Causal Links between Aggregate Consumption and Key Macro-Economic Variables: An Empirical Investigation from Sri Lanka

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ABSTRACT

The study of aggregate consumption behaviour is significant because potential changes in the parameters of the consumption function may have some important policy implications. However, only a few studies are available in the estimation of aggregate consumption function after incorporating the impacts of fiscal policies for developing countries using time series data. This paper estimates the aggregate consumption function for Sri Lanka using time series data from 1978 to 2019 as there have been no studies relating to the issue in the country. The aggregate income (after adjusting tax), public expenditure, public debt, transfer expenditure and exchange rate have been used as explanatory variables in the model. The long-run marginal propensity to consume (MPC) is found to be 0.30 while short-run MPC is 0.71. Accordingly, the estimated short-run MPC is greater than the long-run MPC. The short and long-run coefficients of income indicate that any potential future income increases would result in significant increases in the consumption expenditure. The Granger-causality results detect uni-directional causality towards income to consumption. The results of this study can be used to make reformulate policies related to aggregate consumption behaviour in Sri Lanka.

KEYWORDS: Consumption, Fiscal policy, Income, Sri Lanka

Introduction

Macroeconomic research on the aggregate consumption function begins with the publication of Keynes's (1936) principle that consumption (expenditure) as a stable, not necessarily linear, function of disposable income. Difference between Keynes's above argument and results of subsequent empirical data analyses has led to a number of other theories of consumption. Therefore, familiarity with modern consumption research requires an understanding of four fundamental models viz Keynes's (1936) absolute income hypothesis (AIH), Duesenberry (1948) Relative Income Hypothesis (RIH), Friedman's (1957) permanent income hypothesis (PIH), and Modigliani's (1986) life-cycle hypothesis (LCH) and their theoretical as well as empirical developments. Some of the important theoretical developments in this area include the Barro's equivalence hypothesis (1974), Lucas' critique (1976), Hall's random walk hypothesis (1978) as well as flexible approaches by Giovannini (1985). Modern consumption research is based to varying degrees on at least one of these approaches.

Keynes argued that any change in income results in a smaller change in consumption implying that the marginal propensity to consume is less than the average propensity to consume (Muellbauer, 1994). Short-run studies broadly support a consumption function of this form, however, long-run data suggest that the average and the marginal propensities to consume are roughly the same. Relative Income Hypothesis (RIH) that was developed by Duesenberry (1948) conceives consumption in relation to the income of other households and past income. Accordingly, an individual is less concerned with the absolute level of consumption than by relative levels. The percentage of income consumed by an individual depends on his percentile position within the income distribution (Duesenberry, 1948). It also hypothesizes that that present consumption is not influenced merely by present levels of absolute and relative income, but also by levels of consumption attained in the previous period (Muellbauer and Lattimore, 1995). It is difficult for a family to reduce the level of consumption once attained. The aggregate ratio of consumption to income is assumed to depend on the level of present income relative to past income. This implies that households find it easier to adjust to rising incomes than falling incomes. There is, in other words, a "ratchet effect" that holds up consumption when income declines (Mehra, 2001).

Milton Friedman (1956) proposed his permanent income hypothesis which maintains that households spend a fixed fraction of their permanent income[1] on consumption. At the theoretical level, its construct of permanent income introduced income expectations, thereby adding a sensible forward-looking dimension to consumption theory (Jappelli and Pistaferri, 2010). At the same time, Modigliani and Brumberg (1980) were developing their lifecycle model. According to lifecycle theory, individuals choose a lifetime pattern of consumption that maximizes their lifetime utility subject to their lifetime budget constraint. The lifecycle approach makes at least four important contributions to the consumption theory (Jappelli and Pistaferri, 2010). Firstly, it introduces the utility maximization approach into consumption theory. Secondly, the lifecycle consumption theory includes lifetime income expectations in the lifetime budget constraint. Thirdly, the constrained utility maximization framework introduces credit markets and borrowing and lending. Fourthly, this also introduces the effects of interest rates and time preference on consumption. In addition to this, lifecycle theory incorporates a sociological dimension into consumption behaviour, explicitly recognizing that consumption expenditures may vary by stage of life (Muellbauer and Lattimore, 1995). At the empirical level, this is confirmed by evidence that population age distribution affects aggregate consumption (Fair and Dominguez, 1991).

According to Lucas (1976), under rational expectations agents should only perceive a structural relationship between permanent income and consumption. This study argued that there was no reason to expect a stable relation between current and permanent income because changes elsewhere in the economy could alter the optimal way consumers make inferences about permanent income from observed income.

[1] Permanent income is defined as the annuity value of lifetime income and wealth.

Hall (1978) addresses Lucas' critique for consumption and solves the time series problem of non-stationarity. He argues that the structural relationship for consumption does not originate from the relationship between current consumption and current income but from the ordering of intertemporal preferences. He develops the idea of random walk hypothesis (RWH) which indicates that the consumption follows a random walk. Zuehlke and Payne (1989) clearly demonstrate that in developing countries, the RWH is questioned for its validity due to lack of efficient credit markets and information flows. They justify the estimations of current consumption based on the PIH for developing countries.

Although the permanent-income hypothesis has contributed to developing the consumption-based research, a series of influential papers published after its inception revealed some notable discrepancies between theoretical and empirical work. As a result, more theoretical as well as empirical work in this area, has been growing than before in order to understand the difference between the theoretical development and empirical work. One of such contributions to consumer theory is called buffer-stock model, pioneered by the work of Deaton (1991), Carroll (1992) and Kaplan et al. (2014) which modifies the PIH to allow for precautionary saving motives, impatience, and restrictions on borrowing[2]. However, several authors have argued that the buffer-stock paradigm provides a good description of the median consumer's behaviour (Feldstein 1996; Jappelli and Pistaferri, 2010). Meanwhile, some authors including Mehra (2001) explains why consumption appears to be too smooth at high frequencies of the macroeconomic variables while attempting to explain durable consumption behaviour at both the micro and macro levels.

Consumer expenditure accounts between 60 to 85 per cent of spending in most developing economies. It has also been one of the most studied concepts of the aggregate expenditure and a key element of all the macro-econometric models (Garcia and Ramajo, 2005). Consumption spending is a major component of aggregate demand in Sri Lanka as well. The average private consumption expenditure in Sri Lanka was 86 % of GDP between 1978 and 1990 while it has decreased to 83 % between 1991 and 2000. Its average remained at the same level between 2001 and 2010. However, it has further decreased to 76 % between 2011 and 2019. The share of consumption to GDP decreased during this period due to the fluctuations in the saving rate and, in turn, the saving/investment balance. Furthermore, in general, the Keynesian macroeconomic model implies that changes in the consumption expenditures have significant impacts on economic growth by affecting total expenditures. Therefore, policymakers should determine and apply appropriate policies to maintain these variables.

[2] The literature normally considers two scenarios: one where consumers may face high borrowing costs (soft liquidity constraints) and another one where consumers are not allowed to borrow at all (hard liquidity constraints). Both scenarios lead to lower consumption compared to REPI if agents have low resources at their disposal. Current income has as a result a much more important role determining consumption behaviour than future income.

However, as there have not been any studies in this area in Sri Lanka, policy-makers have been deprived of a proper knowledge with regard to aggregate consumer behaviour to make sound policy decisions in the country. Given this background, it is worthwhile to study the behaviour of the aggregate consumption function in Sri Lanka that has never been studied before.

The rest of the paper is organized as follows. Section two briefly explains the issues and objective of this study while section three focuses on the literature survey. Then theoretical model as well as empirical models are explained in section four. Empirical findings are reported in section five. Section six summarizes the paper while concluding the results.

The Issue and Objectives

Modelling consumption successfully is an important requirement for successful policy-making. There are two types of studies available in the literature to investigate the behaviour of aggregate consumption functions. Some of them are empirical studies while others are simulations. Empirical studies are based on three types of data sets namely time-series, cross-sectional and panel data analyses. While most of these studies estimate the consumption function in developed countries, studies focusing on the aggregate consumption function in developing countries are limited. Specially to the best of my knowledge, no studies have been found in estimating aggregate consumption function using recent time-series data in Sri Lanka. Therefore, this study attempts to estimate the aggregate consumption function for Sri Lanka using time series data from 1978 to 2019. The main objective of the study is to identify the causal links between aggregate consumption and key macro-economic variables in the country. Results of the study would help in understanding the short run as well as the long-run relationship between consumption and income in the country.

Literature Review

Major studies of aggregate consumption for developed and developing countries have made substantial contributions to the literature. Wright (1967) and Heien (1972) estimated a negative and significant relationship between the interest rate and consumption expenditure. In contrast, Weber (1970) reported a positive and significant effect of the interest rate on consumption. Feldstein and George (1973) estimated the consumption function by adding social security in the USA. Accordingly, social security provision has resulted in reducing personal saving of US citizens by 30 % to 50 %. Munell (1974) looks at the same issue with endogenous retirement age and finds that a negative effect of benefits on saving is cancelled out by a positive effect of early retirement. Hall (1978) indicates that consumption expenditure follows a random walk, which implies that only unexpected policy changes can affect consumption. Darby (1979) uses the money supply and relative price of durable goods in his regression and finds a negative effect in most cases.

Flavin (1981) quantifies the revision in permanent income while Davidson and Hendry (1981) questioned the validity of Hall's model for the United Kingdom data.

Carlino (1982) rejected the hypothesis that variations in the real interest rate altered consumption decisions while Leimer and Lesnoy (1982) find that the effect of social security is insignificant when they use different methods for the formation of expectations in the perception of benefits. Meanwhile, Heller and Starr (1979), Falvin (1981), Hall (1978), and Campbell and Mankiw (1989) present empirical findings that suggest the rational expectation permanent income hypothesis does not hold because consumption displays an excess dependence on current income. Flavin (1981) generally specify the permanent income model with variables in levels and then remove a deterministic time trend from the data to achieve stationarity of the variables. Chan (1983), Blanchard (1985), Barsky et al. (1986), and Feldstein (1988) show how Ricardian equivalence might not hold. Giovannini (1985) estimated the response of expected rate of growth of aggregate consumption to the expected real interest rate. Campbell and Mankiw (1989) estimated an insignificant effect of the real interest rate on consumption. Chow (1985) found that for China, the rational expectations-permanent income hypothesis could not be rejected while Zuehlke and Payne (1989) find the complete opposite results for the eight developing countries. Zuehlke and Payne (1989) argue that in developing countries the random walk hypothesis is questioned for its validity due to lack of efficient credit markets and information flows.

Several empirical studies by Bovenberg (1988), Laumas (1989), Knot and De Haan (1995), and Reinhart and Sack (2000) have provided evidence in line with the rationale of the Keynesian proposition. On the other hand, other authors such as Barro (1989), Darrat (1990), Deaton (1991), and Muellbauer (1994), support the Ricardian equivalence that government deficits have no impact on key macroeconomic variables. Seater and Mariano (1985), Aschauer (1988), and Barro (1989) present surveys of empirical consumption studies. The results of these studies are mixed with respect to Ricardian equivalence. Results are sensitive to the sample period and variables included, and the tests may have low power. Feltenstein et al. (1990) reported that for China's aggregate consumption, the real interest rate was negative and significant if the virtual price was employed. Pourgerarni and Ghouri (1991) estimates the consumption function for Pakistan. They find that the permanent-income hypothesis or the random walk hypothesis was not affected by the expected inflation rate or the real interest rate. Carroll (1992) examined the sensitivity of the decomposition of permanent and transitory components and supported the traditional permanent-income hypothesis for Colombia. Muellbauer and Lattimore (1995) also indicated that credit constraints could offer a potential explanation of an error correction form of the consumption function. Browning (2001) review the literature on saving using many consumption models. Parker (1999) considers different theories of consumption that may explain why the saving ratio was low in the late 1990s in the US. Attanasio and Martin (1995) considers the impact that interest rates have on consumption under a variety of models.

Carroll (2001) reviews the main workings of the buffer stock model. Blake (2004) uses error correction models and finds that state pensions have a strong saving replacement effect in the UK.

Garcia and Ramajo (2005) analyse whether the Ricardian equivalence hypothesis is a valid approximation for Spain's economic reality or whether there exist deviations from that situation which would be more in line with the conventional Keynesian perspective of the effects of debt on private consumption savings decisions. Dvornak and Kohler (2007) investigates whether or not the public social security system affects consumption in a developing country by using a time series aggregate consumption model based on the life cycle hypothesis. The result shows that its effect on consumption is positive and robust. Li and Chen (2014) reveal that the estimated short-run MPC is greater than the long run MPC. These estimates of the MPC are different from previous estimates for the Indian economy based on the conventional econometrics Jappelli and Pistafferi (2010) investigate that households with low cash on hand exhibit a much higher MPC than affluent households and the calculations of the aggregate effects of fiscal policy have no effect on general equilibrium. Alimi (2015) estimate the consumption function of Nigeria and South Africa under the Permanent Income Hypothesis using a time series data on final household consumption expenditure, real GDP and real interest rate. The results support the existing of a long-run relationship between consumption and income for the two countries. Attanasio and Pistaferri (2016) estimate the sensitivity of aggregate consumption to predictable changes in aggregate income. Gahtany et al. (2020) estimated the micro-founded life cycle model for Saudi Arabia. The analysis revealed significant differences in consumers' intertemporal optimizing behaviour, highlighting quantitative differences in short-run and long-run responses.

According to the above review of literature, it is evident that various studies have concentrated on different aspects of consumption functions in developing as well as developed countries. The findings of those studies indicate that support for Ricardian equivalence is mixed and also find very little support for the Keynesian specification of consumption and fiscal policy. Furthermore, studies on estimating aggregate consumption function in Sri Lanka is not available. This paper attempts to examine aggregate consumption function and its determinants in Sri Lanka.

Methodology

According to John Maynard Keynes consumption (C) became a function of mainly to aggregate disposable income, *Y*, defined as income less taxes and transfer payments. This relationship has been called the Absolute Income Hypothesis (AIH). A linear form of the AIH is obtained by expanding the implicit relationship between consumption and income by the Taylor series while ignoring the nonlinear terms. The intercept of the line captures autonomous consumption that is any consumption that is not induced by income. The slope of the line, $0 < \partial c / \partial y < 1$, is the Marginal Propensity to Consume (MPC) and on average, the amount of an additional income that is consumed in a community. The Keynesian model uses the MPC to estimate a multiplier that predicts how a change in investment will boost GDP. The Keynesian hypothesis mainly implies that consumption is a function of disposable income while the Ricardian hypothesis is that consumption depends on income minus government spending. Accordingly, the basic model that we are going to use in this study is as follows.

$$C_t = \beta_0 + \beta_1 Y_t + \beta_3 GE_t + \beta_4 PD_t + \beta_5 TR_t + \beta_6 ER_t + U_t \quad [1]$$

C : Consumption expenditure (Rs.)
Y : Aggregate income after adjusting to tax (Rs.)
GE : Government expenditure (Rs.)
PD : Public debt (Rs.)
TR : Transfer expenditure (Rs.)
ER : Exchange rate

Where *t* stands for the time period while *U* is the error term. This study uses co-integration and the error correction method developed by Engle and Granger (1987) to capture the long-run as well as the short-run relationship among the relevant variables. As the first step of the estimation process, the Augmented Dickey-Fuller (ADF) tests and Phillips-Perron test were employed to examine the time-series properties of the data series. In these tests, the decision to include intercept and/or trend terms depends on the nature of the data (Dickey and Fuller 1979). The second step in the method involves testing the cointegration rank. We form a Vector Autoregressive Regression (VAR) system. This step involves testing for the appropriate lag length of the system, including residual diagnostic tests. The approach is based on the following n-lag vector autoregressive (VAR) model.

$$X_t = \mu + \pi_1 X_{t-1} + \cdots + \pi_k X_{t-n} + U_t \quad [2]$$

Where X_t is a vector of non-stationary $(N \times 1)$ with *I (1)* variables; μ is a vector of constant terms $(N \times 1)$; $\pi_1, \ldots \pi_k$, are coefficient matrices $(N \times N)$ and U_t is the vector of error terms $(N \times 1)$. We specify the VAR as a six-variable system with a maximum of two lags. The procedure employed here to identify the appropriate lag length includes the Akaike Information Criterion (AIC) and Schwartz's Criterion (SC)[3]. The presence of distinct cointegrating vectors can be obtained by determining the significance of the characteristic roots of π.

The procedure developed by Johansen (1992) was used to investigate the cointegrating relationship between the integrated series. The Johansen trace test, as well as the eigenvalue test, was used to determine the significance of the number of characteristic roots that are not different from unity. The adjustments to disequilibrium are captured over *n* lagged periods in the coefficient matrix Γ_i. This part of the Error Correction Model (ECM) represents a traditional vector autoregression of the differenced variables. For this analysis, the ECM and cointegrating relationship allow us to compare the immediate and overall effects.

[3] Akaike (1973) Information Criterion (AIC); AIC(p) = Ln (e'e /T)+ (2P/T).
Schwartz's criterion (SC); SC(p) = AIC(p) + (P/T) (lnT -2).
P = Number of Lags, T = Time, n = sample size, e'e = residual some of squares

In this way, the model will indicate the speed of adjustments. Next, we interpret the cointegrating relations and test for weak exogeneity. Based on these results a vector error correction model (VECM) of the endogenous variables is specified. Finally, granger causality tests were done to identify the direction of causality.

Results and Discussion

This section provides estimates of short and long-run electricity demand coefficients on a sample of Sri Lankan annual data covering the period, 1978-2019. This section also reports the results of the long-run causality test. As the first step in modelling the consumption function, descriptive statistics of the relevant variables were examined. Sri Lankan's statistical data on private consumption expenditures are not broken down into spending on consumer durables and non-durable goods and services. Therefore, aggregate private consumption is considered without differentiating between these two important categories. Table 1 shows the descriptive statistics of the data set used. Of all the variables used in the study, a higher variation is evident for aggregate income which is taken after adjusting to tax payment[4].

Table 1: Descriptive Statistics of the Data

Variable	Mean	Std. Dev.	Maximum	Minimum
Consumption expenditure (*C*)	2,665.90	3,492.08	1,181.770	36.13
Aggregate income (*Y*)	3,211.77	4,346.90	14,398.41	32.68
Government expenditure (*GE*)	697.79	855.09	2,915.29	17.68
Public debt (*PD*)	2,746.16	3,587.71	13,031.54	30.95
Transfer expenditure (*TR*)	231.50	324.70	1,117.20	34.20
Exchange rate (*ER*)	78.20	48.06	182.75	15.45

Note: Except for the interest rate, all other variables are given 000 mn. The exchange rate is the value of Sri Lankan rupees with respected to USD

In order to identify the existing trend each series were graphed separately. Figure 1 shows the graphs of all these variables. Then formal tests for the order of integration were carried out on each variable. The results of the Augmented Dickey-Fuller and Phillips-Perron tests for each series within the sample period 1978– 2019 are reported in Table 2. These unit root tests were performed for both a form of model that contained only an intercept as well as one that contained a trend and an intercept. It must be noted that of the different forms of the unit root tests, it is important to select the form that coincides with the nature of the data (Dickey and Fuller, 1979). It is recommended by econometricians that if a variable has a zero mean, there is no need to include an intercept or a trend.

[4] Official series for disposable income is not available in Sri Lanka and therefore had to be constructed after adjusting for tax.

Given, no variables used in this analysis held this characteristic and showed no obvious graphical traits of this kind of form, a unit root test with no intercept and trend was tested.

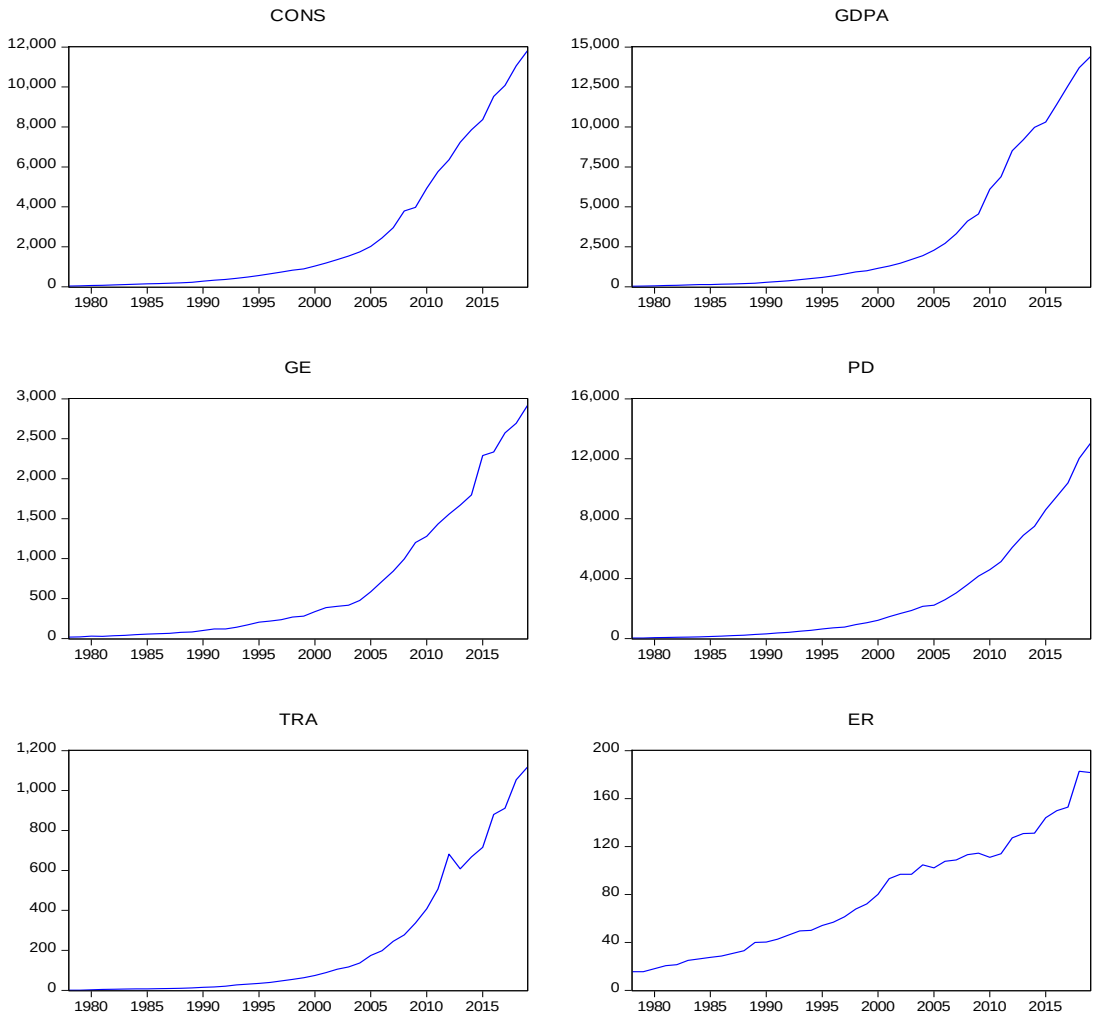

Figure 1: Graphs of Each Variable with Time

Note: CONS - Consumption, GDPA – Gross domestic product, GE - Government expenditure, PD - Public debt, TRA - Transfer expenditure, ER - Exchange rate

Under both forms of models tested, the original series (level data) are non-stationary as the calculated test statistics fail to reject the null hypothesis of a unit root in the series. Their first differences, however, are stationary. The results in Table 2 show that all variables in the first-differenced data are integrated in order one but the first-differenced data are stationary. According to Engle and Granger (1987), if two series are integrated in order one *I(1)*, we can conduct tests for cointegration.

The implication is that it is possible to have a co-integrating vector whose coefficients can directly be interpreted as long-term equilibrium. Therefore, in the next step, a Johansen trace test is used to check whether there is a cointegrating relationship. The results of the trace test and the maximum eigenvalue tests are reported in Table 3. It shows the number of cointegrating vectors.

Table 2: ADF and Phillips-Perron Tests of Unit Roots in Annual Data

Variables	ADF and PP tests for level data		ADF and PP tests in first-differenced data	
	ADF Test Statistics	Phillips-Perron Test Statistics	ADF Test Statistics	Phillips-Perron Test Statistics
C	-0.423(2)	2.216	-4.561(2)*	-3.873*
Y	-0.356(3)	-1.248	-6.234(3)*	-4.869*
GE	1.287(2)	1.226	-4.925(2)*	-4.135*
PD	1.342(2)	1.652	-8.432(2)*	-7.987*
TR	2.341(4)	2.438	-2.964(4)**	-3.883*
ER	1.053 (3)	1.782	-2.991(3)**	-3.651*

*Note: 99% and 95% critical values are -3.60 and 2.93 for all the variables. The SIC-based optimum lag lengths are in parentheses. Significant variables under 1% and 5 % are denoted by an * and an** respectively.*

Table 3: Cointegration Test Results

H_0	H_1	Trace Test			Maximum Eigenvalue Test	
		Eigenvalue	Statistic	Critical Value-95 %	Statistic	Critical Value-95%
$r = 0$	$r < 0$	0.983	120.123	107.346	64.474	43.419
$r < 1$	$r = 1$	0.955	86.649*	89.341	24.456	37.163*
$r < 2$	$r = 2$	0.639	62.192	65.245	20.854	30.815
$r < 3$	$r = 3$	0.267	21.338	35.010	12.435	24.252
$r < 4$	$r = 4$	0.173	8.902	18.397	7.631	17.147
$r < 5$	$r = 5$	0.031	1.271	3.841	1.271	3.841

Note: i. The Asterix (*) shows that the null hypothesis is not rejected at the 5% level of significance in the first instance
ii. SIC-based optimum lag lengths in the VECM are set at two

According to Table 3, we can easily reject the null hypothesis that no cointegration exists, but cannot reject the hypothesis of the existence of more than one stationary linear combinations. The first column gives the null hypothesis of more than N – r cointegrating vectors, against the alternative in column two. The results of both the trace and maximum eigenvalue tests are compared against the critical values reported by Osterwald-Lenum (1992). Both the trace test and maximum eigenvalue test decisively reject the null hypothesis of no cointegrating vectors ($r = 0$).

However, the tests are unable to reject the null that $r < 1$, suggesting the presence of a single cointegrating relation. This cointegrating relation can then be interpreted as determinants of the long-run consumption function.

After considering the linear combination of the existing cointergration vector, we obtain the results contained in Table 4. The results can be used to interpret the long-term equilibrium relationship among the variables for the period, 1978-2019.

Table 4: Long-Run Relationship between Demand for Electricity and Influencing Factors

Variables	Model
Constant	-158.235 (32.431)*
Y	0.337 (0.016)*
GE	0.686 (0.254)*
PD	0.252 (0.059)*
TR	0.246 (0.135)*
ER	-1270.428 (514.773)*

Note: Numbers in parentheses are standard errors of the estimated parameters. Asterix (*) denotes the significant variables at 5 % level of significance.

These values were normalized for *Y, GE, PD, TR* and *ER*. The estimators presented above indicate the long-run equilibrium relations between the variables. The results show that there exists a stable long-run relationship among the variables in the model. As expected, *Y, GE, PD* and *TR* play a significant role in influencing the aggregate consumption in the country. As expected, all variables have a significant influence on consumption and have the expected signs. A unit increase in income results in a 0.33 increase in consumption, ceteris paribus. A unit increase in the government expenditure increases the consumption by 0.68, ceteris paribus. Public debt and transfers have similar impacts on consumption while the exchange rate has negatively affected which is theoretically consistence.

In order to appropriately model the dynamic behaviour of aggregate consumption, we need to incorporate short-run adjustment factors along with the cointegrating equilibrium relationship. This is best done using the error-correction model technique introduced above. The error correction model provides a generalization of the partial adjustment model and permits the estimation of short-run impacts. Error correction models also are attractive as they incorporate information from economic theory about long-run equilibrium forces, while at the same time allowing for a flexible lag structure that permits the data to play a strong role in the specification of the models dynamic structure. Table 5 shows the estimates of the ECM.

The four most important equations in the error correction model are those containing ΔC, ΔY, ΔGR and ΔPD as dependent variables. These models contain significant error-correction terms. This term was obtained from the long-run relationship and expressed deviations in aggregate consumption from its long-run mean. This coefficient measures the speed of adjustment in current consumption to the previous disequilibrium value.

The error-correction term in the first equation is significant and has a coefficient of -0.15. This indicates that when consumption is above or below its equilibrium level, consumption adjusts by approximately 15% within the first year. This term is stable since the coefficient is statistically significant, negative and less than 1. Similar results could be found of the studies done by Muhamm and Masood (2011).

Table 5: Estimates of the Vector Error Correction Model

Variables	ΔC_t	ΔY_t	ΔGR_t	ΔPD_t
ΔC_{t-1}	0.304 (0.021)*	0.040 (0.241)	0.008 (0.114)	1.196 (0.121)*
ΔC_{t-2}	0.074 (0.02)*	0.088 (0.563)	0.065 (0.321)	1.211 (1.326)
ΔY_{t-1}	0.717 (0.021)*	0.019 (0.000)*	0.060 (0,001)*	-6.193 (2.313)*
ΔY_{t-2}	0.499 (0.001)*	0.279 (0.123)	0.515 (1.239)	11.033 (13.540)
ΔGE_{t-1}	0.487 (0.02)*	0.019 (0.211)*	0.356 (0.113)*	-0.821 (0.001)*
ΔGE_{t-2}	1.427 (1.23)	0.144 (0.431)	-0.156 (0.154)	-2.051 (2.971)
ΔPD_{t-1}	0.065 (0.023)*	-0.059 (0.001)*	0.129 (0.140)	0.103 (0.132)
ΔPD_{t-2}	-0.491 (0.251)	-0.046 (0.045)	0.288 (3.210)	0.173 (0.121)
ΔTR_{t-1}	4.199 (2.110)*	0.488 (0.543)	-2.426 (1.921)	2.775 (2.095)
ΔTR_{t-2}	0.351 (0.412)	0.153 (0.136)	-.2.255 (1.451)	1.379 (2.091)
ΔER_{t-1}	-39.374 (48.251)	5.748 (0.543)*	-48.995 (32.001)	50.698 (32.097)
ΔER_{t-2}	46.746 (29.218)	36.887 (29.342)	-12.026 (9.129)	08.681 (7.920)
U_{t-1}	-0.151 (0.429)*	-0.088 (0.023)*	0.459 (0.108)*	-0.614 (0.039)*

Notes: Numbers in parentheses are standard errors of the estimated parameters. The Asterix (*) denotes the significant variables at a 5 % level of significance. The optimum lag length using the SIC criterion was set at two.

The coefficient estimates of ECM provide interesting information on the dynamic properties of aggregate consumption expenditure. Most of the coefficients with respect to lags variables are significant in the first equation. Accordingly, current consumption is highly related (0.30) with the last year consumption and the impacts will be decreasing when coming to the second year lag variable (0.07). Both years lags impacts of income variable is significant implying that current consumption is not an independent of the previous year's income. These findings are largely in line with the studies in this area (Somadina and Kalu, 2012). Further, recently Abada (2016) found similar results in Nigeria. This equation also shows the importance of the immediate impacts of government expenditure, public debt and transfer expenditure on current consumption in the country.

Most of the lag variables in the second, third and fourth equations are not statistically significant. However, statistically, significant variables highlight the short-term impact of each variable that can have on *Y, GR* and *PD*. The error-correction terms of all these equations are significant and have coefficients between -0.1 and -0.03, a very low value. The results of the study were compared with some other studies conducted in this area and found that the results are consistent with most of the studies in this area (Rohn, 2010; Muhamm and Masood, 2011). One of the interesting features of the VAR model is that it allows us to test for the direction of causality.

The causality in the long-run exists only when the coefficient of the cointergration vector is statistically significant and different from zero (Granger and Lin, 1995). In this analysis, the long-run Granger causality test is also used. It involves variable deletion (F-type) tests for the coefficient of the cointergrating vector. The results of the Granger causality test are reported in Table 6.

The results shown in Table 6 suggest two-way causality. For example, row one suggests the aggregate income causes aggregate consumption to increase, while row two suggests aggregate consumption does not cause aggregate income to increase as it is not significant.

Table 6: Granger Type Causality

Direction	*F* - Value	Critical Value
Y does not Granger Cause *C*	5.858*	0.0064
C does not Granger Cause *Y*	2.083	0.1396
GE does not Granger Cause *C*	20.028*	0.000002
C does not Granger Cause *GE*	5.467*	0.0086
PD does not Granger Cause *C*	1.300	0.2852
C does not Granger Cause *PD*	2.733**	0.0788
TR does not Granger Cause *C*	1.444	0.2496
C does not Granger Cause *TR*	15.241*	0.00002
ER does not Granger Cause *C*	6.339*	0.004
C does not Granger Cause *ER*	5.413*	0.008
GE does not Granger Cause *Y*	7.270*	0.002
Y does not Granger Cause *GE*	1.432	0.252
PD does not Granger Cause *Y*	0.013	0.986
Y does not Granger Cause *PD*	3.931*	0.028
TR does not Granger Cause *Y*	3.294*	0.048
Y does not Granger Cause *TR*	4.652*	0.016
ER does not Granger Cause *Y*	5.146*	0.011
Y does not Granger Cause *ER*	1.833	0.174
PD does not Granger Cause *GE*	1.429	0.253
GE does not Granger Cause *PD*	5.126*	0.011
TR does not Granger Cause *GE*	0.562	0.575
GE does not Granger Cause *TR*	20.423	0.000001
ER does not Granger Cause *GE*	4.824*	0.014
GE does not Granger Cause *ER*	1.692	0.198
TR does not Granger Cause *PD*	0.752	0.478
PD does not Granger Cause *TR*	4.588*	0.017
ER does not Granger Cause *PD*	2.224	0.123
PD does not Granger Cause *ER*	8.018*	0.001
ER does not Granger Cause *TR*	2.523**	0.094
TR does not Granger Cause *ER*	2.089	0.138

Notes: F-values are calculated by using different sets of variables. Critical values are different due to the different lag lengths. Asterix (and **) denotes rejection of null hypothesis at less than 5% and 10 % level of significance respectively.*

The GE results detect bi-directional causality between aggregate consumption and government expenditure consumption suggesting that these two variables are jointly determined. However, one-way causality flowing from public debt to aggregate consumption was found. The causality related to other variables can also be interpreted in the same way.

Conclusion and Policy Implications

Aggregate consumption spending as a percentage of GDP in Sri Lanka has been decreasing from 84 % in 1978 to 78 % in 2019. This type of changes in consumption affects national income, necessitating continued reliance on other finance sources to domestic investment. Given fluctuations of main macro-level variables related to the consumption in the country, it is important to study the behaviour of private consumption using available data for Sri Lanka that has never been studied for this purpose before. This paper examined the causal links between aggregate consumption expenditure and its determinants from using a time series perspective employing modern econometric techniques. In particular: a) the paper identifies the integration properties of the data using appropriate strategies when the series are non-stationary; b) the paper examines the cointegration properties of the system variables and c) the two paradigms are investigated within the empirical framework of multivariate Granger causality using the valuable information from the error-correction mechanism. It also looks into the long-run equilibrium relationship along with the causal relationship between the main macro-economic variables and their direct impact on each other.

The determinants of consumption generally and the specific effects of government policies on consumption are pivotal forces in investment and economic growth. However, most of the economic researches suggest policies based on supply-side point of view for economic growth, although the demand side may be more powerful in developing countries like Sri Lanka. The results of this study clearly show that aggregate private consumption expenditure is basically determined by the aggregate income, government expenditure, public debt, private transfer and exchange rate in the country. Furthermore, as expected it is more responsive in the short-run than in the long-run. The long-run association between aggregate consumption expenditure and other variables is confirmed by cointergration model. It is evident from the findings that consumption expenditure as well as income influences each other significantly. Further, the results of the error correction model show that consumption and relevant variables except the exchange rate are positively related. The study further reveals that consumers do not adjust immediately after economic shocks. The error-correction term is significant and has a coefficient of – 0.15, indicating that when consumption is above or below its equilibrium level, it adjusts by approximately 15% within the first year. Furthermore, the results show the causality among the variables during the study period. The results from this analysis can be used as a valuable input into future consumption planning, both at the policy and grassroots level. It also can assist with identifying the impacts of changing consumption which is basically determined by other macro-economic variables in the country.

It is evident that this study has considered the impacts of only a few macroeconomic variables on consumption. In addition to that changes in interest, money supply or net export will affect aggregate consumption in a country. Therefore, further research in this area after incorporating those variables is needed to understand the realistic behaviour of the consumption in a particular country.

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