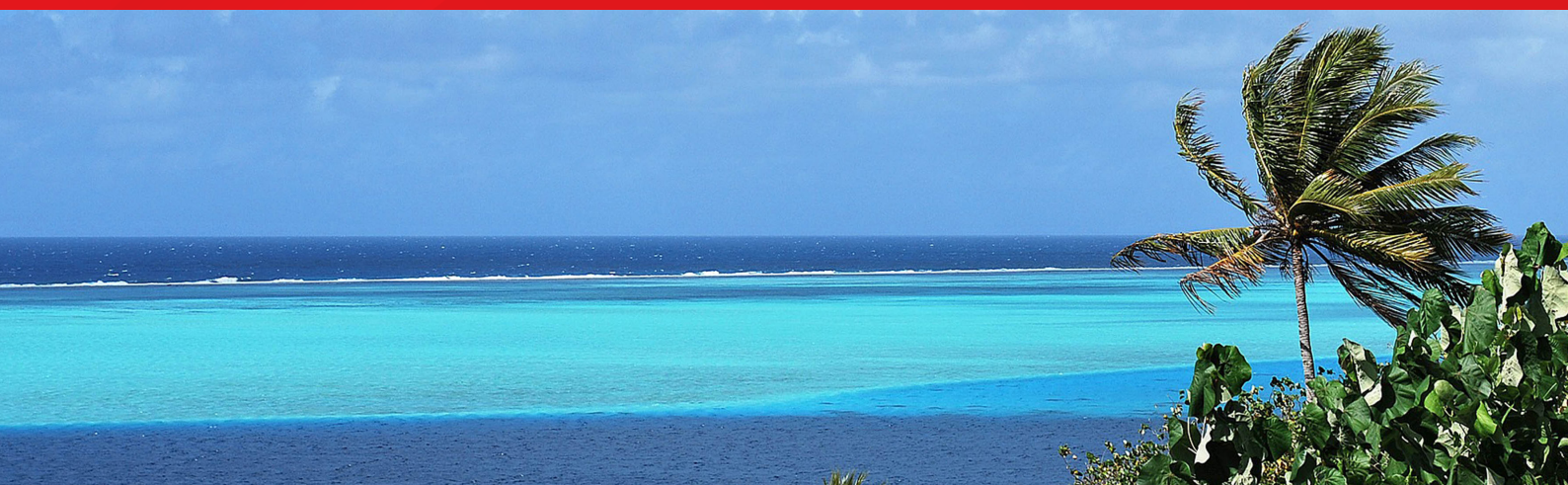# Effect of government expenditure on consumption in Timor-Leste

Marcelino de Jesus da Costa Banco Central de Timor–Leste
Octavio Manuel dos Reis Banco Central de Timor–Leste
Tarlok Singh Griffith University

Griffith Asia Institute

Griffith University–South Pacific Central Banks
Joint Policy Research Working Paper Series

Effect of government expenditure on
consumption in Timor–Leste

Marcelino de Jesus da Costa[a],
Octavio Manuel dos Reis[a] and Tarlok Singh[b,c]

[a] Banco Central de Timor–Leste
[b] Department of Accounting, Finance and Economics, Griffith University
[c] Griffith Asia Institute, Griffith University

About the Griffith Asia Institute

The Griffith Asia Institute (GAI) is an internationally recognised research centre in the Griffith Business School. We reflect Griffith University's longstanding commitment and future aspirations for the study of and engagement with nations of Asia and the Pacific.

At GAI, our vision is to be the informed voice leading Australia's strategic engagement in the Asia Pacific—cultivating the knowledge, capabilities and connections that will inform and enrich Australia's Asia-Pacific future. We do this by: i) conducting and supporting excellent and relevant research on the politics, security, economies and development of the Asia-Pacific region; ii) facilitating high level dialogues and partnerships for policy impact in the region; iii) leading and informing public debate on Australia's place in the Asia Pacific; and iv) shaping the next generation of Asia-Pacific leaders through positive learning experiences in the region.

About this publication

The Joint Policy Research Working Paper Series endeavours to disseminate the findings of work in progress to academics, governments and the public at large to encourage the exchange of ideas relating to the development of the South Pacific financial sector and thereby national economic growth and development. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors and do not necessarily represent the views of the partner Bank or Government.

Disseminating findings quickly, even if work is still in draft form, is expected to encourage early and wider debate.

This joint Banco Central de Timor-Leste—Griffith University working paper is part of an ongoing extensive research capacity building program led by Griffith University for the South Pacific central banks.

The texts of published papers and the titles of upcoming publications can be found on South Pacific Centre for Central Banking page on the Griffith Asia Institute website: www.griffith.edu.au/asia-institute/our-research/south-pacific-centre-central-banking

'Effect of government expenditure on consumption in Timor-Leste', Griffith University–South Pacific Central Banks Joint Policy Research Working Paper No. 16, 2020.

Acknowledgement

About the Authors

Marcelino de Jesus da Costa
Marcelino is a current Economic and Statistic Officer at the Economic and Statistic Division, Banco Central de Timor-Leste. He graduated from the National University of Timor-Leste with a Bachelor of Science in Agricultural Economic, completed a Master of Science in Agricultural and Resource Economics from the University of Western Australia in 2012 and a PhD in Agricultural Economics from the University of Philippines Los Baños in 2019. Prior to joining the economic team in the Central Bank, he was a Monitoring and Evaluation data analyst in East Timor Red Cross and Seeds of Life program within the Ministry of Agriculture and Fisheries.

Octavio Manuel dos Reis
Octavio is a current Economic and Statistic Officer at the Economic and Statistic Division, Banco Central de Timor-Leste. He graduated from Federal University of Alagoas, Brazil in 2018 with a Bachelor of Science in Economics. Prior to working with the Central Bank, he was a constitutional and law analyst for the national parliament of Timor-Leste.

Tarlok Singh
Associate Professor Tarlok Singh's teaching expertise includes interest rate, money and central banking, international economics, intermediate macroeconomics, advanced macroeconomics, macroeconomic policy analysis, applied econometrics, and financial economics. He has published a number of research papers in the areas of macroeconomic modelling and economic growth. Associate Professor Singh has been as a manuscript referee for a number of international journals. His primary research interests are in the area of open economy macroeconomics, applied econometrics, economic growth and development, money and financial economics.

Contents

Annexures

Abstract

This study examines the impact of government expenditure on household and public consumption as well as on food and non-food consumption in Timor-Leste. Using time series data from last quarter of 2003 to third quarter of 2019 and short-run Autoregressive Distributed Lag model, the study finds government expenditure had positive effect on household consumption at lag zero and two but negative effect at lag one. It also had positive effect on public consumption at lag one but negative effect at lag zero and two. At the sectoral level, government expenditure on goods and services, minor capital, capital development and public transfer had mixed effects on household consumption while the expenditure on salary had positive effect on household consumption. Overall, government expenditure had positive effects on household food and non-food consumption. Therefore, increasing government expenditure is likely to enhance household food and non-food consumption, hence, improving the living conditions of the citizens.

Keywords: Government expenditure, consumption, Timor-Leste, Short-run Autoregressive Distributed Lagged model

1. Introduction

Government expenditure has been traditionally considered as an important element of gross domestic product (GDP) along with consumption, investment and net exports (export-import). About 84 per cent of Timor-Leste's non-oil GDP in 2015 was contributed by government expenditure (GDS, 2016) which is equal to 30 per cent of non-oil GDP after separating the public investment from the total government expenditure. Although the share was decreased by 11 per cent to 73 per cent in 2018 (GDS, 2019), it still contributed to most of the country's non-oil GDP. Given the heavy reliance of the economy on government expenditure, reducing it could adversely affect the economy.

Government allocated its expenditure into several sectors namely: salary; goods and services; minor capital; capital development; public transfer; and contingency expenses.

The amounts allocated into these sectors varied from year to year (MoF, 2019) and mostly allocated to salary, goods and services, minor capital and capital development. Only a small portion of the government budget was allocated to public transfer and contingency expenses, however, the effect of these sectors on consumption still remains less known.

This study aims to explore the effect of government expenditure on household and public consumption as well as on household food and non-food consumption. Moreover, it evaluates the effects of sectoral government expenditure on household consumption as well as on household food and non-food consumption in the country. The questions considered in this study are: Does government expenditure have a significant effect on household and public consumption as well as on food and non-food consumption? If it does, does it have a significant positive or negative effect on consumption? What are the effects of sectoral government expenditure on household consumption and on household food and non-food consumption?

Employing the Vector Autoregressive model (VAR), Fatas and Mihov (1998) found that positive innovation in government expenditure resulted in a strong and persistent increase in consumption and employment. However, the study recognised that the positive conditional correlation in the response of employment and consumption cannot be matched under plausible assumptions for the values of the calibration parameters after comparing the finding to several variations of a standard real business cycle model. Similarly, Kuncoro (2018) using Almost Ideal Demand System (AIDS) found that government expenditure resulted in a crowding out effect on consumption with reduced elasticity on income, suggesting decreasing relative importance of the public sector on the economy.

The results of this study showed that government expenditure had mixed effects on consumption, positive at lag zero and two and negative at lag one. Overall, government expenditure had a significant positive effect on household food and non-food consumption. At the sectoral level, salary contributed positively to household consumption while other sectors had mixed effects on consumption, either positively, negatively or did not have an impact at all.

The rest of this paper is organised as follows: section 2 discusses the overview of economy, government expenditure and consumption; section 3 discusses the pattern of investment, government expenditure, inflation and consumption; section 4 discusses the summary of previous empirical studies and section 5 discusses the data and method of analysis of the study. It then discusses the results of the study in section 6 and finally, section 7 presents the conclusion and policy implications of the study.

2. Overview of economy, government expenditure and consumption

2.1. Sectoral composition of GDP

Timor-Leste's GDP has been decreasing in absolute terms during the 2012-2018 period after growing on average by 13 per cent in the prior decade (2002-2011). Due to low government expenditure, coupled with wider trade deficit, GDP contracted in 2017 and 2018. Overall GDP during 2002-2018 was mostly underpinned by oil activities (Figure 1). Notably, non-oil GDP has been increasing gradually since 2006.

Figure 1. Gross domestic product (GDP), oil sector and non-oil sector GDP in million dollars
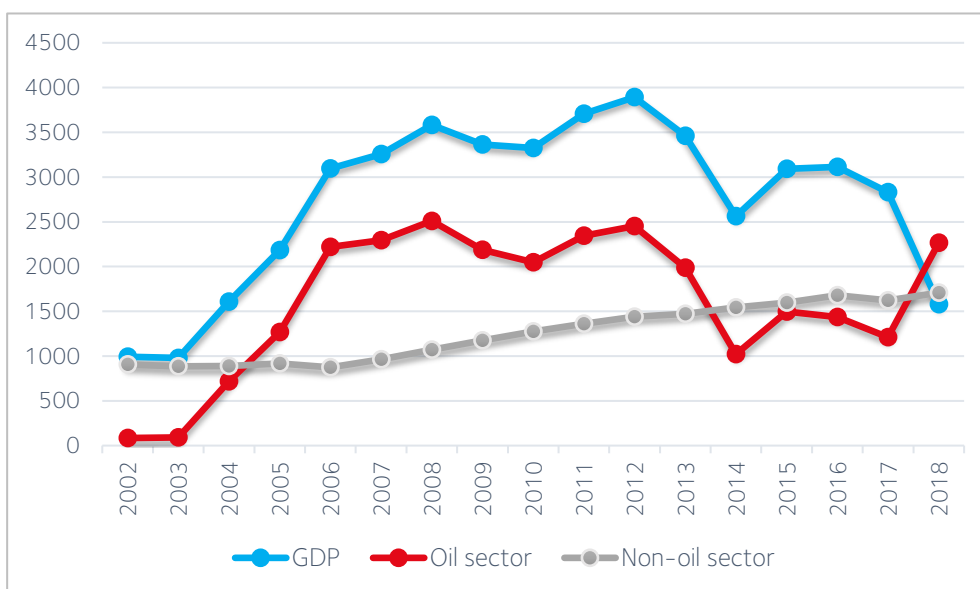
Source: Ministry of Finance

The non-oil economy has been underpinned by several sectors (Table 1), mostly by the public administration, defence, education, human health and social work activities, followed by agriculture, forestry and fishing, wholesale and retail trade, transportation and storage, accommodation and food services and construction and real estate activities. A small portion of GDP was also contributed by the remaining sectors—mining and quarrying, manufacturing and other industry, information and communication, financial and insurance activities, professional, scientific, technical, administration and support services and other unspecified activities. Most non-oil activities have been supported by government.

Table 1. Sectoral composition of non-oil gross domestic product in percent

Component of non-oil GDP	2013	2014	2015	2016	2017	2018
Agriculture	20.0	18.9	17.4	16.4	16.5	17.4
Mining and quarrying	0.1	0.1	0.1	0.1	0.1	0.1
Manufacturing and other industry	0.7	0.8	1.0	1.1	1.6	1.7
Construction	17.0	14.7	17.2	17.6	12.7	13.5
Wholesale and retail trade	18.4	18.5	18.2	18.6	17.9	16.4
Information and communication	2.7	1.4	2.3	2.5	2.5	2.6
Financial and insurance activities	0.8	0.8	0.7	0.9	1.5	1.4
Real estate activities	10.3	11.6	11.4	11.2	12.2	11.9
Professional and scientific	2.8	3.2	3.2	2.9	3.2	2.6
Public administration	20.6	23.7	24.2	24.3	27.6	29.4
Other service activities	4.2	3.9	3.6	3.9	3.9	3.3

Source: Ministry of Finance

2.2. Government expenditure and its ratio to non–oil GDP

Government expenditure from 2002 to 2018 noted a general upward trend, with a notable pickup from 2008. However, declines were observed for 2007, 2013, 2015, 2017 and 2018, respectively. The lower government expenditures in 2017 and 2018 were associated with political instability. In 2017, the parliament failed to pass the proposed budget of seventh constitutional government. As such, the President disolved the national parliament and called for another election. The unstable political situation continued into 2019 and mid–2020 as eight of the nine constitutional govenrmental ministries were vacant. This affected the execution of the approved budget for 2018 and 2019. Consequently, the execution of the 2018 annual budget was lower by 7.7 per cent, and total infrastructure budget lower by 13 per cent than in 2017, leading to an economic growth slowdown (BCTL, 2019a).

In 2006, government spending increased by 46.8 per cent with a higher budget allocated for goods and services and minor capital, after political stability was restored. While in 2007, government spending decreased due to the impact of the political turmoil in 2005/2006. This outturn may also be associated with incomplete data especially on salary, goods and services over six months, and for minor capital and capital development over 10 months in 2007.

Figure 2. Total government expenditure in million dollars
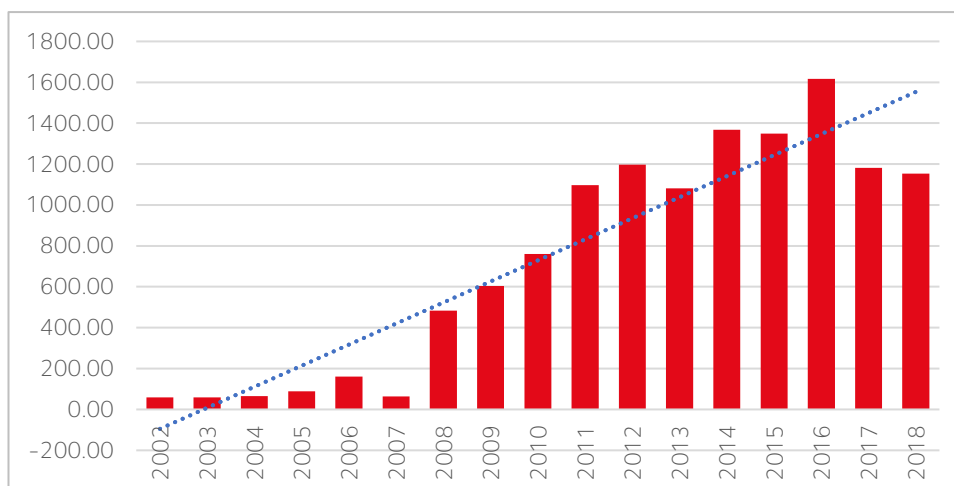
Source: Ministry of Finance

Only an average amount of $82.95 million was allocated during the 2002-2007 (Figure 2) which gives us insight that not much budget was made available during that period. However, higher government expenditure with an average amount of $1,081.31 million was made available during 2008-2018 which helped us to safely infer that much of the development in Timor-Leste occurred from 2008 onwards. The government budget was financed from the Timor-Leste Petroleum Fund[1] and domestic revenue[2] (MoF, 2020) and allocated to public investment and general government final consumption expenditure (GDS, 2019). However, the petroleum fund is also prone to global oil price as it depends on the global oil market, which can further affect government expenditure, although maximum withdrawal limits on the fund are regulated.

Overall, government expenditure accounted for 51 per cent of non-oil GDP during 2002-2018. More specifically, it accounted for 73-99 per cent of the non-oil GDP during 2011-2018 and accounted for 7-18 per cent of the non-oil GDP during 2002-2007 while during 2008-2010, it accounted for 45-59 per cent of the non-oil GDP (Figure 3). In 2016, more especially, non-oil GDP was sourced almost entirely from government expenditure, as it accounted for 99 per cent.

Figure 3. Ratio of total government expenditure to non–oil GDP
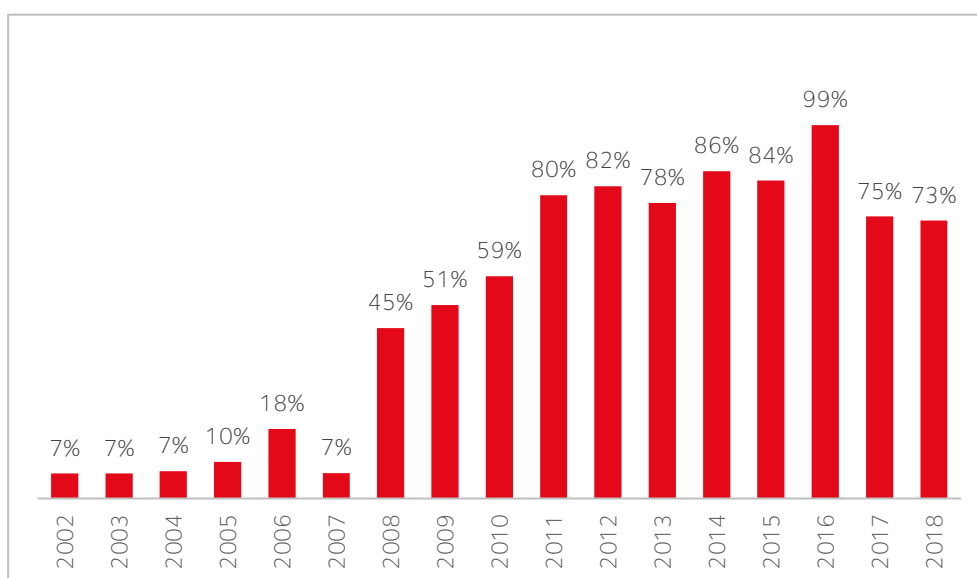
Source: Author's calculation

2.3. Sectoral government expenditure

As shown in Table 2, much of the government expenditure went towards goods and services as well as to capital development, each of which accounted for 30 per cent, followed by public transfer and salary which accounted for 23 per cent and 13 per cent, respectively during 2003-2018—only 1 per cent of budget was allocated for contingency expenditure during the 2011-2018 period. No budget was allocated for contingency expenditure during the 2003-2010 period.

Figure 4. Sectoral government expenditure in million dollars
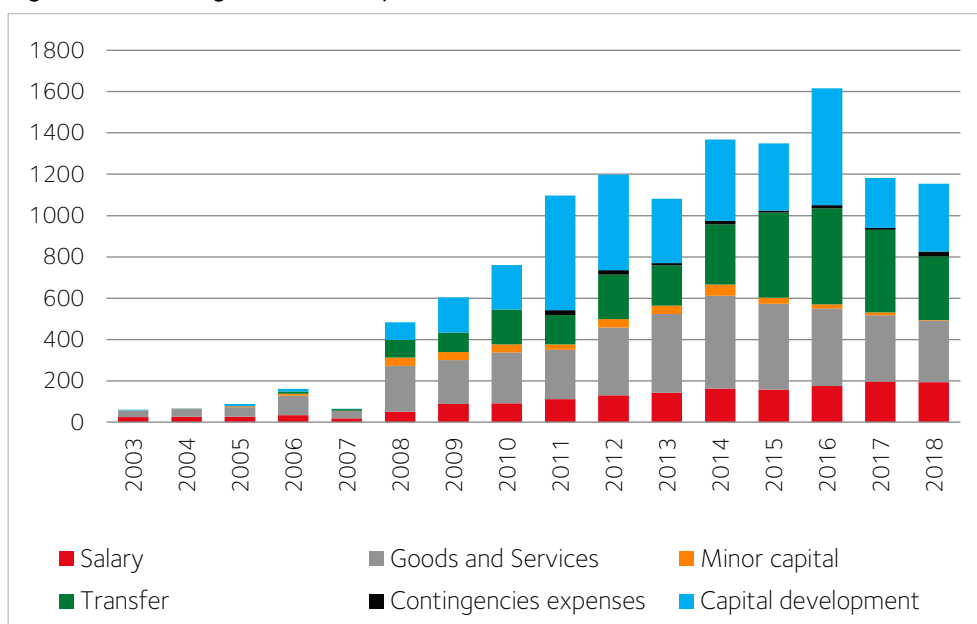
Source: Ministry of Finance

Table 2. Sectoral government expenditure growth in percent

Expenditure	2004	2005	2006	2007	2008	2009	2010	2011
Salary	5.6	2.8	28.6	−48.4	188.2	73.7	4.8	22.0
Goods and Services	13.4	25.6	102.6	−60.5	496.1	−3.5	15.2	−2.9
Minor capital	0.0	162.5	161.5	−92.6	5916.8	−6.5	−1.0	−31.4
Transfer	0.0	00.0	0.0	−29.0	907.7	11.7	79.1	−16.1
Contingencies expenses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital development	−36.5	640.6	−5.2	−93.8	11796.9	97.6	26.4	157.0

Expenditure	2012	2013	2014	2015	2016	2017	2018	% of total
Salary	16.8	8.9	14.5	−2.5	9.8	12.5	−1.4	13
Goods and Services	37.7	16.1	17.7	−7.6	−9.5	−14.3	−7.2	30
Minor capital	52.4	0.8	34.4	−46.8	−27.7	−37.3	−79.4	3
Transfer	52.1	−9.0	49.0	41.6	12.6	−13.8	−23.0	23
Contingencies expenses	−10.4	−51.7	58.6	−40.9	51.3	−36.5	142.6	1
Capital development	−16.8	−32.5	26.4	−17.7	74.9	−57.4	36.2	30

Source: Author's calculation

2.4. Composition of consumption

Final consumption expenditure (FCE) derived from household consumption (HCE), consumption of non-profit institution serving households (PCE) and government final expenditure (GEXP) has been increasing since 2005 (Figure 5). It was almost equally shared by HCE and GEXP, while only a small portion of it was contributed by the consumption of PCE. Of the total GEXP of $1,154.1 million in 2018, 62 per cent was allocated to government consumption and 38 per cent to public investment (GDS, 2019).

Figure 5. Final consumption and its composition in million dollars
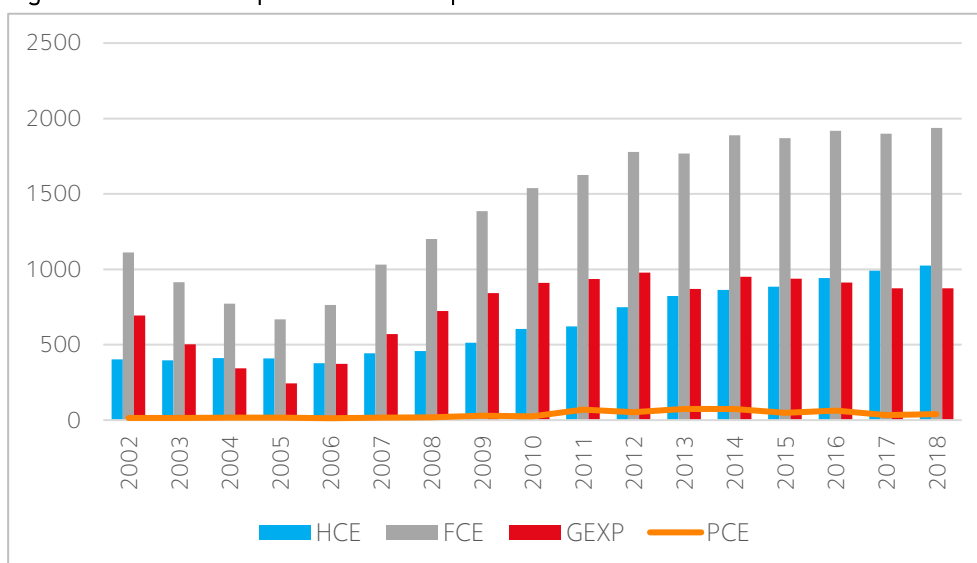
Source: Ministry of Finance

Consumption of HCE refers to many things—both food and non-food items—mostly sourced from abroad (BCTL, 2020). Therefore, improving consumption means improving both food and non-food items, which will improve the overall living condition of people in the country. This is also in line with the goals of the strategic development plan that sets out to reduce the poverty rate by 10 per cent in 2023 and to become an upper middle-income country in 2030 (SDP, 2010).

3. Pattern of investment, government expenditure, GDP, inflation and consumption

3.1. Investment and consumption

Investment consists of public and private investments with public investment (GI) dominated total investment in Timor-Leste since 2008, which created a wider gap between private and public investment[3] (Figure 6). Consequently, the private sector has had a smaller impact on employment (Inder and Cornwell, 2017), which also indicated that the public sector plays important role in the country's labour market. Thus, expanding private sector investment will have a greater impact on employment.

Figure 6. Private and public investment and household and public consumption in million dollars
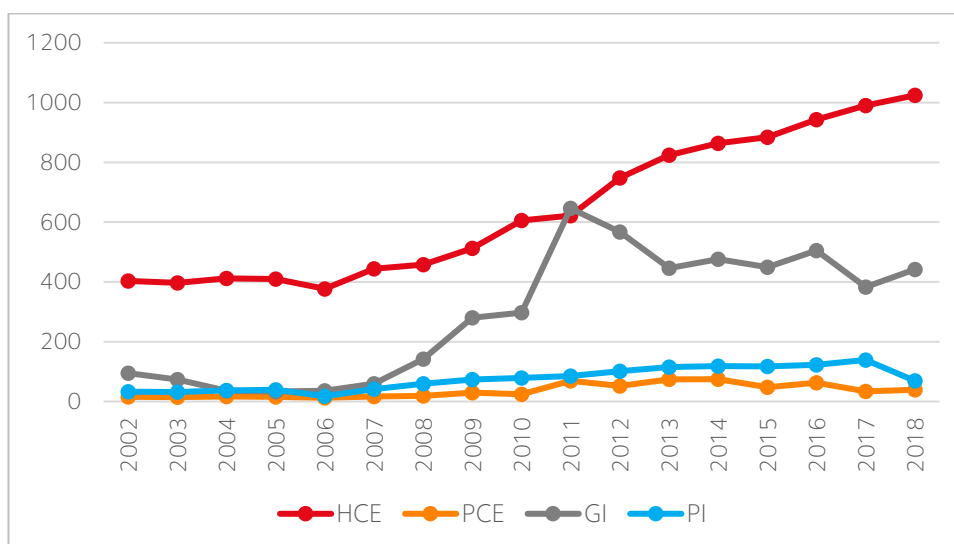
Historically, private investment (PI) increased slowly during 2006-2017, while public investment increased significantly during 2006-2011, but fell from 2012 to 2018. Contrary to private investment, public investment increased by 15.3 per cent in 2018 although government expenditure decreased by 2.4 per cent from 2017. Investment was mostly on dwellings and their related structure, machinery and equipment, cultivation of biological resources and intellectual property products (GDS, 2016).

Household consumption and private investment increased gradually during 2002-2018 while public consumption and public investment faced three major volatilities during the same period, decreasing during 2002-2005, increasing during 2005-2011 and decreasing again during 2011-2018. In 2018, household consumption and private investment moved in opposite directions, although they were moving in the same direction during 2002-2017 where household consumption increased while private investment decreased. All of these indicate that an increase in private and public investment will not always lead to an increase in household and public consumption.

3.2. Government expenditure and consumption

When comparing the government expenditure data with consumption data over the years (Figure 7), they show that higher government expenditure is not always positively correlated to household consumption. In 2006 for example, government expenditure increased by 54 per cent from 2005 while household consumption decreased by 8 per cent. The same pattern also applies in the public sector when looking at the government expenditure on public consumption. It shows that higher government expenditure does not always necessarily push the public consumption in the same direction. For example, in 2012, government expenditure increased by 4.5 per cent from 2011 at the same time public consumption decreased by 26 per cent. In contrast, in 2016 government expenditure decreased by 3 per cent from 2015 at the same time public consumption increased by 32 per cent, while during 2007-2009, government expenditure and public consumption went in the same direction.

In contrast to household consumption, government expenditure decreased significantly during 2002-2005 before increasing sharply during 2005-2012 and slightly decreased during 2012-2018. While public consumption, peaked in 2013 and 2014 before decreased sharply during 2014-2018. This is comparable with the decreasing of GDP during 2012-2018, which gives us insight that government expenditure really affects the economy.

Figure 7. Government expenditure and household and public consumption in million dollars
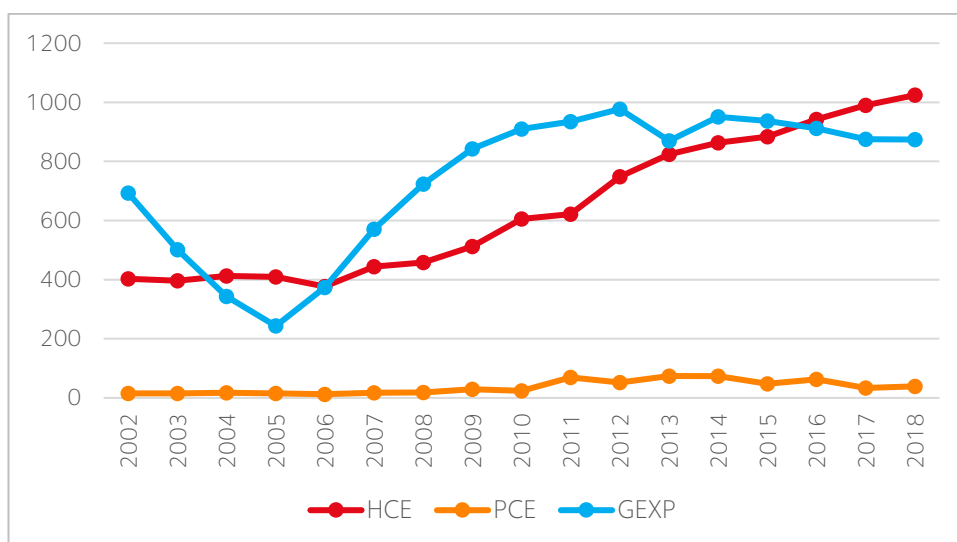
3.3. Gross domestic product and consumption

GDP and household consumption level tend to move in the same direction in most of the years (Figure 8), indicates that household consumption increased when GDP increased in most of the years and only in few of the years, household consumption decreased when GDP increased. However, the gap became wider during 2008-2018 compared to during 2002-2007, indicating that household consumption did not increase in the same proportion as the increase in GDP. In contrast, GDP and public consumption did not always move in the same direction as household consumption.

Figure 8. Gross domestic product and household and public consumption in million dollars
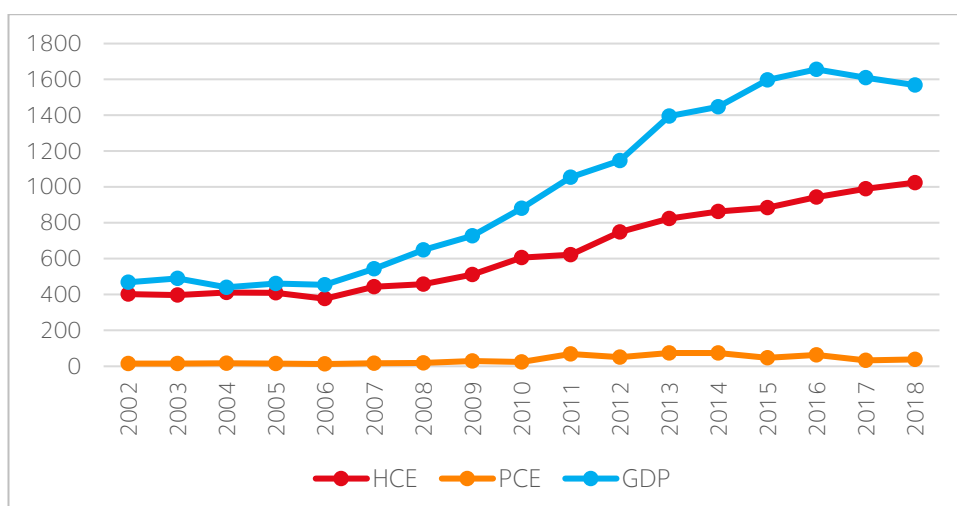
Source: Ministry of Finance

3.4. Inflation and consumption

Consumption level also did not always follow the pattern of inflation rate during 2014-2018 as theoretically suggested that lower inflation rate leads to higher consumption level (Figure 9) as it improves the purchasing power. Household consumption keeps increasing during 2014-2018 while inflation rate was volatile during the same period. Similarly, public consumption (PCE) also did not follow the pattern of inflation rate during 2014-2017. It showed that public consumption and inflation both decreased during 2014-2015 and that public consumption increased when inflation rate fell during 2015-2016.

This is due to remittance that was sent to Timor-Leste by Timorese citizens who worked in overseas. Rose (2019) showed that apart from aid, remittance was becoming the largest source of income before coffee in Timor-Leste. In 2018, it accounted for 6 per cent of non-oil GDP and accounted for 3-6 per cent of non-oil GDP during 2013-2018 (BCTL, 2019b). Over the same period, government expenditure kept decreasing. This might also affect the consumption pattern of households in the country.

Figure 9. Inflation (%) and consumption and government expenditure (million dollars)
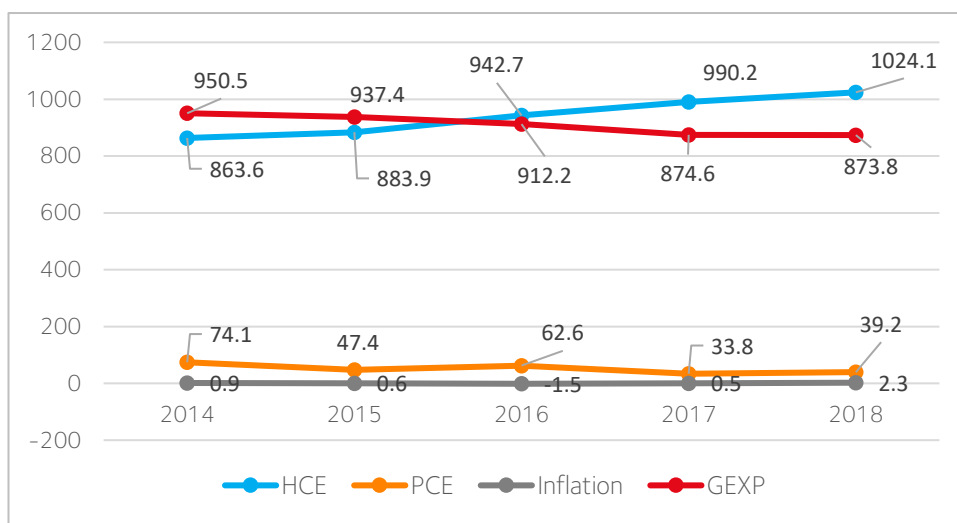
Source: Minsitry of Finance and Banco Central de Timor-Leste

4. Summary of previous empirical studies

Several past studies have showed that there is no general agreement on the effects of expansionary fiscal policy on the economy. In their non-technical summary, Gali, Lopes-Salido and Valles (2004) found that government spending significantly increased consumption while the impact of investment on consumption was mixed. The authors summarised the effects of government expenditure from several papers as follows: a positive government spending shock led to a persistent rise in government expenditure; fiscal expansion generated a positive response in output; expansionary fiscal policy led to a large increase in consumption; and a spending shock resulted in mixed outcomes on investment. Callegari (2007) found a government spending shock increased wage/salary, income and consumption.

However, not all government expenditure on different sectors resulted in a positive impact on income and consumption. Dada (2013) showed that government expenditure on education and health, social security, agriculture and administration had a positive effect on output while government expenditure on communication, transport and construction had a negative effect on output. Contrarily, Easterly and Rebelo (1993) showed that investment in communication and transport consistently correlated with growth while the effects of taxation were difficult to isolate empirically. While the study of Radulescu *et al.* (2019) in Central and Eastern Europe showed that a significant increase in public spending—especially on salary and social protection—boosted private consumption but it could not support the long run economic growth as private consumption boosted only the demand for imported goods instead of domestic investment.

Similarly, the study of Alamanda (2020) in Indonesia found that government expenditure on social aid, subsidy and grant expenditure did not have a significant effect on reducing income inequality and poverty but infrastructure expenditure was negatively and significantly correlated with income inequality in both rural and urban areas. Infrastructure expenditure was also negatively and significantly correlated with poverty in Indonesia and more significant in rural than urban areas. Additionally, Bivens (2017) showed that expenditure on infrastructure created more than a million jobs to US citizens and positively contributed to economic growth.

In Timor-Leste, although the total number of people worked increasing during the 2010-2016 with number of people employed increased by 35.1 per cent and 60.6 per cent from 2010 and 2013, respectively (SEFOPE *et al.*, 2017), economic growth was increased at a decreasing rate since 2012 and became negative in 2017 and 2018 (MoF, 2019; BP, 2019) which can also affected consumption in the country. At the same time government expenditure also increasing although it was decreased in 2017 and 2018. This raises another question on the effect of government expenditure on the economy, consequently, on consumption. The World Bank report indicated that economic growth fell (-1.8 per cent) in 2017 due to lower government expenditure (World Bank, 2018). Thus, increasing government expenditure play an important role for the growth of the economy.

Theoretically, income increases when government expenditure increases and consumption increases when income increases as in the case of Keynesian (Keynes, 1936 in Parker, 2010). Since consumption is considered as a function of income, this indicates that consumption tends to increase when income is increased by a certain percentage point, often refers to marginal propensity to consume. In the permanent income hypothesis[4], permanent consumption is proportional to permanent income, hence, consumption increase proportional

to a rise in income. This is in line with the finding of Kahn *et al.* (2015) which indicated that gross domestic product and wealth are the most important determinants of aggregate private consumption in both the short and long run. In the life-cycle hypothesis model, wealth is the past assets and the discounted sum of all current and future receipts including income from non-human assets.

This study fills this gap by exploring the effects of government expenditure on both household and public consumption using econometrical approaches. Total government expenditure was shared among the general government final consumption expenditure and public investment (GDS, 2019); and so, in the analysis, only the final government consumption expenditure was considered as government expenditure while public investment was kept as it is. While focusing on the impact of aggregate government expenditure on consumption, this study also segregates government expenditure into salary, goods and services, capital development, minor capital, public transfer and contingency expenditure as defined in the Timor-Leste's MoF budget book on household consumption.

Dada (2013) and Bivens (2017) split the government expenditures into education, transport, construction and social program on consumption while Glomm and Ravikumar (1997) grouped government expenditure into two, namely expenditure on inputs as productive input such as road and bridge and expenditure to enhance utility which potentially distort labour-leisure choices. In this study, all expenditure as defined by the Dada, Alamanda, Bivens and Glomm and Ravikumar fall under the sectoral categorization of MoF. The next section presents the data and method of analysis, empirical results of the study and conclusion and policy implication of the study.

5. Data and method of analysis

5.1. Data

Data for empirical analysis in this study were collated from the Timor-Leste National Account, MoF. Private consumption data were used as household consumption while non-government institution consumption data were used as a proxy for public consumption. Non-government institution consumption data were derived from the same components as government final consumption, namely compensation of employees, net goods and services and consumption of fixed capital while household consumption was derived from food and non-alcohol beverage, alcohol and beverage, clothing and footwear, housing and utilities, furniture and routine maintenance, health, education, transport, communication, recreation and culture, restaurants and hotels and other miscellaneous goods and services. These are further grouped as food (all food and non-alcohol beverage items) and non-food items (all non-food and alcohol beverage items). Quarterly data of government expenditure, consumption, gross domestic product and investments from last quarter of 2003 to third quarter of 2019 were used for the inferential statistics.

Government expenditure further split into salary, goods and services, minor capital, capital development, public transfer and contingency expenses. As shown in the general budget of Timor-Leste (OGE, 2018), salary composes of remuneration and wages of government staff while goods and services composes of expenditure for supporting government operation, transport, telecommunication, electricity, health, school meal, food security and official visit of government officials and human development capital for scholarship, research and other related activities. Public transfer composes of public transfer made for social programs such as combating poverty, transfer to non-government organization (NGO), church, veteran pension, elderly and disable people, pension and community development program, etc. Minor capital composes of spending for office facilities such as computer, transport and telephone. Capital development composes of expenditure on various infrastructures while contingency expenses are money set aside to cover any unforeseen government expenditure or projects.

5.2. Method of analysis

The short run Autoregressive Distributed lagged (ARDL) model was used to evaluate the effect of government expenditure on household and public consumption as well as on household food and non-food consumption. It contains the lag values of the dependent variables, the current and lag values of the explanatory variables.

The model was chosen because no bound cointegration was found between the variables in the equations, given that the F-statistic value was smaller than the F-critical values of I(0).The stationary test (Wei, 2006), showed that the variables are integrated of different orders i.e. both I(0) and I(1). I(1) refers to integrated of order one, that is, stationary after first difference while I(0) refers to integrated of order zero, that is stationary at level form. The ARDL model can also be used as an alternative to avoid spurious regression problem (Ghouse et al., 2018). Unlike the VAR model whereby the variables are strictly endogenous, the ARDL model uses a combination of endogenous and exogenous variables.

5.3. Model specification

The generalised ARDL (p, q) model is specified as follows:

$$Yt = \gamma 0i + \sum_{i=1}^{p} \delta iYt - 1 + \sum_{i=0}^{q} \beta' iXt - 1 + \varepsilon it$$
$$1$$

Where Y't is a vector and the variables in the (X't) are allowed to be I(0) or I(1) or cointegrated; β and δ are coefficient and γ is the constant; i=1,2,3…k; p, q are optimal length of lag order; εt is a vector of error terms – observable zero mean white nose vector process (serially uncorrelated or independent). P lags are used for dependent variables and q lags are used for regressors.

The following ARDL models were used in this study:

Government expenditure on household consumption:

$$\Delta HCE_t = c_0 + c_{1i} \sum_{i=1}^{p} \Delta HCE_{t-i} + c_{1j} \sum_{j=1}^{q} \Delta Gexp_{t-j} + c_{1k} \sum_{k=1}^{q} \Delta GI_{t-k} + c_{1l} \sum_{l=1}^{q} \Delta GDP_{t-l} + c_{1m} \sum_{m=1}^{q} \Delta PI_{t-m} + c_1 HCE_{t-1} + c_2 Gexp_{t-1} + c_3 GI_{t-1} + c_4 GDP_{t-1} + c_5 PI_{t-1} + \varepsilon_{1t}$$
$$2$$

Government expenditure on public consumption:

$$\Delta PCE_t = c_0 + c_{1i} \sum_{i=1}^{p} \Delta PCE_{t-i} + c_{1j} \sum_{j=1}^{q} \Delta Gexp_{t-j} + c_{1k} \sum_{k=1}^{q} \Delta GI_{t-k} + c_{1l} \sum_{l=1}^{q} \Delta GDP_{t-l} + c_{1m} \sum_{m=1}^{q} \Delta PI_{t-m} + c_1 HCE_{t-1} + c_2 Gexp_{t-1} + c_3 PI_{t-1} + c_4 GI_{t-1} + c_5 GDP_{t-1} + \varepsilon_{1t}$$
$$3$$

Sectoral government expenditure on household consumption:

$$\Delta HCE_t = c_0 + c_{1i} \sum_{i=1}^{p} \Delta HCE_{t-i} + c_{1j} \sum_{j=1}^{q} \Delta S_{t-j} + c_{1k} \sum_{k=1}^{q} \Delta GS_{t-k} + c_{1l} \sum_{l=1}^{q} \Delta MC_{t-l} + c_{1m} \sum_{m=1}^{q} \Delta CD_{t-m} + c_{1n} \sum_{n=1}^{q} \Delta T_{t-n} + c_{1o} \sum_{o=1}^{q} \Delta CE_{t-o} + c_1 HCE_{t-1} + c_2 S_{t-1} + c_3 GS_{t-1} + c_4 MC_{t-1} + c_5 CD_{t-1} + c_6 T_{t-1} + c_7 CE_{t-1} + \varepsilon_{1t}$$
$$4$$

Government expenditure on household food consumption:

$$\Delta HFC_t = c_0 + c_{1i} \sum_{i=1}^{p} \Delta HFC_{t-i} + c_{1j} \sum_{j=1}^{q} \Delta Gexp_{t-j} + c_{1k} \sum_{k=1}^{q} \Delta GI_{t-k} + c_{1l} \sum_{l=1}^{q} \Delta GDP_{t-l} + c_{1m} \sum_{m=1}^{q} \Delta PI_{t-m} + c_1 HFC_{t-1} + c_2 Gexp_{t-1} + c_3 GI_{t-1} + c_4 GDP_{t-1} + c_5 PI_{t-1} + \varepsilon_{1t}$$
$$5$$

Sectoral government expenditure on household food consumption:

$$\Delta HFC_t = c_0 + c_{1i} \sum_{i=1}^{p} \Delta HFC_{t-i} + c_{1j} \sum_{j=1}^{q} \Delta S_{t-j} + c_{1k} \sum_{k=1}^{q} \Delta GS_{t-k} + c_{1l} \sum_{l=1}^{q} \Delta MC_{t-l} + c_{1m} \sum_{m=1}^{q} \Delta CD_{t-m} + c_{1n} \sum_{n=1}^{q} \Delta T_{t-n} + c_{1o} \sum_{o=1}^{q} \Delta CE_{t-o} + c_1 HFC_{t-1} + c_2 S_{t-1} + c_3 GS_{t-1} + c_4 MC_{t-1} + c_5 CD_{t-1} + c_6 T_{t-1} + c_7 CE_{t-1} + \varepsilon_{1t}$$
$$6$$

Government expenditure on household non-food consumption:

$$\Delta HNFC_t = c_0 + c_{1i} \sum_{i=1}^{p} \Delta HNFC_{t-i} + c_{1j} \sum_{j=1}^{q} \Delta Gexp_{t-j} + c_{1k} \sum_{k=1}^{q} \Delta GI_{t-k} + c_{1l} \sum_{l=1}^{q} \Delta GDP_{t-l} + c_{1m} \sum_{m=1}^{q} \Delta PI_{t-m} + c_1 HNFC_{t-1} + c_2 Gexp_{t-1} + c_3 GI_{t-1} + c_4 GDP_{t-1} + c_5 PI_{t-1} + \varepsilon_{1t}$$
$$7$$

Sectoral government expenditure on household non-food consumption:

$$\Delta HNFC_t = c_0 + c_{1i} \sum_{i=1}^{p} \Delta HNFC_{t-i} + c_{1j} \sum_{j=1}^{q} \Delta S_{t-j} + c_{1k} \sum_{k=1}^{q} \Delta GS_{t-k} + c_{1i} \sum_{l=1}^{q} \Delta MC_{t-l} + c_{1m} \sum_{m=1}^{q} \Delta CD_{t-m} + c_{1n} \sum_{n=1}^{q} \Delta T_{t-n} + c_{1o} \sum_{o=1}^{q} \Delta CE_{t-o} + c_1 HFC_{t-1} + c_2 S_{t-1} + c_3 GS_{t-1} + c_4 MC_{t-1} + c_5 CD_{t-1} + c_6 T_{t-1} + c_7 CE_{t-1} + \varepsilon_{1t}$$
$$8$$

Where: HCE = household consumption, PCE = public consumption, HFC = household food consumption, HNFC = household non-food consumption, Gexp = government spending, PI = private investment, GI = public investment, S = salary, GS = good and service, MC = minor capital, CD = capital development, T = public transfer, CE = contingency expenditure, c_0 = intercept, $c_{1i…C1o}$ = slope of explanatory variables, ε = error term, p, q = optimal length of dependent (p) and independent (q) variable lags and t = time.

The Akaike Information Criteria (AIC) was used to select the optimal length of lags for each variable of the models. The AIC was employed to avoid taking too short or too large length of lags in the analysis. Taking too short length of lags results in series correlation in the error terms, while taking too large length of lags reduces the number of observations and, the power of the test.

Based on AIC, the optimal length of lags selected was two for government expenditure on household and public consumption, food and non-food consumption and sectoral government expenditure on household consumption as well as on household food consumption (Annexure 1a, b, c, d, e and f) and four for sectoral government expenditure on household non-food consumption (Annexure 1g). However, the length of lags was automatically generated for the dependent and independent variables when running the ARDL model. Thus, the length of lags for the independent and dependent variables are not always necessary the same in each of the models.

6. Empirical results

6.1. Unit root test

The Augmented Dickey Fuller test showed that all data for each variable were stationary at first difference although half of them were also stationary at level form. Hence, the data can be used to predict or evaluate the effect of government expenditure, GDP, public and private investment on household and public consumption as well as on food and non-food consumption.

Table 3. Augmented Dickey-Fuller test of unit root for selected variables

Variable	Z stat (level)	Z stat (1st diff.)
S	-1.54^{ns}	-9.72^{***}
GS	-2.91^{*}	-17.00^{***}
MC	-6.09^{***}	-13.19^{***}
CD	-3.77^{***}	-15.67^{***}
T	-2.01^{ns}	-16.60^{***}
CE	-5.29^{***}	-13.59^{***}
Gexp	-2.65^{*}	-16.14^{***}
GI	-3.93^{***}	-15.48^{***}
GDP	-1.94^{ns}	-5.62^{***}
PI	-4.04^{***}	-9.32^{***}
HCE	-0.74^{ns}	-5.64^{***}
PCE	-1.29^{ns}	5.30^{***}
FNAB	-0.85^{ns}	-4.32^{***}
NFNAB	0.35^{ns}	-3.71^{***}

Notes: ***, **, * and ns = significant at Z-crit (1%, 62 and 63) = 3.56, Z-crit (5%, 62 and 63) = 2.92, Z-crit (10%, 62 and 63) = 2.60 and not significant, respectively. S = salary, GS = goods and services, MC = minor capital, DC = capital development, T = transfer, CE = contingency expenditure, Gexp = government expenditure, GI = government investment, GDP = gross domestic product, PI = private investment, HCE = household consumption, PCE = public consumption, FNAB = food and non-alcohol beverage and NFANB = non-food item.

6.2. Bound cointegration test

The ARDL bound test result showed no cointegration between the variables defined in the models, since the values of the F-statistic were smaller than the F-critical values of I(0) at the 10 per cent, 5 per cent and 1 per cent levels (Table 5).

In the case of household food consumption, the F-statistic value of 3.24 falls between the 5 per cent and 10 per cent F-critical values of I(0) and I(1), so, the decision was inconclusive. However, the value was closer to 10 per cent and 5 per cent F-critical values of I(0), 2.45 and 2.89 than I(1), 3.53 and 4.01, hence, this study accepts the null hypothesis of no cointegration. Therefore, the appropriate model to apply for household food consumption is the short-run ARDL model.

Table 4. ARDL bound cointegration test

Dependent variable	Null hypothesis	Alternative hypothesis	F–Stat	Cointegration	Model required
HH consumption	$c_1=c_2=c_3=c_4=0$	$c_1 \neq c_2 \neq c_3 \neq c_4 \neq 0$	1.62	No	SR ARDL
Public consumption	$c_1=c_2=c_3=c_4=0$	$c_1 \neq c_2 \neq c_3 \neq c_4 \neq 0$	2.33	No	SR ARDL
Sectoral HH consumption	$c_1=c_2=c_3=c_4=c_5=c_6=0$	$c_1 \neq c_2 \neq c_3 \neq c_4 \neq c_5 \neq c_6 \neq 0$	1.16	No	SR ARDL
Food consumption	$c_1=c_2=c_3=c_4=0$	$c_1 \neq c_2 \neq c_3 \neq c_4 \neq 0$	3.24	No	SR ARDL
Sectoral food consumption	$c_1=c_2=c_3=c_4=c_5=c_6=0$	$c_1 \neq c_2 \neq c_3 \neq c_4 \neq c_5 \neq c_6 \neq 0$	1.66	No	SR ARDL
Non-food consumption	$c_1=c_2=c_3=c_4=0$	$c_1 \neq c_2 \neq c_3 \neq c_4 \neq 0$	1.81	No	SR ARDL
Sectoral non-food consumption	$c_1=c_2=c_3=c_4=c_5=c_6=0$	$c_1 \neq c_2 \neq c_3 \neq c_4 \neq c_5 \neq c_6 \neq 0$	0.77	No	SR ARDL

Note: 1. F-critical of I(0) at 10%=2.45, at 5%=2.86, at 1% =3.74 while F-critical of I(1) at 10%=3.52, at 5%=4.01 and at 1%=5.06

2. HH = household and SR = short-run

6.3. Diagnostic test

The results of diagnostic tests on model 1, 2, 5, 7 and 8 showed no issue with serial correlation (Annexure 2a, b, d, f and g), heteroscedasticity (Annexure 3a, b, d, f and g) and largely stable (Annexure 4, 5, 7, 9 and 10). Model 3 also showed no issue with heteroscedasticity (Annexure 3c) and stability (Annexure 6) but did have issue with serial correlation (Annexure 2c). Similarly, model 6 had no issues with heteroscedasticity (Annexure 3e) and largely stable (Annexure 8) but had issue with serial correlation (Annexure 2e).

Although some of the models had issues with serial correlation and stability, all error and instability coefficients have been minimised. The models also did not require structural break as the Gregory-Hansen test showed Z statistic of household consumption (Z_t = -4.52), public consumption (Z_t = -4.71), household food consumption (Z_t = -4.40) and household non-food consumption model (Z_t = -4.16) smaller than Z critical value at α = 5% significant level (Z_{crit} = 5.56).

6.3. Impact of government expenditure, public and private investment and gross domestic product on household and public consumption

The result of the study shows that government expenditure had a positive effect on household consumption at lag zero and two and had a negative effect at lag one. All significant at α = 1 per cent level with a coefficient of 112.3, 85.6 and -189.5 (Table 5), indicate that a 1 per cent increase in government expenditure will increase household consumption by 112.3 and 85.6 percentage points at lag zero and two and will decrease household consumption by 189.5 percentage points at lag one. It also had mixed effects on public consumption, negative at lag zero and two and positive at lag one. They were significant at α = 10 per cent and 5 per cent level with coefficient of -0.002, 0.003 and -0.002 at lag zero, one and two (Table 6), indicate a 1 per cent increase in government expenditure will reduce

public consumption by 0.002 percentage points at lag zero and two and will improve public consumption by 0.003 percentage points at lag one.

GDP did not affect household consumption at lag zero (P>t=0.197) but did have positive effect at lag one. It significant at α = 10 per cent (p=0.09) level with coefficient of 31.8 (Table 5), indicate a 31.8 percentage points increase in household consumption at lag one was associated with a percentage point increase in GDP. In contrast, GDP had mixed effects on public consumption, positive at lag zero and negative at lag one, indicate a 1 per cent increase in GDP will significantly improve public consumption at lag zero, 0.004 and reduced it at lag one, –0.003 (Table 6).

Public investment did not have an effect on household consumption, P>t=0.255 and 0.207 at lag zero and one (Table 5), respectively, signifying that increasing public investment will not change household consumption significantly. However, it had a significantly positive effect on public consumption at lag zero and two and had a negative effect at lag one. All were significant at α = 1 per cent level with coefficient of 0,015, -0.024 and 0.011 at lag zero, one and two (Table 6), meaning a percentage point increase in public investment will improve public consumption by 0.015 and 0.011 percentage points at lag zero and two and will deteriorate it by 0.024 percentage points at lag one.

Private investment had a positive effect on household consumption at lag zero and two and had a negative effect at lag one, all were significant at α = 1 per cent level with coefficient of 19.18, 16.65 and –38.83 (Table 5), respectively. They imply that increasing private investment by a percentage point will increase household consumption by 19.18 and 16.65 percentage points at lag zero and two and will reduce it by 38.83 percentage points at lag one. However, it did not affect public consumption, P>t=0.682 (Table 6), indicate that increasing private investment will not change public consumption significantly.

Table 5. Estimated coefficient of selected variables on household consumption

HCE	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
$HCE_{(t-1)}$	1.621	0.131	12.350	0.000	1.357	1.884
$HCE_{(t-2)}$	–0.650	0.153	–4.250	0.000	–0.958	–0.342
$Gexp_{(t-0)}$	112.302	13.346	8.410	0.000	85.482	139.122
$Gexp_{(t-1)}$	–189.494	29.223	–6.480	0.000	–248.220	–130.768
$Gexp_{(t-2)}$	85.586	21.093	4.060	0.000	43.197	127.974
$GI_{(t-0)}$	4.941	4.288	1.150	0.255	–3.677	13.559
$GI_{(t-1)}$	–5.225	4.084	–1.280	0.207	–13.433	2.983
$GDP_{(t-0)}$	–26.626	20.378	–1.310	0.197	–67.578	14.326
$GDP_{(t-1)}$	31.758	18.242	1.740	0.088	–4.901	68.417
$PI_{(t-0)}$	19.177	4.398	4.360	0.000	10.338	28.015
$PI_{(t-1)}$	–38.834	8.219	–4.720	0.000	–55.350	–22.317
$PI_{(t-2)}$	16.650	5.870	2.840	0.007	4.855	28.446
_cons	–48.692	70.039	–0.700	0.490	–189.440	92.056

n	62
F (12, 49)	7378.95
Prob>F	0.000
R-squared	0.999
Adj R-squared	0.999
Root MSE	3.022

Note: HCE = household consumption serves as both dependent and independent variables, Gexp = government expenditure, GI = public investment, GDP = gross domestic product and PI = private investment
t-0, t-1 and t-2 refer to lag 0, 1 and 2

Household consumption was also influenced by its own lagged variables. It showed that increasing household consumption by a percentage point will increase household consumption at lag one, 1.621 and reduce it at lag two, -0.650 (Table 5). Similarly, public consumption was also influenced by its own lagged variables. It showed that increasing public consumption will increase public consumption at lag one, 1.367 and reduced it at lag two, -0.546 (Table 6). They all indicate that increasing consumption will improve both, household and public consumption at lag one but will reduce them at lag two.

Segregating the government expenditure into several sectors (Table 7), the study revealed that government expenditure on salary had positive effect on household consumption and significant at $\alpha=10$ per cent level (P>t=0.066), implies that increasing government expenditure on salary will improve household consumption. The coefficient of 0.299 indicates a percentage point increase in government expenditure on salary will increase household consumption by a 0.299 percentage points.

Table 6. Estimated coefficient of selected variables on public consumption

PC	Coef.	Std. Err	t	P>t	[95% Conf.	Interval]
$PC_{(t-1)}$	1.367	0.109	12.520	0.000	1.148	1.586
$PC_{(t-2)}$	-0.546	0.113	-4.810	0.000	-0.773	-0.318
$Gexp_{(t-0)}$	-0.002	0.001	-1.880	0.065	-0.003	0.000
$Gexp_{(t-1)}$	0.003	0.001	2.420	0.019	0.001	0.006
$Gexp_{(t-2)}$	-0.002	0.001	-2.390	0.021	-0.004	0.000
$GI_{(t-0)}$	0.015	0.002	9.150	0.000	0.012	0.019
$GI_{(t-1)}$	-0.024	0.003	-7.860	0.000	-0.031	-0.018
$GI_{(t-2)}$	0.011	0.002	5.120	0.000	0.007	0.016
$GDP_{(t-0)}$	0.004	0.002	1.940	0.059	0.000	0.007
$GDP_{(t-1)}$	-0.003	0.002	-1.790	0.079	-0.007	0.000
PI	0.001	0.003	0.410	0.682	-0.005	0.007
_cons	0.149	0.078	1.910	0.062	-0.008	0.306
n	62					
F (11, 50)	336.060					
Prob > F	0.000					
R-squared	0.987					
Adj R-squared	0.984					
Root MSE	0.079					

Note: PCE = public consumption serves as both dependent and independent variables, Gexp = government expenditure, GI = public investment, GDP = gross domestic product and PI = private investment
t-0, t-1 and t-2 refer to lag 0, 1 and 2

Government expenditure on goods and services had mixed effects on household consumption, negative at lag zero and two and positive at lag one, all significant at $\alpha = 1$ per cent level. The coefficient of -1.86, 3.80 and -2.01 at lag zero, one and two indicate that increasing government expenditure on goods and services will reduce household consumption by 1.86 and 2.01 percentage points at lag zero and two and will improve household consumption by 3.80 percentage points at lag one.

Government expenditure on minor capital also had mixed effects on household consumption and all significant at α =1per cent level. It had positive effect at lag zero and two and had negative effect at lag one with coefficient of 6.41, 6.94 and –13.22, respectively. They indicate that a percentage point increase in government expenditure on minor capital will increase household consumption by 6.41 and 6.94 percentage points at lag zero and two and will reduce it by 13.22 percentage points at lag one.

Similarly, government expenditure on capital development also had mixed effects on household consumption. They were significant at α = 1 per cent and 5 per cent level. It had positive effect on household consumption at lag zero and two and had negative effect at lag one. The coefficient of 0.10, –0.16 and 0.07 at lag zero, one and two, respectively indicate that an increase in household consumption by 0.10 and 0.07 percentage points at lag zero and two and a decline in household consumption by 0.16 percentage points at lag one was associated with a percentage point increase in government expenditure on capital development.

Table 7. Estimated coefficient of sectoral government expenditure on household consumption

HCE	Coef.	Std. Err	t	P>t	[95% Conf.	Interval]
$HCE_{(t-1)}$	1.920	0.055	35.120	0.000	1.810	2.030
$HCE_{(t-2)}$	-0.956	0.057	-16.640	0.000	–1.072	–0.840
$S_{(t-0)}$	0.299	0.159	1.880	0.066	-0.021	0.619
$GS_{(t-0)}$	–1.862	0.223	-8.350	0.000	-2.312	-1.413
$GS_{(t-1)}$	3.804	0.371	10.250	0.000	3.056	4.552
$GS_{(t-2)}$	-2.014	0.244	-8.270	0.000	-2.504	-1.523
$MC_{(t-0)}$	6.411	0.938	6.830	0.000	4.522	8.301
$MC_{(t-1)}$	-13.219	1.532	-8.630	0.000	-16.305	–10.133
$MC_{(t-2)}$	6.944	0.971	7.150	0.000	4.989	8.899
$CD_{(t-0)}$	0.097	0.042	2.320	0.025	0.013	0.180
$CD_{(t-1)}$	–0.157	0.051	-3.090	0.003	-0.260	–0.055
$CD_{(t-2)}$	0.074	0.033	2.250	0.029	0.008	0.139
$T_{(t-0)}$	0.900	0.125	7.180	0.000	0.647	1.152
$T_{(t-1)}$	–1.760	0.214	-8.240	0.000	-2.190	–1.329
$T_{(t-2)}$	0.879	0.141	6.220	0.000	0.595	1.164
$CE_{(t-0)}$	-0.081	0.601	-0.130	0.894	–1.292	1.130
_cons	7.444	3.012	2.470	0.017	1.377	13.510

n	62
F (16, 45)	6813.7800
Prob > F	0.000
R-squared	0.9996
Adj R-squared	0.9994
Root MSE	2.7239

HCE = household consumption serves as both dependent and independent variables, S = salary, GS = goods and services, MC = minor capital, CD = capital development, T = transfer payment, CE = contingency expenditure
t-0, t-1 and t-2 refer to lag 0, 1 and 2

Government expenditure on public transfer also had mixed effects on household consumption. All were significant at α = 1 per cent level with coefficient of 0.90, -1.76 and 0.88 at lag zero, one and two, respectively. They indicate that a percentage point increase in government budget on public transfer will improve household consumption by 0.90 and 0.88 percentage points at lag zero and two, respectively while at lag one, it will reduce household consumption by 1.76 percentage points.

Lastly, the study revealed that government expenditure on contingency expenses did not affect household consumption, P>t=0.894. It indicates that increasing government budget on contingency expenditure will not change household consumption significantly.

It is also important to note that not only government expenditure influences household consumption; the study of Khan *et al.* (2015) shows that wealth and employment and/or unemployment rate also affect household consumption, therefore, these factors need to consider when analysing household consumption. Wealth is the sum of discounted income over the lifetime as shown in the permanent income hypothesis and lifecycle model; hence, wealth is the accumulation of discounted income itself over the lifetime. Thus, income has double effects; it improves both wealth and consumption.

6.4. Impact of government expenditure, GDP and private and public investment on household food and non-food consumption

The study revealed that government expenditure affected both food and non-food consumption. The coefficients of 0.0003 (Table 8) and 0.024 (Table 9) indicates that a percentage point increase in government expenditure will increase household food and non-food consumption by 0.0003 and 0.024 percentage points, respectively. They were significant at α = 5 per cent and 10 per cent level, respectively.

Increasing consumption of food items also directly contribute positively to food security condition of households as hunger level of Timor-Leste has being reported as serious, which ranks at 110 out of 117 qualifying countries with a score of 34.5 (GHI, 2019). Improving food security[5] condition of household through improving household income will improve the living condition of people in the country as government expenditures cover all aspects of development include food security and job creation programs.

Public investment had a negative effect at lag zero, a positive effect at lag one and no effect at lag two on household food consumption, P>t=0.000, 0.000 and 0.155, respectively. The coefficients of -0.002 and 0.003 of lag zero and one (Table 8), indicate that a percentage point increase in public investment will reduce household food consumption by 0.002 percentage points at lag zero and will improve it by 0.003 percentage points at lag one. While on non-food consumption, it had significant negative effect at lag zero (P>t=0.099) but had no effect at lag one, P>t of LGI$_{(t-1)}$ = 0.172 (Table 9). The coefficient of -0.03 of public investment at lag zero indicates that a percentage point increase in public investment is associated with a 0.03 percentage points decline in household non-food consumption. Log was used to GI (LGI) in table 10 due to model stability reason as it minimised the instability to the minimum level.

Table 8. Estimated coefficient of selected variables on household food consumption

HFC	Coef.	Std. Err	t	P>t	[95% Conf.	Interval]
HFC$_{(t-1)}$	1.357	0.120	11.310	0.000	1.117	1.598
HFC$_{(t-2)}$	-0.468	0.121	-3.870	0.000	-0.711	-0.225
Gexp$_{(t-0)}$	0.0003	0.0001	2.060	0.044	7.05e-06	0.001
GI$_{(t-0)}$	-0.002	0.0004	-5.570	0.000	-0.003	-0.001
GI$_{(t-1)}$	0.003	0.001	4.410	0.000	0.001	0.004
GI$_{(t-2)}$	-0.001	0.0004	-1.440	0.155	-0.002	0.0003
GDP$_{(t-0)}$	0.049	0.029	1.670	0.101	-0.010	0.107
PI$_{(t-0)}$	-0.001	0.001	-1.980	0.053	-0.003	0.00002
_cons	0.192	0.111	1.720	0.091	-0.032	0.416
n	62					
F (8, 53)	1178.410					
Prob > F	0.000					
R-squared	0.994					
Adj R-squared	0.994					
Root MSE	0.020					

Note: HFC = household food consumption serves as both dependent and independent variables, Gexp = government expenditure, GI = public investment, GDP = gross domestic product and PI = private investment
t-0, t-1 and t-2 refer to lag 0, 1 and 2

GDP did not affect household food consumption, P>t = 0.101 (Table 8) but did have mixed effects on household non-food consumption, P>t = 0.000, 0.001 and 0.062 at lag zero, one and two (Table 9), respectively. The coefficient of 0.34, -0.51 and 0.19 at lag zero, one and two, respectively imply that a percentage point increase in GDP will improve household non-food consumption by 0.34 and 0.19 percentage points at lag zero and two and will reduce it by 0.51 percentage points at lag one.

Private investment had a significant negative effect on household food consumption, P>t=0.053 with coefficient of -0.001 (Table 8), which indicates that a percentage point increase in private investment will reduce household food consumption by 0.001 percentage points. However, it had mixed effects on household non-food consumption, P>t=0.000, 0.000 and 0.007 at lag zero, one and two with coefficient of 0.009, -0.017 and 0.007 (Table 9), respectively. They indicate that a percentage point increase in private investment will improve household non-food consumption by 0.009 and 0.007 percentage points at lag zero and two and will reduce it by 0.017 percentage points at lag one.

Table 9. Estimated coefficient of selected variables on household non-food consumption

HNFC	Coef.	Std. Err	t	P>t	[95% Conf.	Interval]
$HNFC_{(t-1)}$	1.476	0.127	11.610	0.000	1.220	1.731
$HNFC_{(t-2)}$	-0.459	0.136	-3.370	0.001	-0.733	-0.185
$Gexp_{(t-0)}$	0.024	0.014	1.740	0.087	-0.004	0.051
$LGI_{(t-0)}$	-0.031	0.018	-1.680	0.099	-0.067	0.006
$LGI_{(t-1)}$	0.023	0.017	1.390	0.172	-0.010	0.056
$GDP_{(t-0)}$	0.339	0.089	3.800	0.000	0.160	0.518
$GDP_{(t-1)}$	-0.514	0.152	-3.390	0.001	-0.819	-0.209
$GDP_{(t-2)}$	0.194	0.102	1.910	0.062	-0.010	0.398
$PI_{(t-0)}$	0.009	0.002	6.080	0.000	0.006	0.012
$PI_{(t-1)}$	-0.017	0.003	-5.400	0.000	-0.023	-0.011
$PI_{(t-2)}$	0.007	0.002	2.810	0.007	0.002	0.011
_cons	-0.233	0.112	-2.080	0.042	-0.457	-0.008
n	62					
F (11, 50)	5821.610					
Prob > F	0.000					
R-squared	0.999					
Adj R-squared	0.999					
Root MSE	0.014					

Note: HNFC = household non-food consumption serves as both dependent and independent variables, Gexp = government expenditure, LGI = log of public investment, GDP = gross domestic product and PI = private investment
t-0, t-1 and t-2 refer to lag 0, 1 and 2

The study also revealed that household food and non-food consumption were influenced by their own lagged variables. They were significant at $\alpha = 1$ per cent level and all had mixed effects, positive at lag one and negative at lag two (Table 8 and 9), meaning increasing household food and non-food consumption will improve household food and non-food consumption at lag one but will reduce them at lag two.

At the sectoral level, government expenditure on salary had mixed effects on household food consumption and significant at $\alpha = 1$ per cent and 5 per cent level, respectively. The coefficients of -0.015, 0.026 and -0.009 at lag zero, one and two (Table 10) indicate that a percentage point increase in government expenditure on salary will reduce household food consumption by 0.015 and 0.009 percentage points at lag zero and two and will improve it by 0.026 percentage points at lag one. It also had mixed effects on household non-food consumption and all significant at $\alpha = 1$ per cent level with coefficients of -0.015, 0.026 and -0.011 at lag zero, one and two (Table 11). They indicate that a decline in household non-food consumption by 0.015 and 0.011 percentage points at lag zero and two and an increase in household non-food consumption by 0.026 percentage points at lag one was associated with a percentage point increase in government expenditure on salary.

Table 10. Estimated sectoral government expenditure coefficients on household food consumption

HFC	Coef.	Std. Err	t	P>t	[95% Conf.	Interval]
$HFC_{(t-1)}$	1.552	0.122	12.770	0.000	1.308	1.797
$HFC_{(t-2)}$	-0.657	0.114	-5.760	0.000	-0.886	-0.427
$S_{(t-0)}$	-0.015	0.003	-5.150	0.000	-0.020	-0.009
$S_{(t-1)}$	0.026	0.005	4.810	0.000	0.015	0.036
$S_{(t-2)}$	-0.009	0.004	-2.150	0.037	-0.017	-0.001
$GS_{(t-0)}$	-0.007	0.001	-4.910	0.000	-0.010	-0.004
$GS_{(t-1)}$	0.012	0.002	5.170	0.000	0.007	0.016
$GS_{(t-2)}$	-0.005	0.001	-3.560	0.001	-0.008	-0.002
$MC_{(t-0)}$	0.033	0.006	5.430	0.000	0.021	0.045
$MC_{(t-1)}$	-0.052	0.010	-5.320	0.000	-0.072	-0.033
$MC_{(t-2)}$	0.022	0.006	3.500	0.001	0.010	0.035
$CD_{(t-0)}$	0.0001	0.0002	0.670	0.505	0.0003	0.001
$T_{(t-0)}$	0.0001	0.0003	-0.320	0.751	-0.001	0.001
$CE_{(t-0)}$	-0.012	0.004	-2.930	0.005	-0.020	-0.004
$CE_{(t-1)}$	0.019	0.004	4.470	0.000	0.010	0.027
$CE_{(t-2)}$	-0.006	0.003	-1.840	0.072	-0.013	0.001
_cons	0.403	0.152	2.650	0.011	0.097	0.710
n	62					
F (16, 45)	955.310					
Prob > F	0.000					
R-squared	0.997					
Adj R-squared	0.996					
Root MSE	0.016					

Note: HFC = household food consumption serves as both dependent and independent variables, S = salary, GS = goods and services, MC = minor capital, CD = capital development, T = transfer payment, CE = contingency expenditure
t-0, t-1 and t-2 refer to lag 0, 1 and 2

Government expenditure on goods and services also had mixed effects on household food consumption. All were significant at α = 1 per cent. The coefficients of -0.007, 0.012 and -0.005 at lag zero, one and two (Table 10) indicate that household food consumption will decrease by 0.007 and 0.005 percentage points at lag zero and two and will increase by 0.012 percentage points at lag one when increasing government expenditure on goods and services by a percentage point. It also had mixed effects on household non-food consumption and all significant at α = 1 per cent level. The coefficients of -0.008, 0.013 and -0.006 at lag zero, one and two (Table 11) imply that a decline in household non-food consumption by 0.008 and 0.006 percentage points at lag zero and two and an increase in household non-food consumption by 0.013 percentage points at lag one was associated with a percentage point increase in government expenditure on goods and services.

Table 11. Estimated sectoral government expenditure coefficients on household non-food consumption

HNFC	Coef.	Std. Err	t	P>t	[95% Conf.	Interval]
$HNFC_{(t-1)}$	1.757	0.107	16.490	0.000	1.543	1.971
$HNFC_{(t-2)}$	-0.758	0.119	-6.350	0.000	-0.998	-0.518
$S_{(t-0)}$	-0.015	0.002	-6.950	0.000	-0.020	-0.011
$S_{(t-1)}$	0.026	0.004	7.150	0.000	0.019	0.033
$S_{(t-2)}$	-0.011	0.003	-4.240	0.000	-0.016	-0.006
$GS_{(t-0)}$	-0.008	0.001	-7.910	0.000	-0.010	-0.006
$GS_{(t-1)}$	0.013	0.002	8.310	0.000	0.010	0.017
$GS_{(t-2)}$	-0.006	0.001	-5.060	0.000	-0.008	-0.003
$MC_{(t-0)}$	0.036	0.005	8.060	0.000	0.027	0.045
$MC_{(t-1)}$	-0.062	0.007	-8.610	0.000	-0.076	-0.047
$MC_{(t-2)}$	0.027	0.005	5.490	0.000	0.017	0.037
$CD_{(t-0)}$	6.11E-05	0.0001	0.5000	0.617	-0.0002	0.0003
$T_{(t-0)}$	3.97E-05	0.0002	0.1900	0.851	-0.0004	0.0005
$CE_{(t-0)}$	0.0004	0.0024	0.1800	0.861	-0.0045	0.0053
_cons	0.0103	0.1456	0.0700	0.944	-0.2827	0.3033
n	62					
F (14, 47)	6595.050					
Prob > F	0.000					
R-squared	0.9995					
Adj R-squared	0.999					
Root MSE	0.01134					

Note: HNFC = household non-food consumption serves as both dependent and independent variables, S = salary, GS = goods and services, MC = minor capital, CD = capital development, T = transfer payment, CE = contingency expenditure
t-0, t-1 and t-2 refer to lag 0, 1 and 2

Government expenditure on minor capital also had mixed effects on household food consumption. All were significant at $\alpha = 1$ per cent level with coefficients of 0.033, -0.052 and 0.022 at lag zero, one and two (Table 10), respectively, imply that a percentage point increase in government expenditure on minor capital will increase household food consumption by 0.033 and 0.022 percentage points at lag zero and two and will reduce it by 0.052 percentage points at lag one. It also had mixed effects on household non-food consumption. All were significant at $\alpha = 1$ per cent level with coefficient of 0.036, -0.062 and 0.027 at lag zero, one and two (Table 11), respectively, imply that increasing a percentage point in government expenditure on minor capital will improve household non-food consumption by 0.036 and 0.027 percentage points at lag zero and two and will reduce it by 0.062 percentage points at lag one.

Government expenditure on capital development and public transfer did not have an effect on both household food and non-food consumption. The P>t=0.505 and 0.751 of capital development and public transfer on food consumption (Table 10) and P>t=0.617 and 0.851 of capital development and public transfer on non-food consumption (Table 11), respectively were greater than $\alpha = 10$ per cent significant level. They indicate that increasing government expenditure on capital development and public transfer will not change household food and non-food consumption significantly.

Government expenditure on contingency expenses had mixed effects on household food consumption. They were significant at $\alpha = 1$ per cent and 10 per cent level with coefficient of -0.012, 0.019 and -0.006 (Table 10), respectively. The study revealed that a percentage point increase in government expenditure on contingency expenses will reduce household food consumption at lag zero (-0.012) and two (-0.006) and will increase it at lag one (0.019). In contrast, it did not have an effect on household non-food consumption, $P>t=0.861$ (Table 11), meaning that increasing government expenditure on contingency expenses will not change household non-food consumption significantly.

7. Conclusion and policy implications

7.1. Conclusion

This study examines the effect of government expenditure on household and public consumption as well as on food and non-food consumption in Timor-Leste using the short-run ARDL model. It revealed that government expenditure had mixed effects on household consumption, improves household consumption at lag zero and two and reduces it at lag one. It also had mixed effects on public consumption, whereby it decreases public consumption at lag zero and two and increases it at lag one. On household food and non-food consumption, it had a positive effect, thereby improving household food and non-food consumption.

At the sectoral level, expenditure on salary did have a positive effect on household consumption while expenditure on goods and services, minor capital, capital development and public transfer had mixed effects on household consumption. Goods and services had a positive effect at lag one and negative at lag zero and two while minor capital, capital development and public transfer had a positive effect at lag zero and two and a negative at lag one. Minor capital also had a positive effect on household food and non-food consumption at lag zero and two and a negative effect at lag one, while salary and goods and services had a positive effect at lag one and a negative effect at lag zero and two. In contrast, capital development and public transfer did not significantly affect household food and non-food consumption. Similarly, contingency expenditures did not affect household consumption. It also did not affect household non-food consumption but did have mixed effects on household food consumption, positive at lag one and negative at lag zero and two.

GDP had mixed effects on public consumption, positive at lag zero and negative at lag one. It did not affect household consumption at lag zero but had positive effect at lag one. It also did not have an effect on household food consumption but did have mixed effects on household non-food consumption, positive at lag zero and two and negative at lag one.

Public investment did not affect household consumption but had mixed effects on public consumption, positive at lag zero and two but negative at lag one. It also had mixed effects on household food and non-food consumption, positive at lag one, negative at lag zero and does not have any effect at lag two while on household non-food consumption, it had a positive effect at lag zero but did not have any effect at lag one.

Private investment had mixed effects on household consumption, positive at lag zero and two and negative at lag one but had no effect on public consumption. It had a negative effect on household food consumption and mixed effects on household non-food consumption. It reduces household food consumption at lag zero and contrarily, it improves household non-food consumption at lag zero and two but reduces it at lag one

7.2. Policy implications

Since government expenditure was not always positively correlated to consumption, it needs to be closely and thoroughly monitored so that budgets are allocated in a more efficient and effective way. By doing this, the government can identify the weaknesses and gaps in the budget allocation, improve and/or maintain its budget allocation so that the targeted sectors achieve their intended outcomes. As shown in the result section under zero lags (t-0) coefficients, government expenditure generally and salary, minor capital, capital development and public transfer more specifically are positively correlated with household consumption, therefore, increasing government expenditure on these sectors is necessary. Increasing

expenditure on minor capital is also suggested as it is positively correlated with food and non-food consumption with zero lags.

Government also needs to increase its expenditures on investments as government allocated only 38 per cent of its total expenditure on investment with a focus on sectors that can substitute imports as most of the food and non-food items consumed in the country were imported. This can be realised through either directly investing as state companies or through partnership with private investors on sectors such as agriculture and construction and machinery-related industries.

The study also considers that the gap between public and private investment has widened over the years. This led to private investment having a smaller effect on the economy. To boost its impact on the economy and consumption, the government needs to create a situation to attract private investors to invest in the country. One way to achieve this is through lowering the interest rate. A lower interest rate will attract more private investors to borrow money which leads to more investments, and consequently improves the economy and creates job opportunities.

Notes and references

Alamanda, 2020, 'The effect of government expenditure on income inequality and poverty in Indonesia', *Info Artha*, vol. 4, no. 1, pp. 1–11.

Banco Central de Timor-Leste (BCTL), 2019a, 'BCTL preliminary comments on the proposed 2018 state budget', *Banco Central de Timor-Leste*, Dili, Timor-Leste.

Banco Central de Timor-Leste (BCTL), 2019b, 'Report of money transfer services', *Banco Central de Timor-Leste*, Dili, Timor-Leste (unpublished).

Banco de Portugal (BP), 2019, '2018-2019 economic development in Portuguese speaking African countries and Timor-Leste', *Banco de Portugal*, Lisbon.

Biven, J, 2017, 'The potential macroeconomic benefit from increasing infrastructure investment', *Economic Policy Institute.*

Callegari, G, 2007, *Fiscal Policy and Consumption* (thesis), Department of Economics, European University Institute.

Dada, MA, 2013, 'Composition effects of government expenditure on private consumption and output growth in Nigeria: A single equation correction modelling', *Romanian Journal of Policy (RJFP),* ISSN 2069-0983, Editura ASE, Buchares, vol. 4, no. 2, pp. 18-34.

Easterly, W and Rebelo, S, 1993, 'Fiscal policy and economic growth: an empirical investigation', Working paper, *National Bureau of Economic Research*, Cambridge.

Fatas, A and Mihove, I, 1998, 'The effects of fiscal policy on consumption and employment: theory and evidence', *Economic and Political Science*, Insead.

Gali, J, Lopes-Salido, JD and Valles, J, 2004, 'Understanding the effect of government spending on consumption' *International Research Forum on Monetary Policy*, European Central Bank.

General Directorate of Statistic (GDS), 2016, 'Timor-Leste National Account 2010-2015', *General Directorate of Statistics,* Ministry of Finance*,* Timor-Leste.

General Directorate of Statistic (GDS), 2019, 'Timor-Leste National Account 2000-2018', *General Directorate of Statistics,* Ministry of Finance*,* Timor-Leste.

Ghouse, G, Khan, SA and Rehman, AU, 2018, 'ARDL model as remedy for spurious regression: problems, performance and prospectus', *Pakistan Institute of Development Economics.*

Global Hunger Index (GHI), 2019, *Timor-Leste Global Hunger Index*, Available at: https://www.globalhungerindex.org/timor-leste.html.

Glomm, B and Ravikumar, B, 1997, 'Productive government expenditure and long-run growth', *Journal of Economic Dynamics and Control,* vol. 21, pp. 183-204.

Inder, B and Cornwell, C, 2017, 'Labour markets and productivity in Timor-Leste', *Centre for Development Economics and Sustainability,* Monash University.

Khan, K, Fei, C, Kamal, MA and Shaikh, SA, 2015, 'Determinant of consumption function in case of China and G7', *International Journal of Economics and Empirical Research.*

Kuncoro, H, 2018, 'The impact of government consumption on the private expenditures in developing country: the case of Indonesia', *Business and Economic Horizon*, vol. 14, no. 1, pp. 1-16.

Ministry of Finance (MoF), 2018, *Timor-Leste Petroleum: 2018 Annual Report*, Ministry of Finance, Timor-Leste.

Ministry of Finance (MoF), 2019, *Government Transparency Portal, Budget Book 1 and PF Quarterly Report*, Ministry of Finance, Timor-Leste.

Ministry of Finance (MoF), 2020, *State Budget 2020: Budget Overview,* Cabinet of Vice Minister, Ministry of Finance, Timor-Leste.

Orsamento Geral do Estadu (OGE), 2018, 'Orsamento Geral de Estadu (general state budget)', *Ministry of Finance,* Dili, Timor-Leste.

Parker, J, 2010, Theory of consumption and saving. *Economics 314 coursebook.*

Radulescu, M, Serbanescu, L and Sinisi, CI, 2019, 'Consumption vs investments for stimulating economic growth and employment in the CEE countries – a panel analysis', *Economic Research-Ekonomska Istraživanja*, vol. 32, no. 1, pp. 2329-53. Available at: https://www.tandfonline.com/doi/full/10.1080/1331677X.2019.1642789

Renzaho, AMN and Mellor, D, 2010, 'Food security measurement in cultural pluralism: Missing the point or conceptual misunderstanding?' *Nutrition*, vol. 26, pp. 1-9.

Rose, M, 2019, 'Remittances and diversification in Timor-Leste', DevPolicy Blog. Available at: https://devpolicy.org/remittances-and-diversification-in-timor-leste-20191106/

Secretaria de Estado da Formação Professional e Emprego (SEFOPE), Ministry of Finance (MoF), Direccao Geral de Estatica (DGE), and International Labour Organization (ILO), 2017, *Summary of Timor-Leste Labour Force Survey 2010, 2013, 2016*, SEFOPE, MoF and ILO, Timor-Leste. Available at: http://www.statistics.gov.tl/wp-content/uploads/2019/10/summary-LFS-english.pdf

Strategic Development Plan (SDP), 2010, *Timor-Leste Strategic Development Plan 2011-2030*, Dili, Timor-Leste.

The World Bank, 2018, *Timor-Leste Economic Report: Lower Public Spending Leads to Slower Growth*, The World Bank. Available at: https://www.worldbank.org/en/country/timor-leste/publication/march-2018-timor-leste-economic-report

Wei, WWS, 2006, *Time series analysis*, Second Edition, Pearson.

Notes

1. Petroleum fund is a revenue that government received in form of royalty and tax from international companies that explore oil and gas in Timor Sea. It is also an account of Ministry of Finance held in Banco Central de Timor-Leste (BCTL), which is appointed as operational manager of the fund (MoF, 2018). The amount received varies, depending on volume of exploration and oil price in the global market. And to control over withdrawing, government is only allowed to withdraw 3% of estimated sustainable income (ESI) which depends on real investment return to fund its spending, but practically some of the government budget deficit is also financed through this fund by withdrawing additional fund beyond the 3% of the ESI.

2. Domestic revenue comes from tax on commodity, income, service and other tax revenue.

3. Public investment refers to investment performed by government while private investment is performed by private citizens, whether individually or as a group.

4. https://repository.up.ac.za/bitstream/handle/2263/23964/02chapter2.pdf

5. Food security exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life [(World Food Summit (WFS), 1996 in Renzaho and Mellor, 2010)].

Annexures

Annexure 1. Optimal length of lag

Sample:	2003q4	–	2019q3			Number of obs = 60		
Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
				a.	Household consumption			
0	-263.639				0.005328	8.95465	9.02292	9.12918
1	183.863	895.01	25	0.000	4.10E–09	–5.12878	–4.71917	–4.0816
2	276.936	186.15*	25	0.000	4.3e–10*	–7.3979*	–6.6469*	–5.4781*
3	293.192	32.511	25	0.144	6.00E–10	–7.10639	–6.0141	–4.31393
4	310.28	34.177	25	0.104	8.60E–10	–6.84266	–5.40904	–3.17756
				b.	Public consumption			
0	–50.5746				4.40E–06	1.85249	1.92076	2.02702
1	374.278	849.7	25	0.000	7.20E–12	–11.4759	–11.0663	–10.4288
2	462.502	176.45*	25	0.000	8.9e–13*	–13.583*	–12.832*	–11.664*
3	472.766	20.528	25	0.719	1.50E–12	–13.0922	–11.9999	–10.2997
4	480.829	16.126	25	0.911	2.90E–12	–12.5276	–11.094	–8.86253
				c.	Sectoral household consumption			
0	–1485.2				9.40E+12	49.7401	49.8357	49.9845
1	–908.981	1152.4	49	0.000	222364	32.166	32.9306	34.1208
2	–799.771	218.42	49	0.000	31878.1*	30.159*	31.5927*	33.8241*
3	–771.381	56.779	49	0.208	75471.1	30.846	32.9487	36.2215
4	–726.574	89.615*	49	0.000	125058	30.9858	33.7575	38.0717
				d.	Household food consumption			
0	–700.597				11277.1	23.5199	23.5882	23.6944
1	–229.684	941.83	25	0.000	0.003966	8.65613	9.06574	9.7033
2	–142.363	174.64*	25	0.000	.000506*	6.57877*	7.32972*	8.49859*
3	–128.698	27.331	25	0.340	0.000772	6.95659	8.04888	9.74905
4	–117.979	21.438	25	0.668	0.001357	7.43263	8.86625	11.0977
				e.	Sectoral household food consumption			
0	–1131.41				7.10E+07	37.9471	38.0427	38.1915
1	–567.2	1128.4	49	0.000	2.50768	20.7733	21.5379	22.728*
2	–484.482	165.44	49	0.000	.869392*	19.6494*	21.083*	23.3145
3	–450.335	68.293	49	0.036	1.69889	20.1445	22.2472	25.52
4	–391.982	116.71*	49	0.000	1.79226	19.8327	22.6044	26.9186
				f.	Household non–food consumption			
0	28.4919				3.10E–07	–0.78306	–0.7148	–0.60853
1	531.818	1006.7	25	0.000	3.80E–14	–16.7273	–16.3176	–15.6801
2	624.869	186.1*	25	0.000	4.0e–15*	–18.996*	–18.245*	–17.076*
3	640.134	30.53	25	0.205	5.70E–15	–18.6711	–17.5789	–15.8787
4	652.166	24.063	25	0.516	9.60E–15	–18.2389	–16.8052	–14.5738
				g.	Sectoral household non–food consumption			
0	–1118.66				4.70E+07	37.5219	37.6175	37.7662
1	–544.089	1149.1	49	0.000	1.16067	20.003	20.7676	21.9577*
2	–460.578	167.02	49	0.000	.391894*	18.8526	20.2862*	22.5177
3	–428.442	64.272	49	0.070	0.818883	19.4147	21.5174	24.7902
4	–359.686	137.51*	49	0.000	0.610761	18.7562*	21.5279	25.8421

Annexure 2. Breusch–Godfrey LM test of Autocorrelation

Lags(p)	Chi2	df	Prob>chi2
a. Household consumption (HCE)			
2	0.576	2	0.7498
b. Public consumption (PCE)			
2	1.854	2	0.3957
c. Sectoral household consumption (HCE)			
2	10.209	2	0.0061
d. Household food consumption (HFC)			
2	2.434	2	0.2962
e. Sectoral household food consumption (HFC)			
2	5.143	2	0.0764
f. Household non–food consumption			
2	0.328	2	0.8486
g. Sectoral household non–food consumption (HNFC)			
4	4.794	4	0.3091

Except sectoral government expenditure on HCE and HFC, all models had no issue with serial correlation

## Annexure 3. White's test of homoscedasticity

a. Household consumption (HCE)	
Chi2(61)	62
Prob > chi2	0.4402
b. Public consumption (PCE)	
Chi2(61)	62
Prob > chi2	0.4402
c. Sectoral household consumption (HCE)	
Chi2(61)	62
Prob > chi2	0.4402
d. Household food consumption (HFC)	
Chi2(44)	48.24
Prob > chi2	0.3054
e. Sectoral household Food consumption (HFC)	
Chi2(61)	62
Prob > chi2	0.4402
f. Household non–food consumption (HNFC)	
Chi2(61)	62
Prob > chi2	0.4402
g. Sectoral household non–food consumption (HNFC)	
Chi2(61)	62
Prob > chi2	0.4402

All are homoscedasticity, therefore, accept the null hypothesis. There were no issues with heteroscedasticity.
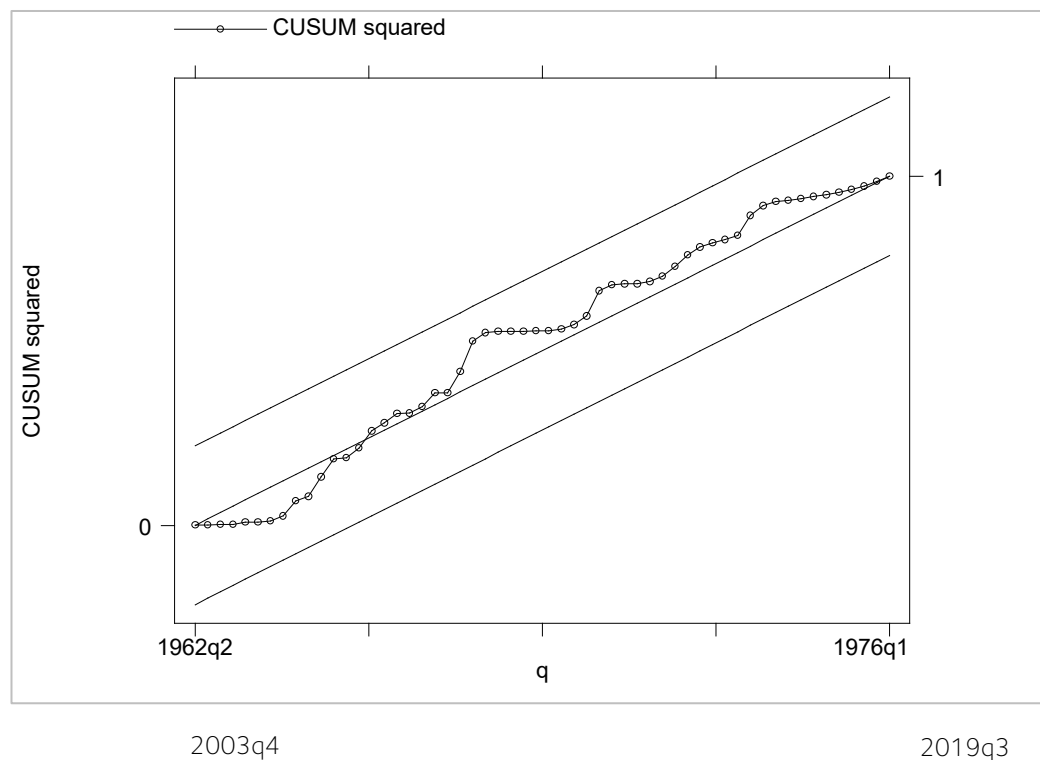
Annexure 4. Cusum square test of model stability on household consumption
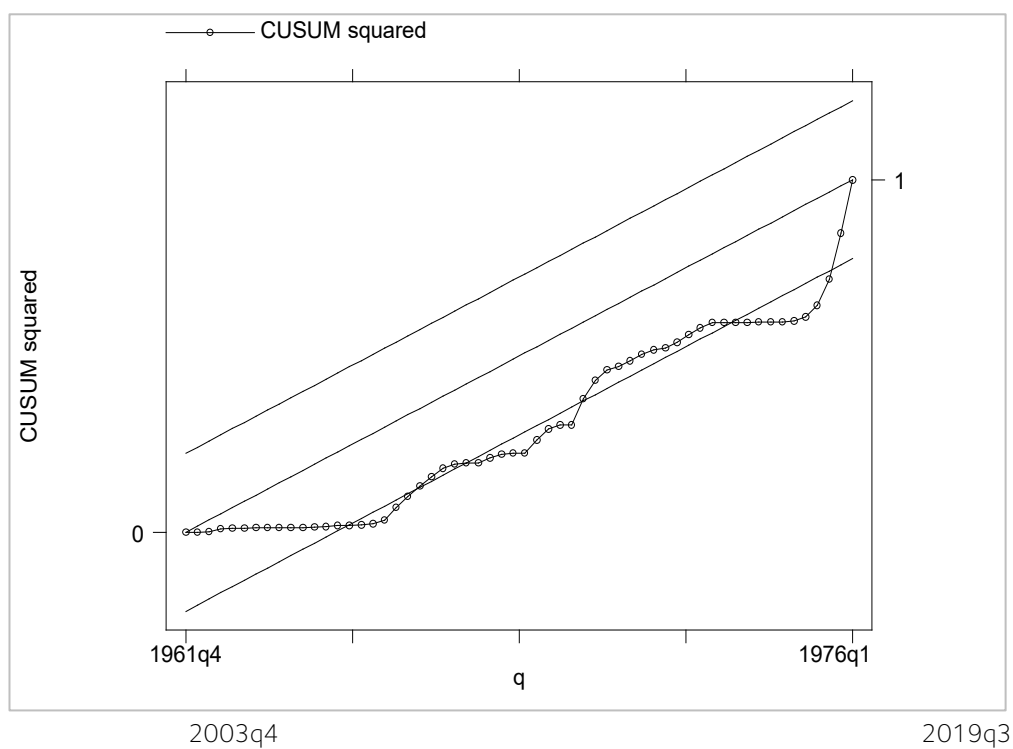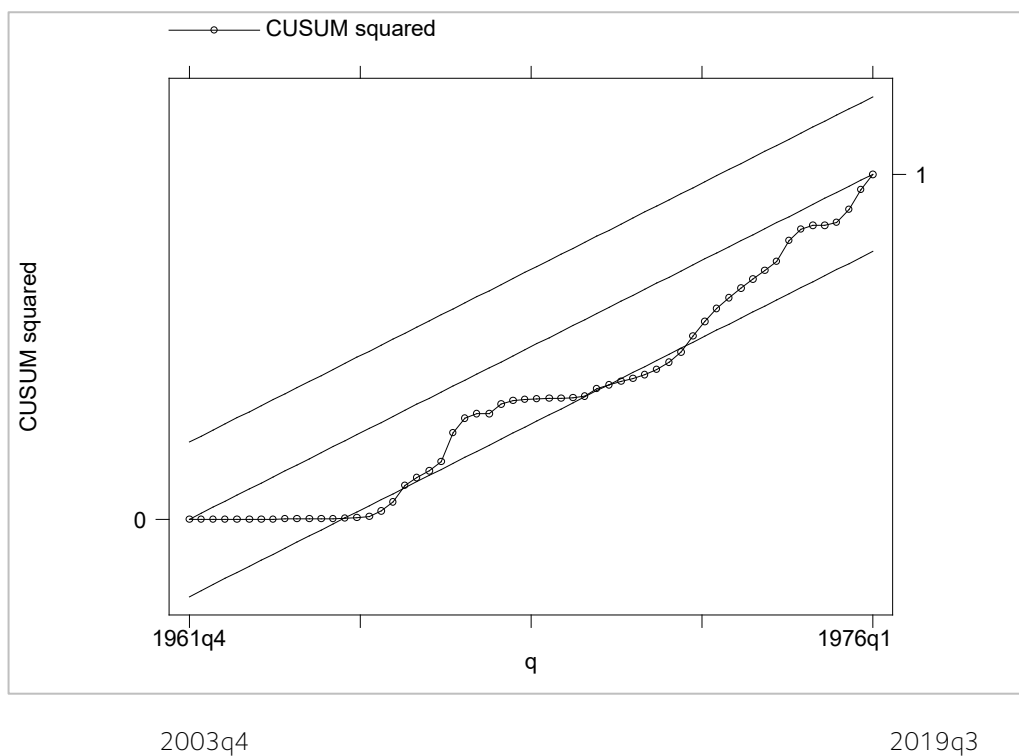

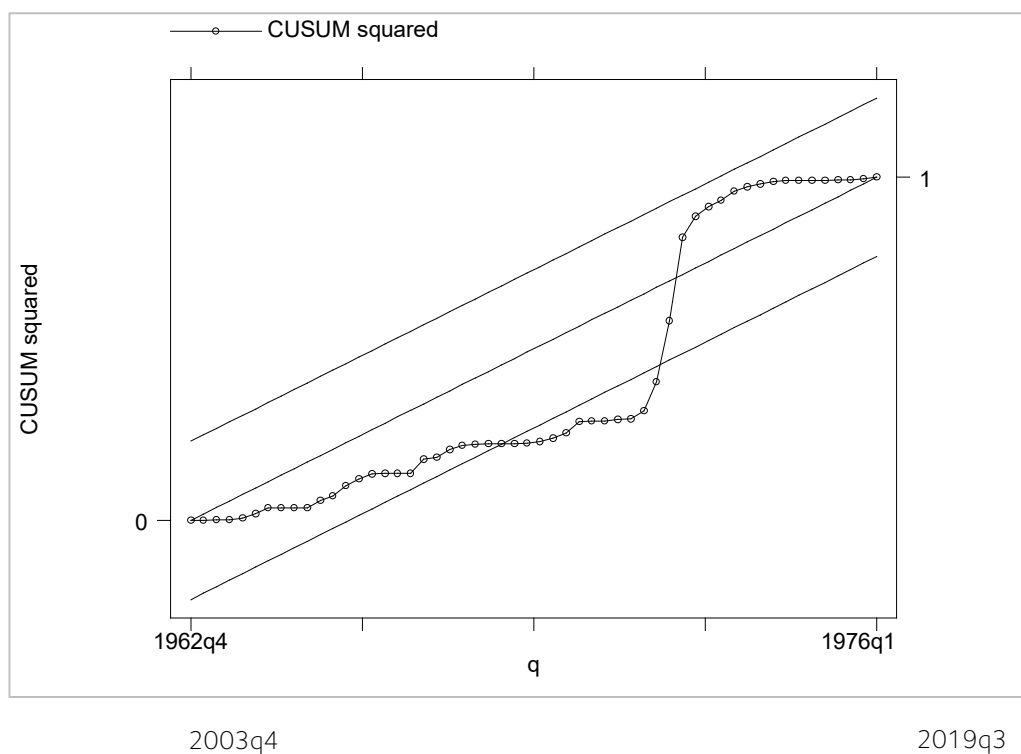## Annexure 5. Cusum square test of model stability on public consumption
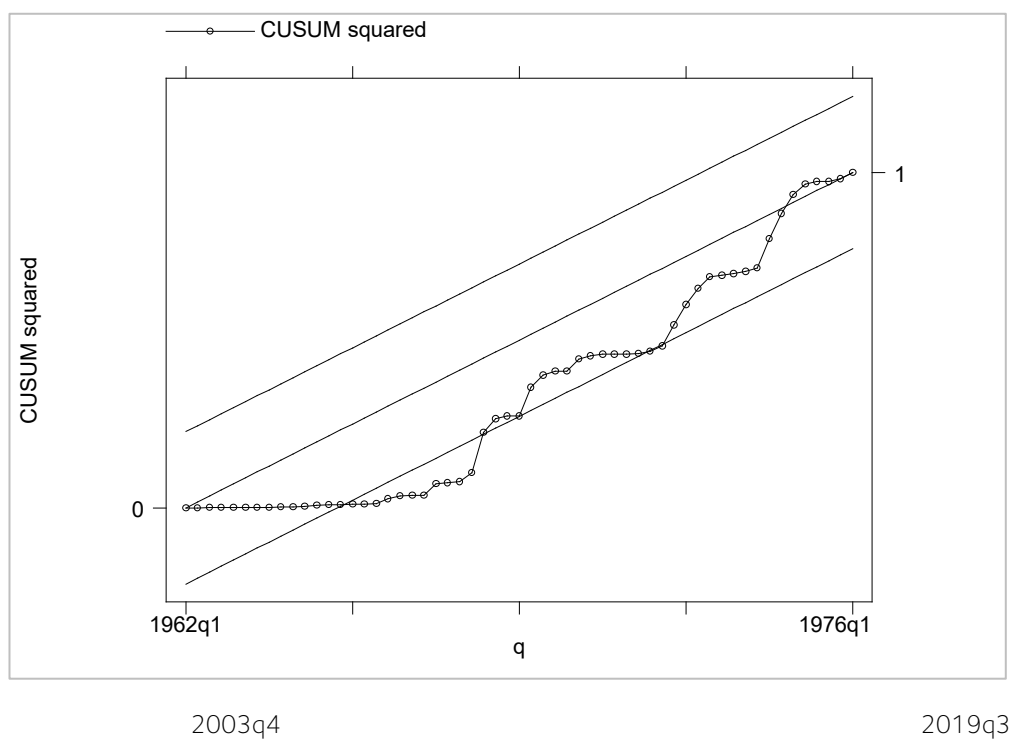
Annexure 6. Cusum square test of model stability on sectoral household consumption
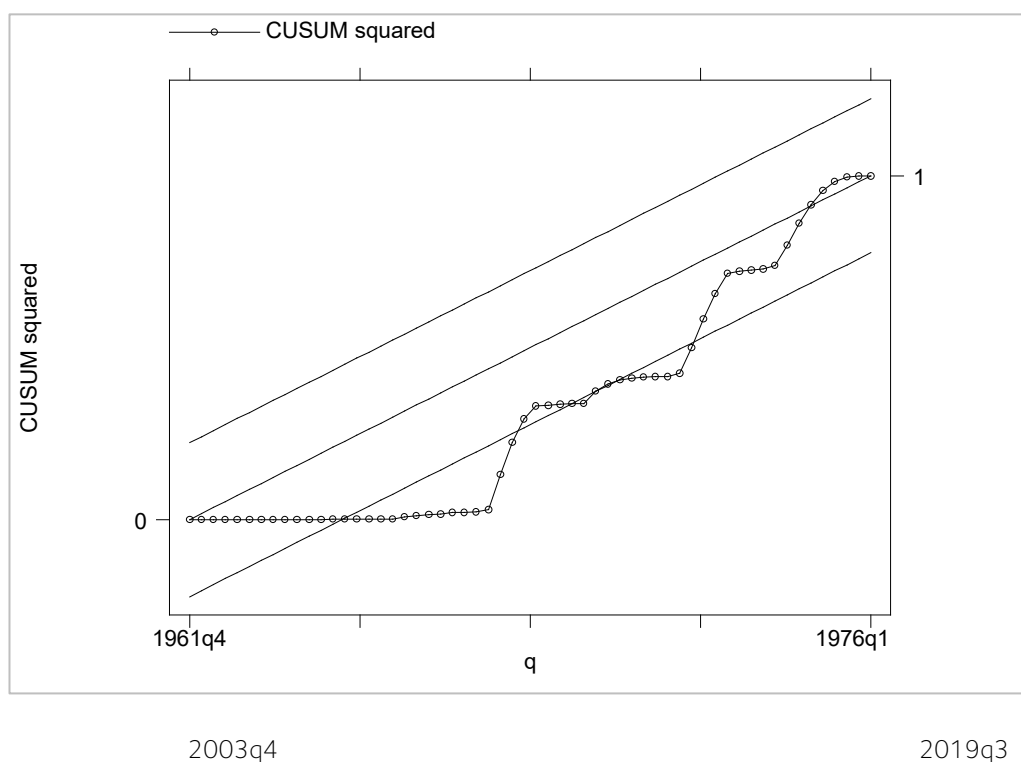

2003q4   2019q3

Annexure 7. Cusum square test of model stability on household food consumption

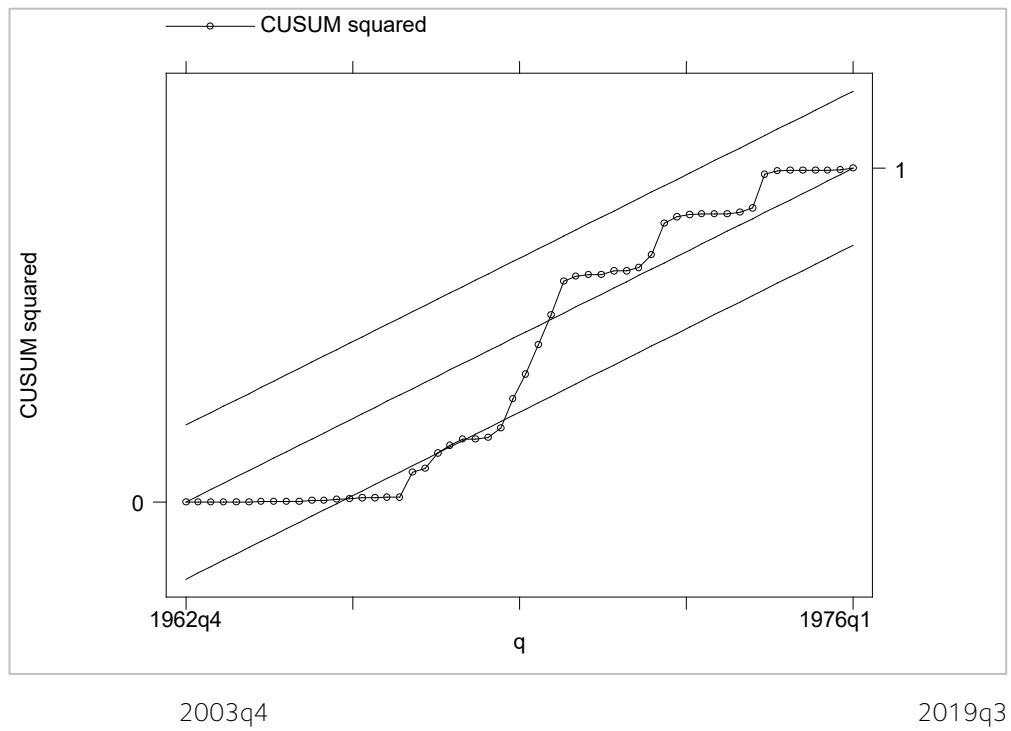2003q4   2019q3

Annexure 8. Cusum square test of model stability on sectoral household food consumption

Annexure 9. Cusum square test of model stability on household non-food consumption

Annexure 10. Cusum square test of model stability on sectoral household non-food consumption

griffith.edu.au/asia-institute

GRIFFITH ASIA INSTITUTE

griffith.edu.au/asia-institute