Does Trade Liberalization Reduce Trade Tax Revenue in Laos?

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Abstract

This paper empirically examines the impact of trade liberalization on trade tax revenue in Laos over the period 1980–2011. The results show that approximately 0.48 percentage points of the customs revenue losses can be attributed to one percentage point of opening up a country for international trade and that the low responsiveness of trade-tax revenue to the increased domestic indirect taxes can potentially reduce the country's social welfare. This study suggests that further reduction of tariff rates offers the opportunity for broader tax base through the potential expansion of domestic industrial sector.

Keywords: fiscal reform, trade liberalization, Laos

1. Introduction

Opening up a country to foreign trade has been a key focus of market-oriented policy reforms in Laos. The principal purpose to promote trade flows is grounded on the belief that it can play a crucial role in stimulating the process of economic transition, and constitute a more competitive business environment for future development of the private sector. To further stimulate sustained economic growth, industrialization may be required. Policy to enhance international trade therefore seems a clear means to boost the domestic production and integrate the country into the regional and global economy, and thereby remove Laos from the list of less developed country. However, efforts to liberalize trade reduce fiscal revenue unless the liberalizing countries are able to find alternative sources of revenue. The fact that any policy aimed at liberalizing trade can result in losses of government revenue is the theory, but does it actually

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prevail in the Lao economy?

To address this issue, it is useful to explain some economic fundamentals of Laos. At an aggregate level, the Lao economy has performed moderately well in recent years, with an annual average growth of real gross domestic product (GDP) of 7% since 2000, slightly above the average rate over the preceding decade. Trade openness—measured as the ratio of trade to GDP—increased from 34.5% in 1990 to 64% in 2011, while foreign direct investment (FDI) inflow as percentage of GDP rose sharply from 0.69% in 1990 to 5.75% in 2011. With exports as the leading engine of growth, real per capita GDP increased from $261 in 1990 to $754 in 2011. Economic reforms, beginning in 1986, have seemingly contributed to these favourable outcomes by permitting greater participation in local, regional, and global markets through trade and FDI. However, it is recognized that further removal of obstacles to the functioning of markets may be further enhanced by reducing tariffs for intermediate inputs and capital goods. This is especially important in Laos where physical capital is lack.

While the existing literature supports the positive contribution of trade to growth (see, for example, Frankel and Romer, 1999; Greenaway et al., 2002), there are contradicting views regarding the impact of trade liberalization on tax revenue. Using a panel dataset, Ebrill et al. (1999) investigate the impact of trade liberalization on trade-tax revenue and find that tariff reforms have not resulted in the reduction of trade-tax revenue. In contrast, employing a panel data of 80 countries over the period 1970–1998, Khattry and Rao (2002) find that low and middle-income countries have experienced declining tax revenues due to falling income tax and trade-tax revenues and that all countries were below the revenue-maximizing rate of trade taxation. Consequently, the authors conclude that trade liberalization has resulted in significant fiscal costs. Moreover, the empirical result by Rao (1999) indicates that low-income countries have confronted a trade-off between lowered protection and lowered revenues from trade liberalization.

The existing literature has shown some mixed results, implying that the relationship between trade liberalization and trade-tax revenue is complex and remains inconclusive. The fiscal impact of trade liberalization is potentially of great importance, especially if such liberalization largely reduces tariff revenues which are worth considering in an overall assessment of the costs and benefits of participating in free trade. This aspect of fiscal impact is particularly acute in transitional economies like Laos, where macroeconomic stabilization has been implemented with limited instruments. So far, a number of empirical works have been carried out for developing countries which mostly excluded Laos. This paper, therefore, is an attempt to fill in this gap. More precisely, the objectives of this paper are to investigate the impact of trade liberaliza-

tion on trade-tax revenue and to examine whether reforms of domestic indirect taxes have been targeted to compensate for fiscal revenue losses from trade liberalization in Laos.

The rest of this paper is organized as follows. Evolution of fiscal policy in Laos is reviewed in Section 2. Changes in the tax structure as a result of economic reforms in Laos are explored in Section 3. Econometric model and data description are provided in Section 4. Descriptive analysis of the fiscal impact of trade liberalization is examined in Section 5, while its empirical analysis is reported in Section 6. Conclusion is provided in Section 7.

2. Evolution of Fiscal Policy in Laos

Fiscal policy has three principal functions that are interrelated. The first function is to secure some form of adjustment in the resource allocation. This involves minor changes in the resource allocation affected by the market. The second function is to influence the distribution of income and wealth so as to achieve a politically desired distribution. This objective can be attained by the mobilization of the tax and transfer system. The third function of fiscal policy aims to maintain macroeconomic stability, a high level of capacity utilization, and macroeconomic balance. The three main functions of public policy play variant roles according to the kind of economic system, the development strategy, and historical and political factors. In market economies, most resource allocation is determined by the market, as is the distribution of income. While the fiscal policy plays a limited role in securing adjustments in the resource allocation and income distribution, it plays a significant role as a stabilization policy with price stability and a high level of employment.

Since 1986 Laos has implemented an ambitious reform programme in order to transform the Lao economy into a market economy. The fiscal reform that accompanied the reform programme in Laos has addressed the revenue and expenditure sides of the budget. According to Bourdet (2000), Laos' fiscal reform comprises three key components. The first and most important component is the reform of the tax system. The second is the establishment of an allocation and total level of public expenditures that should be compatible with the objectives of overall reform policy and the magnitude of external assistance to Laos. The third component is a reform of the institutional framework and an upgrading of administrative capacity and procedures to facilitate the implementation of the revised fiscal policy.

The first wave of reforms occurred at the end of the 1980s and extended over a three-year period, although some small changes occurred in early 1993. The main objective was to gener-

ate sufficient revenue at the beginning of the reform process when the key source of revenue, transfers from public enterprises, diminished due to the autonomy provided to state-owned enterprises (SOEs) and the privatization of some of them, to the price reform, and to the tightening of bank credits. To compensate for the losses of transfers from public enterprises, the government in 1988 introduced a company profit tax with varying rates between economic sectors. In June 1989, this tax was replaced by a uniform tax rate of 45% on the net profits of industrial enterprises in order to avoid the distortions on resource allocation resulted from different sector rates. The first wave served as the foundation for the development of the current tax system.

The second wave is associated with the tax law of 1995, aiming to broaden the tax base in order to finance increased development expenditures. The most important changes introduced by the 1995 tax law involved key areas: first, the broadening of the turnover tax, that currently covers most domestically produced goods and imported goods; second, the reduction and the standardization of the profit tax; third, the replacement of specific excise duties by ad valorem excise duties; and finally, the increase of income tax for the lowest bracket from 2 to 10%. Parallel to the 1995 tax law, trade liberalization measures were introduced with a simplification and lowering of import duties and the elimination of most export duties.

As shown in Table 1, the tax reforms have contributed positively to the tax revenues, rising from 10.6% of GDP in 1993–1997 to 13.6% of GDP in 2008–2011. The average growth rate of the tax revenues over the period 1993–2011 was recorded about 10.4%, which was much higher than the 6.9% tax revenue growth in the initial reform in 1993–1997. While tax revenues constitute about 65% of total revenue over the period 1993–1997, grants and non-tax revenues account for about 22% and 13%, respectively, of total government revenues. Among these three sources of government revenues, tax revenues have been increasingly contributing to growth of total public revenues, accounting for about half of the growth rate of total public revenues in 1993–1997 and more than two-thirds in 2008–2011.

This privatization of SOEs in the 1990s and the expansion of businesses have resulted in an increase in revenues from turnover and profit taxes. Table 1 illustrates that over the period 1993–2011, revenues generated from turnover tax were averaged about 2.2% of GDP with the annual growth of 7.6%, while those from profit tax were about 1.6% with the annual growth of 16.6%. Both turnover and profit taxes have played an increasingly significant role in raising total government revenues. Their combined growth rates contributed to the growth of total public revenues about 12.7% in 1993–1997 and 27% in 2008–2011. In addition, revenues from excise tax were also significant which recorded about 1.8% of GDP, and performance has been

Table 1 Laos' real government revenues, period averages

Description	Share of GDP				Growth rates				Contribution to total reve nue growth			
	1993–1997	1998–2002	2003–2007	2008–2011	1993–1997	1998–2002	2003–2007	2008–2011	1993–1997	1998–2002	2003–2007	2008–2011
Revenue	**13.4**	**11.1**	**12.1**	**15.4**	**5.3**	**12.2**	**7.9**	**11.9**	**4.2**	**5.2**	**40.3**	**12.1**
Non-tax revenue	**2.7**	**2.2**	**1.9**	**1.8**	**0.6**	**10.9**	**−2.4**	**9.8**	**0.9**	**1.0**	**5.8**	**1.5**
Tax revenue	**10.6**	**8.9**	**10.2**	**13.6**	**6.9**	**12.7**	**9.9**	**12.3**	**3.3**	**4.2**	**34.5**	**10.7**
Profit tax	1.2	1.1	1.4	2.6	14.9	15.6	24.4	11.6	0.3	0.5	5.0	1.9
Income tax	0.7	0.7	0.7	0.8	12.3	16.1	4.8	16.2	0.2	0.4	2.2	0.7
Agricultural/Land tax	0.2	0.1	0.1	0.2	8.1	15.7	9.9	17.5	0.1	0.0	0.3	0.1
Turnover tax	2.0	1.8	2.4	2.5	13.0	11.4	11.8	−5.9	0.5	0.9	8.1	2.4
Excise tax	0.6	1.7	2.0	3.0	34.1	28.8	18.7	12.8	0.1	0.8	7.3	2.4
Import duties	2.6	1.1	1.5	1.5	4.6	0.5	8.3	8.6	0.7	0.5	4.7	1.2
Export duties	0.4	0.3	0.1	0.1	13.6	7.0	−13.4	49.9	0.2	0.1	0.4	0.1
Timber royalties	2.4	1.4	0.7	0.2	−3.6	32.7	−15.5	−11.2	1.1	0.6	1.7	0.1
Hydropower royalties	0.0	0.2	0.2	0.2	0.0	42.2	−4.7	39.9	0.0	0.1	0.5	0.1
Natural resources taxes	0.0	0.1	0.4	0.7	31.8	31.2	68.1	18.9	0.0	0.0	1.9	0.6
Other taxes*	0.5	0.5	0.7	1.8	5.6	19.2	15.9	74.4	0.2	0.2	2.5	1.1
Grants	**4.8**	**3.5**	**2.2**	**4.5**	**15.2**	**−2.1**	**34.1**	**45.6**	**2.1**	**2.3**	**8.1**	**3.8**
Revenue and grants	**18.1**	**14.7**	**14.3**	**19.8**	**6.3**	**7.5**	**9.7**	**16.0**	**6.3**	**7.5**	**48.4**	**16.0**

substantially strong relative to those from turnover and profit taxes, with growth around 23.6% on average.

Tax revenues from the resource sector, namely timber, hydropower, and natural resources, accounted for 1.6% of GDP and 9.6% of total public revenues (see Table 1). While revenues from timber royalties have trended downward, both hydropower royalties and natural resources taxes have shown upward trends. Nonetheless, increased tax revenues from hydropower and natural resources were insufficient to compensate for the decreased tax revenues from timber. As a result, contribution of the resource sector to the growth of total public revenues was only 5.3% in 2008–2011, declining from 16.7% in 1993–1997.

Fiscal adjustment in a transition to market economy cannot be carried out by relying exclusively on a reform of the tax system. A contraction of public expenditure should be associated with the tax reform in order to contain fiscal imbalances within manageable limits. Nonetheless, the reduction of public expenditures is difficult since some of the adjustment costs are taken up by the budget (severance payments, wage increases to compensate for the suppression of subsidies, etc.) and also due to resistance on the part of those affected by economic restructuring. Such problems existed in Laos, where the combined impact of the reform of current and capital expenditures on total budget expenditures were relatively small.

Total public expenditures account for an even greater share of GDP (over 20.5%), and its growth has been moderately strong which was around 9.7% on average (see Table 2). The bulk

Table 2 Laos' real government expenditure, period averages

Sector	Share of GDP				Growth rates				Contribution to total expenditure growth			
	1993–1997	1998–2002	2003–2007	2008–2011	1993–1997	1998–2002	2003–2007	2008–2011	1993–1997	1998–2002	2003–2007	2008–2011
Current expenditure	**11.4**	**6.4**	**9.6**	**12.8**	**1.4**	**8.0**	**14.2**	**11.7**	**4.8**	**2.0**	**4.9**	**7.5**
Wages and salaries	5.2	2.5	3.7	5.1	4.7	4.8	12.7	12.7	2.1	0.8	1.7	3.0
Materials and supplies	3.7	1.6	1.8	2.2	–4.3	4.9	8.2	14.5	1.7	0.5	1.0	1.3
Transfers	1.5	1.2	2.0	2.5	5.0	28.8	4.0	20.8	0.6	0.2	0.8	1.4
Debt payment	0.8	1.0	1.5	1.8	9.6	22.3	43.4	4.0	0.3	0.5	1.0	1.1
Others	0.2	0.1	0.6	1.2	–14.7	142.2	331.9	7.2	0.1	0.1	0.4	0.7
Capital and net lending	**11.5**	**12.1**	**8.7**	**9.6**	**24.1**	**8.5**	**6.2**	**18.6**	**5.4**	**4.1**	**4.5**	**5.6**
Total expenditure and net lending	**22.9**	**18.4**	**18.3**	**22.5**	**10.3**	**6.1**	**9.4**	**13.1**	**10.3**	**6.1**	**9.4**	**13.1**

Source: Authors' compilation based on data from 'Annual Economic Report' of the Bank of the Lao PDR, various issues.

of the growth contribution has come from current expenditures, which accounts for half of total government expenditures and about 10.1% of total GDP, and has grown at over 8.8% on average. The share of current expenditures in GDP has grown rapidly, rising from 11.4% in 1993–1997 to 12.8% in 2007–2011. The most important contributor to the rising current expenditures is the expenditure for wage and salaries, which accounts for about 20.2% of total public expenditures and 4.1% of GDP. It has increasingly contributed to the growth of total public expenditures, accounting for about 20.6% of public expenditure growth in 1993–1997 and 23.2% in 2007–2011. Another is the rising debt payment, increasing from 0.8% of GDP in 1993–1997 to 1.8% in 2007–2011. This can be one of the great challenges for future development of Lao economy as resources have been diverted away from the socio-economic development plan.

Given the constant share of total public expenditures in GDP, the rising current expenditures were compensated by the gradual reduction of the capital expenditure and net lending. While both current and capital expenditures accounted for an equivalent share in total public expenditures in 1993, the latter has been dominated by the former since 2003–2007 (Table 2). As of 2008–2011, the capital expenditures and net lending accounted for about 43% of total public expenditures and 9.6% of GDP, whereas the current expenditures accounted for 57% of total public expenditures and 12.8% of GDP.

Having explained the developments of public revenues and expenditures, it is useful to consider the evolution of budget outcome. To do so, it is important to note that the development of budget policy in Laos has not been occurring in a vacuum, but by interacting with the developments of other macroeconomic variables, namely prices and outputs. Therefore, the fiscal balance should not be viewed as the exclusive result of fiscal reforms beginning in the late 1980s

and some subsequent fiscal reforms.

A comprehensive fiscal reform of the kind implemented in Laos takes a fair time to work through the system. In the short run, the impacts of the fiscal policy reform on the budget situation should be much less favourable due to the difficulties in controlling public expenditures at the beginning of the transition period. The difficulties in expenditure control include severe adjustment problems coupled with the time needed for revised tax system. The privatization of the SOEs may also bring about a rapid erosion of non-tax revenue. In the long run, however, improved economic conditions and a more effective tax administration should result in a better budget outcome (less budget deficit). In other words, the pattern of fiscal developments exhibits an inverted J-curve with a fast growing budget deficit in the years following the beginning of the reform process, and a slow and continuous improvement afterward.

This conjecture is partly supported by the fiscal developments in Laos, where fiscal transition follows more a U-curve than an inverted J-curve. The transition period can be divided into three sub-periods. In the first years of transition, between 1987 and 1994, the budget situation deteriorated dramatically following the introduction of the new tax system and the structural reforms. The overall budget deficit (including grants) reached 5.9% of GDP in 1994 (see Fig. 1). The second sub-period stretches over the period 1995–1996. Both public expenditures and revenues decreased, but former dominated the latter. Therefore, there was minor improvement in the budget deficit, falling from 5.9% of GDP in 1994 to 5.2% in 1996. The third sub-period covers the period 1997–2011. There has been a gradual improvement in the budget situation. Similar patterns are also true for the budget deficit when grants are excluded.

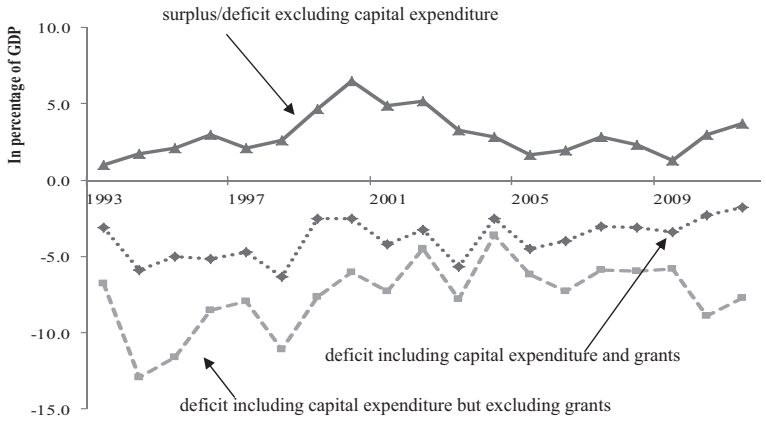

Fig. 1 Fiscal account in Laos, 1993–2011 (compiled from 'Annual Reports' of the Bank of the Lao PDR)

Since the volume of foreign assistance accounts for the large share of capital expenditures in Laos, it may be more useful to exclude capital expenditures when assessing the impact of fiscal reform on the budget deficit. The development of the budget deficit, capital expenditures excluded, is illustrated in Fig. 1. To a large extent, it confirms the pattern that emerges when concentrating on the overall budget deficit. Following the introduction of the new tax system in the late 1980s, the budget balance deteriorated rapidly. Since 1994, the budget deficit has steadily improved. Over the period 1993–2011, domestic tax and non-tax revenue has covered all current expenditures.

The institutional changes in the early 1990s coupled with the tax reforms and expenditures control beginning in the late 1980s in Laos may explain the limited effect of the fiscal reforms on public finance in first half of the 1990s. This result emphasizes the role of institutional changes needed for the successful fiscal reforms. The slower progress of administrative and institutional change in Laos can be due largely to political system, the lack of trained officials in the remote areas, and the time required to develop such skills.

3. Developments of trade liberalization and tax revenues in Lao PDR

Following Laos' economic reform in 1986, among other tax reforms, foreign trade tax as well as domestic indirect tax (turnover tax and excise tax) have been reformed. Efforts of the fiscal reform in the late 1980s aimed at generating sufficient sources of revenue to compensate for the losses of transfers from public enterprises due to the autonomy provided to state-owned enterprises, the price reform and the tightening of bank credits.[1)]

As shown in Fig. 2, the share of total tax revenue in GDP rose from 1.2% in 1987 to 8.7% in 1988 and to 14.4% in 2011. One of the important sources of revenue is foreign trade tax. Approximately one third of total revenue was contributed from this source during 1988–1999, while it accounted for only one fifth of total revenue prior to the implementation of the reform during 1980–1987. The dramatic rise in trade-tax revenue in 1988 is explained by the significant increase in both import and export duties. While exports contracted since 1992, imports continued to rise until 1997. Fundamental factors describing the performance of revenue from import duties included trade liberalization and the rising imports of intermediate inputs and capital goods, the substantial devaluation of Lao kip due to the unification of exchange rates at level close to parallel market rate, the elimination of exemptions for those benefiting imports

1) 60 out of about 200 state-owned enterprises were privatized.

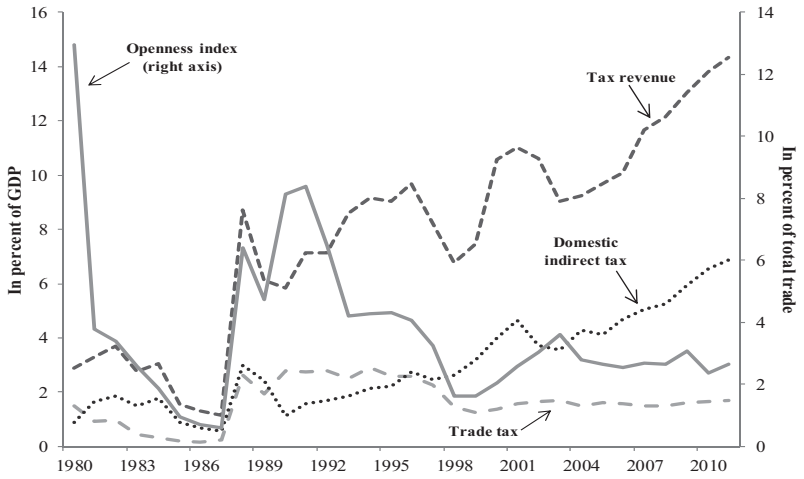

Fig. 2 Fiscal revenue and openness index in Laos, 1980–2011 (see Fig. 1 for source of data)

from the non-convertible area, and improved tax collection. The fundamental factors describing the performance of revenue from export duties in the period 1988–1991 consisted of the elimination of most export restrictions, the introduction of a tax on profits from export and on exploitation of natural resources, the primary sector development, and improved tax collection.

The openness index, measured as the percentage share of trade tax in total trade, follows the same pattern as the trade-tax revenue. The greater the openness index is, the less open the Lao economy is. As can be seen from Fig. 2, the openness index fell from 8.4% in 1991 to 2.7% in 2011, implying that Laos' foreign trade has been gradually liberalized. Trade liberalization has been rapid since 1997 due to the membership of the Association of South East Asian Nations and the preparation for the World Trade Organization membership.

In response to the need to compensate for the losses of transfers from public enterprises and the growing trade liberalization and to finance the public expenditure, the Lao government, in March 1988, established a turnover tax on service enterprises in the range of 1–15%. In June 1989, this tax was broadened to include not only services, but also wholesale trade and imports, with five rates in the range 3–20%. In February 1991, number of turnover tax rates in the range of 5–10% decreased from five to two and excise taxes on petroleum products and luxury goods were introduced. In 1995/96, specific excise duties—including gasoline, vehicles, alcoholic drinks, cigarettes—were replaced by *ad valorem* excise duties. The value added tax has also been introduced since 2010. The revenue generated by turnover and excise taxes increased gradually and exceeded the trade-tax revenue in 1996 (see Fig. 2). The domestic taxes on goods

and services accounted for 6.9% of GDP or 47.8% of total tax revenue in 2011, which rose from 1.1% of GDP or 19% of total tax revenue in 1990. At present, both turnover and excise taxes constitute the main source of government revenue.

Economists contend that domestic taxes on goods and services should increase to compensate for losses of trade-tax revenue due to trade liberalization. For the case of Laos, the trade-tax revenue has been stable since 1998, whereas the domestic taxes on goods and services have increased gradually. This divergence indicates that their relationship is complex as the reform of budget policy in Laos has been implemented by interacting with the systemic and macroeconomic components of the reform programme. This interaction determines the macroeconomic outcome of the transition process. Of particular importance is the determination of capacity utilization and economic growth which in turn affect the nature and path of fiscal reform. Consequently, the analysis of the relationship between trade liberalization and domestic indirect taxes should not only be limited to an analysis of fiscal revenue, but also be considered in a broader analysis of how fiscal reform has affected macroeconomic performance, especially price stability, and how economic growth has had an impact on fiscal performance. In order to take these factors into consideration, it is useful to employ a multivariate analysis to investigate the fiscal impact of trade liberalization.

4. Econometric model and data

To examine the fiscal impact of trade liberalization in Laos, the methodology of Khattry and Rao (2002) is adopted and slightly modified in this paper. Trade-tax revenue (*TT*), represented by the share of trade-tax revenue in GDP, is determined by the natural logarithm of real per capita income (ln*YC*), the natural logarithm of population size (ln*PP*), the age-dependency ratio (*AD*), the degree of urbanization (*UB*), the index of openness (*TO*) and its square (TO^2), the trade/GDP ratio (*TR*), the share of domestic indirect taxes in GDP (*DTAX*), the log of real exchange rate (ln*ER*), and the dummy of the Asian financial crisis (*DM*). These definitions are shown in Table 3. The impact of openness on trade-tax revenue can be empirically analysed as follows:

$$TT_t = \delta_0 + \delta_1 \ln YC_t + \delta_2 \ln PP_t + \delta_3 AD_t + \delta_4 UB_t + \delta_5 TO_t + \delta_6 TO_t^{\,2} + \delta_7 TR_t + \delta_8 DTAX_t + \delta_9 \ln ER_t + \delta_{10} DM_t + \varepsilon_t \quad (1)$$

The impact of the effective rate of trade taxation on trade-tax revenue is presumably nonlinear as prohibitively high rates of trade taxation may result in trade tax reduction. Therefore, the

Table 3 Variable definitions, expected signs, data sources used in the trade tax model

Variable	Definition	Expected sign	Data source
Dependent variable			
TT	Share of trade tax revenue in GDP.		WB's country reports and BOL Annual Reports
Independent variable			
ln*YC*	Logarithm of real per capita income.	Negative	UNCTAD (2012)
ln*PP*	Logarithm of population size.	Positive	IMF (2012)
AD	Age-dependency ratio.	Positive	World Bank (2012)
UB	Degree of urbanization.	Negative	World Bank (2012)
TO	Ratio of trade tax revenue to total trade.	Positive	WB's country reports and BOL Annual Reports
TO^2	Square of the ratio of trade tax revenue to total trade.	Negative	WB's country reports and BOL Annual Reports
TR	Ratio of trade to GDP.	Positive	UNCTAD (2012)
DTAX	Share of domestic indirect taxes in GDP.	Negative	WB's country reports and BOL Annual Reports
ln*ER*	Logarithm of real exchange rate.	Negative	IMF (2012)
DM	Dummy of the Asian financial crisis, equal to during 1997–1999 and 0 otherwise.	Negative	Authorsto

Source: Authors' compilation.

impact of trade liberalization on trade-tax revenue is specified in a quadratic form. Partially differentiating *TT* with respect to *TO* and solving for *TO* provide the revenue-maximizing rate of trade taxation: $TO = -\delta_5 / \delta_6$.

The coefficient of ln*YC* is expected to be negative as higher income level allows the government to raise more tax revenue from domestic sources and be less dependent on trade-tax revenue. The coefficient of population size is expected to be positive because a larger population size will increase the share of trade-tax revenue in GDP if there are economies of scale in tax collection. The coefficient of *AD* is assumed to be positive, while that of *UB* is negative. The coefficient of *TR* should be positive as greater trade/GDP ratio generates more trade-tax revenue.

The variable *DTAX* is used to capture the impact of domestic indirect taxes which is expected to have a negative sign. The coefficient of *ER* is assumed to have a negative sign both because the Lao government has imposed more taxes on imports than on exports and because the manufacturing sector in Laos is very tiny. The dummy of the Asian financial crisis (*DM*) is included into the model to capture the structural change during the crisis, whose value is equal to one for the period 1997–1999 and zero otherwise. The coefficient of *DM* is expected to be negative as the crisis might severely affect the Lao economy.

4.2 *Data description*

To examine the determinants of trade-tax revenue in Laos, data for the following variables are used: tax revenue, real per capita GDP, population size, age-dependency ratio, urbanization rate, aggregate trade flows, and real exchange rate. The important sources for these variables are the World Bank online database 'World Development Indicators and Global Development Finance', the IMF online database 'World Economic Outlook Database' (WEO), UNCTAD online database 'UNCTADSTAT', World Bank publications 'Lao PDR Country Economic Memorandum (various issues)', and Bank of the Lao PDR 'Annual Economic Report (various issues)'. Summary statistics of variables used in the analysis are provided in Table 4.

Table 4 Summary statistics of variables used the analysis

Variable	Mean	Maximum	Minimum	Std. Dev.
TT	1.63	2.90	0.15	0.81
ln*YC*	5.83	6.63	5.25	0.39
ln*PP*	8.45	8.75	8.08	0.21
AD	83.54	91.26	60.17	9.61
UB	20.63	35.78	12.39	7.23
TO	3.65	12.95	0.59	2.52
TO^2	19.52	167.70	0.35	31.99
ln*ER*	8.98	9.45	8.06	0.37
TR	48.87	89.48	11.55	19.65
DTAX	2.98	6.86	0.55	1.74
DM	0.09	1.00	0.00	0.30

Source: Authors' calculation

5. Descriptive analysis of the relevant variables

5.1 *Composition of trade-tax revenue and its annual change*

In order to examine the composition of trade-tax revenue and its annual change in Lao PDR, we first divide customs revenue into two main categories: import tax and export tax. As illustrated in Fig. 3(a), import-tax revenue accounted for a large percentage share of the total customs revenues over the period 1980–2011 compared with the export-tax revenue. The share of import-tax revenue decreased from 79% in 1980–1985 to 53% in 1986–1990, but then rose again to 74% in 1991–1995 and to 93% in 2006–2011. In contrast to the import-tax revenue share, the export-tax revenue share declined over the period under investigation. The percentage decline was more pronounced in 2006–2011 than in other periods.

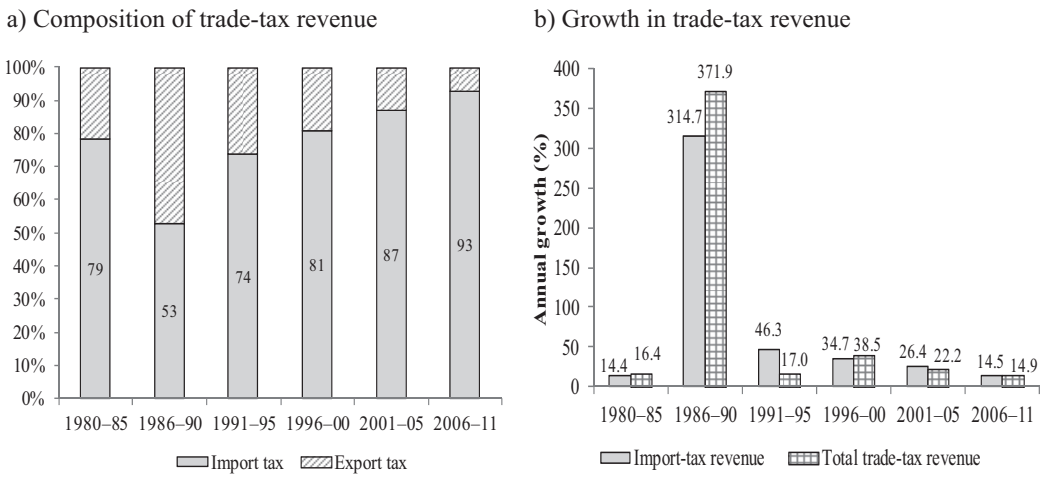

Fig. 3 Composition of trade-tax revenue and its annual change in Lao PDR during 1980–2011 (calculated using data from the World Bank and Bank of the Lao PDR).

Moreover, Fig. 3(b) indicates that total trade-tax and import-tax revenues grew rapidly between 1980 and 2011, with an average growth rate of 80% and 75%, respectively. The average annual growth rate of total trade-tax revenue rose sharply from 16.4% in 1980–1985 to 372% in 1986–1990. Its growth rate was then recorded around 15% in 2006–2011. A similar trend was evident for the growth rate of import-tax revenue.

5.2 *Tax revenue, trade openness, and real per capita income*

On average, Fig. 4(a) suggests that higher per capita real income in Laos is not necessarily associated with a decrease in the share of trade-tax revenue in GDP. Real per capita GDP rose gradually from US$220 in 1980–1985 to US$351 in 1996–2000, and to US$641 in 2006–2011. The ratio of trade-tax revenue to GDP increased from 0.7% in 1980–1985 to 2.7% in 1991–1995, but remained unchanged at 1.6% during 1996–2011.

Fig. 4(b) illustrates that the average annual growth rate of real per capita GDP between 1980 and 2011 varied significantly. The growth rate of real per capita GDP was about 5.2% per annum in 1980–1985, while it was about 1.5% in 1986–1990. It then gradually rose from 3.6% in 1991–1995 to 4.7% in 2001–2005. The fastest growth period was in 2006–2011, recorded around 8%. Fig. 4(b) also shows that the ratio of domestic indirect-tax revenue to GDP increased gradually, from 1.4% in 1980–1985 to 3% in 1996–2000, and to 5.7% in 2006–2011. This suggests that revenue from indirect tax is growing faster than GDP.

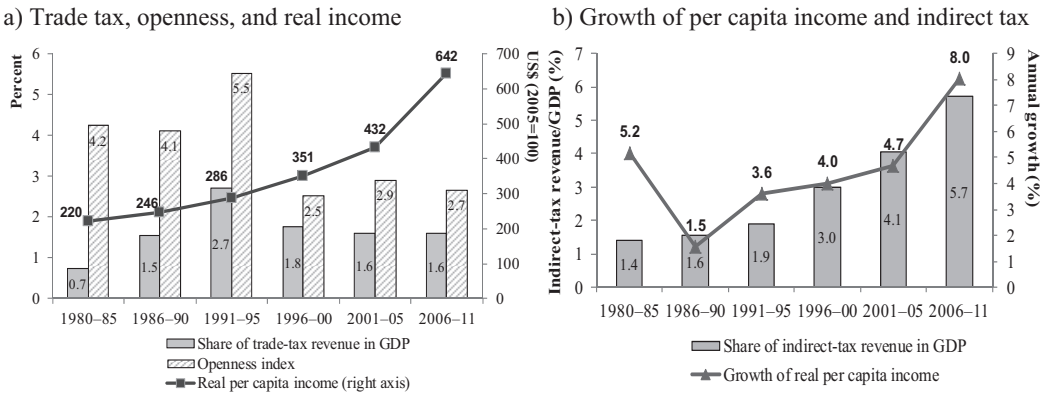

Fig. 4 Tax revenue, trade openness, and real per capita income (see Fig. 2 for sources of data).

5.3 *Population and urbanization*

The Laos' population is growing gradually, while the age-dependency ratio is declining. Fig. 5 (a), its population in 2006–2011 stood at 6.1 million, compared to 5.1 million in 1996–2000 and to 3.4 million in 1980–1985. In 2011, the population is predominantly composed of young people, with 62.4% between the ages of 15 and 64, 33.7% below 15 years old, and only 3.9% older than 64 years (World Development Indicator, 2013). As shown in Fig. 5(a), the age-dependency ratio steadily decreased from about 91% in 1980–1985 to 87.2% in 1996–2000, and dramatically fell from 79.4% in 2001–2005 to 66.1% in 2006–2011.

Fig. 4(b) illustrates that the country's population growth rate increased from 2.4% in 1980–1985 to 2.7% in 1991–1995, but dropped to 2.1% in 1996–2000 and to 1.5% 2006–2011. The

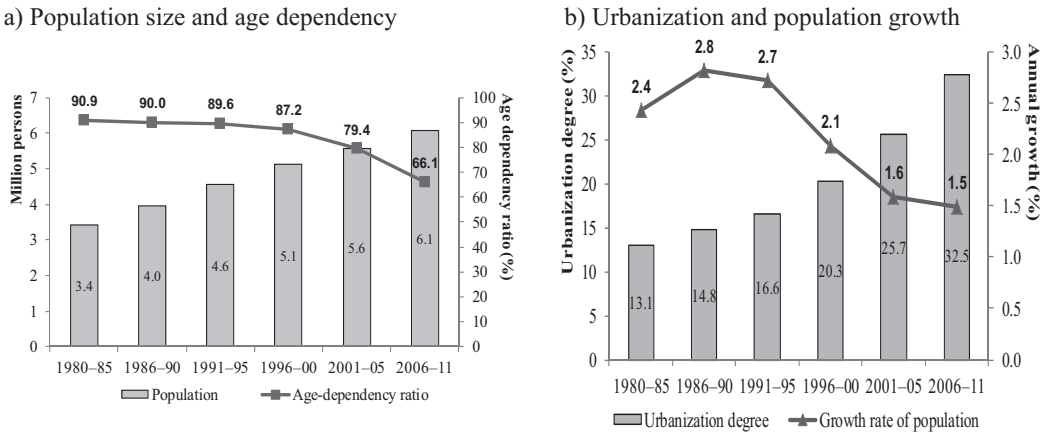

Fig. 5 Population and urbanization

majority of the population still resided in rural areas. As shown on the left axis of Fig 5(b), the degree of urbanization was more than double from 1980–1985 to 2006–2011. The urbanization degree was 32.5% in 2006–2011, compared with 20.3% in 1996–2000 and 13.1% in 1980–1985.

The graphical demonstration of the trade-tax revenue and its determinants provides the patterns of their developments. It is also useful to examine their relationships using statistics.

5.4 *Correlation matrix for all variables*

As a preliminary analysis of the relationship between the ratio of trade-tax revenue to GDP and its determinants, it is useful to calculate the correlation matrix for all variables as shown in Table 5. The correlation is +1 in the case of a perfect positive linear relationship, −1 in the case of a perfect negative linear relationship, and some value between −1 and 1 in all other cases, indicating the degree of linear dependence between the variables. As it approaches zero there is less of a relationship. The closer the coefficient is to either −1 or 1, the stronger the correlation between the variables.

Table 5 illustrates that the trade-tax revenue to GDP ratio (*TT*) has the strongest positive correlation with openness index (*TO*) followed by ratio of trade to GDP (*TR*), Logarithm of real exchange rate (ln*ER*), Square of the ratio of trade-tax revenue to total trade (TO^2), Logarithm of population size (ln*PP*), Share of domestic indirect taxes in GDP (*DTAX*), Logarithm of real per capita income (ln*YC*), Degree of urbanization (*UB*), and Dummy of the Asian financial crisis (*DM*). In contrast, the trade-tax revenue to GDP ratio has a negative relationship with age-dependency ratio (*AD*). The correlation coefficient between them is –0.01, suggesting that their relationship is very small.

Table 5 Correlation matrix for all variables used in the analysis

Variable	*TT*	ln*YC*	ln*PP*	*AD*	*UB*	*TO*	TO^2	ln*ER*	*TR*	*DTAX*	*DM*
TT	1										
ln*YC*	0.12	1									
ln*PP*	0.31	0.94	1								
AD	–0.01	–0.95	–0.81	1							
UB	0.09	0.99	0.92	–0.97	1						
TO	0.57	–0.36	–0.31	0.26	–0.32	1					
TO^2	0.34	–0.39	–0.38	0.26	–0.34	0.95	1				
ln*ER*	0.42	0.37	0.57	–0.19	0.36	–0.15	–0.30	1			
TR	0.42	0.65	0.81	–0.44	0.6	–0.33	–0.40	0.67	1		
DTAX	0.13	0.94	0.87	–0.93	0.95	–0.28	–0.34	0.39	0.6	1	
DM	0.01	0.03	0.14	0.13	–0.02	–0.19	–0.15	0.29	0.49	–0.04	1

Source: Authors' estimation.

The descriptive statistics, provided in this and the preceding subsections, helps describe the patterns of interrelationship between the customs revenue and other explanatory variables that might emerge from the data. Descriptive statistics do not, however, allow us to make conclusions beyond the data we have analysed or reach conclusions regarding any hypotheses we might have made. In order to test hypothesis about the relationship between trade liberalization and customs revenue, we need to employ the regression analysis.

6. Empirical results

The result of trade tax determinants in Laos, specified in Eq. (1), is illustrated in Eq. (1'). Robust standard errors following White (1980) are used and the superscript '***' denotes the 1% significance level. t-statistic for each corresponding variable is in bracket. As indicated by the adjusted R-square, the trade tax model can explain the relatively high variation in the customs revenue about 98%. The F-statistics is statistically significant at 1% level, indicating that the estimated model can be used to determine trade-tax revenue in Laos. Finally, the Durbin-Watson (DW) statistic is 2.55. For 10 regressors and 32 observations, the critical value of DW statistic is 0.77 for the lower bound (dL) and is 2.31 for the upper bound (dU). Since the DW statistic is 2.55 which is larger than dU (2.31), the null hypothesis of no autocorrelation cannot be rejected. This indicates that the estimated regression model does not suffer from autocorrelation, and thereby providing efficient estimates and valid statistical inference based on the least squares method. Given these diagnostic tests, it is reasonable to use the estimated model in (1') to investigate the determinants of trade-tax revenue in Laos.

$$\begin{aligned} TT_t = &-32.18 - 0.52\ln YC_t + 6.29\ln PP_t - 0.13AD_t - 0.29UB_t \\ &[-5.01]^{***} \quad [-0.53] \quad [3.95]^{***} \quad [-2.96]^{***} \quad [-3.45]^{***} \\ &+ 0.59TO_t - 0.03\,TO_t^2 + 0.02TR_t - 0.02DTAX_t - 0.23\ln ER_t - 0.14DM_t \\ &[12.90]^{***} \quad [-9.34]^{***} \quad [4.33]^{***} \quad [-0.23] \quad [-1.69] \quad [-1.09] \\ &\text{Adjusted } R^2 = 0.98 \quad F\text{-statistic} = 159.13 \quad N = 32 \quad \text{DW} = 2.55 \end{aligned} \tag{1'}$$

The fact that coefficient of *TO* is large and positive indicates that trade-off between lowered trade tax revenue and lowered protection is considerable. The negative coefficient of TO^2 suggests that there is a potential Laffer effect for trade-tax revenues. Evaluating at mean of *TO*, 0.48 percentage points of the customs revenue losses can be attributed to one percentage point of greater openness. The revenue-maximizing rate of trade taxation is estimated to be 9.1%

whereas, from Fig. 2, the effective rate of trade taxation was lower than this rate over the period 1981–2011. Consequently, trade taxation in Laos has been operating on the rising part of the Laffer curve.

The coefficient of domestic indirect-tax revenue/GDP ratio has an expected negative sign but is not statistically significant even at 5% level. This implies that the government incentive of raising domestic indirect-tax revenue is weakly associated with the reduction of trade tax. A possible explanation for this is that the focus here on replacement from domestic tax revenue is too narrow as the Lao government has also succeeded in recovering lost trade-tax revenue by strengthening the income tax.

The result from eq. (1') also shows that a percentage point increase in trade/GDP ratio results in 0.02 percentage points rise in trade tax/GDP ratio. Furthermore, structural factors exert strong influence on the trade-tax revenue/GDP ratio in Laos. The coefficient of population size—a proxy variable for economies of scale—is positive and statistically significant at 1% level, suggesting that there is a positive scale effect on trade tax collection in the Lao economy. A rise of one percentage point in the urbanization rate is observed to result in a decline of 0.29 percentage points in trade tax/GDP ratio. The presence of a significantly negative correlation between the age-dependency ratio and customs revenue is surprising, as it is expected to have a positive relationship. Perhaps this is accounted for by the fact that because age-dependency ratio in Laos is so high, lower age-dependency ratio facilitates increased trade and therefore higher trade-tax revenue. While the log of real per capita GDP, real exchange rate, and dummy of Asian financial crisis are not statistically significant, they do have the expected negative coefficients.

7. Conclusion

Tax reform in Laos can be considered rather successful if one focuses on the period 1986–2011. Of particular importance is that the fiscal reform has led to greater trade liberalization and tax revenue. This occurred even though some of the macroeconomic conditions in Laos worked against the interests of Lao people. The econometric analysis provided in this paper suggests that there is a potential Laffer effect for trade-tax revenue and the revenue-maximizing rate of trade taxation, estimated to be 9.1%, is higher than the actual rate, and that approximately 0.48 percentage points of the customs revenue losses can be attributed to one percentage point of opening up a country for international trade.

Between 1986 and 2011, fiscal revenue grew significantly, but took the sole form of raising

domestic indirect taxes. The analysis provided in this paper suggests that this strategy had a low pay-off in terms of reduced trade-tax revenue. This implies that further reduction of tariff rates offers the opportunity for further enhancing production efficiency through greater importation of capital goods and intermediate inputs as well as improving consumer welfare through greater access to a variety of consumer goods. Over time, the structure of domestic production would be affected as trade provides channels of communication that stimulate cross-border learning of production methods, product design, organization methods, and market conditions. The resulting expansion of industrial sector should provide more sources for taxation.

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