Assessing the Fiscal Impact of Trade Liberalization in Laos: A General Equilibrium Approach

Sithanonxay Suvannaphakdy and Toshihisa Toyoda

Assessing the Fiscal Impact of Trade Liberalization in Laos:

A General Equilibrium Approach

Sithanonxay Suvannaphakdy[+] and Toshihisa Toyoda[*]

[+]*Laos-Australia Development Learning Facility, Level 2, Vieng Vang Tower, Boulichan Road, PO Box 468, Vientiane Capital, Lao PDR*
[*] *Center for Social Systems Innovation and GSICS, Kobe University*

Abstract

   Trade liberalization entails the transition from trade taxes to domestic taxes. Certain structural characteristics such as narrow tax base and significant proportion of subsistence sectors, however, constrain such transition and hence reducing public revenues in developing countries. This paper contributes to this debate by assessing the impact of trade liberalisation on domestic tax revenue in Laos. We find that Laos has been able to recover revenue loss from tariff reduction through the introduction of value-added tax (VAT). VAT generated LAK 5,510 billion or 30% of tax revenue in 2017, which was about twice higher than the ratio of tariff revenue to tax revenue in 2000. Our simulation results of tariff liberalization using a computable general equilibrium (CGE) model also reveals that further reduction in tariff rate will be associated with lower indirect tax rate. In particular, the 20% tariff reduction will increase private consumption by 1.14%, but will decrease the effective indirect tax rate from 6.2% to 5.2% and reduce tax revenue by 11%. The worsening tax revenue loss reflects the non-optimal indirect tax rate, which needs to be reduced by 11%. The key policy implication is that any policy designed for raising tax revenue should aim at improving tax collection system and broadening tax base rather raising indirect tax rate.

Key words: Trade liberalization, Fiscal impacts, Domestic tax revenue, Laos, CGE model

1. Introduction

How much should domestic tax revenue change in response to tariff liberalization? For policy makers, this question became a focus of study after the seminal works by Mitra [16] and Greenaway and Milner [6], which emphasized the important relationship between fiscal adjustment and sustainable trade liberalization. Subsequent work has established a strategy for realizing the efficiency gains from tariff reform without reducing public revenue for a small economy through the combination of a cut in import duties and an increase in domestic consumption taxes [8]. Developing countries (low- and middle- income countries) in particular experience declining tax revenues due to falling income and trade tax revenues [9]. This is why developing countries need to develop alternative sources of revenue to replace losses of trade tax revenue if they are to enhance trade liberalization [2].

This paper complements the literature by assessing the impact of trade liberalisation on domestic tax revenue in a least developed country (LDC) exemplified by the case of Laos. It aims to address two research questions related to tariff liberalization in Laos: has the country recovered from domestic taxes the revenues it lost from tariff liberalization over the past one and half decades? How much do indirect taxes need to be changed in response to tariff liberalization to maintain the current account deficit from deteriorating, while keep the same level of productive investment in the economy? We analyse the transition from trade liberalization to domestic taxes. We then apply a simple computable general equilibrium (CGE) model for Laos to quantify the fiscal impact of tariff liberalization.

Assessing the fiscal impact of trade liberalization in Laos can provide insights for tax reforms in LDCs. First, there is no Lao study on the optimal VAT rate given the tariff rate. International studies emphasize the need for replacing tariff with domestic taxes, especially value-added tax (VAT), but provide little guidance about what the VAT rate should be. In this paper, we argue that the VAT rate should be determined by the state of the economy given the tariff rate. Second, the net effect of tariff liberalization on government revenue is an empirical issue, which depends on the size of the tariff cut, the response of imports to the tax change, the relative importance of import tariffs as a source of public revenue, and changes in other tax bases. The detailed analysis of fiscal adjustments in a small, developing, and landlocked economy, which, furthermore, relies heavily on tariff revenue, can be of considerable help to policymakers and economists interested in trade liberalization [3].

The proposed CGE model is suitable for analysing the fiscal impact of trade liberalization in Laos for three reasons. First, it provides a simple but rigorous method to estimate the direction and magnitude of fiscal consequences based on the empirical elasticities of substitution and transformation between foreign and domestic goods [4]. The model is simple because it contains two sectors (i.e., export sector and non-traded sector) and three goods (i.e., export good, non-traded (domestic) good, and import good). The empirical elasticities are derived from the estimation of econometric models using Lao data. Second, it requires modest data, namely national income, fiscal and balance-of-payment accounts, which are normally released by the

Government of Lao PDR. Third, it facilitates the interpretation of results from more complex CGE models of previous Lao studies such as Kyophilavong [10] for economic impact of mining booms and Warr [18] for poverty impact of rural road development, since these are essentially multisector analogues of the small models proposed in this paper.

The plan of the paper is as follows. Section 2 presents a short background on the Lao economy. Section 3 analyses the transition from trade liberalization to domestic taxes in Laos. Section 4 explains the structure of CGE model used for the analysis and data source. Simulation results and policy implications are presented in Section 5. Section 6 concludes the paper.

2. Background of the Lao Economy

Laos is a least-developed, natural resource-based economy. According to the 2018 triennial review[1], Laos has for the first time passed two out of three LDC graduation criteria: GNI (gross national income) per capita and Human Assets Index (HAI). GNI per capita rose from US$1,232 in 2015 to US$1,996 in 2018, which passed the graduation threshold of US$1,230. HAI increased from 60.8 in 2015 to 72.8 in 2018, which exceeded the graduation threshold of 66. The largest improvement of HAI element was adult literacy rate, followed by gross secondary enrolment ratio and under-five mortality rate. But the Economic Vulnerability Index (EVI) measuring the country's resilience to shocks and instability is still to be met. EVI improved from 36.2 in 2015 to 32.7 in 2018, which has not yet passed the graduation threshold of 32.[2] Key improvements of EVI elements include the share of agriculture in gross domestic product (GDP), victims of natural disasters, and export concentration. Limited improvements of EVI elements include agricultural instability and remoteness. Lack of improvement of EVI element was export instability. Nonetheless, if Laos sustains development gains and meets the criteria again in 2021, it will be formally removed from the list of LDCs in 2024.

Over the period 2011-2015, Laos has achieved rapid economic growth, but partially achieved inclusive economic growth. Growth rate of the Lao economy, measured by the annual growth of real GDP, recorded at 7.8% over the period 2011-2015, which was almost twice higher than the average growth rate of GDP (4.1%) for economies in East Asia and the Pacific over the same period. Sustaining rapid GDP growth raised the level of its real GDP per capita by 28%, increasing from US$1,216 in 2011 to US$1,557 in 2015 [24]. This is an encouraging result for utilizing economic growth as an instrument to narrow income gap across countries in the region and to fight poverty in poor countries such as Laos.

On the demand side, GDP growth in Laos has been mainly driven by growth in physical capital accumulation. Sources of GDP growth can be categorised into four factors: physical capital, education, labour input, and total factor productivity (TFP) based on the augmented

---

[1] Conducted by the Committee for Development Policy, United Nations Economic and Social Council.

[2] Lower EVI index means better country's economic development.

Solow-growth model [14, 17]. Figure 1 illustrates the contributions of the growth of each factor to the growth of real GDP for Laos and some selected Asian countries over the period 2011-2015. It shows that the growth rate of physical capital accounted for 62% of GDP growth in Laos, which was higher than other Asian countries such as Vietnam, China, Thailand, and Republic of Korea. In contrast, education was the smallest contributor to growth in Laos, which accounted for only 6% of GDP growth.
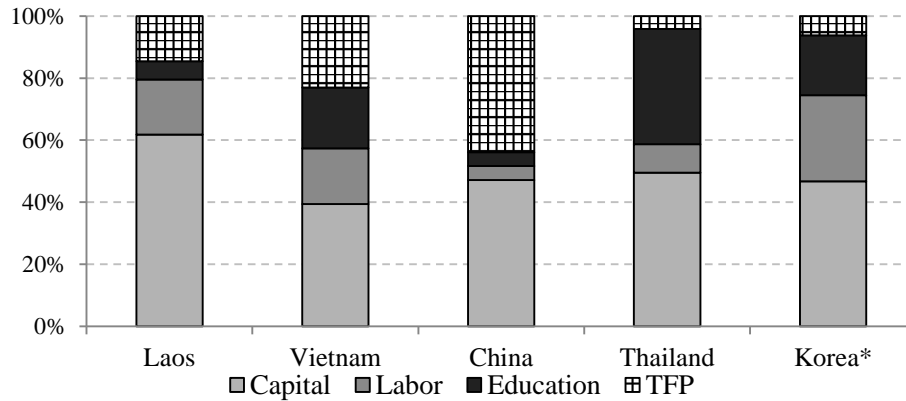

Figure 1. Sources of GDP Growth for Laos and Selected Asian Countries, 2011-2015

Note: * Republic of Korea. TFP stands for total factor productivity.

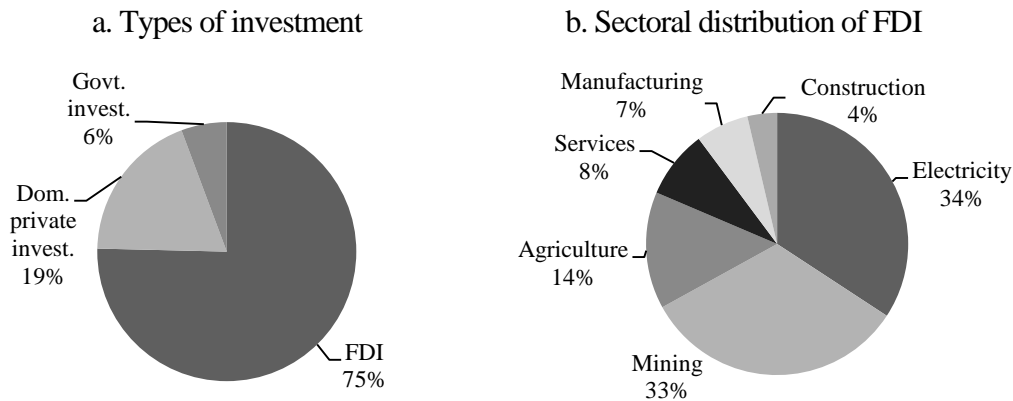*Source*: Author's calculation using data from [24].

Figure 2. Types of Investment and Distribution of FDI by Sector in Laos, 2011-2015

Note: 'Govt. invest.' stands for 'government investment'. 'Dom. Private invest.' stands for 'domestic private investment. Data on types of investment and sectoral distribution of FDI are based on value of approved investment projects.

Source: Authors' calculation using investment data from [15].

The growth in physical capital accumulation has been driven by foreign direct investment (FDI) inflows. Figure 2a shows the proportion of three types of investment in Laos during 2011-

2015: FDI, domestic private investment, and government investment. FDI accounted for 75% of total investment, while domestic private investment accounted for only 19% of total investment (Figure 2a). About two thirds of FDI inflows concentrated in electricity and mining sectors (Figure 2b). It is still unclear whether rapid economic growth driven by FDI in Laos has resulted in the diversification of economic activities and generated sufficiently large number of jobs in the country.

On the production side, the service and electricity sectors have increasingly become the key driver of economic growth in Laos. The share of services in GDP increased from 36% in 2011 to 41% in 2015, while the share of electricity in GDP increased from 4% to 7% over the same period. Meanwhile, the share of agriculture and forestry in GDP reduced from 27% to 17% in the same period. The shares of manufacturing and construction in GDP remain unchanged or slightly decreased (Figure 3). According to the World Bank [23], the expansion of services has been resulted from the liberalization of trade, tourism, banking, and transport sectors, and spill-overs from natural resource projects.
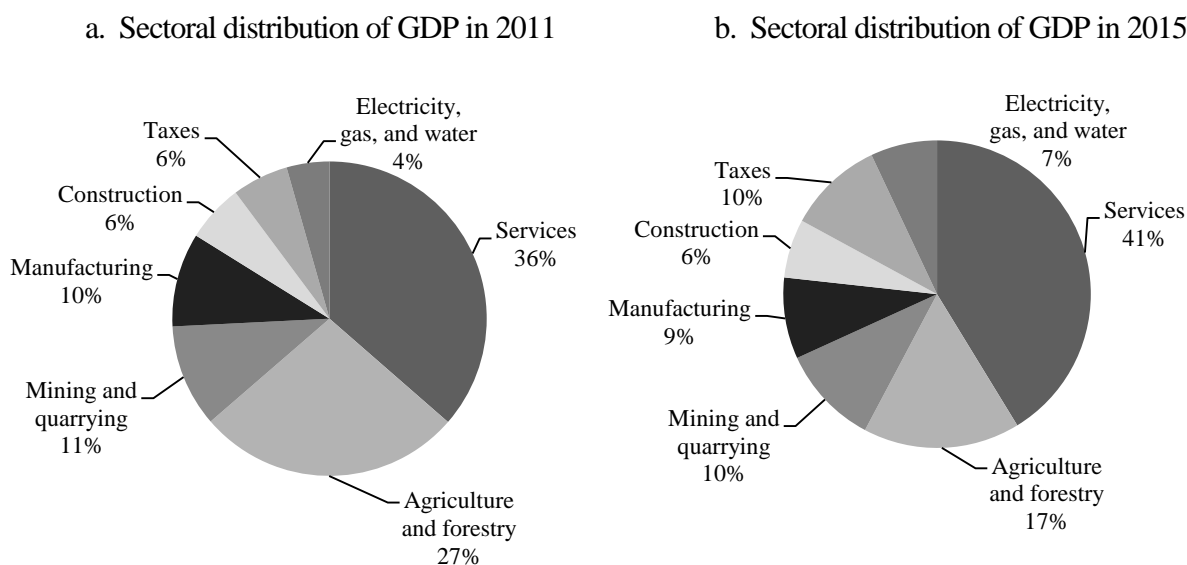
a. Sectoral distribution of GDP in 2011   b. Sectoral distribution of GDP in 2015

Figure 3. Sectoral Distribution of GDP in Laos (%), 2011 and 2015
Source: Data for 2011 were obtained from [13]. Data for 2015 were obtained from [1].

Significant changes in the structure of outputs have been associated with limited changes in the structure of employment for the period 2010-2015. The analysis of outputs in Figure 3 and employment in Figure 4 reveals three salient features of structural change in the Lao economy.

・Increased share of services in GDP was not associated with greater share of employment within the sector. The share of employment in the service sector fell from 20% of total

a. Sectoral distribution of employment in 2010   b. Sectoral distribution of employment in 2015
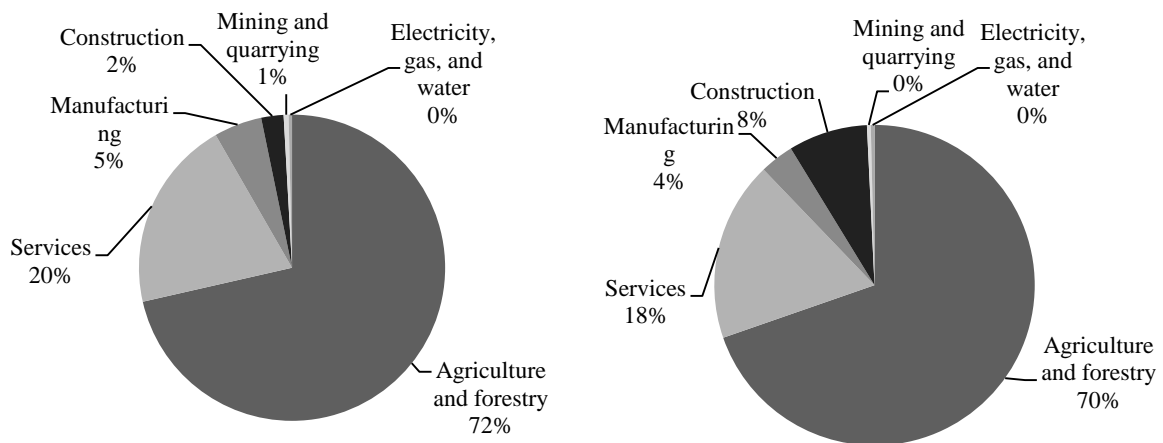

Figure 4. Sectoral Distribution of Employment in Laos, 2010 and 2015
Source: Authors' calculation using data from [11, 12].

employment in 2010 to 18% in 2015 (Figure 4). This may reflect productivity improvement in services, which could produce more outputs without hiring additional labours. Further expansion of the service sector is needed to absorb additional labour force.

- The agriculture and forestry sector has been characterized by low productivity. The share of employment in agriculture and forestry sector accounted for 70% in 2015 (Figure 4b), but it could generate real output for only 17% of GDP (Figure 3b). This confirms the need for improving productivity and promoting investment in manufacturing and service sectors to absorb surplus labour in agriculture. Employment in the manufacturing sector, for instance, accounted for only 4% of total employment, but its real output accounted for 9% of GDP.

- The construction sector has become one of the key sectors for generating jobs. The share of employment in the construction sector rose from 2% in 2010 to 8% in 2015 (Figure 4) although the share of its real output in GDP remained unchanged (Figure 3).

The status of LDC and limited diversification in the Lao economy indicate that Laos has not reached a development threshold where it can rely more on sophisticated tax instruments. It has weak tax administrations, as well as large informal sectors (with unrecorded or illicit transactions), narrowing the tax base. We analyse how Laos managed to transition from tariff to domestic taxes over the past one and half decades in the next section.

3. Transition from tariff to domestic taxes in Laos

Three main trends can be identified in the evolution of trade liberalization in Laos since 2000. First, Laos has reduced tariff rates since 2000 when it has deepened economic integration into

regional economy through full member of the ASEAN Economic Community and the global economy through the formal accession to the WTO in 2013. These agreements entailed profound changes to Laos' regulatory framework governing international trade, including tariff and non-tariff measures (NTMs). Figure 5 shows the evolution of the weighted average applied tariff rate in Laos for import of goods from all trading partners, Thailand, China and France from 2000 to 2017. It reveals two salient features of tariff liberalization. First, Laos' applied tariff rate for all trading partners shows a downward trend, falling from 14.06% in 2000 to 5.22% in 2014 and 1.48% in 2017. Second, ASEAN members face lower tariff rate than non-ASEAN members. From 2000 to 2017, the tariff rate faced by ASEAN member such as Thailand and member of ASEAN-China FTA such as China reduced by more than 10 percentage points, while that faced by non-ASEAN member such as France fell by only four percentage points.

Parallel to tariff liberalization is the reduction of NTMs on Laos' imports since its WTO accession. According to World Bank [21], the percentage of products covered by at least one NTM reduced from 72% in 2011 to 13% in 2014. A notable reduction in NTMs is the use of quantity controls. Yet, the frequency of using quantity controls in Laos is still higher than other regional countries, such as Indonesia and the Philippines. A similar trend of NTMs reduction in Laos can be observed in the case of the coverage ratio where the reduction goes from 83% to 42% of the import value that is subjected to at least one NTM. The number of NTMs that are applied to the average import product (pervasiveness score) was also significantly reduced from 2.6 in 2011 to 0.4 in 2014.
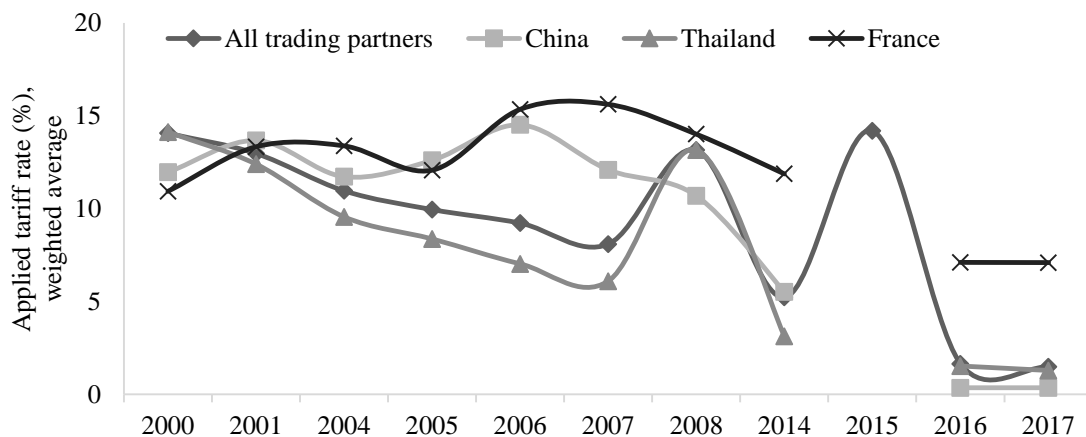

Figure 5. Reduction of Laos' Tariff Rate, by Trading Partners

Source: Authors' calculation using data from World Bank's World Integrated Trade Solution.
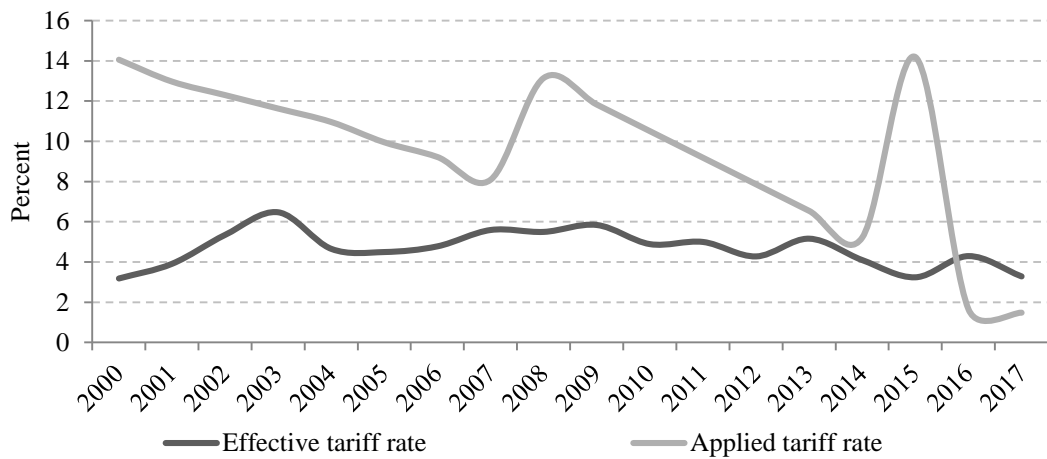
Figure 6. Effective and Applied Tariff Rates in Laos, 2000-2017

Source: Authors' calculation using applied tariff rate from World Bank's World Integrated Trade Solution and effective tariff rate from [1].

Second, the effective tariff rate measured as the ratio of import duties to total import of goods is lower than the applied tariff rate between 2000 and 2015 (Figure 6). The effective tariff rate showed a stable trend, while the applied tariff rate showed a downward trend but was consistently higher than the applied tariff rate. Hence, the gap between the effective and applied tariff rates reduced from 10.87 percentage points in 2000 to 1.12 percentage points in 2014 and increased to 10.94% in 2015. Such gap can be explained by three factors: exemptions on imports of raw materials for the manufacture of exports; exemptions for imports by government and donor-funded projects; and concessional duty rates of only 1% on imports of plant, equipment and raw materials by approved domestic and foreign investors [5].

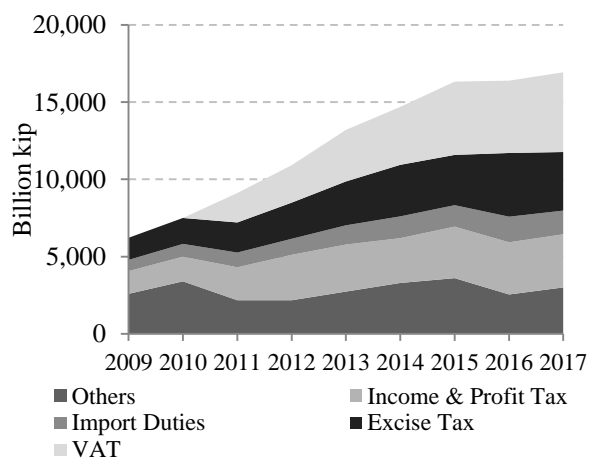a. Ratio of tariff revenue to tax revenue
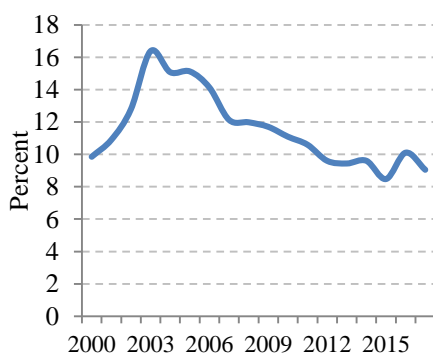
b. Composition of tax revenue

Figure 7. Tariff Revenue Reduction and Alternative Sources of Tax Revenue

Source: Authors' calculation using data from [1].

Third, loss in tariff revenue is compensated by raising revenues from domestic taxes, especially through the introduction of value-added tax (VAT). For a period of 14 years, the ratio of tariff revenue to tax revenue dropped by almost half from 16.38% in 2003 to 9.04% in 2017 (Figure 7a). Among domestic taxes, VAT is the most important sources of tax revenue. VAT was introduced in 2010 at a rate of 10%. The ratio of VAT revenue to tax revenue rose from 21% in 2011 to 25% in 2014 and 30% in 2017 (Figure 7b). However, VAT revenue collection is not very effective. In 2011, the ratio of VAT revenue to GDP was only 2.92%, which was only one-third of the official VAT rate. In 2017, the ratio of VAT revenue to GDP increased slightly to 3.66%, which was still far below the VAT rate (not reported in Figure 7). A possible explanation for this is the limited capacity of government agency to collect tax from companies across the country [25]. The Revenue Collection Division in the Tax Department is tasked to monitor the compliance of large taxpayers, and currently oversees more 500 companies in Laos. The top 10 taxpayers represent 66% of total large business tax collection in 2017, and the top 50 taxpayers represent almost 90% of total large business tax collection.

4. CGE Modelling and Data

This section constructs a CGE model for explaining the relationship between tariff revenue, domestic taxes, and other macroeconomic variables. The CGE model is calibrated with Lao macroeconomic data.

4.1 CGE Modelling

This paper applies the 1-2-3 CGE model to explore the impact of tariff reduction on public revenue in Laos [3, 4]. The basic nature of the 1-2-3 CGE model is a modified Salter-Swan methodology which separates the economy into two producing sectors and three goods. The country is small in world markets, facing fixed world prices for exports and imports. The economy consists of two sectors of production, one for export good and another for domestic good. Three goods include an export good (denoted as E), a domestic good (D), and an import (M). Export good is sold to foreigners and is not demanded domestically. Domestic good is only sold domestically. Both export and domestic goods are produced in the country. Import good is produced in foreign country.

The CGE model is presented in Table 1. It consists of 20 equations, two identities, and 19 endogenous variables. The model has three actors: a producer, a household, a government and the rest of the world. Equation (1) defines the domestic production possibility frontier, which gives the maximum achievable combinations of E and D that the economy can supply. The function is assumed to be concave and will be specified as a constant elasticity of transformation (CET) function with transformation elasticity Ω. The constant $\bar{X}$ defines aggregate production and is fixed. Equation (4) gives the efficient ratio of exports to domestic output (E/D) as a function of relative prices. Equation (9) defines the price of the composite commodity and is the

cost-function dual to the first-order condition underlying equation (4). The composite good price P^x corresponds to the GDP deflator.

Equation (2) defines a composite commodity made up of D and M which is consumed by the single consumer. The composite commodity is given by a constant elasticity of substitution (CES) aggregation function of M and D, with substitution elasticity σ. Consumers maximize utility, which is equivalent to maximizing Q in this model, and equation (5) gives the desired ratio of M to D as a function of relative price. Equation (14) defines the price of the composite commodity. It is the cost-function dual to the first-order conditions underlying equation (5). The price P^q corresponds to an aggregate consumer price. Equation (7) determines household income. Equation (3) defines household demand for the composite good.

In Table 1, the price equations define relationships among seven prices. There are fixed world prices for E and M, domestic prices for E and M, the price of the domestic good D; and prices for the two composite commodities, X and Q. Equations (1) and (2) are linearly homogeneous, as are the corresponding dual price equations, (13) and (14). Equations (4) and (5) are homogeneous of degree zero in prices - doubling all prices, for example, leaves real demand and the desired export and import ratios unchanged. Since only relative prices matter, it is necessary to define a numeraire price; in equation (15), this is specified to be the exchange rate R.

Equations (16) ~ (18) define the market-clearing equilibrium conditions. Supply must equal demand for D and Q, and the balance of trade constraint must be satisfied. Equation (19) defines investment equal to saving. Equation (20) defines the budget balance. The two identities - (21) and (22) - arise from the homogeneity assumptions.

Table 1. CGE Model with Taxation

Real Flows

(1) $\bar{X} = \alpha(\lambda E^\gamma + (1-\lambda)D^\gamma)^{\frac{1}{\gamma}}$

(2) $Q^S = \epsilon(\delta M^{-\rho} + (1-\delta)D^{-\rho})^{-\frac{1}{\rho}}$

(3) $Q^D = C + Z + \bar{G}$

(4) $\frac{E}{D} = k\left(\frac{P^e}{P^d}\right)^\Omega$

(5) $\frac{M}{D} = k'\left(\frac{P^t}{P^m}\right)^\sigma$

Nominal Flows

(6) $T = t^m \cdot R \cdot pw^m \cdot M + t^s \cdot P^q \cdot Q^D$
$\quad\quad + t^y \cdot Y - t^e \cdot R \cdot pw^e \cdot E$

(7) $Y = P^x \cdot \bar{X} + tr \cdot P^q + re \cdot R$

(8) $S = \bar{s} \cdot Y + R \cdot \bar{B} + S^g$

(9) $C \cdot P^t = (1 - \bar{s} - t^y) \cdot Y$

(10) $P^m = (1 + t^m) \cdot R \cdot pw^m$

(11) $P^e = (1 + t^e) \cdot R \cdot pw^e$

(12) $P^t = (1 + t^s) \cdot P^q$

(13) $P^x = \frac{P^e \cdot E + P^d \cdot D}{\bar{X}}$

(14) $P^q = \frac{P^m \cdot M + P^d \cdot D}{Q}$

(15) $R = 1$

Equilibrium Conditions

(16) $D^D - D^S = 0$

(17) $Q^D - Q^S = 0$

(18) $pw^m \cdot M - pw^e \cdot E - ft - re = \bar{B}$

(19) $P^t \cdot Z - S = 0$

(20) $T - P^q \cdot \bar{G} - tr \cdot P^q - ft \cdot R - S^g = 0$

Accounting Identities

(21) $P^x \cdot \bar{X} = P^e \cdot E + P^d \cdot D^S$

(22) $P^q \cdot Q^S = P^m \cdot M + P^d \cdot D^D$

Endogenous variables:
E: Export good
D: Domestic good
M: Import good
D^S: Supply of domestic good
D^D: Demand for domestic good
Q^S: Supply of composite good
Q^D: Demand for composite good
P^e: Domestic price of export good
P^m: Domestic price of import good
P^d: Producer price of domestic good
P^t: Sales price of composite good
P^x: Price of aggregate output
P^q: Price of composite good
R: Exchange rate
T: Tax revenue
S^g: Government savings
Y: Total income
C: Aggregate consumption
S: Aggregate savings
Z: Aggregate real investment

Exogenous variables:
pw^m: World price of import good

Exogenous variables (continue):
pw^e: World price of export good
t^m: Tariff rate
t^e: Export subsidy rate
t^s: Sales/excise/value-added tax rate
t^y: Direct tax rate
tr: Government transfers
ft: Foreign transfers to government
re: Foreign remittances to private sector
$\bar{s}$: Average savings rate
$\bar{X}$: Aggregate output
$\bar{G}$: Real government demand
$\bar{B}$: Balance of trade
Ω: Export transformation elasticity, $\Omega = 1/(\rho - 1)$
σ: Import substitution elasticity, $\sigma = 1/(1 - \rho)$

Parameters:
α: Shift parameter of CES
λ: Share parameter of CES
ϵ: Shift parameter of CET
δ: Share parameter of CET
γ: Substitution parameter of CES
ρ: Substitution parameter of CET

Note: k is defined as $\left(\frac{1-\lambda}{\lambda}\right)^\Omega$. k' is defined as $\left(\frac{1-\delta}{\delta}\right)^\sigma$.

Source: Authors' construction from [3, 4].

4.2 Data and Calibration

To conduct simulations in the CGE model, we used the 2016 data for national income, fiscal, and balance-of-payments accounts from the 2017 Annual Economic Report published by the Bank of the Lao PDR (Table A.1). The original data were measured in billions of kip (LAK). In the calibration, all data were scaled and indexed with respect to output, which is set to 1.00 in the base year.

Empirical estimates of elasticities for CES and CET were obtained from Devarajan [4]. The estimate of elasticity for CES for Laos is 0.84. Since the estimate of elasticity for CET for Laos is not available, it is proxy by that of Myanmar which is 0.24. We then used these elasticities and macroeconomic data to calibrate other parameters (Table A.2) and variables of the CGE (Table A.3).

5. Simulation Results and Policy Implications

In this section, we measure the impact of tariff liberalization on government revenue and welfare in Laos, given various changes to the effective tariff and indirect tax rates. Government revenue captures direct impact of tariff liberalization. Welfare effects of tariff liberalization are measured by private consumption and total investment (public and private), which capture indirect impact of tariff liberalization. The purpose of this simulation is to illustrate whether the target policy variables of tariff and tax reform should consider both government revenue and welfare indicators; and how different combinations of effective tariff and indirect tax rates result in different economic outcomes. Devarajan [3, 4] have used this approach to simulate trade reforms for developing countries.

5.1 Simulation Results

Using the CGE model developed in Section 4, we simulate three policy scenarios based on changes in effective tariff and indirect tax rates: (i) fully coordinated tariff and tax reform; (ii) moderately coordinated tariff and tax reform; and (iii) lack of coordinated tariff and tax reform. Table 2 summarizes key policy instruments and their changes in three policy scenarios. In each policy scenario, policy instruments change in four steps from the baseline: 20%, 50%, 80%, and 100%.

The fully coordinated tariff and tax reform consists of two instruments, namely tariff rate (exogenous) and endogenous indirect tax rate, which aim to maximize private consumption and maintain the same level of investment. The salient feature of the first policy scenario is that indirect tax rate is determined by the tariff rate and the state of the economy. Changes in government revenue depend on tariff reduction and optimal indirect tax rate. This implies the customs authorities design the tariff rates set out in free trade agreements (FTA) and then consult them with the tax authorities to determined appropriate indirect tax rate based on the state of the economy. The coordination between customs and tax authorities is likely to happen in Laos, where both the Customs and Tax Departments are operating under the Ministry of Finance. But

determining appropriate indirect tax rate remains the key challenge given limited research capacity and prevalence of informal economy in the form of micro and small enterprises.

Table 2. Policy Scenarios for Coordinated Tariff and Tax Reform

Policy scenarios	Policy instruments	Changes in policy instruments			
		± 20%	± 50%	± 80%	± 100%
1. Fully coordinated tariff and tax reform	1. Tariff rate (tm) 2. Endogenous indirect tax rate (ts)	tm (-20%)	tm (-50%)	tm (-80%)	tm (-100%)
2. Moderately coordinated tariff and tax reform	1. Tariff rate (tm) 2. Indirect tax rate (ts)	tm (-20%) ts (+20%)	tm (-50%) ts (+50%)	tm (-80%) ts (+80%)	tm (-100%) ts (+100%)
3. Uncoordinated tariff and tax reform	Tariff rate (tm)	tm (-20%)	tm (-50%)	tm (-80%)	tm (-100%)

Note: '-' denotes 'decrease'. '+' denotes 'increase'.

Source: Authors' construction.

The second policy scenario is the moderately coordinated tariff and tax reform, which consists of two policy instruments, namely tariff rate and indirect tax rate. It aims to maximize private consumption regardless of the level of investment. The salient feature of the second policy scenario is that both tariff and indirect tax rates are determined exogenously and decreases in tariff rates correspond to increases in indirect tax rates. Changes in government revenue depend on the net effect of tariff reduction and indirect tax increase. This may reflect the current form of tariff and tax reform in Laos, which aims to replace losses in trade taxes with domestic taxes.

The third policy scenario is the lack of coordinated tax reform, which considers only tariff rate as the key policy instrument. It aims to maximize private consumption regardless of the level of investment. The salient feature of the third policy scenario is that tariff reform is implemented without domestic tax reform. Changes in government revenue only depend on tariff reduction. It reflects the delay in designing indirect tax rates in response to tariff reduction under ASEAN+1 FTAs, Regional Comprehensive Economic Partnership (RCEP), and World Trade Organization (WTO).

Scenario 1: fully coordinated tariff and tax reform. In Scenario 1, we conduct the simulations in two steps. First, the current effective indirect tax rate is assessed whether it is optimal given the current VAT rate. Our simulation result shows that the current effective indirect tax rate is higher than its optimal rate. Column 2 of Table 3 shows that the indirect tax rate should be reduced by 21% from 6.2% (current indirect tax rate) to 4.9% (optimal indirect tax rate). Indirect tax reduction will decrease sales price by 1.21%. This will stimulate private consumption by 1.27%, while reducing tax revenue by 10.82% and government saving by 174%.

Second, we simulate the impact of tariff reductions on indirect tax and other economic variables. Our simulation results show that the coordinated tariff and tax reform for Laos means lower government revenue through the reduction of the combination of tariff and indirect tax

rates. Columns 3-6 of Table 3 show different estimates of the indirect tax rate associated with tariff reductions. The reduction of tariff rate by 20% requires the actual indirect tax rate to reduce by 16%. Further reduction of tariff rate from 50% to the elimination of tariff rate (reduced by 100% of baseline) requires lower reduction of the actual indirect tax rate ranging from 10.9% to 2.3%.

Lower indirect tax rates associated with tariff liberalization will stimulate consumption and production in the economy. The reduction of tariff rate by 20% reduces prices of goods and services in the economy. The notable declines in prices are sales price and import price, which will drop by 1.50% and 0.64%, respectively. Lower sales price and import price stimulate private consumption by 1.14% and reduce nominal income by 0.38%. Meanwhile, the reduction of both tariff and indirect tax rates will reduce government revenue by 10.94% and government saving by 170%. The worsening tax revenue loss reflects largely the non-optimal indirect tax rate, which needs to be reduced in parallel with tariff liberalization.

Table 3. Fully Coordinated Tariff and Tax Reform in the Lao Economy

Variable	% change of baseline				
Changes in policy instrument					
Effective Tariff Rate (tm)	0.00	-20.00	-50.00	-80.00	-100.00
Responses of endogenous variables					
Target variables					
Consumption (Cn)	1.27	1.14	1.14	1.14	1.14
Investment (Z)	0.00	0.00	0.00	0.00	0.00
Tax Revenue (TAX)	-10.82	-10.94	-12.32	-13.70	-14.62
Indirect Tax Rate (ts)	-20.83	-15.99	-10.94	-5.80	-2.29
Other important variables					
Total Income (Y)	0.00	-0.38	-0.95	-1.53	-1.91
Aggregate Savings (S)	-4.39	-4.44	-4.99	-5.55	-5.91
Government Savings (Sg)	-173.81	-170.06	-183.66	-197.26	-206.22
Adjustment of prices and exchange rate					
Import Price (Pm)	0.00	-0.64	-1.61	-2.58	-3.22
Export Price (Pe)	0.00	0.00	0.00	0.00	0.00
Sales Price (Pt)	-1.21	-1.50	-2.07	-2.64	-3.02
Price of Supply (Pq)	0.00	-0.58	-1.44	-2.31	-2.89
Price of Output (Px)	0.00	-0.36	-0.91	-1.45	-1.82
Price of Domestic Good (Pd)	0.00	-0.53	-1.32	-2.12	-2.65
Exchange Rate (Er)	0.00	0.00	0.00	0.00	0.00

Source: Authors' calculation based on CGE simulation.

Scenario 2: partially coordinated tariff and tax reform. Scenario 2 involves reductions in tariff rates and increases in indirect tax rates by 20%, 50%, 80%, and 100% (first panel of Table 4). The combination of 20% reduction in tariff rate and 20% increase in indirect tax rate will raise

sales price by 0.59%, while reducing prices of import, supply, domestic good, and output by 0.64%, 0.58%, 0.53%, and 0.36%, respectively. The net effect of price changes reduces private consumption by 0.96% and nominal income by 0.38%, while raises tax revenue by 7.64% and investment by 6.03%. Higher tax revenue will increase government saving by 128% and aggregate saving by 3.11%. The combinations of further reductions in tariff rates and further increases in indirect tax rates worsen private consumption and nominal income, but increase tax revenue and investment (second panel of Table 4).

Scenario 3: uncoordinated tariff and tax reform. Scenario 3 involves reductions in tariff rates by 20%, 50%, 80%, and 100%, given the indirect tax rate (first panel of Table 5). The 20% reduction in tariff rate will reduce prices of goods and services in the economy (column 1 of Table 5). The notable reductions of prices are import price (0.64%) and sale price (0.58%). The net effect of price changes increases private consumption by 0.20% and investment by 2.55%, while reduces tax revenue by 2.69%. Lower tax revenue will reduce government saving by 37% and aggregate saving by 1.1%. Further reductions in tariff rates stimulate private consumption and investment, but reduce tax revenue, nominal income, government saving and aggregate saving (columns 3~6 of Table 5).

Table 4. Partially Coordinated Tariff and Tax Reform in the Lao Economy

Variable	% change of baseline			
Changes in policy instruments				
Effective Tariff Rate (tm)	-20.00	-50.00	-80.00	-100.00
Effective Indirect Tax Rate (ts)	+20.00	+50.00	+80.00	+100.00
Responses of endogenous variables				
Target variables				
Consumption (Cn)	-0.96	-2.42	-3.68	-4.55
Investment (Z)	6.03	9.62	13.03	15.38
Tax Revenue (TAX)	7.64	18.87	29.82	36.28
Other important variables				
Total Income (Y)	-0.38	-0.95	-1.53	-1.91
Aggregate Savings (S)	3.11	7.64	12.14	14.73
Government Savings (Sg)	128.39	315.82	502.07	610.11
Adjustment of prices and exchange rate				
Import Price (Pm)	-0.64	-1.61	-2.58	-3.22
Export Price (Pe)	0.00	0.00	0.00	0.00
Sales Price (Pt)	0.59	1.52	2.24	2.77
Price of Supply (Pq)	-0.58	-1.44	-2.31	-2.89
Price of Output (Px)	-0.36	-0.91	-1.45	-1.82
Price of Domestic Good (Pd)	-0.53	-1.32	-2.12	-2.65
Exchange Rate (Er)	0.00	0.00	0.00	0.00

Source: Authors' calculation based on CGE simulation.

Table 5. Uncoordinated Tariff and Tax Reform

Variable	% change of baseline			
Changes in policy instruments				
Effective Tariff Rate (tm)	-20.00	-50.00	-80.00	-100.00
Responses of endogenous variables				
Target variables				
Consumption (Cn)	0.20	0.50	0.80	1.01
Investment (Z)	2.55	1.74	0.92	0.36
Tax Revenue (TAX)	-2.69	-6.72	-10.76	-13.46
Other important variables				
Total Income (Y)	-0.38	-0.95	-1.53	-1.91
Aggregate Savings (S)	-1.09	-2.72	-4.35	-5.44
Government Savings (Sg)	-37.43	-93.67	-150.01	-187.63
Adjustment of prices and exchange rate				
Import Price (Pm)	-0.64	-1.61	-2.58	-3.22
Export Price (Pe)	0.00	0.00	0.00	0.00
Sales Price (Pt)	-0.58	-1.44	-2.31	-2.89
Price of Supply (Pq)	-0.58	-1.44	-2.31	-2.89
Price of Output (Px)	-0.36	-0.91	-1.45	-1.82
Price of Domestic Good (Pd)	-0.53	-1.32	-2.12	-2.65
Exchange Rate (Er)	0.00	0.00	0.00	0.00

Source: Authors' calculation based on CGE simulation.

5.2 Policy Implications

The key result of this paper—the greater the coordinated tariff and tax reform, the greater the private consumption gains to Lao people—is a key policy implication for further trade liberalisation between Laos and its trading partners. Our simulation results indicate that the coordinated tariff and tax reform for Laos means lower government revenue through the reduction of the combination of tariff and indirect tax rates. Any policy designed for raising tax revenue should aim at improving tax collection system and broadening tax base rather raising the indirect tax rate. In the short run, however, while both tariff and indirect tax reductions expand private consumption, they reduce tariff revenue, leading to a lower level of tax revenue in the more aggressive cases of tariff and indirect tax reductions.

The worsening tax revenue loss reflects largely the non-optimal indirect tax rate, which needs to be reduced in parallel with tariff liberalization. This is likely to be a temporary phenomenon given the country's current stage of economic development. Over time, such optimal indirect tax rate coupled with cheaper imported intermediate and capital goods will help to build domestic productive capacity, which will likely broaden domestic tax base. That said, the turnaround will also depend on the country's ability to improve business environment and productivity of

enterprises. Laos is ranked 141 out of 190 economies according to the World Bank's ease of doing business index in 2018[3], behind all the other economies in the region, except Myanmar.

Strengthening the tax collection system under the optimal indirect tax rate will improve fair business competition in the Lao economy. Law-abiding enterprises find competition with non-registered and tax-evading enterprises unfair and detrimental to their own businesses. The proportion of registered enterprises that reported informal competitors' practices related to non-compliance of tax payment was largest for small enterprises (27.3%), followed by medium enterprises (22.7%) and large enterprises (12.5%). About 77% of registered enterprises are competing with unregistered enterprises [22]. Concern about informal competitors' practices tends to rise in the future because non-registered enterprises have been growing alongside registered enterprises. According to World Bank [19], household-based enterprises, a proxy variable for non-registered enterprises, increased by almost 50% between 1997/98 and 2002/03. Household-based enterprises perceived registration procedures as particularly burdensome; and the benefits of registering do not seem to offset the costs of moving to formal sector.

Improving the efficiency of import system through non-tariff measure reform will lower the cost of doing business in Laos. The current import licensing scheme and the associated fees increase significantly the cost of importing, for three main reasons [21]. First, the system for granting licences is centralised in the capital, resulting in increased costs for rural traders. Second, the lack of coordination between central authorities in charge of granting licences and border agencies in charge of enforcing the licences leaves room for discretion for provincial authorities to influence the process. Third, internal procedures for granting licences by the central government are not well communicated to the trading community, leaving room for unnecessary delays and encouraging informal payments to expedite the process. These extra trade costs are passed onto the price faced by consumers in sectors such as vegetable oils, processed foods, and vegetables, with negative implications for households, especially the poor; and they encourage importers to resort to informal channels to bring their products to the market, putting the health of consumers at risk.

Developing sector-specific workforce in line with potential export-oriented industry will raise productivity of enterprises, which has been stagnant over the past decade. The actual level of total factor productivity (TFP) was estimated to be about half of the potential level of TFP and lower than countries with similar level of per capita income. The actual labour productivity, measured by value added per worker, was US$ 1,600 per worker which was about three times lower than the potential labour productivity of US$ 5,300 per worker. Similarly, the actual capital intensity of the median enterprises, measured by the book value of capital divided by the number of workers, was US$ 2,400 per worker, which was about double lower than the potential capital intensity of US$ 4,400 per worker [20].

---

[3] See: http://www.doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB2018-Full-Report.pdf.

6. Conclusions

Trade policy in Laos has changed significantly since 2000. Being a member of ASEAN Economic Community, ASEAN+1 FTAs, and WTO have contributed to reductions of tariff and non-tariff measures. The analysis of the transition from trade liberalization to domestic taxes reveals that Laos has been able to recover from domestic taxes the revenues it lost from tariff reduction over the past one and half decades. First, there is a robust sign of strong replacement of the tariff revenue loss through VAT. VAT generated LAK 5,510 billion or 30% of tax revenue in 2017, which was about twice higher than the ratio of tariff revenue to tax revenue in 2000. Second, tariff rate faced by all trading partners reduced by more than tenfold from 14.06% in 2000 to 1.48% in 2017, while ASEAN countries faced lower Laos' tariff rate than non-ASEAN countries. Third, the effective tariff rate is relatively low due to exemptions on imports of raw materials, capital goods and government procurements.

The simulation results of tariff liberalization using a CGE model reveals that private consumption gains are largest when tariff reform is well coordinated with indirect tax reform. The coordinated tariff and tax reform treats an indirect tax rate as an endogenous variable, which is determined by the state of the economy given the tariff rate. In this policy scenario, our simulation results show that reduction in tariff rate results in lower effective indirect tax rate. In particular, the 20% tariff reduction will increase private consumption by 1.14%, but will decrease the effective indirect tax rate from 6.2% to 5.2% and will reduce tax revenue by 11%. The worsening tax revenue loss reflects the non-optimal indirect tax rate, which needs to be reduced by 11%. In other words, high domestic tax rate has increased domestic tax revenue, which significantly exceeded revenue loss from tariff reduction.

The key result of this paper—the greater the coordinated tariff and tax reform, the greater the private consumption gains to Lao people—is a key policy implication for further trade liberalisation in Laos. Our simulation results indicate that the coordinated tariff and tax reform means lower government revenue through the reduction of the combination of tariff and indirect tax rates. Any policy designed for raising tax revenue should aim at improving tax collection system and broadening tax base rather raising the indirect tax rate.

Appendix

Table A. 1. Laos' Macroeconomic Data in 2016 for CGE Simulations

		LAK Billion	Output=1			LAK Billion	Output=1
	National Accounts			3	**Fiscal Account**		
1	Output (Value Added)	114589.72	1.00		Revenue	19363.81	0.17
	Wages	31416.58	0.27		Non-Tax	2976.63	0.03
					Current Expenditure	18637.00	0.16
	GDP at market prices	129528.72	1.13		Goods & Services	14215.00	0.12
	Private Consumption	92474.21	0.81		Interest Payments	1585.00	0.01
	Public Consumption	15484.34	0.14		Transfers & Subsidies	2837.00	0.02
	Investment	34228.12	0.30		Capital Expenditure	7818.00	0.07
	Exports	35886.17	0.31		Fiscal Balance	-7091.19	-0.06
	Imports	54382.42	0.47				
	Tax Revenue			4	**Balance of Payments**		
2	Sales & Excise Tax	8344.00	0.07		Exports - Imports	-18496.25	-0.16
	Import Tariffs	1810.00	0.02		Net Profits & Dividends	-3171.49	-0.03
	Export Duties	49.45	0.00		Interest Payments	-3212.46	-0.03
	Others	2547.55	0.02		Net Private Transfers	1589.84	0.01
	Personal Income Tax	1470.00	0.01		Net Official Transfers	1753.74	0.02
	Turnover Tax	1847.00	0.02		Current Account Balance	-15595.20	-0.14
	Total	16068.00	0.14				
					External Debt	63243.41	0.55
					Debt Service Payments	2247.25	0.02

Source: Authors' compilation using data from Bank of the Lao PDR's 2017 Annual Economic Report.

Table A. 2. Calibrated Parameters

Parameters	value
Elasticity for CET (st)	0.24
Elasticity for CES/Q (sq)	0.84
Scale for CET (at)	2.57
Share for CET (bt)	0.96
Rho for CET (rt)	5.17
Scale for CES/Q (aq)	1.97
Share for CES/Q (bq)	0.40
Rho for CES/Q (rq)	0.19

Source: Authors' calculation.

Table A.3. Calibrated Variables

Exogenous Variables	Base Year	Endogenous Variables	Base Year
World Price of Imports (wm)	0.97	Export Good (E)	0.31
World Price of Exports (we)	1.00	Import Good (M)	0.49
		Supply of Domestic Good (Ds)	0.69
Import Tariffs (tm)	0.03	Demand of Domestic Good (Dd)	0.69
Export Duties (te)	0.00	Supply of Composite Good (Qs)	1.18
Indirect Taxes (ts)	0.06	Demand of Composite Good (Qd)	1.18
Direct Taxes (ty)	0.05		
		Tax Revenue (TAX)	0.14
Savings rate (sy)	0.12	Total Income (Y)	0.97
Govt. Consumption (G)	0.13	Aggregate Savings (S)	0.31
Govt. Transfers (tr)	0.01	Consumption (Cn)	0.76
Foreign Grants (ft)	0.02		
Net Priv Remittances (re)	-0.04	Import Price (Pm)	1.00
Foreign Saving (B)	0.19	Export Price (Pe)	1.00
Output (X)	1.00	Sales Price (Pt)	1.06
		Price of Supply (Pq)	1.00
		Price of Output (Px)	1.00
		Price of Dom. Good (Pd)	1.00
		Exchange Rate (Er)	1.00
		Investment (Z)	0.28
		Government Savings (Sg)	0.01
		Walras Law (Z-S)	-0.01

Source: Authors' calculation.

References

[1] Bank of Lao PDR (various issues). Annual Economic Report, Vientiane.

[2] Baunsgaard, T. and Keen, M., 2010. Tax revenue and (or?) trade liberalization. *Journal of Public Economics*, 94, pp.563–577.

[3] Devarajan, S. et al., 1997. Simple General Equilibrium Modelling. In J. F. Francois and K. A. Reinert, eds. *Applied Methods for Trade Policy Analysis*. Cambridge: Cambridge University Press, pp. 156–186.

[4] Devarajan, S., Go, D.S. and Li, H., 1999. *Quantifying the fiscal effects of trade reform*, Policy Research Working Paper No. WPS2162, Washington D.C.: World Bank.

[5] Fane, G., 2006. Trade liberalization, economic reform and poverty reduction in Lao PDR. *Journal of the Asia Pacific Economy*, 11(2), pp.213–226.

[6] Greenaway, D. and Milner, C., 1991. Fiscal dependence on trade taxes and trade policy reform. *Journal of Development Studies*, 27(3), pp.95–132.

[7] Greenaway, D., Morgan, W. and Wright, P., 2002. Trade liberalisation and growth in developing countries. *Journal of Development Economics*, 67(1), pp.229–244.

[8] Keen, M. and Ligthart, J.E., 2002. Coordinating tariff reduction and domestic tax reform. *Journal of International Economics*, 56, pp.489–507.

[9] Khattry, B. and Mohan Rao, J., 2002. Fiscal faux pas?: an analysis of the revenue implications of trade liberalization. *World Development*, 30(8), pp.1431–1444.

[10] Kyophilavong, P., 2016. Mining booms and growth in Laos – empirical result from CGE model. *International Journal of Development Issues*, 15(1), pp.51–61.

[11] Lao Statistics Bureau, 2010. Labour Force and Using Child Labour Survey 2010, Vientiane.

[12] Lao Statistics Bureau, 2015. Laos Population and Housing Census 2015, Vientiane.

[13] Lao Statistics Bureau, 2012. Statistical Year Book 2012. Vientiane Capital: Ministry of Planning and Investment.

[14] Lee, J.-W. and Hong, K., 2012. Economic growth in Asia: Determinants and prospects. *Japan and the World Economy*, 24(2), pp.101–113.

[15] Ministry of Planning and Investment, 2017. Statistics. Available at: http://www.investlaos.gov.la/index.php/resources/statistics [Accessed November 8, 2017].

[16] Mitra, P., 1992. The Coordinated Reform of Tariffs and Indirect Taxes. *The World Bank Research Observer*, 7(2), pp.195–219.

[17] Park, J., 2012. Total factor productivity growth for 12 Asian economies: The past and the future. *Japan and the World Economy*, 24(2), pp.114–127.

[18] Warr, P., 2008. How road improvement reduces poverty: the case of Laos. *Agricultural Economics*, 39(3), pp.269–279.

[19] World Bank, 2007. Lao PDR - Private Sector and Investment Climate Assessment Reducing Investment Climate Constraints to Higher Growth, Vientiane.

[20] World Bank, 2014. Lao PDR Investment Climate Assessment 2014, Vientiane.

[21] World Bank, 2016. A Comparative Overview of the Incidence of Non-Tariff Measures on Trade in Lao PDR, Vientiane.

[22] World Bank, 2016. Enterprise Survey: Lao PDR 2016. Available a t: http://documents.worldbank.org/curated/en/214641482731818886/pdf/111256-WP-PUBLIC-Lao-PDR-.pdf [Accessed November 10, 2017].

[23] World Bank, 2017. Lao Economic Monitor: Challenges in Promoting More Inclusive Growth and Shared Prosperity, Vientiane.

[24] World Bank, 2017. World Development Indicators | DataBank. Available at: http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators [Accessed November 8, 2017].

[25] World Bank, 2018. Lao PDR - Public Finance Management Modernization Program 2016-2018, Vientiane.