

## **ANALYSIS OF THE INTERREGIONAL TRADE OF AGRICULTURAL COMMODITIES IN WEST SUMATERA, INDONESIA**

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**Abstract:** This study aims to investigate factors affecting interregional trade of agricultural commodities between regions in West Sumatera, Indonesia. For this purpose, this study use modified gravity model. There are four commodities that represent interregional trade of agricultural commodities in this study, namely: rice, chicken egg, broiler and fresh sea fish. This study uses cross section data of the 15 regencies/city in West Sumatera. The data is obtained from survey to wholesaler group of agricultural commodities in West Sumatera (primary data). The result of this study shows that factors affecting interregional trade in West Sumatera are: the difference in price (for commodities: rice, chicken egg and broiler), transportation costs (for commodities: broiler and fresh sea fish).

Key Words: Interregional trade, Modified Gravity Model, Spatial Interaction.  
Paper Type: Research Paper

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### **Introduction**

During last two decades there has been a dramatic shift in stance development policy from "import substitution models" to "export-led growth model". This shift is driven by the economic recession that emerged in the 1970s. There are three factors that encourage the adoption of export-led growth model (Palley (2003: 1-29). First, at the time, many countries experienced slow economic growth and inflation which increases rapidly. Second, the import substitution model requires government to impose tariffs and quotas for protection. This causes distortions in the economy that led to wastage and rent seeking. Finally, a shift in the policy stance, also driven by the empirical fact of the success of Japan's spectacular economic growth (after twenty-five years of World War II) and the success of the economic growth of the four Asian tigers namely South Korea, Taiwan, Hong Kong, and Singapore.

As a result of these factors, the export-led growth model has been used as a standard development model that has been recommended by IMF to all of its client countries (Sapsford and Singer, 1998: 1653-1660). With 75 developing countries that subject to IMF permanent program, it means that export led growth model have become a global development model (Sachs, 1997). However, the more export-led growth model was applied in the whole world, world economic growth has slowed. This is mainly occurred in low-income and middle-income countries.

The problem of export-led growth model is readily understandable from a standard Keynesian perspective. Keynesian economics emphasizes that aggregate demand determine the equilibrium, and maintains that the level of economic activity is equal to the level of aggregate demand (Palley, 2011: 1-24). Within the framework of Keynesian economics, export led growth policies have problems that comes from the fallacy of composition, in which the efforts of a country to increase its domestic aggregate demand by increasing exports, it will reduce the aggregate domestic demand in destination countries.

The logic of this static Keynesian theory also valid for Keynesian theory of growth where the growth rate is influenced by the rate of growth of demand (Palley, 1996: 113-135; Blecker, 2000). Export growth a means of demand, and thus increase the economic growth. However, if the export growth appears at the expense of growth in foreign demand, it means that shifting the composition of growth in the country without increasing the overall world economic growth.

However, the problems encountered in the implementation of export-led growth model among developing countries are somewhat different. Developing countries generally are in a competitive situation to each other. When one of the developing countries succeeded in increasing its exports, then the exports of other countries will decrease. Export-led growth model can work when adopted by only one or a few countries. It will not have a positive impact when all countries adopt the strategy (Palley, 1990: 1-16). The implication of this argument is the paradigm of export-led growth is not appropriate for developing countries. It is also at risk of endangering the global economy. It means that there is a need to shift from export-led growth model to domestic demand led-growth model. It is not meant that the export is not needed. Countries will always need exports to pay for imports of goods that they cannot produce. It means building the domestic demand and reduces the dependence on the strategy aimed at attracting export-oriented FDI.

Table 1 below shows export share of ASEAN's Member Countries, Some of Northern Asia Countries, Some Latin Countries, and Southern Asia Countries to U.S merchandise imports.

**Table 1.** Export's share of ASEAN's Member Countries, Some of Northern Asia Countries, Some Latin Countries, and Southern Asia Countries to U.S. Merchandise Imports, 2008-2012 (In Percentage)

Countries	Year					Average Change of Export Share to US Merchandise Import
	2008	2009	2010	2011	2012	
Indonesia	4.96	5.79 (0.17)	5.58 (-0.04)	5.61 (0.01)	5.57 (-0.01)	0.03
Malaysia	7.13	8.22 (0.15)	7.64 (- 0.07)	7.07 (- 0.07)	6.87 (- 0.03)	-0.01
Philippines	2.18	2.59 (0.19)	2.63 (0.02)	2.26 (- 0.14)	2.39 (0.06)	0.03
Singapore	14.29	17.07 (0.19)	16.94 (- 0.01)	15.51 (- 0.08)	15.13 (- 0.02)	0.02
Thailand	6.28	7.11 (0.13)	6.82 (- 0.04)	6.60 (- 0.03)	6.63 (0.00)	0.02
Argentina	2.13	2.58 (0.21)	2.47 (- 0.04)	2.28 (- 0.08)	2.07 (- 0.09)	0.00
Brazil	5.86	6.88 (0.17)	6.42 (- 0.07)	5.94 (- 0.07)	5.81 (- 0.02)	0.00
Mexico	9.91	11.31 (0.14)	11.41 (0.01)	10.92 (- 0.04)	11.07 (0.01)	0.03
China	44.66	50.95 (0.14)	53.95 (0.06)	49.62 (- 0.08)	49.66 (0.00)	0.03
Japan	31.02	30.42 (- 0.02)	31.65 (0.04)	27.90 (- 0.12)	27.12 (- 0.03)	-0.03
Korea, Rep.	17.35	22.18 (0.28)	21.28 (- 0.04)	20.54 (- 0.03)	20.83 (0.01)	0.05
Pakistan	0.72	0.89 (0.24)	0.87 (- 0.02)	0.78 (- 0.10)	0.65 (- 0.17)	-0.01
India	9.19	11.33 (0.23)	11.34 (0.00)	11.60 (0.02)	11.85 (0.02)	0.07

Source: World Bank, Development Indicator 2013.

Note: Figure in bracket is share % changes from year to year.

Almost all of ASEAN's Member Countries, Some of Northern Asia Countries, Some Latin Countries, and Southern Asia Countries export share to U.S. merchandise imports declined. Some countries, such as: China, South Korea and India have an increasing share of its exports to U.S. merchandise imports in 2012. Meanwhile, the change of export shares of all other countries to U.S. merchandise imports decreased from year to year during the period 2009 to 2012. It shows that the role of exports in promoting economic growth declined. While the role of domestic demand in promoting economic growth increased. It means that the growth model driven by exports (export led growth model) has been shifted to the growth model driven by domestic demand (domestic demand led growth model).

Table 2 shows the role and the percentage of each type of expenditure of Indonesia's Gross Domestic Product at 2000 constant prices over 2010 to 2013 periods. In the table, it is clear that the role of export and import to Indonesian GDP decreased since 2012. It shows that the role of domestic demand has been rising in the Indonesian economy.

**Table 2.** Distribution of Indonesia's Gross Domestic Product by Type of Expenditure at 2000 Constant Price and Its Changes, 2010-2013 (In Percentage)

Type of Expenditure	2010	2011	2012*)	2013**)
House Hold Consumption Expenditure	56.53	55.58	55.07	54.81
		(-1.68)	(-0.92)	(-0.47)
General Government Consumption Expenditure	8.49	8.23	7.84	7.77
		(-3.06)	(-4.74)	(-0.89)
Gross Domestic Fixed Capital Formation	23.91	24.32	25.11	24.85
		(1.71)	(3.25)	(-1.04)
Change in Inventories	0.03	0.37	1.92	1.94
		(1133.33)	(418.92)	(1.04)
Statistical Discrepancies	0.60	0.18	0.87	-0.01
		(-70.00)	(383.33)	(-101.15)
Export of goods and services	46.43	49.55	47.57	47.35
		(6.72)	(-4.00)	(-0.46)
Less Import of goods and services	35.92	38.23	38.38	36.72
		(6.43)	(0.39)	(-4.33)
Total	100.00	100.00	100.00	100.00

Source: BPS-Statistics Indonesia, Statistical Year Book of Indonesia, 2014.

Note : Figure in bracket indicate percentage of change of share to GDP Indonesia

The increasing of domestic demand role in West Sumatera can be seen in Table 3. Table 3 shows that export and Import of West Sumatera consist of foreign and inter-Provincial export and import. In general, export and import of West Sumatera tends to increase. But if we pay attention carefully, in the reality foreign export and import of West Sumatera tend to decrease. On the other hand, inter-provincial export and import of West Sumatera tend to increase. It shows that domestic demand has been a more important thing to increase West Sumatera economy. It supports the analysis of Palley (1996: 113-135) who said that the export-led growth is not the days where it will be replaced by "Domestic Demand-led strategy, where the role of domestic demand is very important to increase economic growth of a country.

**Table 3.** Distribution of GDRP of West Sumatera by Expenditure 2000 at Constant Price and its Percentage of its changes, 2008-2012 (In Percentage)

Type of Expenditure	2008	2009	2010	2011	2012	Average Change
Household Consumption Expenditure	30.20	30.30	28.20	27.00	26.70	
		(0.00)	(-0.07)	(-0.04)	(-0.01)	-0.03
Consumption Expenditure of Private Non-Profit Institutions	0.50	0.50	0.50	0.50	0.50	
		(0.00)	(0.00)	(0.00)	(0.00)	0.00
Government Consumption	6.60	7.00	7.40	7.50	7.60	
		0.06	0.06	0.01	0.01	0.04
Gross Fixed Capital Formation	10.00	10.30	10.50	10.60	10.80	
		0.03	0.02	0.01	0.02	0.02
Stock changes	-0.10	0.20	-1.40	-2.00	-0.90	
		-3.00	-8.00	0.43	-0.55	-2.78
Export of goods and services	18.30	18.30	19.50	20.00	19.30	
		0.00	0.07	0.03	-0.04	0.01
Foreign	15.00	14.40	15.50	15.20	14.00	
		-0.04	0.08	-0.02	-0.08	-0.02
Inter-Provincial	3.30	3.90	4.10	4.70	5.40	
		0.18	0.05	0.15	0.15	0.13
Imports	8.20	7.90	7.80	8.20	8.40	
		-0.04	-0.01	0.05	0.02	0.01
Foreign	4.60	3.60	2.80	3.10	3.20	
		-0.22	-0.22	0.11	0.03	-0.08
Inter-Provincial	3.50	3.50	5.00	5.20	5.20	
		0.00	0.43	0.04	0.00	0.12
Total	100.00	100.00	100.00	100.00	100.00	

Source: BPS-Statistics West Sumatera, West Sumatera in Figure 2013.

As a developing country, Indonesia has an agricultural economic structure. As part of Indonesia, West Sumatera also has an agricultural economic structure. Agricultural country is a country which most of its population works agriculture sector. It can be seen in Table 4. In table 4 we can see that the agriculture sector is the major employment in Indonesia and in West Sumatera.

**Table 4.** Distribution of Total Population of Indonesia and West Sumatera Province by Major Employment, 2013 (In Percentage)

Industrial Origin	Indonesia	West Sumatera Province
1. Agricultural, Livestock, Forestry and Fishery	34.36	53.50 <sup>1)</sup>
2. Mining and Quarrying	1.28	0.00
3. Manufacturing Industry	13.43	5.42
4. Electricity, Gas, and Water Supply	0.23	0.00
5. Construction	5.67	0.00
6. Trade, Hotel, and Restaurant	21.42	17.63
7. Transport and Communication	4.55	0.00
8. Financial, Real Estate, and Business Services	2.63	12.38 <sup>2)</sup>
9. Services	16.44	11.08 <sup>3)</sup>
Total	100.00	100.00

Source: BPS-Statistics Indonesia, Statistical Yearbook of Indonesia 2014 and BPS-Statistics West Sumatera, West Sumatera in Figure 2014.

Note: 1. Include Agriculture, Forestry, hunting and Fishery; 2.Include Community, Social and Personal Services; 3.Include Mining and quarrying, Insurance, Real Estate and Business Services

The dominant sector in GRDP of West Sumatera is the agricultural sector. While in GDP of Indonesia, the most dominant sector is manufacturing sector. Distribution of GDP of Indonesia and GDRP of West Sumatera province can be seen in Table 5. Value and the role of the agricultural sector is the largest in GDRP of West Sumatera. Contribution of this sector is 22.58 and 21.75 percent of GDRP West Sumatera in 2012 and 2013.

**Table 5.** Value and Distribution of GDP Indonesia and GDRP West Sumatera Province at 2000 Constant Market Price, 2010-2013 (In Billion Rupiahs)

Industrial Origin	Indonesia		West Sumatera	
	2012	2013	2012	2013
1. Agricultural, Livestock, Forestry and Fishery	328,279.70 (12.76)	339,890.20 (12.47)	9,918.25 (22.58)	10,279.54 (21.75)
2. Mining and Quarrying	193,115.70 (7.50)	195,708.50 (7.18)	1,300.83 (2.96)	1,929.34 (4.08)
3. Manufacturing Industry	624,740.00 (24.28)	662,830.40 (24.32)	5,212.94 (11.87)	5,466.10 (11.57)
4. Electricity, Gas, and Water Supply	20,080.70 (0.78)	21,201.00 (0.78)	480.95 (1.09)	501.32 (1.06)
5. Construction	170,884.80 (6.64)	182,117.90 (6.68)	2,439.19 (5.55)	2,644.99 (5.60)
6. Trade, Hotel, and Restaurant	473,110.60 (18.38)	501,158.40 (18.39)	8,000.21 (18.21)	8,604.16 (18.21)
7. Transport and Communication	265,383.70 (10.31)	292,421.50 (10.73)	6,794.27 (15.47)	7,363.52 (15.58)
8. Financial, Real Estate, and Business Services	253,022.70 (9.83)	272,151.90 (9.98)	2,228.54 (5.07)	2,369.67 (5.01)
9. Services	244,869.90 (9.52)	258,237.90 (9.47)	7,550.62 (17.19)	8,097.60 (17.14)
Total	2,573,487.80 (100.00)	2,725,717.70 (100.00)	43,925.81 (100.00)	47,256.24 (100.00)

Source: BPS-Statistics Indonesia, Statistical Yearbook of Indonesia 2014 and BPS-Statistics West Sumatera, West Sumatera in Figure 2014.

The agricultural sector consists of 5 sub-sectors, namely food crops and horticulture, plantation, animal husbandry, forestry and fisheries. Among the fifth subsector, the share of food crops and horticultural subsector is the largest (BPS, Statistics West Sumatera, 2013). Production of plantation subsector, forestry subsector and fisheries subsector is intended for export, while the production of food crops and horticulture subsector, animal husbandry subsector and a small portion of the production of fishery subsector are traded between regions.

Research on trade between regions within a country have been done by Chun et al (2012: 1-9), Cadarajat (2007: 1-36), Firdaus and Widyasanti (2010: 1-15). While research on spatial interactions (trade flows between regions) in smaller scope (inter-regency/city) has not been done both abroad and in Indonesia (including West Sumatera). Therefore, this study focus on: first, how is the pattern flow of inter-regional trade in agricultural commodities in West Sumatera? Second, what factors do affect inter-regional trade in agricultural commodities in West Sumatera? In this study have been selected four commodities which represent agricultural commodities traded between regions, namely: rice, chicken eggs, broiler and fresh sea fish. All of these commodities represent each agricultural subsector which is generally traded between regions in West Sumatera.

The remainder of this paper is organized as follows: section 2 presents a relevant literature review. Section 3 present research methodology. Section 4 presents results and discussion. Finally, section 5 presents the conclusions and policy implications.

## **LITERATURE REVIEW**

Spatial interaction theory is generally used to predict and model the flow of commodity between regions. Interregional trade plays an important role in maintaining productivity and stimulating the economy of a region. If a region wants to be prosperous, then the region must active to trade with other region. Region actively trading with other region will be surplus in balance of payment. On the other hand, non actively trading region will be deficit in balance of payment (Amstrong and Taylor, 2000: 119)

Gravity model is one of the most successful models to analyze spatial interaction empirically. Its concept is so natural and can be used to explain the economic relationship between a pair of geographic units with or without the word "gravity". Isaac Newton (1643-1727) is often considered as the inventor of the gravity model. Newton's gravity model states that the attraction between objects is proportional to its mass multiplication and inversely proportional to the distance between them (Deadorf, 1998: 49).

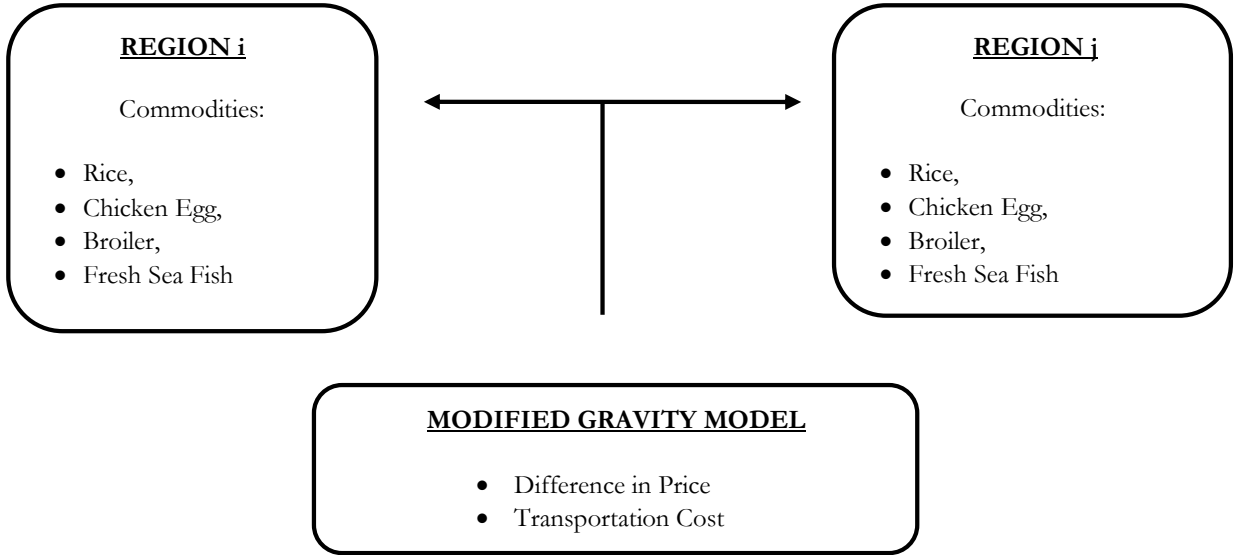
The gravity model was originally applied to explain the factors that influence the number of trips between cities. Then the experts also apply the law of gravity on both foreign trade (Brocker, 1989: 7-18; Carrillo and Li, 2002:1-29; Batra, 2004:1-38; Athukorala, 2011: 1-64; Kristjansdottir 2008: 1-23) and domestic trade (Chun et al, 2012: 1-9; Firdaus and Widyasanti, 2010: 1-15; Cadarajat (2007: 1-36).

Basic equations of the gravity models, has also been modified by many researchers to incorporate variables other than GDP, population and distance. Variables are added by the researchers include: income per capita (Carrillo and Li, 2002:1-29; Chun et al, 2012: 1-9), geographical distance, (Carrillo and Li, 2002:1-29; Batra, 2004:1-38; Athukorala, 2011:1-64; Chun, 2012: 1-9), free trade agreements (Carrillo and Li, 2002:1-29; Batra, 2004:1-38; Kristjansdottir, 2008: 1-23; Athukorala, 2011:1-64), common language (Barta, 2004: 1-38; Athukorala, 2011: 1-64), newly independent countries (Athukorala, 2011: 1-64; Batra, 2004: 1-38), archipelago (Batra, 2004: 1-38), exchange rate (Cadarajat, 2007: 1-36), sector decomposition (Kristjansdottir, 2008: 1-23). Transportation costs and the Human Development Index (Firdaus and Widyasanti, 2010: 1-15), trading quality index (Athukorala, 2011, 1-64), cultural similarity (Athukorala, 2011: 1-64), The influence of regional and global economic crisis (Athukorala, 2011: 1-64), The number of employees in the area of origin, average production in the region of origin, the size of the plant in the region of origin, the number of residents in the area of destination, the number of factories in the region of destination, and competing destinations (Chun et al, 2012: 1-9).

Based on the description above we can conclude that some of the factors affecting trade between regions are: the population of origin region, the population of destination region, GDP in the origin region, GDP in destination region , distance, Transportation costs, differences in income per capita, geographic, free trade agreements, common language, the newly independent states factor, the island nation factor, exchange rate, decomposition of the sector, Human Development Index, quality index trading, cultural similarities. The influence of regional and global economic crisis, number of employees in origin region, average production in origin region, plant size in origin region, the number of factories in destination region, and Competing destination.

In this study, factors affecting trade between region is limited on the relevant variables in trading between regions in a country. Frameworks of this research can be illustrated in figure 1. In Figure 1 is illustrated that factors affecting trade between the region is difference in price and transportation costs.

**Figure 1.** Framework of Factors Affecting Interregional Trade in West Sumatera.



**RESEARCH METHODOLOGY**

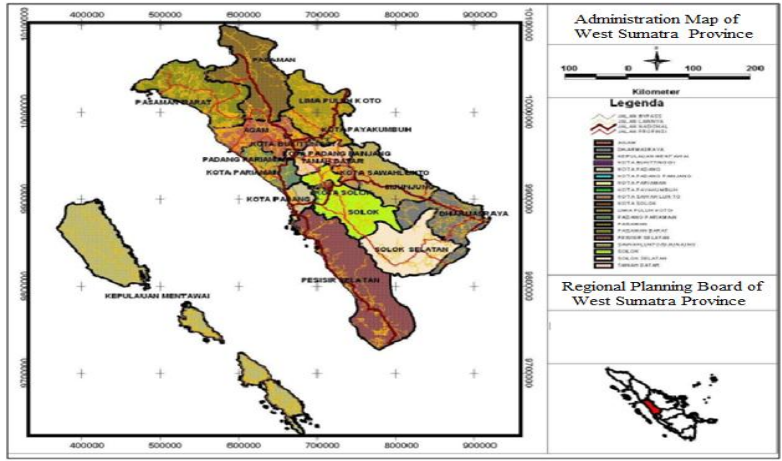
The scope of this research is the regency/city of West Sumatera (except some regency that are not included because it is fraction of its parent district, namely South Solok regency, West Pasaman regency, Dharmasraya regency and the Mentawai Islands regency). Regencies /cities included in this study consist of 15 regencies/cities in West Sumatera province. The map of West Sumatera can be seen in figure 2.

The data used in the study is obtained from the survey to wholesaler in each region (the survey is done from 1 July to 15 July 2013) the commodities studied are: rice, chicken eggs, broiler, and fresh sea fish. These commodities was chosen because of the production of these commodities was quite large and it was a widely traded between regions in West Sumatera. The population in this study is wholesalers trading the commodities of rice, broiler, chicken egg and fresh sea fish.

Sekaran (1992: 252) provide some guidelines for determining sample size are:

1. The appropriate sample size for most studies is between 30 to 500.
2. If the sample is broken down into subsamples (male/female, junior/ senior, and so on), the minimum sample size is 30 for each category.
3. For multivariate research, the sample size should be ten times of the number of variables.
4. For simple experimental study sample size is between 10 to 20.

**Figure 2.** The Administration Map of West Sumatera Province, 2013



Source: Regional Planning Board of West Sumatera Province, 2013

Based on preliminary research conducted before, the number of population is 230. Number of samples in this study was calculated using the formula Slovin (Bartlet et al, 2001: 43-50; Riduwan and Kuncoro, 2011: 65) as follows:

$$n = \frac{N}{(N.(d)^2 + 1)} \dots\dots\dots (3.1)$$

where:

- n is sample size.
- N is number of population
- d is precision level of 95% or sig. = 0.05.

The number of samples for each regency/city can be seen in Table 6. The number of samples in this study was 146 (calculated by applying the formula Slovin). The number of samples for each county / city is determined by using random sampling method. Methods of data collection in this study using snowball sampling method. The method is performed by searching the key respondents for each district/city, then based on the information from the key respondents encountered another respondent in accordance with the amount needed.

**Table 6.** Number of Population and Sample in Each Regencies/Cities.

No	Regency/ City	Population* ) (person)	The number of whole- sellers **) (unit)	Ratio of Number of Wholesaler in each district/city to Total Wholesaler(perce ntage)	Number of Sample ( $\alpha = 0.05$ ) (Unit)
(1)	(2)	(3)	(4)	(5)	(6)=(4)x(5)
1	Pesisir Selatan Regency	429,246.00	15.00	0.07	10.00
2	Solok Regency Swl.Sijunjung	348,566.00	15.00	0.07	10.00
3	Regency	201,823.00	15.00	0.07	10.00
4	Tanah Datar Regency	338,494.00	15.00	0.07	10.00
5	Pdg Pariaman Regency	391,056.00	15.00	0.07	10.00
6	Agam Regency	454,853.00	15.00	0.07	10.00
7	50 Kota Regency	348,555.00	15.00	0.07	10.00
8	Pasaman Regency	253,229.00	15.00	0.07	10.00
9	Padang City	833,562.00	20.00	0.09	13.00
10	Solok City	59,396.00	15.00	0.07	10.00
11	Sawahlunto City	56,866.00	15.00	0.07	10.00
12	Pdg. Panjang City	47,008.00	15.00	0.07	10.00
13	Bukittinggi City	113,312.00	15.00	0.07	10.00
14	Payakumbuh City	116,825.00	15.00	0.07	10.00
15	Pariaman City	79,043.00	15.00	0.07	10.00
Total		4,071,834.00	230.00	1.00	146.00 ***)

Note: \*) BPS-Statistics West Sumatera, West Sumatera in Figure 2013 ;\*\*) Estimated from preliminary research; and \*\*\*) Calculated by applying the formula of Slovin.



In analyzing the factors that affect inter-regional trade in West Sumatera is used a modified gravity model. The formula of Newtonian gravity models can be written as follows :

$$GF_{ij} = A \cdot \frac{M_i \cdot M_j}{D_{ij}^2} \dots\dots\dots (3.2)$$

Where:

- GF<sub>ij</sub> = gravity force between region i and region j
- M<sub>i</sub> = the mass in the region i
- M<sub>j</sub> = the mass in the region j
- D<sub>ij</sub> = the distance between the region of i and the region j.

If we apply the law of gravity within trade and by a little change in the symbol, hence the formula is as follows (Suryanta (2012: 57-76):

$$T_{ij} = A \cdot \frac{Y_i^{\alpha_1} Y_j^{\alpha_2}}{D_{ij}^{\alpha_3}} \dots\dots\dots (3.3)$$

Where:

- T<sub>ij</sub> = Interregional trade between region i and region j.
- A = constant
- Y<sub>i</sub> = Gross Domestic Regional Product of region i.
- Y<sub>j</sub> = Gross Domestic Regional Product of region j.
- D<sub>ij</sub> = Distance between region i and region j.
- α<sub>1</sub>, α<sub>2</sub> = parameters.
- e<sub>ij</sub> = error term.

Equation (3.3) can be transformed into a linear form by writing it in the form of logarithms as follows:

$$\text{Log } T_{ij} = \text{Log } A + \alpha_1 \text{Log } Y_i + \alpha_2 \text{Log } Y_j - \alpha_3 \text{Log } D_{ij} + e_{ij} \dots\dots\dots (3.4)$$

The model estimated in this research is:

$$NP_{ij} = \frac{(\Gamma_{ij})^{a_1}}{(\Gamma_{ij})^{a_2}} \dots\dots\dots (3.5)$$

Equation (3.5) can be transformed into linear form by writing it in the form of logarithms follows:

$$\text{Log } NP_{ij} = \text{Log } a_0 + a_1 \cdot \text{Log } SH_{ij} - a_2 \cdot \text{Log } BT_{ij} + E_{ij} \dots\dots\dots (3.6)$$

Where:

- NP<sub>ij</sub> = the sum of sales and purchases value by wholesaler group in the region i with wholesaler group in the region j (measured in billion rupiah).
- SH<sub>ij</sub> = the difference in selling price and purchasing price by wholesaler groups in region i and region j (measured in Rupiah).
- BT<sub>ij</sub> = transportation costs spent by wholesalers group between region i and region j (measured in Rupiah/km)
- a<sub>0</sub> = constants.
- a<sub>1</sub>, a<sub>2</sub> = regression coefficient
- e<sub>ij</sub> = error terms

Before conducting regression analysis, it is necessary to test the classical assumption such as: test of data normality, multicollinearity test, test of heteroscedasticity and autocorrelation test (Gujarati, 2003: 66-224).

## RESULT AND DISCUSSION.

### Interregional Export and Import of Agricultural Commodities in West Sumatera

Volume of inter-regional exports of commodities: rice, chicken eggs, broilers and fresh sea fish in West Sumatera can be seen in Table 7. Table 7 shows that Padang is the Major export destination in inter-regional trade in West Sumatera. Padang has a very large number of population. The large number of population was a source of great demand as well. Padang rice production is unable to meet the huge demand for rice so it must be imported from other areas. Major rice-producing areas in West Sumatera are: Solok regency, Agam regency, Pesisir Selatan regency, Padang Pariaman regency and Tanah Datar regency. Besides to the needs of residents of Padang, Padang rice merchants also re-export the rice to other regions (both other regions inside West Sumatera and other areas outside of West Sumatera).

**Table 7.** Volume of Inter-Regional Exports of Commodities of Rice, Chicken Eggs, Broilers and Fresh Sea Fish in West Sumatera, 2013

Export Destiny Region	Pesisir Selatan Regency	Solok Regency	Sawahlunto Sijunjung Regency	Tanah Datar Regency	Padang Pariaman Regency	Agam Regency	50 Kota Regency	Pasaman Regency	Padang City	Solok Town	Sawah-lunto Town	Padang Panjang Town	Bukittinggi Town	Payakumbuh Town	Ariaman Town
Pesisir Selatan Regency															
1)	215.3	-	-	-	-	-	-	-	215	-	-	-	-	-	-
2)	12.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3)	393.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4)	53.8	-	-	-	-	-	-	-	98.4	44.6	-	-	-	-	-
Solok Regency															
1)	-	73.9	-	-	-	-	46.6	-	141.6	27.4	21.1	21.1	43.2	31.2	-
2)	-	10.3	-	-	-	-	-	-	-	-	-	-	-	-	-
3)	-	449.3	-	-	-	-	-	-	-	-	-	-	-	-	-
4)	-	29.6	-	-	-	-	-	-	-	-	-	-	-	-	-
Sawahlunto Sijunjung Regency															
1)	-	-	138.2	-	-	-	-	-	-	-	-	-	-	-	-
2)	-	-	6.1	-	-	-	-	-	-	-	-	-	-	-	-
3)	-	-	289.4	-	-	-	-	-	-	-	-	-	-	-	-
4)	-	-	19.9	-	-	-	-	-	-	-	-	-	-	-	-
Tanah Datar Regency															
1)	-	-	-	139.2	-	-	-	-	133.4	-	-	16.3	26.9	-	23.0
2)	-	-	1.4	7.7	-	-	-	-	-	-	-	0.8	-	-	-
3)	-	-	-	438.1	-	-	-	-	-	-	-	132.2	132.2	-	-
4)	-	-	-	22.5	-	-	-	-	-	-	-	-	-	-	-

**Table 7. Continued**

<b>Export Destiny Region</b>	<b>Pesisir Selatan</b>	<b>Solok Regency</b>	<b>Sawahlunt o Sijunjung</b>	<b>Tanah Datar</b>	<b>Padang Pariaman</b>	<b>Agam Regency</b>	<b>50 Kota Regency</b>	<b>Pasaman Regency</b>	<b>Padang City</b>	<b>Solok Town</b>	<b>Sawah- lunto Town</b>	<b>Padang Panjang</b>	<b>Bukittinggi Town</b>	<b>Payakum- buh Town</b>	<b>Ariaman Town</b>
<b>Padang Pariaman Regency</b>															
1)	-	-	-	-	201.6	97.9	-	131.5	-	-	46.6	-	-	-	60.0
2)	-	-	-	-	11.6	-	-	-	-	-	-	-	-	-	-
3)	-	91.2	-	-	304.1	-	-	136.1	-	-	-	-	-	-	-
4)	-	-	-	-	38.9	38.9	21.3	-	65.6	-	-	-	8.8	10.2	-
<b>Agam Regency</b>															
1)	-	-	-	-	-	218.9	-	60.5	150.7	-	-	11.0	38.4	43.2	14.9
2)	-	-	-	-	-	13.3	-	-	-	-	-	-	-	-	-
3)	-	-	-	-	-	557.3	-	-	-	-	-	-	-	-	-
4)	-	-	-	-	-	82.7	-	6.6	-	-	-	-	45.1	31.0	-
<b>50 Kota Regency</b>															
1)	-	-	-	-	-	187.7	144.0	-	-	-	-	-	27.4	39.4	-
2)	-	0.2	-	0.1	0.1	-	7.3	-	-	-	-	-	-	3.2	-
3)	-	-	-	-	-	145.6	319.0	85.5	1,073.7	56.6	174.9	28.5	235.0	290.0	57.9
4)	-	-	-	-	-	-	28.1	-	-	-	-	-	-	-	-
<b>Pasaman Regency</b>															
1)	-	-	-	-	-	-	-	229.0	-	-	-	-	-	-	-
2)	-	-	-	-	-	-	-	7.6	-	-	-	-	-	-	-
3)	-	-	-	-	-	-	-	565.9	-	-	-	-	-	-	-
4)	-	-	-	-	-	-	-	19.1	-	-	-	-	-	-	-
<b>Padang City</b>															
1)	292.8	-	-	-	-	-	-	-	724.8	-	-	-	37.4	-	-
2)	8.6	-	-	-	-	-	-	-	16.3	-	-	-	-	-	-
3)	330.9	403.9	-	-	-	-	-	-	1,714.6	-	-	-	-	-	-
4)	-	-	-	19.4	-	-	19.7	-	197.5	70.6	-	12.8	43.3	25.5	-
<b>Solok Town</b>															
1)	-	-	90.7	-	-	-	-	-	-	100.3	68.2	12.0	-	-	-
2)	-	-	0.4	-	-	-	-	-	-	1.1	0.4	-	-	-	-
3)	-	-	-	-	-	-	-	-	-	596.2	-	-	-	-	-
4)	-	0.3	0.2	-	-	-	-	-	-	256.8	205.4	-	-	-	-
<b>Sawahlunto Town</b>															
1)	-	-	60.9	-	-	-	-	-	-	-	128.6	-	-	-	-
2)	-	-	0.7	-	-	-	-	-	-	-	1.2	-	-	-	-
3)	-	-	-	-	-	-	-	-	-	-	213.8	-	-	-	-
4)	-	-	-	-	-	-	-	-	-	-	43.6	-	-	-	-
<b>Padang Panjang Town</b>															
1)	-	-	-	-	-	-	-	-	56.2	-	-	138.7	-	-	40.3
2)	-	-	-	-	-	-	-	-	-	-	-	1.9	-	-	-
3)	-	-	-	-	-	-	-	-	-	-	-	159.8	-	-	-
4)	-	-	-	-	-	-	-	-	-	-	-	18.9	-	-	-

Table 7. Continued

Export Destiny Region	Pesisir Selatan Regency	Solok Regency	Sawahlunto Sijunjung Regency	Tanah Datar Regency	Padang Pariaman Regency	Agam Regency	50 Kota Regency	Pasaman Regency	Padang City	Solok Town	Sawahlunto Town	Padang Panjang Town	Bukittinggi Town	Payakumbuh Town	Pariaman Town
<b>Bukittinggi Town</b>															
1)	-	-	-	-	-	-	-	61	89.3	-	-	-	98.9	22.6	25.9
2)	-	-	-	-	-	0.2	-	-	-	-	-	-	3.1	-	-
3)	-	-	-	-	-	-	-	-	-	-	-	-	475.2	-	-
4)	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-
<b>Payakumbuh Town</b>															
1)	-	-	-	-	-	-	2.9	-	37.4	-	-	-	38.4	180	-
2)	-	-	-	-	-	-	0.6	-	-	-	-	-	-	3.0	-
3)	-	287.3	-	211.6	-	196.6	483.9	272.2	574.6	120.9	-	105.8	332.6	272.2	166.3
4)	-	-	-	-	-	-	-	-	-	-	-	-	-	12.0	-
<b>Pariaman Town</b>															
1)	-	-	-	-	-	50.9	-	-	89.8	-	-	-	-	-	137.8
2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9
3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190.1
4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.7

Note :

- The Data in shaded Area is trade in itself.
- The Sign - indicates agricultural trade between the two regions is zero.
- 1) Commodity Rice (In Tons)
- 2) Commodity Chicken Eggs (In Thousands Tie, 1 Tie = 10 plates = 300 eggs)
- 3) Commodities broiler (In Thousands boxes, 1 box = 12 chickens))
- 4) Commodities fresh sea fish (In Tons)

Region which export commodities chicken eggs to other regions are Tanah Datar Regency, 50 Kota Regency, Padang City, Solok Town, Sawahlunto Town, Bukittinggi Town and Payakumbuh town. Tanah Datar Regency, 50 Kota Regency, Padang City and Payakumbuh Town export chicken eggs to other regions because the region have production surplus, while Solok Town, Sawahlunto Town and Bukittinggi Town import it from surplus regions then re-export it to other regions.

50 Kota regency is the biggest exporter of broiler in West Sumatera while Payakumbuh town is the second largest exporter of broiler in West Sumatera. The other exporter of broiler in West Sumatera is Padang City, Tanah Datar regency and Padang Pariaman regency

Fresh sea fish exporters regions are Pesisir Selatan Regency, Padang Pariaman Regency, Agam Regency, Padang and Solok Town . In general, the exporters are a producing region of fresh sea fish (except Solok Town ). Solok town can be a fresh sea fish exporters (although Solok Town is not a producing region of fresh sea fish) because the wholesalers of Solok Town buy fresh sea fish from other region and sell it to other areas located adjacent to such Solok Regency, Sawahlunto Town and Sawahlunto Sijunjung Regency. Most of the fresh sea fish exports are addressed to Padang. This relates to the amount of Padang population is very large. The large population was a major source of demand for fresh sea fish.

Table 8 below shows the volume of inter-regional import of commodities: rice, chicken eggs, broilers and fresh sea fish in West Sumatera in 2013. Table 8 shows that Padang city is the greatest

importer of rice. Padang city import rice from Pesisir Selatan regency, Solok regency, Tanah Datar regency, Padang Pariaman regency, Agam regency and Bukittinggi town.

**Table 8.** Volume of Inter-Regional Import of Commodities : Rice, Chicken Egg, Broiler and Fresh Sea Fish in West Sumatera, 2013.

The origin of Import	Kab. Pesisir Selatan	Kab. Solok	Kab. Sawahlunto Sijunjung	Kab. Tanah Datar	Kab. Padang Pariaman	Kab. Agam	Kab. 50 Kota	Kab. Pasaman	Kota Padang	Kota Solok	Kota Sawahlunto	Kota Padang Panjang	Kota Bukittinggi	Kota Payakumbuh	Kota Pariaman
Exporter	Kab. Pesisir Selatan	Kab. Solok	Kab. Sawahlunto Sijunjung	Kab. Tanah Datar	Kab. Padang Pariaman	Kab. Agam	Kab. 50 Kota	Kab. Pasaman	Kota Padang	Kota Solok	Kota Sawahlunto	Kota Padang Panjang	Kota Bukittinggi	Kota Payakumbuh	Kota Pariaman
<b>Pesisir Selatan Regency</b>															
1)	215.3	-	-	-	-	-	-	-	216.2	-	-	-	-	-	-
2)	4.2	-	-	-	-	-	6.2	-	8.6	-	-	-	-	4.1	-
3)	121.0	-	-	-	-	-	-	-	272.2	-	-	-	-	-	-
4)	196.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Solok Regency</b>															
1)	-	290.9	-	41.8	-	75.4	-	-	-	-	-	-	-	-	-
2)	-	-	-	-	-	-	6.2	-	-	-	-	-	-	4.1	-
3)	-	-	-	-	-	-	159.8	-	133.9	-	-	-	-	155.5	-
4)	-	-	-	-	-	-	-	-	-	29.8	-	-	-	-	-
<b>Sawahlunto Sijunjung Regency</b>															
1)	-	108.5	92.6	99.4	-	-	-	-	-	-	16.3	-	-	-	-
2)	-	-	-	-	-	-	1.2	-	-	4.9	-	-	-	-	-
3)	-	-	-	-	-	-	233.3	-	-	-	-	-	-	56.2	-
4)	-	-	-	-	-	-	-	-	-	19.9	-	-	-	-	-
<b>Tanah Datar Regency</b>															
1)	-	115.2	-	120.5	22.3	82.8	-	-	-	-	-	-	24.7	-	-
2)	-	-	-	4.9	-	-	3.0	-	-	-	-	-	-	2.0	-
3)	-	-	-	67.4	101.5	-	215.6	-	-	-	-	-	-	185.8	-
4)	-	-	-	-	8.5	2.7	-	3.4	-	-	-	-	-	-	-
<b>Padang Pariaman Regency</b>															
1)	-	193.0	-	-	237.1	-	-	-	-	-	-	-	-	-	-
2)	-	-	-	-	1.2	-	5.8	-	-	-	-	-	-	5.8	-
3)	-	-	-	-	95.0	-	224.6	-	-	-	-	-	-	216.0	-
4)	-	-	-	-	190.1	-	-	-	-	-	-	-	-	-	-
<b>Agam Regency</b>															
1)	-	129.1	-	-	71.5	245.3	27.4	14.9	-	-	-	-	-	-	-
2)	-	-	-	-	-	-	8.2	-	-	-	-	-	-	5.2	-
3)	-	-	-	-	-	-	341.3	-	-	-	-	-	-	216.0	-
4)	-	-	-	-	-	206.6	-	-	-	-	-	-	-	-	-
<b>50 Kota Regency</b>															
1)	-	-	-	119.5	-	-	131.0	-	-	-	-	-	-	-	-
2)	-	-	-	-	-	-	5.5	-	-	-	-	-	-	5.0	-
3)	-	-	-	-	-	-	1,425.0	-	-	-	-	-	-	1,477.4	-
4)	7.0	-	-	-	-	12.6	-	7.0	-	-	-	-	-	-	-

**Table 8.** Continued

Import from															
Exporter	Kab. Pesisir Selatan	Kab. Solok	Kab. Sawahlunto Sijunjung	Kab. Tanah Datar	Kab. Padang Pariaman	Kab. Agam	Kab. 50 Kota	Kab. Pasaman	Kota Padang	Kota Solok	Kota Sawahlunto	Kota Padang Panjang	Kota Bukittinggi	Kota Payakumbuh	Kota Pariaman
<b>Pasaman Regency</b>															
1)	-	127.2	-	-	-	104.6	-	89.8	-	-	-	-	-	-	-
2)	-	-	-	-	-	-	4.5	-	-	-	-	-	-	3.1	-
3)	-	-	-	-	-	-	349.9	-	-	-	-	-	-	216.0	-
4)	-	-	-	-	-	4.4	-	-	-	-	-	-	-	-	-
<b>Padang City</b>															
1)	306.0	422.4	-	52.8	141.6	324.0	-	-	43.2	-	-	-	52.8	-	-
2)	-	-	-	-	-	-	7.7	-	13.5	-	-	-	-	3.8	-
3)	-	-	-	-	707.2	-	498.5	-	1,089.5	-	-	-	-	154.2	-
4)	119.5	-	-	-	191.5	-	-	-	77.8	-	-	-	-	-	-
<b>Solok Town</b>															
1)	2.4	-	-	30.7	36.5	73.4	-	-	-	2.4	-	-	8.4	-	-
2)	-	-	-	-	-	-	1.4	-	-	-	-	-	-	0.9	-
3)	-	-	-	-	280.8	-	203.0	-	-	-	-	-	-	112.3	-
4)	35.6	-	-	-	-	-	-	-	62.9	-	-	-	-	-	-
<b>Sawahlunto Town</b>															
1)	-	109.4	-	-	-	-	-	-	-	39.8	95.5	-	-	-	-
2)	-	-	-	-	-	-	0.5	-	-	1.7	-	-	-	-	-
3)	-	-	-	-	171.1	-	133.5	-	-	-	-	-	-	88.6	-
4)	-	-	-	-	-	-	-	-	-	19.9	-	-	-	-	-
<b>Padang Panjang Town</b>															
1)	-	40.3	-	103.7	-	176.4	-	-	-	-	-	31.2	-	-	-
2)	-	-	-	0.4	-	-	0.9	-	-	-	-	-	-	0.6	-
3)	-	-	-	-	82.1	-	43.2	-	-	-	-	-	-	34.6	-
4)	-	-	-	-	8.8	-	-	-	10.1	-	-	-	-	-	-
<b>Bukittinggi Town</b>															
1)	-	55.9	-	63.1	-	142.1	27.4	-	-	-	-	-	142.1	-	-
2)	-	-	-	-	-	-	2.0	-	-	-	-	-	-	1.3	-
3)	-	-	-	-	90.7	-	237.6	-	-	-	-	-	-	146.9	-
4)	2.8	-	-	-	2.8	-	-	-	2.8	-	-	-	-	-	-
<b>Payakumbuh Town</b>															
1)	-	10.6	-	32.6	-	53.8	124.8	-	-	-	-	-	-	10.6	-
2)	-	-	-	-	-	-	2.1	-	-	-	-	-	-	1.5	-
3)	-	-	-	-	-	-	1,762.6	-	-	-	-	-	-	1,153.4	-
4)	1.2	-	-	-	4.5	-	-	-	3.8	-	-	-	-	-	-
<b>Pariaman Town</b>															
1)	-	-	-	158.4	69.1	-	-	-	-	-	-	22.1	28.8	-	158.4
2)	-	-	-	-	0.9	-	1.2	-	-	-	-	-	-	0.8	-
3)	-	-	-	-	112.3	-	60.5	-	-	-	-	-	-	17.3	-
4)	-	-	-	-	6.2	-	-	-	-	-	-	-	-	-	4.5

Note :

- The Data in shaded Area is trade in itself.
- The Sign - indicates agricultural trade between the two regions is zero.
- 1) Commodity Rice (tons)
- 2) Commodity Chicken Eggs (Thousands Tie, 1 Tie = 10 plates = 300 eggs)
- 3) Commodities broiler (thousands of boxes, 1 box = 12 chickens))
- 4) Commodities fresh sea fish (Tons)

Almost all of regencies/Towns imports chicken egg from Payakumbuh Town and 50 Kota Regency. Padang is the greatest chicken eggs importer because chicken egg production in Padang city is not sufficient for needs of its large population. Therefore Padang import it from other region (especially from 50 Kota Regency and Payakumbuh Town. 50 Kota Regency is the greatest producer of chicken egg and Payakumbuh Town is the second. Other region which also produce chicken egg is in West Sumatera is Padang City, Tanah Datar Regency and Padang Pariaman Regency. Other region import chicken egg from the regions.

In Table 8 we can see that Padang is the largest broiler importer in West Sumatera. Solok Town is the second largest importer and Solok Town is the third largest importer. Padang wholesalers import chicken egg not only to fulfil its own need, but it also for selling to other region. So do Solok Town and Pasaman Regency. Besides import to fulfil its own region needs, they also re-export it to other region.

Trade between 50 Kota regency and Payakumbuh Town is very large. Although 50 Kota Regency is a broiler exporter region, but they also import it from Payakumbuh Town and vice versa. Besides trade with Payakumbuh Town, 50 Kota Regency also trade with other region in West Sumatera. Other region import broiler from Payakumbuh Town and Payakumbuh Town.

Though as an exporter of fresh sea fish to other areas, but the city Padang also import of fresh sea fish from other regions, namely from Pesisir Selatan Regency and Padang Pariaman Regency. Some regions such as Pesisir Selatan Regency, Padang Pariaman Regency and Agam Regency are only as exporter of fresh sea fish. They export fresh sea fish to other region and they never import fresh sea fish from other regions.

### Factors Affecting Interregional Trade of Agricultural Commodities in West Sumatera Base on Primary Data.

Before doing regression analysis, it must be done test of classical assumption previously such as: normality test, autocorrelation test, heteroscedasticity test and multicollinearity test.

#### Normality Test

Normality test conducted to avoid the regression bias. There are some methods to test the normality of data. This research used Jarque Berra Test. If the value of Jarque Berra Test smaller than Chi-Square value hence it means that the data is normally distributed, vice versa. Table 12 shows the result of data normality test. The table shows that value of Jarque Berra Test is smaller than value of chi Square, so it can be concluded that data is normally distributed.

**Table 12.** Result of Normality Test of Factors Affecting Interregional Trade Value of Farming Commodity In West Sumatera by Using “Jarque Berra Test”

Variable	Jarque-Berra Test			
	Rice*)	Chicken Egg**)	Broiler***)	Fresh Sea Fish****)
LogNP <sub>ij</sub>	0.329	2.085	1.677	1.239
LogSH <sub>ij</sub>	10.306	34.740	0.630	2.615
LogBT <sub>ij</sub>	49.076	22.019	8.123	1.854

Note : \*) Chi-Square value ( $X^2$ ) at df 90 = 113,145

\*\*\*) Chi-Square value ( $X^2$ ) at df 40 = 55,758

\*\*\*\*) Chi-Square value ( $X^2$ ) at df 60 = 79.082

\*\*\*\*\*) Chi-Square value ( $X^2$ ) at df 31 = 43.773

### ***Autocorrelation Test***

Indicator of autocorrelation is value of Durbin Watson Test (DW test). Value of Durbin Watson test for each commodity are: 2.109 (for rice), 2.587 (for chicken egg), 2.585 (for broiler) and 2.566 (for fresh sea fish). Value of dL is 1,60 and value of dU is 1.7. The value of Durbin Watson test for each commodity are greater then dU (Durbin Watson test > dU) . It can be concluded that there are no autocorrelation in the model.

### ***Heteroscedasticity Test***

There are some method to test heteroscedasticity, namely: Arch test, White test, Glesjer test etc. This research use Arch test. The result of Arch test shown in Table 13.

**Table 13. Results of Heteroscedasticity Test of Factors Affecting Interregional Trade of Agricultural Commodity in West Sumatera, by Using Arch Test.**

Commodities	Rice	Chicken Egg	Broiler	Fresh Sea Fish
Prob. Chi-Square(1)	0.562	0.202	0.367	0.602

If the value of Probability of Chi-Square > 0.05, then there is no heteroscedasticity and vice versa. The value of Probability of Chi-Square in this research is shown in Table 13. It shows that all of the value of Probability of Chi Square is greater than 0.05. (Probability of Chi-Square of all commodities > 0.05). It can be concluded that there is no heteroscedasticity problem in the model.

### ***Multicollinearity Test***

One of method to test multicollinearity is by checking partial correlation among independent variable. The value of partial correlation among independent variable is shown in Table 14. If value of partial correlation among independent variable less than 0.9, then there is no multicollinearity in the model, vice versa. The value of partial correlation of independent variable for commodities: rice, chicken egg, broiler and fresh sea fish is less than 0.9. It means that there is no multicollinearity in the model.

**Table 14. Correlation Among Independent Variable**

Variable Commodities	LogBT <sub>ij</sub>			
	Rice	Chicken Egg	Broiler	Fresh Sea Fish
LogSH <sub>ij</sub>	-0.005	0.072	0.966	0.051

Summary of the data processing for Rice, Chicken Egg, Broiler and Fresh Sea Fish can be seen in Table 15.



**Table 15.** Regression Results for Factors Affecting Interregional Trade Value For Commodities : Rice, Chicken Eggs, Broiler and Fresh Sea Fish in West Sumatera Province.

Variable	Rice		Chicken Egg		Broiler		Fresh Sea Fish	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
<b>Constant</b>	2.331	0.108	-12.334	0.372	-0.031	0.800	-0.025	0.851
<b>LogSH<sub>ij</sub></b>	2.326 <sup>*</sup>	0.000	3.547 <sup>*</sup>	0.005	46.150 <sup>*</sup>	0.000	0.469	0.223
<b>LogBT<sub>ij</sub></b>	-0.362	0.263	-0.603	0.706	-3.151 <sup>*</sup>	0.000	-0.605 <sup>**</sup>	0.017
<b>Adjusted R<sup>2</sup></b>	0.432		0.167		0.241		0.162	
<b>Durbin-Watson Stat.</b>	2.109		0.952		2.585		2.565	
<b>F-statistic</b>	32.570 <sup>*</sup> 0.000		4.509 <sup>**</sup> 0.018		10.035 <sup>*</sup> 0.000		3.801 <sup>**</sup> 0.035	

Note : <sup>\*</sup>) and <sup>\*\*</sup>) indicate significance at 1% and 5% respectively.

In the table we can see that the value of determination coefficient (Adjusted R<sup>2</sup>) for rice is 0.432, it means that 43.2% change in the value of rice trade is affected by changes in the price difference variables and transportation costs. The rest is influenced by variables not examined in this study. Other variables such as commodity production of rice in the region of origin, consumer tastes and others. It needs to be studied in more depth in an another study by including several variables that have not been studied in this research.

The value of determination coefficient (Adjusted R<sup>2</sup>) for chicken egg, broiler and fresh sea fish are 0.167, 0.241 and 0.162 respectively. It means that for each commodity the variation of the trade value of rice between regions in West Sumatera Province is caused of variations in the price difference and transportation costs 43.2%, 16.7%, 24.1% and 16.2% respectively. For commodity chicken eggs, broilers and fresh sea fish, the coefficient of determination is very low at 16.7%, respectively, 24.1% and 16.2%. From this value we can see that less than 25% change in the three commodity trade value is influenced by changes in foreign prices and transportation costs. The need for further assessment of other factors that influence agricultural trade between regions in the province of West Sumatera.

Constant values for rice, chicken egg, broiler and fresh sea fish are 2.331, -12.334, -0.031 and -0.025 respectively. This means that in the absence of changes in the price difference variable, variation and variable transport costs, then the value of interregional trade of rice, chicken egg, broiler and fresh sea fish are: 0.367 billion rupiahs (antilog of 2.331) for rice, 1.091 billion rupiahs (antilog of -12.334) for chicken egg, -1.51 billion Rupiah (antilog of -0.03) for broiler and -1.602 billion Rupiah (antilog of -0.024) for fresh sea fish respectively. All of this constant are not significant statistically at level of significance 0.05%

Probability (t-statistic) of the difference in price (LogSH<sub>ij</sub>) of rice, chicken eggs and broiler is smaller than 0.05 (<0.05). It means that the variation of the difference in price of rice, chicken egg and broiler affected the interregional trade value of rice, chicken egg and broiler significantly at level of significant 5%. While the Probability (t-statistic) of the difference in price of fresh sea fish is greater than 0.05 (>0.05). It means that the variation of the difference in price of fresh sea fish doesn't affect the interregional trade value of fresh sea fish significantly at degree of significant 5%. Based on the probability value of the regression coefficient for commodity rice, eggs and broiler chickens, we can conclude that the difference in price significantly influence changes in the value of the three trading agricultural commodities.

This is in accordance with the opinion of Krugman (1995: 857-880) and Venables (1996: 341-359; 1998: 1-5) who developed a model of the new economic geography (NEG). They said that trade between regions arises because of the difference in price. However, with the increasing communication technology, the price differences between regions will be getting smaller. This occurs because traders will quickly figure out the price difference in the two areas and then send the goods out of the region with a lower price to the region at a higher price. Finally, the price

difference in the two regions will be smaller. The smaller the price difference shows that in a commodity market is efficient. Because of the difference in price affect the trading of commodities rice, chicken eggs and broiler, it can be said that the commodities market have not been efficient. It required the intervention of the government in informing the market price to the public so that people know the price in each region. Thus, the difference between the prices will not be too noticeable. As for the fresh sea fish commodity price difference does not significantly affect the value of trade between regions. This shows that the commodity market fresh sea fish is more effective than commodity markets of rice, chicken eggs or broiler.

For commodity broiler and fresh sea fish, transportation cost variations significantly affect the interregional trade value in West Sumatera province. These results are consistent with findings of other researchers (Carrillo and Li, 2002:1-29; Batra, 2004:1 -38; Kristjansdottir, 2008: 1-23; Athukorala, 2011:1-64; Cadarajat, 2007: 1-36; Firdaus and Widyasanti, 2008:1-23) who found that transportation cost significantly affect interregional trade. While transportation costs ( $\text{LogBT}_i$ ) variations of rice and eggs doesn't affect the variation in the interregional trade value of rice and eggs significantly. This is contrary to the results of research conducted by other researchers who found that the cost of transportation significantly affect trade. It happens because the commodities traded in the other research are industrial goods that is not a necessity. While the rice and chicken eggs is a basic needs goods, so even though the cost of transportation has increased, it does not reduce the trade in goods.

Probability (F-statistics) are smaller than 0.05 for all commodities. It means jointly variations of Difference in Price and Cost of Transportation significantly affect changes in the value of interregional trade for all commodities studied.

## CONCLUSION AND POLICY IMPLICATION

Based on the discussion in the previous section it can be concluded that: Factors that significantly affect inter-regional trade are: Difference in price (for commodities: Rice, Egg and Broiler Chickens), Transportation Costs (for commodities: Broiler and Fish Fresh Sea).

Inter-regional trade in agricultural commodities is affected by the difference in price at each trading region, it is necessary to create a mechanism of information commodities (especially agricultural goods) through internet media. So far, the department of trade and industry of West Sumatera have created a website that contains information on the price of agricultural goods, but it only covers a few items only and only at Padang. In the future is expected to be developed market information systems through internet media for more commodity type and includes all districts / cities in West Sumatera, so that traders can obtain information about the latest agricultural commodity prices at each region.

Transportation costs affect spatial interaction in terms of inter-regional trade of agricultural commodities (especially for commodities broilers and fresh sea fish). Therefore it is recommended to Government of West Sumatra to : build a new road connecting trade centres in regencies/cities/town that does not exist before, increase the condition of existing roads and create an alternative roads to avoid congestions ions on crowded roads. This will reduce transportation cost and the price differences between regions. In turn, it will increase interregional trade.

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