Impacts of the Euro sovereign debt crisis on global trade and economic growth: A General Equilibrium Analysis based on GTAP model

Li Na[1,2], Shi Minjun[1,2], Huang Wen[1,2]
1. University of Chinese Academy of Sciences, Beijing 100049, China
2. Research Center On Fictitious Economy & Data Science, Chinese Academy of Sciences, Beijing 100190, China
lina@ucas.ac.cn, mjshi@ucas.ac.cn, hwcas@sina.com

Abstract: Euro sovereign debt crisis will influence international trade and global economy through affecting factors supply, consumer and investment demand, and production efficiency in the PIIGS region. This paper aims to examine the impacts of Euro sovereign debt crisis on global import, export and global economic growth through trade channels by using the methods of general equilibrium analysis and scenario simulation based on GTAP model.

As Euro sovereign debt crisis still continue, this research is carried out by two steps to examine its impacts on global economy: 1) the impacts of Euro sovereign debt crisis on global economy up to now (until the end of 2012); 2) the impacts of different trends of Euro sovereign debt crisis on global economy in future (2012-2015).

The simulation results show that global economic growth has suffered a serious damage from 2010 to 2012. Affected by Euro sovereign debt crisis, the average annual growth rate of the global economy has reduced by 0.65% and global unemployment rate has risen by 1.81%. Global trade was in depression and the average annual trade growth was reduced by 1.14%. The import and export trade of the United States and China suffered more serious affected by the crisis. Due to the impact of the European sovereign debt crisis, the average annual growth of China's economy decreased 0.37 percentage points, which is more serious than the United States and other BRIC countries. The exports of raw materials processing and machinery and electronics manufacturing industries of China were affected more serious.

The impacts of the European sovereign debt crisis on global economic growth will continue in the next few years (2012-2015). The gap of the prospects for global economic growth between in pessimistic and optimistic scenarios is larger, and boosting the global economy still needs stronger economic stimulus policies to carry out. Trade diversion is hard to offset the impacts of the shrinking market of EU, and the European sovereign debt crisis will continue to affect global trade. The external demand environment of Chinese economy will continue in depression, and the decline of investment and consumption of other countries caused by the European sovereign debt crisis on will further led to reduce their imports from China, which requires the concern and vigilance of the Chinese government.

Key Words： Euro sovereign debt crisis; Global Economy; GTAP; General Equilibrium Analysis

1. Introduction

Plagued by the European sovereign debt crisis, the Euro zone economy is facing a severe test. The weak economic growth in the Euro zone will drag on world economic growth and the risk of global double-dip recession are growing. The spread and evolution of European sovereign debt crisis will result in a significant and far-reaching impact on the European economy and may reshape the global economic pattern. Therefore there is a necessary to study deeply on the impacts of the European sovereign debt crisis on the global economy and look ahead the trend of the global economic pattern after the European sovereign debt crisis, which will provide a reference of making decision for the timely and effective policy response.

The impact of financial crisis on the global economy mainly through affecting crisis countries' consumption demand, investment demand and government spending, in turn affect international trade and the global economy. Kim (2001) found that the Asian financial crisis has important impacts on saving and consuming behaviors of directly suffered countries and other Asian countries. Inklaar and Yang (2012) found that the financial crisis have a negative impact on investment, especially more obvious affect on the countries with larger uncertainty and lower bear ability by 74 countries data analysis during 1970-2005. Financial crisis will bring about consumption and investment demand shrinking, government spending reduction, and the trade balance change, thereby affecting the economic growth of the country and other countries. Benati (2012) found that the US subprime mortgage crisis had led to more than 60% reduction of potential output growth in the Euro zone, the US, the UK and Japan. UK is the hardest hit and the growth rate of output decreased by 4.4%. As the financial crisis has led to the lack of demand, the higher the degree of foreign trade dependence of the country, the more significant the affection by the financial crisis(Gupta et al, 2006; of Berkmen et al, 2012). Cheng (2012) analyzed the impacts of the US financial crisis on the world economy and China's economy. The results showed that the economic growth of the major developed countries, the emerging market countries in Asia and Europe were severely affected by the US financial crisis. For the impact of the US financial crisis on China's economy, trade pathway is a main channel and the role of the virtual economy channels such as FDI and financial channels is smaller. Larry et al. (2012) studied the impacts of European sovereign debt crisis by simulating the world economy situation in the disorderly debt default scenario and extreme situations of financial instability scenario. The results show that the level of GDP in the Euro area will decrease by 4.25 % after one year lower than the basic scenario by 2.0-2.25% and Greek exiting from the Euro zone would trigger a global recession. The majority of the research above is referring to the impact of the financial crisis happened in history on global trade and economy, but the research on the impact of the European sovereign debt crisis on the global economy is very little, especially the study from the view of trade chain conduction to analyze quantitatively the impact of the European debt crisis on the global economy is rare.

Based on the above background, this paper focuses on the impact of the European sovereign debt crisis on the global economy through the trade chain conduction. This paper use a multi-national multi-sectoral CGE model-GTAP (Global Trade Analysis Project) model through scenario analysis and policy simulation methods to analyze the shock of the European sovereign debt crisis on the supply and demand side, and then simulate the impact of the European sovereign debt crisis on the global import, export and economic growth through trade channel.

As the impact of the European sovereign debt crisis continues, the study of the impact of European sovereign debt crisis on the global economy can be divided into two parts: 1) the impact of European sovereign debt crisis on the current global economy since it started (due to the European debt crisis began in late 2009, the impact of European sovereign debt crisis on the current global economy is from 2010 to 2012); 2) the impact of the development trend of the European sovereign debt crisis on the future global economy (2013-2015). This study is expected to provide scientific references for China to make strategies to deal with the European sovereign debt crisis.

2. Methods and data

In this study, GTAP model is used to study the economic impact of the European sovereign debt crisis by comparative static simulation analysis. GTAP database 2007 is chosen as the data of the base year for simulation. According to research needs, the regions and sectors were properly aggregated (Table 1 and 2). In order to better simulate the impact of the European sovereign debt crisis, we make a dynamic simulation to change 2007 aggregated database to 2009 base on regional economic output in 2009, and then use this as a simulation database.

Table 1 Regional Aggregation

No.	Code	Include Countries and areas
1	PRT	Portugal
2	IRL	Ireland
3	ITA	Italy
4	GRC	Greece
5	ESP	Spain
6	ROEZ	Austria/Belgium/Cyprus/Estonia/Finland/France/Germany/Malta/Slovakia/Slovenia/Netherlands/Luxembourg
7	ROEU	Rest of Europe
8	CHN	China
9	US	USA
10	JPN	Japan
11	ROB	India/Brazil/Russia/south Africa
12	ROAS	Rest of Asia
13	ROAM	Rest of America
14	ROAF	Rest of Africa

Table 2 Sectoral aggregation

No.	Code	Description
1	AGR	Paddy rice\Wheat\Cereal grains nec\Vegetables, fruit, nuts\Oil seeds\Sugar cane, sugar beet\Plant-based fibers\Crops nec\Cattle,sheep,goats,horses\Animal products nec\Raw milk\Wool, silk-worm cocoons\Forestry\Fishing
2	EXT	Coal\Oil\Gas\Minerals Mining nec
3	PRF	Meat: cattle,sheep, goats, horse\Meat products nec\Vegetable oils and fats\Dairy products\Processed rice\Sugar\Food products nec\Beverages and tobacco products
4	TED	Textiles\Wearing apparel\Leather products\Wood products\Paper products, publishing
5	RAW	Petroleum, coal products\Chemical, rubber, plastic prods\Mineral products nec\Ferrous metals\Metals nec
6	PMF	Metal products\Motor vehicles and parts\Transport equipment nec\Electronic

		equipment\Machinery and equipment nec
7	OMF	Manufactures nec
8	BSE	Electricity\Gas manufacture, distribution\Water\Construction\Transport nec\Sea transport\Air transport
9	CSE	Trade\Communication\Financial services nec\Insurance\Business services nec\Recreation and other services\PubAdmin/Defence /Health/Educat\Dwellings

3. Scenario Design

(1) Baseline scenario

The baseline scenario is the scenario that the European sovereign debt crisis did not happen and the economic development is normal as before. Baseline scenario is also a reference scenario compared with other scenarios. In the baseline scenario, the economic growth trend of each Euro zone country since 2010 should be in accordance with its historical normal trend of economic growth. By remove the particular economic downturn in the financial crisis from 2008 to 2009, the average level of economic growth from 2003 to 2007 is set as the economic growth in baseline scenario (the last volume in Table 3).

Tale 3 Economic growth of the Euro zone (%)

Regions	2003	2004	2005	2006	2007	2008	2009	2010	2011	2003-2007 Average
PRT	-0.91	1.53	0.8	1.43	2.39	-0.03	-2.9	1.36	-1.71	1.54
IRL	3.86	4.36	5.9	5.43	5.45	-2.08	-5.5	-0.79	1.4	5.28
ITA	-0.03	1.72	0.95	2.21	1.66	-1.12	-5.5	1.8	0.44	1.63
GRC	5.97	4.42	2.26	5.57	3.04	-0.14	-3.26	-3.51	-6.87	3.81
ESP	3.05	3.3	3.63	4.12	3.45	0.87	-3.75	-0.32	0.38	3.62
PIIGS	1.45	2.52	2.14	3.18	2.59	-0.41	-4.63	0.55	-0.14	2.61
ROEZ	0.35	2.04	1.46	3.35	3.16	0.78	-4.32	2.87	2.26	2.65

(2) Crisis scenario

The crisis scenario is an actual economic recession scenario since the European sovereign debt crisis (2010-2012). In this scenario, the rise of unemployment rate (the decline of labor supply), the decline of investment demand, consumption demand and production efficiency in the Euro zone during 2010-2012, are main consideration factors of the shock of the European sovereign debt crisis. Table 4 shows the settings of the shock extent of variables. In the short term, the employment of the Non-Euro Zone countries will also be affected, so the labor markets of the Non-Euro Zone countries are considered as non-full employment in macroeconomic closure.

Table 4 Settings of the shock variables in the crisis scenario- compared with the baseline scenario (%)

Regions	Unemployment rate	Consumption	Investment	GDP
PRT	4.71	-23.81	-18.00	-7.85
IRL	7.57	-49.58	-68.96	-15.61
ITA	0.97	-5.71	-12.54	-4.78

GRC	7.77	-42.71	-58.08	-27.76
ESP	9.27	-21.26	-49.19	-12.18
PIIGS	4.65	-5.14	-22.16	-7.63
ROEZ	-0.23	-1.00	-2.63	-2.41

(3) Pessimistic scenario

According to the development trend of the European sovereign debt crisis, two different scenarios are set. One is the pessimistic scenario and the other is the optimistic scenario.

In the pessimistic scenario, it is expected that the European sovereign debt crisis will continue for many years, fiscal austerity will accelerate shrinking demand, unemployment will continue to rise, and the economic measures with little success. Some European leaders and scholars hold that the European sovereign debt crisis requires more than ten years to be resolved. We assume that under the pessimistic scenario, the Euro zone economy will have a recovery in 2016 and are fully restored to pre-crisis level in 2020, and the European sovereign debt crisis will lead to an economic depression in 2015. From a pessimistic point of view, the value of shock variables of the Euro Zone in the models can be set according to the counterparts of the worst few countries in the Great Depression (Table 5). The labor markets of the Non-Euro Zone countries are considered as non-full employment.

Table 5 Settings of the shock variables in the pessimistic scenario- compared with the baseline scenario (%)

Regions	Unemployment rate	Consumption	Investment	GDP
PRT	7.81	-23.81	-31.08	-15.77
IRL	13.19	-49.58	-90.60	-33.98
ITA	1.55	-5.71	-24.86	-9.77
GRC	14.40	-42.71	-82.30	-54.39
ESP	12.85	-21.26	-84.20	-25.61
PIIGS	7.69	-7.62	-60.61	-19.54
ROEZ	0.50	0.96	-5.87	-5.13

(4)Optimistic scenario

In the optimistic scenario, it is assumed that the Euro zone economy will get a gradual recovery starting in 2013 by some European stimulus plans. The degree of recovery can be set with reference to the degree of recovery of the US financial crisis during 2008-2009. From the actual data, the average annual GDP growth rate of the Euro zone except PIIGS in 2010 is 2.87%, equivalent to 90% of 3.16% of GDP growth rate in 2007. Therefore, the average annual GDP growth rate of other Euro zone countries except PIIGS during 2013- 2015 are set to return to about 90% of the average annual GDP growth rate during 2003-2007.Because PIIGS has not yet fully recovered from the US financial crisis before it involved into European sovereign debt crisis, there is no relevant data can be referred. Therefore, we assume that the average annual GDP growth rate of PIIGS during 2013- 2015can return to 80% of average annual GDP growth rate during 2003-2007. Labor employment, investment demand, consumption demand and production efficiency are assumed all gradually recovering during 2013- 2015. The labor markets of the Non-Euro Zone countries are considered as non-full employment.

Table 6 Settings of the shock variables in the optimistic scenario- compared with the baseline scenario (%)

Regions	Unemployment rate	Consumption	Investment	GDP
PRT	4.84	-13.79	-18.20	-9.13
IRL	9.09	-31.70	-73.60	-21.73
ITA	1.04	-3.52	-15.34	-6.03
GRC	8.94	-26.01	-61.66	-33.12
ESP	9.28	-13.15	-63.64	-15.85
PIIGS	6.67	-16.18	-46.49	-11.84
ROEZ	0.11	-0.10	-3.56	-3.11

4. Simulation results

4.1 The impacts of European sovereign debt crisis on the current global economy

(1) The rate of unemployment rises; the global economic growth became weaker and suffered a serious damage.

On circumstance of the slowdown of consumption and investment, the economic growth in each country confronts with serious challenges. Compared with the baseline scenario, the average annual growth rate of the global economy has reduced by 0.65% from 2010 to 2012. Among the PIIGS, Greece suffered the most damage whose average annual economic growth rate has reduced by 10.27% from 2010 to 2012. Outside Europe, Japan suffered more than other countries.

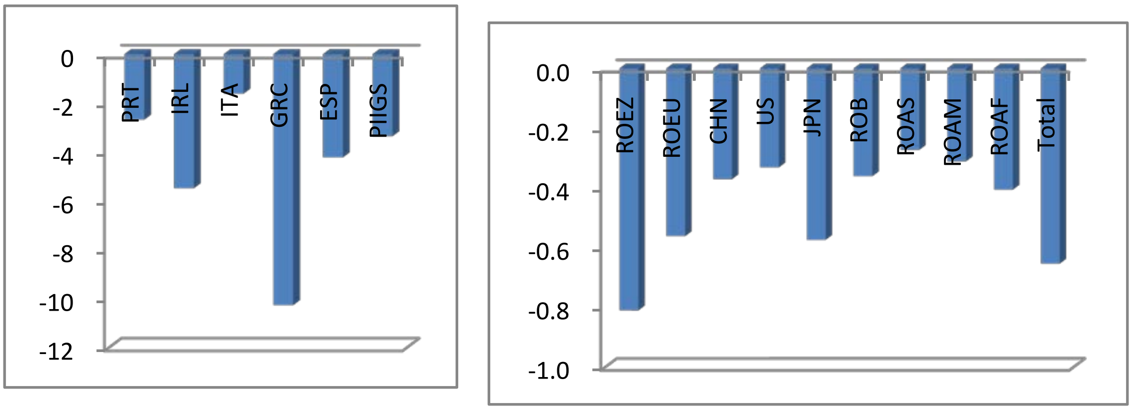


Figure1 Impacts on the average annual GDP growth rate in each area from 2010 to 2012 (%)

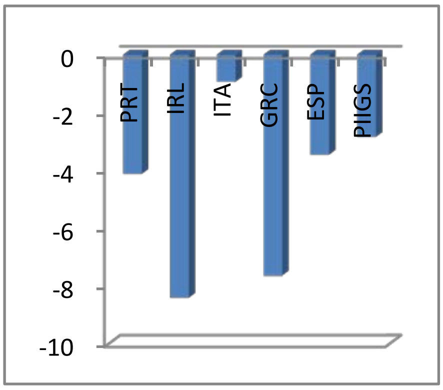
Due to the economy recession, the decline in investment also leads to a decrease in global employment. From 2010 to 2012, global unemployment rate has risen by 1.81%. Except that the rate in Euro Zone countries showed a slight decrease, the unemployment rate in most countries all suffered negative effects. Especially, the high rate in Spain is 9.27%.

Table 7 Employment rate under crisis in 2012 (%)

Regions	Baseline scenario	Crisis scenario	Change	Regions	Baseline scenario	Crisis scenario	Change
PRT	8.82	13.53	4.71	CHN	4.00	6.11	2.11

IRL	4.10	11.67	7.57	US	5.80	7.11	1.31
ITA	8.90	9.87	0.97	JPN	3.90	6.84	2.94
GRC	12.30	20.07	7.77	ROB	6.00	8.04	2.04
ESP	13.06	22.33	9.27	ROAS	3.50	5.26	1.76
PIGS	11.02	16.44	5.42	ROAM	6.00	7.77	1.77
ROEZ	7.48	7.25	-0.23	ROAF	9.00	12.08	3.08
ROEU	9.00	11.76	2.76	World	5.90	7.71	1.81

Because of the unemployment, some families reduce even lost their sources of income due to the future uncertainty. On the aspect of residents' revenue, the most affected area is Africa outside Europe. The decrease in global residents' revenue results in a weak global consumption demand and also in adverse effects on future global economic growth.



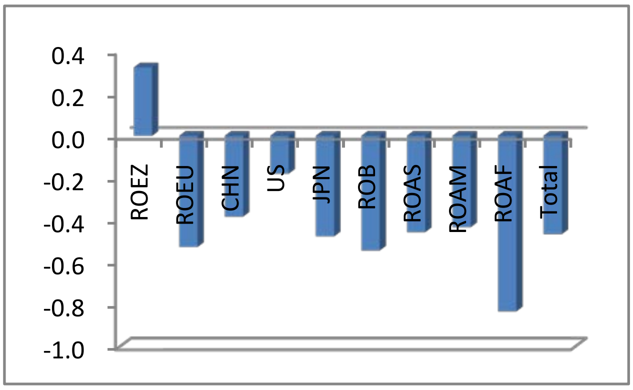
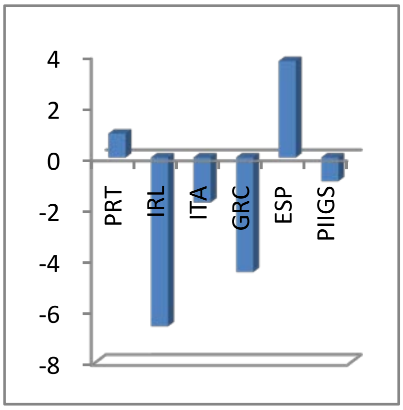


Figure 2 Impacts on the average annual growth rate of residents' revenue in each area from 2010 to 2012 (%)

(2) Global trade declined and global demand confronted with a downturn.

As a result of global demand downturn and sluggish economy, global trade was also in depression. From 2010 to 2012, the average annual trade growth was reduced by 1.14%. The countries whose import and export trade were most affected by the crisis are Ireland, Greece, Spain and other countries outside Europe such as America and China.

On the aspect of export, the export volume decreased in all areas except Portugal and Spain. The average annual growth of export volume has decreased by 0.92% in PIIGS countries. America, China and other BRIC countries suffered more due to the European sovereign debt crisis.



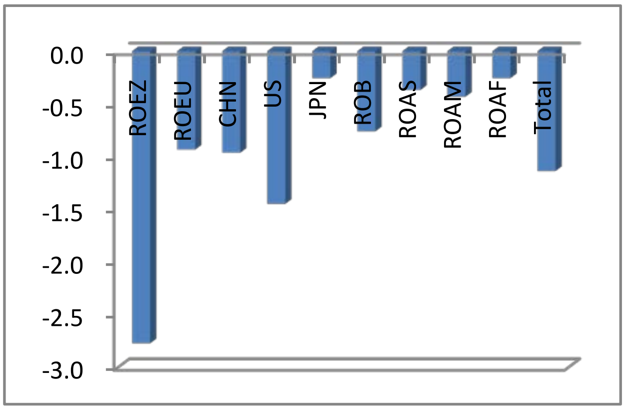


Figure 3 Impact on the average annual growth rate of exports in volume in each area from 2010 to 2012 (%)

Different from export, decline in import took place in all areas. The average annual growth of import volume in PIIGS countries have decreased by 7.46% which is higher than the export suffered. Outside, African countries, Japan and BRIC countries suffered more. In terms of net exports, China is the country which suffered most except Europe countries (Table 8).

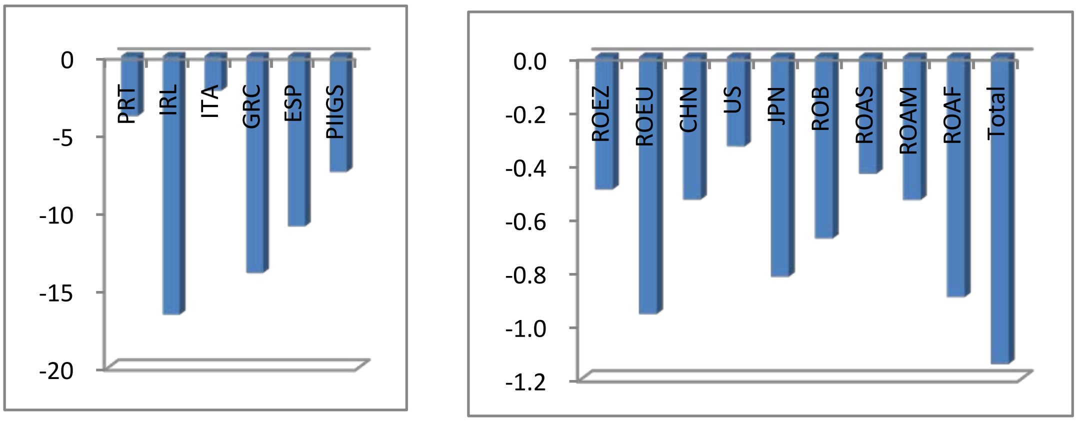


Figure 4 Impact on the average annual growth rate of imports in volume in each area from 2010 to 2012 (%)

Table 8 Net export rate of GDP in each area (%)

Regions	Baseline scenario	Crisis scenario	Change	Regions	Baseline scenario	Crisis scenario	Change
PRT	-8.94	-4.20	4.73	CHN	6.89	6.46	-0.43
IRL	22.65	39.64	16.98	US	-5.48	-5.84	-0.36
ITA	0.37	0.78	0.40	JPN	8.11	8.48	0.37
GRC	-16.32	-7.23	9.09	ROB	1.72	1.65	-0.07
ESP	-8.30	4.65	12.95	ROAS	1.71	1.78	0.07
PIGS	-3.01	3.45	6.45	ROAM	-0.16	-0.08	0.08
ROEZ	2.27	-0.46	-2.74	ROAF	-1.74	-1.06	0.68
ROEU	-1.68	-1.64	0.04	World	6.89	6.46	-0.43

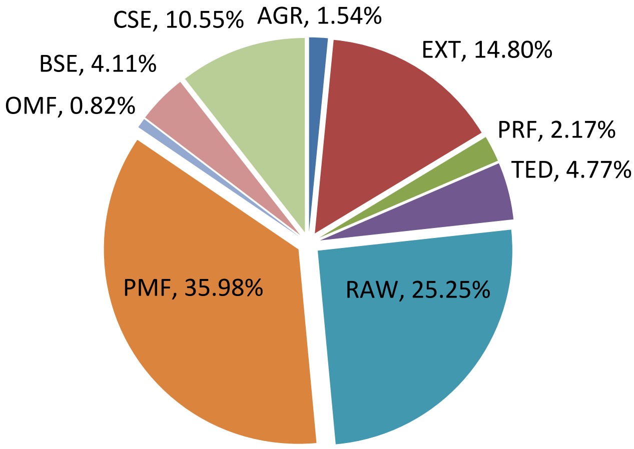


Figure 5 Ratio of each industrial exports decline accounted for the total exports decline from 2010 to 2012 (%)

Due to different trade shares of different industries in global trade, the extents of trade decrease in each sector are different. The two industries whose trade decreases are the biggest are raw material industry (RAW) and machinery and electronics manufacturing industry (PMF). The trade decline volumes of the two industries accounted for the total trade decline volume are 35.98% and 25.25% respectively. The effects of mining industry (EXT) and commercial service industry (CSE) all also big and the ratios are 14.8% and 10.55% respectively. Other industries are affected less due to the crisis.

(3) European sovereign debt crisis brought apparently negative effects to China's exports and economic growth.

Since the crisis took place, the exports growth rate in China became slower. Comparing with the statistics last year, China's exports growth rate decrease by 7.25% and the growth rate of exports to Europe decrease by 21.7% in 2012. Table 3 presents that the growth rate of trade to Europe is bigger than the whole trade growth rate before the US subprime mortgage crisis, and after the US subprime mortgage crisis, exports showed a slump from 2008 to 2009 and a rebound in 2010. However, one more slump took place in China's exports from 2011 to 2012 due to the factors of European sovereign debt crisis.

Table 9 Growth rate of China's exports for each year

	2003-2007 Average	2008	2009	2010	2011	2012
Total exports	28.27%	7.30%	-18.29%	30.47%	15.15%	7.90%
Exports to Europe	38.98%	21.70%	-27.70%	34.20%	22.00%	-2.50%

Note: the statistics of gross export from 2003 to 2011 is calculated by the relevant data of "China Statistical Yearbook 2012". The statistics in 2012 is derived by General Administration Customs. The statistics of trade to Europe is derived from Commerce Department and the figures in 2012 are in the first three quarters.

Through the measurement and calculation, the average annual drop in growth rate of China's exports in volume is about 0.97%. In addition, worst situation is in the trade to Europe and the average annual drop is about 4.05%.

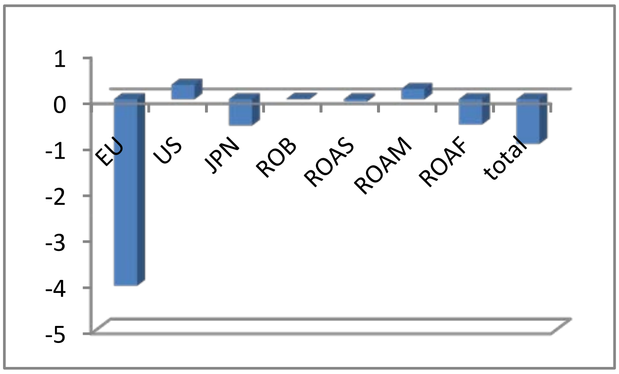


Figure 6 Impacts on the growth rate of China's exports in volume to each area from 2010 to 2012 (%)

From the aspect of sector, the mining industry (EXT) suffered the biggest damage whose average annual growth rate of exports dropped by 3.59% from 2010 to 2012. Textile and paper, and other manufacturing industries suffered less by the European sovereign debt crisis.

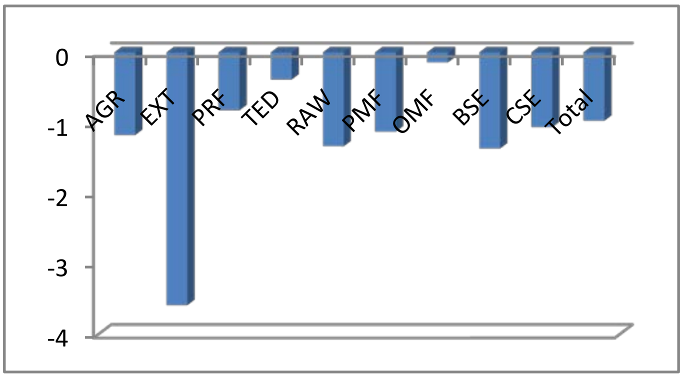


Figure 7 Impacts on the average growth rate of exports in volume in China's industries from 2010 to 2012 (%)

Due to the different contribution of different industries to China's exports, the extents of exports decrease in each sector are different. The raw material processing industry and electronics manufacturing industry suffered the most. Compared with the rate of 3.59% in mining industry, though the average annual growth rate of export decline (1.34% and 1.13%) are smaller, each decline occupied the larger parts of the whole decline in China's exports (57.21% and 22.29%).

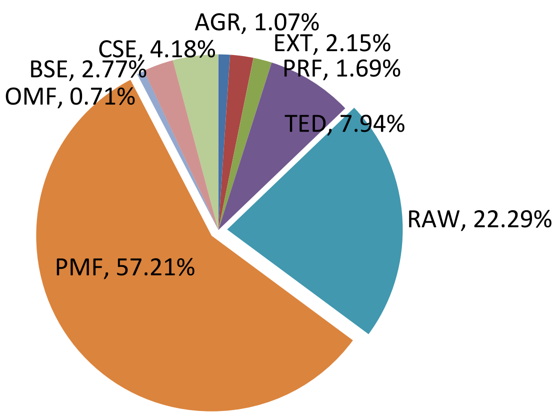


Figure 8 Ratio of each industrial export decline accounted for the total China's export decline in volume from 2010 to 2012 (%)

Caused by the European sovereign debt crisis, the average growth rate of China's economy dropped by 0.37%, which is bigger than the rate of America and BRIC countries and is smaller than that of Japan.

Table 10 Economic growth rate in each area in the crisis scenario (%)

Regions	Baseline scenario	Crisis scenario	Change	Regions	Baseline scenario	Crisis scenario	Change
PRT	1.54	-1.15	-2.69	CHN	8.20	7.83	-0.37
IRL	5.28	-0.22	-5.50	US	2.60	2.27	-0.33
ITA	1.63	0.01	-1.62	JPN	1.94	1.37	-0.57
GRC	3.81	-6.46	-10.27	ROB	4.80	4.44	-0.36
ESP	3.62	-0.62	-4.24	ROAS	3.60	3.33	-0.27
PIGS	2.61	-0.76	-3.37	ROAM	3.00	2.69	-0.31
ROEZ	2.65	1.84	-0.81	ROAF	3.90	3.49	-0.41
ROEU	2.54	1.98	-0.56	World	3.50	2.85	-0.65

4.2 The trend of European Sovereign Crisis and the impacts of it on global economy

(1) The impacts of the European sovereign debt crisis on global economic growth will continue. The gap of the prospects for global economic growth between pessimistic and optimistic scenarios is larger, and stronger economic stimulus policies which boost the global economy are needed to carry out.

In the next few years, the consumption and investment will decrease and as well the impacts of European sovereign debt crisis on global economic growth will continue. Under the pessimistic scenario, the average annual growth rate of global economic will drop by 0.7%; while under optimistic scenario, the rate will drop by 0.15% between 2013 and 2015.

Table 11 Economic growth in the pessimistic and optimistic scenarios for each area (%)

Regions	2013-2015			Change	
	Baseline scenario	Pessimistic scenario	Optimistic scenario	pessimistic scenario	optimistic scenario
PRT	1.54	-1.17	1.11	-2.71	-0.43
IRL	5.28	-1.26	3.20	-6.54	-2.08
ITA	1.63	-0.06	1.21	-1.69	-0.42
GRC	3.81	-6.00	1.99	-9.81	-1.82
ESP	3.62	-1.07	2.38	-4.69	-1.24
PIIGS	2.61	-0.97	1.72	-3.58	-0.89
ROEZ	2.65	1.67	2.42	-0.98	-0.23
ROEU	2.54	2.00	2.41	-0.54	-0.13
CHN	8.20	7.82	8.12	-0.38	-0.08
US	2.60	2.27	2.55	-0.33	-0.05
JPN	1.94	1.24	1.83	-0.70	-0.11
ROB	4.80	4.47	4.73	-0.33	-0.07
ROAS	3.60	3.32	3.54	-0.28	-0.06

ROAM	3.00	2.70	2.95	-0.30	-0.05
ROAF	3.90	3.54	3.82	-0.36	-0.08
World	3.50	2.80	3.35	-0.70	-0.15

The negative impacts of European sovereign debt crisis on global economy under the optimistic scenario are less serious than those under the pessimistic scenario. Currently, the effects of global economy recovery simulated by the economic policies carried out by European countries are still limited. To achieve the effects of economy recovery in the optimistic scenario, European countries need more efforts. Meanwhile, sluggish economy will continue to increase the global unemployment rate and influence the residents' revenue growth. Affected by European sovereign debt crisis, the global unemployment rate will increase by 3.58% and 2.15% respectively in the pessimistic and optimistic scenarios.

Table 12 Unemployment rate in the pessimistic and optimistic scenarios in 2015 (%)

Regions	2013-2015			Change	
	Baseline scenario	Pessimistic scenario	Optimistic scenario	pessimistic scenario	optimistic scenario
PRT	8.82	16.64	13.67	7.82	4.85
IRL	4.10	17.29	13.19	13.19	9.09
ITA	8.90	10.45	9.94	1.55	1.04
GRC	12.30	26.70	21.24	14.40	8.94
ESP	13.06	25.91	22.34	12.85	9.28
PIIGS	11.02	19.14	16.66	8.12	5.64
ROEZ	7.48	7.98	7.59	0.50	0.11
ROEU	9.00	14.40	12.39	5.40	3.39
CHN	4.00	8.24	6.58	4.24	2.58
US	5.80	8.41	7.30	2.61	1.50
JPN	3.90	10.41	7.38	6.51	3.48
ROB	6.00	9.92	8.42	3.92	2.42
ROAS	3.50	7.05	5.64	3.55	2.14
ROAM	6.00	9.49	8.08	3.49	2.08
ROAF	9.00	14.80	12.66	5.80	3.66
World	5.90	9.48	8.05	3.58	2.15

Under the pessimistic and optimistic scenarios, the impacts on residents' revenue of other African countries are the biggest except Europe. It is possible that African poverty will be aggravated and that the realization of UN's target on a thousand years' development will become more difficult.

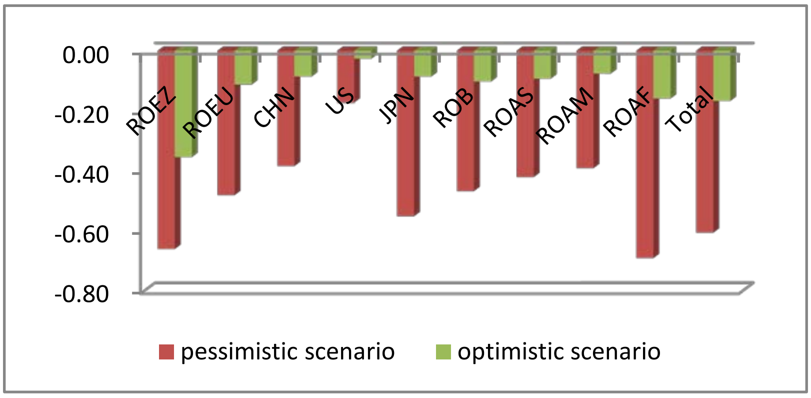


Figure 9 Impacts on the average growth rate of residents' revenue from 2013 to 2015 (%)

(2) European sovereign debt crisis will continue to influence global trade. The external demand of China's economy will keep the situation of downturn.

Under the pessimistic and optimistic scenarios, the average annual growth rate of global trade will drop by 0.97% and 0.22% respectively. From the aspect of regions, the impacts on European countries and countries whose trade are much related to European such as America and China are bigger. Additional, BRIC countries also suffered some damage and other areas suffered less affected by the European sovereign debt crisis.

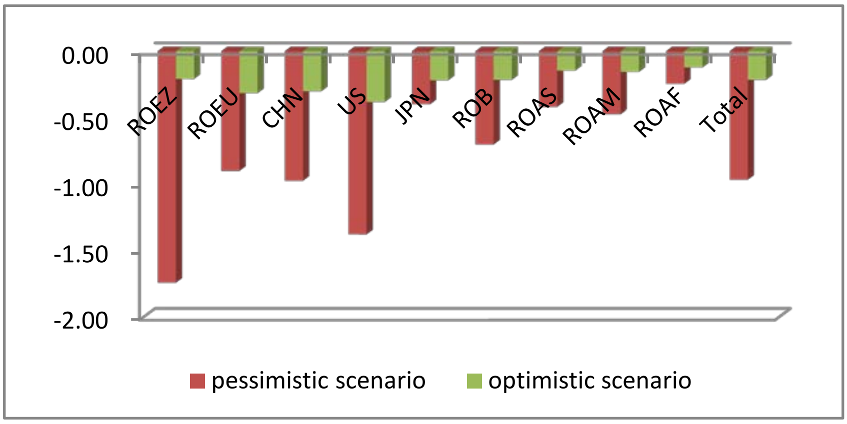


Figure 10 Impacts on the average growth rate of exports in volume from 2013 to 2015 (%)

Some industries which possess comparative advantage have higher proportions of exports and therefore, the damage is apparent by the European sovereign debt crisis. Along with the crisis deepening, the damage will be enlarged. The service industry in Europe, machinery electronic manufacturing industry in America and China, and agricultural industry in BRIC countries and Asian, African and Latin American countries will be influenced a lot.

Table 13 Impacts on the average growth rate of exports in volume on each sector in each country in the pessimistic scenario (%)

	EU	CHN	US	JPN	ROB	ROAS	ROAM	ROAF
AGR	-6.34	-7.12	-5.52	-2.30	-5.22	-4.62	-4.51	-5.69
EXT	-12.88	-23.64	-16.28	-22.81	-14.43	-12.14	-14.71	-10.83
PRF	-4.17	-5.73	-5.79	-1.32	-3.76	-2.91	-3.73	-4.28

TED	-6.87	-4.22	-8.83	-3.32	-4.36	-3.20	-3.09	-2.13
RAW	-13.83	-10.04	-10.70	-5.05	-6.12	-2.91	-2.68	-1.92
PMF	-10.22	-8.62	-11.79	-4.43	-5.92	-5.22	-4.88	-4.90
OMF	-7.05	-2.86	-9.26	-1.31	-3.58	-0.13	-3.10	2.43
BSE	-7.56	-7.47	-7.72	-6.07	-5.47	-5.71	-6.05	-2.61
CSE	-10.64	-6.70	-6.33	-2.71	-4.01	-4.38	-4.37	-0.28

Table 14 Impacts on the average growth rate of exports in volume on each sector in each country in the optimistic scenario (%)

	EU	CHN	US	JPN	ROB	ROAS	ROAM	ROAF
AGR	-1.61	-5.32	-4.11	-2.53	-4.31	-3.83	-3.65	-5.34
EXT	-7.24	-15.92	-11.30	-16.30	-9.75	-8.07	-9.81	-7.21
PRF	-1.87	-4.00	-3.97	-1.70	-2.75	-2.18	-2.88	-3.58
TED	-4.10	-2.78	-5.74	-2.72	-2.77	-2.12	-1.93	-1.50
RAW	-9.23	-6.65	-7.09	-3.49	-3.99	-1.83	-1.65	-1.36
PMF	-6.86	-5.46	-7.45	-2.94	-3.46	-3.15	-2.82	-3.29
OMF	-4.33	-2.04	-5.98	-1.00	-2.20	0.01	-2.00	1.78
BSE	-4.67	-4.86	-5.09	-3.94	-3.59	-3.71	-4.01	-1.69
CSE	-6.87	-4.63	-4.14	-1.32	-2.71	-2.97	-2.98	-0.17

China will still be one of the countries whose exports are affected most by the European sovereign debt crisis. The simulation results show that the effects on China's net export are the most serious.

Table 15 Comparison ratio of net export accounted for GDP for each area in the pessimistic and optimistic scenarios (%)

Regions	2013-2015			Change	
	Baseline scenario	Pessimistic scenario	Optimistic scenario	pessimistic scenario	optimistic scenario
PRT	-8.94	0.34	-4.39	9.28	4.55
IRL	22.65	51.44	42.37	28.79	19.72
ITA	0.37	1.17	0.70	0.79	0.33
GRC	-16.32	-7.94	-7.83	8.38	8.50
ESP	-8.30	17.27	9.43	25.58	17.73
PIIGS	-3.01	8.30	4.98	11.31	7.99
ROEZ	2.27	-1.72	-0.42	-3.99	-2.69
ROEU	-1.68	-1.66	-1.82	0.03	-0.14
CHN	6.89	6.01	6.27	-0.88	-0.62
US	-5.48	-6.21	-5.98	-0.73	-0.51
JPN	8.11	8.91	8.40	0.81	0.29
ROB	1.72	1.55	1.55	-0.17	-0.17
ROAS	1.71	1.80	1.69	0.09	-0.02
ROAM	-0.16	-0.04	-0.16	0.12	0.00
ROAF	-1.74	-0.50	-1.07	1.25	0.67
World	-8.94	0.34	-4.39	9.28	4.55

Under pessimistic scenario, the average annual growth rate of China's exports will drop by 0.98% and the rate of the exports to Europe will drop 3.6%. While under the optimistic scenario, the two ratios are 0.3% and 1.22% respectively.

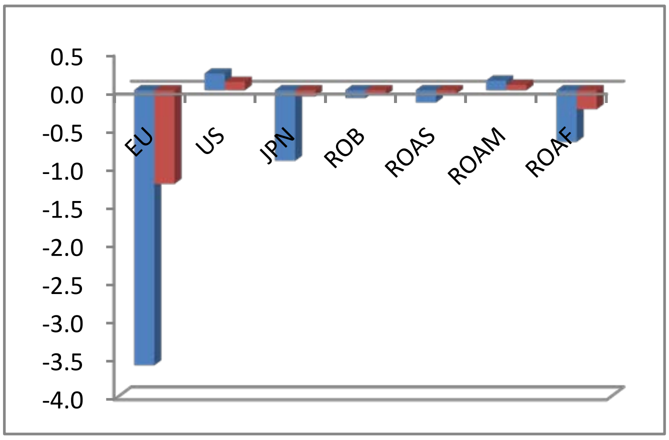


Figure 11 Impacts on the average annual growth rate of China's exports in volume for each area from 3013 to 2015 (%)

On the aspect of sector, the impacts on raw material industry and machinery electronics manufacturing industry are bigger and the impacts on some industries are smaller which have smaller price elasticity of demand such as textile and paper industry and other manufacturing industry. Demand downturn will make China's economy confront with continuously serious challenges. The average annual growth rate of China's economy will drop by 0.38% and 0.08% respectively under the pessimistic and optimistic scenarios.

(3) The effect of trade diversion is hard to offset the impacts of the shrinking market of EU; The decline in investment and consumption of other countries caused by the European sovereign debt crisis will further lead to a reduction in China's import.

Some trade diversions to non-Euro countries in Europe, American countries and Asian countries will take place due to the shrinking market of EU especially in textile and paper, raw material processing, machinery electronics manufacturing, infrastructure and service industries. However, the effects of trade diversion are limited and cannot offset the impacts of the shrinking market of EU. As an example of textile industry, compared with the decline in trade to Euro zone, the ratio of exports diverted to other areas is 22.57% and 26.94% respectively under the pessimistic and optimistic scenarios.

Table 16 Trade diversion of China's exports in volume

Regions	Ratio of trade diversion		Main trade diversion regions
	pessimistic	optimistic	
AGR	0.00%	0.00%	
EXT	0.00%	0.00%	
PRF	7.49%	4.80%	America
TED	26.94%	22.57%	Non-Euro countries in Europe, America, BRIC countries, Asian countries, American countries
RAW	2.78%	3.21%	Non-Euro countries in Europe, America
PMF	7.95%	12.33%	America, BRIC countries, Asian countries, American countries

OMF	80.22%	71.26%	Non-Euro countries in Europe, America, Japan, BRIC countries, Asian countries, American countries
BSE	7.16%	6.00%	America, Asian countries, American countries
CSE	18.97%	16.62%	Non-Euro countries in Europe, America, BRIC countries, Asian countries, American countries

Except the direct influence on China's exports by the shrinking market of EU, the decline of investment and consumption of other countries caused by the European sovereign debt crisis will further lead to a reduction of their imports on products and service. This kind of indirect influence also requires the concern and vigilance of the Chinese government especially on Japan and African countries. Under the pessimistic and optimistic scenarios, the average annual growth rates of China's exports to African countries has dropped by 0.67% and 0.25% respectively and the rates of trade to Japan has dropped by 0.92% and 0.08% respectively.

5. The implication for China and policy suggestion

(1) The goal of economic growth should not be too high

The sluggish of external demand led to decline in net export which is an important factor of "Three drives", developing consumption will take some time, so the situation of economic growth depending on investment will continue. At the same time, the scale of investment is quite huge in China, in order to promote China's economic transformation, our goal of economic growth should not be too high. Taking the goal of " double 2010 GDP and per capita income to 2020" proposed by 18^{th} CPC National Congress into account, China's economic growth targets should be about 7.0%-7.5% in next few years.

(2) Implement the strategy of exports diversification actively

Because China's trade partners were concentrated in the developed economies in Europe and America, European sovereign debt crisis reduced their imports from China; we should explore other markets actively and implement the strategy of diversification. By doing this, we can avoid negative influences brought by the European sovereign debt crisis partly in the short term and conducive to the healthy development of China's trade in the long run.

From a regional perspective, focus on strengthening the economic and trade ties with the BRICS and ASEAN, promote the construction of free trade zones actively will be helpful. In the implementation of the strategy to diversify exports, we can also take measures to increase financial and policy support. For example, to strengthen support to key development market by Export-Import Bank and the Export Guarantee Corporation, to reduce the loan interest rate and premium appropriately; to construct some foreign trade information consulting systems to promote the scientific and reasonable development of foreign trade market; to establish policy fund to help medium and small enterprises to explore overseas market.

(3) Pay attention to maintaining global strategic balance

The European sovereign debt crisis has a significant impact on international economic pattern changes. The recession and its unknown prospects shake the economic status of Euro zone, it has brought new challenges to the global strategic balance. In order to maintain the multi-polarization of world economy development and the global strategic balance, China should encourage its enterprises to invest in high quality projects in Europe, and purchase or introduce the advanced technology. By doing so, we can enhance the competitiveness of enterprises in China, and help the Euro zone economy to restore vitality, which can help to maintain the balance of the world economy.

(4) "Going out" should be more focus on long-term investment and livelihood investment

Africa occupies an important position in China's strategy of "going out". China's investment in Africa was mainly in the infrastructure and energy sector in the past. Considering the great effect on Africa by the European sovereign debt crisis, the future of China's investment should be paid more attention on people's livelihood, in order to increase the employment opportunities and the income of local residents, at the same time to exploit Africa market. Due to the greater impacts of European sovereign debt crisis on Africa household income and consumption demand, we should be more focus on long-term investment and reduce the expectation of short-term returns appropriately.

References

Benati, L., 2012. Estimating the financial crisis' impact on potential output. Economics Letters 114, 113-119.

Berkmen, S.P., et al., 2012. The global financial crisis: Explaining cross-country differences in the output impact. Journal of International Money and Finance 31, 42-59.

Gupta, P., Mishra, D., Sahay, R., 2007. Behavior of output during currency crises. Journal of International Economics 72, 428-450.

Inklaar, R., Yang, J., 2012. The impact of financial crises and tolerance for uncertainty
Journal of Development Economics 97, 466-480.

Kim, Y.H., 2011. The Asian crisis, private sector saving, and policy implications. Journal of Asian Economics, 12: 331-351.

Larry Hatheway，Andrew Cates，Paul Donovan，Sophie Constable. Impacts of the Euro sovereign debt crisis on global economic growth. Global economic review, 2012,6.14. UBS Securities Pte. Ltd.

Cheng Si Wei. 2012. Analysis of American financial crisis and Its Enlightenment. Beijing: Science Press.