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Impact Evaluation of the Tariff Reduction on the Fisheries Sector in Taiwan: A Comparison of Multi-Sector CGE Model and Single-Sector Multi-Activity Sector Model

Chin-Hwa Sun, Fu-Sung Chiang, and Cheng-Hong Lin[1]

Abstract

This study tries to evaluate the impact of the 35.5% tariff reduction in average on the fisheries sector after Taiwan's accession to the WTO by two different specified models, i.e., a multi-sectors CGE model, which is derived from ORANI and implemented by the GEMACK software, and a single-sector multi-activities partial equilibrium (PE) model, which is derived from the welfare maximization and implemented by the GAMS software.

According to the 1996 Taiwan's Input-Output tables, there are 160 commodities and sectors. The fishery sector is specified as one single sector. Even though the fishery products are highly substituted among consumers, the fishery sector should be disaggregated to distant water fishery, which targets the export market, and the aquaculture and offshore/coastal fisheries, which mainly target the domestic market. For example, the aquaculture and offshore/coastal fishery commodity outputs value for domestic market would decrease by 4.29% and 10.73%, respectively. The total supplies of imported aquaculture and imported offshore and coastal fishery commodity would increase 86.89% and 134.24%, respectively, and the employment in this sector would decrease 2.71% and 9.10%, respectively, after the WTO tariff reductions.

Based on the differences in production activity and the input cost structure for various fisheries products, this paper has further specified a single-sector multi-activities partial equilibrium (PE) model to disaggregate three fisheries sector into 52 production activities. The PE model is derived from the welfare maximization and implemented by the GAMS software. The results show that the impact would be more severely. The output value of the aquaculture and offshore/coastal fishery for domestic market will decrease 14.53% and 13.89%, respectively. The difference between the multi-sector CGE model and the multi-activities PE model are substantial. It is important to build a linkage to incorporate the macro effect of the tariff reduction from the multi-sectors CGE model to the multi-activities partial equilibrium fishery model.

Keywords: Tariff Reduction, ORANI multi-sectors CGE model, single-sector multi-activities partial equilibrium model, Fisheries Sector, Taiwan

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Background and Motivation

Taiwan is committed to trade liberalization and the globalization of its domestic markets and is generally perceived as a party "willing and able" to meet the World Trade Organization's (WTO) implicit requirements as well as the requirements of its trading partners. In 2000, Taiwan has formally concluded trade negotiations on all products with all of the interested WTO members. Taiwan was included as the 144th WTO member in January 2002 and the accession commitments have currently been implemented.

The WTO Agriculture Agreement was negotiated in the 1986 to1994 Uruguay Round and is a significant first step towards fairer competition and a less distorted resource allocation. Though it is agreed that free trade will benefit all nations and that trade liberalization is highly in demand, one can hardly deny the process of adjustment toward a free trade regime can be time-consuming and costly. In line with the spirit of trade liberalization, the Taiwanese government has pursued tariff reductions over the last several years. The nominal tariff on agricultural products fell from 12.7% in 1985 to 11.77% in 1999, while the tariff on industrial goods fell from 6.11% to 2.40% over the same period.

Upon joining the WTO in 2002, a significant tariff reduction on agriculture, livestock, and fishery will be expected in 2004 when Taiwan eliminate almost all its direct import control regulations. After 2004, the average tariff rates of agriculture, livestock, and fishery will decrease 39.2%, 31.9%, and 35.5%, respectively. The impacts could be considerably large in agriculture, livestock, and fishery sectors. As a result, the value of imports is expected to grow in the near future, and the domestic agriculture may experience enormous challenge, because most Taiwan's agricultural products are not competitive in the world market.

In 1996, Taiwan's total output value (calculated at the producers' level) of primary agriculture, livestock, and fishery sectors is about NT$622 billion, which accounted for about 3.15% of the total output value in Taiwan, and their employment share accounted for about 7.43% of total employment, which mainly provide major employment opportunity for the unskilled labor in the countryside. The primary factor (margin, labor, capital, land, and other cost) payment of agriculture, livestock, fishery accounted for about 61.18%, 17.38%, and 59.99% of the total inputs value, respectively. Especially, both agriculture and fishery sectors are labor-intensive. Noted that both agriculture and fishery sectors use more primary labor inputs than other sectors. The labor payment in both agriculture and fishery sectors is the major input, which accounts for 44.67% and 29.76% of the total output value, respectively.

The average unskilled labor in these three sectors accounts for 97.52% of the total labor force, which is much higher than the average unskilled percentage in other sectors (51.85%). It is expected that after joining in the WTO, Taiwan have the advantage to raise its GDP and import-export quantity based on the industry sector's

competitiveness in comparing to foreign industry. However, huge unemployed unskilled labor force is expected to occur in agriculture, livestock, and fishery sectors.

This study attempts to analyze the impacts of tariff reductions on fishery sectors in Taiwan. By utilizing the input-output data in 1996, this paper specifies a multi-sectors, computable general equilibrium (CGE) model of the Taiwan's economy which is constructed to evaluate the economy-wide impacts of tariff reductions on agriculture, livestock, and fishery and to evaluate impacts of tariff reductions on agriculture, livestock, and fishery imports in Taiwan based on WTO trade negotiation results.

In addition, by considering the diversity of various fisheries activities in the fishery sector, this study further specified a single-sector multi-activities partial equilibrium (PE) model, which is derived from the welfare maximization and implemented by the GAMS software. It is of interest to discuss the difference of the results between the multi-sector CGE model and the multi-activities PE model and to build a linkage to incorporate the macro effect of the tariff reduction from the multi-sectors CGE model to the multi-activities partial equilibrium fishery model.

Multiple-Sector ORANI CGE Model

The model applied in this study is derived from ORANI and implemented by the GEMACK software, which is developed from Monash University in Australia (Dixon, Parmenter, Sutton and Vincent, 1982: Dixon, Parmenter, Powell, and Wilcoxen, 1992). For the detailed ORANI model specifications, please see Dixon et al., 1982 and 1992. ORANI model allows each industry to produce several commodities and use them as inputs in domestic and imported commodities. The primary inputs contain labor, land, capital, and other costs. Furthermore, commodities destined for exports are distinguished from those for local use. The multi-input, multi-output production specification is kept manageable by a series of separability assumptions and the CGE model exhibit the nesting production structure.

The industry's production input demand in the CGE Model is formulated by a four-level nested structure, and the production decision-making of each level is independent. Product market and factor market are assumed to be completely competitive market, that is, producers are price takers regardless whether they are in product market or in factor market. In cost minimization and technology constraint at each level of production, producers will make optimal input demand decisions. At the top level, industry product is produced by combining aggregated primary inputs with aggregated intermediate inputs under the assumption of the Leontief production function. It is assumed that primary inputs and intermediate inputs are separable and the production technology bears the features of separability and constant return to scale. Consequently, they are all demanded in direct proportion to the industry activity. The aggregated intermediate input is calculated, under the Armington assumption and constant elasticity of substitution (CES) form.

At the second level, each commodity composite is a CES function of domestic goods and the imported equivalent (the Armington assumption). And at the third level, the primary-factor composite is specified as a constant ratio of elasticities of substitution, homothetic (CRESH) functional form to aggregate three types of primary

inputs, such as labor, land, and capital. At the fourth level, the labor composite is a CES aggregation of skilled and unskilled labor.

The input-output database was compiled from the 160-sector of the 1996 Taiwan's Input-Output tables. Various behavior equations are specified for producers, private households, government, and import-exporters. An absorption matrix, a MAKE matrix, and an import duty vector using a database that satisfies the following balance equations: (1) market clearing for tradable goods; (2) market clearing for (mobile) endowment; (3) zero profit condition; (4) household budget balance; and (5) investment-savings balance.

Single-Sector Multi-Activities Partial Equilibrium Model

From the concept of "consumer's surplus," Samuelson (1952) defined a "net social pay-off function," and transferred the regional exchange problem to a solution of maximized problem on a base of this definition. Under the postulate of linear price-supply functions and price-demand functions, Takayama and Judge (1973) developed a quadratic programming model from Samuelson's approach. In area of agricultural production and distribution, Takayama and Judge (1973), Hall, Heady and Plessner (1968), Hall et al. (1975) are just a few of the many applications of the single sector partial equilibrium model. In the energy, the model by Kennedy (1974), the PIES model (Hogan, Sweeney and Wagner (1978), and the Zimmerman (1981) Coal Model and the associated paper by Shapiro and White (1982) are based upon the SPE model. Sun, Chang and Chiang (1999) had specifies a Single-Sector Multi-Activities Partial Equilibrium Model for the fisheries sector in Taiwan evaluate the impacts of the zero tariff reduction on all fisheries output under the APEC EVSL scenario. The model is specified as follows,

$$\text{Max} \quad \sum_{h} \int P_h^D(Z_h)\, d Z_h + P_h^D E_h - \sum_{i} \int P_i^S(X_i)\, d X_i - P_i^S M_h \qquad (1)$$

$$\text{Subject to} \quad Z_h + E_h - \sum_{k} \alpha_{hk} Q_k - M_h \le 0 \quad \text{for all h} \qquad (2)$$

$$\sum_{k} \beta_{ik} Q_k - X_i \le 0 \quad \text{for all i} \qquad (3)$$

$$\text{and} \quad Z_h, X_i, Q_k \ge 0 \quad \text{for all h, i, k}$$

Suppose there are k activities in the fisheries sector in Taiwan, such as defined in equation (1) to equation (3). Each of the activity produce the Q_k output level base on the number of fishing boats and the acres of the aquaculture farm. Suppose the h represent the h^{th} output fish species and each of the fish output production activity requires "i" input factors. Suppose there exists a integratable inverse demand curve for each of the outputs and input factors, which is represents as $P_h^D(Z_h)$ and $P_i^S(X_i)$, where P_h and Pi represent the output price and input price, respectively.

In addition, Z_h, E_h, and M_h represent the consumption, export, and import level of the h^{th} commodity; α_{hk} is the output level of the hth commodity via the kth activity; β_{ik} is the input demand of the ith input factor via the kth activity; X_i is the input supply of the ith input factor. The objection function such as defined in Equation (1)

represents the sum of the consumer surplus and producer surplus, which also defined the market equilibrium condition. Equation (2) and (3) represent the total demand for the hth commodity must less or equal to the supply from all k activity export; the demand for the ith input factor must less or equal to the quantity of input supply. When the equilibrium conditions of the problem are satisfied, the shadow prices implied in equation (2) and (3) represent the equilibrium output and input prices. Since the possibility of substitution one input factor to the others are quite low, i.e., it's not possible to substitute the oil input by more employment to maintain the output level under the fishing activity, this paper assume a constant return to scale Leontief production function to represent the fixed input-output relationship.

Data

There are 160 commodities and sectors in the most recently published 1996 Taiwan's Input-Output tables. The agricultural sector is consisted of eight sectors in the 160 Input-Output tables, such as paddy rice, other common crops, sugarcane, other special crops, fruits, vegetables, other horticultural crops, and agricultural services sectors. Livestock sector is consisted of two sectors, such as hogs and other livestock products.

However, the fishery sector was considered as one single sector in the original 160 input-output table. Even though the fishery products are highly substituted among consumers, the fishery sector could be disaggregate to aquaculture, far-sea fishery, and offshore/coastal fishery based on their operation. The far-sea fishery in Taiwan targets the export market rather than the domestic market, which is the target market for the aquaculture and offshore and coastal fishery. In addition, the major cost item in far-sea, offshore and coastal fishery is fuel/oil cost, but the feed expense is the major cost in aquaculture fishery. Based on the differences in production activity and the input cost structure, this paper has further disaggregated the output value into three sectors, such as aquaculture fishery, far-sea fishery, and offshore and coastal fishery.

This study defines a 67 sectors and commodities which contains eight agricultural sectors, two livestock sectors, one forest sector, three fishery sectors, sixteen food processing sectors and thirty-seven industry and service sectors. Table 1 shows the value share of domestic and imports demand for major agriculture, livestock and fishery sectors, including intermediate inputs of products, investment, household consumption, exports, inventory, and import demand. As shown in table 1, most of the output of paddy rice, sugarcane, other special crops, hogs, other livestock, and agricultural services are demanded by processing and industry sectors to be used as intermediate inputs. On the contrary, fruits, vegetables, other horticultural crops, aquaculture products, and offshore/coastal fishery products are consumed the mostly by households. The demand for the far-sea fishery products and miscellaneous food products[2] have greater parts in the export aspect.

Such as showed in the cost share of intermediate inputs and primary endowments

[2] Miscellaneous food products contains Slaughtering & By-Products, Edible Oil & Fat By-Products, Flour, Rice, Sugar, Animal Feeds, Canned Foods, Monosodium Glutamate, Seasonings, Dairy Products, Sugar Confectionery & Bakery Products, Misc. Food Products, Non-Alcoholic Beverages, Alcoholic Beverages, and Tobacco sectors.

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of major agriculture, livestock and fishery sectors, the agricultural sectors such as paddy rice, other common crops, sugarcane, etc., are the fundamental industries that use a great deal of primary inputs such as labor and accounted for labor-intensive sectors. Livestock industry such as hogs and other livestock sectors, use a large number of intermediate inputs, which accounted for more than 70% of total input. In the fishery sector, far-sea fishery uses the most primary inputs such as capital and labor inputs; far-sea fishery uses more capital inputs than labor inputs. It is obvious that each sector exhibits different cost structure.

The value used for import/domestic substitution elasticities are listed in Appendix 1. A higher values of the Armington elasticities for agricultural goods, food and other consumer goods than for capital goods and equipment. This accords with various empirical studies (Dixon, Sutton, and Vincent, 1982). For example, in their work on Australia, Alaouze et al. (1997) and Alaouze (1997) found substitution elasticities of 6.8 for footwear, 5.0 for motor vehicles and 3.4 for clothing. For electrical machinery, chemical fertilizers, clay products and cement their estimates were respectively, 1.3, 1.4, 1.4 and 0.8. (A summary of the work of Alaouze and co-workers can be found in Dixon, et al. (1982, section 29.1).) Other studies of import elasticities (substitution elasticities and import demand elasticities) are surveyed in Stern et al. (1976).

Since the tariff reduction magnitude for each fish species is actually quite different and most of the fishing activities usually exhibits composite output. It is of interest to justify the various degree of impact on various fishing activities. For the fisheries sector, this study specifies a 39 commodities-52 production activities partial equilibrium model, such as shown in Figure 1, to represent the fisheries sector in Taiwan based on the number of fishing vessels, number of aquaculture acres, and the output fish species level reported in the Fisheries Yearbook in Taiwan during 1995 to 1997. The domestic consumption for fresh, chilled, or frozen fish commodities is defined as domestic production minus export plus import for each of the output fish species. The domestic demand elasticity for each fish species is specified according to various publications regarding the estimation result of fish demand system (Chiang, 2000).

Each of the production activities is specified based on one composite fixed cost and three variable input levels, such as labor, vessel, and land (*Annual Economics Survey of Offshore Fisheries and Aquaculture in Taiwan*, 1997). The composite fixed cost includes cost for fishing gear, fry, feed, fertilizer, medicine, electricity, maintenance, transportation, insurance, oil, rent, ice and salt, fresh water, bait, entrance fee, and other costs. Each of the fishing activities is available for fishing vessels in various tonnage classes and various input supply elasticities for each class of fishing vessels is specified. The aquaculture farming land is also specifies as an input supply for the total acres of land utilized in aquaculture fisheries. In addition, labor supply is account for the total person-day devoted in all 52 activities. The market cleaning mechanisms will force the equilibrium condition on the total number of fishing vessel for each tonnage class, the number of aquaculture land and the total number of labor.

Results and Simulations

It is very important to define the exogenous and endogenous variables in this study, for the suitable choice of exogenous variables of CGE Model applies in the purpose of policy simulation. It is the so-called the closure set. In this study, a

long-run static analysis was used to analyze the impacts of reductions in tariff on the fishery sector. Suppose capital, land, technology changes of basis factors, the hobby of household consumption and import tariff are all defined as exogenous variables in the model. Tariff reductions are treated as shocks in the model. These shocks are defined as power of tariff, such as follows,

$$Power\,of\,Tariff = \frac{(1+Tariff_{WTO})-(1+Tariff_{2001})}{1+Tariff_{2001}}$$

The tariff reductions for all 67 sectors after Taiwan's accession to WTO were list in Appendix 2. Note that the tariff reduction in Agriculture, Livestock, and Fishery sectors seems much serious than that of most of the industry sectors.

Scenario 1 defines a long-run full employment condition that hold employment exogenous. Further, Taiwan is a small importing country and the amount of imports will not affect the world price.

The long-run general equilibrium setting that all the sectors will automatically adjust, it is important to realize that the excess labor or capital in agriculture, livestock, fishery, and food processing sectors might not be so flexible to be utilized by the industry sectors. Especially, the unemployed elder worker from the paddy rice sector will not meet the requirement to work in the industry sectors. Hence, a short-run Keynesian sticky wage setting is defined as Scenario 2, which assume the nominal wage is fixed and that temporary unemployment exists.

Table 1 lists the percentage changes in selective macroeconomic variables under tariff reductions on fishery sectors in Taiwan. By comparing the result from the scenario 1 vs. the result from the scenario 2 in Table 1, we will be able to realize if the average nominal wage is hold constant then the aggregate employment would decrease 0.87% and the real GDP from the expenditure side would decrease 0.57% when the consumer price index decrease 1.51%.

The percentage changes of various economic factors under tariff reductions on fishery sectors are shown in Table 2. For example, the offshore and coastal fishery commodity outputs for domestic market would decrease the output for domestic market by 5.55%, the total supplies of imported goods would increase 148.58% and the employment in this sector would decrease 9.10% after the WTO tariff reductions. The output price of locally-produced commodity of this sector would also decrease by almost 5.18%.

The variations of Input-Output can be seen through the Fan Decomposition mechanism in terms of local market effect, import share effect, and export share. Table 3 shows the Fan Decomposition of related domestic products under tariff reductions on fishery sectors in Taiwan. A positive local market effect means the partial increments from the expanding the local market. However, the positive local market effect might be dominated by the substitution from the expanding of import goods, if the import share effect might be more negative than the positive local market effect. Such as shown in Table 4, imports to the fishery would increase by 3,843 million NT dollars; and the domestic production of fishery would experience a reduction of 4,016 million NT dollars.

By considering each of the fisheries sectors consist different production

activities, this study further specified a single-sector multi-activities partial equilibrium (PE) model, which is derived from the welfare maximization and implemented by the GAMS software. The results, such as shown in Table 5, represent the WTO impact on fisheries sector would be more severely. The domestic aquaculture and offshore/coastal fisheries, which depends mostly on domestic market, suffer most severely with 7.15% and 8.14% decreases in production, respectively. The output value of the aquaculture and offshore/coastal fishery for domestic market will decrease 14.53% and 13.89%, respectively. The import quantity will increase 88.06% and the total domestic production and value will decrease 3.77%, and 8.98%, respectively. Even though the consumer surplus will increase1.98%, the producer surplus will decrease19.62%. The usage of land and employment in aquacutlure and offshore/coastal fisheries decreases 7.09%, and 5.76%, respectively, such as shown in Table 6. The paper concludes with a discussion of the policy implication on how to justify the losses of the fisheries sector in Taiwan. The difference between the multi-sector CGE model and the multi-activities PE model are substantial.

Concluding Remarks

On one hand, this study used a single-country 67-sector CGE model to evaluate the impacts of 35.5% tariff reductions on fishery sector, after Taiwan's accession to the WTO. Results show that the output commodities of the aquaculture sector and offshore/coastal fishery sector would experience a decrease of 2.14% and 5.55%, respectively. A 10.67% and 14.34% decrease in the basic price of imported goods, which is significantly severely than the 2.15% and 5.18% decrease in the basic domestic price of locally-produced commodity of the aquaculture sector and offshore/coastal fishery sector, respectively. Consequently, the output value of the aquaculture and offshore/coastal fishery sector would experience a 4.29% and 10.73% reduction, respectively. The total supplies of imported goods in the aquaculture and offshore/coastal fishery sector would increase by 97.56% and 148.58%. As a result the value of seafood imports is expected to grow after Taiwan joining the WTO and the imports of fishery product would increase by 3,843 million NT dollars.

On the other hand, the result from the 39 commodities-52 production partial equilibrium fisheries model seems more severely. The output value of the aquaculture and offshore/coastal fishery for domestic market will decrease 14.53% and 13.89%, respectively. It is important to build a linkage to incorporate the macro effect of the tariff reduction from the multi-sectors CGE model to the multi-activities partial equilibrium fishery model.

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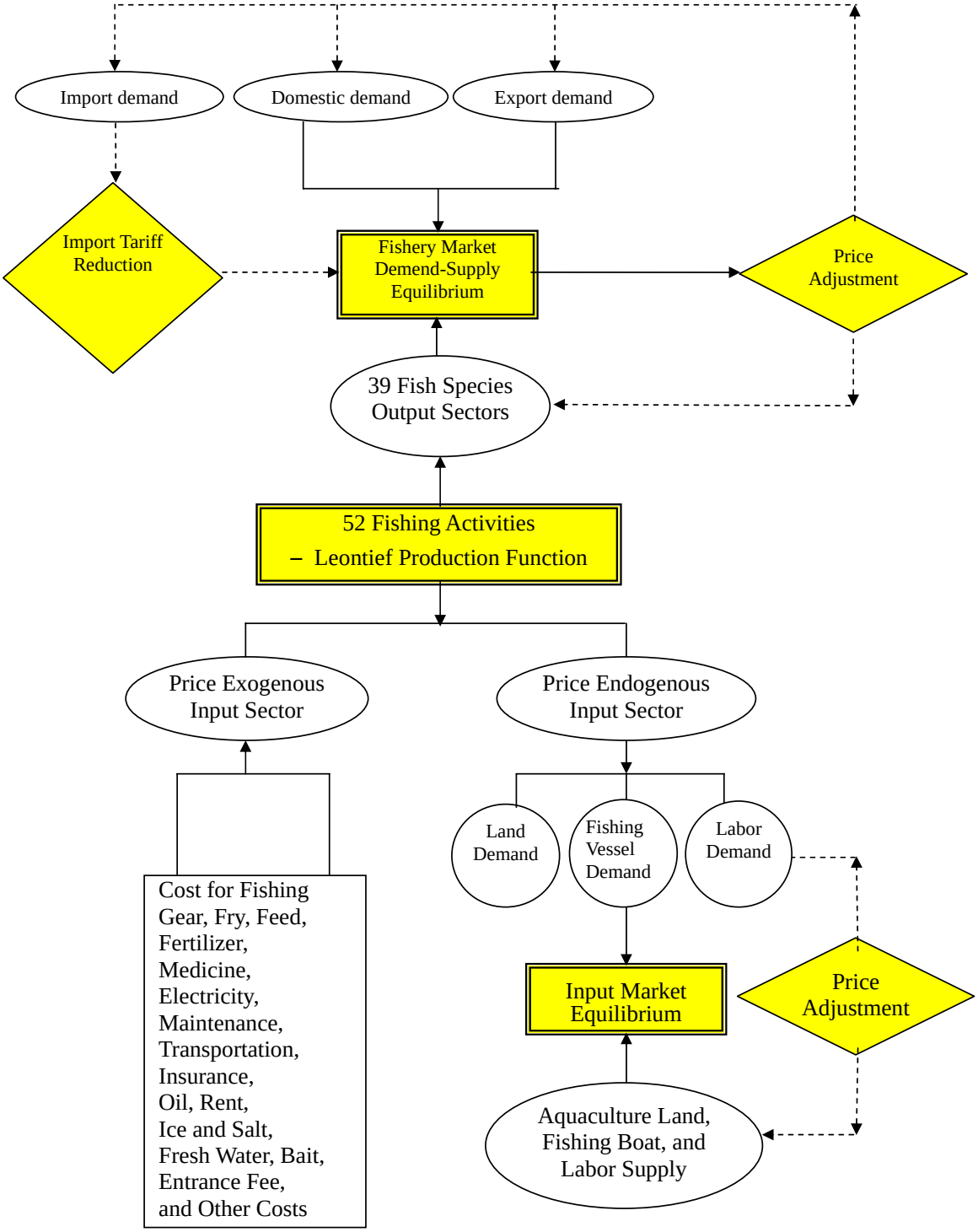

Figure1. Model Structure of the WTO Tariff Reduction on the Fisheries Sector via the Single-Sector Multi-Activities Partial Equilibrium Model

Table 1. The Percentage Changes of Various Macroeconomic Variables under Two General Equilibrium Scenarios of the Multi-Sectors CGE Model for WTO Tariff Reduction in Taiwan

Percentage Changes of Various Macroeconomic Variables	Long Run Closure	Short Run Closure
	Scenario 1. Employment Exogenous (%)	Scenario 2. Nominal Wage Exogenous (%)
Aggregate employment: wage bill weights	0.00	-0.87
Average nominal wage	-1.09	0.00
Average real wage	0.46	1.54
Nominal GDP from expenditure side	-1.81	-1.84
GDP price index, expenditure side	-1.84	-1.28
Real GDP from expenditure side	0.03	-0.57
Value of imports plus duty	3.00	1.67
Import volume index, C.I.F. weights	5.23	3.71
Export volume index	5.98	2.19
Consumer price index	-1.54	-1.51
Basic price of imported goods	-1.88	-1.80

Table 2. Impacts of the WTO Tariff Reduction on the Output of the Fisheries Sector in Taiwan via the Multi-Sector CGE Model under the Second Scenario Regime for WTO Tariff Reductions in Taiwan

Unit: %

Item / Sector	Output of commodities for local market (1)	Basic price of domestic goods (2)	Output value of domestic goods (3)=(1)+(2)	Total supplies of imported goods (4)	Basic price of imported goods (5)	Value of imported goods (6)=(4)+(5)	Employment Payment (7)
Aquaculture	-2.14	-2.15	-4.29	97.56	-10.67	86.89	-2.71
Distant Water Fisheries	0.08	-0.17	-0.09	31.84	-4.31	27.53	0.28
Offshore & Coastal fishery	-5.55	-5.18	-10.73	148.58	-14.34	134.24	-9.10

Table 3. Fan Decomposition of the Domestic Fisheries Products under the Second Scenario Regime of the Multi-Sector CGE Model for WTO Tariff Reductions in Taiwan

Unit：%

Sector \ Item	Local Market Effects	Import Share Effects	Export Effects	Total Effects
Aquaculture	3.65	-5.90	0.10	-2.14
Distant Water Fisheries	0.40	-0.88	0.57	0.08
Offshore & Coastal fishery	5.40	-10.97	0.01	-5.55

Table 4. Impacts of Various Economic Factors under the Second Scenario Regime of the Multi-Sector CGE General Equilibrium Model for WTO Tariff Reductions in Taiwan

Sector \ Item	Change of Commodity Outputs' Value (Mill. NT $)	Change of Import Value (Mill. NT $)	Employment Payment (Mill. NT $)
Fishery Products	**-4,016**	**3,843**	**-1,114**
Aquaculture	-1,494	1,557	-357
Distant Water Fisheries	-39	393	23
Offshore & Coastal Fishery	-2,483	1,893	-780

Table 5. Impacts of the WTO Tariff Reduction on the Output of the Fisheries Sector in Taiwan via the Single Sector Multi-activities Partial Equilibrium Model

Fishing Gear		Base Year	2004	% Change
Aquaculture	Output (M.T.)	257,551	239,147	-7.15%
	Revenue (1000 NT)	29,841,293	25,697,020	-13.89%
	Cost (1000 NT)	31,789,410	28,485,574	-10.39%
	Profit (1000 NT)	-1,948,117	-2,788,554	-43.14%
Distant Water Fisheries	Output (M.T.)	741,253	732,353	-1.20%
	Revenue (1000 NT)	57,897,639	55,296,057	-4.49%
	Cost (1000 NT)	34,547,667	34,489,024	-0.17%
	Profit (1000 NT)	23,349,972	20,807,034	-10.89%
Offshore & Coastal Fisheries	Output (M.T.)	237,636	218,302	-8.14%
	Revenue (1000 NT)	20,415,440	17,448,284	-14.53%

	Cost (1000 NT)	6,095,656	5,819,543	-4.53%
	Profit (1000 NT)	14,319,784	11,628,740	-18.79%
Aggregated Fisheries Sector	Output (M.T.)	1,236,441	1,189,803	-3.77%
	Revenue (1000 NT)	108,154,372	98,441,361	-8.98%
	Cost (1000 NT)	72,432,733	68,794,140	-5.02%
	Profit (1000 NT)	35,721,639	29,647,220	-17.00%
	Import Quantity (M.T)	86,795	163,222	88.06%
	Import Value (1000 NT)	19,595,811	25,293,979	29.08%
	Export Quantity (M.T)	357,625	355,846	-0.50%
	Export Value (1000 NT)	30,112,089	29,983,170	-0.43%

Table 6. The Impact of the WTO Tariff Reduction on the Iutput of the Fisheries Sector in Taiwan via the Single-Sector Multi-Activities Partial Equilibrium Model

Fishing Gear		Base Year	2004	% Change
Employment (1000 person day/year)	Total	36,248	34,103	-5.92%
	Aquaculture	26,054	24,207	-7.09%
	Distant Water Fisheries	5,258	5,245	-0.26%
	Offshore & Coastal Fisheries	4,936	4,651	-5.76%
Wage (NT $/person day)	Aquaculture	537	489	-8.86%
	Distant Water Fisheries	1,532	1,524	-0.52%
	Offshore & Coastal Fisheries	723	607	-16.02%
Land (ha.)	Aquaculture	56,719	52,493	-7.45%
Number of Fishing Vessel of Distant Water Fisheries	500-1000 ton	380	380	-0.03%
	200-500 ton	329	326	-0.82%
	100-200 ton	340	340	-0.03%
	Total Fishing Vessel	1,049	1,046	-0.29%
Number of Fishing Vessel of the Offshore and Coastal Fisheries	50-100 ton	446	433	-2.95%
	10-50 ton.	1,631	1,356	-16.91%
	0-10 ton.	1,124	1,062	-5.54%
	Powered Craft	1,572	1,456	-7.35%
	Purse Seine for Mackerel	8	8	0.00%
	Total Fishing Vessel	4,781	4,315	-9.75%