Impact of tax revenue on economic growth: A study from Cambodia

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ABSTRACT

The study examines the impact of tax revenue on economic growth in Cambodia from 1994 to 2022. The Autoregressive Distributed Lag (ARDL) method is applied to test the cointegration between variables. It analyzes long- and short-run dynamics between tax revenue and economic growth, considering special taxes, public expenditure, and the service sector's growth. The findings reveal a significant positive association between tax revenue and economic growth in the long run, indicating that a 1% increase in tax revenue leads to a 0.11% increase in economic growth, while special taxes positively impact economic growth. However, public expenditure exhibits a negative relationship with long-term growth. Moreover, the growth of the service sector emerges as a vital driver of economic expansion. The short-run dynamics suggest fluctuations in tax revenue's impact on economic growth. The regression model exhibits high explanatory power, with diagnostic tests confirming its reliability. Therefore, The Royal Government should balance and optimize tax laws and regulations, continually amending and compiling them. Additionally, consistent policies and strategic plans should be established to prevent tax evasion and eliminate corruption in tax affairs.

1. Introduction

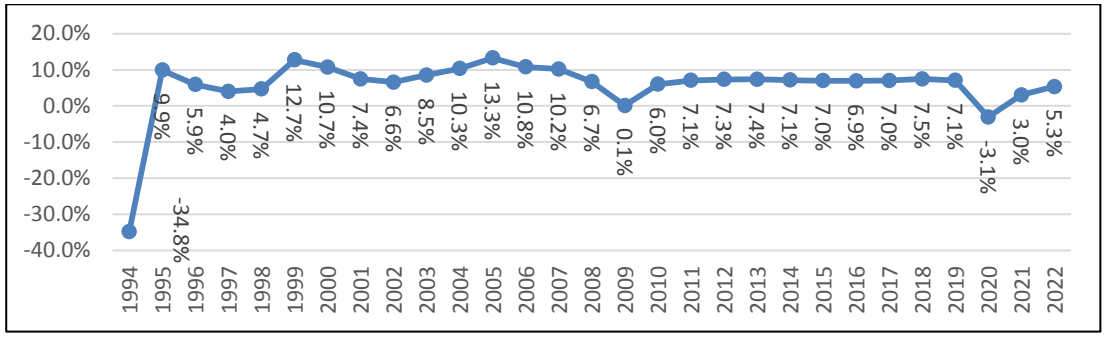
According to Todaro and Smith (2006), economic growth entails a persistent advancement whereby the economy's productive capacity progressively expands, leading to augmented levels of national output and income. Over the past two decades, Cambodia has experienced significant macroeconomic growth, averaging around 7% per year. This growth trajectory has positioned the country to sustain and potentially accelerate its economic momentum, with its Gross Domestic Product (GDP) growing from 8,965 billion riels in 1994 to 59,502 billion riels in 2022 (National Institute of Statistics, 2022). Such achievements have garnered recognition and optimism both domestically and internationally, fueling aspirations for Cambodia to transition into a high-middle-income country by 2030 and ultimately reach high-income status by 2050 (Royal Government of Cambodia, 2019). In response to this vision and the evolving socio-economic landscape, the Royal Government of Cambodia is committed to implementing comprehensive reforms aimed at managing macroeconomic dynamics, fostering sustainable growth, ensuring inclusivity, and building resilience to crises.

Aligned with the country's strategic development plans, including the Rectangular Strategy Phase 4, the National Strategic Development Plan 2019 - 2023, the Public Financial

Management Reform Program 2019 - 2025, and the Revenue Mobilization Strategy 2019 - 2023, the Royal Government has achieved notable milestones (Ministry of Economy and Finance, 2022). As an overall result, over the period from 1994 to 2022, the trends in GDP growth rate (National Institute of Statistics, 2022) and tax revenue growth (General Department of Taxation, 2022) are illustrated by the graphical representation in Figure 1 and Figure 2.

Figure 1

Economic Growth as a Percentage of Constant 2000 Price

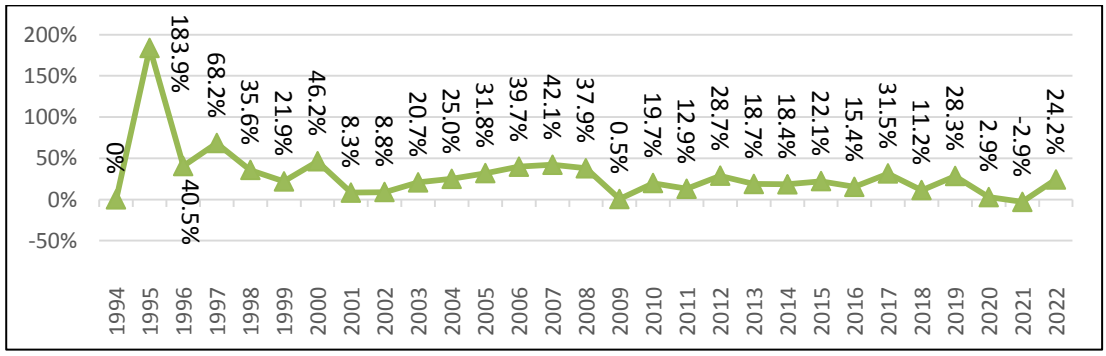


Source. Author's calculation

These graphs provide a visual depiction of Cambodia's economic progress, showcasing the effectiveness of the government's policies in driving sustainable development and economic growth.

Figure 2

Annual Tax Revenue Growth as a Percentage



Source. Author's calculation

These results include revenue growth, human resource capacity building, institutional strengthening, enhanced governance, improved inter-ministerial coordination, and effective revenue management and collection (Ministry of Economy and Finance, 2022). The tax sector, in particular, has undergone significant reforms focusing on refining fiscal policies, modernizing tax administration, providing training and workshops, establishing international agreements, and embracing digital technology advancements (General Department of Taxation, 2022). These efforts underscore the government's commitment to transparent, accountable, and efficient tax revenue collection, which has contributed substantially to national budget revenue growth.

Despite these advancements, gaps remain in understanding the effectiveness and efficiency of tax policies and their impact on economic growth. Comprehensive research in this area is crucial for informing future tax policy decisions and ensuring continued economic development. Recognizing this need, this study focuses on investigating the relationship between tax revenue and economic growth in Cambodia. By employing advanced econometric methods

according to Pesaran et al. (2001), such as the Autoregressive Distributed Lag (ARDL) model and cointegration analysis, this research aims to provide insights into the role of tax revenue as a driver of economic growth in the country.

In conclusion, this study's significance lies in its contribution to the understanding of Cambodia's long-term economic vision and the effectiveness of tax policies in achieving sustainable economic growth. By analyzing the relationship between tax revenue and economic growth, this research seeks to inform evidence-based decision-making in tax policy formulation and strategic planning. The findings are expected to guide the Royal Government in optimizing tax laws and regulations, enhancing tax administration, promoting tax compliance, and fostering a conducive environment for economic development aligned with the public finance theory (Ulbrich, 2011).

With a comprehensive analysis of tax revenue's impact on economic growth, this study aims to support Cambodia's aspirations for continued prosperity, inclusivity, and resilience in the face of evolving socio-economic challenges.

2. Literature review

2.1. Theoretical framework

The relationship between fiscal policy and economic growth is a subject of extensive theoretical exploration. Economists have introduced various theories and principles of tax collection over time to guide countries in achieving fair and equitable tax practices. Among these theories, Endogenous Growth Theory suggests that policy measures, including those funded by tax revenue, can have a lasting impact on economic growth by influencing factors like technology, innovation, and human capital development (Acemoglu, 2014). Productivity Growth Theory: The growth of the service sector can also contribute to economic growth through improvements in productivity. Advances in technology and organizational efficiency in service industries can lead to higher productivity levels, which in turn can boost overall economic output (Kahn & Rich, 2003). New Growth Theory: This theory introduces the concept of "creative destruction" as a mechanism for sustained economic growth. It argues that innovation and technological progress are endogenous to the economic system, driven by competition, entrepreneurship, and incentives for innovation. This theory emphasizes the importance of market structure, intellectual property rights, and competition policy in fostering innovation and fostering long-term economic growth (Aghion & Howitt, 2009).

2.2. Related studies

Taxation theory encompasses various perspectives on how governments should raise revenue and distribute the tax burden. The cost-of-service theory suggests that those benefiting from specific government services should collectively cover the expenses associated with them. However, criticisms of this theory highlight its limitations in practical application and its potential to constrain government welfare activities (Ojong et al., 2016). In response, the benefit-received theory emerged, proposing that citizens contribute taxes in proportion to the benefits they derive from government services (Chauke, 2023). Nonetheless, challenges arise in accurately measuring individual benefits. Alternatively, the socio-political theory of taxation, advocated by Chigbu et al. (2012), emphasizes using tax policies to address broader societal issues, promoting social welfare, equity, and social cohesion. This theory underscores the importance of considering socio-political dynamics and distributional impacts when designing tax policies to foster a more equitable and inclusive society. In contrast, the Ability to Pay

Theory, proposed by Anyaduba and Otulugbu (2019), argues that taxpayers should be taxed based on their financial capacity to ensure justice and equity. On the other hand, the Fiscal Exchange theory, articulated by Ogbonna and Appah (2020), suggests that taxpayer compliance is influenced by the government's provision of public goods and services. From a neoclassical perspective, taxes can impact economic growth by distorting incentives for work, investment, and entrepreneurship (Mankiw & Taylor, 2014). Special taxes, such as targeted levies, may exacerbate inefficiencies and reduce resource allocation efficiency, affecting overall growth. However, the impact of special taxes on growth depends on how the revenue is utilized. For example, revenue from environmentally harmful activities could fund projects promoting sustainable economic growth (Barro & Sala-i-Martin, 2004). Furthermore, tax competition theory, as proposed by Wilson (2014), suggests that special taxes influence economic growth by affecting jurisdiction competitiveness. High special taxes may deter businesses, while well-designed tax incentives can attract investment and stimulate growth.

Keynesian economics, as expounded by Keynes in 1936, underscores the role of government spending in driving economic growth, particularly during periods of economic downturn (Stiglitz & Walsh, 2015). Taxation policies are crucial in financing government initiatives aimed at bolstering demand and creating employment opportunities, thereby contributing to overall economic expansion. However, neoclassical economists, as articulated by Mankiw in his influential work, "Principles of Economics," caution against the adverse effects of taxation on economic growth (Mankiw, 2017). They argue that higher taxes can distort incentives for work, investment, and entrepreneurship, reducing the return on investment and labor income, and potentially leading to lower levels of capital accumulation and labor supply, thus hindering economic growth. The "crowding out" effect, extensively debated in economics, describes how heightened government spending or borrowing can diminish private sector investment, potentially resulting in adverse impacts on economic activity. Conversely, effective use of tax revenue for productive public investments can lead to "crowding in," where private investment is stimulated by improved infrastructure and a more educated workforce (Auerbach & Gorodnichenko, 2012). Perotti (2007) discusses the Ricardian Equivalence theory, which suggests that heightened public spending prompts consumers to anticipate future taxes, leading to increased savings and reduced consumption, thus impacting aggregate demand and GDP growth negatively. Ramey (2011) elaborates on fiscal multipliers, indicating that government spending may have varying impacts on GDP depending on its efficiency and alignment with productive uses. Bom and Ligthart (2014) emphasize the importance of directing public expenditure towards enhancing supply-side factors to foster long-term growth, warning against inefficiencies and resource misallocation. Additionally, Arnold et al. (2011) highlight the impact of distortionary taxes, which can dampen incentives for economic activity, potentially impeding growth.

This study is grounded in these theoretical frameworks, recognizing the complexity of tax policy and its implications for economic growth. By exploring these theories and synthesizing related studies, the research aims to provide comprehensive insights into the relationship between tax revenue and economic growth in Cambodia. Through empirical analysis, informed by both theoretical constructs and empirical findings from related studies, the study seeks to contribute to the understanding of how tax policies can be designed to foster sustainable economic development and societal well-being in the Cambodian context. Overall, this theoretical and empirical framework provides a solid foundation for investigating the dynamics of tax revenue and its impact on economic growth, informing evidence-based policy decisions and strategic planning in Cambodia's fiscal landscape.

2.3. Hypothesis development

Based on the research aim of investigating the impact of tax revenue on economic growth in Cambodia from 1994 to 2022, the hypothesis of this study is formulated as follows:

H1: There is a statistically significant impact of tax revenue on economic growth in Cambodia

H2: There is a statistically significant impact of a special tax on economic growth in Cambodia

H3: There is a statistically significant impact of public expenditure on economic growth in Cambodia

H4: There is a statistically significant impact of the growth of the service sector on economic growth in Cambodia

3. Methodology

3.1. Data

This study utilizes annual time series data spanning from 1994 to 2022, sourced from the National Institute of Statistics of Cambodia and the General Department of Taxation of Cambodia. Cambodia's economic growth is based on the value of real GDP represented by Real Gross Domestic Product Growth (RGDPG). Tax Revenue is the total amount of tax collected by the General Department of Taxation from all types of taxes as defined in the laws and regulations on taxation of the Kingdom of Cambodia, excluding customs revenue or other non-tax revenue represented by Tax Revenue (TXR). Special tax serves as a revenue source for the national budget. This type of tax is levied on goods deemed harmful to health or those that the government does not encourage excessive consumption of, such as luxury goods and non-essential services. It includes various beverages, wines, beers, cigars, and locally produced items like cement (Law on the Amendment of the Financial Law for Management, 1995). Public expenditure represents the amount, measured in millions of riels, allocated in the national budget and disbursed through the national treasury. This expenditure encompasses both current and capital expenditures (Law on Public Financial System, 2008). The growth in services encompasses growth in trade, hotels and restaurants, transport and telecommunications, and finance. Data on all the variables were transformed into natural logarithms to achieve stationarity in variance. It should be noted that if the F-statistics (Wald test) establishes a single long-run relationship and the sample data size is small ($n \leq 30$) or finite, the ARDL error correction representation becomes relatively more efficient (Nkoro & Uko, 2016).

3.2. Model specification

To examine the impact of tax revenue on economic growth in Cambodia, this study utilizes the Autoregressive Distributed Lag (ARDL) bounds testing approach for cointegration, developed by Pesaran and Shin (1995). The technique provides several advantages over alternative estimation methods, such as those proposed by Engle and Granger (1987), Johansen (1991). Primarily, it possesses the versatility to be applied irrespective of the integration order of the regressors (either I(1) and/or I(0)). This attribute renders it a statistically more significant approach for correlation analysis, particularly in scenarios with limited data, as opposed to other methods that necessitate larger datasets for validity. Moreover, it accommodates variations in optimal lags among variables, a capability not found in other techniques. Ultimately, the method

employs a unified reduced-form equation to determine both long- and short-term relationships among variables (Babajide et al., 2015; Babajide & Lawal, 2016; Bahmani-Oskooee & Ng, 2002; Kyophilavong et al., 2015; Odhiambo, 2010; Pesaran & Shin, 1999). After delineating the advantages of the ARDL model, this study utilizes a bound test to assess cointegration among the variables under scrutiny. The Autoregressive Distributed Lag (ARDL) is suitable for either I(1) variables or a combination of I(1) and I(0) variables. The ARDL model avoids endogeneity problems when compared with another form of co-integrating and also estimates the long-run and short-run parameters simultaneously. Equation (1) represents the impact of tax revenue on economic growth in Cambodia. The model for this work is as:

$$log\ RGDPG = \alpha_0 + \alpha_1 logTXR + \alpha_2 logST + \alpha_3 logPubex + \alpha_4 logSesvice + \mu_t \quad (1)$$

In the formulated ARDL framework, GDP growth ($\log RGDPG_t$) is the dependent variable (DV), while lag variables of GDP growth ($\log RGDPG_{t-i}$), tax revenue ($\log TXR_{t-i}$), Special Tax ($\log ST_{t-i}$), Public Expenditure ($\log Pubex_{t-i}$) and growth of service sector ($\log Svcsg_{t-i}$) serve as independent variables (IV). To investigate cointegration among the variables outlined in Equation (1), we establish the ARDL framework as follows:

$$\begin{aligned}\Delta log(RGDPG)_t = {} & \alpha_0 + \sum_{i=1}^{n} \alpha_i \Delta log(RGDPG)_{t-i} + \sum_{i=0}^{m} \beta_i \Delta \log(TXR)_{t-i} + \\ & \sum_{i=0}^{p} \pi_i \Delta \log(ST)_{t-i} + \sum_{i=0}^{x} \varphi_i \Delta \log(Pubex)_{t-i} + \sum_{i=0}^{y} \gamma_i \Delta \log(Svcsg)_{t-i} + \\ & \theta_1 \log(RGDPG)_{t-1} + \theta_2 \log(TXR)_{t-1} + \theta_3 \log(ST)_{t-1} + \theta_4 \log(Pubex)_{t-1} + \\ & \theta_5 \log(\text{Svcsg})_{t-1} + \mu_t \end{aligned} \quad (2)$$

In the formulated ARDL framework, 'log' denotes the logarithm of the variables, where '$\log(RGDPG)_t$', '$\log(RGDPG)_{t-i}$', '$\log(TXR)_{t-i}$', '$\log(ST)_{t-i}$', '$\log(Pubex)_{t-i}$', and '$\log(Svcsg)_{t-1}$' are as defined earlier. The symbol Δ represents the first difference operator, α_0 is the constant term, and α_i, β_i, π_i , φ_i , γ_i represent the short-run coefficients. Additionally, θ_1, θ_2, θ_3, θ_4, and θ_5 are the long-run coefficients, while 'n', 'm', 'p', 'x', and 'y' denote the lag length selected by Akaike Information Criteria (AIC). The term μ_t represents the white noise error term. To ascertain the presence of a cointegrating relationship among RGDPG, TXR, ST, Pubex, and Svcsg in the long run, the null hypothesis (H0) is typically formulated as: H0: $\theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = 0$. This implies no effect of the corresponding lagged variable on the dependent variable. The alternative hypothesis (H1) is usually stated as: H1: $\theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq \theta_5 \neq 0$, indicating a significant effect of at least one of the corresponding lagged variables on the dependent variable. This is performed utilizing the F-test developed by Pesaran et al. (2001) and subsequently refined by Narayan (2005). The calculated F-statistic is then compared with upper and lower critical values provided by Pesaran et al. (2001). If the computed F-value surpasses the upper critical value, we reject the null hypothesis of no cointegration, regardless of whether the variables are I (0) or I (1). In line with the suggestion by Pesaran et al. (2001), after confirming cointegration among the variables, we proceed to estimate the Error Correction Model. The error correction model (ECM) representation of the ARDL approach is as follows:

$$\begin{aligned}\Delta \log(RGDPG)_t = {} & \alpha_0 + \sum_{i=1}^{n} \emptyset_i \Delta log(RGDPG)_{t-i} + \sum_{i=0}^{m} \tau_i \Delta \log(TXR)_{t-i} + \\ & \sum_{i=0}^{p} \delta_i \Delta \log(ST)_{t-i} + \sum_{i=0}^{x} \vartheta_i \Delta \log(Pubex)_{t-i} + \sum_{i=0}^{y} \rho_i \Delta \log(Svcsg)_{t-i} + \\ & \omega ECM_{t-1} + \mu_t \end{aligned} \quad (3)$$

The essence of the error correction model is to show the speed of adjustment back to long-run equilibrium after a short-run shock. To validate the accuracy of the model, various

diagnostic tests are conducted. Specifically, the tests focus on assessing heteroscedasticity, normality, serial correlation, and the functional form within the selected model. As highlighted by Pesaran et al. (2001), stability tests (CUSUM and CUSUMQ) play a crucial role in examining the stability of regression coefficients. These tests are iteratively updated and graphically plotted against break points. If the plot remains within the critical bounds at the 5% level of significance, the null hypothesis that all coefficients in the regression are stable cannot be rejected.

4. Result and discussion

4.1. Unit root test

The Augmented Dickey-Fuller (ADF) test is a statistical test used to determine whether a unit root is present in a time series dataset. A unit root suggests that a time series variable is non-stationary, meaning its mean and variance are not constant over time. In econometrics, a common application of the ADF test is to assess the stationarity of variables in time series analysis, particularly in the context of testing for the presence of a long-run relationship or cointegration between variables.

Table 1

Augmented Dickey-Fuller Test Results

Variable	ADF at Level	ADF at 1st Difference	Order of integration
logRGDPG	-1.318	-3.166**	I(1)
logTXR	-2.403	-6.883*	I (1)
logST	-2.119	-6.929*	I (1)
logPubex	-0.245	-4.455*	I (1)
logSvcsg	-1.811	-2.664***	I (1)

Note. * Statistical significance at the 1% level; ** Statistical significance at the 5% level, and *** Statistical significance at the 10% level. The data are from Author's calculation from STATA 15.0

Table 1 presents the results of the ADF test for both levels and the first differences of the variables. The findings indicate that all variables are stationary at the first difference, denoted as I (1). With this confirmed stationarity, we move forward to investigate the potential cointegration among the variables.

4.2. Bounds test approach to cointegration

The ARDL bounds testing approach is employed to investigate the cointegration relationship among the variables. ARDL (2, 4, 4, 3, 4) was automatically selected based on the Akaike Information criteria. Tables 2 and 3 present the results of the bounds test for cointegration. The F-statistic value of 52.726 exceeds the critical values at the 1%, 5%, and 10% significance levels, indicating the presence of a cointegration relationship among the variables.

Table 2

Results of Bounds Test Approach to Cointegration

Function	F-Statistics	k
logRGDPG = f (logTXR, logST, logPubEx, logSvcsg)	52.726	4

Source. The data are from Author's calculation from STATA 15.0

Table 3

Results of Critical Value Bounds

Significance Level	I (0) [Lower Bound]	I (1) [Upper Bound]
1%	6.84	7.84
5%	4.94	5.73
10%	4.04	4.78

Source. The data are from Author's calculation from STATA 15.0

4.3. Long-run relationship analysis

Table 4 presents the results of Long-Run Relationship Analysis. In the long run, tax revenue exhibits a significant positive relationship with GDP growth. The coefficient estimate for tax revenue is 0.11 with a standard error of 0.17 and a t-statistic of 2.98, yielding a p-value of 0.059. it is statistically significant at the conventional 10% significance level (p-value < 0.10). This indicates that a 1% increase in tax revenue leads to a 0.11% increase in GDP growth in the long run, holding other variables constant. The positive relationship between tax revenue and GDP growth aligns with theories like Endogenous Growth Theory, which underscores how policy measures financed by tax revenue foster long-term economic growth by promoting technological advancement, innovation, and human capital development. Moreover, the "crowding in" effect illustrates how strategic public investments funded by tax revenue can stimulate private investment, fostering a conducive business environment. Similarly, the Socio-Political Theory of Taxation advocates for fair tax policies that promote social welfare and provide a stable revenue base for public investments.

The coefficient estimate for special tax is 0.06, with a standard error of 0.04. The t-statistic is 6.53, and the p-value is 0.007. This indicates that special tax has a statistically significant positive effect on GDP growth at the 1% significance level (p-value = 0.007 < 0.01). A 1% increase in special tax leads to a 0.06% increase in GDP growth in the long run. The significant positive effect of special tax on GDP growth implies that targeted levies may contribute to economic expansion. This result resonates with the notion that well-designed tax incentives can attract investment and spur growth, as suggested by tax competition theory.

The coefficient estimate for public expenditure is -0.12, with a standard error of 0.01. The t-statistic is -2.72, and the p-value is 0.073. Although the coefficient suggests a negative effect, it is statistically significant at the conventional 10% significance level. This implies that a 1% increase in public expenditure leads to a -0.12% decrease in GDP growth in the long run. The finding aligns with several economic theories supporting the notion that increased public expenditure can negatively impact long-term GDP growth. The "crowding out" effect posits that heightened government spending can diminish private-sector investment, thereby reducing overall economic activity. Ricardian Equivalence theory suggests that consumers anticipate future tax burdens associated with government debt, prompting them to increase savings and reduce current consumption, thus dampening aggregate demand and GDP growth. Insights from fiscal multipliers further emphasize that inefficient allocation of public spending may fail to generate sufficient economic returns, impeding GDP growth. Moreover, directing government expenditure towards enhancing supply-side factors like productivity and capital stock is essential, as failure to do so can lead to inefficiencies and hinder long-term growth potential. Additionally, funding increased public expenditure through distortionary taxes can dampen

incentives for work, saving, and investment, thereby negatively affecting economic growth. These combined insights from economic theories substantiate the observed relationship between increased public expenditure and diminished GDP growth in the long run.

Table 4

Long-run Relationship Analysis Results

Variable	Coefficient	Std. Error	t-Statistic	P-Value
logTXR	0.11	0.17	2.98	0.059***
logST	0.06	0.04	6.53	0.007*
logPubEx	-0.12	0.01	-2.72	0.073***
logSvcsg	0.81	0.05	14.47	0.001*
Constant	4.07	0.99	4.07	0.027**

Note. * Statistical significance at the 1% level; ** Statistical significance at the 5% level, and *** Statistical significance at the 10% level. The data are from Author's calculation from STATA 15.0

The coefficient estimate for growth of service sector is 0.81, with a standard error of 0.05. The t-statistic is 14.47, and the p-value is 0.001. This indicates that growth of service sector has a statistically significant positive effect on GDP growth at the 1% significance level. A 1% increase in growth of service sector leads to a 0.81% increase in GDP growth in the long run. The significant positive effect of the growth of the service sector on GDP growth is consistent with productivity growth theory, which highlights the contribution of service sector advancements to overall economic output.

4.4. Short-run relationship analysis

Table 5 presents the results of Short-Run Relationship Analysis. The coefficient estimate for the lagged GDP growth at time t-1 is 0.44, with a standard error of 0.16 and a t-statistic of 2.73. While this coefficient is not statistically significant at the conventional 5% level (p-value < 0.05), it is statistically significant at the 10% level (p-value < 0.10). This suggests evidence of a positive relationship between lagged GDP growth at time t-1 and the dependent variable in the short run. Specifically, for every 1% increase in the lagged GDP growth at time t-1, the dependent variable is estimated to increase by 0.44%, indicating a weak but potentially meaningful impact of lagged GDP growth at time t-1 on the dependent variable in the short run.

In the short run, tax revenue in the current year demonstrates a negative relationship with GDP growth, with a coefficient estimate of -0.12 and a t-statistic of -4.77, yielding a p-value of 0.018. This coefficient is statistically significant at the conventional 5% level (p-value < 0.05). This indicates that a 1% increase in current tax revenue leads to a -0.12% decrease in GDP growth in the short run. The negative relationship between current tax revenue and GDP growth in the short run suggests that increases in tax revenue might initially dampen economic activity. This finding aligns with neoclassical perspectives that caution against the adverse effects of taxation on economic growth due to its potential to distort incentives for work and investment.

The coefficient estimate for the lagged tax revenue at time t-1 is -0.1, with a standard error of 0.015 and a t-statistic of -6.64. While this coefficient is statistically significant at the conventional 1% level (p-value < 0.01). This suggests evidence of a negative relationship between lagged tax revenue at time t-1 and GDP growth in the short run. This indicates that a 1% increase in lagged tax revenue at time t-1 leads to a -0.1% decrease in GDP growth in the short

run. The coefficient estimate for the lagged tax revenue at time t-2 is 0.04, with a standard error of 0.016 and a t-statistic of 2.51. This coefficient shows statistical significance at the conventional 10% level (p-value < 0.1), indicating a positive relationship between lagged tax revenue at time t-2 and GDP growth in the short run. Essentially, a 1% increase in lagged tax revenue at time t-2 leads to a 0.04% increase in GDP growth in the short run. The coefficient estimates for the lagged tax revenue at time t-3 stands at 0.09, with a standard error of 0.014 and a t-statistic of 6.27. This coefficient demonstrates statistical significance at the conventional 1% level (p-value < 0.01), providing strong evidence of a positive relationship between lagged tax revenue at time t-3 and GDP growth in the short run. This implies that a 1% increase in lagged tax revenue at time t-3 leads to a 0.09% increase in economic growth in the short run. The negative relationship between lagged tax revenue and GDP growth in the short run implies that past increases in tax revenue might have lingering negative effects on current economic growth. This finding could be interpreted in light of theories such as the "crowding out" effect, where high levels of government borrowing or taxation reduce private sector investment and consumption, thereby restraining economic growth.

The coefficient estimates for the special tax at time t stand at -0.07, with a standard error of 0.005 and a t-statistic of -12.28. This coefficient exhibits statistical significance at the conventional 1% level (p-value < 0.01), indicating compelling evidence of a negative relationship between the special tax at time t and GDP growth in the short run. Consequently, a 1% increase in the special tax at time t leads to a -0.07% decrease in GDP growth in the short run. The coefficient estimates for the lagged special tax at time t-1 is -0.042, with a standard error of 0.006 and a t-statistic of -6.55. Despite being statistically significant at the conventional 10% level (p-value < 0.1), it suggests evidence of a positive relationship between the lagged special tax at time t-1 and GDP growth in the short run. This indicates that a 1% increase in lagged special tax at time t-1 leads to a -0.042% decrease in GDP growth in the short run. However, the lagged special tax at time t-2 and at time t-3 does not exhibit a significant relationship with GDP growth. The negative relationship between special tax and GDP growth suggests that targeted levies may hinder economic expansion in the short run. This result is consistent with the notion that certain types of taxes, especially those that impose additional costs on specific sectors or activities, can distort economic behavior and impede growth.

The coefficient estimate for the public expenditure at time t is 0.09, with a standard error of 0.03 and a t-statistic of 2.85. While this coefficient is statistically significant at the conventional 10% level (p-value < 0.1). This suggests evidence of a positive relationship between public expenditure at time t and GDP growth in the short run. This indicates that a 1% increase in public expenditure at time t leads to a 0.09% increase in GDP growth in the short run. However, the lagged public expenditure at time t-1 and public expenditure at time t-2 does not exhibit a significant relationship with GDP growth. The positive relationship between public expenditure and GDP growth in the short run aligns with Keynesian perspectives, which emphasize the role of government spending in stimulating economic activity, particularly during periods of sluggish growth or recession. This finding suggests that increases in government expenditure might provide a temporary boost to economic output by bolstering demand and creating employment opportunities.

The result suggests that the coefficient associated with the growth of the service sector at time t in the regression analysis is not statistically significant at any conventional level of significance (typically set at 10%, 5%, or 1%). Therefore, changes in the growth of the service

sector at time t do not exhibit a significant relationship with GDP growth. The lack of a statistically significant relationship between the growth of the service sector and GDP growth in the short run is somewhat surprising, considering the significant role that service sector advancements often play in driving economic activity.

A 1% increase in the lagged growth of the service sector at time t-1 leads to a -0.65% decrease in GDP growth in the short run. The coefficient estimates for the lagged growth of the service sector at time t-1 is -0.65, with a standard error of 0.10 and a t-statistic of -6.39. This coefficient is statistically significant at the conventional 1% level (p-value < 0.01), indicating evidence of a negative relationship between lagged growth of the service sector at time t-1 and GDP growth in the short run.

In the short run, a 1% increase in the lagged growth of the service sector at time t-2 leads to a -0.39% decrease in GDP growth. The coefficient estimates for the lagged growth of the service sector at time t-2 is -0.39, with a standard error of 0.03 and a t-statistic of -11.43. This coefficient is statistically significant at the conventional 1% level (p-value < 0.01), providing strong evidence of a negative relationship between the lagged growth of the service sector at time t-2 and GDP growth in the short run.

In the short run, a 1% increase in the lagged growth of the service sector at time t-3 leads to a -0.41 % decrease in GDP growth. The coefficient estimates for the lagged growth of the service sector at time t-3 is -0.41, with a standard error of 0.04 and a t-statistic of -9.11. This coefficient is statistically significant at the conventional 1% level (p-value < 0.01), providing strong evidence of a negative relationship between the lagged growth of the service sector at time t-3 and GDP growth in the short run.

Table 5

Short-run Relationship Analysis Results

Variable	Coefficient	Std. Error	t-Statistic	P-Value
$\Delta\log RGDPG_{t-1}$	0.44	0.16	2.73	0.072***
$\Delta\log TXR_{t}$	-0.12	0.025	-4.77	0.018**
$\Delta\log TXR_{t-1}$	-0.1	0.015	-6.64	0.007*
$\Delta\log TXR_{t-2}$	0.04	0.016	2.51	0.087***
$\Delta\log TXR_{t-3}$	0.09	0.014	6.27	0.008*
$\Delta\log ST_{t}$	-0.07	0.005	-12.28	0.001*
$\Delta\log ST_{t-1}$	-0.042	0.006	-6.55	0.007*
$\Delta\log ST_{t-2}$	-0.004	0.006	-0.70	0.535
$\Delta\log ST_{t-3}$	0.0003	0.006	0.06	0.959
$\Delta\log Pubex_{t}$	0.09	0.03	2.85	0.065***
$\Delta\log Pubex_{t-1}$	0.012	0.03	0.36	0.743
$\Delta\log Pubex_{t-2}$	0.04	0.02	1.76	0.177
$\Delta\log Svscg_{t}$	-0.19	0.13	-1.47	0.239

Variable	Coefficient	Std. Error	t-Statistic	P-Value
$\Delta\log Svscg_{t-1}$	-0.65	0.10	-6.39	0.008*
$\Delta\log Svscg_{t-2}$	-0.39	0.03	-11.43	0.001*
$\Delta\log Svscg_{t-3}$	-0.41	0.04	-9.11	0.003*
Constant	4.07	0.99	4.07	0.027**
ECT_{t-1}	-1.09	0.17	-6.54	0.007*
Model Statistics:	R^2 = 99.93%	$Adj\ R^2$ = 99.42%	Root MSE = 0.25%	

Note. * Statistical significance at the 1% level; ** Statistical significance at the 5% level, and *** Statistical significance at the 10% level. The data are from Author's calculation from STATA 15.0

Additionally, the Error Correction Term (ECT) is negative and significant at the 5% level, indicating the existence of a long-run equilibrium relationship among the variables. The coefficient estimate for ECT is -1.09, suggesting that short-run deviations from long-run equilibrium are corrected by 109% each year.

R-squared is a measure of how well the independent variables explain the variation in the dependent variable. In this case, the R² value of 99.93% suggests that approximately 99.93% of the variation in the dependent variable is explained by the independent variables included in the model. This indicates an extremely high level of explanatory power, suggesting that the model captures almost all of the variability in the dependent variable.

Adjusted R-squared takes into account the number of independent variables in the model and adjusts the R-squared value accordingly. It penalizes the addition of unnecessary variables that do not significantly improve the model's explanatory power. The Adj R² value of 99.42% indicates that approximately 99.42% of the variation in the dependent variable is explained by the independent variables while considering the complexity of the model.

Root MSE is a measure of the average deviation of the observed values from the predicted values. In this case, the Root MSE of 0.25% suggests that, on average, the model's predictions of economic growth deviate from the actual values by approximately 0.25%. Lower values of Root MSE indicate better model performance, suggesting that the model's predictions are relatively close to the actual values.

Overall, these model statistics indicate that the regression model has a high level of explanatory power, capturing a significant portion of the variability in economic growth. Additionally, the model's predictions are relatively accurate, with small deviations from the actual values.

4.5. Diagnostic tests

As per the findings presented in Table 6, The Diagnostic tests were conducted to assess the model's goodness-of-fit. The Breusch-Godfrey LM test for autocorrelation evaluates whether there is a serial correlation in the residuals of a regression model. The p-value associated with the test statistic is 0.4512. Since this p-value is greater than the typical significance level of 0.05, we fail to reject the null hypothesis. This suggests that there is no evidence to conclude that serial correlation exists in the residuals of the regression model. In other words, the residuals do not exhibit a systematic pattern of correlation over time, indicating that the model adequately captures the temporal dependence structure in the data.

The Heteroskedasticity Test using the Breusch-Pagan-Godfrey test assesses whether the error terms in a regression model have constant variance. The p-value associated with the test statistic is 0.9354. Since this p-value is greater than the typical significance level of 0.05, we fail to reject the null hypothesis. This suggests that there is no evidence to conclude that heteroskedasticity is present in the error terms of the regression model. In other words, the variance of the error terms is constant across observations, indicating that the assumptions of homoscedasticity are met.

The Jarque-Bera test is a test for normality that evaluates whether the residuals of a regression model are normally distributed. The p-value associated with the test statistic is 0.5029. Since this p-value is greater than the typical significance level of 0.05, we fail to reject the null hypothesis. This suggests that there is no evidence to conclude that the residuals deviate significantly from a normal distribution. In other words, the assumption of normality is not violated, indicating that the residuals follow a roughly normal distribution.

The Ramsey RESET test is a diagnostic test used to detect the presence of omitted variables in a regression model. The p-value associated with the test statistic is 0.1437. Since this p-value is greater than the typical significance level of 0.05, we fail to reject the null hypothesis. This suggests that there is no statistically significant evidence to conclude that the model suffers from omitted variable bias. In other words, the model appears to adequately capture the relationship between the dependent and independent variables without omitting important explanatory variables.

Overall, based on these diagnostic tests, the regression model appears to be well-specified, with no significant issues such as serial correlation, heteroskedasticity, or non-normality in the residuals. This implies that the model's assumptions are reasonably satisfied, and its results can be interpreted with confidence.

Table 6

Diagnostic Test

Type of Diagnostic	Null Hypothesis	P-Value
Breusch-Godfrey LM test for autocorrelation	*H0. No serial correlation*	0.4512
Heteroskedasticity Test: Breusch-Pagan-Godfrey	*H0. Constant variance*	0.9354
Jarque-Bera normality test	*H0. Normality*	0.5029
Ramsey RESET Test	*H0. Model has no omitted variables*	0.1437

Source. The data are from Author's calculation from STATA 15.0

4.6. Stability test

Table 7 provides the findings of the cumulative sum test for parameter stability. The Cumulative Sum of Recursive Residuals (CUSUM) is applied to assess parameter stability. Since the test statistic of 0.5532 is lower than all the critical values provided (1.1430, 0.9479, and 0.850), we fail to reject the null hypothesis. This suggests that there is no statistically significant evidence of structural change or instability in the model coefficients over time. The results indicate that the model coefficients remain stable throughout the time period considered in the analysis, as the test plot lies within the critical limits shown in Figure 1. Figure 2 displays the CUSUMSQ plots, demonstrating that the statistics consistently fall within the critical boundaries. This indicates that all parameter estimates within the model remain stable.

Table 7

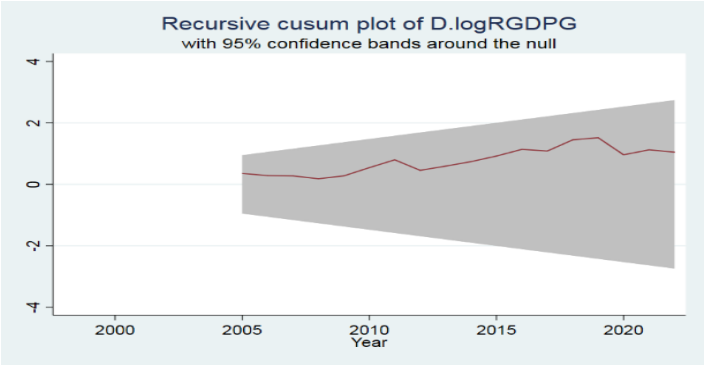
Cumulative Sum Test for Parameter Stability

Statistic	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Recursive	0.5532	1.1430	0.9479	0.850

Source. The data are from Author's calculation from STATA 15.0

Figure 3

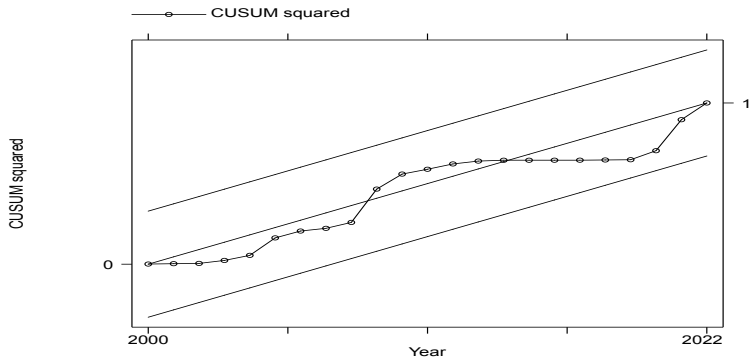
Plots of Cumulative Sum (CUSUM) of Recursive Residuals



Source. The data are from Author's calculation from STATA 15.0

Figure 4

Plots of Cumulative Sum of Squares (CUSUMSQ) of Recursive Residuals (5% Significance)



Source. The data are from Author's calculation from STATA 15.0

5. Conclusions and recommendations

5.1. Conclusions

The study on 'Impact of Tax Revenue on Economic Growth: A study from Cambodia' utilizing the ARDL (ARDL Bounds Test) reveals that in the long run, tax revenue, special tax, and growth of the service sector exhibit statistically significant positive relationships with economic growth, while public expenditure shows a negative relationship.

Tax revenue has a significant positive impact on economic growth in Cambodia in the long run. A 1% increase in tax revenue leads to a 0.11% increase in economic growth, holding other variables constant. The special tax also contributes positively to economic growth in the long run. A 1% increase in special tax leads to a 0.06% increase in economic growth. Contrary to expectations, public expenditure shows a negative relationship with economic growth in the long run. A 1% increase in public expenditure leads to a -0.12% decrease in economic growth. Growth in the service sector significantly contributes to economic growth in Cambodia in the

long run. A 1% increase in service sector growth leads to a 0.81% increase in economic growth. In the short run, tax revenue exhibits a negative relationship with economic growth, indicating potential short-term fluctuations. The regression model shows a high level of explanatory power, capturing almost all of the variation in economic growth. Diagnostic tests suggest that the model is well-specified, with no significant issues such as serial correlation, heteroskedasticity, or non-normality in the residuals.

Tax revenue is essential for Cambodia's economic growth, as it supports the national budget and effective public financial management. It enables the Royal Government to implement a dynamic and efficient political program and supports economic growth through increased investments in both long-term and short-term capital and other vital expenditures. Therefore, optimizing tax revenue collection is crucial for achieving sustainable economic development in Cambodia.

5.2. Recommendations

To bolster economic growth and stability, several key recommendations emerge. Governments should prioritize tax policy reforms that balance revenue generation with economic expansion by restructuring tax systems to incentivize productive activities while ensuring fairness and efficiency. Embracing socio-political principles, tax policies should serve the collective interests of society, promoting economic development and social welfare. Effective utilization of tax revenue is essential for delivering economic and social benefits, adhering to principles of efficiency, effectiveness, accountability, transparency, and inclusiveness to gain public acceptance and achieve higher national income. Special taxes can be strategically employed to encourage targeted economic behaviors that positively impact long-term GDP growth. Governments should actively disseminate information about tax laws to ensure a clear understanding of taxpayer rights and obligations and incorporate digital technology, including AI, in tax governance while expanding payment mechanisms through the banking system in alignment with economic reform policies. Promoting a voluntary taxation culture among investors and enforcing punitive measures to address tax inequalities fosters fair competition and transparency. Strengthened tax audit procedures are crucial to prevent tax evasion, eliminate corruption, and enforce anti-corruption laws. Prudent management of public expenditure is imperative, with policymakers allocating resources efficiently to avoid negative long-term consequences. Investments in infrastructure such as transportation, energy, and digital networks stimulate immediate economic activity and sustain growth by enhancing productivity and connectivity. Additionally, nurturing the service sector is vital for long-term economic resilience, with governments implementing policies to foster innovation and competitiveness within the service industry, including investments in education, research, and technology infrastructure. To address short-term challenges, policymakers must consider the adverse effects of tax increases on economic activity, using gradual tax adjustments or targeted stimulus programs to mitigate short-run impacts on GDP growth while ensuring necessary revenue generation. Addressing lagged effects through targeted interventions to stimulate service sector growth or tax reforms aimed at promoting economic dynamism can counteract negative trends from past policy decisions.

In conclusion, a multifaceted approach encompassing tax policy reforms, strategic investment in infrastructure, and targeted support for the service sector is essential to drive sustainable economic growth. Governments should prioritize initiatives that not only address immediate challenges but also lay the foundation for long-term prosperity and resilience. Increasing investment in infrastructure stands out as a critical component of this strategy, providing both short-term stimulus and long-term economic benefits.

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