A Study on Taiwan's Food Dollar Series

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1   Introduction

With the rapid economic growth, such as trade liberalization, urbanization, diet change, and transformation of logistics, and so on, the processing, the transportation and the wholesaling shares of producing keep rising. Every stage of the food production including production, collection, processing, packaging, transportation, wholesaling, retailing, and finally to the consumers has its own cost, when the agricultural products are made. The produces which customers buy in the final market, mostly, have been already added up with costs. In other words, it implies the value of agricultural products increases while every stage of production proceeds in the agriculture.

Value-added agriculture which means value is added as agricultural products move from the producer to the consumer and is beneficial for both agriculture entrepreneurship and rural development to transform into the new prospect (Coltrain, Barton, and Boland, 2000; Lu and Dudensing, 2015). Lu and Dudensing (2015) suggest that it must take the producer and consumer into account while studying the value-added agriculture and know the whole picture of the agriculture if the government and institutes would like to make implement in the policy effectively on the agriculture sector.

In Taiwan, the agriculture sector contributed 2% of GDP, and 11% of GDP as measured in value-added agriculture including upstream and downstream (Council of Agriculture, 2014; Lin and Chang, 2004). Therefore, we have to focus not only on agriculture but on other industries related to agriculture. That is, the value chain of the overall agriculture. As for the consumption, "Food, Beverage and Tobacco, and Restaurants" has the highest portion of the distribution of total expenditures on household and is stable between 26% and 27%, and thus over one fourth of the expenditures from 2001 to 2014 (see Table 1.1). It reveals that food dollar expenditure is an important part to consumers.

Recently, Council of Agriculture (COA) advocates it is time for Taiwan's agriculture to transform into the newly value-added chain of agriculture and link the marketing sector to the agricultural production (COA, 2014). Nevertheless, the total budget was NT120 billion in 2015 and the subsidies policy in the total budget was accounted for 67%, remaining only 6% for the structural change policy (COA, 2015). Besides, there is no comprehensive study on the value-added agriculture now and the

government of Taiwan has been putting too much emphasis on the production agriculture. Regarding to the transformation of the agriculture, it still faces further big challenges in Taiwan.

Table 1.1 Percent Distribution of Total Expenditures

<div align="right">Unit: %</div>

Year	Food, beverage and tobacco, and Restaurants	Clothing and footwear	Housing, water, electricity, gas and other fuels	Furnishings, household equipment and routine household maintenance	Health	Transport and communication	Recreation, culture and education	Miscellaneous goods and services	Total
2001	26.27	3.66	25.08	2.59	11.43	12.12	12.04	6.82	100.00
2002	25.95	3.57	24.23	2.47	12.16	12.67	12.20	6.75	100.00
2003	25.78	3.53	24.38	2.43	12.52	12.50	11.99	6.88	100.00
2004	25.58	3.48	23.52	2.57	12.74	12.96	12.07	7.08	100.00
2005	25.52	3.41	23.77	2.51	13.19	12.97	11.75	6.88	100.00
2006	25.44	3.37	23.67	2.41	13.75	12.79	11.53	7.03	100.00
2007	26.15	3.27	23.91	2.48	14.11	12.90	11.23	5.95	100.00
2008	26.48	3.18	24.23	2.47	14.35	12.38	11.29	5.62	100.00
2009	26.05	3.19	24.30	2.53	14.45	12.73	11.04	5.71	100.00
2010	26.35	3.23	24.57	2.48	14.39	12.52	11.01	5.45	100.00
2011	26.38	3.10	24.39	2.49	14.62	13.00	10.39	5.63	100.00
2012	27.12	3.03	24.36	2.50	14.55	13.02	10.01	5.41	100.00
2013	26.87	2.98	24.27	2.46	14.67	13.37	9.73	5.65	100.00
2014	26.95	3.02	24.46	2.44	14.87	13.12	9.58	5.55	100.00
Average	26.21	3.29	24.22	2.49	13.70	12.79	11.13	6.17	100.00

Source: Directorate General of Budget, Accounting, and Statistics, 2015.

Other countries also aim at understanding the overall agriculture and food system, including Japan, Canada and the U.S. Especially for the U.S., the congress mandated the Agricultural Marketing Act of 1946 for ensuring the competitiveness of the marketing system implies that how important the relationship between farms and marketing is (Canning, 2011). For the purpose of that, the United States Department of Agriculture (USDA) Economic Research Services (ERS) has been contributing the analysis on the farm share and marketing bill since 1967. In 2006 and 2011, USDA ERS

released the publication "Food Dollar Series" and the revised version for describing the whole domestically produced food system of the U.S. by using the supply chain and input-output (I/O) analysis.

Since studying the interdependences between industry and final market sales, the relatively good way is to apply the I/O analysis using the I/O table for understanding the input structure of each industry and the interdependences among industries to analyze (Chang et al., 2009). As regard for the supply chain, it indicates the products supplied at each stage of production activities are different from the value chain. The extension of the supply chain is the value chain that values at each of the production including the primary production, the suppliers, the enterprises, the marketing, and finally to the consumers (Sun, 2014; Kirimi et al., 2011).

Under the transformation from production to value added in the agriculture, we study the whole food system from the food dollar expenditure and are concerned for if we spend NT100 on the food, this NT100 will go to where? It will return back to the farmers or go to the wholesaling industries or other industries related to the agriculture? Therefore, this paper seeks to demonstrate the distribution of the value-added in Taiwan's agriculture.

In summary, for understanding the overall food system and providing the framework of the value added agriculture in 10 years, this paper examines, with a filter of the U.S. ERS food dollar series, Taiwan's food dollar series through the final market demand by using the 2001, 2006 and 2011 I/O data, published by the Directorate-General of Budget, Accounting, and Statistics in Taiwan, demonstrating two denominations, which are nominal and real, and thus provides the effective policy implemented from the producers to the consumers to the increasing value-added and competiveness on the agriculture.

2 Food Dollar Series

According to Canning(2011), Food Dollar Series is a better way to understand the distribution of the overall value-added agriculture by analyzing U.S. consumers spend on the domestically produced food and using I/O accounts published by different ministries of the U.S. Originally, for understanding the agriculture and food distribution system, U.S. government mandated the Agricultural Marketing Act of 1946 to study on the shares of agricultural inputs and the food marketing. Therefore, USDA's ERS meet

the bill for estimating the marketing costs of the overall food system. Since then, many studies explored the food marketing costs.

For the research methods of the food dollar, Schluter, Lee, and LeBlanc (1998) first proposed the food marketing estimation by using I/O analysis. Elitzak (1999) measured price changes in price spread method and estimated the trend of the marketing costs. In 2011, Canning revised the estimation of the food dollar reported by USDA's ERS using supply chain and I/O analysis for further analysis of the domestically produced food system. Differences between the old and new method as follows: the old method, only estimated the distribution of the inputs and marketing of the food dollar, i.e. Food Marketing Bill Series; the new method, defined ten supply chain industries of the food dollar, assessing the value of each industries, and the shares of primary factors of industry group food dollar, called Food Dollar Series, which is composed of three primary series, including (1) the Marketing Bill Series, (2) the Industry Group Series, and (3) the Primary Factor Series.

Food Dollar Series is a new measurement on the agricultural research and provides the interesting way to explain our food expenditure. Not only the whole food system, but detailed agriculture sectors can also be decomposed and analyzed. Kelly, Canning, and Weersink (2015) decomposed the Marketing Bill Series into the detailed sectors by applying the Canadian database and they conducted the simulation to estimate how farm share changes as the input price changes.

Through food dollar series, we can understand the distribution of the food dollar which we pay for our daily expenditure from three different aspects, the establishment of the overall structure of the value-added agriculture, and the trend of the structural development in agriculture.

3 Methodology

Based on the Food Dollar Series published by USDA's ERS, this paper analyzes Taiwan's food dollar series from the final market by using Taiwan's input-output data. As described above, food dollar series is composed of three series, the marketing bill series, the industry group series, and the primary factor series. In the following sections, the database and methodology of three series applied in this paper will be defined and introduced.

3.1 Data

Consumers spend on agricultural products in the final market. It implies that food dollar expenditure is a final market sale (Canning, 2011). Input-output tables collected by industry, commerce, and service census and other sample surveys from the official reports meet the needs of the data usage and display in the form of matrix for measuring the interdependences between industry (agriculture) and final market sales (food dollar expenditure).

Input-output tables were first compiled by the senior American economist Wassily Leontief in 1931. As for Taiwan's input-output accounts, professor Mo-Huan Hsing was the earliest person to calculate the year 1954 of input output data in 1960. From 1954 to 1982, the input output accounts have been compiled for 10 years in Taiwan. Since 1982, Taiwan's input-output tables are conducted and published by the Directorate-General of Budget, Accounting and Statistics (DGBAS) reporting benchmark tables every 5 years and extended tables every 2 or 3 years. In 2011, input-output tables were classified with 52 sectors, 166 sectors, and 526 sectors and the classification of sectors vary from different years owing to the industrial development. The fundamental input-output table is composed of three parts, (1) intermediate transactions among industries, (2) primary factors of each sectors, and (3) final demands from consumption of commodities.

Since sector classification differs from years, this study displays sectors from Taiwan's I/O data used in the food dollar series in 2001, 2006, 2011 and the sector classifications of each year are shown in Appendix. Based on the Food Dollar Series published by USDA's ERS, this paper analyzes Taiwan's food dollar series from the final market by using Taiwan's input-output data. In the following section, the database and methodology of three series applied in this paper would be defined and introduced.

3.2 The Marketing Bill Series

The marketing bill series indicates the distribution of the food dollar between farm shares and food marketing shares. The food dollar expenditure is defined as domestic consumers' consumption of food which is produced by domestic farms and processed food from domestic processing industries. Farm shares means farmers' value that received from the food dollar and is measured as import-exclusive net farm sales divided by the sum of import-exclusive food dollar sales. The food marketing shares

represents the average value-added to farm production from consumers' food dollar expenditure and is calculated by food marketing bill, measured as the import-exclusive food dollar sales minus import-exclusive net farm sales, which is divided by the sum of import-exclusive food dollar sales.

The estimation of the farm share of the food dollar proceeds through two steps. First, the purpose of a total requirement matrix, also called Leontief matrix, is to calculate the agricultural output (gross farm sales) from either direct or indirect transactions among industries. Second, for avoiding double counting, farm to farm payments must be netted out from the gross agriculture output, defined as net farm sales. In addition, since using domestic I/O accounts in this paper, a measurement of gross farm sales is import-exclusive, the same as net farm sales. The equations of gross farm sales (x_A^{fd}) and net farm sales (x_A^{net}) associated with the food dollar expenditure are presented as follows:

$$x_A^{fd} = L_{A,C} \times y_C^{fd} \quad , \text{where } y_C^{fd} = \overline{S\_fd_C} \cdot y_C \tag{1}$$

where x_A^{fd} = gross farm sales associated with the food dollar expenditure.

$L_{A,C}$ = a section of the total requirement matrix and rows are agricultural commodities only.

y_C = a column vector of each final demand for all commodities.

y_C^{fd} = a column vector of each final demand for food.

S_fd = the share of each final demand for food dollar expenditure.

A = a set of agricultural sector/commodity groups.

C = a set of commodity groups.

fd = a set of food dollar bundle.

$^{-}$ = the symbol indicates a conversion into a square diagonal matrix.

$$x_A^{net} = x_A^{fd} - \left(A_{a,a} + \hat{A}_{a,a} \right) \cdot x_A^{fd} \tag{2}$$

where x_A^{net} = net farm sales associated with the food dollar expenditure.

$A_{a,a}$ = a matrix of farm to farm direct transactions of agricultural production for farm commodity.

$\hat{A}_{a,a} =$ a matrix of farm to farm indirect transactions of agricultural production for farm commodity.

The farm share is derived by eq1 and eq2 and the expression mandated by the Congress of the U.S. is shown below. In equation (3), the numerator is a summation of import-exclusive net farm sales and the denominator is a summation of import-exclusive food dollar sales. Further, both numerator and denominator in the equation of ERS marketing bill series must be eliminated imports through import shares. Nevertheless, Taiwan's I/O accounts have been separated into domestic and import, so we can calculate the farm share directly by using domestic matrices in this study and the equation is shown in equation(4).

$$\textbf{farm share\_US} = \frac{i_A'[x_A^{net} - \overline{S\_m_A} \cdot y_A^{fd}]}{i_C' \cdot [(\bar{\iota}_C - \overline{S\_m_C}) \cdot y_C^{fd}]} \tag{3}$$

$$\textbf{farm share\_Taiwan} = \frac{i_A' \cdot x_A^{net}}{i_C' \cdot y_C^{fd}} \tag{4}$$

where $S\_m =$ the share of import for all commodities or agricultural products.

i = indicates a unit vector.

3.3 The Industry Group Series

Depending on the different stages of production of agricultural products, the agri-food supply chain of Taiwan is divided into 10 industries related to agriculture, including "Farming and Agribusiness," "Food Processing," "Packaging," "Food Transactions," "Transportation," "Energy," "Food Services," "Finance and Insurance," "Legal, Accounting, and Bookkeeping," and "Advertising". Furthermore, the "Food Transactions" industry includes "Food Wholesaling" and "Food Retailing". The industry group series which is value contribution of each agri-food industry groups to food dollar expenditure shows the distribution of the food dollar among 10 agri-food industries.

A measure of the industry group series is estimated as equation (5) where the numerator is the value-added coefficient which equals 1 minus total intermediate input coefficient of each industry multiplier its corresponding industry outputs, namely the value-added of each industry group, and the denominator is the summation of final

demand of each industry groups. Both numerator and denominator must be netted out imports from US I/O data through import shares. In this research, we use domestic I/O accounts to assess industry group series of Taiwan and the equation is shown in equation(6).

In addition, since some inputs of agri-food industry groups including transportation, packaging, energy, finance and insurance, advertising, and legal, accounting, and bookkeeping are not all used for agriculture, this study estimates final demand and total output which are used for agriculture only by using the proportion of intermediate inputs on agriculture and food processing of each specific industry.

The industry group food dollar_US $= \dfrac{\overline{v\_m_S^*} \cdot x_S^{fd_{net}}}{y_S^{fd_{net}}} = \dfrac{\overline{v\_m_S^*} \cdot (x_S^{fd} - \overline{S_{-m_S}} \cdot y_S^{fd})}{(i_S - S_{-m_S})' \cdot y_S^{fd}}$ (5)

The industry group food dollar_Taiwan $= \dfrac{\overline{v\_m_S^*} \cdot x_S^{fd\_net}}{y_S^{fd\_net}}$ (6)

where $v\_m_S^*$ = the average domestic value-added coefficient of each industry.

$x_S^{fd\_net}$ = a vector of each import-exclusive output for agri-food industry groups.

$y_S^{fd\_net}$ = a vector of each import-exclusive final demand for agri-food industry groups .

x_S^{fd} = a vector of each import-inclusive output for agri-food industry groups.

y_S^{fd} = a vector of each import-inclusive final demand for agri-food industry groups .

S = the set of agri-food industry groups.

For understanding more detailed about the industry group series, we take Taiwan's I/O accounts for example by applying the final demand, total output, and value-added coefficient of each industry groups to measure the distribution of the agri-food industry group series. In Figure 3.1, the average domestic value-added coefficients of each industry group are shown in the row of primary input sectors and there are 10 value-added coefficients that correspond to the supply chain industry groups. For instance, v_5 is defined as the input coefficient of the "5" industry group.

3.4 The Primary Factor Series

There are four primary factors in Taiwan's I/O table, including "Worker salaries," "Operating surplus," "Consumption of fixed capital," "Taxes on production and imports" and represents the measurement of GDP by the income approach. The primary factor series points out the distribution of the food dollar on the primary factors of production. The definitions of four primary factors based on Taiwan's I/O table are as follows:

1. Worker salaries: labor compensation paid by the domestic private and public institutes plus benefits and allowances.

2. Operating surplus: interest, rent, transfer expenses and profits.

3. Consumption of fixed capital: fixed capital consumed during production, also called depreciation denotes the regular consumption of capital goods.

4. Taxes on production and imports: taxes paid by the domestic industries except for the income taxes include net commodity taxes, net import duties, value-added taxes, and other taxes, less subsidies.

The primary factor series is measured to be as the value-added of primary factors of each industry group divided by the summation of final demand of each industry groups. It is a similar measurement as the industry group series; the biggest difference is the subscript between the industry group series and the primary factor series. The industry group series is estimated by using supply chain industries, subscript S shown in equation (5) and the primary factor series is used by primary factors, subscript P shown in equation (7). Similarly, the primary factor series of ERS must be eliminated imports by using import shares and we can calculate the primary factor series of Taiwan by using Taiwan's I/O data directly in the research. The equation of primary factor series for the US and Taiwan as indicated in equation (7) are the same.

$$\text{The primary factor food dollar} = \frac{v\_m_{P,S}^{*} \cdot x_{S}^{fd\_net}}{y_{S}^{fd\_net}} \tag{7}$$

where $v_m_{P,S}^{*} = $ the value-added coefficient of primary factor of each industry.

For understanding more detailed about primary factor series, we take Taiwan's I/O for example to consider the input coefficients table of domestic goods and services published by DGBAS. Assuming that there are five industry groups of the agri-food supply chain and four primary factors of each industry group, it means every industry has four primary factors of production and a basic I/O table displays there are 20 value-

added coefficients in Figure 3.2. The notation $v_{P,S}$ is defined as the value coefficient of primary factor of each industry group. For instance, v_{32} represents the value-added coefficient of "consumption of fixed capital" of the "3" industry group.

Figure 3. 1 The value-added coefficient of the industry group series_I/O

Input \ Output		Intermediate Demand Sectors (agri-food)										Final Demand Sectors
		1	2	3	4	5	6	7	8	9	10	
Intermediate Input Sectors (agri-food)	1											Final Demand (value-added)
	2											
	3					Intermediate Input						
	4											
	5											
	6											
	7											
	8											
	9											
	10											
Primary Input Sectors (value-added, v_S)		v_1	v_2	v_3	v_4	v_5	v_6	v_7	v_8	v_9	v_{10}	

Source: DGBAS(2015) and this study.

Figure 3.2 The value coefficient of the primary factor series_I/O

Input \ Output		Intermediate Demand Sectors (Agri-food)					Final Demand Sectors
		1	2	3	4	5	
Intermediate Input Sectors (Agri-food)	1						Final Demand (Value-added)
	2						
	3			Intermediate Input			
	4						
	5						
Primary Input Sectors (value-added coefficient, $v_{P,S}$)	1	v_{11}	v_{12}	v_{13}	v_{14}	v_{15}	
	2	v_{21}	v_{22}	v_{23}	v_{24}	v_{25}	
	3	v_{31}	v_{32}	v_{33}	v_{34}	v_{35}	
	4	v_{41}	v_{42}	v_{43}	v_{44}	v_{45}	

Source: DGBAS (2015) and this study.

4　Empirical Results

4.1 The Marketing Bill Series

The marketing bill series indicates the distribution of the food dollar between farm and food marketing bill. In 2011, farm share is 22.7% which implies that almost NT23 received by farmers as consumers spend NT100 on food expenditure, as shown in figure 4.1.

Further analysis of the trend of farm shares in 10 years is reported in Table 4.1.1, in which farm share has the decreasing trend from NT25 to NT23 and the food marketing share shows the increasing trend.

$22.7 Farm share　$77.3 Food marketing share

Figure 4.1 The Marketing Bill Series_2011

Source: this study.

Table 4.1.1 The Marketing Bill Series_nominal_2001~2011

Year	2001	2006	2011
Farm Share	24.96	24.00	22.66
The Food Marketing Share	75.04	76.00	77.34
Total	100.00	100.00	100.00

Source: this study.

Next, this study takes year 2011 as the base year to measure the deflator of nominal marketing bill series, shown in Table 4.1.2. After considering the inflation, due to the drop in the price level, the real farm shares in 2001 and 2006 increased roughly NT2 compared to the nominal farm shares. However, it appeared a great gap from 2006 to 2011. The raw materials and oil prices rise rapidly in 2006-08, causing the domestic prices rise up. Hence, farm share in real level sharply reduced from 2006 to 2011.

Table 4.1.2 The Marketing Bill Series_real_2001~2011

Year	2001	2006	2011
Farm Share	26.52	26.79	22.66
The Food Marketing Share	73.48	73.21	77.34
Total	100.00	100.00	100.00

Source: this study.

We further observe consumer price index (CPI) and wholesale price index (WPI) announced by DGBAS (2016) shown in Figure 4.2. CPI represents the standard of living of consumers' consumption and WPI is a measure of price index used by the wholesaling prices, including intermediate input which implies production cost. Figure 4.2 shows that the base year (2011) is a cutoff. Before 2011, the price levels are low compared to the base year and the price levels are high comparatively from 2012 to 2015. Especially, WPI rose larger than CPI in 2008. Although world food prices increased dramatically, producers were afraid of raising the price owing to the low demand of consumers market (Yu and Wang, 2011). In addition, food consumption accounts for the proportion of income decline and the consumption patterns change recently, lead to a decrease in average cereal consumption, but the food processing tends to increase (Hsiao, 2008). Therefore, the increasing in international cereal prices has lower effects on domestic food prices so that CPI has smaller changes than WPI from 2007 to 2008.
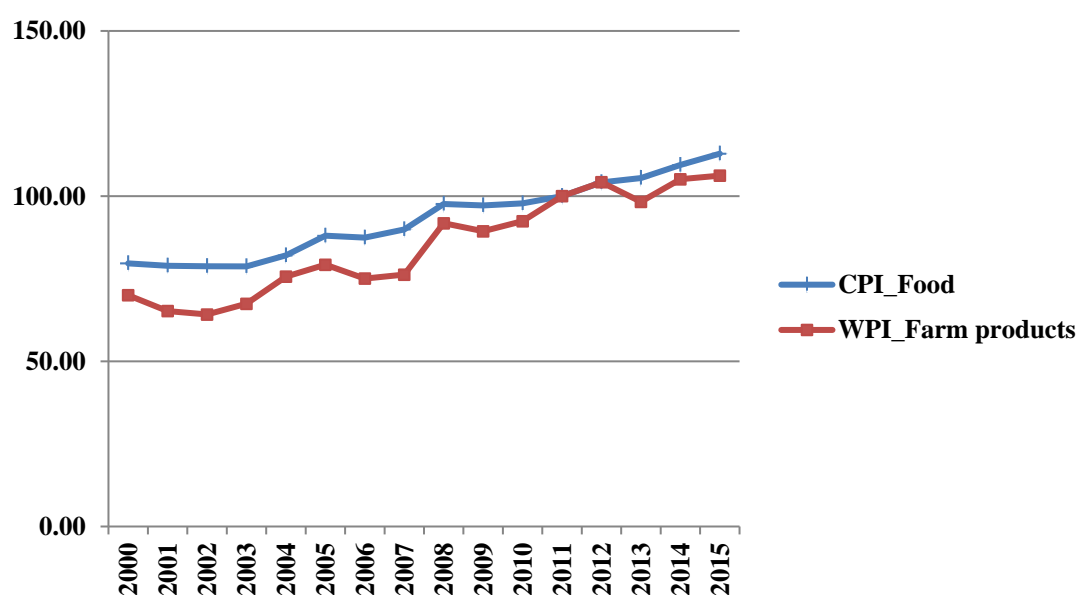

Figure 4.2 Index of farm and food products prices_2000~2015

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Note: CPI = Consumer Price Index; WPI = Wholesale Price Index.

As final consumer demand weakens and the supply remains constant, market price will fall, resulting in reduction of farmers' revenues. If coupled with rising world food prices, farmers' earning will get less. In 5 years, the impact of the food prices on farmers reflected in the essence of the 2011 farm share in real level, lead to the decline from NT27 in 2006 to NT22 in 2011.

4.2 The Industry Group Series

The industry group series demonstrates the distribution associated with food dollar among 10 agri-food industries. It defined the supply chain industry groups including "Farming and Agribusiness," "Food Processing," "Packaging," "Food Transactions," "Transportation," "Energy," "Food Services," "Finance and Insurance," "Legal, Accounting, and Bookkeeping," "Advertising" in this paper. The results suggest that the top four supply chain industries are "Food Transactions" (35.2%), "Food Services" (21.0%), "Food Processing" (18.9%), and "Farming and Agribusiness" (18.8%).

It is worth noting that the farm share in the marketing bill series differs from "Farming and Agribusiness" in the industry group series. Difference between them is that "Farming and Agribusiness" does not include nonfarm value-added. Therefore, in 2011, farm share is NT22.7 and in that NT3.9 comes from nonfarm value-added industries.

Furthermore, the trend of value-added among supply chain industries in 10 years in Table 4.2.1 shows that the "Farming and Agribusiness" industry exhibits the decreasing trend. The share of the "Food Processing" industry was decline in 2006 due to labeling of traceable agricultural products and the validation on "ISO22000 food safety management system" in keeping with the policy implement on food safety promoted by Taiwan's government in 2004. In addition, the food processing industries are small-medium enterprises. If the small firms decide to engage in the food safety, the costs of the processed management will rise. Otherwise, some firms exit the market. The big firms have more sufficient funds than the small firms to establish the food safety system by integrating the upstream and downstream industries. That is the reason why the share of the "Food Processing" industry rise back in 2011.

The "Food Transaction" industry had the decreasing trend from 2001 to 2006 and

rises afterwards. It coincides with the trend of "Food Processing" industry in the opposite direction. The main reason of the trend is that, for avoiding the import shocks on agricultural products since joining WTO in 2002, the government put emphasis on the enterprise management in agricultural business and the integration of industry value chain resulting in the increasing trend of the "Food Transaction" industry in 2006. In 2011, some fruit and vegetable markets shut down almost 20 to 30 markets owing to shrinking supply and with obsolete equipment (Hsu, 2011). That's why the share of the "Food Transaction" industry decreases from 2006 to 2011 but still dominates the highest portion of the industry group series.

Between 2001 and 2011, the "Food Services" industry has shown an increasing trend from NT17 to NT21. It implies that Taiwan's consumers tend to go out to eat and drink more often from 2001 to 2011. Instead, other industry groups of value-added have low shares and small changes during these 10 years.

Table 4.2.1 Industry Group Series_nominal_2001~2011

Unit: NT dollars

Industry Group Series	2001	2006	2011
Farming and Agribusiness	**21.25**	**19.10**	**18.79**
Food Processing	**18.83**	**16.51**	**18.89**
Packaging	1.08	1.08	1.10
Food Transactions	**34.84**	**39.97**	**35.21**
Transportation	1.49	1.14	0.77
Energy	1.98	3.09	2.89
Food Services	**17.33**	**17.59**	**20.97**
Finance and Insurance	2.83	1.10	0.85
Legal, Accounting, and Bookkeeping	0.05	0.03	0.03
Advertising	0.31	0.40	0.49
Total	100.00	100.00	100.00

Source: this study.

As the previous section mentioned, we deflate nominal value to real value through base year 2011 for measuring the real industry group series and the results are shown in Table 4.2.2. The real value of distribution of value-added among industry group only has small changes compared to the nominal industry group series and the trend is also similar to the nominal value. It is clear that the real value of the "Food Transactions"

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industry in 2006 is lower than the nominal value of NT 4 and implies that the 2006 GDP deflator index of wholesaling and retailing are higher than the base period. In the following section, we will further analyze the difference between nominal and real value of the industry group series by using the primary factor series.

Table 4.2.2 Industry Group Series_real_2001~2011

Unit: NT dollars

Industry Group Series	2001	2006	2011
Farming and Agribusiness	**22.80**	**21.16**	**18.79**
Food Processing	**18.11**	**15.17**	**18.89**
Packaging	0.96	1.29	1.10
Food Transactions	**35.02**	**39.87**	**35.21**
Transportation	1.51	1.13	0.77
Energy	1.05	2.23	2.89
Food Services	**17.95**	**17.86**	**20.97**
Finance and Insurance	2.23	0.93	0.85
Legal, Accounting, and Bookkeeping	0.05	0.02	0.03
Advertising	0.32	0.35	0.49
Total	100.00	100.00	100.00

Source: this study.

4.3 The Primary Factor Series

The primary factor series is separated from the primary factor of each agri-food industry group into four primary factors, including labor compensation, operating surplus, consumption of fixed capital, and taxes on production and imports to assess the allocation of food dollar on the primary factor of production.

In 2011, the primary factor share of Taiwanese worker salaries is NT 55.6, NT29.1 for operating surplus. It obviously reveals that the domestic labor compensation dominates the highest portion, and over half of the primary factor food dollar expenditure.

Table 4.3.1 reports the trend of distribution of primary factors in 10 years. "Worker salaries" accounts for the largest proportion of the food dollar. However, as time goes on, agricultural machinery has got progressively larger and the labor intensive of production has declined lead to the decreasing trend of worker salaries from 2001 to 2011. On the contrary, the profits of the agriculture and other industries related to

agriculture rise from NT 21.4 to NT 29.1. "Consumption of Fixed Capital" and "Taxes on Production and Imports" have changed slightly, accounting for about 15% of the overall distribution of primary factors.

Eliminating the inflation, this paper measures the distribution of primary factors in real level by using GDP deflator of each industry, shown in table 5.3.2. Overall, the values in real level are similar to the nominal level. From 2001 to 2011, the real wages are higher than the nominal wages and have shown a downward trend in 10 years. In contrast, the real operating surplus is lower than the nominal surplus. The remaining primary factors in real level have slightly changes.

Table 4.3.1 Primary Factor Series_real_2001~2011

Unit: NT dollars

Primary Factor Series	2001	2006	2011
1.Worker salaries	**65.10**	**57.12**	**55.59**
2.Operating surplus	**21.00**	**29.40**	**29.08**
3.Consumption of fixed capital	8.02	7.51	8.12
4.Taxes on production and imports	5.87	5.97	7.21
Total	100.00	100.00	100.00

Source: this study.

In addition, to understand the thorough trend of primary factor among 10 industry groups, we do the further analysis of four primary factors by subdividing each primary factor into 10 industries. Value-added contribution of each industry is equals to the summation of the four primary factors of each industry groups. In terms of worker salaries, the main factors of the decreasing trend are originated from the "Farming and Agribusiness" industry and the "Food Transactions" industry and the remaining industries have a decreasing trend, except for the "Food Services" industry. With regard to operating surplus, the share of operating surplus rises mainly from the increasing trend in the "Farming and Agribusiness" and "Food Processing" industries and other industry group have small variations. It is worth noting that "Taxes on production and imports" of the "Farming and Agribusiness" industry from 2001 to 2011 are negative since farmers pay no taxes and receive farm subsidies from the government also. Hence, the share of subsidies has kept rising in 10 years.

As for the real value of the primary factor series, the results are presented in table 4.3.3. In general, the nominal and real values of primary factors are substantially the

same. Further analysis of each real primary factor, real labor compensations have shown a downward trend from 2001 to 2011, except for the "Energy" industry; real surplus in 2006 is higher than 2001 and 2011 due to the decline of real consumption of fixed capital of the "Farming and Agribusiness" industry and the "Food Processing" industry. In real taxes on production and imports, the "Food Transactions" and "Energy" industry are the major factors of the increasing trend. According to Department of Statistic of Ministry of Economic Affairs, total revenue in Food and Beverage wholesaling and retailing industry of 2001 dramatically increased from NT 806 billion to NT 1,369 billion of that in 2011, so it is required for the "Food Transactions" industry to pay more sales tax. As to the "Energy" industry related to the agriculture, affected by the international oil prices in 2006 caused the electricity costs and the oil costs rise. After the removal of the price inflation, it demonstrates that the governments provided the subsidies on electricity and oil including agricultural machinery and fishery but the burden of farmers on energy costs were still high.

Additionally, we do the further analysis of results in real value for the top four supply chain industry group. In the "Farming and Agribusiness" industry, all of the real primary factors are higher than nominal values in 2001 and 2006; there are the same trends after eliminating the price inflation. On the contrary, most of real primary factors in the "Food Processing" industry are lower than nominal values and it reveals that GDP deflator index for the "Food Processing" industry in 2006 is higher than the base year.

As for the "Food Transactions" industry, real wages and operating surplus merely have little changes. Both real and nominal wages show a decreasing trend; real and nominal surplus in 2006 are higher than of that in 2001 and 2011. Moreover, based on the statistics of COA, employment in the "Food Transactions" industry over the period 2006 to 2014 have been climbing from 366 thousand people to 453 thousand people and this represents a 23.77% increase as shown in Table 4.3.4. And, the valued added rate of the "Food Transactions" in 2006 was 65%, but the remaining 60% to 2011. The average real worker salaries are likely to have been pulled down owing to increase in employment and failure of adding value. This situation can also be seen from Table 4.3.4. In that, the "Food Transactions" industry shows real wages has the significant downward trend and real operating surplus has slow growth or no growth from 2001 to 2011.

Finally, in the "Food Services" industry, the primary factors in real value in 2001

and 2006 are higher than that of in nominal value. Real operating surplus and taxes on production and imports are on the rise in 10 years; real wages move up and down. From 2006 to 2014, employment has a substantial increase in the "Food Services" industry, an increase of 16.56%, but the value-added rate remains around 50%. Therefore, corporate earnings have increased only, and worker salaries have not.

Table 4.3.3 Primary Factor Series by Industries_real_2001~2011

Unit: NT dollars

Industry Group by Primary factor	2001	2006	2011
Farming and Agribusiness	**22.80**	**21.16**	**18.79**
Worker salaries	15.70	12.78	10.38
Operating surplus	5.17	7.75	8.56
Consumption of fixed capital	2.44	1.67	1.25
Taxes on production and imports	-0.51	-1.05	-1.39
Food Processing	**18.11**	**15.17**	**18.89**
Worker salaries	8.02	7.93	8.65
Operating surplus	2.89	1.54	2.96
Consumption of fixed capital	2.44	1.63	1.81
Taxes on production and imports	4.77	4.06	5.48
Packaging	**0.96**	**1.29**	**1.10**
Worker salaries	0.67	0.91	0.66
Operating surplus	0.12	0.15	0.27
Consumption of fixed capital	0.14	0.20	0.14
Taxes on production and imports	0.03	0.04	0.03
Food Transactions	**35.02**	**39.87**	**35.21**
Worker salaries	24.74	21.65	19.29
Operating surplus	8.32	15.71	13.37
Consumption of fixed capital	1.43	1.67	1.88
Taxes on production and imports	0.53	0.84	0.68
Transportation	**1.51**	**1.13**	**0.77**
Worker salaries	1.06	0.63	0.45
Operating surplus	0.09	0.19	0.12
Consumption of fixed capital	0.29	0.28	0.19
Taxes on production and imports	0.06	0.03	0.01
Energy	**1.05**	**2.23**	**2.89**
Worker salaries	0.22	0.31	0.55
Operating surplus	0.18	0.00	-0.74

Industry Group by Primary factor	2001	2006	2011
Consumption of fixed capital	0.22	0.44	1.26
Taxes on production and imports	0.43	1.48	1.83
Food Services	**17.95**	**17.86**	**20.97**
Worker salaries	13.41	12.28	14.87
Operating surplus	3.16	3.53	4.07
Consumption of fixed capital	0.95	1.52	1.49
Taxes on production and imports	0.44	0.53	0.54
Finance and Insurance	**2.23**	**0.93**	**0.85**
Worker salaries	1.01	0.39	0.41
Operating surplus	1.02	0.43	0.33
Consumption of fixed capital	0.09	0.08	0.08
Taxes on production and imports	0.12	0.04	0.04
Legal, Accounting, and Bookkeeping	**0.05**	**0.02**	**0.03**
Worker salaries	0.04	0.02	0.02
Operating surplus	0.01	0.01	0.01
Consumption of fixed capital	0.00	0.00	0.00
Taxes on production and imports	0.00	0.00	0.00
Advertising	**0.32**	**0.35**	**0.49**
Worker salaries	0.25	0.23	0.30
Operating surplus	0.05	0.10	0.15
Consumption of fixed capital	0.02	0.02	0.03
Taxes on production and imports	0.01	0.01	0.01
Total	100.00	100.00	100.00

Source: this study.

Table 4.3.4 Employment in "Food Transactions" and "Food Services"

Unit: thousand persons

Employment	2006	2007	2008	2009	2010	2011	2012	2013	2014
Food Transactions*	366	438	444	437	432	438	439	447	453
Food Services	616	635	642	642	667	670	689	710	718

Source: COA (2015) and this study.

Note*: Food Transactions includes "Food Wholesaling" and "Food Retailing".

5 Conclusions

For understanding the distribution and changes of value-added agriculture of Taiwan's agri-food system in 10 years, this research calculates Taiwan's Food Dollar Series by using Taiwan's input-output accounts from three different aspects, (1) The Marketing Bill Series; (2) The Industry Group Series; (3) The Primary Factor Series. The empirical results of the Taiwan's food dollar series from 2001 to 2011 is supported by the following evidences.

First, the marketing bill series indicates that if the consumers' total expense on domestically produced food is NT100; however, farm share is 22.7% in 2011, namely, a mere NT22.7 was earned by Taiwanese farmers. And, the farm share has the decreasing trend from NT25 to NT23 and the food marketing costs shows the increasing trend. It implies that if the government continues to neglect earnings that farmers received, farm value will be shrinking over time. Since the government considers value chain and supply chain as agricultural policy oriented, the marketing share will be expanding. It doesn't mean the government has nothing can do for farmers and agriculture. Taiwan's government can learn from the U.S. or other countries to combine agriculture with technology to develop green energy for increasing the value-added of farm products and improving farmers' living. Furthermore, with facing the crisis of population aging, low fertility, and high emigration, the formulation of government policy on agriculture still plays an important role for making the agriculture be more stable and sustainable in Taiwan.

Second, the industry group series suggest that the top four supply chain industries are "Food Transactions" (35.2%), "Food Services" (21.0%), "Food Processing" (18.9%), and "Farming and Agribusiness" (18.8%) in 2011. During the past decade, the "Food Transactions" industry accounts for the largest portion. After all, it would not be easy for consumers to buy agricultural produces from farmers or farms directly, so consumers purchase agricultural products or food through traditional market, supermarket, and hypermarket. The "Food Services" industry has shown an increasing trend from 2001 to 2011 due to increased consumption of eating out. Therefore, policy on agricultural development should consider both producers and consumers preferences with the times.

Nevertheless, the "Farming and Agribusiness" industry declines during the study

period time. Since the value-added distribution is a relative concept, it represents other three industry groups increase faster than the "Farming and Agribusiness" industry. The trend of value-added of the "Food Processing" industry is more stable than others except for the year 2006, but rises up in 2011. Nowadays, the "Food Processing" industry set off a storm of food safety since 2011. Consumers show high awareness of the perception on food and nutrition labels and make changes to eat healthier, so the "Food Processing" industry must be innovative and have considerations from the perspective of consumers to avoid reducing value-added constantly. Therefore, government can implement agricultural policy on each of the top four supply industry groups to add value.

Third, the primary factor series shows the distribution of four primary factors. In 2011, the primary factor share of Taiwanese worker salaries is NT55.6, NT29.1 for operating surplus. From 2001 to 2011, worker salaries has shown a downward trend and operating surplus is in a opposite direction.

Finally, this study compares Taiwan's food dollar series with ERS'. Owing to a different farm size and land size of Taiwan from the U.S., farm share in Taiwan is higher than the U.S. and the big difference between Taiwan and U.S. is that the marketing costs in Taiwan exhibits an increasing trend in 10 years. However, the marketing costs in the U.S. declines gradually. In the industry group series, the overall distribution of value-added share is similar to the U.S. food dollar series and the remaining industries have low shares compared to the ERS food dollar series. It is because there are many SMEs that are diseconomies of scale on production in the agricultural sectors in Taiwan, the value-added shares focus on the top four supply industry group relatively. As for the primary factor series, Taiwanese labor compensations and property income are higher than the U.S. Obviously, Taiwan has a small farm size and less mechanization, so the share of worker salaries and property income in Taiwan are higher than the ERS comparatively.

This paper uses Taiwan's I/O table to measure Taiwan's Food Dollar Series, understanding the food system in Taiwan during 10 years and compares the results between Taiwan and U.S. However, due to the limitation on the data usage, the study period has five years gap from now on and this year (2016) is exactly the year that I/O accounts published. Thus, if the 2016 data can be included in the calculation, the research will be much more comprehensive to analyze the trends of agri-food system in the long run in Taiwan. In addition, if it is feasible to collect I/O data from other

smallholder countries to measure their food dollar series and thus compare with them, it will contribute for us to further understand the overall smallholders' agricultural development and policy making in the future study.

Reference

Alonso, Abel Duarte, Jeremy Northcote, 2013. "Investigating Farmers' Involvement in Value-added Activities: A Preliminary Study from Australia," *British Food Journal*. 115(10): 1407-1427.

Canning, Patrick, 2011. "A Revised and Expanded Food Dollar Series: A Better Understanding of Our Food Cost," Research Report NO.114. Economics Research Service, United States Department of Agriculture.

Chang, Cheng-Lun, Shih-Wei Chen, Ke-Chung Peng, and Jyh-Ping Young, 2009. "The Analysis of Inter-industry Relations on Agribusiness in Taiwan," *Chinese Journal of Agribusiness Management*. 14: 1-23.

Coltrain, David, David Barton, and Mickael Boland, 2000. "Value Added: Opportunities and Strategies," Arthur Capper Cooperative Center, Department of Agricultural Economics, Kansas State University. Available online: http://www.agmanager.info/agribus/busdev/valaddref/VALADD10%202col.pdf. http://www.coa.gov.tw/show_news.php?cat=show_news&serial=coa_diamond_2 0130221203622.

Council of Agriculture, 2014. Agriculture Statistics Yearbook. Taipei, Taiwan.

Council of Agriculture, 2015. Central Government General Budget Bill. Taipei: Council of Agriculture.
Available online:
http://www.coa.gov.tw/htmlarea_file/web_articles/coa/8973/104.pdf.

Coyle, William T., 2007. "The Future of Biofuels: A Global Perspective," Amber Waves. 5(5): 24-29. Available online: http://purl.umn.edu/125366.

Directorate General of Budget, Accounting, and Statistics, 2014. *Input-Output Table: Sector Classification.* Taipei: Directorate General of Budget, Accounting, and Statistics. http://www.stat.gov.tw/public/Data/51692441A8RC8SAF.pdf.

Directorate General of Budget, Accounting, and Statistics, 2015. *The Survey of Family Income and Expenditure*. Taipei: Directorate General of Budget, Accounting, and Statistics.

Directorate General of Budget, Accounting, and Statistics, 2016. *Price Index*. Taipei: Directorate General of Budget, Accounting, and Statistics.

Elitzak, Howard, 1999. "Food Cost Review, 1950-97," Washington DC: United States

Department of Agriculture, Economic Research Service, Agricultural Economic Report No. 780: 19-23.

Available online: http://www.ers.usda.gov/Publications/AER780.

Katz, Jeffrey P. and Michael Boland, 2000. "A New Value-added Strategy for the US Beef Industry: The Case of US Premium Beef Ltd," *British Food Journal*. 102(9): 711-727.

Kelly, Jessica, Patrick Canning, and Alfons Weersink, 2015. "Decomposing the Farmer's Share of the Food Dollar," *Applied Economic Perspectives and Policy*. 37(2): 311-331.

Kirimi, Lilian, Nicholas Sitko, T.S. Jayne, Francis Karin, Milu Muyanga, Megan Sheahan, James Flock, and Gilbert Bor, 2011. "A Farm Gate-To-Consumer Value Chain Analysis of Kenya's Maize Marketing System," paper presented at Tegemeo Working Paper No. 44. Nairobi, Kenya: Egerton University, Tegemeo Institute. Available online: http://purl.umn.edu/202597.

Huang, Biing-Wen, Ching-Chih Shao, and C.W. Feng, 2008. "A Study on the Value-added Sharing System of Strategic Alliance in Broiler Industry," *Journal of the Agricultural Association of Taiwan*. 9(1): 73-88.

Leontief, Wassily, 1986. *Input-output Economics, Second edition*. New work: Oxford University Press.

Lin, Hsing-Chun and Ching-Cheng Chang, 2004. "Agricultural Value Added and Input-Output Analysis in Taiwan," *Taiwanese Agricultural Economic Review*. 10(1): 1-24.

Lin, Sue-Jane, 2003. "Evaluation Indices for Industry Patterns and Grey Relationship Analysis (II)," National Science Center, Executive Yuan. NSC92-2415-H006-008. Department of Environment Engineering, National Cheng Kung University. Available online: http://ir.lib.ncku.edu.tw/handle/987654321/58886.

Liu, Chien-Zer and Biing-Wen Huang, 2006. "From the Viewpoints of Blue Ocean Strategy to Investigate the Issues and Strategies of Agricultural Development in Taiwan," *Journal of Agriculture and Forestry*. 55(4): 293-304.

Lu, Ruoxi and Rebekka Dudensing, 2015. "What Do We Mean by Value-added Agriculture?" *Choices: The Magazine of Food, Farm, and Resource Issues*. 30(4): 1-8.

Padilla-Zakour, Olga I., 2004. "Promoting the Development of Value-added Specialty Foods Through University-based Food Venture Centers," *Journal of Food Service*. 69(3): CRH110-CRH112.

Schluter, Gerald, Chinkook Lee, and Michael LeBlanc, 1998. "The Weakening Relationships between Farm and Food Prices," *American Journal of Agricultural Economics*. 80(5): 1134-1138.

United States Department of Agriculture, 2015. "Number of U.S. Farmers Markets Has Nearly Tripled over the Last 15 Years," Washington DC: United States Department of Agriculture, Economics Research Services. Available online: http://www.ers.usda.gov/data-products/chart-gallery/detail.aspx?chartId=53464.

Wang, Kuang-Cheng and Chung-Yih Tsai, 2010. "Quality Upgrading Policy for the Pig Feeding Industry: An Example in Taipei County," *Agricultural and Resources Economics*. 7(1): 23-53.

Wang, Jiun-Hao, 2015. "Recruiting Young Farmers to Join Small-Scale Farming in EU: A Structural Policy Perspective," *Journal of the Agricultural Association of Taiwan*. 16(1): 1-17.

Wolfe, Kelly L. and Rui Hai Liu, 2003. "Apple Peels as a Value-added Food Ingredient," *Journal of Agricultural and Food Chemistry*. 51(6): 1676-1683.

Woo, Rhung-Jieh, 2004. "The Development and Challenge of Taiwan's Agriculture under Globalization," *Chung-Hsing Journal of History*. 15: 163-170. Available online: http://nchuir.lib.nchu.edu.tw/handle/309270000/143164.

Yang, Chin-Wen, 2012. "Measurement of Energy Efficiency and Its Linkage to Environmental Policy Instruments," *Taipei Economic Inquiry*. 48(2): 287-317. Available online:http://www.ntpu.edu.tw/econ/files/Journal/20120907110637.pdf.

Appendix: Sector Classification with 166 Sectors for 2001, 2006, 2011

Year	2001		2006		2011	
Supply chain industry	Sector NO.	Sector	Sector NO.	Sector	Sector NO.	Sector
Farming and Agribusiness	001	Paddy Rice	001	Paddy Rice	001	Paddy Rice
	002	Coarse Grain Crops	002	Cereals (except Rice)	002	Cereals (except Rice)
	004	Other Special Crops	003	Special Crops	003	Special Crops
	006	Vegetables	005	Vegetables	004	Vegetables
	005	Fruits	004	Fruits	005	Fruits
	007	Other Horticultural Crops	006	Other Horticultural Crops	006	Other Horticultural Crops
	008	Hogs	007	Hogs	007	Hogs
	009	Other Poultry & Livestock	008	Other Poultry & Livestock	008	Other Poultry & Livestock
	010	Agricultural Services	009	Agricultural Services	009	Agricultural Services
	011	Forestry	010	Forest Products	010	Forest Products
	012	Fishery Products	011	Fishery Products	011	Fishery Products
Food Processing					015	Slaughtering & By-Products
					016	Frozen and Processed Meat
	017	Slaughtering & By-Products	016	Slaughtering & By-Products	017	Frozen and Processed Fish, Crustaceans and Molluscs
					018	Frozen and Processed Fruit and Vegetables
	018	Edible Oil & Fat By-Products	017	Edible Oil & Fat By-Products	019	Oil, Fat & by-Products
	027	Dairy Products	025	Dairy Products	020	Dairy Products

Year	2001		2006		2011	
Supply chain industry	Sector NO.	Sector	Sector NO.	Sector	Sector NO.	Sector
	020	Rice	019	Rice	021	Rice
	019	Flour	018	Flour	022	Flour
	022	Animal Feeds	021	Animal Feeds	023	Animal Feeds
	028	Sugar Confectionery & Bakery Products	026	Sugar Confectionery & Bakery Products	024	Sugar Confectionery & Bakery Products
	021	Sugar	020	Sugar	025	Sugar
	025	Monosodium Glutamate	024	Seasonings	026	Seasonings
	029	Other Foods	027	Other Foods	027	Other Foods
	023	Canned Foods	022	Canned Foods		
	024	Frozen Foods	023	Frozen Foods		
	031	Alcoholic Beverages	028	Alcoholic Beverages	028	Alcoholic Beverages
	030	Non-Alcoholic Beverages	029	Non-Alcoholic Beverages	029	Non-Alcoholic Beverages
Packaging	050	Paper Products	047	Paper Products	047	Paper Products
	069	Other Plastic Products	064	Plastic Products	064	Plastic Products
Food Transactions	121	Wholesale Trade	120	Wholesale Trade	122	Wholesale Trade
	122	Retail Trade	121	Retail Trade	123	Retail Trade
Transportation	127	Railroad Vehicle Transportation	122	Railroad Vehicle Transportation	124	Railroad Vehicle Transportation
	128	Other Land Transportation	123	Other Land Transportation	125	Other Land Transportation
	129	Water Transportation	124	Water Transportation	126	Water Transportation
	130	Air Transportation	125	Air Transportation	127	Air Transportation
	131	Services Incidental to Transport	126	Supporting Services to Transportation	128	Supporting Services to Transportation
	133	Warehousing	127	Warehousing and Storage	129	Warehousing and Storage

Year	2001		2006		2011	
Supply chain industry	Sector NO.	Sector	Sector NO.	Sector	Sector NO.	Sector
	134	Postal Services	128	Postal & Courier Services	130	Postal & Courier Services
Energy	065	Petroleum Refining Products	049	Petroleum Refining Products	049	Petroleum Refining Products
	114	Electricity	108	Electricity and Steam	110	Electricity and Steam
	115	Gas	109	Gas	111	Gas
Food Services	126	Restaurant Services	130	Food and Beverage Services	132	Food and Beverage Services
Finance and Insurance	136	Finance	137	Financial Intermediation	139	Financial Intermediation
	138	Insurance	138	Insurance	140	Insurance
	137	Securities & Futures	139	Securities, Futures and Other Activities Auxiliary to Financial Service Activities	141	Securities, Futures and Other Activities Auxiliary to Financial Service Activities
Legal, Accounting and Bookkeeping	142	Legal and Accounting Services	143	Legal and Accounting Services	145	Legal and Accounting Services
Advertising	146	Advertising Services	145	Advertising and Market Research	148	Advertising and Market Research

Source: DGBAS (2014).