

Analysis of China's Import from & Direct Investment in ASEAN—Based on Gravity Models

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ABSTRACT

China and Southeast Asian nations free trade area was formally established on January 1, 2010. By the end of year 2011, China's foreign exchange reserves exceeded 3200 billion US dollars. Trade gravity model originates from the law of universal gravitation. Domestic researchers have made empirical studies using trade gravity model of trade between China and Southeast Asian nations. There are also studies of foreign direct investment or Chinese tourist arrivals in Vietnam, using gravity model. However, neither tariff and foreign exchange reserves are taken into consideration in studying China and Southeast Asian nations free trade area, nor gravity model is used in analyzing China's direct investment and tourist arrivals in Southeast Asian nations. Using econometrics software "Eviews 5.0" and based on a panel data from year 2000 up to 2008, this paper constructs a gravity model, the independent variables of which are gross domestic product per capita of CAFTA countries, foreign exchange reserves of CAFTA countries, squares of southeast Asian nations, and distance between China and southeast Asian nations. And quantitative relationship is made between independent variables and China's direct investment in Southeast Asian nations, import from Southeast Asian nations, as well as arrivals of Chinese visitors in Southeast Asian nations.

Keywords: Gravity Model; ASEAN (Association of Southeast Asian Nations); CAFTA (China-ASEAN Free Trade Area); ODI (Outward Direct Investment); Import; FER (Foreign Exchange Reserves); GDP (Gross Domestic Product) Per Capita

1. Introduction

CASEAN was established on January 1, 2010. By the end of year 2011, China's foreign exchange reserves exceeded 3200 billion US dollars. What are the relationship of and its direct investment in Southeast Asian nations? What's the relationship between China's foreign exchange reserves and Chinese tourist arrivals in as well as its import from Southeast Asian nations? These no doubt are of significant research value. Taking foreign exchange reserves into consideration and using gravity model, this paper studies China's direct investment and tourist arrivals in ASEAN nations. Using econometrics software "Eviews 5.0" and based on a panel data from year 2000 up to 2008, this paper constructs a gravity model, the independent variables of which are gross domestic product per capita of CAFTA countries, foreign exchange reserves of CAFTA countries, squares of southeast Asian nations, and distance between China and southeast Asian nations. And quantitative relationship is made between independent variables and China's direct investment in Southeast Asian nations, import from Southeast Asian nations, as well as arrivals of Chinese visitors in Southeast Asian nations.

The organization of this paper is as follows: Section 2 is a summary of relevant literatures; Section 3 introduces the model construction, including selection of variables, data resources, model formula as well as the estimation method; Section 4 gives out the results and analysis; Section 5 draws conclusion and suggestions. At the end is a list of relevant literatures.

2. Summary of Relevant Literatures

Trade gravity model originates from the law of universal gravitation. While Tinbergen (1962) & Poyhonen (1963) are the first to apply this law of universal gravitation to the field of international trade. Research has shown that the trade flow between two countries is positively correlated with their respective gross domestic products, whereas negatively correlated with the distance between them. The respective gross domestic product indicates supply of the exporting country and demand of the importing country. The distance between two countries is their trade hindrance.

Domestic researchers have made empirical studies using trade gravity model of trade between China and

Southeast Asian nations. For instance, Li Yanru *et al.* from Guangxi Nationality Normal College analyzed bilateral trade between six southeast Asian nations and China, America, Japan, Germany, Korea and Australia, using panel data from year 1998 to 2008, and evaluated the influence of establishment of CAFTA on trade within it [1]; Wang Hongtao from Guangxi College of Finance & Economics used six explanatory variables to construct an extended trade gravity model, and made empirical analysis of bilateral trade between Guangxi and ASEAN [2]; Wu Simin *et al.* from Jiangnan University focused on to what extent disequilibrium in economic development affect intra-regional trade [3]; Shan Wenting *et al.* from Beijing University of Aeronautics & Astronautics constructed both a basic model, which includes variables such as GDP, GDP per capita, and distance, using panel data from year 2000 to 2004, and an expanded model which added variables Chinese, and Chinese population [4]; A comparison made by Song Dongling of North China water conservancy and hydropower college with additional 36 trading partners reveal that traditional elements, *i.e.*, economic scale, average development and distance, still play a significant role, while dummy variables such as WTO membership and proportion of Chinese are not ignorable [5]; Ding Huixia of Zhengzhou University made a summary of theories concerning trade gravity model as well as problems arising from application of the model [6].

International direct investment is closely related with international trade, and gravity model is applicable to direct investment. Research by Gao Guowei shows that direct investment between two countries is negatively correlated with the distance between them, while positively correlated with their economic scale [7].

Grampon was the first (1966) to apply gravity model to tourism study [8]. Taking China’s famous scenic sport Shennongjia as an example, Wan Nianqing *et al.* made empiric study. Huang Ailian from Guangxi University

made use of gravity model in Vietnamese arrivals in China, which reveals that GDP of countries, tourist arrivals, distance and boundaries play important role [9].

However, neither tariff and foreign exchange reserves are taken into consideration, nor gravity model is used in analyzing investment and tourist arrivals. This paper made explorations in this respect.

3. Model Construction

3.1. Selection of Variables

Variables adopted by Li Yanru *et al.* include country *i*’s export to and import from country *j*, GDP of country *i* and country *j*, GDP per capita of country *i* and country *j*, distance between country *i* and country *j*, and a dummy variable of membership; Variables adopted by Wu Simin *et al.* include trade flow between country *i* and country *j*, GDP of country *i* and country *j*, GDP per capita of country *i* and country *j*, difference of GDP per capita between two countries within a free trade area, geological distance between two countries within a free trade area; Variables used by Shan Wenting *et al.* include GDP of the importing country and exporting country, GDP per capita of the importing country and exporting country, difference of GDP per capita between two countries, distance, FDI, a dummy variable of WTO membership, a dummy variable of APEC membership, dummy variables of Chinese, Chinese population and diplomat relationship.

The variables used in this paper is outlined in **Table 1**.

3.2. Data Sources & Data Samples

1) Data resources

Tourist arrivals from China to ASEAN countries originate from Table VIII.27, ASEAN statistical yearbook 2005 and Table VIII.17—Visitor Arrivals from China to ASEAN by Country of Destination, 2000-2008, ASEAN statistical yearbook 2008, see **Table 2**. The export data to China by ASEAN countries come from the

Table 1. Variables and their notation.

Variables	Notation
ODI	China’s outward direct investment in ASEAN countries is the independent variable of this paper, which is neglected by relevant literatures
Tourists	China’s tourist-arrivals is another independent variable of this paper, which is neglected by relevant literatures
Import	China’s import from ASEAN countries or ASEAN export to China is a variable which is closely related with China’s foreign exchange reserves
FER	Foreign exchange reserves are the core variable of this paper, the purpose of which is to investigate into the relationship of FER and other variables
GDP per capita	Instead of GDP, which is an overall amount, GDP per capita reflects the average economic level and take into consideration of the population matter. Thus it can better represent the real situation of a country’s economy
Territory squares	The squares of an ASEAN country are related with tourist arrivals in that country
Distance	The distance between China and an ASEAN country affects not only tourist arrivals in that country

Table 2. Number of Chinese visitors in ASEAN countries.

Year/Destination	Brunei	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	6	31	28	28	425	14	15	434	704	626
2001	6	32	0	41	453	17	19	497	695	673
2002	7	28	20	22	558	18	28	670	763	724
2003	7	39	41	21	351	16	32	568	625	693
2004	5	46	51	33	550	18	40	880	780	778
2005	4	59	53	39	352	20	107	858	762	753
2006	20	81	0	50	439	25	134	1037	1033	516
2007	28	118	181	55	689	30	158	1114	1003	550
2008	28	130	337	106	950	98	164	1079	947	650

UN Commodity Trade Statistics Database (COMTRADE), the original data are shown in **Table 3**. Since little data of Brunei, Myanmar and Laos can be found in COMTRADE, respective data of the three countries are collected from news report and Chinese commercial offices in ASEAN countries. Foreign exchange reserves of China (FRt_China, 0.1 billion dollars) & ASEAN countries (FRit, 0.1 billion dollars) come from UN and China national bureau of statistics websites, shown in **Table 4**. Direct investment (million dollar) of China in ASEAN countries from year 1995 to 2001 come from Table VI.13—FDI inflows into ASEAN Member Countries from China in ASEAN secretary’s ASEAN Statistical Yearbook 2003; Direct investment from year 2000 to 2005 come from Table VI.2—FDI Inflow into ASEAN by Source Country, AECC 2009; 2006 data come from ACIF2008 and Table VI.14—FDI inflows into Brunei Darussalam by Source Country, 1995-2001, ASEAN statistical yearbook 2008, the above data are arranged in **Table 5**. GDP per capita (PGDPit) stem from Item Value—US dollars—Per capita GDP at current prices, UN Statistics Division, shown in **Table 6**. The distance between China and ASEAN countries stems from <http://www.chemical-ecology.net/java/lat-long.htm>, as in **Table 7**. The sources of territory area of ASEAN countries (SQi) is ASEAN Statistics-leaflet—SKI 2011, ASEAN secretariats, refer to **Table 8**.

2) Data samples

Tables 2 to 8 provide the original data got from the above sources.

3.3. Gravity Model Formula

Taking China’s direct investment in ASEAN (Inv), China’s import from ASEAN countries (C_imp), and visitor arrivals from China to ASEAN countries (Vt) as dependent variables, this paper constructs three gravity models.

1) Taking GDP per capita of China (PGDPT_China),

GDP per capita of ASEAN countries (PGDPit), territory area of ASEAN countries (SQi), foreign exchange reserves of ASEAN countries (FRit), foreign exchange reserves of China (FRt_China), distance between China and ASEAN countries (Di) as independent variables, China’s direct investment in ASEAN countries (Inv) as the dependent variable, this paper constructs a investment gravity model as follows:

$$\ln v = f(\text{PGDPit}, \text{PGDPT_China}, \text{FRit_China}, \text{SQi}, \text{Di}) \quad (1)$$

$$\ln v = a_0 * (\text{PGDPit})^{a_1} * (\text{PGDPT_China})^{a_2} * (\text{FRit})^{a_3} * (\text{FRt_China})^{a_4} * (\text{SQi})^{a_5} * (\text{Di})^{a_6} \quad (2)$$

The logarithm form is:

$$\begin{aligned} \ln \ln v &= \ln(a_0) + a_1 \ln(\text{PGDPit} * \text{PGDPT_China}) \\ &+ a_2 \ln(\text{FRit} * \text{FRt_China}) \\ &+ a_3 \ln(\text{SQi}) + a_4 \ln(\text{Di}) + \varepsilon_{ij} \end{aligned} \quad (3)$$

2) Taking GDP per capita of China (PGDPT_China), GDP per capita of ASEAN countries (PGDPit), foreign exchange reserves of China (FRt_China), distance between China and ASEAN countries (Di), and China’s tariff (C_tariff) as independent variables, China’s import from ASEAN countries (C_imp) as the dependent variable, this paper constructs an import gravity model as follows:

$$\begin{aligned} \ln \ln v &= f(\text{PGDit}, \text{PGDPT_China}, \text{FRt_China}, \text{Di}, \text{C_tariff}) \quad (4) \\ \ln \ln v &= a_0 * (\text{PGDPit})^{a_1} * (\text{PGDPT_C})^{a_2} * (\text{FRt_C})^{a_3} * (\text{Di})^{a_4} * (\text{C_tariff})^{a_5} \quad (5) \end{aligned}$$

Table 3. China's import from ASEAN, trade value m\$.

Year/origin	Brunei	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	61.35	24.155	2767.7076	6.42	3028.243	125	663.29	5380.093	2816.305	1536.39
2001	148.24	16.754	2200.6704	7.46	3821.01	134.31	792.756	5330.288	2862.72	1417.42
2002	241.81	8.338	2902.9477	9.65	5265.191	136.94	1355.825	6858.76	3554.36	1518.33
2003	312	6.544	3802.5301	11.2	6787.23	169.53	2144.647	10128.13	5701.477	1883.12
2004	251	12.63	4604.7331	12.65	8496.38	207	2653.036	15371.495	7097.954	2899.14
2005	208	14.26	6662.3538	25.54	9284.4	274.7	4076.996	19757.038	9134.2	3246.38
2006	200.74	15.52	8343.5713	50	11638.253	253	4627.66	26491.28	11774.18	3242.84
2007	217	10.16	9675.5127	85	15443.851	371	5749.864	28924.629	14872.546	3646.13
2008	88.87	12.93	11636.5037	147	19012.612	651.87	5469.186	31080.836	15997.87	4850.11
2009	282	16.38	11499.3273	367	19103.882	646	2933.923	26302.523	16123.83	5402.98

Table 4. FER (0.1 billion US dollars).

Year/Country	Brunei	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	4.1	5	284.4	1.4	294.6	2.2	130.2	799.5	319.4	34.1
2001	3.2963	5.863	273.2	1.2751	305.5	4	134.8	755.7	324.4	36.8
2002	3.691	7.756	307.543	1.855	324.191	4.699	132.005	815.666	380.422	41.21
2003	3.7646	8.1533	350.6	1.8946	446.4	5.5	136.9	960.1	411.9	62.4
2004	3.8468	9.4313	349.5	2.07874	658.8	6.7	131.2	1122.3	486.6	70.4
2005	4.9	9.5	329.8	2.3	698.4	7.7	159.2	1157.7	506.8	90.5
2006	5.2	11.6	411	3.3	821.3	12.4	200.3	1362.6	652.9	133.83
2007	6.3	18.1	547.4	5.2	1006.4	18.0669	300.7	1625.2	851.1	235.9
2008	7.1	22.9	493.4	6.1	906.1	22.9144	330.5	1736.5	1083.2	238.8
2009	10	27.4	605.7	6.2	928.7	27.4374	375.1	1860.1	1336	160.3

Table 5. China's investment in ASEAN: million US dollars.

Year	Brunei	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	0	0.1	-2.8	9.1	0.7	0	0	-168.6	7.2	21
2001	0	2.9	-1.5	11.8	16.9	0.5	0.1	91.5	-2.5	24.2
2002	0.2	49.2	0	1.3	13.2	4.8	0	-170.9	20.9	9.4
2003	0.2	26.2	-0.4	1.8	1.8	0	0	131.7	23.8	1.5
2004	3	33	294.6	0.1	2	108.1	-0.2	212.6	-3.8	85.6
2005	0.1	102.8	299.5	4.5	1	1.2	-0.2	69.2	11.6	48.2
2006	4.8	130.1	123.6	5.3	-6.7	1.5	2.3	616.7	49.9	88.7
2007	17.2	164.9	117.2	1.7	4.6	1.7	-0.1	594.2	73.7	251.8
2008	0	76.9	380.2	42.9	56.5	349.2	-0.2	478	69	44.6

Table 6. Per capita GDP at current prices (US dollars).

Year	Brunei	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam	China
2000	18351	295	773	311	4006	162	1048	24063	1943	396	957
2001	16752	315	742	309	3872	168	966	22030	1808	410	1049
2002	17107	334	893	318	4114	227	1009	22479	1963	436	1152
2003	18801	358	1058	364	4398	216	1020	23484	2182	486	1299
2004	22116	405	1143	423	4875	223	1089	27090	2442	552	1520
2005	26249	471	1258	476	5286	258	1205	29402	2644	636	1777
2006	30975	538	1586	569	5890	297	1403	32955	3078	725	2158
2007	32442	632	1859	710	6904	389	1685	38677	3643	835	2691
2008	37415	749	2172	878	8093	547	1932	39685	3993	1060	3472

Table 7. Distance between Shanghai & ASEAN (km).

Bandar Seri Begawan	Phnom Penh	Jakarta	Vientiane	Kuala Lumpur	Rangoon/Yangon	Manila	Port of Singapore	Bangkok	Hanoi
2994.199	2768.3041	4429.737	2398.94	3740.407	3013.232	1843.4	3801	2885.67	1919

Table 8. Territory: square kilometers.

Brunei	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam	China
5765	181035	1860360	236800	330252	676577	300000	710	513120	331051	9600000

The logarithm form is:

$$\begin{aligned} & \ln \text{Imp} \\ &= \ln a_0 + a_1 \ln(\text{PGDPit}) + a_2 \ln(\text{PGDPt_C}) \\ & + a_3 \ln(\text{FRt_c}) + a_4 \ln(\text{Di}) \\ & + a_5 \ln(\text{C_tariff}) + \varepsilon_{ij} \end{aligned} \tag{6}$$

3) Taking GDP per capita of China (PGDPt_C), GDP per capita of ASEAN countries (PGDPit), territory area of ASEAN countries (SQi), foreign exchange reserves of China (FRt_C), distance between China and ASEAN countries (Di) as independent variables, visitor arrivals from China to ASEAN countries (Vt) as the dependent variable, this paper constructs visitors gravity model as follows:

$$\begin{aligned} & Vt = f(\text{PGDPit}, \text{PGDPt_C}, \text{FRt_C}, \text{SQi}, \text{Di}) \\ & = a_0 * (\text{PGDPit})^{a_1} * (\text{PGDPt_C})^{a_2} \\ & \quad * (\text{FRt_C})^{a_3} * (\text{Di})^{a_4} * (\text{SQi})^{a_5} \end{aligned} \tag{7}$$

The logarithm form is:

$$\begin{aligned} & \ln Vt = \ln a_0 + a_1 \ln(\text{PGDPit}) + a_2 \ln(\text{PGDPt_C}) \\ & + a_3 \ln(\text{FRt_C}) + a_4 \ln(\text{Di}) \\ & + a_5 \ln(\text{SQi}) + \varepsilon_{ij} \end{aligned} \tag{8}$$

3.4. Estimation Method

Individual random effect model is used in estimation of

China's import from ASEAN countries;

Basing on period SUR weight selection, mixed estimation is used for China's direct investment in ASEAN countries and visitor arrivals from China to ASEAN countries.

4. Results and Analysis

We can see from **Table 9** that the significance of F-statistics is 0.000000 and R² is 0.63, indicating a good fitting.

The coefficient of LOG(PGDP?) is positive, which indicates that the higher an ASEAN country's GDP per capita, the higher the value China imports from this country; The coefficient of LOG(FR_CHINA) is positive, indicating that the higher China's foreign exchange reserves, the higher the value China imports from this country.

The largest constant goes to Vietnam, and the corresponding equation is:

$$\begin{aligned} & \text{LOG}(\text{C_IMP_VIETNAM}) \\ &= 2.174672394 - 10.63865183 \\ & + 0.6006569284 * \text{LOG}(\text{PGDP_VIETNAM}) \\ & + 0.693041604 * \text{LOG}(\text{FR_CHINA}) \\ & + 1.157523276 * \text{LOG}(\text{D_VIETNAM}) \\ & - 0.3739946759 * \text{LOG}(\text{PGDP_CHINA}) \\ & + 0.1939684597 * \text{LOG}(\text{C_TARIFF}) \end{aligned} \tag{9}$$

Table 9. Estimation of China’s import from ASEAN.

Dependent variable: LOG(C_IMP?)				
Method: pooled EGLS (Cross-section random effects)				
Sample: 2000 2009				
Included observations: 10				
Cross-sections included: 10				
Total pool (balanced) observations: 100				
Swamy and arora estimator of component variances				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10.63865	24.49846	-0.434258	0.6651
LOG(PGDP?)	0.600657	0.347601	1.728006	0.0873
LOG(FR_CHINA)	0.693042	0.304683	2.274628	0.0252
LOG(D?)	1.157523	3.031632	0.381815	0.7035
LOG(PGDP_CHINA)	-0.373995	0.678293	-0.551376	0.5827
LOG(C_TARIFF)	0.193968	0.676686	0.286645	0.7750
Random effects (Cross)				
_BRUNEI--C	-3.199188			
_INDONESIA--C	1.488676			
_MALAYSIA--C	1.288989			
_PHILIPPINES--C	1.696470			
_SINGAPORE--C	0.765929			
_THAILAND--C	1.852104			
_LAOS--C	-2.450244			
_VIETNAM--C	2.174672			
_MYANMAR--C	-0.243181			
_CAMBODIA--C	-3.374226			
Effects specification				
Cross-section random S.D./Rho			2.486817	0.9685
Idiosyncratic random S.D./Rho			0.448789	0.0315
Weighted statistics				
R-squared	0.627207	Mean dependent var		0.390014
Adjusted R-squared	0.607377	S.D. dependent var		0.712448
S.E. of regression	0.446417	Sum squared resid		18.73313
F-statistic	31.63007	Durbin-Watson stat		0.521162
Prob (F-statistic)	0.000000			

The constant corresponding to Philippines ranks the third, and the estimation equation is:

$$\begin{aligned} & \text{LOG}(C_IMP_PHILIPPINES) \\ & = 1.696469567 - 10.63865183 \\ & + 0.6006569284 * \text{LOG}(PGDP_PHILIPPINES) \\ & + 0.693041604 * \text{LOG}(FR_CHINA) \quad (10) \\ & + 1.157523276 * \text{LOG}(D_PHILIPPINES) \\ & - 0.3739946759 * \text{LOG}(PGDP_CHINA) \\ & + 0.1939684597 * \text{LOG}(C_TARIFF) \end{aligned}$$

The constant of Brunei, Laos, Cambodia, and Myanmar is negative, which shows that among the ten ASEAN countries, these four countries export the least to China. The estimation equation is:

$$\begin{aligned} & \text{LOG}(INV?) \\ & = -22.48829733 - 1.357056484 * \text{LOG}(PGDP?) \\ & + 0.6996357718 * \text{LOG}(FR?) \\ & + 2.753979703 * \text{LOG}(D?) \quad (11) \\ & - 0.6226607568 * \text{LOG}(SQUARE?) \\ & + 2.51269415 * \text{LOG}(PGDP_CHINA) \\ & - 0.08551965235 * \text{LOG}(FR_CHINA) \end{aligned}$$

The fitness coefficient R² in **Table 10** is 0.935473, the significance of F-statistics is 0.000000, which shows a close fitness. The coefficient of LOG(PGDP?) is negative, showing that the higher an ASEAN country’s GDP per capita, the less is China’s direct investment in the ASEAN country; the coefficient of LOG(PGDP_CHINA) is positive, showing that the higher China’s GDP per capita, the more China’s direct investment in ASEAN countries; the coefficient of LOG(FR?) is positive, showing that the higher foreign exchange reserves ASEAN countries have, the more China’s direct investment in ASEAN countries; the coefficient of LOG(SQUARE?) the larger ASEAN country’s territory, the less is China’s direct investment in the ASEAN country; the coefficient of LOG(D?) is positive, showing that the further the distance, the more China’s direct investment in that ASEAN country; the coefficient of LOG(FR_CHINA) is negative, showing that the higher foreign exchange reserves China has, the less is China’s direct investment.

The estimation equation is:

$$\begin{aligned} & \text{LOG}(VT?) \\ & = -10.8024212 + 0.6638701265 * \text{LOG}(PGDP?) \\ & - 0.2960836144 * \text{LOG}(FR_CHINA) \quad (12) \\ & - 0.0006392371085 * \text{LOG}(D?) \\ & + 1.224482102 * \text{LOG}(PGDP_CHINA) \\ & + 0.3257720108 * \text{LOG}(SQUARE?) \end{aligned}$$

The fitness coefficient R² in **Table 11** is 0.971968, the

Table 10. The estimation of China's direct investment in ASEAN countries.

Dependent variable: LOG(INV?)				
Method: pooled EGLS (Period SUR)				
Sample: 2000 2008				
Included observations: 9				
Cross-sections included: 10				
Total pool (unbalanced) observations: 69				
Linear estimation after one-step weighting matrix				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-22.48830	6.648653	-3.382384	0.0012
LOG(PGDP?)	-1.357056	0.216312	-6.273620	0.0000
LOG(FR?)	0.699636	0.093829	7.456464	0.0000
LOG(D?)	2.753980	0.637006	4.323317	0.0001
LOG(SQUARE?)	-0.622661	0.104672	-5.948676	0.0000
LOG(PGDP_CHINA)	2.512694	1.838880	1.366426	0.1767
LOG(FR_CHINA)	-0.085520	1.056921	-0.080914	0.9358
Weighted statistics				
R-squared	0.935473	Mean dependent var	2.180250	
Adjusted R-squared	0.929228	S.D. dependent var	3.375755	
S.E. of regression	0.898052	Sum squared resid	50.00282	
F-statistic	149.8055	Durbin-Watson stat	1.848526	
Prob (F-statistic)	0.000000			
Unweighted statistics				
R-squared	0.498172	Mean dependent var	2.622846	
Sum squared resid	191.0093	Durbin-Watson stat	1.396027	

significance of F-statistics is 0.000,000, which shows a close fitness.

The coefficient of LOG(PGDP?) is positive, showing that the higher an ASEAN country's GDP per capita, the more visitor arrivals from China to ASEAN countries; The coefficient of LOG(FR_CHINA) is negative, indicating that the higher foreign exchange reserves China has, the less visitor arrivals from China to ASEAN countries; The coefficient of LOG(D?) is negative, indicating that the further the distance between China and an ASEAN country, the less visitor arrivals from China to ASEAN countries; The coefficient of LOG(PGDP_CHINA) is positive, showing that the higher China's GDP per capita, the more visitor arrivals from China to ASEAN countries; The coefficient of LOG(SQUARE?) is positive, showing that the larger

an ASEAN country's territory, the more visitor arrivals from China to that ASEAN country.

5. Conclusions and Suggestions

5.1. The Result of China's Import from ASEAN Model Indicates

The higher China's foreign exchange reserves, the higher China's import from ASEAN. Brunei, Laos, Cambodia and Myanmar lag behind other six ASEAN countries in exporting to China. Whereas Vietnam ranks the first, and Philippines ranks the third. Therefore China not only has the potential of expanding import from Brunei, Laos, Cambodia and Myanmar, but also counteracts in regard of South China Sea issue through control of import from Vietnam and Philippines.

Table 11. The estimation of visitor arrivals from China to ASEAN countries.

Dependent variable: LOG(VT?)				
Method: pooled EGLS (Period SUR)				
Sample: 2000 2008				
Included observations: 9				
Cross-sections included: 10				
Total pool (unbalanced) observations: 88				
Linear estimation after one-step weighting matrix				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10.80242	4.004686	-2.697445	0.0085
LOG(PGDP?)	0.663870	0.136499	4.863551	0.0000
LOG(FR_CHINA)	-0.296084	0.161795	-1.829991	0.0709
LOG(D?)	-0.000639	0.465135	-0.001374	0.9989
LOG(PGDP_CHINA)	1.224482	0.396495	3.088266	0.0027
LOG(SQUARE?)	0.325772	0.079314	4.107396	0.0001
Weighted statistics				
R-squared	0.971968	Mean dependent var	3.744166	
Adjusted R-squared	0.970259	S.D. dependent var	5.124123	
S.E. of regression	0.883687	Sum squared resid	64.03401	
F-statistic	568.6480	Durbin-Watson stat	1.789318	
Prob(F-statistic)	0.000000			
Unweighted statistics				
R-squared	0.105666	Mean dependent var	4.728735	
Sum squared resid	218.1786	Durbin-Watson stat	0.060792	

5.2. The Result of Chinese Tourist Arrivals in ASEAN Model Reveals

The higher China's foreign exchange reserves are, the less Chinese tourist arrivals in ASEAN. The further the distance between China and an ASEAN country is, the less Chinese tourist arrivals in ASEAN. The higher China's GDP per capita is, the more Chinese tourist arrivals in ASEAN. The larger the territory of an ASEAN country is, the more Chinese tourist arrivals in ASEAN. Thus Chinese tourist arrivals in ASEAN will expand with China's GDP per capita.

5.3. The Result of China's Direct Investment in ASEAN Model Suggests

The higher GDP per capita of ASEAN, the less China's direct investment. This is in accordance with anticipation. The higher China's GDP per capita, the more China's direct investment. This is also in compliance with antici-

pation. Nevertheless, the higher an ASEAN country's foreign exchange reserve, the more China's directs investment in it. The larger the territory of an ASEAN country, the less China's direct investment in it. The further the distance between China and an ASEAN country is, the more China's direct investment in it. The higher China's foreign exchange reserves are, the less China's direct investment. These run contrary to supposition. Hence China's direct investment in ASEAN can be further expanded to exert a positive influence of huge foreign exchange reserves.

REFERENCES

- [1] Y. R. Li, Z. X. Hu and C. G. Ma, "Expanded Effects of CAFTA on Intra-Regional Trade—A Positive Study Based on Gravity Model," *Productivity Research*, No. 10, 2011, pp. 102-103.
- [2] H. T. Wang, "Empirical Study of Bilateral Trade between Guangxi and ASEAN Based on Trade Gravity Model,"

- Business Times*, No. 29, 2010, pp. 49-50.
- [3] S. M. Wu and Z. H. Zhan, "CAFTA Research Based on Gravity Model," *Special Economic Zone Economy*, No. 11, 2006, pp. 338-339.
- [4] W. T. Shan and Yangjie, "Gravity Model in China and ASEAN Trade Diagnosis Analysis," *Asia Pacific Economic Review*, No. 6, 2006, pp. 16-20.
- [5] D. L. Song, "Gravity Model Research of China—ASEAN Trade," *China Business & Trade*, No. 1, 2010, pp. 173-174.
- [6] H.-X. Ding, "Development of the Theoretical Study on Trade Gravity Model and Issues in Its Application," *Economic Survey*, No. 6, 2009, pp. 38-41.
- [7] G. W. Gao, "FDI and Gravity Model," *World Economy Study*, No. 11, 2009, pp. 83-87.
- [8] N.-Q. Wan and L.-S. Zhang, "A Forecasting Model of Tourism Destination Market Scale Based on the Gravitation Model," *Journal of Henan University (Natural Science)*, Vol. 40, No. 1, 2010, pp. 45-49.
- [9] A. L. Huang, "Influencing Factors of China-Vietnam Entry Tourism Based on Gravitation Model," *Commercial Research*, No. 9, 2011, pp. 207-211.