terms of the evaluation of economic effects, most existing literature has analyzed the industrial correlation with the IO model, discussed the relationship between individual industries and various sectors of the economic system, and explained other industrial linkages and output value caused by individual industries (see Miller and Blair [32]). Therefore, before evaluating the economic effects, it is necessary to discuss the IO model and the theoretical basis of these economic effects. For the sports industry, it can construct benefit analysis models of sports events according to different types of event-related investment (such as venues and infrastructure), expenditure (such as tourism spending), and imports and exports. Among them, additional tourism spending is the most important component for producing overall economic effects (see Kasimati and Dawson [25]; Li, Blake, and Cooper [26]). Although a lot of literature employed the IO model to assess economic effects, the main shortcoming lies in that improper multipliers are often used to overestimate economic benefits (see Baade and Matheson [4]; Coates and Humphreys [9]; Dwyer, Forsyth, and Spurr [16]; Matheson [31]; Porter and Fletcher [35]). Porter and Fletcher [35] indicated that the IO model is a short-term model and is thus not suitable for forecast of the impact of long-term sport events from the demand or expenditure side. In addition, Dwyer, Forsyth and Spurr [17] further pointed out that IO analysis is more suitable for evaluation of regional economic effects, because the impact of overestimated economic benefits is less serious in such cases. Taks, Kesenne, Chalip, Green, and Martyn [40] compared the economic benefits of the Pan-American Junior Athletic Championships in 2005 brought to the host city through the IO method and the cost-benefit analysis respectively. Similarly, they pointed out that the traditional IO method was likely to overestimate the values of sports events, and they believed that the cost-benefit analysis would be better for estimation. Likewise, none of these models can represent economic units' optimal behaviors and general equilibrium economic behavior under resource constraints. Therefore, many subsequent studies advocate considering more practical assumptions and estimating economic effects using the CGE model (see Bohlmann and Van Heerden [7]; Giesecke and Madden [18]; Li, Blake, and Thomas [27]; Madden [29, 30]) or the econometric model (see Baade, Baumann, and Matheson [3];

Hotchkiss, Moore, and Zobay [21]; Kasimati and Dawson [25]). Russo [36] argued that although the econometric model is simpler and requires fewer data than the CGE model in general, it is difficult to capture the interrelationship between different industries in the same economy.

Compared with the traditional IO model, the CGE model emphasizes market mechanism operation and resource constraints. Assuming that there are different degrees of substitution between the same commodity and input factors, it can make up for the shortcoming of neglecting the substitution of such commodity or factors by the IO model. Lofgren, Harris and Robinson [28] first proposed the standard analysis model of CGE based on the four main functions of Leontief, Cobb-Douglas, constant elasticity of substitution (hereafter, CES) and constant elasticity of transformation (hereafter, CET). The CGE model is widely used in various fields because of its comprehensive analysis characteristics, including trade issues such as tariff quotas (see Dixon, Rimmer, and Tsigas [15]), e-commerce and labor market dislocation (see Dixon and Rimmer [13, 14]), population growth and trade policy (see Stenberg [39]) and applied research on the impact effect of imports and exports on the tourism industry (see Wattanakuljarus and Coxhead [41]; Li et al. [26]).

3. Methodology

3.1. Scope and classification of sports industry

Due to the inconsistent scopes and definitions of sports industry around the world, there is no single, complete classification of sports industry categories in Taiwan's official data. According to the latest revision of Taiwan Standard Industry Classification (10th Revision) issued by DGBAS, only some sports services (Group 931) are separately classified into the "Sports, Entertainment and Leisure Services" (Division 93) of "Arts, Entertainment and Leisure Services" (Section R), and can be subdivided into Professional Sports (Class 9311), Sports Venues (Class 9312) and Other Sports Services (Class 9319) (see DGBAS [10]). Based on the DGBAS classification and the definition of sports industry made by Pitts, Fielding and Miller [34], this study suggests that the sports industry should include sports-related facilities and product manufacturing and service industries in a broad sense. Besides, considering the reliability and computational convenience of official data and based on sports-related subcategories in the industrial sectors provided in 166 sectors of the 2006 and 2011 IO tables, the sports industry should be decomposed from various industries and then reorganized into one. Accordingly, the IO table including the sports industry needs to be recompiled. Among them, the sports manufacturing industry covers sports drink manufacturing, sports clothing and accessories manufacturing, sports shoes manufacturing and sports goods manufacturing. Based on the existing 10 sports service subcategories (see SAME [38]), sports services involve estimation of the total output value of Taiwan's sports industry based on this official secondary data and CGE analysis of the overall sports industry according to such IO table.

3.2. Decomposition of sports industry

In order to present a complete picture of output value of the sports industry in a more detailed manner, the input and output values of sports manufacturing are decomposed from manufacturing (Section C). Among them, sports drink manufacturing is separated from non-alcoholic drink manufacturing (Group 092), the output value of which is estimated based on the proportion of total sales statistics of sports drinks from Taiwan Beverage Industries Association to output value of non-alcoholic drink manufacturing in the Industry and Service Census data. Sports clothing and accessories manufacturing is separated from finished apparel and clothing accessories manufacturing (Division 12), the output value of which is estimated based on the product of the proportion of statistical number of sportswear manufacturers from Taiwan Garment Industry Association to total number of member manufacturers and the proportion of sportswear output value of each manufacturer; similarly, sports shoes manufacturing is separated from footwear manufacturing (Class 1302), the output value of which is estimated based on the proportion of statistical sales volume of sports shoes from Taiwan Footwear Manufacturers Association to total sales volume of footwear; the production of bicycles and parts manufacturing (Group 313) and sports goods manufacturing (Class 3311) are directly extracted from the input and output values of 2006 and 2011 IO tables published by DGBAS; finally, all above-mentioned output values of decomposed items are consolidated into the output value of sport manufacturing.

On the other hand, although some sports services (Group 931) have been independently classified, their scope is relatively narrow. In fact, in addition to Arts, Entertainment and Leisure Services (Section R), sports services also involve Wholesale and Retail (Section G), Information and Communication (Section J), Professional, Scientific and Technical Activities (Section M), Support Service Activities (Section N), Education (Section P) and Human Health and Social Work Activities (Section Q). Therefore, sports manufacturing and sports services are consolidated into Taiwan's sports industry. Based on the DGBAS data in 2006 and 2011, the production and transaction price list are recompiled as the industrial linkage matrix for calculation of input coefficient and output value (see DGBAS [10]).

3.3. The CGE model demonstration

For analysis of the CGE model, this study utilizes the ORANI model (see Dixon, Parmenter, Ryland, and Sutton [11]; Dixon, Parmenter, Sutton, and Vincent [12]; Johansen [22]) and linearizes all equations in the industrial system based on the decomposed IO table to obtain the relationships of percentage change between variables and assumes that production and final consumption are separable. In this way, the number of elastic data needed to be collected or estimated can be reduced, and model calibration can be simplified. Finally, they can be solved simultaneously by GEMPACK software package through setting of closure of endogenous and exogenous variables. Reference may be made to the description of Harrison and Pearson [20] for the solution procedure.

After the establishment of the IO table for the sports industry, this study tries to introduce the ORANI model to establish a series of equations to describe the functioning of the sports industry in the overall economic society. According to the decomposition and reorganization of the sports industry in Section 3.2 and industrial sectors provided in 52 sectors of the IO table published by DGBAS in 2011, sport manufacturing and sport services sectors are included to form 54 industrial sectors.

3.3.1. Basic structure of ORANI model

The ORANI model assumes that consumers pursue maximal utility on the demand side and producers pursue minimal costs and maximal profits on the supply side, and then equilibrium prices and transaction volumes of product and input factor markets are determined together with supply and demand. All equations in the model are derived from the assumptions of microeconomic theories on behaviors and technical levels of producers and end consumers, households' preferences and market structures. The basic data come from the IO table.

3.3.2. Production structure of ORANI model

The production structure of ORANI model assumes that each industry produces a wide range of products based on such factors as domestic and imported intermediate products, various types of labor, land, capital and other production costs. In addition, the products produced by domestic industries are also differentiated according to their domestic use or export. In terms of industry cost minimization, the output level (X_j) is formed by summing up primary input factors (I_j), intermediate input factors (Z_{ij}) and other cost expenditure items (C_j) for production of each commodity composite in the nested structure through a Leontief's function. Therefore, input and output form a fixed proportional relation, which can be expressed as formula (3.1).

$$X_j = \text{Leontief}(Z_{1j}, \ldots, Z_{ij}, I_j, C_j). \tag{3.1}$$

In addition, intermediate input factors (Z_{ij}) of each commodity composite is obtained by summing up domestic products (Z_{ij}^D) and imported intermediate products (Z_{ij}^M) through a CES function, which can be expressed as formula (3.2).

$$Z_{ij} = \text{CES}(Z_{ij}^D, Z_{ij}^M). \tag{3.2}$$

The primary input factors of each commodity composite (I_j) are further divided into land (T_j) (land input is only limited to agricultural and mining sectors), labor (L_j) and capital goods (K_j). Likewise, they are formed by summing up individual primary input factors through a CES function and represent the incomplete substitution relationship between them. It is expressed as formula (3).

$$I_j = \text{CES}(T_j, L_j, K_j). \tag{3.3}$$

In addition to the two-stage production functions, the CGE model assumes the zero-profit condition of the perfectly competitive market to describe the results of manufacturers in market competition. The profit equation of the production structure is expressed as formula (3.4):

$$P_j Z_j = \sum_i Z_{ij} * P_j + P_{I_j} * I_j + P_{C_j} * C_j \tag{3.4}$$

where P_j is the price of the aggregate commodity j, P_{I_j} is the price of the aggregate primary input factors (I_j), and P_{C_j} is the price of other cost expenditure items (C_j).

From the zero-profit condition and production function of each production stage, the extended demand for each production input can be solved based on the behavioral hypothesis of manufacturer's profit maximization. Finally, the equation that really enters the CGE model is regarded as the equation for zero-profit condition and extended demand of each production input.

In terms of CET production transformation technology, given the maximum profit of different products produced by the manufacturer and the restriction of production possibility curve, the linearized optimal product transformation decision-making behavior of each industry can be expressed as formula (3.5):

$$y_i = z + \alpha_i \Big(p_i - \sum_j \beta_j p_j \Big) \tag{3.5}$$

where y_i represents the percentage change in output of product i, z represents the percentage change in average output of the industry to which it belongs, p_i represents the percentage change in the expected price of product i, α represents the elasticity of transformation, and if the transformation coefficient between different products of the same industry is large, the production combination of such industry will be relatively easy, that is, the possibility that the industry can produce different products according to its wishes will be higher; j represents all industries, β_j represents the proportion of output value of each product to total output value of the industry to which it belongs, i.e., $\sum_j \beta_j = 1$. Generally speaking, when the price of product j rises $p_i\%$, and p_i is greater than the weighted average $\Big(\sum_j \beta_j p_j \Big)$ of the percentage increase in the expected price of other products, the output of product i will increase, but that of other products will decrease.

3.3.3. Investment structure

In the CGE model, the government is an independent sector, but is not assumed to have the ability to pursue goal optimization; the model only sets the total government expenditure as an exogenous variable. In addition, this model also tries to simplify the treatment of investment. Like general standard gross domestic product (GDP) classification, it divides investment into fixed investment and inventory change. The total

amount of fixed investment is set as an exogenous variable, while the fixed investment expenditure (I_{ij}) of each industrial sector is assumed to be in direct proportion to the total fixed investment (I_j) of such industrial sector, as shown in formula (3.6):

$$I_j = \text{Leontief}(I_{1j}, I_{2j}, \ldots, I_{ij}). \tag{3.6}$$

The CGE model also assumes that capital goods are obtained by inputting domestic and imported intermediate products into production. The nested production structure of capital goods is similar to that of the products of each of the above-mentioned industries. The capital goods system is formed by summing up all commodity composites through a Leontief's function, so each commodity composite has a fixed proportional relation with capital goods that the industry needs. In addition, each commodity composite is obtained by summing up domestic and imported intermediate products through a CES function. Unlike the production of products of each of the above-mentioned industries, the production of capital goods (i.e. formation of fixed capital) does not use primary factors as inputs directly. Therefore, increasing investment to improve capital goods of the industry can increase the production of the industry to show the positive economic benefits of promotion on the supply side. As a result, the sources of fixed investment expenditure (I_{ij}) are divided into domestic (I_{ij}^D) and imported investment goods (I_{ij}^M) (as formula (3.7)), and all inventory changes of commodities are set as exogenous variables in the CGE model.

$$I_{ij} = \text{CES}(I_{ij}^D, I_{ij}^M). \tag{3.7}$$

3.3.4. Consumption and trade structure

The consumption structure is mainly composed of various final demands, including household consumption, government consumption and investment demand. The nested demand structure of household consumption is similar to the structure of investment demand. In the CGE model, total household income is equal to total household consumption and is set as an exogenous variable. This model uses the Stone-Geary utility function, so the demand function for various aggregate commodities and services can be express as a linear expenditure system.

The treatment of trade structure is based on the hypothesis of "small trading country". In terms of import of commodities, Armington's [2] hypothesis is continuously used to address intra-industry trade. The aggregate commodities (including intermediate consumption (Z_{ij}), household consumption or investment demand (I_{ij}) for domestic use are all composed of domestic and imported products, and the incomplete substitution of commodities from these two different sources is represented by summing up through a CES function. In terms of export of commodities, the CGE model assumes that the manufacturer produces commodities for domestic use and export commodities for foreign consumption under the motivation of pursuing profit maximization, and the production possibility frontier of a combination of commodities for domestic use and export commodities produced by the manufacturer can be represented with CET. By analogy, the

production structure of each industry is similar, but both factor input ratio and value of elasticity of each industry are different from each other. This model further divides households' demands for aggregate commodities into domestic products and imports, and sums up through the CES function to represent the incomplete substitution between domestic products and imports consumed by households, as shown in formula (3.8).

$$Z_{ij} = \text{CES}(Z_{ij}^D, Z_{ij}^M). \tag{3.8}$$

Take the consumption substitution between domestic products and imports of CES for example. Considering maximal household utility and budget constraints, the linearized optimal consumption decision-making behavior regarding domestic products and imports can be expressed in formula (9).

$$x_{c,s} = y_c + \beta_c\Big(p_{c,s} - \sum_s \beta_{c,s} p_{c,s}\Big) \tag{3.9}$$

where c represents the commodity category, s represents a domestic or imported product, $x_{c,s}$ represents the percentage change in output of the domestic or imported commodity c; y represents the percentage change in average consumption of the industry to which it belongs, and $p_{c,s}$ represents the percentage change in the expected price of the domestic or imported commodity c; $\sum_s \beta_{c,s} p_{c,s}$ represents Armington elasticity of substitution of a domestic product and import. The greater the elasticity of substitution between the domestic product and its import is, the higher the substitution between the product made in the consumer country and its import, that is, consumers can consume commodities with lower prices according to the level of prices. Generally speaking, when the price of domestic or imported product of model c rises $p_{c,s}\%$, and $p_{c,s}$ is greater than weighted average $(\sum_s \beta_{c,s} p_{c,s})$ of the percentage increase in the expected price of other products, the consumption of domestic or imported product of model c will decrease, and that of products of another source will increase.

According to (3.3) and (3.4), the zero profit equations in the trade and consumption structure can be expressed as (3.10) and (3.11), respectively:

$$P_i Z_{ij} = P_{D_i} * Z_{ij}^D + P_{M_i} * Z_{ij}^M \tag{3.10}$$

$$P_{I_j} * I_j = T_j * v_j + L_j * w_j + K_j * r_j \tag{3.11}$$

where P_{D_i} is the domestic price of domestic product i, P_{M_i} is the import price of import i, r_j is the rental price of capital goods of department j, w_{ij} is the salary paid by department j, and v_j is the rent paid by department j.

3.3.5. Database of ORANI model

The structure of the ORANI model comes from the IO table that shows the equilibrium of an economic society. It means that all producers, investors, households and government sectors can reach equilibrium, which is also called "general equilibrium" in

the neoclassical economics. That is, the ORANI model describes the simplified behavior of each market under the assumption that rational producers pursue minimal cost and maximal revenue and households pursue maximal utility, and its equations can be obtained by the percentage change solving method. Based on the IO table published by DGBAS in 2011, the data are decomposed from and balanced between the logistics disparity table and the cargo tax table to meet the requirements of the ORANI model. The database of the ORANI model is divided into three parts: Absorption matrix, production matrix and import duty vector.

Assuming that each industry produces only one product, the production matrix is a diagonal matrix, and the model allows each industry to produce multiple products. That is, the output values of various products produced by various industries are represented in the production matrix. In addition, the vector of net import tariff is the net amount of import tariff levied on each import, regardless of the purchaser, at the same rate.

3.4. Closure criterion setting and simulation of CGE model

This study assumes that the neoclassical closure criterion is adopted, so the CGE model can be regarded as a long-term equilibrium model. The average real salary level can be freely adjusted as an endogenous variable to make the labor market reach a balance.

Generally speaking, the emerging industries can be fostered, so that the emerging industries to be supported will not be hindered by high taxes. Therefore, this study explores the feasibility of promoting development of the sports industry through business tax relief in accordance with the provisions of Article 10 (Business Tax Credits for Sports Organizations and Professional Sports Organizations) and Article 11 (Tax Credits for Sports Sites and Buildings) of the Sports Industry Development Regulations implemented in Taiwan in 2012. Under basic setting of the ORANI model, the CGE model's long-term closure was introduced to simulate the political shock of the "5% business tax relief" for sports manufacturing and sports services respectively, generating economic effects on the comprehensive industrial level. To compare the sports industry with other industries in more detail, simulation data were taken from the IO table on 52 industrial sectors issued by DGBAS in 2011. After being decomposed from all manufacturing and service sectors, the simulation data are merged into sports manufacturing and sports services according to their production proportions to form Taiwan's 54 industrial sectors.

4. Results and Discussion

4.1. Characteristics and general analysis of sports industry

This study summarizes production and employment of 21 major industrial sectors as shown in Table 1. In Table 1, the total employment in Taiwan's sports industry grew by 4.1% from 2006 to 2011. Among them, the employment growth in sports manufacturing was the highest (about 11.26%), which was higher than that in other manufacturing, while that in sports services was only about 2.79%, which was lower than that of other

services. The total production of the sports industry increased from NT$232.1 billion in 2006 to NT$302.7 billion in 2011, showing a high growth rate (about 30.39%). The increase in production of sports manufacturing was about 35.16%, which was higher than that of other manufacturing; that of sports services also reached 17.63%. The GDSP of the overall sports industry also grew from NT$148.1 billion in 2006 to NT$185.2 billion in 2011, with an increase of approximately 25.05%. It can be seen that the sports industry has considerable development potential. It can also be derived from Table 1 that the total production of the sports industry is mainly contributed by sports manufacturing (in 2006, the total domestic sports production accounted for 72.76%, and the GDSP accounted for 83.37%; in 2011, the total domestic sports production accounted for 75.43%, and the GDSP accounted for 80.81%), but it is worth noting that the GDSP of the overall sports industry in 2011 accounted for only 1.07% of the GDP.

4.2. Economic effects of tax relief for sports industry

After simulation of the shock of 5% business tax relief for sports manufacturing and sports services, the long-term effects of various economic indicators are as shown in Table 2. It indicates that tax relief in sports manufacturing will have a positive impact on the overall economy of Taiwan for the most part, driving investment increase by 0.662%, and its negative impact only includes 0.059% decrease in total consumption and 0.066% increase in prices. The results show that tax relief will improve real investment and production, nominal expenditure and labor supply of sports manufacturing. This is conducive to the increase of employed population and the growth of nominal GDP in the sports industry. Although tax relief in sports manufacturing may also lead to price increases, it is still conducive to the growth of real GDP as a whole. On the other hand, tax relief in sport services will have a negative impact for the most part. Its positive impact only includes 0.053% increase in real wage rate, 0.20% increase in investment, 0.123% decrease in prices, and 0.235% and 0.194% increase in exports and imports respectively, while its negative impact is represented by economic contraction including decline of real GDP, 0.226% decrease in government expenditure and 0.232% decrease in total consumption. The main reason may be that the ratio of government purchase in sports services (including final demand of professional sports and sports venues) is on the high side. As a result, when the tax relief policy is implemented, the focus of economic activities may be shifted from government expenditure to private investment, and private consumption and government expenditure are reduced by a large margin, causing a decline in nominal GDP growth. In addition, it is noteworthy that tax relief in sports services may cause deflation with simultaneous decline in prices and real GDP growth, which is not conducive to the development of the overall economy.

4.3. Economic effects on overall industrial sectors

The effects of tax relief on the production, employment and real investment of Taiwan's 54 industrial sectors are summarized in Table 3, Table 4, and Table 5. Table 3 reveals the increases and decreases in production of various industries after the tax

Table 1: Comparison in overview of 21 industrial sectors in Taiwan in 2006 and 2011.

Industry	Employment (Unit:Thousands People)		Change (%)	Total Domestic Production (Unit:Million NT$)		Change (%)	GDP (Unit:Million NT$)		Change (%)
	2006	2011		2006	2011		2006	2011	
Agricultural, Livestock, Forest, and Fishery Products	554	542	-2.17	451227	559829	24.07	140231	131050	-6.55
Minerals	7	4	-42.86	96956	50192	-48.23	-1070855	-1548520	-44.61
Manufacturing	2742	2910	6.13	13367091	17233739	28.93	3753274	4562085	21.55
Electricity Supply and Gas	28	29	3.57	549187	750927	36.73	100955	119984	18.85
Water and Remediation	60	79	31.67	161292	209921	30.15	17120	15633	-8.69
Construction	829	831	0.24	1258561	1377302	9.43	1063954	1127540	5.98
Wholesale and Retail Trade	1591	1600	0.55	3519204	4090841	16.24	2271860	2491339	9.66
Transportation and Storage	417	411	-1.44	1014672	1088174	7.24	541596	567650	4.81
Accommodation and Food Services	665	728	9.47	463532	670595	44.67	271708	426181	56.85
Telecommunication Services, Data Processing & Information Services	208	217	4.46	715435	831085	16.16	340632	369675	8.53
Finance and Insurance Services	407	428	5.16	1231721	1302278	5.73	505873	615244	21.62
Real Estate Services	66	87	31.82	1408714	1609888	14.28	1143098	1320998	15.56
Professional, Scientific and Technical Services	258	332	28.61	731985	990694	35.34	14499	474277	3171.17
Support Services	204	246	20.43	262060	347975	32.78	-67210	-113560	-68.96
Public Administration Services	334	388	16.17	1204404	1379553	14.54	1119830	1262600	12.75
Education Services	562	627	11.57	698523	799710	14.49	666859	775777	16.33
Human Health and Social Work Services	333	400	20.13	483999	574871	18.78	439705	573582	30.45
Arts, Entertainment and Recreation Services	98	82	-16.32	137280	172933	25.97	114185	130047	13.89
Other Services	524	536	2.29	566948	633519	11.74	461134	502540	8.98
Sport Manufacturing	35	39	11.26	168897	228285	35.16	123455	149628	21.20
Sport Services	190	195	2.79	63227	74372	17.63	24621	35541	44.35
Sport Industry	**225**	**234**	**4.10**	**232124**	**302657**	**30.39**	**148076**	**185169**	**25.05**
Total Industries	**10111**	**10709**	**5.91**	**28554915**	**34976683**	**22.49**	**11976524**	**13989291**	**16.81**

Data source: The original data were compiled from the Industry and Service Census, the IO tables in 2006 and 2011 published by DGBAS and SAME research report.

Note: GDP = Total Domestic Production − Intermediate Demand.

Table 2: Long-term effects of business tax relief for the sports industry on economic indicators.

Economic indicators	5% business tax relief for sports manufacturing (percentage change)	5% business tax relief for sports services (percentage change)
Real wage rate (f1lab_io)	0.185	0.053
Total consumption (w3tot)	-0.059	-0.232
Investment (w2tot_i)	0.662	0.200
Government expenditure (w5tot)	0.047	-0.226
Price (p0gdpexp)	0.066	-0.123
Nominal wage (p1lab_io)	0.263	-0.039
CPI (p3tot)	0.078	-0.096
Nominal GDP (w0gdpexp)	0.129	-0.126
Real GDP (x0gdpexp)	0.063	-0.004
Export (x4tot)	0.201	0.235
Import (x0imp_c)	0.187	0.194

Table 3: Percentage changes of production of 54 industries caused by business tax relief in the sports industry.

Header	SportM	SportServ	Header	SportM	SportServ	Header	SportM	SportServ
Agricultur	-0.140	0.008	Rubber	0.401	0.183	Construct	0.324	0.160
Livestock	-0.140	-0.019	Plastic	-0.022	0.149	Wholesale	0.164	-0.020
Forestry	-0.049	0.291	NonMetallic	-0.112	0.220	Transport	-0.142	0.096
Fishery	-0.328	0.025	SteelIron	0.054	0.242	Accommodat	-0.239	-0.034
Mineral	0.049	0.230	MiscMetal	0.139	0.330	MassCom	-0.069	0.097
ProcFood	-0.163	-0.021	Metallic	-0.092	0.244	Telecom	-0.095	-0.049
Beverage	-0.151	-0.051	Electronic	-0.367	0.229	DataPro	0.143	0.111
Tobacco	-0.238	-0.068	Computers	-0.327	0.208	Finance	-0.120	-0.047
Textile	0.066	0.239	Electrical	-0.171	0.216	RealEstate	-0.091	-0.095
Apparel	0.100	0.296	Machinery	-0.066	0.292	Profession	0.151	0.106
Leather	-0.010	0.298	Motor	-0.388	0.180	Support	-0.059	0.084
WoodBamboo	0.106	0.218	TransEquip	3.473	0.263	PublicSer	-0.122	-0.122
Paper	0.028	0.112	Furniture	-0.788	0.434	Education	-0.167	-0.144
Printing	0.026	0.059	MiscProd	0.089	0.223	Health	-0.163	-0.145
Petroleum	0.054	0.134	Electricity	-0.021	0.077	Arts	-0.079	-0.024
ChemMater	-0.109	0.139	Gas	-0.105	-0.028	OtherServ	-0.116	-0.108
ChemProduc	-0.158	0.173	Water	0.010	0.029	SportM	20.830	0.210
Medicines	-0.239	0.022	Remediation	-0.020	0.095	SportServ	-0.203	2.928

Table 4: Percentage changes of employment caused by business tax relief in the sports industry.

Header	SportM	SportServ	Header	SportM	SportServ	Header	SportM	SportServ
Agricultur	-0.196	0.000	Rubber	0.339	0.156	Construct	0.276	0.151
Livestock	-0.186	-0.110	Plastic	-0.101	0.125	Wholesale	0.054	-0.061
Forestry	-0.062	0.289	NonMetallic	-0.223	0.196	Transport	-0.223	0.079
Fishery	-0.363	0.016	SteelIron	-0.074	0.206	Accommodat	-0.280	-0.056
Mineral	-0.072	0.224	MiscMetal	0.021	0.242	MassCom	-0.123	0.066
ProcFood	-0.181	-0.036	Metallic	-0.158	0.222	Telecom	-0.211	-0.078
Beverage	-15.246	-7.393	Electronic	-0.559	0.210	DataPro	0.074	0.091
Tobacco	-0.412	-0.150	Computers	-0.534	0.214	Finance	-0.189	-0.072
Textile	0.015	0.212	Electrical	-0.276	0.209	RealEstate	-0.250	-0.126
Apparel	0.096	0.294	Machinery	-0.163	0.297	Profession	0.064	0.067
Leather	-0.063	0.271	Motor	-0.490	0.180	Support	-0.144	0.022
WoodBamboo	0.076	0.197	TransEquip	3.117	0.238	PublicSer	-0.199	-0.134
Paper	-0.051	0.059	Furniture	-0.829	0.426	Education	-0.208	-0.149
Printing	-0.020	0.037	MiscProd	-0.054	0.225	Health	0.779	-0.080
Petroleum	0.166	0.129	Electricity	-0.173	0.054	Arts	-0.128	-0.061
ChemMater	-0.259	0.109	Gas	-0.515	-0.109	OtherServ	-0.187	-0.123
ChemProduc	-0.225	0.128	Water	-0.090	0.009	SportM	19.134	0.206
Medicines	-0.318	-0.034	Remediation	-0.097	0.088	SportServ	-0.671	1.899

relief policy for sports manufacturing and sport services is implemented. In terms of effects of tax relief in sports manufacturing: Apart from 20.83% increase in the production of sports manufacturing, the top five increases in production of other industries are 3.473% in Other Transport Equipment, 0.401% in Rubber Products, 0.324% in Construction, 0.164% in Wholesale and Retail Trade and 0.151% in Professional, Scientific and Technical Services. This shows that tax relief for sports manufacturing can drive the development of its highly-related industries and promote the increases in their production. On the contrary, it may also reduce or crowd out the production of other industries. The decreases in production in order are -0.388% in Motor Vehicles and Parts, -0.367% in Electronic Parts and Components, -0.328% in Fishery, -0.327% in Computers, Electronic and Optical Products and -0.239% in Accommodation and Food Services. In terms of effects of tax relief in sports services: Apart from 2.928% direct increase in the production of sports services, the top five increases in production of other industries are 0.434% in Furniture, 0.330% in Miscellaneous Metals, 0.298% in Leather, Fur and Related Products, 0.296% in Finished Apparel and Clothing Accessories and 0.291% in Forestry. In contrast, tax relief in sports services may also reduce or crowd out the production of other industries, including: -0.145% in Human Health and Social Work Services and -0.144% in Education Services.

In Table 4, the changes in employment of various industries after the tax relief policy for sports manufacturing and services are revealed. In terms of effects of tax relief

in sports manufacturing: Apart from 19.134% increase in employment of sports manufacturing, the top five increases in employment of other industries are 3.117% in Other Transport Equipment, 0.779% in Human Health and Social Work Services, 0.339% in Rubber Products, 0.276% in Construction and 0.166% in Petroleum and Coal Products. On the contrary, it may also reduce or exclude the employment of other industries. The decreases in employment in order are -15.246% in Beverages, -0.829% in Furniture, -0.559% in Electronic Parts and Components, -0.534% in Computers, Electronic and Optical Products and -0.49% in Motor Vehicles and Parts. In terms of effects of tax relief in sports services: Apart from 1.899% increase in employment of sports services, the top five increases in employment of other industries are 0.426% in Furniture, 0.297% in Mechanical Equipment, 0.294% in Finished Apparel and Clothing Accessories, 0.289% in Forestry and 0.271% in Leather, Fur and Related Products. The top three decreases in employment are: -7.393% in Beverages, -0.150% in Tobacco and -0.134% in Public Administration Services, but it is also found that only a few industries have been adversely affected and their decreases have also been small.

In Table 5, the effects of tax relief are concluded as follows: Apart from 19.134% increase in real investment of sports manufacturing, the top five increases in real investment of other industries are 3.437% in Other Transport Equipment, 0.779% in Human Health and Social Work Services, 0.623% in Electricity Supply, 0.522% in Rubber Products, 0.324% in Other Manufacturing & Repair and Maintenance of Industrial Machinery and

Table 5: Percentage changes of real investment caused by tax relief in the sports industry.

Header	SportM	SportServ	Header	SportM	SportServ	Header	SportM	SportServ
Agricultur	-0.095	0.014	Rubber	0.522	0.236	Construct	0.276	0.296
Livestock	-0.109	0.042	Plastic	0.103	0.186	Wholesale	0.054	-0.004
Forestry	-0.035	0.292	NonMetallic	-0.013	0.241	Transport	-0.223	0.120
Fishery	-0.246	0.045	SteelIron	0.127	0.262	Accommodat	-0.280	0.027
Mineral	0.127	0.234	MiscMetal	0.200	0.376	MassCom	-0.123	0.164
ProcFood	-0.113	0.019	Metallic	0.044	0.290	Telecom	-0.211	-0.035
Beverage	-15.095	-7.320	Electronic	-0.315	0.234	DataPro	0.074	0.139
Tobacco	-0.282	-0.089	Computers	-0.261	0.206	Finance	-0.189	0.296
Textile	0.181	0.299	Electrical	-0.028	0.226	RealEstate	-0.250	0.296
Apparel	0.301	0.420	Machinery	0.116	0.281	Profession	0.064	0.212
Leather	0.128	0.367	Motor	-0.222	0.181	Support	-0.144	0.251
WoodBamboo	0.261	0.324	TransEquip	3.437	0.261	PublicSer	-0.199	0.296
Paper	0.140	0.187	Furniture	-0.617	0.467	Education	-0.208	-0.120
Printing	0.186	0.134	MiscProd	0.324	0.219	Health	0.779	-0.057
Petroleum	0.054	0.144	Electricity	0.623	0.296	Arts	-0.128	0.119
ChemMater	-0.055	0.150	Gas	-0.300	-0.066	OtherServ	-0.187	-0.035
ChemProduc	-0.069	0.231	Water	0.088	0.044	SportM	19.1341	0.213
Medicines	-0.175	0.065	Remediation	0.115	0.108	SportServ	-0.671	2.637

Equipment, and 0.301% in Finished Apparel and Clothing Accessories. The decreases in real investment in order are -15.095% in Beverages, -0.671% in Sports Services, -0.617% in Furniture, -0.315% in Electronic Parts and Components and -0.300% in Gas Supply. In terms of effects of tax relief in sports services, apart from 2.637% increase in real investment of sports services, the top five increases in real investment of other industries are 0.467% in Furniture, 0.420% in Finished Apparel and Clothing Accessories, 0.376% in Miscellaneous Metals, 0.367% in Leather, Fur and Related Products and 0.324% in Wood and Related Products. In contrast, the decreases in real investment in order are -7.320% in Beverages, -0.120% in Education Services, -0.089% in Tobacco, -0.066% in Gas Supply and -0.057% in Human Health and Social Work Services.

To sum up, the positive and negative effects of tax relief in sports manufacturing on production, employment and real investment of other industries are greater than those of tax relief in sports services.

5. Conclusions

5.1. Findings

In the IO tables published by DGBAS in 2006 and 2011, the reconstructed classification of 54 industrial sectors is in good agreement with the current SIC, so the re-decomposed and reconstructed classification of industrial sector is more detailed and the results of estimation of overview and output value of the sports industry should be more accurate than those in previous studies. After re-compiling the IO table including the sports industry, it is found that the GDSP of Taiwan's overall sports industry accounts for only 1.07% of the whole country's GDP, and the economic scale is smaller than other advanced countries where the sports industry is more mature. Although the proportions of the sports industry in domestic production and employment are not high, its future growth potential and contribution to the overall economy cannot be underestimated.

The results of a 5% business tax relief in the sports industry by CGE simulation show that business tax relief in sports manufacturing and sports services will have positive effects on real wage rate, investment and import and export in terms of the overall economy, but will have negative effects on domestic private consumption. Besides, although tax relief in sports services can promote the growth of private investment and import and export likewise, on the contrary, it may cause decreases in private consumption and government expenditure, resulting in a decline in GDP growth and deflation. Accordingly, this study provides the direction of policy recommendations for the sports industry: Although the tax relief policy cannot directly create demand for sports consumption, it is an important tool to enhance willingness to invest in sports manufacturing. Therefore, if the government expects to promote the development of the whole industry and enhance the overall economic effect through tax relief in the sports industry in the future, the sports industry policy can be gradually oriented to encourage private investment in the sports industry and stimulate the non-governmental consumption tendency of sports services, rather than taking government expenditure as the main support for

the development of sports services. Moreover, the government should focus on providing a high-quality investment environment for sports manufacturing, which will help boost GDP growth. In addition, on the industrial side, the effects on other industries caused by tax relief in sports manufacturing, regardless of positive or negative fluctuations in output value, employment or real investment, are greater than those caused by the tax relief in sports services, which also reflects the phenomenon that multiplier effects of sports manufacturing are significantly greater than those of sports services. To sum up, in order to facilitate development of the sports industry in the future, the government can reconsider the importance of sports manufacturing to the overall national economy and industrial development, and create a favorable investment environment for sports manufacturing to stimulate growth of the overall economy.

5.2. Limitations and further research suggestions

In terms of input and output data acquisition, on the one hand, because the economic activities of Taiwan's sports industry are mostly distributed in different industrial sectors, the data cannot be separated alone, so the statistical calibration of re-decomposed and reconstructed classification of industrial sectors should be overcome when analyzing the output value of the sports industry; on the other hand, because the compilation of the DGBAS IO table is time-consuming and data-intensive, the issued data cannot reflect and present the current economic activities of the sports industry in a timely manner, so this study can only retrieve the official secondary data from more than ten years ago to ensure the reliability of industrial data. In this case, it is necessary to update the data continuously to reveal the latest changes in economic input and output of the sports industry and pinpoint the development trends of the sports industry more accurately. In order to overcome the problem of the immediacy of secondary data, the further study may build a sports satellite account consistent with the compilation principles of IO table to collect more real-time input and output data including consumer expenditure and the supply of the sport-related industry through annual industry surveys.

In addition, this study shows that the effects of tax relief in sports manufacturing are better than those of tax relief in sports services. However, as the classification of the domestic sports industry is not clear and the sports industry is scattered in the industry categories of Taiwan's SIC, it is still necessary to precisely consider the identification of industrial scope and content applicable to tax relief in practice, as well as such technical problems as amendments to tax laws.

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