

The Impact of Global Financial Crisis on Lao Economy

- GTAP Model Approach -

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Abstract

Laos is a Least Developed Country (LDC) experiencing negative impacts from the Global Financial Crisis (GFC). In order to minimize the impact of the GFC, it is important to assess its impact. However, there are few quantitative assessments of the impact of the GFC in Laos. Therefore, this paper's primary objective is to use a multiple-countries computable general equilibrium (CGE) model to examine the impacts of the GFC. The simulation results show that the GFC has a significant negative impact on Lao economy.

Keywords: Lao economy, Global financial crisis, and CGE model.

JEL Classification: C68; F13

Introduction

Even though the Lao financial system is not directly linked to the global financial system, the Global Financial Crisis (GFC) is having a negative effect on the Lao economy. According to an International Monetary Fund (IMF) projection, the world economy will experience negative growth (about -2%), and the growth in emerging and developing economies will be reduced to 2% in 2009. IMF projects that Laos will grow about 4.5 % in 2009 and 5.50% in 2010 (IMF, 2009a).¹

The GFC can affect the Lao economy in a variety of ways. To begin with, a downturn in the global economy has lead to declining demand for Lao exports; exports of mineral, garments, and agriculture products have been affected. Mineral exports

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¹ However, the Lao government predicts the Lao economy might grow over 7% in 2009 despite the impact of the Global Financial Crisis (Target, 35)

claim one of highest shares of export, accounting for about 37.4% of total export during 2004-2006 (IMF, 2007). With sharply falling mineral prices during the GFC, mineral exports are expected to continue to decline, which will have a severe impact on trade and other macroeconomic factors. Secondly, declining Foreign Direct Investment (FDI) from lower market demand and falling commodity prices is also taking its toll. Since 2003, FDI has mainly focused on the natural resources sector (mining, hydropower), accounting for about 90% of all sectors. As mineral prices fall sharply, FDI in mining will decline. In addition, on-going mining and hydropower projects will be suspended and delayed. Thirdly, during the global economic downturn, remittances from Lao people living in developed countries and from Lao migrant labor in neighboring countries will decline. Remittances from abroad are a significant source of income and investment for families. Fourthly, the GFC affects tourism, one of the most important industries in Laos. In 2008, 1.6 million tourists came to Laos, generating an income of about 233 million US\$ (LNTA, 2008). With the ongoing GFC, the number of tourists will decline.

Because the Lao economy is highly dependent on the mining sector in term of budget revenues, exports and employment, declining mining exports seem to be the most serious consequence of the GFC. Declining mining exports will have a negative impact on government revenue (lower profit tax, turnover tax and dividends); the budget deficit (including off-budget) is projected to rise to 7.8% of GDP in 2008/2009, compared to 2.0% of GDP in 2007/2008 (IMF, 2009b).

In order to minimize the impact of the GFC, the Lao government has implemented the following policies. As revenue is lost from the mining sector, the government will increase loans and grants from donors². Despite its budget constraints, the government plans to stimulate the economy through increased public wage spending, expenditures for the SEA Games, and infrastructure development (World Bank, 2009). In addition, the Lao government is also enhancing trade liberalization through

² Some quasi-fiscal operations are increasingly being financed by the Bank of Lao P.D.R , which increases external vulnerability and downward pressure on international reserves (IMF, 2009b).

the implementation of ASEAN Free Trade Area (AFTA), and by improving laws related to trade—including standards, intellectual property, customs and enterprises—in order to join the WTO. Despite this concern, there has not yet been a quantitative analysis of the impact of the GFC on the Lao economy.

This paper is organized as follows. Section 2 describes the current situation of the Lao economy. Section 3 explains the trade structure in Laos. Section 4 describes the GTAP model and database in terms of the methodology for this analysis and explains the simulation design. Section 5 presents the simulation results. Section 6 includes the conclusion and constraints of this study.

Lao Economy

Since introducing the New Economic Mechanism (NEM) in 1986,³ Laos has been in transition from a centrally planned economy to a more market-oriented economy. As a result, except during the Asia Financial Crisis of the 1990s, Laos has been achieving high rates of economic growth with low inflation. The average rate of economic growth was about 6.53 % during 2001-2006, which increased from 6.18 % during 1996-2000.⁴ The average inflation rate was maintained at one digit during 2001-2006, which is a significant decline from the average rate of 57 % during 1996-2000. The exchange rate was also stable during 2001-2006 (Table 1). Of the nation's total GDP of US\$ 4,053 million in 2007, the agricultural sector accounted for 40.3 %, the industry sector for 34.1 % and the services sector for 25.6 % (World Bank, 2008). However, since 2003, the industry sector has grown more than 10%, which has caused the agricultural share of GDP to decline.

Even though Laos has been maintaining high economic growth with low inflation and a stable exchange rate, it still has serious macroeconomic issues to overcome. Firstly,

³ After establishing the Lao People's Democratic Republic in 1975, the Lao government adopted a planned economy, following other socialist countries.

⁴ The engine of growth during this period was capital inflows of Foreign Direct Investment (FDI) in the mining and hydropower sectors and mining production and exports. For a more detailed discussion of the impact of FDI in the mining and hydropower sectors on the Lao economy see Kyophilavong and Toyoda (2008).

Laos is basically facing chronic twin deficits in both government spending and international trade. The average ratio of budget deficit to GDP was 4.4% during 2001-2006. The average ratio of current account balance deficit to GDP was 9.24 % during the same period.⁵ These deficits are mainly financed by Official Development Assistant (ODA), Foreign Direct Investment (FDI), and remittances. The fiscal issue is particularly serious in Laos. If the budget deficit continues to expand, it might cause an accelerating inflation rate and the devaluation of the kip (Lao currency), and could lead to economic instability like during the period of the Asian Financial Crisis (Okonjo et al, 1999). Secondly, there is a huge gap between savings and investment. The savings rate is low because of low average incomes—GDP per capita was about US\$580 in 2007 (World Bank, 2008)—and because financial sectors are underdeveloped. The banking sectors are occupied by the state commercial banks, which are unable to perform full banking functions.⁶ Thirdly, Laos is also facing a high burden of external debts. The external debt accumulation was more than 60 % of GDP in 2007. If Laos becomes too dependent upon foreign finance, especially to meet its debt obligations, this could cause a foreign debt crisis and might lead to macroeconomic instability. Therefore, the impact of GFC might have serve impact on Lao economy.

⁵ It is important to note that trade data used for this analysis is based on data from international organizations. The Lao government claimed that the trade deficit became a surplus in 2006.

⁶ More details about financial issues, monetary and exchange rate policies in Laos are discussed in Kyophilavong (2008).

Table 1 Key Macroeconomic Indicators

Macroeconomic indicators	2001-2006	1996-2000	1990-1995
Population (million. person)*	5.46	4.86	4.40
Population growth (%)	2.12	2.06	2.52
GDP (current million US\$) **	2,416	1,618	1,276
GDP growth (%)	6.53	6.18	6.46
GDP per capita (constant 2000 US\$) **	379	307	248
GDP per capita growth (%)	4.04	3.68	3.80
Reserve Money (M2) (million US\$)*	450,981	270,728	148,280
Money supply (M2) (%)*	21.14	65.99	30.92
Inflation -CPI (%)	9.73	57.00	15.27
Trade Deficit (million. US\$)***	-219.91	-263.21	-174.92
Trade Deficit /GDP (%)	-9.24	-16.06	-13.14
Foreign reserve (million. US\$)***	220	127	48
External debt (million US\$) *	2,640	2,410	1,965
External debt /GDP (%)	115	152	161
Budget Deficit (including grants)(million US\$)	-104	-58	-100
Budget Deficit /GDP (%)	-4.42	-3.60	-7.61
Budget Deficit (exclude grants)(million US\$)	-149	-121	-145
Budget Deficit /GDP (%)	-6.29	-7.58	-11.21
Exchange Rate (kip/US\$) Official Rate***	10,163	4,094	727

Sources:

* Asian Development Bank (ADB), *Key Indicators for Asia and the Pacific 2008* www.adb.org/statistics

** World Bank, *World Development Indicators CD-ROM (2005)* and

*** International Monetary Fund, *International Financial Statistics CD-ROM August 2008*

Trade Structure

Laos is facing chronic trade deficits. However, trade deficits have been narrowing since 2003⁷. The average trade deficit to GDP ratio was 9.24 % during 2001-2006, a decline from 16.06 % during 1999-2000. The average export growth during 2001-2006 was 20.4 %, an increase from 1.7 % during 1996-2000. On the other hand, the average growth of imports was 14.10 % during 2001-2006 (Table 1).

Laos imports various goods from other countries, from basic consumption goods to investment goods and fuel. The top three import commodities were Electrical and mechanical machine (19.08%), Oil and mineral products (18.63%), and Transport equipment (12.38%) during 2001-2006. Laos' main exports were Wood (31.44%),

⁷ The increase in mining exports is primarily responsible for the narrowing trade deficit. One of the largest mining projects in Laos is the Sepon Mining Project.

Apparel (28.55%) and Base metals and their products (15.31%) during 2001-2006; Base metals and their products have increased since 2001. ASEAN members are Laos' main trading partners; they account for 56.3 % of Lao exports and 77.40 % of imports. In ASEAN, Thailand claims the highest share of exports and imports. Thailand accounted for 65.1 % of total exports from Laos and 85 % of total imports to Laos during 2001-2006 (Table 2, 3, 4 and 5). As Thailand has suffered more during the GFC comparing with ASEAN countries, it might have impact on Lao trade and economy.

Table 2 Exports by County (share, %)

Export	2001-2006		1996-2000		1990-1995	
	Value	share	Value	share	Value	share
	(1000US\$)	(%)	(1000US\$)	(%)	(1000US\$)	(%)
ASEAN	1,731,493	56.3	304,358	25.6	350,454	43
EU	937,474	30.5	534,506	44.9	204,614	25.1
ASIA	301,482	9.8	250,224	21	205,152	25.2
US	54,421	1.8	89,334	7.5	45,880	5.6
Oceania	27,056	0.9	1,441	0.1	263	0
Other	25,687	0.8	11,000	0.9	7,856	1
Total word	3,077,613	100	1,190,864	100	814,218	100
Thailand	1,127,454	65.1	287,440	94.4	334,529	95.5
Vietnam	529,853	30.6	-	-	-	-
Singapore	3,873	0.2	14,551	4.8	14,327	4.1
Malaysia	63,022	3.6	153	0.1	1,138	0.3
Cambodia	529	0	36	0	-	-
Indonesia	6,668	0.4	2,160	0.7	459	0.1
Philippine	83	0	19	0	-	-
Brunei	10	0	-	-	-	-
Total ASEAN	1,731,493	100	304,358	100	350,454	100

Source: Compile from COMTRADE data in the WITS database.

Table 3 Exports by Commodity (share, %)

Commodity			2001-2006		1996-2000		1990-1995	
			Value	Share	Value	Share	Value	Share
			(1000US\$)	(%)	(1000US\$)	(%)	(1000US\$)	(%)
1	1-5	Animals & animal products	24,944	0.81	15,782	1.33	3,200	0.39
2	6-14	Vegetable products	162,192	5.27	85,476	7.18	40,182	4.94
3	15	Animal and Vegetable oils	27	0.00	61	0.01	20	0.00
4	16-24	Processed foods, drink & tobacco	18,883	0.61	7,936	0.67	3,056	0.38
5	25-27	Oil and mineral products	269,742	8.77	33,353	2.80	9,854	1.21
6	28-38	Chemical products	10,578	0.34	2,139	0.18	6,195	0.76
7	39-40	Plastics & rubber product	25,449	0.83	2,459	0.21	616	0.08
8	41-43	Skin, furs and their products	6,840	0.22	7,390	0.62	11,147	1.37
9	44-46	Wood	966,658	31.44	459,470	38.58	484,601	59.54
10	47-49	Wood products & paper	3,537	0.12	1,918	0.16	291	0.04
11.1	50-60	Textiles	7,145	0.23	2,991	0.25	829	0.10
11.2	61-63	Apparel	877,772	28.55	493,639	41.45	200,420	24.62
12	64-67	Shoes, hats, umbrellas, etc	43,627	1.42	35,325	2.97	1,165	0.14
13	68-70	Stone, ceramic & glass products	668	0.02	589	0.05	64	0.01
14	71	Jewelry & precious metal products	45,903	1.49	1,569	0.13	1,312	0.16
15	72-83	Base metals and their products	470,674	15.31	3,857	0.32	40,151	4.93
16	84-85	Electrical and mechanical machines	31,956	1.04	6,749	0.57	3,120	0.38
17	86-89	Transport equipment	55,014	1.79	2,644	0.22	716	0.09
18	90-92	Photographic, precision instruments	1,134	0.04	350	0.03	937	0.12
19	93	Arms & munitions	23	0.00	8	0.00	2	0.00
20	94-96	Furniture & assorted products	13,207	0.43	17,774	1.49	2,016	0.25
21	97-98	Objets d' art	618	0.02	190	0.02	435	0.05
22	99	Other	35,370	1.15	8,326	0.70	3,749	0.46
Total			3,071,962	100	1,189,997	100	814,077	100

Source: Compile from COMTRADE data in the WITS database (see www.wits.worldbank.org)

Table 4 Imports by County (share, %)

Import	2001-2006		1996-2000		1990-1995	
	value	Share	value	Share	value	Share
	(1000US\$)	(%)	(1000US\$)	(%)	(1000US\$)	(%)
1 ASEAN	4,281,062	77.4	2,087,341	79.3	1,173,624	68.5
2 Europe	278,011	5	191,122	7.3	113,934	6.6
3 ASIA	841,249	15.2	318,436	12.1	336,202	19.6
4 US	37,310	0.7	17,702	0.7	15,134	0.9
5 Oceania	79,704	1.4	14,412	0.5	74,070	4.3
6 Other	12,198	0.2	3,265	0.1	1,046	0.1
Total Word	5,529,533	100	2,632,278	100	1,714,100	100
1 Thailand	3,637,465	85	1,910,061	91.5	1,083,996	92.4
2 Vietnam	413,394	907	-	-	-	-
3 Singapore	192,536	405	158,817	7.6	82,739	7
4 Malaysia	20,956	0.5	8,828	0.4	3,665	0.3
5 Cambodia	4,632	0.1	3,184	0.2	-	-
6 Indonesia	10,289	0.2	5,959	0.3	3,224	0.3
7 Philippine	1,643	0	482	0	-	-
8 Brunei	147	0	10	0	-	-
Total ASEAN	4,281,062	100	2,087,341	100	1,173,624	100

Source: Compile from COMTRADE data in the WITS database.

Table 5 Imports by Commodity (share, %)

Commodity			2001-2006		1996-2000		1990-1995	
			Value	Share	Value	Share	Value	Share
			(1000US\$)	(%)	(1000US\$)	(%)	(1000US\$)	(%)
1	1-5	Animals & animal products	61,357	1.11	25,195	0.96	25,980	1.52
2	6-14	Vegetable products	114,419	2.07	62,558	2.38	45,469	2.65
3	15	Animal and Vegetable oils	15,503	0.28	10,060	0.38	4,843	0.28
4	16-24	Processed foods, drink & tobacco	596,643	10.79	316,297	12.02	186,380	10.87
5	25-27	Oil and mineral products	1,030,291	18.63	317,093	12.05	169,041	9.86
6	28-38	Chemical products	300,015	5.43	122,397	4.65	106,326	6.20
7	39-40	Plastics & rubber product	206,129	3.73	93,058	3.53	68,640	4.00
8	41-43	Skin, furs and their products	5,692	0.10	3,046	0.12	1,744	0.10
9	44-46	Wood	7,460	0.13	3,351	0.13	1,857	0.11
10	47-49	Wood products & paper	65,459	1.18	31,082	1.18	15,449	0.90
11	50-60	Textiles	487,822	8.82	198,930	7.56	103,809	6.06
11	61-63	Apparel	68,894	1.25	23,691	0.90	23,748	1.39
12	64-67	Shoes, hats, umbrellas, etc	22,537	0.41	10,359	0.39	16,941	0.99
13	68-70	Stone, ceramic & glass products	141,162	2.55	86,397	3.28	40,498	2.36
14	71	Jewelry & precious metal products	68,731	1.24	15,878	0.60	67,015	3.91
15	72-83	Base metals and their products	394,482	7.13	165,011	6.27	100,379	5.86
16	84-85	Electrical and mechanical machines	1,055,188	19.08	488,686	18.56	294,883	17.20
17	86-89	Transport equipment	684,292	12.38	572,809	21.76	387,199	22.59
18	90-92	Photographic, precision instruments	48,838	0.88	35,342	1.34	16,009	0.93
19	93	Arms & munitions	1,066	0.02	59	0.00	786	0.05
20	94-96	Furniture & assorted products	51,043	0.92	25,666	0.97	17,240	1.01
21	97-98	Objets d' art	598	0.01	71	0.00	112	0.01
22	99	Other	110,801	2.00	32,655	1.24	21,183	1.24
Total			5,529,386	100	2,632,368	100	1,714,100	100

Source: Compile from COMTRADE data in the WITS database (see www.wits.worldbank.org)

Table 6 Tariff Rate Structure Changes

No.	Product Code	Description	MFN Rate					ASEAN Rate	ASEAN FTA rate	Preferential tariff for ASEAN countries
			2007	2006	2005	2001	2000	2004	2001	2005
1	1-5	Animals & animal products	14.30	14.30	14.30	14.684	13.742	7.18	12.03	5.11
2	6-14	Vegetable products	18.32	18.32	54.80	18.28	18.91	10.44	18.03	6.11
3	15	Animal and Vegetable oils	10.36	10.36	13.08	10.28	29.20	6.57	11.00	3.90
4	16-24	Processed foods, drink & tobacco	16.55	19.10	15.61	19.46	14.40	10.63	13.04	7.80
5	25-27	Oil and mineral products	6.33	6.36	5.53	5.38	5.36	2.92	0.00	4.02
6	28-38	Chemical products	10.19	9.57	10.19	8.59	9.79	5.27	5.78	4.33
7	39-40	Plastics & rubber product	15.00	8.39	15.00	8.11	15.68	7.26	4.00	4.36
8	41-43	Skin, furs and their products	17.12	16.66	17.12	16.68	21.00	10.98	0.00	7.87
9	44-46	Wood	13.90	20.45	13.33	21.00	6.34	8.78	12.71	8.06
10	47-49	Wood products & paper	6.24	5.69	6.53	5.92	7.06	6.10	0.00	3.34
11	50-60	Textiles	9.15	8.54	8.89	8.50	9.42	5.93	8.98	3.04
12	61-63	Apparel	11.90	11.07	11.07	10.43	16.34	5.26	8.82	2.80
13	64-67	Shoes, hats, umbrellas, etc	11.28	13.68	10.96	14.75	6.00	8.60	12.38	5.46
14	68-70	Stone, ceramic & glass products	5.10	6.06	5.10	6.30	5.27	4.72	5.90	3.32
15	71	Jewelry & precious metal products	5.16	5.00	5.16	5.00	5.00	3.65	3.57	3.00
16	72-83	Base metals and their products	8.05	7.83	8.05	7.62	8.92	5.49	5.25	3.97
17	84-85	Electrical and mechanical machines	17.36	6.42	17.63	6.47	14.29	6.33	6.77	3.99
18	86-89	Transport equipment	9.01	12.69	9.01	10.93	8.34	7.07	8.00	5.42
19	90-92	Photographic, precision instruments	19.79	16.67	19.79	16.67		6.51	9.00	4.48
20	93	Arms & munitions	9.13	18.16	7.07	18.65		0.00	0.00	0.00
21	94-96	Furniture & assorted products	5.00	8.45		8.34		7.67	6.11	5.69
22	97-98	Objets d' art						3.00	4.00	2.75
23	99	Other						0.00	0.00	0.00
Average			11.391	11.608	13.410	11.526	11.948	6.103	6.755	4.297

Source: Compile from COMTRADE data in the WITS database (see www.wits.worldbank.org)

Under the planned economy, international trade was controlled by the government. At that time, Laos' main trading partners were socialist countries. However, Laos shifted from a planned economy to a market economy in 1986. Trade liberalization has been one of the pillars of economic reforms in Laos (Martin, 2001). The tariff rate changes are shown in Table 6. In November 2004, Laos was granted Normal Trade Relations status by the United States. Moreover, Laos plans to join the WTO by 2010.

Laos applied for the WTO membership in 1997; by February 1998, an official observer statute had been granted and a WTO Working Party for Laos' accession had been established. The first substantive phase of accession began with the collection of data. The Memorandum on the Lao Foreign Trade Regime was submitted to the WTO secretariat in March 2001 and it received a consolidated set of 263 questions from WTO members such as Australia, the European Union (EU) and the United States in early 2002. The fourth working party session took place in July 2008, by which time Laos had made good progress towards becoming a WTO member. The Lao delegation discussed bilateral trade agreements with a number of WTO member states and was also successful in reaching an agreement with the EU on open market access for goods; the service sector in Laos will be negotiated at the next meeting. Despite this progress, many areas still require improvement, such as laws related to trade, including standards, intellectual property, customs and enterprises. These actions indicate that Laos is keen to participate more fully in the global economy in the near future. Both challenges and opportunities remain in order for Laos to gain the benefits of WTO membership.

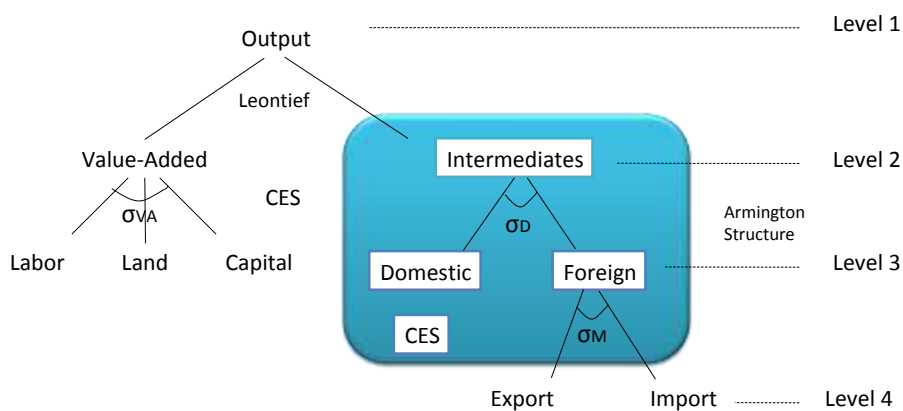
The GTAP Model and database

The Global Trade Analysis Project (GTAP) model, a multi-region computable equilibrium (CGE) model, is one of the most popular models for analyzing the impact of trade policy. There are various advantages to the GTAP model. Firstly, since it is a multi-regional model of world production and trade, it can take into account the

overall trade implications of Laos' WTO accession as well as third-party countries. Secondly, it contains a database for different sectors and thus can explore the trade implications for various sectors of interest.⁸

The GTAP model assumes perfectly competitive markets, where the zero profit condition holds, and that all the markets are cleared. The regional household allocates expenditures across three categories: private household, government, and savings. It derives income from the 'sale' of primary factors to the producers, which combines them with domestically produced and imported intermediate composites to produce final goods. These final goods are in turn sold both domestically to private households and the government, and exported to the rest of the world. Both government and private households also import final consumption goods from the rest of the world. A global bank intermediates between global savings and regional investments by assembling a portfolio of regional investment goods and selling shares in this portfolio to regional households in order to meet their savings demands. Finally, a global transport sector assembles regional exports of trade, transport and insurance services and produces a composite goods used to move merchandise trade among regions (Hertel and Tsigas, 1997). The production structure in the GTAP model is illustrated in Figure 1.

Figure 1 Production structure in the GTAP model



⁸ FoI Source: Hertel (1997) ee Hertel (ed), 1997. A graphical presentation of the GTAP model with particular emphasis on the accounting relationships is given by Brockmeier (1996).

Various studies have used the GTAP model to analyze the impact of trade policies. Tongzon (2001) used the standard GTAP model to assess the impact of China's WTO membership on the exports of East Asian developing economies. Anderson and Strutt (1999) used a GTAP model to investigate the impact of the Asian crisis and trade reforms on Indonesia. While many studies have used the CGE model for developing countries, there are very few studies using CGE model building for the Lao economy. Fukase and Martin (1999) built a simple CGE model to analyze the economic effect of joining the AFTA; their simulation results showed that AFTA accession is economically beneficial. Using the CGE modeling, Warr and Menon (2006) studied the effect of rural road improvements on poverty incidence in Laos. Their simulation results showed that there is considerable scope for reducing poverty incidence in Laos by reducing rural transport costs through improving the quality of rural roads. Warr (2006) built a two-sector, multi-household CGE model to analyze the impact of the hydropower dam Nam Theun 2 (NT2). His simulation results showed that the project had significant effects on poverty incidence, but if poor households do not share directly in the proceeds of the project, poverty incidence is likely to rise. Stone et al. (2009) used a GTAP model to investigate the impact of transport infrastructure projects on socioeconomic characteristics in the Greater Mekong Subregion. There are very few quantitative studies on the impact of the GFC on Lao economy. However, the newest version of the GTAP 7 database includes Laos' input-output table, which might provide significant contributions to empirical studies of this issue. The latest version of the GTAP database, version 7, is used for this study. To facilitate our analysis, we have aggregated sectors into 10 sectors and the country into 21 regions. The breakdown of sectors and regions is shown in Table 7 and Table 8.

Table 7 Model Sectors

No	Commodity code	Comprising	Description
1	GrainsCrops	PDR(Paddy rice) WHT (Wheat) GRO(Cereal grains nec) V_F(Vegetables, Fruit, Nuts) OSD(Oil seeds) C_B(Sugar cane, sugar beet) PFB(Plant-based fibers) OCR(Crops nec) PCR(Processed rice)	Grains and Crops
2	MeatLstk	CTL(Bovine cattle, sheep and goats, horses) OAP(Animal products nec) RMK(Raw Milk) WOL(Wool, Silk-worm cocoons) CMT(Bovine meat products) OMT(Meat Products nec)	Livestock and Meat Products
3	Extraction	OMN(Minerals nec)	Mining and Extraction
4	ProcFood	VOL(Vegetable oil and Fats) MIL(Diary Prodcuts) SGR(Sugar) OFB(Food products nec) B_T(Beverages and tobacco Products)	Processed Food
5	TextWapp	TEX(Textiles) WAP(Wearing apparel)	Textiles and Clothing
6	LightMnfc	LEA(Leather products) LUM(Wood Procuts) PPP(Paper Products, Publishing) FMP(Metal products) MVH(Motor vehicles and parts) OTN(Transport equipment nec) OMF(Manufactures nec) FRS(forestry) FSH(Fishing)	Light Manufacturing
7	HeavyMnfc	P_C(Petroleum, coal products) CRP(Chemical, rubber, plastic products) NMM(Mineral products nec) I_S(Ferrous metals) NFM(Metals nec) ELE(Electronic equipment) OME(Machinery and equipment nec)	Heavy Manufacturing
8	Util_Cons	ELY(Electricity) GDT(Gas manufacture, distribution) WTR(Water) CNS(Construction) COA(Coal) OIL(Oil) GAS(Gas)	Utilities and Construction
9	TransComm	TRD(Trade) OTP(Transport nec) WTP(Water transport) ATP(Air transport) CMN(Communication) OFI(Financial services nec) OFI(Financial services nec) ISR(Insurance) OBS(Business Services nec)	Transport and Communication
10	OthServices	ROS(Recreational and other services) OSG(Public Adminidtration, Defense, Education, Health) DWE(Dwellings)	Other Services

Source: the author's, compiled from GTAP database.

Table 8 Regions in Model

No.	Country and region	Code
1	China	CHN
2	Hongkong	HKG
3	Japan	JPN
4	Korea	KOR
5	Taiwan	TWN
6	Indonesia	IDN
7	Laos	LAO
8	Philippine	PHL
9	Singapore	SGP
10	Thailand	THA
11	Vietnam	VNM
12	Malaysia	MYS
13	India	IND
14	Canada	CAN
15	USA	USA
16	Russia	RUS
17	Latin America	ARG BOL BRA CHL COL ECU PRY PER URY VEN XSM CRI GTM NIC PAN XCA XCB
18	EU_25	AUT BEL CYP CZE DNK EST FIN FRA DEU GRC HUN IRL ITA LVA LTU LUX MLT NLD POL PRT SVK SVN ESP SWE GBR
19	Middle East	XWS EGY MAR TUN XNF
20	Sub-Sahara	NGA SEN XWF XCF XAC ETH MDG MWI MUS MOZ TZA UGA ZMB ZWE XEC BWA ZAF XSC
21	Rest of World	AUS NZL XOC XEA KHM MMR XSE BGD PAK LKA XSA MEX XNA CHE NOR XEF ALB BGR BLR HRV ROU UKR XEE XER KAZ KGZ XSU ARM AZE GEO IRN TUR

Source: the author's, compiled from GTAP database.

Simulation Design

There are various routs of the GFC on Lao economy such as declining demand for Lao exports, declining Foreign Direct Investment (FDI), declining remittances from Lao people living in developed countries and from Lao migrant labor in neighboring , declining of tourism revenues. However, this study focuses only on the impact of the GFC though declining demand for world though declining real GDP in global economy (Jongwanich et al, 2009; Willenbockel and Robinson, 2009) especially in Asia which is the main trade partner for Laos. The declining real GDP from GFC is shown in table 9.

Table 9. The simulation scenario

No.	Country	2007	2008
1	China	13	9
2	Taiwan Province of China	5.7	0.1
3	Hong Kong SAR	6.4	2.4
4	India	9.4	7.3
5	Indonesia	6.3	6.1
6	Thailand	4.9	2.6
7	Philippines	7.1	3.8
8	Malaysia	6.2	4.6
9	Vietnam	8.5	6.2
10	Singapore	7.8	1.1
11	United States	2.7	0.4
12	EU_25	2.5	0.7
13	Japan	2.3	-0.7
14	United Kingdom	2.6	0.7
15	Canada	2.5	0.4
16	Sub-Sahara	7	5.5
17	Russia	8.1	5.6
18	Middle East	6.2	5.4
19	Latin America	5.7	4.2
20	The rest of the world	5.2	3

Source: IMF (2009c).

Simulation Results

Changes in macroeconomic variables resulting from the simulations are shown in Table 10. The GFC has a negative impact on equivalent variation (EV), real GDP, and the terms of trade. EV declines by 9.36 \$US million, real GDP declines 0.48 %, and the terms of trade declines 0.38%, though trade balance increases 2.13 \$US million. There are basically 4 majors source for any welfare change (EV): Allocative efficiency effect, endowment effect, technology effect and terms of trade effect (Huff and Hertel, 2000; Hanslow, 2000; Adams, 2005).

Table 10. Impact on macroeconomic variables

Macroeconomic variables	Impact of GFC
EV (\$US million)	-9.36
Real GDP (%)	-0.48
Term of trade (%)	-0.38
Trade balance (\$US million)	2.13

Source: author's GTAP model results.

Most of sectors suffer from the impact of GFC. *Livestock and Meat Products, Mining and Extraction, Textiles and Clothing, Light Manufacturing, Heavy Manufacturing* decline their output due to the impact of GFC. *Manufacturing and Heavy Manufacturing* decline more than other sectors. However, *Processed Food* increases due to the impact of GFC (table 11).

Table 11. Impact on output (%)

Sectors	Impact of GFC
Grains and Crops	0.00
Livestock and Meat Products	-0.65
Mining and Extraction	-0.01
Processed Food	0.29
Textiles and Clothing	-0.3
Light Manufacturing	-2.11
Heavy Manufacturing	-1.92
Utilities and Construction	-3.68
Transport and Communication	-0.54
Other Services	0.41

Source: author's GTAP model results.

The impact on the trade balance is shown in Table 12. Due to the GFC, the trade balance is improved. The trade balance from Mining and Extraction and Heavy Manufacturing improve the most. In on the other hand, the trade balance of Textiles and Clothing and Light Manufacturing are aggravated .

Table 12. Impact on trade balance (\$US million)

Sectors	Impact of GFC
Grains and Crops	1.52
Livestock and Meat Products	0.14
Mining and Extraction	5.74
Processed Food	0.49
Textiles and Clothing	-0.83
Light Manufacturing	-2.23
Heavy Manufacturing	3.81
Utilities and Construction	-0.22
Transport and Communication	-2.69
Other Services	-3.62

Source: author's GTAP model results.

Skill and un-skill labor of most sector decline due to the impact of GFC. The skill and un-skill labor of *Light Manufacturing* and *Heavy Manufacturing* decline the most from the impact of GFC (table 13).

Table 13. The impact on factor product (%)

Sector	Land	Un-Skill labor	Skill Labor	Capital	Natural resource
Grains and Crops	0.1	-0.07	-0.07	-0.07	0
Livestock and Meat Products	-0.37	-0.94	-0.94	-0.94	0
Mining and Extraction	0.12	-0.02	-0.02	-0.02	0
Processed Food	0.55	0.29	0.29	0.29	0
Textiles and Clothing	0.3	-0.3	-0.3	-0.3	0
Light Manufacturing	-0.5	-2.11	-2.11	-2.11	0
Heavy Manufacturing	-0.41	-1.92	-1.92	-1.92	0
Utilities and Construction	-1.11	-3.68	-3.68	-3.68	0
Transport and Communication	0.28	-0.54	-0.54	-0.54	0
Other Services	0.62	0.41	0.41	0.41	0

Source: author's GTAP model results.

Conclusion

This paper attempts to examine the impact of GFC on the Lao economy. The GFC affects the Lao economy through various routes, but this study focuses on the declining demand. The preliminary conclusions are as follows.

The GFC has a negative impact on the Lao economy, shown by declining household welfare (EV) and real GDP. The output of some sectors also decline from the impact of GFC. Therefore, I conclude that the GFC has the negative impact of the GFC in Laos. However, the impact seems to be small. However, this study is characterized by several weaknesses. First, it uses a static GTAP model, which does not reflect the real impact of the GFC. Second, this study limits the impact of the GFC to the declining world demand and does not include declining FDI, remittances, tourism and government revenue in assessing the impact of the GFC.

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