EXTENDED ABSTRACTS

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The Impact of Food and Non-Food Inflation on Poverty: A Case Study of Sri Lanka

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***Keywords**: Cointegration; Error Correction Model; Food Inflation; Non-food Inflation; Poverty*

Introduction

Poverty has become a major concern among the economists and policy makers as it limits the access to basic needs of poor. Since poor people have lack of power in the political and the decision making process, they are generally exposed to misuse by society and state. Poor people often suffer by economic shocks, especially from unpredicted rise in rate of inflation. Therefore, if there is any crisis in the economy, poorer has to pay higher prices than the richest people, whereas they gain generally less compared to rich during the economic booms. In this background, some people prefer inflation than the deflation while other people prefer very low inflation or even deflation. Inflation tends to smash poorest in the society while it badly affects the savings of middle class.

In general, a moderate inflation does not necessarily increase poverty but higher inflation will lead to increase it. Chani et al. (2011) identified a positive and significant relationship between inflation and poverty in the long run and the short run for Pakistan. Choi et al. (1996) confirmed that inflation hits more harshly to poor than the rich and higher income people. Bruno and Easterly (1998) also invented that poor household get more benefits than the rich when there is stabilization policies to control inflation. Gylfason (1998) and Easterly

(1993) found that high economic growth and low inflation tend to decrease poverty. Using the Philippines data, Fuji (2011) showed that poor are vulnerable to the food inflation. When we look at the Sri Lankan context, there is a lack of quantitative studies in the area that investigate the relationship between rate of inflation and poverty. This motivated us to do the quantitative assessment between these variables. In this study, we partition inflation rate into two namely food and non-food inflation to address above issues.

Objective

The purpose of this study is to examine the impact of food and non-food inflation on poverty level of Sri Lanka.

Methodology

Monthly data of Sri Lanka between January 2009 and December 2015 is used for this study. Data of poverty head count ratio, food and non-food inflation (2006/2007 as based year) are collected from Department of Census and Statistics whereas unemployment[1] rate and Gross Domestic Product (control variables) are extracted from Central Bank of Sri Lanka's Annual Reports. The series of poverty, unemployment and GDP are interpolated using the method of Chow and Lin (1971) and Vinayagathasan (2014; 2015). The best linear unbiased interpolation method is adopted in order to get the monthly data. All the data were seasonally adjusted using Census X12 additive approach.

ADF, PP and Ng-Perron unit root test is applied to check stationarity properties of the time series data. Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Sequential modified LR tests statistics are adapted to determine the optimal lag length. The number of co-integrating relationship is examined using Johansen co-integration approach which is described as below:

[1] Multicolinearity test did not identify any correlation among the regressors. Results are not given here but available upon request

$$\mathrm{POV_t} = \pi_0 + \pi_1 \mathrm{FINF_t} + \pi_2 \mathrm{NFINF_t} + \pi_3 \mathrm{UNEMP_t} + \pi_4 \mathrm{GDP_t} + \mathrm{u_t} \qquad (1)$$

Where, POV: poverty head count ratio, FINF: food inflation, NFINF: non-food inflation, UNEMP: unemployment rate, GDP: Gross Domestic Product and u is the white noise error term and t refers the period of time. We used Error Correction Model (ECM) to identify the short-run and long-run relationship as well as long-run equilibrium of the model. The model is given below:

$$\Delta \mathrm{Y_t} = \delta_0 + \Psi \mathrm{Y_{t-1}} + \sum_{i=1}^{p-1} \Upsilon_i^* \, \Delta \mathrm{Y_{t-i}} + \varepsilon_t \qquad (2)$$

where, $\Psi = \alpha\beta'$. where, α: error correction term, β': (1×5) vector of cointegrating coefficients, $\mathrm{Y_t} = [\mathrm{POV_t}, \mathrm{FINF_t}, \mathrm{NFINF_t}, \mathrm{UNEMP_t}, \mathrm{GDP_t}]'$ vector of dependent variables, $\mathrm{Y_{t-i}}$: lagged value of $\mathrm{Y_t}$ and ε_t: white noise error term.

Results and Discussions

All three unit root tests method confirmed that all the variables are stationary at their first difference. All lag length selection criteria are suggested to use two lags as optimal lag length. The maximum Eigenvalue statistics of Johansen co-integration technique detected one co-integrating relation in the system of equation at 5 % level of significance. The long run part of the results of ECM shows that increase in UNEMP, FINF and NFINF have positive and significant long-run relationship with POV as expected to theory whereas GDP is negatively and significantly affects POV. The co-integration (i.e., long run part of ECM) result is given by the following Equation:

$$\mathrm{POV_t} = \underset{}{13.8} + \underset{(6.25)}{10.71}\mathrm{FINF_t} + \underset{(6.72)}{8.73}\mathrm{NFINF_t} + \underset{(3.15)}{4.97}\mathrm{UNEMP_t} - \underset{(-5.56)}{0.0016}\mathrm{GDP_t}$$

Note: t-statistics are given in the parenthesis.

Table 1 depicts the ECM results of the long run equilibrium. Accordingly, the coefficient of speed of adjustment of poverty head count ratio is negative as expected which is not statistically significant. This indicates that the external shocks do not bring the model to equilibrium significantly in the long-run.

Table 1: ECM Results of the long run equilibrium

	D(POV)	D(GDP)	D(FINF)	D(NFINF)	D(UNEMP)
Cointegrating Equation	-0.0058	$-4.04\text{E}+10$	-0.0111	0.0364	-0.0264
	$[-0.403]$	$[-2.547]$	$[-0.489]$	$[2.415]$	$[-2.769]$

Note: t-statistics are given in the brackets

Since speed of adjustment coefficient of the dependent variable (POV) is negative, independent variables (GDP, FINF, NFINF, UNEMP) coefficient of speed of adjustment should have positive sign to bring the model to long run equilibrium. However, the results show that GDP, FINF and UNEMP coefficient have negative sign which indicates that poverty model with these regressors as independent variables do not have long-run equilibrium whereas coefficient of NFINF is positive as expected, indicating that model with this variable as a regressor bring the model towards long run equilibrium after the external shocks. However, since the coefficient of the speed of adjustment for POV is insignificant then any external shocks do not have impact on the long run equilibrium significantly. The rise in last month and two month before the FINF and last month NINF increases the current period POV significantly in the short run while other regressors do not have significant impact on it.

Conclusion

This study attempts to examine the impact of food and non-food inflation on poverty head count ratio of Sri Lanka. The unit root tests confirmed that all the variables are stationary at their first difference and all lag length selection criteria suggested to use two lags as optimal

lag length. Johansen co-integration technique detected one co-integrating relationship between the variables considered in this study. The ECM results confirmed that the long-run positive and significant relationship between POV and FINF, POV and NFINF, POV and UNEMP while negative and significant relationship between POV and GDP in the long run. The lagged value of FINF (one and two month) and NFINF (one month) are positively correlated with POV in the short run. This study confirms that the inflation component has significant impact on poverty in long-run and short-run. Therefore, a special attention needs to be given by the government on reducing both food and non-food inflation in order to eradicate the poverty level of Sri Lanka.

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Table 2: The Results of VECM

Cointegrating Eq:	CointEq1
POV(-1)	1.0000
GDP(-1)	0.0016 [5.561]
FINF(-1)	-10.712 [-6.258]
NFINF(-1)	-8.7383 [-6.722]
UNEMP(-1)	-4.9768 [-3.154]
C	-13.841

Panel 1

Error Correction:	D(POV)	D(GDP)	D(FINF)	D(NFINF)	D(UNEMP)
Panel 2 CointEq1	-0.0058 [-0.403]	-0..4040 [-2.547]	-0.0111 [-0.489]	0.0364 [2.415]	-0.0264 [-2.769]
D(POV(-1))	-0.6436 [-2.869]	1.7E+11 [0.735]	0.2723 [0.782]	-0.0777 [-0.335]	-0.0395 [-0.270]
D(POV(-2))	-0.0810 [-0.374]	2.1E+11 [0.925]	0.1865 [0.556]	0.3774 [1.693]	0.0429 [0.304]
D(GDP(-1))	-3.6E-13 [-1.538]	-0.8566 [-3.358]	-9.6E-13 [-2.639]	-5.2E-13 [-2.175]	8.5E-14 [0.558]
D(GDP(-2))	-1.1E-13 [-0.647]	-0.3676 [-2.181]	-6.4E-13 [-2.673]	-5.4E-14 [-0.339]	4.5E-14 [0.450]
D(FINF(-1))	0.4184 [2.636]	4.1E+11 [2.373]	0.5131 [2.083]	-0.0049 [-0.031]	-0.0097 [-0.094]
D(FINF(-2))	0.2885 [2.539]	1.6E+11 [1.328]	0.3279 [1.859]	0.2918 [2.490]	-0.0138 [-0.187]
D(NFINF(-1))	0.5225 [3.637]	1.3E+11 [0.871]	0.1961 [0.880]	0.4031 [2.721]	-0.0167 [-0.179]
D(NFINF(-2))	0.1684 [1.293]	-1.6E+10 [-0.114]	0.0083 [0.041]	0.0810 [0.603]	-0.0857 [-1.010]
D(UNEMP(-1))	0.2549 [0.936]	4.6E+11 [1.558]	0.7812 [1.849]	-0.1270 [-0.452]	-0.0914 [-0.515]
D(UNEMP(-2))	-0.4136 [-1.579]	-2.4E+11 [-0.835]	0.0046 [0.011]	-0.7501 [-2.776]	-0.1884 [-1.103]
C	-0.0060	1.7E+10	0.0817	-0.0254	-0.0441

Panel 3

Note: t statistics are given in the brackets

The Impact of Non-Tariff Barriers for the Success of Indo – Sri Lanka Free Trade Agreement

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***Keywords**: ISFTA; Non-Tariff Barriers; Trade patterns; Case Study*

Introduction

The Indo – Sri Lanka Free Trade Agreement (ISFTA) was signed in 1998 with the aim of expanding the trade between the two countries. The ISFTA came into effect from 2000 (Hand Book of ISFTA, 2013). There have been suggestions to expand the ISFTA and include more service exchange between two countries and it was proposed to sign Economic and Technology Corporation Agreement (ETCA).

According to the initial agreement, if any product is to be considered under the ISFTA, at least 35 % of the value addition should take place in the country of origin. Accordingly, ISFTA facilitates more than 70 % of the exports to India. However, only less than 30 % is exported from India to Sri Lanka through the ISFTA. When the ISFTA was initially signed, Sri Lanka was allowed a larger negative list (1,180 tariff lines) than India (429 tariff lines). However, in 2003, the duty exempted items for Sri Lanka was increased from 1,351 to 4,150 (Kelegama, 2003). It was evident that the removal of tariff barriers has resulted in increasing the existence of NTBs. ISFTA, too had been subjected to the NTBs which had hindered the possibilities of expanding the bi-lateral trade.

Many research conducted to evaluate the success of ISFTA and to identify shortcomings of it. Ever since the ISFTA came into effect, certain exporters are facing NTBs which are not easily comprehended or foreseen until someone faces the situation. It was evident that during

last decade, the trade with India had not grown sufficiently in spite of the existence of ISFTA. Literature identifies that NTBs has been acting as obstacles to trade in contrast to tariff barriers which has been reduced by a large margin. At this moment, it is very vital to identify the NTBs exist in trading with India. Therefore, it is an utmost need to identify the existing barriers prior to expansion of the ISFTA.

Objectives

The research has the major objectives of identifying the NTBs existed within the scope of the ISFTA. It also attempts to examine the reasons for the existence of NTBs. The paper further attempts to investigate whether there has been sufficient efforts to address NTBs faced by exporters.

Methodology

The research adopts the method of descriptive analysis and case study method to analyze how NTBs hindered the trade under ISFTA. Interviews were conducted with officials in charge of the Department of Commerce who handle the matters which relate to the ISFTA, and exporters who faced NTBs were interviewed to analyze the root causes for NTBs.

Results and Discussion

In the analysis following issues are identified. (a) issue regarding quality assurance: A company faced the issue of rejecting the compound chocolate produced by Indian companies even if chocolate is an item come in the duty free list in the ISFTA (HS 1806.20 and HS 1806.90). However, compound chocolates are manufactured in India and are available in the Indian market. This clearly seems to be a NTB that is not only hinder the trade, but also mislead exporters. (b) Issue of imposing floor price: It was found that restrictions have been imposed on Sri Lankan marble and granite exporting to India (Chapter 68 of

IT(HS) Code) under ISFTA. According to the exporting company, Indian authorities had arbitrarily imposed floor price which has been acting as a barrier over the years. (c) anti-dumping duty issue: Another exporting company faces an issue of being imposed an anti-dumping duty by the Indian government. Accordingly, they were facing the issue over the years and despite the complaints made and cases filled, the issue remains unaddressed. However, the Department of Commerce in Sri Lanka has no right to intervene in resolving the dispute and the company alone has to fight the battle. (d) port restrictions: time to time India had imposed certain ports restrictions regarding certain products exported by Sri Lanka. For example in 2004, regulation was imposed on copper exports.

Conclusion and Recommendation

The evidence shows that the NTBs act as a hindrance to expand the Indo – Lanka trade and fully utilize the ISFTA. It was identified through case studies that the asymmetry of information too had caused NTBs. Further, it was identified that the lack of an independent body to evaluate certain actions taken in relation to the ISFTA, had allowed countries to act arbitrarily. In this context, this study suggests to establish a common body for quality assurance in order to avoid NTBs. It is also suggested to allow the Department of Commerce to intervene in a more active manner in solving NTBs issues related to foreign trade.

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Structural Relationship between Under-Employment and Shadow Economy: A Theoretical Investigation

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Keywords: *Shadow Economy; Under-employment; Job Finding and Separation Rate; Structural Relationship*

Introduction

Shadow economy reflects a part of economic activities involving goods and services which are paid by cash but not declared for tax. The affiliation between shadow economy and labour force is vastly discussed upon the relationship with the rate of unemployment and shadow economy (Dell'Anno and Solomon, 2008, Schneider et.al, 2010, Davidescu and Dobre, 2012). However, as mentioned by Sengenberger (2011) "*unemployment statistics are often criticized in developed and in developing countries alike - for failing to reflect the 'true' extent of the employment problem*", unemployment seems not a border challenge for emerging economies when compared to new challenges occur with underutilization and inefficiency matters of contemporary labor market.

The degree of impact from underutilization of labour force to the growth of shadow economy can vary according to the type of economy. Within under developed economies, majority of people who employed are not usually having a wage rate which can fulfill their all needs. Therefore, this may worse with under-employed people. In addition to that people may underemployed within such economies due to lack of job opportunities and vocational skills. Then people with higher educational qualifications also engaged with low grade jobs with lower

salaries. This may provide incentives for them to engage in shadow economic activities to earn more. As a result of that study attempts to develop a structural relationship between under-employment and shadow economy. Under-employment reflects a situation where employee works, but not belongs to their actual or exact capacity. Here this 'capacity' will identify in different prospects such as underutilization, underestimate or undermine the employee skills and capabilities LFS-Annual report (2014); Walling and Clancy (2010); ADB (2005).

Objective

This study attempts to develop a structural relationship between the rate of under-employment and shadow economy.

Methodology

The study uses the structural relationship developed by Dell'Anno and Solomon (2008) between the level of unemployment and shadow economy. Study also uses certain assumptions in advance to facilitate the core of the theoretical argument and its rationality in a situation with the presence of under-employment issue at the economy.

Results and discussion

Consider a closed economy model that includes objective of an efficient labor market to let the under-employment ($\mathbf{U}^{*}$) to zero. This analysis may concern a situation with the presence of under-employment at the economy.

Let's assume that the total labour force is L workers and it is constant. The labour force consist stock of workers who are employed (E) and Unemployed (U).

$$L = U + E$$

Then the rate of unemployment = U/L

When the job separation rate (s) determines a rate where employee losses a job and becomes unemployed, the job finding rate (s) determines a rate where a person find a job and become employed. However, with the presence of under-employment in the economy, job finding rate should be determined with both proper employment and under-employment. Then if we concern the steady state equilibria without considering the impact from under-employment, it may give a situation where s<f. This means that the presence of under-employment will devaluate the job separation rate. Because, workers who under-employed does not prefer for their current job but stay at the same place due to lack of proper and suitable job opportunity for his/her skills and preference. Therefore steady state equilibria can be written as below by using impact from both proper employment and under-employment to determine 'f'.

At the steady state, (equilibria): $s + f^* = f$

Where add the damage of job separation rate (f^*) with the presence of under-employment. Here 'f^*'use as the notation, because the reason for underestimate the job preparation rate is under-employment, a part which increase the job preparation rate. When we are considering the stock of workers who are employed (E) and unemployed (U) under these rates,

From the steady state: $s = f - f^*$

Then, $(f - f^*)U = sE$ (1)

When under-employment = U^*,

Underemployment is a part of total employment. If the percentage of proper employment (E^* – employees who are not under-employed) is

60 percent of total employment[2], then the under-employment can be recognize from the equation below.

$$E - 0.6E^* = U^*$$

Then, $E = U^* + 0.6E^*$ (2)

From the equation (1) with the presence of under-employment

$$(f - f^*)U = sE$$

Then, $E = \frac{(f-f^*)U}{s}$

When substitute equation (2) to above,

$$U^* + 0.6E^* = \frac{fU-f^*U}{s}$$

$$U^* = \frac{fU-f^*U}{s} - 0.6E^* \quad (3)$$

When $\frac{U}{L} = \frac{s}{(f+s)}$ is the equation derived by Dell'Anno and Solomon (2008) for the relationship exists between unemployment rate with both 's' and 'f'.

In a situation with the presence of under-employment,

$$s = \frac{U}{L}(f - f^* + s) \quad (4)$$

Then substitute (4) to (3),

$$U^* = \frac{fU - f^*U}{U/L\,(f - f^* + s)} - 0.6E^*$$

$$U^* = \frac{(f - f^*)L}{(f - f^* + s)} - 0.6E^*$$

$$\frac{U^*}{L} = \frac{(f-f^*)}{(f-f^*+s)} - \frac{0.6E^*}{L} \quad (5)$$

[2] This is an assumption that 60 percent of employees from total employees are perfectly employed and the rest of 40 percent are under-employed.

If all goods in official economy are produced using only labour and labour is the only stock that are in employment, then output of official economy can be exhibited as below.

If the output in the official economy = Y_1

Function of technology = A

Stock of workers who are employed = E

Therefore, $Y_1 = AE$

If technology assumed to be constant, then $\mathbf{Y_1 = E}$

Since $L = U + E$, then $L = U + U^* + 0.6E^*$

$$U^* = L - U - 0.6E^*$$

$$\frac{U^*}{L} = \frac{L - U - 0.6E^*}{L}$$

When $U = L - E$

$$\frac{U^*}{L} = \frac{L - (L - E) - 0.6E^*}{L}$$

When $Y_i = E$,

$$\frac{U^*}{L} = \frac{L-(L-Y_i)-0.6E^*}{L}$$

$$\frac{U^*}{L} = \frac{Y_1-0.6E^*}{L} \qquad (6)$$

When the total output = Y_T and the output produced in shadow economy = Y_2

$Y_T = Y_1 + Y_2$ and then,

$$Y_1 = Y_T - Y_2 \qquad (7)$$

Substitute (7) to (6)

$$\frac{U^*}{L} = \frac{(Y_T - Y_2) - 0.6E^*}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T - 0.6E^*}{L} - \frac{U^*}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{U^*}{L} - \frac{0.6E^*}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \left(\frac{U^*}{L} + \frac{0.6E^*}{L}\right) \quad (8)$$

Then substitute (5) to (8)

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \left(\frac{(f-f^*)}{(f-f^*+s)} - \frac{0.6E^*}{L}\right) - \frac{0.6E^*}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{(f-f^*)}{(f-f^*+s)} + \frac{0.6E^*}{L} - \frac{0.6E^*}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{(f-f^*)}{(f-f^*+s)}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{f}{(f-f^*+s)} + \frac{f^*}{(f-f^*+s)} \quad (9)$$

Above equations 8 and 9 are represent the nature of relationship between shadow economy, the rate of employment and the rate of under-employment. As in equation (8), shadow economy demonstrates a negative relationship with the rate of employment. Employment may consist both under-employed and properly employed workers. However, further derivations from equation (9) give further detail on this relationship. Above negative relationship will not a common factor for each and every economy. Increase in the stock of workers who find jobs (f) in formal sector increase the employment rate and this has resulted in a decline in shadow economy as a proportion of labour force. Increase in stock of workers who are not properly employed (f*) will improve the size of shadow economy. Moreover, the rate of proper employment (f - f*) and job separation rates may determine the size of both total and underutilized job finding rates. When f* = 0, there will be perfect negative relationship between under-employment and the

size of shadow economy. Moreover, the validity of above outcome can be checked through re arranging the outcome to observe the nature of relationship between shadow economy, the rate of employment and the rate of unemployment.

When $E = U^* + 0.6E^*$, then $E^* = \frac{E-U^*}{0.6}$

Substitute above equation for E^* to equation 6.

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{U^*}{L} - \frac{0.6\left(\frac{E-U^*}{0.6}\right)}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{U^*}{L} - \frac{(E-U^*)}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{U^*}{L} + \frac{U^*}{L} - \frac{E}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{E}{L} \qquad (10)$$

According to equation 10, there is an inverse relationship between shadow economy and level of employment.

On the other hand, since $E = L - U$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{(L-U)}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} - \frac{L}{L} + \frac{U}{L}$$

$$\frac{Y_2}{L} = \frac{Y_T}{L} + \frac{U-L}{L} \qquad (11)$$

Equation 11 demonstrates the positive relationship between shadow economy and unemployment. Therefore the outcome derive an inverse relationship between shadow economy and under-employment rate is presence according to the previous theoretical derivations and may be useful to understand the nature of relationship between under-employment and the shadow economy to some extent.

Conclusion

Study use series of equations to investigate possibilities of relationship exists between the rate of under-employment and the size of shadow economy. Findings of these equations are given a possibility to have either positive or negative relationship between the rate of under employment and the shadow economy.

The magnitude of damage occurred within the job separation rate (f*) can introduce as the determinant which decide the nature of relationship. With the absence of f* (if f*=0) there is usual negative relationship between the rate of under-employment and shadow economy. On the other hand, higher the magnitude of f* will turn this relationship into a positive where $f = f^*$ is the critical condition which determine the turnover of the existence of either positive or negative relationship.

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Technical Efficiency Gap between Bank of Ceylon and Commercial Bank in Sri Lanka: A Data Envelopment Analysis

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Keywords: *Banks; Technical Efficiency; Data Envelopment Analysis; Comparative Measure*

Introduction

Data Envelopment Analysis (DEA) is a non-parametric technique for measuring the relative efficiency of a set of similar units, usually referred to as decision-making units (DMUs). It was initially used to assess the relative efficiency of not-for-profit organizations. However, gradually its application has been extended to cover for-profit organizations as well. Its first application in banking industry appeared with the work of Sherman and Gold (1985). The technical efficiency relates to the productivity of inputs (Sathye, 2001). A bank is said to be technically inefficient if it operates below the frontier. A measure of technical efficiency under the assumption of Constant Returns-to-Scale (CRS) is known as Overall Technical Efficiency (OTE).

In Sri Lanka, variables such as operational risk, inflation and market capitalization had a positive effect on Technical Efficiency (TE) in asset transformation of banks (Seelanatha, 2012). Fernando et al (2014) found that mean technical efficiency score of the Sri Lankan banking industry was 83 percent and the highest efficiency was recorded in the year 2011. However, none of the empirical studies in the existing literature have considered the efficiency gap between Bank of Ceylon and Commercial Bank in Sri Lanka. The Bank of Ceylon (BOC) and Commercial Bank are famous commercial banks in Sri Lanka. The

Bank of Ceylon is a government bank but Commercial Bank is a private bank in Sri Lanka. By measuring the level of technical efficiency, this study compares the technical efficiency of the both banks.

Objective

The objective of the study is to measure the technical efficiency gap between Commercial Bank and Bank of Ceylon from 2004 to 2015 by using Data Envelopment Analysis (DEA).

Methodology

Data was gathered from various annual reports of the both banks. The study used one output variable (profits of the bank before taxation) and three inputs variables (Loans and advances, liabilities, and a number of labours of the bank). The study mainly used Charnes, Cooper and Rhodes (CCR) model and Banker, Charnes, and Cooper (BCC) model of DEA. The CCR model is named after its developers Charnes, Cooper, and Rhodes (1978), and is based on the assumption of Constant Returns-to-Scale (CRS). The BCC model is named after its developers Banker, Charnes and Cooper (1984), and is based on the assumption of Variable Returns-to-Scale (VRS). The both CCR and BCC models can be divided into two categories, input-oriented and Output oriented models. The study applied only input-oriented of both CCR and BCC model given below

$$\min_{\theta\beta} \theta_k$$

Subject to

$$\sum_{j=1}^{n} \beta_j X_{ij} \leq \theta_k X_{ik} \quad (i= 1, 2,\ldots..,s) \tag{1}$$

$$\sum_{j=1}^{n} \beta_j Y_{rj} \geq Y_k \tag{2}$$

$$\beta_j \geq 0, \quad (j=1, 2,\ldots.n) \tag{3}$$

$$\sum_{j=1}^{n} \beta_j = 1, \quad \text{if VRS} \tag{4}$$

Where, X_{ik} = amount of inputs *i* used by bank k

Y_k = amount of output *Y* produced by bank *k*

θ_k = technical efficiency score for bank k
n = the number of banks (j= 1,, ……, n), where n =2
s = the number of inputs (i= 1, …., s), where s = 3

There are restrictions 1, 2, and 3 for CCR model and restrictions 1, 2, and 4 for BCC model. The CCR model provides Overall Technical Efficiency (OTE) and BCC model provides the pure technical efficiency (PTE). The OTE is decomposed by Pure Technical Efficiency (PTE) and Scale Efficiency (SE). The SE is measured by a ratio of OTE to PTE score. The PTE measure has been used as an index to capture managerial performance and SE measure provides the ability of the management to choose the optimum size of resources. All results have estimated by using Data Envelopment Analysis Program (DEAP) version 2.1 (Coelli, 1999).

Results and Discussion

The model is estimated by using cross-sectional data and the results are reported in Table 1. In Table 1 every year, the efficiency score of Commercial Bank was equal to one. This did not mean Commercial Bank had the same level of efficiency at every year. Here, the study considered two banks. In this case, a bank which is efficient among them will take an efficient score of one when estimating the model for each year. In Sri Lanka, if Commercial Bank was efficient compared to Bank of Ceylon, overall technical efficiency score of Commercial Bank was equal to one for each year. In 2009, OTE gap between Bank of Ceylon and Commercial Bank was (64.4 %) very large. In 2015, it is (8.5 %) very small. During the Global financial crisis years (2007-2009), the technical efficiency gap increased to 60.7 % as an average of three years (see Table 2).

Table 1: Results of overall TE of bank of Ceylon and commercial bank

Year	OTE score of Bank of Ceylon	OTE score of Commercial Bank	Technical Efficiency (OTE) Gap	Three years Average of OTE Gap
2004	0.641	1.000	0.359	
2005	0.560	1.000	0.440	0.399
2006	0.602	1.000	0.398	
2007	0.394	1.000	0.606	
2008	0.431	1.000	0.569	0.607
2009	0.356	1.000	0.644	
2010	0.588	1.000	0.412	
2011	0.843	1.000	0.157	0.250
2012	0.818	1.000	0.182	
2013	0.576	1.000	0.424	
2014	0.745	1.000	0.255	0.255
2015	0.915	1.000	0.085	

Source: Author's calculation

Table 2 shows decompose of overall technical efficiency (OTE) Gap between Bank of Ceylon and Commercial Bank. Here, the reader should mind Bank of Ceylon had less than or equal but no more than efficiency score (PTE and SE) to Commercial Bank.

Table 2: Decompositions of overall technical efficiency gap

Year	Pure Technical Efficiency Gap (%)	Scale Efficiency Gap (%)
2004	0	35.9
2005	34.6	14.3
2006	38.7	1.8
2007	41.5	32.6
2008	38.1	30.4
2009	39.1	41.5
2010	0	41.2
2011	0	15.7
2012	0	18.2
2013	0	42.4
2014	0	25.5
2015	0	8.5
Mean	16.0	25.7

Source: Author's Calculation

The pure technical efficiency gap between the both banks was more than 34 % between 2005 and 2009 and was no gap in other years. There is always scale efficiency gap between both banks. The SE gap was (42.4 %) very high in 2013 but it was (1.8 %) very less in 2006. Bank of Ceylon had more inefficiency in resource allocation than inefficiency in managerial performance. Because an average of SE Gap was greater than the average of PTE Gap. Commercial Bank has been performed well compared to Bank of Ceylon in terms of OTE, PTE, and SE.

Conclusion and Recommendation

The study concluded that Commercial Bank has been performed well compared to Bank of Ceylon in terms of OTE, PTE and SE. Further, Bank of Ceylon had more inefficiency on resource allocation than inefficiency on managerial performance because average SE Gap was greater than average PTE Gap between these banks. Therefore, Bank of Ceylon should focus more on resource allocation because its scale inefficiency is greater than the pure technical inefficiency.

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An Economic Analysis on Water Pollution Impact of Fossil Fuel Power Station on Agriculture: A Case of Onion Cultivation in Sri Lanka

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Keywords: *Fossil fuel; Water pollution; Agricultural productivity; Production and Profit functions*

Introduction

Economic liberalization creates higher demand for electricity through industrial expansion, urbanization and improved life style of people. Increased demand over electricity could not only fulfill by renewable resources (such as water, solar radiation, biomass, wind and waves) based power generation, instead many countries established fossil fuel power plants where generally coal, gasoline, diesel, crude oil, nuclear and natural gases have been highly used to generate power which emit harmful emissions like chemicals, oil to the environment and create various negative impacts on nature, society and economy. According to Shamshad et al. (2012) and Kumar et al. (2013) such power plants have serious negative impact on land, soil, air, water and on human health as well as leads to various social consequences.

Emission of oil and crease wastes into the water sources by fossil fuel power stations is one of the major environmental and economic issue, which leads to water and land pollution that results in loss of biodiversity, increasing human health hazards, decreasing agricultural cultivation and deprivation of livelihood avenues of poor families and also caused to indirect impacts on income, unemployment and poverty. A study by the World Bank (2007) estimated that water pollution

caused by power stations leads to loss of 12 percent yield reduction in agriculture. Khai & Yabe (2012) analyzed the impact of industrial water pollution on rice production in Vietnam and identified yield loss in rice production, and which is about 0.67 tons/hectare/crop and the profit loss is about 26 percent. Khait et al. (2014) analyzed quality of surface and ground water around the thermal power plants and found that the people living in surrounding villages have impact on their health and local biota.

With the end of civil war in 2009 in Sri Lanka, resettlement process and rehabilitation of economic activities in the Northern and Eastern provinces induced higher industrial and domestic demand for electricity which leads to expansion of fossil fuel power stations in the region. Over one third of the families living in Jaffna district (about 63,280 families) have been depended on agriculture for their livelihood and income. Hence, establishment of the fossil fuel power plants closer to the agricultural firms in the Jaffna district has been experiencing heavy emissions of oil and crease wastes into the inland water source which create water and land pollution finally have negative impacts on agricultural cultivation, human health and biodiversity Central Environmental Authority (2014).

While there has been many studies such as Effects of thermal power plant on Environmental Pokala (2011), Environmental Impact of Thermal Power Plant for Sustainable Development Kumar et al (2013) and Quality Assessment of Surface and Ground Water around Thermal Power Plants Khati et al (2014) conducted to estimate statistically the impact of power station caused water pollution on agricultural in many countries, such effort is lacking in Sri Lanka and the researchers, government policy makers still pay less attention in this area. Especially, the economic aspects on impact of fossil fuel power station caused water pollution on agricultural cultivation in the Jaffna district is not yet adequately explored.

Objective

This study attempts to conduct an economic analysis on water pollution impact of fossil fuel power station on agricultural cultivation, focusing the onion cultivation in Jaffna district of Sri Lanka. The study evaluate especially the economic impacts of the water pollution considering production, cost and profits structure of the onion cultivation activity by adopting Production, Profit and Cost functions approaches.

Methodology

This study uses primary data collected from two Divisional Secretariat Divisions (DSD) of the Jaffna district: i.e Valikamam South and Valikamam East, both reflect uniform environmental, economic and social characteristics but vary from inland water pollution level caused by fossil fuel power plant. Ground water sources of Valikamam South are identified as contaminated and the Valikamam east as non-contaminated due to emissions from fossil fuel power station based on classification done by Disaster Management Centre in 2015. Eighty agricultural families using ground water for their agricultural activities were selected using stratified random sampling method from above each DSD and primary data were collected from these families by using semi-structured questionnaires, interviews and observations in 2015. The necessary secondary information was collected from reliable official sources.

Theoretical and Functional Models: Kai and Yabe (2012) recommended to estimate economic impacts by using three functions related to the production, cost and profit which is adopted in this study considering most suitable to reach the objective. Hence, the functional forms of the study models have been developed by using neo classical theory which provide basis to modify the Production, Cost and Profit functions of onion cultivation by incorporating water pollution caused by fossil fuel power station as an independent variable that determine

the production, cost and profit of the onion cultivations as given below with functional models:

Production Function: $Y = f(L, K, I, E_d, D_W, D_E, D_G)$ (1)

Cost Function: $C = f(W_h, W_f, Ws, E_d, R_c, Y, D_E, D_G, D_w)$ (2)

Profit Function: $\pi = f(W_i, W_s, F_c, E_d, E_x, Y, D_G, D_w)$ (3)

where, Y: yield of onion (Thousand Rs/ Sq Km); C: total cost of a firm (thousand Rs/ Sq km); π: total profit of a firm (thousand Rs/ Sq Km) it indicatestTotal revenue minus variable cost, L: labour (man-day/Sq Km); K: capital (thousand Rs/ Sq Km); I: average cost of inputs (Kg/Sq) [seeds (Kg), fertilizers (Kg), herbicides (ml), pesticides (ml/), fuel (ml), electricity charge (Rs)]; W_h : average price of herbicides & pesticides (Rs/ml); W_f : price of fertilizers (Rs/Kg); W_S : price of seeds (Rs/Kg); R_C : replacement cost of a firm (Rs/ Sq Km); Wi : average price of inputs (Rs/Kg); F_C : fixed cost (thousand Rs/ Sq Km); E_d : education level of the farmer (in years); E_x: experience of the farmer (in years); D_W: location of firm (dummy: if firm is in polluted area = 1, otherwise = 0; D_E : cultivation methods (dummy: if modern technique adopted = 1, otherwise = 0); and D_G : gender (dummy: if men = 1, otherwise = 0)

Econometric Specification: The above three functions are further developed econometrically into Cobb-Douglas production function. These functions are transformed into log-linear form of multiple regression models. This provides econometric basis to identify the water pollution impacts of fossil fuel power station on agricultural cultivation in a linear relation. The Cobb-Douglas models are given as follows:

$$\ln Y_i = \alpha_0 + \alpha_1 \ln L_i + \alpha_2 \ln K_i + \alpha_3 \ln I_i + \alpha_4 \ln Ed_i + \alpha_5 D_{Wi} + \alpha_6 D_{Ei} + \alpha_7 D_{Gi} + \mu_{1i} + U_{1i} \quad (4)$$

$$\ln C_i = \beta_{0+} \beta_1 \ln W_{hi} + \beta_2 \ln W_{fi} + \beta_3 \ln W_{si} + \beta_4 \ln Ed_i + \beta_5 \ln Rc_i + \beta_6 \ln Y_i + \beta_7 D_{Ei} + \beta_8 D_{Gi} + \beta_9 D_{wi} + \mu_{2i} + U_{2i}. \quad (5)$$

$$\ln\pi_i = \delta_0 + \delta_1 \ln W_{ii} + \delta_2 \ln W_{si} + \delta_3 \ln Fc_i + \delta_4 \ln Ed_i + \delta_5 \ln Ex_i + \delta_6 \ln Y_i + \delta_7 D_{Gi} + \delta_8 D_{wi} + \mu_{3i} + U_{3i} \quad (6)$$

Where, α_0, β_0, and δ_0 are intercepts of equation (4), (5) and (6) respectively.
α_1, α_2 .....α_7 are coefficient of explanatory variables of production function.
β_1, β_2.....β_9 are the coefficient of explanatory variables of Cost function.
δ_1, δ_2 .....δ_8 are the coefficient of explanatory variables of Profit function.
U_{1i}.....U_{3i} are error terms of the equation (4), (5) and (6) respectively.
μ_{1i}.....μ_{3i} are individual specific fixed effect of equation (4), (5) and (6) respectively.

Results and Discussions

The outcome of the Fixed Effect Multiple Linear Regression Model (FEMLRM) (See Annexure I) are given the following three estimated models for production, cost and profit functions respectively.

$$\ln Y = -4.998 + 0.2319 \ln L_i + 0.849 \ln K_i + 0.088 \ln I_i - 0.246 \ln Ed_i - 0.13 D_{Wi} - 0.08 D_{Ei} + 0.037 D_{Gi} + \mu_{1i} + U_{1i} \quad (7)$$

$$\ln C = 4.17 + 0.123 \ln W_{hi} + 0.239 \ln W_{fi} + 0.197 \ln W_{si} - 0.18 \ln Ed_i + 0.129 \ln Rc_i + 0.684 \ln Y_i - 0.32 D_{Ei} + 0.24 D_{Gi} + 1.228 D_{Wi} + \mu_{2i} + U_{2i} \quad (8)$$

$$\ln \pi = 2.96 - 0.675 \ln W_{ii} - 0.264 \ln W_{si} + 0.055 \ln Fc_i - 0.19 \ln Ed_i - 0.012 \ln Ex_i + 1.56 \ln Y_i + 0.255 D_{Gi} - 0.279 D_{Wi} + \mu_{3i} + U_{3i} \quad (9)$$

According to result of FEMLRA, the goodness of fit (R^2) and F-tests of all three models: the Production, Cost and Profit Functions show that all models are statistically significant at 5 % level. The estimation of the Production function (equation 7) explain that explanatory variables of the model; Labour (L) and Capital (K) statistically have positive impact while Education of the farmer (Ed) have negative impact on onion production at 5 % significant level. However, Location of farms (D_W) has statistically negative impact on at 10 % significant level. The

estimated values of Cost function (equation 8) shows that independent variables such as Price of fertilizers (W_f), Price of seeds (Ws), Replacement cost of a farmer (R_C), Onion yield of a firm (Y) and Location of farms ($D_{W)}$ have a statistically positive impacts while Cultivation methods (D_E) has statistically negative significant impact on the onion production at 5% significant level. The estimated values of Profit function (equation 9) indicates that the independent variables such as Average price of inputs (Wi), Average price of seeds (Ws) and Location of farms (D_W) have a statistically negative impact on onion profit at 5% significant level but Onion yield of a firm (Y) has a statistically positive impact on the onion profit at only 5% significant level.

Location of firms (D_W) is an important variable of these models have statistically significant negative impacts on production and profit while has statistically significant positive impact on cost. This reflects that the water pollution caused by fossil fuel power station in Jaffna district has negative impacts on onion cultivation which confirms that fossil fuel power plant caused water pollution reduce the agricultural cultivation. The results further shows that the impacts of water pollution caused by emissions from fossil fuel power station contributes negatively to the onion cultivation by 0.13 %, and 0.279 % in the aspect of change in production, and profit respectively but it contributes by 1.228 % positively to the cost structure of onion cultivation, which identify as the negative economic impact on onion cultivation.

Conclusion

The study concludes that the inland water pollution caused by fossil fuel power plants have negative economic impact on agricultural cultivation. In a war recovery situation while larger number of population depend on agriculture for their livelihood and income, the government should give more attention considering it is a more sensitive issue in livelihood building process. The government should implement the necessary action to clean the inland water sources which

are already polluted and necessarily be avoided in establishing the fossil fuel power plants closer to the fertile agricultural lands and the land which are highly sensitive to agricultural activities.

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Table 1: Estimated results of production function

Lny	**Coef.**	**Std. Err.**	**t**	**P>|t|**
Lnl	0.231937	0.0874588	2.65	0.01*
Lnk	0.8489009	0.0783896	10.83	0*
Lni	0.0882551	0.0711407	1.24	0.219
lned	-0.246456	0.1017271	-2.42	0.018*
Dw	**-0.1300236**	0.0704315	-1.85	**0.069****
De	-0.0834744	0.0770042	-1.08	0.282
Dg	0.0375158	0.1962465	0.19	0.849
Cons	-4.998053	0.6637364	-7.53	0*

No of observation - 80 R^2= 0.9321 *, ** denotes Significant at 5%, 10% level

Table 2: Estimated result of cost function

	Coef.	**Std. Err.**	**t**	**P>|t|**
lnwh	0.1231434	0.0668833	1.84	0.07**
lnwf	0.2390269	0.0473263	5.05	0*
lnws	0.1971626	0.0922806	2.14	0.036*
Lned	-0.1805051	0.1365697	-1.32	0.191
Lnrc	0.1286792	0.0606608	2.12	0.037*
Lny	0.6839626	0.0593693	11.52	0*
De	-0.3221171	0.0885122	-3.64	0.001*
Dg	0.2432715	0.1870911	1.3	0.198
Dw	**1.228016**	0.5759974	2.13	**0.037***
Cons.	4.167776	0.6166746	6.76	0*

No of observation - 80 R^2= 0.8469 *, ** denotes Significant at 5%,10% level

Table 3: Estimated result of profit function

ln π	Coef.	Std. Err.	t	P>|t|
Lnwi	-0.67498	0.099247	-6.8	0*
Lnws	-0.26388	0.153406	-1.72	0.09**
Lnfc	0.054677	0.045772	1.19	0.236
Lned	-0.19152	0.188853	-1.01	0.314
Lnex	-0.01245	0.09215	-0.14	0.893
Lny	1.559489	0.081323	19.18	0*
Dw	**-0.27885**	0.102621	-2.72	**0.008***
Dg	0.254911	0.339502	0.75	0.455
Cons.	2.958787	0.819682	3.61	0.001*

No of observation - 80 R^2= 0.8871 *, ** denotes Significant at 5% ,10% level

Long-term Impact of Population Ageing on Sri Lanka's Public Finance

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Keywords: *Population Ageing; Fiscal Sustainability; Budget Forecasting Model; Social Security*

Introduction

Population ageing is a major socioeconomic challenge faced by Sri Lanka during recent years. The United Nations' forecast of the age structure transition of Sri Lanka from 2015 to 2050 shows an increasing share of the aged population who are 60 years and above, from 13.9 per cent to 28.6 percent (United Nations, 2015). The old age dependency ratio would rise from 14.1 in 2015 to 37.7 in 2050. When compared to other countries in the region, Sri Lanka is foremost as a society with a rapidly ageing population (Siddhisena, 2004).

Accordingly, policymakers are confronted with two conflicting objectives: to develop socioeconomic systems which provide economic security to the increasing elderly population, and to sustain economic growth in the long-run while coping with the ageing population. Success in achieving these objectives depends on right and effective policies implemented when required. The study focuses on the sustainability of public finances in Sri Lanka when increasing public expenditure due to elderly population.

According to King and Jackson (2000), increases in elderly population do not lead to negative fiscal consequences. Visco (2001) examined the fiscal impact and sensitivity of age related expenses up to 2050. Similar

to Jackson's (2000), Visco's study noted that ageing has an impact on public finances, but whether it would be fiscally sustainable had not been analyzed. Narayana (2012) has analyzed whether ageing of Indian population has a long-run bearing on public finances from 2005 through 2050 using Miller's Budget Forecasting Model and National Transfer Accounts. He concluded that ageing population is not a huge burden on India's public finances. The study by De Silva (2007) assessed long-term demographic dynamics of the Sri Lankan population from 2001-2081, and concluded that Sri Lankan population would face major changes in its age structure in the coming decades.

Objectives

The primary objective of the study is to quantify long-run impacts of population ageing on Sri Lanka's public finances. This research problem is specifically chosen because almost every previous research has emphasized on the issue of ageing population and the need to increase expenditure for the benefit of the elderly, but whether it is fiscally sustainable for Sri Lanka has not been comprehensively analyzed. Therefore, an attempt is made in this study to fill the above research gap.

Methodology

Both quantitative and qualitative secondary data are used in the analysis. In order to estimate long-run economic impacts of ageing on public finances, the sample period considered is 1980-2050. Data from 1980-2014 are used in a forecasting exercise to predict values till 2050 using Vector Auto Regression in Eviews software. The researcher has employed Budget Forecasting Model to forecast effects of changing demographic age structure on two major social sector budgets: public pensions and social protection. Impact is assessed by simulating two fiscal instruments: government revenue and expenditure. Analysis is fiscally sustainable if a favorable Fiscal Support Ratio is observed in 2050.

Results and Discussion

The increasing size of Pensions and Social Protection budgets is clear evidence of population ageing effects on public finances (Table 3). The increased share is largely accounted for by larger public expenditure on pensions and other transfers (Table 4). One reason for this could be that Sri Lanka does not have a universal old age social security system. Expenditure on social protection would rise due to the oldest category of the aged increasing, and the likely reduction of family support for them in the future.

Only 50 per cent of employed population is estimated to be covered by organized retirement programs while it is 25 per cent in the informal sector. In contrast, majority of Sri Lankan employees are engaged in the informal sector without a proper social security scheme. Estimates also say that pensions or provident funds are available only to 30 per cent while public assistance is only for 10 per cent of Sri Lankan aged. Government funding in various retirement programs is a huge burden on public finances. Between 1992 and 2002, government expenditure on retirement programs increased approximately four- fold to a level that constituted about 20 per cent of total government expenditure (Siddhisena 2004). This fiscal burden would increase owing to the larger number reaching retirement age as the number of government employees have increased significantly.

The forecasted share of total expenditure for elderly population shows an increase from about 17 per cent in 2021 to about 29 per cent in 2050 (Table 5). An increasing trend is observed in absolute terms of tax revenue during 2021-2050 (Table 2). In contrast, the Fiscal Support Ratio (FSR) gives a reverse trend as number of tax payers relative to public transfer beneficiaries drops due to ageing. The percentage of pensioners increasing from 2 per cent in 2000 to 3.7 per cent in 2014 is evidence for this. Similar calculations for FSR show 298 for 2010 and 199 for 2015. Change in FSR indicates the relative size of tax increase or cut in benefits required to return to initial tax position. Assumption

on FSR is that age profiles of benefits and taxes remain unchanged over time, with their absolute levels increasing at the same rate as economic growth.

Table1: Fiscal support ratio

Year	FSR
2021	233
2031	189
2041	156
2050	134

If the above were to happen, it would have a negative impact on Sri Lanka's public finances. However, FSR is still above the conventional benchmark of 100 in 2050 which suggests that ageing would not drastically reduce tax buoyancy in the long-run. It is likely that pension and social security expenditure grow at a rate higher than the ability of the tax base to sustain them. Government has to anyway pay pensions which it has already promised to employees when they are recruited. The declining FSR may also due to falling proportion of the productive labor force during 2021-2050, as revealed by projections. However, the decline in FSR is not that drastic because around 61 per cent of the Sri Lankan workers are in the informal sector according to the Department of Census and Statistics.

Conclusion and Recommendations

Population ageing does matter for public finances of Sri Lanka. The forecasting exercise demonstrates that ageing would impose financial pressure on the social security system. Amidst the increasing aggregate public expenditure for elderly and the future tendency to reduce tax buoyancy, the positive FSR implies that population ageing may not have an adverse impact on Sri Lanka's public finances.

The projected shrinking of the labor force could be compensated by three ways: increasing retirement age, labor productivity and female

labor participation. Phased retirement and increased flexibility of employment, especially for employees with a long service record, are measures taken elsewhere in the world which Sri Lanka could follow. Jobs which require less physical work need to be expanded for the elderly to be productively engaged in the labor market. Part time jobs should be available to older workers who are still willing to work although retired. Suitable jobs for educated young women must be created. Industries favoring female workers should be promoted, there has to be an attitudinal shift regarding employing females, and flexible working arrangements should be in place to allow female re-entry to work force after child bearing.

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Table 1: Fiscal and non-fiscal variable descriptions and measurement

Variable	Measurement
1. Tax revenue	Total tax revenue received by central government
2. Total government Spending	Combined recurrent and capital expenditure of central government
3. Education	
4. Health	
5. Poverty and other social Protection	
6. Interest payments	Combined expenditure of central government on interest payments
7. Pensions and other transfers	Annual expenditure allocated by central government for pensions and other transfers
8. Government services	Total government spending minus (3) through (7)

Data Forecasting using E-Views 9

Forecasting Assumptions

- Fiscal structure of 2013-14 continued till 2050 as baseline scenario.
- Since age-specific public expenditure categories are unavailable in Sri Lanka, Pensions and Social Security entirely targeted towards the elderly.
- All variables measured at current market prices.

Table 2: Forecasted total public expenditure and tax revenue

Year	TPE	Tx
2021	4, 397, 665	1, 716, 738
2031	10, 292, 738	4, 033, 304
2041	21, 418, 373	8, 281, 167
2050	41, 386, 757	15, 999, 630

Notes: a) Population projections in secondary sources are calculated every 10 years.
b) Forecasted data in calculating TPE are given in Table 1.
c) TPE = PENS+ SP+ GS+ HEL+ EDU+ IRP

Timothy Miller's Budget Forecasting Model (BFM): The aggregate expenditures are estimated as the multiplicative sum of per capita expenditures and total population size:

Equation 1: B (t) = b (t) * p (t)
B (t) - aggregate budget expenditure at time t
b (t) - per capita budget expenditure at time t
p (t) - total population size at time t
Demographic details are added to the model by:

Equation 2: B (t) = sum { b (x, t) * p (x, t)}
b (x, t) - per capita budget expenditure at age x and
time t p (x, t) - population at age x and time t
Socioeconomic details are added to the model by (E.g. SP):
Equation 3: B (t) = sum { b (sp, x, t) * p (sp, x, t)}

b (sp, x, t) - per capita budget expenditure for social protection sp, at age x and time t
p (sp, x, t) - population for social protection sp, at age x and time t

Assumptions of the model

- Budgetary factors, i.e. per capita expenditures remain constant (in Equation 2) at their current levels in order to estimate age-specific government spending patterns over time, i.e. b (x, t) = b (x, 2014)

This assumption is used because it is difficult to evaluate age-specific spending components. By using the above assumption, the researcher was able to isolate the effect of changing demographic age structure on budget expenditures.

- The age profiles are held constant (in Equation 3) to analyze effects of changing demographic age structure on budget expenditures, i.e. B (t) = b (x) * p (x, t)
- Rate of productivity, interest and inflation rates are unaffected by levels of government taxation and distribution of government spending.

Influence of Supply Gaps of Utility Services on Livelihood Sustenance of Rural Sector: Lessons from the Case of Kalyanipura, Weli-Oya in Northern Sri Lanka

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Keywords: *Service Supply Gaps; Semi-structured Interviews; Livelihood Sustenance*

Introduction

In the present day context, sustaining livelihood in rural village setting has become a challenge. Providing basic utility services such as water (both for drinking purposes and for farming), electricity and motorized mobility to remote villages is capital intensive. Non-availability of access to such services could make rural life uneasy and unattractive, and could lead to unsustainability of such villages.

Kalyanipura in Weli-Oya is such a deep rural enclave in the Mullaitivu District where the villagers face immense hardships in meeting their basic utility requirements. The village, formerly known as "Dollar Farm", a Sinhala village which was brutally destroyed by the LTTE terrorists in 1984, was re-settled in the aftermath of the defeat of terrorism in 2009, together with six other villages. Over 200 families were given two acres of paddy land and another two-and-a-half acres of land for a house, under the supervision of Mahaweli Authority. Kalyanipura is one of the few Sinhala villages currently existing within the Northern Province.

The village has neither motorized transport access, nor has it got electricity grid connectivity. Though farming appears to be the intended main livelihood of the villagers (as reflected by the land provided when

re-settled), there is no irrigation system, and the farmers have to depend either on well water or on rain for irrigation purposes. Well is the only source of potable water, in close proximity to an area where Chronic Kidney Disease of unknown etiology (CKDu) is quite frequent. A significant utility service supply problem is therefore evident. No surprise that nearly three fourths of the number of families settled after 2009 have already left the village, and only 43 families continue to live there.

The paradigm of providing rural access to utility services is different to that in urban settings, and involves construction of utility infrastructure over longer distances. With regard to electricity, for instance, rural electrification calls for bringing electricity to distant villages Galindo (2014) and supplying through the grid might involve heavy energy losses on the one hand and inadequate economies of scale on the other. According to Brookshire and Wittington (2010) significant share of population in developing countries does not have access to satisfactory water supply; the problem is particularly acute in the rural areas. Inadequate quantity or quality of water supply can be a limiting factor in poverty alleviation and economic recovery, resulting in poor health and low productivity, food insecurity and constrained economic development Gbadegesin and Olorunfemim (2007). Even though the strategic importance of water resources management is now recognised because of increasing demands and rising costs, coupled with diminishing supplies Sharma *et. al.* (1996), the efforts of solving the problems faced by people, particularly those living in the rural areas, have not been successful. The planning process has routinely failed to lead to successful development projects. Often, the projects do not pass the simplest of benefit-cost analyses, and the institutional frameworks developed for the administration of such projects are found flawed.

Any weaker supply of utilities and their quality would make village life cumbersome and unpleasant, thus could push residents to abandon such villages, leading to lesser and lesser number of villagers remaining and causing further diseconomies of supply. This creates a negative cycle of

causes and effects, and becomes a development dilemma. Rural access toutilities thus deserves special reflection; the parameters may vary from one country to another and one locality to another, leading to different policy outcomes, and directly affecting design, implementation and evaluation parameters of utility supply programmes Galindo (2014).

Objectives

In the above context, the objectives of the research were to understand the extent to which the lack of electricity, water supply and transport services could have affected the village life at Kalyanipura, Weli-Oya, and could have threatened is very sustenance, and also to throw light on possible and pragmatic course of action the authorities could develop and implement in view of sustaining the village by filling the service supply gaps. The focus of this paper is on electricity and water supply aspects of the study.

Methodology

Semi-structured set of interviews was conducted with the participation of the residents of Kalyanipura in order to understand the conjuncture, to perceive the living conditions and to identify welfare facility gaps. The survey was exhaustive in the sense that all households (29) present at the time of survey were subject to interviews based on a pre-defined questionnaire. Information gathered included those pertaining to basic social life conditions and service supply needs; the findings relevant to electricity and water supply aspects are discussed in this paper.

Results and Discussion

Kalyanipura is among those rural enclaves without electricity grid connection in a country where the grid coverage now exceeds 98 % (Ministry of Power and Energy, 2015). The survey revealed that the inability of the village households (for their poor income levels) to pay the initial connection charge has been the main cause (96.5%

respondents) behind this electricity poverty, which was reflected in their monthly income levels as well. However, the survey also revealed that there is a general reluctance to make this payment even when they could afford to, owing to (a) the perception among the villagers that this requirement for the initial payment would be waived by the Ceylon Electricity Board (CEB) at one stage or the other, as it has done with regard to many other similar settings, and (b) the feeling that the CEB was not ready with the necessary transformers and other equipment and thus, any initial payment would be futile.

The survey revealed that the water supply problem was even more critical with regard to the sustenance of the village. The villagers reported that they have to travel 1.5 km in average to fetch potable water from the tube well provided by the Mahaweli Authority, five to six times every day. Even if water from this tube well is assumed to be of acceptable quality in a region where chronic kidney disease is prevalent, this distance is too inconvenient for the villagers to carry water from, and thus, almost all (98 % of the houses) have dug their own surface wells for water supply. Two problems were found associated with this method of fetching potable water: (i) the suitability of water in these shallow wells for drinking purposes is not clear, and (ii) such wells tend to dry out during long dry spells. Water availability also appears to have affected agricultural activity. This is reflected by the fact that only 23% of the villagers have reported that their vocation was farming, in spite of the fact that each family had been given two acres of land for cultivation. The lack of a proper irrigation system appears to be the crux of the problem, which, according to information gathered from the villagers and officials, has been made further complicated by an inappropriate land allocation pattern in which low lying areas were supposedly given for housing while allocating higher lands for cultivation. This has resulted flooding of houses during rainy seasons, and drying up wells at residences and thus the inability of sourcing water for drinking and cultivation purposes during dry periods.

Conclusion and Recommendations

The research enabled inference that the Kalyanipura village might not be sustainable unless the two pressing problems of water (for drinking and agriculture purposes) and electricity supply are resolved. The fact that nearly 77 % of the families settled in 2009 have already abandoned the village indicates that solutions have to be provided urgently if the village is to be sustained.

Given the distances involved and associated economics, alternative energy sources to provide electricity to village households might be worth exploring. An overall economic feasibility might thus be warranted to examine whether an alternative micro scale power generation technology (such as solar or biogas power system) would not be more economical to both the producers and to the national economy. If grid connectivity is thought more appropriate, the Government might consider subsidising the households on their initial payment requirement to CEB, which might be less costly, in the national sense, than letting village being gradually abandoned.

Water supply for both drinking and cultivation purposes also might require examination of alternative solutions. Re-arrangement of settlement plan and agricultural land allocation through an appropriate intervention by the Mahaweli Authority also might be warranted to facilitate water resource availability and delivery, particularly if the observations brought to the notice of the research is correct regarding the claimed inappropriate land allocation. Rain-water harvesting also might be worth exploring, at least as a solution for drinking water supply during wet seasons. Irrespective of such medium term solutions, an urgent intervention to test the quality and to ensure the appropriateness of both shallow and deep well water for drinking purposes is necessary. If the quality is found unsuitable, provision of drinking water at least by a mobile water supply mechanism, administered by the local or central authorities, will be imperative to sustain the village life in the short run.

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The Causal Relationship between Interest Rates and Exchange Rate in Sri Lanka

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Keywords: *Interest Rate; Exchange Rate; Causality; Cointegration*

Introduction

The exchange rate has (the Sri Lankan rupees against US dollar) depreciated from 1986 to 2013 in Sri Lanka (CBSL, 2013). It means the loss of value of Sri Lankan currency with respect to US dollar. The exchange rate is affected by many components including interest rate as one of those macroeconomic variables. According to the exchange rate channel indicated in Monetary Transmission Mechanism, it can work through either net exports or import prices. Increased money supply tends to lower the interest rate leading to a depreciation of the exchange rate. The depreciation of the exchange rate also raises import prices, which directly affect the several price levels, thus creating inflation (Amarasekara, 2005).

The theoretical as well as empirical relationship between interest rates and exchange rates has been a debatable issue in economics literature. Dash (2004) found that call money rate has negatively and significantly influenced the exchange rate in India. In other words, declines in the value of the exchange rate have prompted monetary authorities to raise domestic interest rates. Another study by Wilson & Sheefeni (2014) found that for Namibia, there is no relationship between interest rates and exchange rates. Kisaka (2014) found that exists a long-run relationship between the foreign exchange rates and interest rates and

there is unidirectional causality running from interest rates to foreign exchange rates in Kenya. Since the causation runs from interest rates to foreign exchange rates then authorities in the Kenyan financial markets use interest rates to stabilize the foreign exchange rates in Kenya. Tafa (2015) found that in the case of Albania, an increase in interest rates of deposits in ALL, caused the exchange rate of ALL/USD to increase, with USD becoming more expensive. While in the case of EUR/ALL exchange rate, it was found that when interest rate in ALL deposits increase, ALL was appreciating against Euro. Therefore, Lek (currecy of Albania) was becoming more expensive. Kayhan (2013) interest rate affects exchange rate in only China and this effect exist only in the long run. On the other hand, exchange rate shocks induce changes in interest rate in the shorter period. In Sri Lanka, although the causal relationship between inflation and exchange rate for instance, Perera (1997) found that even though Exchange Rate effect on Consumer price index, does not effect on wholesale price index in Sri Lanka. And also a dynamic relationship between activities of share market and short run interest rates has been attracted by previous researchers, there is lack of studies about the relationship between interest rate and exchange rates in Sri Lanka.

On the other hand, previous researchers used only one interest rate for their research even though there are various different interest rates pertaining to diverse financial assets which are expected to have different relation with exchange rates. This study attempts to fill this void by examining the causal relationship between different interest rates and exchange rate in Sri Lanka.

Objective

The objective of this study is to examine the causal relationship between different interest rates and exchange rate in Sri Lanka.

Methodology

This study used data from Sri Lanka over the period of 1986-2013. The data was extracted from the annual reports of Central Bank of Sri Lanka. Nominal Exchange Rate (NER) represented by the Sri Lankan rupees against US dollar and the interest rate represented by the central Bank Rate (BR), Average Weighted Prime Lending Rate (AWPLR), Commercial Bank Savings Deposit Rate (CBSDR), Commercial Bank 12 months Fixed Deposit Rate (CBFDR) and 91 days Treasury Bill Yield Rate (TBYR) were used. Since there are various different interest rates pertaining to diverse financial assets. ADF test and PP test was used to test the stationary property of time series data and Granger Causality test was adapted to identify the direction of causality between variables. Engle-Granger co-integration is used to investigate the long run relationship between variables.

Results and Discussion

The results of unit root tests confirmed that all variables except exchange rate are stationary at their first difference suggesting that they are integrated in order one. Since all interest rate are represented by percentage value and they are stationary at their first difference, we also transform the exchange rate in percentage value by taking first difference of logarithm in order to get the same order of integration. This form of exchange rate is stationary at its first difference. Therefore, all the series that are considered under this study is stationary at their first difference.

In order to determine the causal relationship between the variables, Granger Causality test was used. The results are presented in Table 1. As shown in Table 1, in all cases null hypothesis is accepted since probability value is greater than the significance level of 1 % or 5 % or 10 % suggesting that each interest rate does not granger causes exchange rate. And also exchange rate does not granger causes each interest rate respectively.

Table 1: Results of Granger causality test

Null Hypothesis (H_0)	Obs.	F- statistic	Prob.
BR does not granger causes NER	25	1.863	0.1860
NER does not granger causes BR		0.055	0.8163
AWPLR does not granger causes NER	25	2.593	0.1215
NER does not granger causes AWPLR		0.272	0.6068
CBFDR does not granger causes NER	25	0.018	0.8941
NER does not granger causes CBFDR		0.157	0.6952
CBSDR does not granger causes NER	25	0.352	0.5585
NER does not granger causes CBSDR		1.072	0.3117
TBYR does not granger causes NER	25	1.565	0.2240
NER does not granger causes TBYR		2.9e-07	0.9996

Note: *, **, *** represents significance at 10 %, 5 %, 1% level of significance respectively

It revealed that there is no causal relationship between interest rate and exchange rate of Sri Lanka. Both variables are I (1) and error term is I (0) required the co-integration test on order to identify the long run relationship. The result of Engel Granger cointegration for NER and BR is given below:

$$NER_t = 46.51881 + 1.879962BR_t$$

The results reveal that there is a positive but insignificant relationship between NER and BR in the long run. Next the result of Engel Granger cointegration for NER and CBFDR is given below:

$$NER_t = 150.4456 - 6.176078CBFDR_t$$

The results reveal that there is a negative and significant relationship between NER and CBFDR in the long run. Next the result of Engel Granger cointegration for NER and CBSDR is given by:

$$NER_t = 164.3168 - 11.65930CBSDR_t$$

The results reveal that there is a negative and significant relationship between NER and CBSDR in the long-run. Next the result of Engel Granger cointegration for NER and AWPLR is given by:

$$NER_t = 168.4426 - 5.964090AWPLR_t$$

The results illustrate that there is a negative and significant relationship between NER and AWPLR in the long-run. Finally, the result of Engel Granger cointegration for NER and TBYR is given below:

$$NER_t = 127.9410 - 3.877113TBYR_t$$

The results reveal that there is a negative and significant relationship between NER and TBYR in the long-run.

In the long-run, higher interest rates make it more attractive to save in the markets relevant to each interest rates, therefore more investors will switch to that markets to invest, then exchange rate decrease (Sri Lankan rupees seems to appreciate against US dollar) therefore the value of the rupees will increase in Sri Lanka.

Conclusion

The study mainly focuses on investigating the causal relationship between interest rates and exchange rates in Sri Lanka for the period of 1986-2013. The results reveal that there is no causality relationship between interest rates and exchange rate. But there are long-run relationship between nominal exchange rate and each interest rate except bank rate. Thus, in the long-term, higher interest rates make it more attractive to save as saving deposit and fixed deposit in the Sri Lanka, therefore more investors will switch to the Commercial bank. Therefore the value of the rupees will increase. When a central bank raises Treasury bill yield rates (yields rise, and bond prices fall), the currency appreciates as it becomes more attractive to hold. Therefore, interest rates fluctuations are important for the financial market actors, speculators and traders in international market. They should take into account interest rate changes in order to avoid probable loses causing

from exchange rate shocks. Authorities in the Sri Lankan financial market can use interest rates to stabilize the foreign exchange rates in Sri Lanka.

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Evaluating Financial and Social Efficiency of Microfinance Institutions in Afghanistan: A Two Stage Data Envelopment Analysis

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Keywords: *Microfinance; Dual Objectives; Financial Sustainability; Social Outreach*

Introduction

Although Afghanistan witnessed exponential growth in its economy since 2002, it remains one of the world's poorest countrie. It was ranked 169 out of 187 countries in the Human Development Index in 2013, and it is estimated that 36 percent of its population lives below the national poverty line. The country's financial sector is largely underserved, with only 9 percent of adults holding an account at a formal financial institution and 7 percent having a loan. On the other hand, microfinance is found to be a promising means of poverty alleviation and economic development as such. In this paper, we have attempted to evaluate the financial and social performance of MFIs in Afghanistan using a two stage Data Envelop Approach (DEA).

In the existing literature DEA is applied under both production and intermediation approach assuming either CRS or VRS assumptions. Bassem (2008) by analyzing the performance of MFIs in the Mediterranean zone applying DEA found that a few Non-Bank Financial Institutions (NBFIs) should reduce the size of their operation but some NGOs are required to increase the extent of their operations to operate more efficiently. Haq et al., (2010) evaluated the cost efficiency microfinance institutions across Africa, Asia and the Latin America

using DEA. They found that NGOs are the most efficient MFIs specifically under production approach. Kipesha (2012) examined the performance of MFIs in five East African countries by employing DEA. Input oriented production approach under both assumptions of CRS and VRS have been used. The result of the study implies that main source of efficiency is TE and it further implies that banks are more efficient than nonbank MFIs. Jayamaha (2012) analyzed the efficiency of small financial institutions (SFIs) in Sri Lanka using DEA. The study reveals that there is difference in efficiency scores by geographical locations and the size and the efficiency are positively correlated.

Singh et. al. (2013) studied the efficiency of MFIs in India by undertaking a two stage DEA approach using both intermediation and production approach. The study concluded that two MFIs are efficient under CRS and three MFIs under VRS and there is a regional variation in efficiency score too. Ahmad et.al (2014) evaluated the efficiency of MFIs in south Asia including 14 MFIs from Afghanistan. The study implies that Non-Bank Financial Institutions (NBFI) and credit union of large size should cut down the size of their activity in order to improve efficiency. NGO should increase the size of operation whereas rural bank should increase accessibility and loan size for the clients in pursuit of attainment of dual objectives.

Objective

The above reviewed literatures suffer at least from one major methodological flaw that is the performance evaluation of MFIs based on a single model. However, in Afghanistan MFIs are mostly funded by the donors, hence, the social outreach efficiency of MFIs operating in Afghanistan may interest them more than the financial sustainability. This study has attempted to fill this methodological gap by measuring the performance of MFIs from both social and financial perspectives separately. The study attempt to measure the level of overall technical inefficiency of MFIs operating in Afghanistan and identify the major source of technical inefficiency of these institutions

Methodology

This paper attempts to evaluate the financial and social performance of MFIs in Afghanistan using a two stage Data Envelopment approach (DEA). In the first stage, the overall technical efficiency (OTE) of MFIs is calculated using input oriented CCR model. Moreover, for our study to provide robust and reliable policy implications, the second stage DEA is also undertaken where the efficiency scores obtained in the first stage is regressed to some socio-economic variables which are beyond control of management but may affect the efficiency of MFIs.

For the second stage the following regression model using OLS techniques is applied:

$$TE_{it}^{super} = \beta_0 + \beta_1 AGE_{it} + \beta_2 ROA_{it} + \beta_3 EQAST_{it} + \beta_4 OSS_{it} + B_5 RISK_{it} + u_{it}$$

Where $i\ reprsents\ MFIs\ and\ \ t = 2006, \dots, 2010$

The source of the data for the present study is Mix Market (www.mixmarket.org). The inputs and output variables are selected as follows: For computing the financial efficiency, two variables namely total asset and operating expenses as inputs and Gross Loan Portfolio (GLP) and financial revenue have been selected as outputs. The rationale behind choosing above as the appropriate input and output variable is that Total asset indicates the capital and resources MFIs possess for smooth functioning of their operation and operating expenses account for the expenses MFIs incur during operation. For measuring the social efficiency of MFIs, inputs are the same as financial case but some other proxies have been specified to account for the social output. In microfinance, social efficiency refers to depth and breadth of outreach. Breadth of outreach indicates the number of people to whom credit extended, while the Depth of outreach captures whether microfinance services has been extended to the ultra-poor and most deserving customers (Quayes, 2012).

Therefore, we have specified Number of female borrowers as indicator of depth of outreach and a variable known as poverty index (PI) as a proxy for both depth as well as breath of outreach. Both of these variables capture the social objective of microfinance institutions.

Results and discussion

The result of first stage DEA using input oriented DEA CCR model shows that the average financial efficiency score over the period (2006-10) is ranging between 0.579 and 0.995 while that of social efficiency is ranging between 0.043 and 0.978. In other words, the financial inefficiency level is ranging between 42.1 % and 0.5 % while social efficiency is fluctuating between 95.7 % and 2.2 %. It implies that a huge amount of resources are wasted in microfinance sector in the country.

The empirical findings of the study further reveals that the source of inefficiency in most MFIs are attributed to inappropriate allocation of operating expenses, Gross loan portfolio and insufficient coverage of female borrowers. Only two of the twelve MFIs have succeeded in achieving dual objectives. Furthermore, the OLS regression result in the second stage DEA indicates that equity asset ratio (EQAST) is the only socio-economic factor which inversely influences both social and financial efficiency of MFIs in Afghanistan. But in case of financial efficiency of MFIs two more factors namely OSS and RISK are positively affecting the efficiency of MFIs as well as the inverse effect of EQAST.

Conclusion and Recommendation

This study attempts to evaluate the financial and social performance of Microfinance institutions operating in Afghanistan using a two stage DEA approach for a panel data of 12 MFIs and four years period (2006-07/2009-10). In the first stage, the overall technical efficiency of MFI is calculated using CCR input oriented DEA model. Moreover,

further attempt has been made to find the slacks associated with each input and output which captures the sources of inefficiency in MFIs. Meanwhile, a matrix called socio-financial efficiency matrix has been constructed to find the direction of efficiency improvements of MFIs in pursuit of the double bottom line objective. In the second stage, first super efficiency scores have been calculated to do away with the truncation of technical efficiency scores in the first stage then the derived super efficiency scores regressed to some socio-economic variables to highlight the factors influencing the technical efficiency score in the first stage.

This study suggests that the MFIs have to decrease the operating cost, and increase the Gross loan Portfolio in order to achieve the double bottom line objectives of social outreach and financial sustainability. Meanwhile, they are recommended to reach out to more female borrowers. The study further suggests that, OXUS-AFG and FINCA-AFG which are currently operating in Afghanistan are inappropriate channels of donors fund for poverty alleviation purposes as they have been successful in attaining neither of the dual objectives of Microfinance. Furthermore, based on the prescription of this study, the new and existing Microfinance institutions are recommended to keep the Equity Asset Ratio (EQAST) at its lowest possible level to increase their efficiency. But for them to be only financially efficient they are suggested to make two more adjustments i.e. enhance their Operating Self Sufficiency (OSS) and Portfolio at Risk (RISK).

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Socio-economic Determinants of Household Solid Waste Management in Kandy Municipal Area

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Keywords: *Willingness to Pay; Solid Waste Management; Socio-economic Determinants*

Introduction

Municipal Solid Waste (MSW) management is an important role of urban authorities and it is directly related with the protection of environmental wellbeing, human health and living standards of people. The recent literature shows that, the rapid increase in solid waste generation due to accelerated urban population growth, unplanned urbanization, and increasing economic activities, has become a crucial problem in all countries regardless of the development status of them (Kwetey, 2014). In fact, the services related to solid waste management are far from satisfactory level in many developing countries due to some financial and social problems (Wang, 2011).

With the current phase of rapid urbanization, relevant authorities in Sri Lanka are also experiencing serious difficulties in addressing this problem. In 2005, the estimated average solid waste generation in Sri Lanka was 2838.46 tons/day and it has increased to approximately 7,250 tons/day by 2009. In 2005, the average per capita MSW generation was 0.62 kg/cap/day and it has been predicted to reach 1.0 kg/cap/day by 2025.[3]According to the database of MSW in Sri Lanka (2005), the gross weight of the solid waste, collected by the Kandy

[3]Database of Municipal solid waste in Sri Lanka, 2005 (Ministry of environment and natural resources)

Municipal Council (KMC) is 145.04 tons and per capita waste collection per day is 0.62kg.[4]

During the past few decades solid waste generation in Kandy area has also increased rapidly, thus KMC requires more efficient and effective solid waste management system. However, as KMC state, lack of funds is one of the major constraints for implementing such a service. To the best of our knowledge, no any systematic research has been conducted focusing this issue and consequences of not drawing attention to this problem may be aggravated in the future in many folds than it is today unless alternatives are designed to address it. Therefore by conducting a primary survey, this study mainly expects to achieve the following objectives.

Objectives

First, we identify the major socio economic factors affect to the household solid waste generation in Kandy municipal area. Secondly, we estimate the people's average amount of willingness to pay for a better municipal solid waste management system. Finally, study identifies the major socio economic factors affecting to households' willingness to pay for a better solid waste system.

Methodology

This research used both primary data collected from a household survey in Kandy Municipal area during the period from 20th September to 30th October, 2015, and the secondary data obtained from the KMC solid waste management database. A sample of 80 households from different areas in Kandy municipality was selected using stratified random sampling method and the relevant information was collected using a structured questionnaire and interviews. Household's willingness to pay

[4] Database of municipal solid waste in Sri Lanka, 2005 (Ministry of environment and natural resources)

was measured by using Contingent Valuation Method. Two regression analyses were estimated to analyze the primary data. The first OLS regression model is used to study the percentage of solid waste generated by household per day (out of total waste generated by the households how much they give to the Municipal waste collection service) against the household income (*I)*, household size/total number of people in the household (*Hsize)*, education status of the household (*edu)*, extra land size within the compound of the household (*exland)*, distance from the center of the city (*distance)* and the gender of household head (*gender)*. These variables were defined based on the previous literature[5].The percentage of waste which a household gives to the municipal waste collection system per day was taken as an indicator of household waste generation since it was practically difficult to measure the total waste generated by a household.

$$lnW_i = \beta_0 + \beta_1 I_i + \beta_2 Hsize_i + \beta_3 exland_i + \beta_4 edu_i + \beta_5 distance_i + \beta_6 gender + u_i$$

where u_i is the white noise random error term.

Secondly, by using Logit regression model, probability of households' Willingness to Pay (WTP) was regressed against the household income (*I)*, Amount of property tax paid by household (*tax)*, Amount of waste generated by H/H (*waste)*, Distance from the center of the city (*distance)*, Education level of the H/H head (*edu)*, Extra land size within the compound of the household (*exland)* and the Ownership of residency (*own)*[6]

$$WTP = \beta_0 + \beta_1 I_i + \beta_2 tax_i + \beta_3 waste_i + \beta_4 exland_i + \beta_5 distance_i + \beta_6 edu_i + \beta_7 own + u_i$$

[5] Sankoh et al, 2012. A situational Assessment of Socio Economic Factors Affecting Solid Waste Generation and Composition in Freetown, Sierra Leone.

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Results and Discussion

According to the survey results, average amount of solid waste generated by households per day is 1.79 Kg. As it shows in Table 1, major socio economic factors which determine the household solid waste generation are household income, household size, education status of the house and the distance to the house from the center of the city. Gender of the household and extra land size within the house does not have any significant impact on waste generation. H/H income has a significant positive impact on household solid waste generation. However, size of the household is the most important factor which determines the H/H waste generation in Kandy Municipal area. Education status of the household also has a significant negative impact on waste generation.

Table 1: Determinants of solid waste generation

lnW	Coefficient	t value	P value
Income	0.021	2.25	0.027**
Hsize	0.106	3.41	0.001***
Exland	-0.0002	-0.06	0.950
Edu	-0.116	-2.40	0.019**
Distance	0.105	3.22	0.002**
Gender	0.088	0.81	0.422

Note: *, **, *** represent the significant at 10 %, 5 % and 1 % respectively

According to the survey results, 62.5 % of the households (50 households out of 80) are willing to pay for introducing a better waste management system while only 37.5 % (30 households out of 80) are not willing to pay. The percentage of willingness to pay is higher in the high income groups and lower in low income groups. The average amount of money which households are willing to pay for the waste management service is Rs 93.63 per month.

Table 2: Estimated results of WTP

WTP	coefficient	Marginal Effect	Z value	P value
income	0.0025	0.0052	2.57	0.010**
tax	-0.043	-0.0089	-2.58	0.012**
waste	0.866	0.179	1.74	0.081*
exland	-0.183	-0.038	- 2.92	0.004***
distance	-0.555	-0.115	-1.79	0.073*
edu	1.156	0.246	0.014	0.014**
own	-1.759	-0.261	0.465	0.465

Note: *, **, *** represent the significant at 10%, 5% and 1% respectively

The major socio economic factors which determine the H/H willingness to pay for a better waste management system are H/H income, amount of property tax paid by the household, education level of household head, amount of waste generated by the H/H and distance from the core of the city. Ownership of the residency does not have any significant impact on willingness to pay. H/H income has a positive impact on willingness to pay which means when the income increases probability of willing to pay also increases. However, marginal effect (0.0052) of income on willingness to pay is very small. Amount of property tax paid by the household also has a significant but negative impact on willingness to pay as the increase in tax amount will reduce the peoples' motivation to pay. When the household head is more educated, he /she will be more aware on environmental cleanliness and willing to pay more for a better waste management system. Extra land within the housing area is negatively correlated with the H/H willingness to pay because people dispose some amount of their waste within the housing area and less likely to depend on municipal service. When the average amount of waste generated by the household increases, they face problems such as waste collection, storage and disposal. As a result households demand for municipal waste management service is more. Distance from the core of the city also has a significant negative impact on households' WTP as they have more space and more alternative ways to dispose the waste rather than using the municipal collection

service. The ownership of the residency is not significantly important in determining the WTP for a better solid waste management service in Kandy area.

Conclusion and Policy Implications

This study identifies household income, household size, education status of the house and the distance to the house from the center of the city as the major determinants of household solid waste generation. About 62.5 % of the households in the city are willing to pay for a better waste management service while only 37.5 % households are not willing to pay for such improved service. Households' mean willingness to pay for improved solid waste management service was estimated as Rs 93.60 per month. Monthly household income, annual property tax amount paid by the household, education level of the household head, extra land area are highly significant in determining the willingness to pay whereas amount of waste generated by the house and the distance from the core of the city are weakly significant. By levying a flat rate service fee which is equal to the mean willingness to pay, municipal council can earn approximately Rs. 30,584,736/= amount of revenue annually, and thereby KMC can save 15 % from the annual recurrent expenditure. Therefore, introducing a service fee for the waste management service provided by KMC can be recommended and seems to be financially feasible in providing a better waste management service.

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Trend of Dengue Cases in Sri Lanka: An Empirical Investigation in Doluwa Area in Kandy District

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Keywords: *Dengue Fever; Cost of Prevention; Empirical Investigation*

Introduction

Dengue Fever (DF) is an infectious tropical disease caused by the dengue virus. As there is no commercially available vaccine, prevention is sought by reducing the habitat thus resulting a decrease in the number of mosquitoes and limiting exposure to bites. According to the WHO report (2012) approximately 2.5 billion people, two fifths of the world's population is now at risk of dengue and estimates that there may be 50 million cases of dengue infection worldwide every year. The disease is now endemic in more than 100 countries.

The cases of dengue related diseases have dramatically increased in Sri Lanka over the last few decades, and also there was an explosive increase in geographic distribution of dengue after 1950s in the country. Reasons such as uncontrolled urbanization, rapid population movement, inadequate water, bad waste management as well as unsustainable vector control programs have already been identified. Sri Lanka is classified as a "Category A" country by W.H.O. which means dengue fever is a leading cause of hospitalization and death. Limited researches have been done to estimate the cost in prevention and treatment for dengue in Sri Lanka and there is no research done to estimate the cost in prevention and treatment dengue in Kandy district. Estimation of the costs of dengue has many dimensions which include information on the economic benefits of dengue control, prevention

intervention and information on cost-effectiveness and budget impact analysis. A number of studies have been already undertaken to investigate various aspects of the spread of dengue fever and cost of prevention and treat dengue in different countries (Kovats et al. 2001; Lafferty, 2009). Then cost elements were examined to identify variables and fixed costs pertaining to each activity within each element. Health cost of dengue prevention activities in Colombo district reached a total of LKR 127 million. The review of the previous studies shows that most studies have considered the different aspects on spreading of dengue in different countries and estimates the cost for dengue. However, these studies have only provided limited information on these links. Accordingly, it is obvious that more conceptual and theoretical work is needed to develop a better understanding of this relationship. This study will fill this void in the literature.

Objectives

The goal of this study is to investigate the trend of dengue cases in Sri Lanka and measure the cost of prevention of dengue fever in Doluwa M.O.H area in Kandy district. Study attempts to measure the cost of dengue control activation implemented by Doluwa M.O.H. team and measure the cost of dengue treatment. This study will investigate these issues by using secondary data covering all GS divisions in Doluwa M.O.H. area in Kandy district.

Methodology

This study employs a descriptive method of study in order to analysis the trend of dengue cases in Sri Lanka. Measuring the cost of dengue control activities implemented by Doluwa M.O.H team is examined through collecting secondary data from the M.O.H office of Doluwa. Data collection is based on 6 years and a year wise comparison is conducted. On the other hand, measuring the cost of treatment on the dengue patients in Doluwa M.O.H area is also examined by collecting secondary data from past 6 years from M.O.H office of Doluwa. The

total cost for treatment is divided as direct and indirect cost. Direct cost is based on the expenditure done on treating the patient whereas the indirect cost is based on the loss of working days. Cost of illness approach is used to find the cost of prevention of DF as well as cost of treatment on patients.

Results and Discussion

In the analysis first, the trend of dengue cases in the country was investigated and it is reported in Table 1 (see Annexure). When considering the total it is shown that the dengue cases have increased throughout the years. Table 1 shows the number of provincial wise dengue cases as well. Here the highest average number in period between 2011 and 2016 is from the Western Province. This can be seen as a result of Western Province being the most urbanized and industrialized province when compare to others. According to the Table 3, the highest average of dengue cases reports in July 5173 of average precisely. The lowest average is shown in the month of April which is 1952. These results are due to the climatic changes in Sri Lanka. Table 2 shows the cost for dengue prevention in Doluwa MOH area. Divisional secretariat office Dolwa, Udapalatha Pradeshiya Sabha and Peradeniya and Gampola police stations have put a significant effort to prevent dengue cases in those areas. Table 4 gives the information of the main cost components of treatment of dengue patients. Further, it was estimated the cost of dengue treatment for the patients who suffered from dengue in Doluwa M.O.H area which shows in Table 5. In year 2012 the cost for treating dengue patients in Doluwa M.O.H area was 325,034 LKR. This remains the lowest cost reported between, 2011-2016. The highest cost for dengue treatment was in 2011 which increased up to 797,377 LKR.

Conclusion and Recommendation

The results of this analysis show that during the last few years, suspected dengue cases have been increasing in Sri Lanka.

Interestingly, more than 50 % of dengue cases were reported from the Western province. Simultaneously, the cost of treatment and prevention is also increasing. This situation shows the important of regular removal of possible mosquito breeding sites from the environment. It is also important to seek medical attention in the event of fever by day three of the illness and make awareness program in high risk areas in the country. Prevention programmes need to be continued with the assistance of public health officers, police and military personnel. Not only residences but also the officers both public and private will be thoroughly inspected and legal actions would be taken against offenders. This type of policy measures can reduce the reported dengue cases in Sri Lanka in the future.

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Figure 1: Basic Framework of Methodology

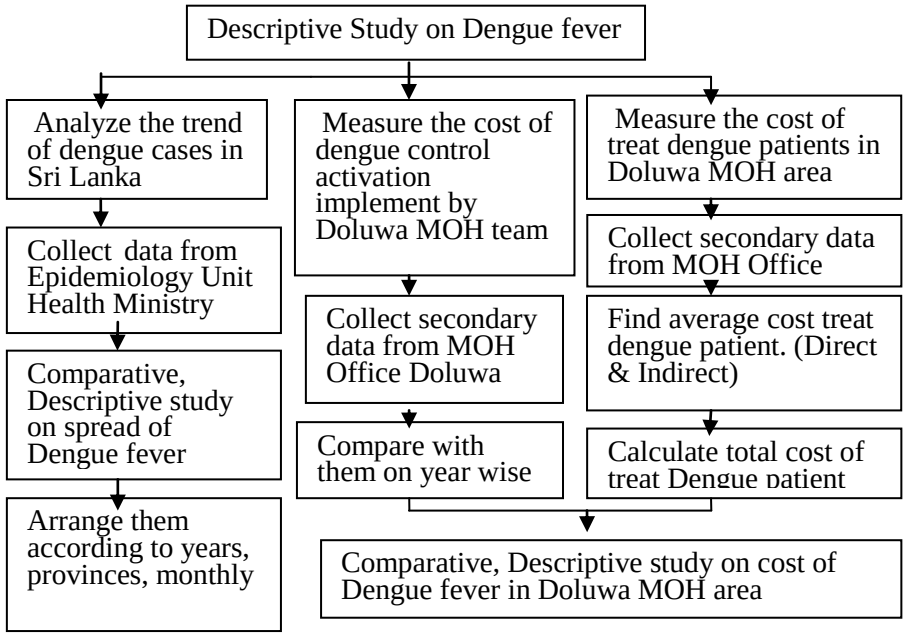

Table 1: Number of dengue cases

Province	Cases of dengue					
	2011	2012	2013	2014	2015	2016 (Jan. to Aug.)
Western	15913	20814	16540	26153	15582	19300
Central	2252	3455	2530	3299	1906	3973
Southern	2090	3952	1771	2637	1887	2976
Northern	666	1319	1161	2564	2552	2174
Eastern	2154	1442	1509	2306	2666	1343
North-western	1611	5337	3696	3380	1992	2783
North Central	603	782	1077	1190	651	872
Sabaragamuwa	2240	6643	2966	4547	1752	3303
Uva	944	717	813	1426	789	879
Total	28473	44461	32063	47502	29777	37603

Source: Epidemiology unit Ministry of Health

Table 2: Cost for dengue prevention in Doluwa M.O.H area

Year	2011	2012	2013	2014	2015	2016
Expenses (Rs.)	17000	31375	76250	12200	35000	54000

Source: MOH office Doluwa

Table 3: Cases of dengue in Sri Lanka

Month	Cases of dengue					
	2011	2012	2013	2014	2015	2016
January	933	3986	3462	3610	6345	6674
February	1052	3145	3258	2011	3731	4439
March	1118	2628	2996	1648	1962	2696
April	1771	2028	2109	1682	1293	2830
May	1967	2550	2614	4292	1625	2412
June	3471	5955	2427	6736	1477	4730
July	4817	5193	2924	5721	2125	10259
August	2106	5266	3282	4022	1604	3563
September	2445	2857	1912	2640	1099	
October	2127	3181	1636	4297	2066	
November	2203	4034	2611	5452	2762	
December	4463	3638	2832	5391	3688	

Source: Epidemiology unit Ministry of Health

Table 4: The main costing elements in treatment of dengue patients are

Patient type	Diagnosis	Place of treat	Average cost (Rs.)
Paediatric	Dengue fever	Ward	6717
Paediatric	D.Hemorregic fever	Ward	16985
Paediatric	Dengue fever	ICU	10378
Paediatric	D. Hemorregic fever	ICU	58179
Adult	Dengue fever	Ward	4210
Adult	D.Hemorregicfever	Ward	11965
Adult	Dengue fever	ICU	43256
Adult	D.Hemorregicfever	ICU	91902

Source: Thalagala (2013).

Table 5: Cost for treating dengue in Doluwa MOH area

Year	Total cases	Adult Patients		Peadia. patients	Cost for treatment LKR	Number of daily wage patients	Daily wage LKR	Loss of wage LKR	Total cost LKR
		DF ward	DHF ICU	DF ward					
2011	46	40	05	01	634627	31	750	162750	797377
2012	20	18	02	00	259584	11	850	65450	325034
2013	25	22	03	00	368326	14	950	93100	461426
2014	30	27	02	01	304191	22	1050	161700	465891
2015	31	28	03	00	393586	20	1150	161000	554586
2016	22	22	02	00	276424	15	1250	131250	407674

Social and Economic Disparities: A Case Study of Post War Period of Jaffna District in Sri Lanka

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Keywords: *Economic Anthropology; Economic Activities; Disparities; Post War Period*

Introduction

The economic activities can be explained using economic anthropology or economic sociology. Economic activities are directly related with the land, labor and money. In Sri Lanka, the consequences of the three decades of the war is felt in every sphere of social and economic life. The northern and eastern regions have been the main victims of the war. There was a wide spread sense of insecurity and vulnerability among the population, a feeling of despair and hopelessness among young and erosion of political, legal and social right. According to Tamil community is determined by caste, gender relationship, minority or ethnic group identity (socio-economic, cultural and political background of past). Thus, another major change that come with the war and post war transformation is that the elite began claiming economic activities and common resource in many ways. However, the living conditions of those who were disadvantage group of people in the Tamil communities are suffering a lot. This study focus on stories about the ordinary lives of people and socio- economic disparities through different human and non- human symbols in post war Jaffna.

Objective

This paper attempt to explore the nature of existing socioeconomic disparities in Jaffna. The study especially focuses on two major components such as social and economic disparities in post war Jaffna within the framework of economic activities in every day with special reference to selected visual representation of the society.

Methodology

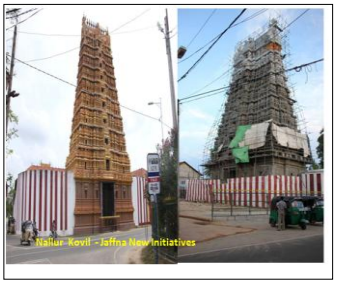
To understand the way of social and economic disparities are constructed, this research is implemented visual methods. This research mainly focuses on different part of Jaffna district. Jaffna is the most important metropolitan district in the Northern Province. Data for this study has been collected through visual methods and analysis is also based on visual qualitative method. The photography captured in different part of Jaffna from 2015 to 2016 are used in the analysis. By using the purposeful random sampling method, total number of 25 photography have been selected for the study. This work has been carrying out within a framework of the comparative approach. The comparative approach helps to frame larger ideas and concepts about the society. Such comparative studies help us to move to a marked differences found in the society. Photography is used as a tool to understand different interpretations of a social and culture.

Results and Discussions

Jaffna peninsula is a conglomeration of the higher and lower social groups functioning in a stratified social structure. This part of the paper discuss in detail the existing social and economic disparities in post war Jaffna.

Nallur Temple - Jaffna New Initiatives:

Nallur temple is the most famous Hindu temple in Sri Lanka. Thitemple has the reflection of traditional architecture. The



Nallur festival in Jaffna in August is the island`s longest festival. It gives an economic benefits for the rural people of Jaffna. Mainly, it has spanning 25 days of vibrant chariot processions, drumming, dancing, and acts of self- mortification held in honour of the war god Skanda. There are two building in front of the temple. It is called Kopuram or Thoolalingam (south and north side building- 2015).

This kind of the building gives social and economic benefits for the community. There are stiffening architecture engine. At the beginning some south Indian workers took part in constructing buildings However, above those buildings were a co-operative action and built by local workers. So, there was a high demand for local labor. These kinds of the building can work as a pattern of commodification in the contemporary Jaffna society. It is a new social advantage or social benefits. It brings many advantages from inside to the societies. It can bring economic advantages as well.

Jaffna Fish Market Different Narratives: There are a number of small fish markets around in Jaffna. Some of the fishing community activities which taken in this study. Community data (photography) show that the different stories or narratives. First one is an underage worker. It is a subculture in the fishing community. Another side is a fisherman; he is a really capable person by economically. It reflects on a symbol of mobile phone watch, gold ring etc. This is a new kind of economic disparities in the contemporary Jaffna society.

Diversity in Agricultural Economy: Jaffna has special features as a place. Jaffna peninsula is a conglomeration of the higher and lower groups functioning in a stratified social structure. The livelihood of Jaffna peninsula is based on agriculture. There are people over 65% of the work force in the society depend on agriculture for their livelihood. Tobacco is one of the traditional cultivation in Jaffna. It was introduced by portholes. It is market-oriented or commercial purpose cultivation in Jaffna. Valigamam north and east which are the most important tobacco farming division in the Jaffna. It cultivated for a long time period. And also they sell tobacco not only inside of Sri Lanka but also south Asia.

There are traditional tobacco lands misused by military. There is around 400 hectares tobacco area of valikamam. This area is uncultivated land of the high-security zones by the military. Another side of the photography is a coconut coir business which is used as preservation for tobacco in Jaffna. Also it is a small scale production and Investments involved is also small scale.

Stories of Victims from Different Traumatic Events - IDP Camps People: Many of people are living in internal camps in different part of Jaffna. They dimpled from time to time and high-security zones established by Sri Lankan military in 1990. They are living the long term in the temporary welfare centers. They did fishing and toddy activities at their own area. After the displacement they become bonded or wage Labor of Jaffna. Such an attempts by government and non government agent put them in a cycle of poverty. They are seasonal workers and caste based disadvantage group of people in Jaffna. Their life is a hard because they have been suffering without space to sleep in their temporary house without water and Toilet.

Palmyrah Products and Economic Replacements: The people of Jaffna specialize in palmyra products. This photography is a one of the palmyrah product. It is called in Tamil karruppattivellam or panaivellam or panakkaddy. Also, it is called jaggery or sugar. This kind of Palmyra products carries on small or large scale in the Jaffna society. This product gives a benefits for particular group of people in villages.

Tourism and Education Icons: Tourism is as effective on an economic and social development of countries, in which, economists call tourism as invisible export. The tourism industry in Sri Lanka has been evolving following the end of civil war. In order to cater the ever increasing demand, a significant investment is taking place in the identified tourism site and location. Tourist places bring new kind of work opportunities among the local people (small scale traders) and increasingly multiculturalism in the society.

Conclusion

This study concludes that there are existing social economic disparities in post war Jaffna through different human and non-human symbols. An economic activity plays a fundamental role in sustainable life in all living beings and has multiple purposes. The existing social economic disparities are related to land, labor, and money. It is also observed that social economic and cultural life of Jaffna society is changing rapidly.

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Export and Economic Growth Nexus in Sri Lanka: A Time Series Analysis

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Keywords: *Export led growth; Trade; Time Series Analysis*

Introduction

The nature of the relationship between exports and national output growth has been one of the most debated in the recent past. However, still a little consensus in the theoretical and empirical literature in international trade and development economics can be seen. Central to this debate is the question of whether strong economic performance is export-led or growth-driven. This question is important because the determination of the causal pattern between export and growth has important implications for policy-makers' decisions about the appropriate growth and development strategies and policies to adopt. Aiming at a rapid economic growth, governments of the developing world have pursued export promotion strategies, with the belief that export might overcome natural limits and constraints to economic growth which exists in their domestic economies. Sri Lanka is not an exception to this case, which implemented export oriented strategies, particularly after opening up the economy in 1977.

The Export-Led Growth (ELG) hypothesis suggests that there is a strong positive linear relationship between a country's exports and economic growth. This interesting question has been the subject for a number of research works in the recent past. Many econometric analyses have been performed to identify the export causality towards economic growth with varying degree of results.

Objective

The main objective of this paper is to examine the relationship between export and economic growth in Sri Lanka during 1977-2014. The paper also attempts to identify the recent trends, developments and obstacles for exports in Sri Lanka.

Methodology

Annual time series data on gross domestic production, export, gross fixed capital formation, employment and inflation, which cover the 1977–2015 period, have been used in this study for the analysis. The data are taken from sources such as economic surveys of Sri Lanka, World Bank Reports, Central Bank Reports of Sri Lanka, UNCTAD (United Nations Conference on Trade and Development) Reports, and IMF reports. All data figures are expressed in rupees millions, unless otherwise percentage. In order to achieve the objective the following general version of time series model is used:

$$GDP_t = \beta_0 + \beta_1 EXPO_t + \beta_2 GFCF_t + \beta_3 EMP_t + \beta_4 INF_t + \mu_t \qquad (1)$$

Where dependent variable is gross domestic production (GDP) and the independent variables are export (EXPO), gross fixed capital formation (GFCF), employment (EMP) and inflation (INF). μ_t is the white noise error term. Log transformation of the model can be written as follows.

$$LGDP_t = \beta_0 + \beta_1 LEXPO_t + \beta_2 LGFCF_t + \beta_3 LEMP_t + \beta_4 LINF_t + \mu_t \quad (2)$$

First, we used ADF unit root test to check the stationarity property of the time series data and then Johansen Co-integration test was adopted to examine the number of co-integrating equation. Vector Error Correction model (VECM) was employed to investigate the short-run, long-run relationship as well as long-run equilibrium of the model. Finally, Granger casualty test was rented to identify the direction of the causality.

Results and Discussion

Augmented Dickey Fuller test was used to determine the order of integration of the variables in the model. The result of unit root test is presented in Table1.

Table 1: Augmented Dickey-Fuller test of unit root (1977-2015)

Variables	Level		1st Differences	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
	t - stat.	t -stat.	t - stat.	t - stat.
LGDP	-1.0986	-0.3148	-4.2280**	-4.6197**
LEXPO	-1.0888	-1.9916	-6.5917***	-6.5824***
LGFCC	-1.4426	-2.4658	-5.4013***	-5.4165***
LEMP	-1.4471	-2.5759	-4.7832***	-5.4029***
LINF	-4.0396**	-4.6448**		

Note: Significant levels - at 1% denotes *** , 5 % denotes ** and 10 % denotes * respectively.

The estimated results show that none of the variables are stationary at their level form except inflation whereas all the variables are stationary at their first difference with intercept only and with intercept and linear trend. Therefore, we used all the variables in the first difference with intercept in order to make the same order of the series. The long-run relationship between the variables can expressed the following estimated equation:

$$LGDP_t = 13.97 + 1.80LEXPO_t + 0.36LGFCF_t + 0.103LEMP_t - 0.003LINF_t$$

t stat. (17.8) (7.302) (8.601) (4.821) (-1.514)

Note: t-statistics are given in the parenthesis

The estimated results show that export, gross fixed capital formation and employment have positive and significant impact on GDP in the long-run whereas inflation does not have significant impact on GDP.

The long-run relationship between the variables indicates that there is Granger-causality in at least one direction which is determined by the F-statistic and the lagged error-correction term. In this model, R square is 0.99 (99 %), it shows that model is accurate. Out of the 100 % variation of the GDP growth, all these variables explains the 99 % of that variation with this model. Only other factors explain the 1% variation of the GDP variation.

Conclusion and Recommendation

In this study we empirically examined the validity of export-led hypothesis for Sri Lanka by testing causality between export and economic growth after including capital, labour and inflation. There are many studies that have examined the export–growth nexus, but the findings are questionable. The reasons for the inconsistencies mainly include sample bias, the selection of appropriate proxies for variables, methodological deficiencies and the quality of data. The findings of this article reveal that export which promotes economic growth, capital investment and employment in the short-run and long-run for Sri Lanka. We find that the reported results confirm the validity of export-led growth hypothesis for Sri Lanka. That is, openness indeed leads to higher economic growth.

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Table 2: Unrestricted Co-integration rank test (Maximum Eigenvalue)

No of co-integrating equation	Trade statistic	0.05 Critical value	P value
None*	89.566	69.818	0.0006
At most 1*	47.856	47.856	0.0125
At most 2*	29.797	29.797	0.0334
At most 3*	15.494	15.494	0.0646
At most 4	3.8414	3.8414	0.2061

Table 3: Trace Test

No of co-integration equation	Max-Eigen Value	0.05 Critical Value	Probability value
None*	35.77365	33.87687	0.0294
At most 1	22.49767	27.58434	0.1960
At most 2	16.54845	21.13162	0.1944
At most 3*	13.14805	14.26460	0.0745
At most 4	1.598952	3.841466	0.2061

Table 4: Granger Causality Test Results (1 Lags)

Direction of the Causality	Probability	Decision	Outcome
EXP →GDP	0.6594	Don't reject null	EXP does not causes GDP
GDP →EXP	0.0752*	Reject null	GDP causes EXP
EMP →GDP	0.1582	Don't reject null	EMP does not causes GDP
GDP →EMP	0.0005*	Reject null	GDP causes EMP
GFCF→GDP	0.4872	Don't reject null	GFCF does not causes GDP
GDP → GFCF	0.0328*	Reject null	GDP causes GFCF
EMP →EXP	0.6321	Don't reject null	EMP does not cause EXP
EXP→EMP	0.0114*	Reject null	EXP causes EMP
INFL→EXP	0.3398	Don't reject null	INFL does not cause EXP
EXP →INFL	0.0442*	Reject null	EXP causes INFL
GFCF→EXP	0.2292	Don't reject null	GFCF does not cause EXP
EXP→GFCF	0.0504*	Reject null	EXP cause GFCF

Satisfaction of Tourists with Public Transport System in Sri Lanka

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Keywords: *Tourists; Public Transport; Sustainable Mobility*

Introduction

Tourism can be defined as voluntary short term movements of people through time and space, either, between home places and destination or within the destination. Transport system is an essential factor to maintain tourists' mobility to reach their destinations. Various transportation systems including private and public transport modalities can be used for tourist transportation.

However, the concept of sustainable tourism has been identified as a major concept of current tourism. It covers several aspects such as environmental protection, ecology protection and minimized air and land pollution. To achieve sustainable tourism, sustainable mobility of tourists is essentially needed to be achieved. Sustainable mobility can be attained with the use of public transportation systems which have less ecological damages than use of several private transportation methods which may collectively cause extra negative ecological externalities. According to Banister (2008) sustainable mobility is not only objective based transport planning system, but also it needs public acceptability. Public acceptance can be estimated via satisfaction on various elements of transportation systems. In developed countries, public transportation systems are more organized with variety of facilities than developing countries (Iles, 2005). As a developing country, Sri Lankas' public passenger transport system has not yet well developed and remains highly criticized in terms of quality of the

service (Sevenatha, 2002). Therefore, it is essential to evaluate presence of aforementioned objective based transport system with public acceptability in Sri Lanka in order to create positive future changes. After evaluation of tourists' satisfaction on Sri Lankan public transport, we can evaluate the level of quality of public transport system as they usually answer by comparing the level of their transport experience in their countries. Thus, these feedbacks will help on future development of public transport systems in Sri Lanka. As a result, higher tourism satisfaction with public transport would lead to attract more tourists to public transport and to the country, making it a better centre for tourism.

However, the satisfaction on tourists with public transport in Sri Lanka is remaining to be assessed. According to previous studies conducted in Sri Lanka, Sri Lankan passengers are not satisfied with public bus transport system (Kumarage, 2008). Further, according to Sevenatha (2002), some reasons for low passenger satisfaction regarding Sri Lanka bus service are lacks of punctuality, reliability, passenger information and properly planned bus halts. Nonetheless, there is no previous study, conducted which fully examined tourists' opinion on Sri Lankan public transport. On this Study, tourist satisfaction on different aspects of public transport is assessed.

Objectives

The main objectives of this study to understand tourists' satisfaction with public transport system in Sri Lanka. It compares tourists' satisfaction between public bus transport service and railway transport service in Sri Lanka and provide practical recommendations for promoting the public transport in the country.

Methodology

This research adopts questionnaire survey by personal interviews with international tourists during their visit to Sri Lanka. Random sampling

method was used to gather data. Due to the time constraints and resources, the data were collected only in Colombo district, which is the capital city of the Sri Lanka. To generate the highest number of respondents, the survey was carried in locations which considered as tourist sites in Colombo. Those are Colombo Fort, Colombo Central Bus Stand and Mount Lavinia beach from 18th April to 2nd May in 2016.Totally, 86 questionnaires were collected, 80 were usable and 06 were rejected because some of self-administered questionnaires were not completed properly.

The service aspects of bus transport system verses train transport system are analyzed with Wilcoxon Signed Rank Test. To compare the significant difference between demographic factors with service attributes, Mann-Whitney U Test was used. In this test the null hypothesis was there is no significant difference between the satisfaction of public bus transport and train transport while alternative hypothesis was that there is a significant differences between the satisfaction of public bus transport and train transport.

Results and Discussion

Table 1, shows a comparison between public bus transport and train transport. The researcher aims to find which service elements have significant difference. Availability of information, reliability of the service, punctuality of the service, comfort on bus stops and train stations, space on the bus and train and traffic and waiting time while on the journey are the service elements which shows the significance difference between public bus service verses train service. Remain twelve service elements such as easy of the payment, cleanliness of the buses and trains, convenience of the time schedule etc. are not showing significant difference.

Table 1: Satisfaction of public transport vs. train transport

Satisfaction of public bus transport vs. train transport - Wilcoxon Signed Rank Test	
	P value
Availability of the information	0.003
Convenience of the time schedule	0.907
Accessibility to bus stops and train stations	0.328
Time frequency of buses and trains	0.056
Reliability of the service	0.016
Punctuality of the service	0.041
Staff behavior	0.116
Safety and security onboard	0.078
Safe and security at bus stations and train stations	0.079
Comfort on bus stops and train stations	0.036
Cleanliness of buses and trains	0.916
Space on bus and train	0.023
Crowding	0.217
Noise	0.697
Seat availability	0.565
Ticket price	0.674
Easy of Payment	1.000
Traffic and waiting time while on journey	0.004
General satisfaction on services	0.336

It is clear that the public train transport service has significantly higher satisfaction level on aforementioned service elements which were having significant difference. The results of Mann- Whitney U Test revealed that tourist's from developing countries show statistically higher satisfaction level on following service attributes than developed countries tourists those are convenience of the bus time schedule, accessibility to bus stops, time frequency of buses, punctuality of the bus service, bus staff behavior, safety and security onboard on buses, safe and security at bus stations, comfort on bus stops, bus seat availability, bus ticket price, time frequency of trains, reliability of the train service, punctuality of the train service, train staff behavior, safety and security onboard on train, safe and security at train stations,

comfort on train stations, cleanliness of trains, train noise, train ticket price and easy of payment on train. Moreover, male tourists show higher satisfaction levels on following service attributes than female tourists. Those are spaced on the bus and crowding on the bus. However, female tourists show higher satisfaction levels on the service attribute; convenience of the train time schedule. As well, graduate tourists have less satisfaction level than high school tourists regarding following service attributes. Those are time frequency of buses, bus ticket price, easy of payment on bus, accessibility to the train stations and time frequency of trains.

Conclusion and Policy Recommendations

According to the frequency bar charts, generally tourists have a somewhat satisfaction level regarding public transport system in Sri Lanka. Tourists showed higher satisfaction with train service regarding some service attribute. Those are availability of information, reliability of the service, punctuality of the service, staff behavior, safety and security on board, safe and security at train stations, cleanliness of the trains, space availability, ticket price and traffic and waiting time while on the journey. On the contrary, tourists showed higher satisfaction with bus service those are accessibility to the bus stops, service frequency, crowding, noise and ease of payment. Nearly same satisfaction level is shown for the convenience of the time schedule regarding both transport services. Mann Whitney U Test revealed that tourists from developing countries show higher satisfaction than tourists from developed countries regarding some service elements. Further, male tourists show higher satisfaction than female tourists and graduate tourists have less satisfaction than high school tourists for some attributes of service. Tourists proposed a number of recommendations such as adding more buses to late night services, providing more comfortable buses and trains, improving connectivity between transport modes. Further, they suggested that they would like to pay more for getting a comfortable travel experience. Therefore, it is

suggested that responsible authorities should take necessary actions to improve Sri Lankan public transport services.

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Group 1: Table 02: Availability of Information - Wilcoxon Signed Rank Test (P value: 0.003)

Availability of the Information	Number of Tourists
Train < Public bus	5
Train > Public bus	21
Train = Public bus	31

Table 02**:** Reliability of the service - Wilcoxon Signed Rank Test **(**P value: 0.016**)**

Reliability of the Service	Number of Tourists
Train < Public bus	9
Train > Public bus	23
Train = Public bus	25

Table 03: Punctuality of the service - Wilcoxon Signed Rank Test **(**P value: 0.041**)**

Punctuality of the Service	Number of Tourists
Train < Public bus	10
Train > Public bus	22
Train = Public bus	25

Table 04: Comfort on bus stops and train stations - Wilcoxon Signed Rank Test **(**P value: 0.036**)**

Comfort on bus stops and train stations	Number of tourists
Train < Public bus	10
Train > Public bus	20
Train = Public bus	27

Table 05: Space on bus and trains - Wilcoxon Signed Rank Test **(**P value: 0.023**)**

Space on bus and trains	Number of tourists
Train < Public bus	10
Train > Public bus	20
Train = Public bus	27

Table 06: Traffic and waiting time while on journey – Wilcoxon Signed Rank Test **(**P value: 0.004**)**

Traffic and waiting time while on journey	Number of tourists
Train < Public bus	6
Train > Public bus	24
Train = Public bus	27

Group 2:

Table 01: Satisfaction of public transport among developing vs. developed countries tourists- Mann-Whitney Test

	Developing countries mean ranks	*Developed countries mean ranks*	*P* value
Convenience of the time schedule - bus	39.77	25.96	0.001
Accessibility to bus stops	38.5	27.73	0.014
Time frequency of buses	37.76	28.77	0.038
Punctuality of the service - bus	37.94	28.52	0.033
Staff behavior - bus	40.32	25.2	0.001
Safety and security onboard - bus	39.76	25.98	0.001
Safe and security at bus stations	39.26	26.68	0.005
Comfort on bus stops	39.04	26.98	0.005
Seat availability - bus	37.92	28.54	0.040
Ticket price - bus	39.62	26.18	0.003
Time frequency of trains	41.73	29.27	0.005
Reliability of the service - train	40.07	30.93	0.035
Punctuality of the service - train	40.27	30.73	0.033
Staff behavior - train	42.20	28.80	0.003
Safety and security onboard - train	42.63	28.37	0.001
Safe and security at train stations	40.57	30.43	0.020
Comfort on train stations	42.43	28.57	0.002
Cleanliness of trains	39.89	31.11	0.049
Noise - train	40.07	30.92	0.042
Ticket price - train	43.83	27.17	0.000
Easy of Payment - train	42.09	28.91	0.003

Table 02: Satisfaction of public transport among male vs. female tourists- Mann-Whitney Test

	Male mean rank	Female mean rank	P value
Space on bus	38.18	26.98	0.014
Crowding - bus	37.39	28.30	0.046
Convenience of the time schedule - train	31.57	44.07	0.008

Table 03: Satisfaction of public transport among different education levels (Graduate vs. High School) of tourists- Mann-Whitney Test

	High School mean rank	Graduate mean rank	P value
Time frequency of buses	39.77	25.96	0.001
Ticket price - bus	38.5	27.73	0.004
Easy of Payment - bus	37.76	28.76	0.001
Time frequency of trains	37.94	28.52	0.009
Reliability of the service - train	40.32	25.20	0.003

Trend Analysis of Budgetary Allocation to Agricultural Sector in Nigeria

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Keywords: *Government Expenditure; Agricultural Output; Structural Break; Chow Test*

Introduction

Agriculture continues to dominate the economy of Nigeria in terms of contribution to gross domestic product, job creation, poverty reduction and provision of raw materials. A large proportion of agricultural labour force in Nigeria engaged in subsistence farming rather than modern agriculture. It has greater capacity for absorbing large number of unemployed youth and covers way for overall growth and development (Ajakaiye, 2016). Both theoretical and empirical studies have shown that public spending to agriculture has a significant impact on output and the general performance of the economy (Ahungwa et. al, 2014; Olomola *et al.* 2014). Therefore, government continue to allocate a significant amount of resources to this sector through lending, subsidies and financing of various programs and policies under numerous sub-sectors aimed at transforming the agricultural sector.

However, the sector has not yielded up to the level of expectations. According to Ita *et al.* (2013), there was instability in the way budgets were allocated to the agricultural sector. Oyinbo et. al (2013) conclude that the relationship between agricultural budgetary allocation and economic growth in Nigeria is positive but not significant in the long

run. Therefore, it is vital to examine the nature of trend of budgetary allocation to agricultural sector in Nigeria.

Objective

The foremost objective of this study is to examine the trend of budgetary allocation to agricultural sector in Nigeria using annual data between 1981 and 2014. Study basically intends to find the reason for positive but insignificance long run relationship as mentioned in previous literature (Oyinbo et. al, 2013) between agricultural budgetary allocation and economic growth in Nigeria, since the agricultural production mainly stimulate the factors of Nigerian economic growth.

Methodology

This study adopted a simple econometric analysis, the well-known 'Chow test' to test whether there is a structural break within the pattern of government expenditure for agriculture in Nigeria after 2001. This test examines whether a single regression for whole data series is more efficient than two separate models for sub samples of the same series of data.

$$\mathrm{AP_t} = \beta_0 + \beta_1 \mathrm{GEA_t} + \mathrm{u_t} \quad (1)$$

Where AP for agricultural production in Nigeria, GEA for government expenditure on Nigerian agriculture, u is for unexplained factors and t is for time period from 1981 to 2014. Then two separate models for the assumption of the presence of structural break in 2001 can demonstrate as below.

$$\mathrm{AP_t} = \alpha_1 + \alpha_2 \mathrm{GEA_t} + \mathrm{u_{1t}} \quad (2)$$

$$\mathrm{AP_t} = \lambda_1 + \lambda_2 \mathrm{GEA_t} + \mathrm{u_{2t}} \quad (3)$$

Here t is from 1981-2000 for model (2) and t is from 2001-2014 for model (3). When the estimated parameters of two separate models before and after the break are similar ($\alpha_1 = \lambda_1$and $\alpha_2 = \lambda_2$), model (2)

and (3) can use as a single model. Therefore, model (1) is more efficient than using separate models. When results proven that the two sub samples are more efficient than the single data series, then there is a structural break. Regression Sum of Squares (RSS) from all models and F-statistic of main model are used to determine the efficiency.

$$F = \frac{RSS_1 - (RSS_2 + RSS_3)/k}{RSS_2 + RSS_3)/n - 2k} \quad (4)$$

The data for the study were sourced from Central Bank of Nigeria Statistical Bulletins from 1981 to 2014. Series of data was limited to 1981 due to lack of availability of data for agricultural production in Nigeria. Graphs and tables are used for descriptive purposes of the analysis.

Results and Discussion

Figure 1 shows that the share of total government expenditure to agriculture had been trending up without any severe change till 2000. Afterwards, the pattern has been drastically changed due to a sudden improvement of the amount of government expenditure in 2001.

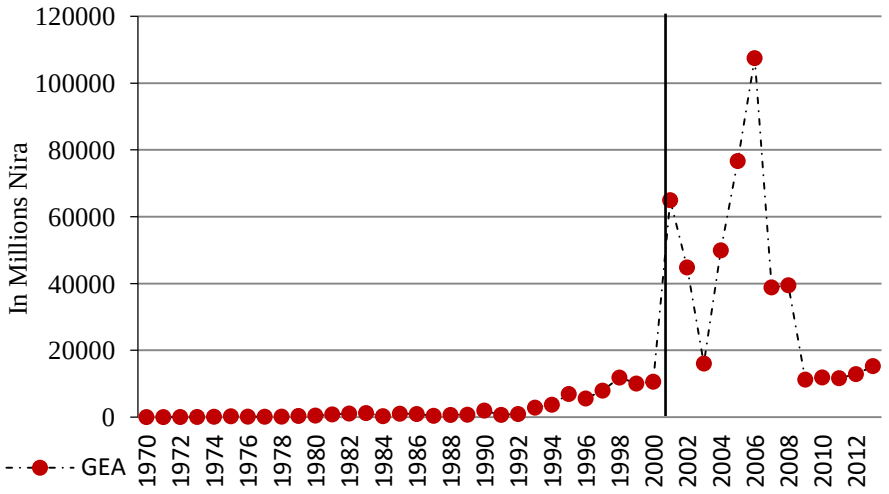

Figure 1: Total government expenditure to agriculture in Nigeria

It is clear that the relative dynamics of expenditure had been varing over different years up to 2014. This seems like a structural break of the data series with more dynamis in later on. Therefore, it was imperative to identify the reason for this completely different behaviour of expenditure to agriculture. It may be a qualitative change in the properties of the government expenditure. Therefore, results of the 'Chow test' can use as below to indentify whether there is a structural break or not.

Table 1: Results of Chow Test

Model	F Statistics	t Statistics	R-Squared
$AP_t = \beta_0 + \beta_1 GEA_t + u_t$ *t from 1981-2014*	3.3	1.82	0.0962
$AP_t = \alpha_1 + \alpha_2 GEA_t + u_{1t}$ *t from 1981-2000*	326.08***	18.06***	0.9477
$AP_t = \lambda_1 + \lambda_2 GEA_t + u_{2t}$ *t from 2001-2014*	5.66**	-2.38**	0.3396

*** and ** for 99 per cent and 95 per cent confidence levels respectively

As mentioned in the results of 'Chow test', single regression for whole data series is less efficient than two separate models for sub-samples from 1981-2000 and 2001-2014. In addition to that estimated parameters ($\alpha_1 = -53636 \; and \; \alpha_2 = 166.12$ for model 2. $\lambda_1 =$ 1.05e+07 and $\lambda_2 = -79.49$ for model 3) are totally different from each other for two separate models.

Table 2: Results of Chow Test (Estimated Parameters)

Model	Num: of Observations	Constant ($\beta_0, \alpha_1 and \; \lambda_1$)	Regressor ($\beta_1, \alpha_2 and \; \lambda_2$)
$AP_t = \alpha_1 + \alpha_2 GEA_t + u_{1t}$ *t from 1981-2000*	20	(-53636.9)	166.12
$AP_t = \lambda_1 + \lambda_2 GEA_t + u_{2t}$ *t from 2001-2014*	13	1.05e+07	(-79.49)

Conclusion

Empirical results of this study are statistically proven the existence of structural break of the government spending on agriculture sector of Nigeria. Therefore, the period before 21st century has shown a smooth and robust positive trend of budgetary allocation to agricultural sector. However, by this time period despite the role of agricultural sector play in the growth process of Nigeria economy, priorities was given to the sector in development strategies and agricultural sector was not funded sufficiently. In fact, it is lower than spending in other key sectors such as education, health, and water. However, the relationship between government spending on agricultural sector and agricultural production was found to be negative in the study period.

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A Comparative Study on Financial Performance of Foreign and Domestic Commercial Banks in Sri Lanka: An Application of CAMEL Rating System

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Keywords: *Financial Performances; Commercial Banks; CAMEL Rating System*

Introduction

Banks are playing a major role of the financial system of all countries as well as in Sri Lanka. Sri Lankan banking system can be divided into two as commercial banks and special purpose banks. This study arms to find the performance of the foreign commercial banks in Sri Lankan economy and compare it with domestic commercial banks. To provide a satisfactory service to the customers, each institute should aware of their turning points. In the view of customers, it is very important that the awareness of the possibility of negotiation with the institutions. This study considers performance of those banks by using various indicators which is not focused in the previous literature.

There are a number of studies in this area. They have focused different aspects of the banking sector. A comparative study on state and private sector commercial banks in Sri Lanka for the time period of 2008-2012 has been conducted by applying CAMEL rating system (Anojan and Nimalathasan, 2014). In the study they have stated that private sector banks are better than state banks in the performance of capital, earning to the asset quality and management soundness of the banks in Sri Lanka.

Objective

Although there are various financial reports prepared by the Central Bank and each banking institutions, there is no a comparative study among foreign and domestic commercial banks in Sri Lanka. The overall objective of this study is to compare the financial performance of foreign and domestic commercial banks in Sri Lanka by using CAMEL rating system.

Methodology

Researcher selected three foreign banks and three domestic banks for the study. Hongkong and Shanghai Banking Corporation of Sri Lanka (HSBC), Standard Chartered bank of Sri Lanka and Citibank Sri Lanka were selected to represent the foreign bank sector. Sampath bank PLC, Commercial bank of Ceylon PLC and National Development Bank PLC (NDB Sri Lanka) were selected for the domestic sector. The data was analyzed by applying ratio analysis which is a supervisory rating system originally developed in US to classify a bank's overall condition. This rating system was extensively used by many researcher in assessing the efficiency of financial institutions. The variables are Capital Adequacy, Assets Quality, Management Soundness, Earnings and Liquidity. Data for the study was collected for the time period of 2008-2014. Interpretation of the ratio analysis is given in Table 1.

Table 1: Ratio Analysis of CAMEL Rating System

Aspect	Ratio/s	Formula
Capital Adequacy		Equity Capital / Total Assets **(>4.6%)**
Assets Quality		Loans & advances / Total Assets
Management Soundness		Operating cost / Profit after tax
	Return on Assets (E1)	Net profit after tax / Total assets
Earnings	Net Interest Margin (E2)	Net interest income / Total Assets (>4.5%)
	Net Profit Margin (E3)	Profit after tax / Total loan & advances
	Diversification Ratio (E4)	Non-interest income / Total income
Liquidity	Loan to Deposit Ratio	Total loans / Total deposits (<80%)

Results and Discussion

In order to fulfill the objectives of the study, data were collected from secondary sources mainly from annual financial statements of selected banks. Mainly Fitch Rating Lanka annual reports were used to collect relevant data from foreign sector commercial banks. Calculated final ranking with average ratios using those data are given in Table 2.

Table 2 shows the ranking of the banks according to the CAMEL rating system. Sampath bank and Standard Chartered bank can be ranked as first according to the above results. Commercial bank, NDB bank and Citibank can be ranked as second and it becomes clear that HSBC is the last. Next we compares the performance of the foreign and domestic sector banks and results are given in Table 3.

According to the above results, domestic sector banks perform well in assets quality, management soundness and liquidity while foreign sector perform well in capital adequacy and earnings. Accordingly, it can be concluded that domestic sector banks stand forward in the overall financial performance of commercial banks in Sri Lanka during last few years.

Table 2: Final ranking with average ratios of selected banks

	Commercial Bank (%)	Sampath Bank (%)	NDB Bank (%)	HSBC (%)	Standard Chartered Bank (%)	Citibank (%)
Capital Adequacy	9.54	7.62	10.18	10.7	17.71	31.11
Rank	5	6	4	3	2	1
Assets Quality	58.27	64.11	69.19	47.2	56.74	42.52
Rank	3	2	1	5	4	6
Management Soundness	20.75	30.64	14.86	15.43	9.85	15.14
Rank	2	1	5	3	6	4
Earnings	6.24	5.79	8.63	10.25	13.78	15.76
Rank	5	6	4	3	2	1
Liquidity	71.89	79.12	56.19	55.69	71.98	49.93
Rank	3	1	4	5	2	6
Final Rank	3	1	3	6	1	3

Table 3: Comparison between foreign and domestic sectors

	Domestic Sector (%)	Foreign Sector (%)
Capital Adequacy	9.11	19.84
Rank	2	1
Assets Quality	63.86	48.82
Rank	1	2
Management Soundness	22.08	13.47
Rank	1	2
Earnings	6.89	13.26
Rank	2	1
Liquidity	69.07	59.2
Rank	1	2
Final Rank	1	2

Conclusion and Recommendation

This study was conducted with the aim of comparison of the financial performance of foreign and domestic sector commercial banks using CAMEL rating system in Sri Lanka. According to the findings, it can be stated that domestic sector banks are better than foreign sector banks in the performance of assets quality, management soundness and liquidity while foreign bank sector is better in capital adequacy and earnings. Accordingly, it can be concluded that domestic sector has a better performance than the foreign sector in the financial performance of commercial banks in Sri Lanka. In the case of capital adequacy, domestic banks should avoid furthermore debt capital in the future. In assets quality, foreign sector should take necessary steps to recover the loans and advances from the customers. NDB and Standard Chartered banks need to increase the total income of the banks. In the case of bank's earnings, domestic sector should work hard in order to raise the total income. To stipulate the liquidity position NDB, HSBC and Citibank would give priority to increase the source of current assets.

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Effect of Price Changes on Electricity Conservation: An Empirical Study

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***Keywords**: Price Elasticity; Electricity Conservation; Electricity Price*

Introduction

Electricity generation in Sri Lanka mainly depends on coal with 12 %, hydro power with 57 % and oil with 27 % (CEB, 2013) contributions. Accordingly 39 % of Sri Lanka's electricity is generated using imported resources such as coal and oil. This dependence on imported resources to generate electricity is likely to go up in the future with the increasing use of coal in power generation. Thus electricity conservation is so vital to Sri Lanka to reduce this dependence as well as to save foreign exchange that will be spent on importing those resources. At the global scale electricity conservation is a part of broader energy conservation. Given the declining trends in non-renewable fossil fuel resources such as coal and oil, energy conservation has drawn attention of many countries.

Energy conservation is considered as a reduction in the energy consumption from the existing level. However, every year what we observe is an increase in the overall energy consumption and electricity is no exception. The governments can use various policy tools for energy conservation such as, implementation of awareness programs, raising prices...etc. In this study we examine whether the price can be effectively used to achieve electricity conservation objectives. Electricity prices in Sri Lanka are determined by the Public Utilities Commission of Sri Lanka (PUCSL). The Sri Lankan government has

reduced electricity prices in 2014 by 25 %. However, this price reduction in electricity that is considered in this study has done with the aim of easing the burden on consumers and not for conservation. We empirically investigate the response of the consumers to this price change using primary as well as secondary data.

Objective

The main objective of this study is to examine the consumer response to the price change in electricity. We also examine whether similar change will help in achieving energy conservation objectives.

Methodology

This research uses primary data collected covering 100 households. Households were selected representing all provinces in Sri Lanka. Within each provincial cluster we used convenient sampling strategy. Number of households sampled from each province is proportional to the provincial population. The data were gathered using a questionnaire and also we collected electricity bills of two months (before and after the last electricity price change that occurred on 19th of September 2014).

Two multiple regression models were estimated using OLS method. Both models were estimated with the objective of investigating the effect of price change on electricity conservation (a reduction in electricity consumption). Thus the first model examines the difference in the electricity consumption after the price change. The second model considers the provincial variation in energy consumption. Both models consider log of monthly electricity consumption (number of units). Independent variables are household average price (monthly bill amount divided by the monthly number of electricity units consumed), number of people employed in the household as a fraction of number of family members in the household, monthly household income, location of household (urban or rural, dummy variable), dummy variable to

identify the two periods (before and after the price change) and 9 provincial dummies to identify provincial variation.

Model 1:

$$\log Q_i = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \alpha D_1 + \alpha D_2 + \alpha D_3 + \alpha D_4 + \alpha D_5 + U_i$$

where, $\log Q_i$ = log value of monthly number of electricity units consumed
$\log X_1$ = log value of average household price
$\log X_2$ = log of number of people employed as a fraction of total number of family members in the household.
$D_1 \rightarrow D_4$ are four dummy variables that identifies household income groups
D_1 =1 if monthly income less than Rs.5000, Otherwise 0
D_2=1 if monthly income is between Rs.5000-10000, Otherwise 0
D_3=1 if monthly income is between Rs.10000-30000, Otherwise 0
D_4 =1 if household belong to rural area, Otherwise 0
D_5 = 1 Before price change, Otherwise 0
u_i = Random error term

Model 2:

$$\log Q_i = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \gamma_1 P_1 + \gamma_2 P_2 + \gamma_3 P_3 + \gamma_4 P_4 + \gamma_5 P_5 + \gamma_6 P_6 + \gamma_7 P_7 + \gamma_8 P_8 + U_i$$

where, $P_1 - P_8$ are eight provincial dummies were added to Model 1 to identify provincial variation in electricity consumption. The other province is used as the base province.

Results and Discussion

Table 1 presents the OLS output of model 1 which was estimated to examine whether the price change has a significant effect on the electricity consumption. The key variable is the dummy variable that identifies the time period after the price change.

Table 1: Regression result: Electricity consumption

Variable	Coefficient	T-value	P value
Constant	3.4201***	22.28	0.000
$\ln aX_1$	.3320***	5.43	0.000
$\ln aX_2$	.2932 **	1.90	0.058
Less 5000	-.7590***	-5.11	0.000
5000-10000	-.3843**	3.48	0.001
10000-30000	-.1800**	-2.38	0.018
Rural	-.2400 **	-3.44	0.001
Time period dummy	.0860	1.36	0.176
R-squared	0.5890		
F-stat	16.74		

Dependent Variable: Log of monthly electricity consumption

According to results, Model 1 can be accepted in 1 % significant level (F test result) and coefficient of determination is 0.58 which explains that 58 % of the variation in electricity consumption can be explained by explanatory variables in the model. Average price and dummy variable for income less than Rs.5000 are significant at 1% significance level. The dummy variable for monthly income level between Rs.5000 -10000 and the variable that represents rural households are significant at 5% (monthly income more than Rs.30,000 was omitted from the income groups) while other variables appear to be insignificant at 10 % level significance.

The estimated coefficient for number of people work in a household as a fraction of the number of people in the household is 0.29 which means that 1% increased of the percentage employed in the household will increase the electricity consumption by 29 %. However, this relationship is not significance within the estimated model. The model uses three dummy variables for income groups. Compared to the omitted group which is monthly income is greater than Rs. 30000, all other three income groups have significantly lower electricity consumption.

The dummy variable that identifies rural and urban difference indicates that in rural areas electricity consumption is significantly lower than urban areas. The dummy variable used to identify the difference in consumption between the time periods due to price change in electricity is not significance indicating that there is no significant difference in electricity consumption between the two time periods due to price change. The price reduction made by the government by 25% can increase purchasing power of consumers which has not resulted in changing the electricity consumption. Within the consumer budget the increased real income of consumers due to reduction in electricity price may have increased their spending on other goods and services. This raises a question whether the electricity conservation targets can be achieved by price changes.

Table 2: Regression result- Model 1

Variable	Coefficient	T-value	P value
Constant	3.597***	21.26	0.000
$\ln X_1$	0.292***	4.66	0.000
$\ln X_2$	0.210	1.37	0.172
less5000	-0.587***	-3.86	0.000
5000-10000	-0.364**	-3.35	0.001
10000-30000	-0.171*	-2.31	0.022
Rural	-0.218**	-3.05	0.003
Reform Dummy	0.0839	1.38	0.168
North	0.224	1.29	0.197
North Central	-0.119	-0.78	0.438
North West	-0.377**	-2.97	0.003
Eastern	-0.467	-2.62	0.010
Central	-0.030	-0.25	0.804
Western	-0.023	-0.22	0.827
Uva	-0.319	-2.14	0.033
Sabaragamuwa	-0.201	-1.58	0.116
R-squared	0.6247	F-stat	10.23

***1% significant level **5% significant level *10% significant level

To analyze the impact of provincial differences in electricity consumption the above model has extended including eight dummy variables (one province was omitted) representing every province in Sri Lanka while keeping southern province as the omitted one.

The estimated slope coefficient for the extended regression model with their associated t and probability values are given in Table 02. The estimated dummy variables to represent provinces are insignificant except the dummy variables used for north west province which is significant at 10 % level of significance. Further, it appears to be insignificant the price change variable indicating that 25 % price reduction has not made a significant effect in consumption. However coefficient of determination for this model has increased to 62 % which indicates model 2 is a better fit compared to model 1.

Conclusion

This study concludes that a 25 % reduction in electricity price has not resulted a significant change in the electricity consumption in Sri Lanka. It seems that the consumers continued their consumption pattern (number of units) unchanged regardless of the price change. Additional savings derived within their budget, due to reduction in price may have spent on other goods and services. Several questions arises from this study. First, can we use price as a conservation policy tool? What will be the response of consumers if the government raises price, say by 25% with the objective of electricity conservation? It is more likely that the consumers will respond to an increase in price than a decrease with a significant reduction in consumption. However, this needs further research to confirm such an outcome. Further, this study focused only about households which are basically a consumption unit. It would be interesting to examine how industry will respond to such a price change.

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Economic Determinants of Budget Deficit in Sri Lanka

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Keywords: *Budget Deficit; Economic Growth; Time Series Analysis*

Introduction

Deficit budget was adopted in both developing and developed countries to adjust macroeconomics policies in 1980s. When considering about Sri Lankan situation, data shows that budget deficit varies between 5 to 10 % of GDP over the last few decades (Central Bank Report, 2014). According to the economic theory, if budget deficit exceeds around 8 % of GDP, it is not a favorable condition for the economy as it creates adverse effects such as reduces national savings, increases borrowings, crowding out and inflation. Therefore, it is worthwhile to understand the reasons behind the budget deficit.

Among the empirical studies, Chihi and Normandin (1960) found that there is a positive co-movement between external trade and budget deficits. Chowdhury and Saleh (2007) explained that current account deficit, savings–investment balance and budget deficit have positive long run relationship. Anojan (2014) concluded that direct tax revenue significantly affect to the budget deficit in Sri Lanka. Given this background it is important to identify the important determinants of budget deficit in Sri Lanka.

Objectives

This study examines the impact of economic growth, male and female labour force participation rate, tax revenue, government investment, net exports, pension and Samurdhi expenses on budget deficit in Sri Lanka.

Methodology

The study uses time series data analysis technique to achieve research objectives. Data is used for the period of 1960 to 2015. All the data were obtained from Annual Reports of Central Bank of Sri Lanka and World Bank data base. The general specification of the regression model is given below:

$$Y_t = \alpha_0 + \alpha_1 GR_t + \alpha_2 MLP_t + \alpha_3 FLP_t + \alpha_4 PEN_t + \alpha_5 SAMU_t + \alpha_6 TR_t$$

$$+ \alpha_7 NX_t + \alpha_8 GEI_t + U_t$$

where, Y_t is the dependent variable which indicates budget deficit (% of GDP). GR_t is the growth rate of gross domestic production. MLP_t and FLP_t are Male and Female labour participation rate respectively. PEN_t and $SAMU_t$ are pension expenditure of the government (% of GDP) and Samurdhi/Janasaviya or any other household welfare payment as a % of GDP. TR_t is the tax revenue as a % of GDP. NX_t and GI_t denote net exports and government investment in Sri Lanka respectively as a percentage of GDP. U_t is the random error term. The stationarity of data is checked by using Augmented Dickey Fuller (ADF) test. Johansen Co-integration test is adapted to identify the long run relationship between the variables whereas Vector Error Correction Model (VECM) is used to identify the short run relationships among variables as well as long-run equilibrium of the model.

Results and Discussion

The ADF unit root test confirms that all variables are first differenced stationary which implies that all variables are integrated in order one. The lag length selection criteria suggested one lag as an optimal. Johansen Co-integration rank test identified one co-integrating relationship among selected variables with confirming long run relationship. And also it suggests to use VECM in the study. The long-run part of the ECM results can be shown as follows:

DY(-1) = -0.02+ 1.23 DSAMU(-1) – 2.46 DMLP(-1) – 3.34DGR(-1) + 4.58 DFLP(-1)-
[2.111] [-1.689] [-1.909] [2.350]
1.939 DTR(-1) - 2.56DPENS(-1) + 7.92DGEI(-1) + 0.023DNX(-1)
[-0.885] [-0.203] [1.523] [0.454]

Samurdhi expenses and female labour force participation have positive relationship with the budget deficit in the long-run whereas male labour participation rate and GDP growth rate have negative relationship in the long-run. It shows that tax revenue, pension expenses, government investment and net export do not have significant relationship with Sri Lankan government budget deficit in the long-run. The study also reveals that Samurdhi expenses have a positive relationship with budget deficit in the short run. A negative and significant error correction coefficient of (-1.39) budget deficit reveals that 1.39 % disequilibrium is corrected each year.

Conclusions and Policy Implications

This study defines that increasing of Samurdhi expenses and female labour force participation creates more burden to the budget deficit in the long run whereas male labour participation rate and GDP growth rate affect favorably. Thus, the research confirms that decreasing trends of tax revenue and net export and increasing trends of pension expenses and government investment are not responsible for increasing the budget deficit in Sri Lanka.

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Table 1: Results of ADF unit root test

Variable	Level		First Difference	
	t- Statistics	Probability	t- Statistics	Probability
Y	-2.471471	0.1280	-13.26329***	0.0000
GR	-5.784975***	0.0000	-5.784975	0.0000
MLP	-0.914606	0.7763	-8.622885***	0.0000
FLP	-1.456441	0.5480	-7.152003***	0.0000
TR	-1.923330	0.3195	-6.622308***	0.0000
SAMU	- 3.366333***	0.0165	-3.366333	0.0165
PEN	-3.038503***	0.0376	-3.038503	0.0376
NX	-3.287849***	0.0203	-3.287849	0.0203
GI	-2.644801	0.0904	-10.21072***	0.0000

Note: *, **, *** represents stationary at 10 %, 5 % and 1 % level of significance respectively

Table 2: Lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1134.5	NA	19994	42.351	42.68*	42.47*
1	-1041.4	151.56*	1332*	41.90*	45.22	43.18

Note: * indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error, AIC: Akaike information criteria, SC: Schwarz information criteria, HQ: Hannan-Quinn information criteria

Table 3: Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.771790	233.8973	197.3709	0.0002
At most 1	0.649674	154.1129	159.5297	0.0948
At most 2	0.384561	97.47272	125.6154	0.6797
At most 3	0.373871	71.26007	95.75366	0.6796
At most 4	0.272824	45.97734	69.81889	0.7982
At most 5	0.250081	28.77366	47.85613	0.7790
At most 6	0.145160	13.23300	29.79707	0.8807
At most 7	0.071512	4.763603	15.49471	0.8334
At most 8	0.013919	0.756911	3.841466	0.3843

Note: Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4: Long-run relationship part of the VECM results

Variable	Coefficient	Std.error	t-statistic
GR(-1)	-3.34	1.749	1.90931*
MLP(-1)	-2.46	1.456	1.68941*
FLP(-1)	4.58	1.952	-2.35015**
TR(-1)	-1.93	2.189	0.88561
SAMU(-1)	-1.23	0.582	-2.1112**
PENS(-1)	-2.56	12.62	0.20345
NX(-1)	0.02	0.050	-0.45478
GEI(-1)	7.92	5.202	-1.52345

Note: *, **, *** represents stationary at 10%, 5% and 1% level of significance respectively

Table 5 :Long-run equilibrium part of VECM results

Variable	Coefficient	Standard error	t-statistic
CointEq1	-1.397944	0.17638	-7.92570***

Note: *, **, *** represents stationary at 10%, 5% and 1% level of significance respectively

Table 06: Short run part of VECM results

Variable	Coefficient	Standard error	t-statistic
DY(-1)	-0.05	0.155	-0.3351
DGR(-1)	2.084195	1.53344	1.35916
DMLP(-1)	2.274338	1.63789	1.38858
DFLP(-1)	-2.389061	1.89586	-1.26015
DTR(-1)	-0.64	2.798	-0.23215
DSAMU(-1)	-1.10	0.4542	2.4437**
DPENS(-1)	6.300798	13.1652	0.47860
DNX(-1)	0.005648	0.08615	0.06556
DGEI(-1)	-6.063344	6.65197	-0.91151
C	0.261181	5.37939	0.04855

Note: *, **, *** represents stationary at 10 %, 5 % and 1 % level of significance respectively

The Role of NGOs in Poverty Alleviation: A Case Study of Karachchi Divisional Secretariat Division in Kilinochchi District

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***Keywords**: Poverty; Poverty Alleviation; NGOs; Logit Model*

Introduction

Poverty has been one of the major social and economic issues in many developing countries. Government of many developing countries attempts to overcome poverty by introducing various state funded poverty alleviation programmes. However, NGOs emerged as a better supplement to the state in reducing poverty. Therefore, a large number of NGOs has been operating in developing countries with the aim of reducing poverty. In some developing countries NGOs claim that they could reach the poorest of the poor and succeed in reducing the poverty. In this regard Sri Lankan government as well as local and foreign NGOs has perpetually attempted to address the problems of poverty even before the independence from British colonization. This poverty alleviation program becomes more serious in Kilinochchi district after 1983. There are several studies which examine the role of NGOs in poverty alleviation locally and internationally (Vinaygathasan and Pallegedara, 2014; Lawson et al., 2009; De Silva, 2008; Ullah and Routray, 2007; Ahsan, 2005; Tek Nath Dhahal, 2002; Kang Xiaong, 2001; Rodriguez and Smith, 1994). Many of these studies found that NGOs are succeeded in reducing the poverty.

According to the Human Development Index (HDI) of 2015, Sri Lanka had gradually improved in human development reaching 0.757 in 2014

from 0.679 in 2000 while the world average in 2014 is 0.711 and South Asia averaged at 0.607. Even though poverty level of Sri Lanka has been decreased dramatically from 8.9 % to 4.5 % within five years starting from 2010 (Central Bank of Sri Lanka, 2015) still it is not clear the actual situation of poverty in war affected area in the country. However, according to visual observation, socio economic conditions of peoples of Kilinochchi district are very depraved. Further, beside the state funded many poverty alleviation activities NGOs also are working in this area for a long period in order to reduce the poverty level. However, the quantitative assessment of the effectiveness and contribution of NGOs on poverty alleviation activities are not examined so far in the context of Kilinochchi district.

Objective

The main purpose of this study is to examine the impact of NGOs on reducing the poverty in Kilinochchi district.

Methodology

We used both primary and secondary data to analyze in this study. The primary data were collected from two rounds of household survey (2010 and 2015) from beneficiaries, and key informal interviews with officials from NGOs and government organization. We used purposive random sampling method to choose District and the Division. However, percentage random sampling method is used to select the village and the beneficiaries. Accordingly, we selected 6 villages and 75 families (5 % of sample) from one survey where poverty alleviation programs were implemented by 6 NGOs for a long period. In this study we considered household average monthly income (ainc), household average education level (edu), dependency ratio (dpr), labor force participation rate (lfpr), household size (hhs), household total asset (asset), age (age) as explanatory variables whereas household health facilities (health), household head (hhh) and T as dummy variables. In this case, health takes value 1 if the household has proper drinking water and sanitation,

0 otherwise; hhh takes value 1, if the household head is male, 0 otherwise; and T takes value 1 if the year was 2015 (i.e. after the intervention of NGOs in the study area) and 0 otherwise (soon after the resettlement of the study group in 2010. The secondary data was extracted from Central Bank of Sri Lanka, Kilinochchi District Secretariat office.

In order to estimate whether the NGOs activities has improved the living standard of the beneficiaries of the study area, we used Logit model which is given by Equation 1:

$$P_{it} = \emptyset(\beta_0 + \beta_j X_{itj} + \beta_j D + \delta T_a + u_{it}) \quad (1)$$

where, dependent variable P_{it} is the probability of household i being under poverty line at time t which is a dummy variable and takes value 1, if the household i is under poverty line at time t, 0 otherwise; $i = 1,2,\dots,n$; $t = 1,2$; $j = 1,2,\dots,6$; $\emptyset$ is the function, $X_{itj} = [ainc_{it}, edu_{it}, dpr_{it}, lfpr_{it}, hhs_{it}, asset_{it}]$, $D = [health, hhh]$, T is a dummy variable which is explained above and u_i is the white noise error term.

Next we used fixed effect multiple linear regression model to identify the determinants of income of the beneficiaries of study area which is shown as:

$$ainc_{it} = \alpha_0 + \alpha_1 edu_{it} + \alpha_2 hhs_{it} + \alpha_3 Lfpr_{it} + \alpha_4 dpr_{it} + \alpha_5 age_{it} + \alpha_6 asset_{it} + \alpha_7 d_1 + \alpha_8 d_2 + \mu_i + u_{it} \quad (2)$$

where, $i = 1,2,\dots,n$; $t = 1,2$. d_1 is health, d_2 is household head and u_{it} is the zero mean white noise error term. Further, we employed hypothesis test to check out whether these variables has resulted a significant improvement in the beneficiaries' income level.

Results and Discussions

As expected, hhs and dpr have significant and negative impact on the beneficiaries income while lfpr has significant and positive impact on it. Further, our dummy variable T has positive and significant impact on the household income which implies that after the NGOs intervention, there is a significant improvement in the income level of the beneficiaries of the study area. Other variables do not have significant impact on it. According to the hypothesis test, lfpr, edu, health and T have statistically significant impact on income level.

Next, we discuss whether the NGOs' activities related to poverty alleviation have decreased poverty level of the beneficiaries. The result of the Logit regression model reveals that ainc, lfpr, hhs and time have a significant and negative impact on poverty level of the study area. First, negative estimated coefficient of household average income indicates that an increase in household average income decreases the probability of the beneficiary household being below the poverty level. Second, a rise in labour force participation rate appears to shrink the poverty level implying households with higher labour force participation rate have lower level of poverty. Third, a rise in household size decreases the poverty level of beneficiary household. Further, coefficient for year 2015 dummy variable is negative and statistically significant which indicate that there is a statistically significant difference of poverty level in 2010 and 2015. That is after the NGOs intervention, the probability of the beneficiary household being below the poverty level has been decreased.

Conclusion

This study attempts to examine the role of NGOs activities in reducing poverty level of Karachchi divisional secretariat at Kilinochchi district of Sri Lanka. Accordingly, the finding of the descriptive and quantitative analysis reveals that NGOs' intervention in the poverty alleviation program resulted in considerable improvement in the living

standard of the people in the study area. That is, the result of the Logit regression model reveals that, household average income (ainc), labor force participation rate (lfpr), household size (hhs) and T seems to be improved after the introduction of the NGOs activities in the study area. Further, Fixed effect model estimation results indicates that, the variables such as household size and dependency ratio (dpr) have significant and negative impact while labor force participation rate has positive and significant impact on the household average income. Moreover, the variable T has significant and positive impact on the income level of the household. Therefore, this study suggests that NGOs should target on income generations, and job creation activities when they implement the projects in a war affected area.

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Table 1: Estimated results of fixed effect MLRM

Y	Coefficient.	Std.err	T	P >|t|
Edu	90.56306	117.6842	0.77	0.443
Hhs	−475.5847*	112.9127	-4.21	**0.000**
Lfpr	1909.351*	692.0325	2.76	**0.007**
Dpr	−2568.023*	619.2761	-4.15	**0.000**
D1	601.5896	376.0907	1.60	0.112
D2	128.7084	357.1895	0.36	0.719
Age	8.538063	11.70695	0.73	0.467
T	1499.221*	296.9635	5.05	**0.000**
Asset	0.007268	0.058913	0.12	0.902
Cons	2686.614	1035.231	2.60	0.010

Note: *, **, *** represent the variables are significant at 1%, 5% and 10% level of significance respectively

Table 2: Estimated results of Logit Model

Variables	Coefficients	p-value	Ods Ratio
ainc	−0.00576***	**0.079**	**0.9524**
edu	3.17710	0.202	23.9771
dpr	−1.37853	0.790	0.25194
lfpr	−12.6910***	**0.068**	**0.3245**
hhs	−2.71298***	**0.074**	**0.0663**
health	0.82827	0.757	2.28937
hhh	0.93393	0.976	2.54449
asset	0.00067	0.293	1.00067
T	−0.2210**	**0.001**	**0.0564**
Cons	−34.527	0.362	……
Observations : 150	Lr chi 2	113.74	

Note: *, **, *** represent the variables are significant at 1%, 5% and 10% level of significance respectively**.**

Impact of Trade Openness on Economic Growth in Sri Lanka

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Keywords: *Cointegration; Granger Causality; Economic Growth; Trade Openness*

Introduction

The long run linkage between trade openness and economic growth is a debatable economic phenomenon in development economics literature. In contrast, there is a greater acceptance among most of the economists, academicians and policy planners that trade openness potentially enhances economic growth. However, some economists believe that trade openness itself does not matter for economic growth since the level of institutional development determines how countries respond to the situation imposed by international competition (Stensnes, 2006). Sri Lanka is a lower middle income country in the region of South Asia which mostly followed protectionist trade policies in the initial phases of economic development due to the excessive protection of domestic industries, foreign competition and protective balance of payments movements. However, Sri Lanka liberalized its trade in 1977, being the first country to open up the economy in South Asia. In addition to that Sri Lanka started to move forward in the direction of intra-regional and international trade by liberalizing its trade policies to some extent. It is with this backdrop, this paper is an attempt to examine the relationship of trade openness and economic growth in Sri Lanka.

Research Objective

The general objective of this research is to identify the long run relationship of trade openness and economic growth in Sri Lanka.

Under this general objective, there are two specific objectives. They are: to identify the statistical significance of trade openness on promoting economic growth in Sri Lanka and to identify the causality between trade openness and economic growth by examining whether the relationship is unidirectional or bi-directional.

Methodology

The operational methodology adopted is the Engle Granger cointegration to capture both long-run adjustments and short-run dynamics between trade openness and real output growth. This study is entirely based on time series secondary data on real GDP and openness (Exports + Imports/ GDP) for the time period spanning from 1960 to 2015 in Sri Lanka. The data were obtained from world development indicators by the World Bank.

First, Augmented Dickey- Fuller (ADF) test is conducted to examine the levels of the integration of two data series. The general specification of the cointegration model can be defined as bellow:

$$y_t = \beta_0 + \beta_1 s_t + u_t \quad (1)$$

Where Y_t: the dependent variable (real GDP), which is integrated of order one, the s_t is independent variable (trade openness) and u_t is the white noise error term. If the residual (u_t) from the above equation is found to be stationary via a unit root test that is, integrated of order zero then there is a co-integrating relationship. Then this suggested to estimate the error correction model to identify the short run dynamics and long-run equilibrium. The error correction model is takes the form as:

$$\Delta y_t = \lambda_0 + \lambda_1 \Delta s_t - \tau(\hat{u}_{t-1}) \quad (2)$$

where, $\hat{u}_{t-1}$ is the error correction term which tell us the speed of adjustment (i.e. in τ %) with which our model returns to equilibrium following an exogenous shock.

Results and Discussion

Table 1 presents the results of ADF unit root test. It indicates that all variables are stationary at their first difference. Since all variables are integrated of the same order cointegration test is possible.

Table 1: ADF unit root test results

Variable	Level	P-value	1st Difference	P-value	Conclusion
LNGDP	-1.8197	0.6816	-7.9777***	0.0000	I (1)
LNOPEN	-0.1999	0.9702	-6.9124***	0.0000	I (1)

Note: *, ** and *** represent significance at 10%, 5% and 1% respectively.

Table 2: The results of the long-run relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-11.1936	0.5034	-22.2327	0.0000
LNOPEN	0.7801	0.0225	34.6264	0.0000
R-squared		0.9569		
Adjusted R-squared		0.9561		
F-statistic		1198.91		
Prob(F-statistic)		0.0000		
Durbin-Watson		0.1086		

Note: *, ** and *** represent statistical significance at 10%, 5% and 1% respectively.

It is clearly observable that model is found to be spurious since its R^2 value is greater than the Durbin-Watson test statistics.

Table 3: Augmented Dickey-Fuller Unit Root Test for residual

	t-Statistic	Prob.
Augmented Dickey-Fuller test statistic	-8.5122***	0.0000
Engle-Granger Critical values (K=2)	1% level	-3.92
	5% level	-3.35
	10% level	-3.05

Note: *, ** and *** represent significance at 10%, 5% and 1% respectively.

Table 3 indicates the ADF test statistics with regard to the residual series of the regression model. Results indicate that residual series is

stationary at 1 % level since its test statistics is greater than the Engle-Granger critical values at 1 % level of significance. This implies that there is a long-run relationship between these variables. Additionally, the static long-run relationships between these output growth and trade openness are positive. This concludes that economic growth in Sri Lanka is enhanced by the trade openness owing to the fact of trade liberalization after 1977. After the trade liberalization in Sri Lanka, foreign investors started their businesses in Sri Lanka. Free Trade Zones were established and massive amount of apparel products have been exported to other countries since then. This economic phenomenon has enriched Sri Lankan real output continuously. This articulates that Sri Lanka can further boost its growth by expanding the external trade capacity.

Table 4: The results of the error correction model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.0167	0.0094	1.7731	0.0821
LNOPEN	0.5066	0.0699	7.2397	0.0000
$u_{(-1)}$	-0.1968	0.0692	-2.8408	0.0064
R-squared		0.6595		
Adjusted R^2		0.6464		
F-statistic		50.3741		
Prob(F-statistic)		0.0000		
Durbin-Watson		1.3440		

Note: *, ** and *** represent statistical significance at 10%, 5% and 1% respectively.

Coefficient of error correction term is negative and is statistically significant at 1% level. Value of error correction term is slightly far from zero which highlighted a faster process of adjustment towards equilibrium. In other words the coefficient of the $u_{(-1)}$, -19 % represents the speed at which the dependent variable (LNGDP) returns to the equilibrium after a change in openness. Thus this implies the greater sensitivity between trade openness and economic growth in Sri Lanka.

Table 5: The results of the Granger Causality tests

Null Hypothesis	Obs.	F-Stat.	Prob.
LNOPEN does not GC LNGDP	46	2.3329**	0.0418
LNGDP does not GC LNOPEN		1.8983*	0.0941

Note: *, ** and *** represent statistical significance at 10%, 5% and 1% respectively.

There is a unidirectional relationship from trade openness to economic growth. This implies that trade openness causes economic growth in Sri Lanka and no reverse order at 5 % level of significance whereas there is bi-directional causality at 10 % level of significance. Based on the results, it is highly evident that there is a long run positive impact of trade openness on economic growth in Sri Lanka.

Concluding Remarks and Policy Recommendations

The study examines the long run relationship of trade openness and economic growth in Sri Lanka using Engle-Ganger Cointegration approach and Granger causality test. The study revealed a positive long run relationship between trade openness and economic growth in Sri Lanka. This implies that trade openness promotes economic growth in Sri Lanka. Further, the ECM implies an expeditious adjustment process of real GDP to the changes of trade openness indicating the greater influence of trade openness on economic growth in Sri Lanka. According to the results of Granger causality, a unidirectional relationship exists and it suggests that trade openness promotes the economic growth in Sri Lanka. As policy recommendations, Sri Lanka should focus more on export oriented industries and further liberalize trade policy attracting more FDI to the country.

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