SRI LANKA ECONOMICS RESEARCH CONFERENCE

SLERC - 2013

PROCEEDINGS

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2nd International Economics Research Conference, Sri Lanka Forum of University Economists

Volume II

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MESSAGE FROM THE VICE CHANCELLOR
University of Peradeniya

It gives me great pleasure to be invited to write a message on the occasion of the second Sri Lanka Economics Research Conference organized by the Sri Lanka Forum of University Economists.

The theme of the conference, "Growth Pole Shift towards Asia: Opportunities and Challenges" is very timely. Post-war Sri Lanka is faced with many opportunities for accelerated economic growth and development, deriving from greater stability and greater internationalization of markets. And, yet, this also brings it with it exposure to many challenges both from within and outside the country. How does Sri Lanka seize the opportunities arising from increased globalization with an additional emphasis on Asia whilst also minimizing the inherent risks that arise from such inter-relatedness? My hope is that this conference will provide us with the opportunity for critical engagement, debate and discussion on these important issues.

The teaching of Economics at the University of Peradeniya has a history dating back to the origins of the university itself. The Economics Department has produced many distinguished alumni who have served in academia, government and the business sector, both in Sri Lanka and overseas. In this regard, I am pleased that the Department of Economics and Statistics is serving as the current Chair of the Sri Lanka Forum of University Economists and, as a result, the University of Peradeniya serves as the hosting institution for the Conference.

I wish the conference all success.

Prof. Atula Senaratne
Vice Chancellor
University of Peradeniya

MESSAGE FROM THE DEAN
Faculty of Arts, University of Peradeniya

It is with great pleasure that I write this message to the second Sri Lanka Economics Research Conference organized by the Sri Lanka Forum of University Economists.

I understand that this conference will bring together academics within the Economics discipline from the entire university system of Sri Lanka. The conference provides an opportunity for mutual sharing of research findings, dissemination of new knowledge created through academic research, and for opportunities to discuss policy implications which will contribute to the task of national development. In this context, I am pleased that the conference organizers have chosen the theme, "Growth Pole Shift towards Asia: Opportunities and Challenges". Given where we as a nation stand today, in the context of increased Asia-driven globalization, this conference is well-timed.

I am also pleased that the Department of Economics & Statistics, one of the more prominent departments within the Faculty of Arts, is currently serving as the Chair of the Sri Lanka Forum on University Economists. Over the last several years, the department has grown in terms of academic strength of staff, quality of research output and contribution to faculty and university development.

Let me also take this opportunity to welcome all fellow academics from the Sri Lankan university system to the Faculty of Arts – which will be serving as your "home" during the conference days.

I wish the conference all success.

Prof. A.M. Navaratne Bandara
Dean/Faculty of Arts
University of Peradeniya

MESSAGE FROM THE CHAIRPERSON
Sri Lanka Forum of University Economists (SLFUE)

It is with great pleasure that I write this message for the proceedings of the Sri Lanka Economics Research Conference (SLERC-2013) organized and hosted by the Department of Economics and Statistics, Faculty of Arts, University of Peradeniya. SLERC-2013 is the Second International Economics Research Conference of the Sri Lanka Forum of University Economists (SLFUE), and is planned and conceptualized by the SLFUE, comprising Economics Departments in the State University system in Sri Lanka.

Research in the discipline of Economics has global significance given the current challenges faced by developing economies. To realize the benefits of research, it is vital to disseminate the findings. 2012 marked the beginnings of the SLFUE and also the first ever SLERC, hosted by the University of Colombo as the Chair/SLFUE. If SLERC-2012 marked the "…beginning of the voice of Sri Lankan university economists", SLERC-2013 takes the important step of making sure that the voice of economists in the country will not be muted, but be heard ever louder in addressing issues of the economy. I trust that the outcomes of this conference – bringing together leading academics and researchers from both within and outside Sri Lanka - will actively contribute to stimulating and enriching further research in the discipline of economics among the students and academic staff in the University system, as well as underpin policy-making in this country.

No conference of this nature can be organized without the joint and untiring efforts of many people. I take this opportunity to express my thanks to all those who contributed in numerous ways to make this event a success. It is my wish and belief that this good work will be carried forward by the Sri Lanka Forum of University Economists. I wish all the participants a productive and pleasant time at this gathering and the endeavor all success.

Dr. John Nigel
Head of the Department of Economics and Statistics
University of Peradeniya,

Chairperson
Sri Lanka Forum of University Economists - 2013

MESSAGE FROM THE CHAIRPERSON
Sri Lanka Economics Research Conference (SLERC) - 2013

The establishment of the SLFUE is, without doubt, a significant step in the rising voice of economists in the country. Research is essential to nation building. While research directly contributes to progress, economic growth and prosperity, it helps us better equip and train our workforce and encourages creativity and innovation in the country. In short, research makes our nation more competitive in the global economy.

The Sri Lanka Forum of University Economists (SLFUE) is a network of all Departments and Units of Economics within the university system of Sri Lanka. The Forum was organized with the objective of promoting closer co-operation, dialogue, collaborative research and mutual enhancement among the academics in the field of Economics. As part of its activities, SLFUE organizes the Sri Lanka Economics Research Conference (SLERC) which is now well known within the academic and professional arena, not only in Sri Lanka but also in a number of foreign countries, and its image is strongly established. This year's conference is on the broad theme of "Growth pole shifting towards Asia: Opportunities and Challenges", which is interesting and timely given the current context of development of our country and others in the region. It is expected that the conference will broaden the opportunities available for academics and other researchers in the field of Economics to publish their research work, discuss and deliberate on their findings, and disseminate knowledge to the wider public and policy makers. Therefore, I believe that the Conference provides a unique opportunity for economists serving the university system in the country to meet and learn from each other.

The Editorial Committee has worked hard within time constraints and with the help of external reviewers and colleagues to select extended abstracts covering a range of interesting sub- themes. I have no doubt that the presentations will be eagerly followed and discussed and debated in the technical sessions.

I also take this opportunity to express appreciation and gratitude to Professor Atula Senaratne, Vice Chancellor, University of Peradeniya and Professor A. M. Nawaratne Bandara, The Dean Faculty of Arts, University of Peradeniya for their cooperation and support to make this event a success. Sponsorship received from Ministry of Mass Media and Information, Regional Development Bank, State Mortgage and Investment Bank and Development Lottery Board are also greatly acknowledged.

While extending my sincere thanks to all who devoted their time to bring this second International Conference to a reality today, I welcome the National and International

Research Community, Industry, International Organizations and Governments' Representatives to discuss and suggest solutions that contribute to a better performing competitive country, Sri Lanka in the global economy. I wish everyone a fruitful time!

Dr. Wasantha Athukorala
Chairperson of SLERC – 2013
Coordinator of SLFUE - 2013

SRI LANKA ECONOMICS RESEARCH CONFERENCE - 2013

2nd International Economics Research Conference,
Sri Lanka Forum of University Economists

Organized by

The Department of Economics and Statistics
University of Peradeniya

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Macroeconomics and Trade

Application of the Country Product Dummy Method to Construct Spatial and Temporal Price Indices for Sri Lanka

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***Keywords**: Inequality measurement, Multilateral price indices, Country Product Dummy method, Sri Lanka.*

Introduction

Currently available indices are not appropriate for the purpose of inequality measurement because of inadequate geographic coverage, inadequate population coverage, short length of series and inappropriate methodological features. Almost all existing price indices (for example, indices constructed and used by Department of Census and Statistics, 2004, Dutt and Gunewardena, 1997, Gunewardena, 2007)have been computed for the specific purpose of measuring poverty, and use the consumption patterns of around 40 per cent of households with the lowest consumption expenditure to construct the price indices. Hence, they are not appropriate to measure inequality.

There is also a methodological weakness inherent in the use of binary index numbers such as Paasche, Laspeyres and Fisher, on which currently available price indices are based, as they do not satisfy the property of transitivity. As a result, it is difficult to ensure that the entire set of price comparisons that these methodologies yield, is internally consistent between all possible direct and indirect comparisons (Kravis et al., 1982). In contrast, multilateral methods such as the Elteto-Koves-Szulc (EKS) index, the Geary-Khamis (GK) method, and the Country-Product-Dummy (CPD) method, satisfy the property of transitivity. However, the EKS and GK methods also require a set of region or region-wise prices and quantities of items of uniform quality specifications, which is difficult to obtain. In contrast, the CPD methodology was originally developed as a specialized regression technique to deal with representative price lists of different countries that were not identical and to ensure base country

invariance (Coondoo et al., 2004). Hence this paper applies the CPD methodology to construct price indices for the analysis of inequality trends in Sri Lanka.

Objective

We apply the Country Product Dummy method to construct a spatial and temporal price index that can be used for inequality analysis between 1980 and 2010 in Sri Lanka other than in the North and the East. The former conflict-affected regions are excluded from the analysis due to lack of data from these regions for most of this period.

Methodology

The CPD methodology is really a bridge-region method that links two regions together on the basis of the relationship of each to a (base) region by taking into account all price comparisons with all other regions (Kravis et al., 1982). Consequently, the method regards each price as being dependent on the region in which it is observed, and on the item to which it refers.

The standard CPD formulation regresses the logarithm of observed prices on two sets of dummy variables, one relating to the various regions and the other to the various commodities. The model has no intercept. It includes the observations of unit prices for the base region in the base year in its vector of prices representing the dependent variable but does not include a dummy to represent the base as an explanatory variable. Setting region j = 1 as base and introducing the dynamic of time $t(t = 1, 2, ..., T)$, the regression version of the model is:

$$\ln p_{jit} = \eta_{21} D_{21} + ... + \eta_{MT} D_{MT} + \pi_1 D_1^* + \pi_2 D_2^* + ... + \pi_N D_N^* + u_{jit} . \quad (1)$$

In equation (1), D_{jt} refers to the j-the region dummy variable in time t, taking value equal to 1 for all observations for region j in time t and zero for all other regions and times. D_i^* is the i-th commodity dummy variable taking value equal

to 1 for commodity i and zero for all other commodities. The random disturbance term u_{ijt} is a normally distributed variable with mean zero and variance σ^2.

The coefficient η_{jt} of each region dummy variable denotes the differences in the log of prices between the base region in the base year and the subscripted region at the subscripted time. e^{η} is the purchasing power parity for that particular region relative to the base of region 1 when $t = 1$.

Rao (1995) generalised the estimation procedure of the model by making use of quantity and value data and extending the model to allow for the use of weights. The extension had its roots in weighted least squares with weights being equivalent to the square root of expenditure shares, and is as follows:

$$\sqrt{v_{jit}} \ln p_{jit} = \eta_{21}\sqrt{v_{jit}} D_{21} + \ldots + \eta_{MT}\sqrt{v_{jit}} D_{MT} + \pi_1\sqrt{v_{jit}}\ D_1^* + \pi_2\sqrt{v_{jit}}\ D_2^* + \ldots + \pi_N\sqrt{v_{jit}}\ D_N^* + u_{jit} \quad (2)$$

The analysis uses expenditure data (value and quantity) from the Labour Force and Socio-Economic Surveys (LFSS) of 1980/81 and 1985/86 and the Household Income and Expenditure Surveys (HIES) of 1990/91, 1995/96, 2002, conducted by the Department of Census and Statistics, Sri Lanka. The surveys are broadly comparable in design and methodology, particularly in the schedules related to household expenditure. The surveys could not be carried out in the Northern and Eastern Provinces for twenty years after 1985, although with the ending of the conflict (from most of the East in 2007 and in the North in 2009), first the Eastern Province and then the Northern Province were covered. However, since the present paper aims to construct a price index that can be used to investigate inequality trends in Sri Lanka during the post-liberalization period we are compelled to exclude the North and the East from the analysis because of the lack of data. Nevertheless, in a companion paper we will construct a spatial and temporal price index for all Sri Lankan provinces

including the North and the East for the years 1980, 1985 and 2010 in order to enable the analysis of inequality in the entire island.

We use household price and expenditure data for seven survey years for seven provinces, each with urban and rural sectors. The price index for the urban sector in region 1 (Western Province) in 1980, the first year for which data is available, was set as the base or numerary. Consequently, the number of region dummies in the basic model of equation (1) applied to seven survey years, seven provinces and two sectors, amounted to a total of 97regional dummies (7 regions*7 years*2 sectors – 1 [for base] = 97). The model accounted for 44 aggregated food and non-food commodity categories for which quantity data were available. The classification system, consisting of 39 food and 5 non-food categories, was based almost entirely on Dutt and Gunewardena's(1997) method.

Unit values for the price variable are defined as follows. For region *j*,

$$p_{ji} = \frac{\overline{v}_{ji}}{\overline{q}_{ji}} \text{.....(3)}$$

Results

Ordinary Least Squares estimation can be used to obtain the coefficients of the explanatory variables in equation (2), so long as the least squares assumptions hold. One such assumption is that the explanatory variables are independent from each other. If, however, there are one or more exact linear relationships among the explanatory variables, then the least squares estimator cannot be defined. Tests for multi-collinearity ruled out the presence of exact collinearity between explanatory variables in equation (2), although the two commodity dummy variables for rice and cereals and food bought out, reported high (>10) variance inflation factors. However, the solution for this problem, either dropping the correlated variables or instrumenting for them, was not practical as these two commodities are staples and represent an important component of household consumption. In any case, in the absence of exact collinearity, the least squares estimator still remains the best linear unbiased estimator by the Gauss-Markov theorem (Hill et al., 2011). Besides, our interest here is the

coefficients of the regional dummies from which we derive our spatial and temporal price indices, rather than the coefficients of the commodity dummies, and tests for multi-collinearity ruled out the presence of exact linear relationships between our variables of interest.

Table 1 presents the regression results for the spatial dummy variables for the urban sector, while Table 2 sets out the results for the rural sector. Regression results for the commodity dummies are not presented as they are not required for the construction of regional price indices other than in the specification of the CPD model, but are available from the authors on request. The full set of urban and rural price indices is set out in in Table 3, which is derived from the exponentials of the coefficients of the regional dummies in Tables 1 and 2. The regression results appear sensible. For example, all proved significant at the 1 per cent or 5 per cent critical level other than for the coefficients representing first year (1980) variables for all regions and both sectors. With Western Province's urban sector of the first survey year, 1980, taken as the base, the data suggests a twelve (urban) to sixteen (rural) fold increase in prices between 1980 and 2010. This is in keeping with the movement of the Colombo Consumer's Price Index (CCPI) over the same period (Central Bank of Sri Lanka, various years). Moreover, the twelve to fifteen-fold increases in urban prices since 1980 is broadly consistent across regions.

However, rural prices have been generally lower than urban prices until 2002, after which they have become higher. To test whether (a) the coefficients of the urban sector regional dummies were significantly different from 0 in the base year 1980, and (b) whether the coefficients for the regional dummies of each of the other years, both urban and rural, were equal to each other, we conducted Wald tests and Table 4 sets out the results. It can be seen that other than for rural prices of 2007 and 2010, the hypothesis that regional prices are different from each other in any year was rejected at the 5 per cent level of significance. It is likely that variations in commodity prices across regions averaged out to produce regional price indices that are close to each other during most of this period. The relatively higher rural prices of 2007 and 2010, however, merit further investigation in future research.

Conclusion

This study constructed spatial and regional price indices for the years 1980, 1985, 1990, 1995, 2002, 2007 and 2010 for the admittedly limited purpose of measuring trends in consumption inequality. The empirical research revealed recently emerging differences in rural and urban prices that are significant and a cause for concern. These differences merit careful investigation to find out underlying factors, using more appropriate and extensive data. For example, multivariate time series analysis using the spatial consumer and producer price data series maintained by the Central Bank of Sri Lanka, may throw further light on the extent to which commodity markets are spatially integrated, and help identify the commodities and district markets that are lagging behind. As importantly, such an analysis will show whether differentials between the prices that consumers pay for products, and the prices that producers receive, have decreased over the years with better transport and connectivity, or whether these differentials have remained the same, or even increased, due to other reasons such as anti-market practices. Research on these lines can better inform policies aimed at controlling inflation even while making sure that producers get better prices for their products.

A major limitation of the present study is that the price indices produced cannot be used to analyze the progress of inequality in the North and the East, and, in fact, in the country as a whole. However, in a companion paper, we intend constructing a spatial and temporal price index for all Sri Lankan provinces including the North and the East for the years 1980, 1985 and 2010 that will enable the analysis of inequality in those regions as well.

Table 1: CPD Regression Results for Regional Dummies, Urban Sector

Province0 / Year	1980	1985	1990	1995	2002	2007	2010
Western	-	0.5781***	1.1500***	1.6046***	2.0991***	2.2930***	2.7420***
	-	(-0.1170)	(-0.1182)	(-0.1178)	(-0.1184)	(-0.1213)	(-0.1203)
Central	-0.1394	0.5416***	1.1369***	1.5580***	2.0055***	2.1533***	2.6960***
	(-0.1101)	(-0.1164)	(-0.1154)	(-0.1205)	(-0.1191)	(-0.1208)	(-0.1154)
Southern	-0.0608	0.4208***	1.0326***	1.4325***	2.0716***	2.2263***	2.7177***
	(-0.1120)	(-0.1124)	(-0.1130)	(-0.1181)	(-0.1071)	(-0.1166)	(-0.1194)
North Western	0.0062	0.3742***	1.0402***	1.4770***	2.0665***	2.0933***	2.5971***
	(-0.1114)	(-0.1085)	(-0.1138)	(-0.1152)	(-0.1171)	(-0.1150)	(-0.1220)
North Central	-0.1240	0.3911***	1.0695***	1.5751***	2.0810***	2.1694***	2.6623***
	(-0.1043)	(-0.1175)	(-0.1151)	(-0.1121)	(-0.1140)	(-0.1170)	(-0.1174)
Uva	0.0618	0.4867***	1.0753***	1.4454***	2.0584***	2.2040***	2.6637***
	(-0.1124)	(-0.1146)	(-0.1146)	(-0.1169)	(-0.1135)	(-0.1075)	(-0.1125)
Sabaragamuwa	-0.0184	0.4752***	1.0671***	1.4450***	2.1222***	2.1633***	2.6687***
	(-0.1097)	(-0.1134)	(-0.1156)	(-0.1181)	(-0.1165)	(-0.1240)	(-0.1205)

Notes: Standard errors in parentheses. * Significant at 5%;** significant at 1%.

Table 2: CPD Regression Results for Regional Dummies, Rural Sector

Province / Year	1980	1985	1990	1995	2002	2007	2010
Western	0.0429	0.4635***	1.0358***	1.4856***	2.0603***	2.3269***	2.8015***
	(-0.1190)	(-0.1233)	(-0.1221)	(-0.1248)	(-0.1239)	(-0.1199)	(-0.1206)
Central	-0.0379	0.4024***	1.0065***	1.3825***	1.9881***	2.2026***	2.6115***
	(-0.1148)	(-0.1188)	(-0.1236)	(-0.1250)	(-0.1220)	(-0.1186)	(-0.1267)
Southern	-0.0800	0.3128**	0.9486***	1.3767***	1.9282***	2.2106***	2.8785***
	(-0.1121)	(-0.1214)	(-0.1187)	(-0.1206)	(-0.1248)	(-0.1181)	(-0.1060)
North Western	-0.0800	0.3229**	0.9386***	1.3476***	1.9148***	2.2000***	2.6483***
	(-0.1053)	(-0.1274)	(-0.1184)	(-0.1258)	(-0.1252)	(-0.1203)	(-0.1174)
North Central	-0.0456	0.3036***	0.9576***	1.3242***	1.8410***	2.1974***	2.6066***
	(-0.1076)	(-0.1154)	(-0.1166)	(-0.1189)	(-0.1193)	(-0.1117)	(-0.1141)
Uva	-0.0042	0.3290***	0.9694***	1.3011***	1.8671***	2.1960***	2.5385***
	(-0.1026)	(-0.1177)	(-0.1166)	(-0.1202)	(-0.1219)	(-0.1164)	(-0.1183)
Sabaragamuwa	-0.0960	0.3718***	0.9866***	1.3813***	1.9622***	2.4490***	2.6048***
	(-0.1140)	(-0.1170)	(-0.1193)	(-0.1214)	(-0.1214)	(-0.1087)	(-0.1149

Notes: Standard errors in parentheses. * significant at 5%;** significant at 1%.

Table 3: Spatial and Temporal Price Indices, Sri Lanka 1980-2010

Region	1980	1985	1990	1995	2002	2007	2010
Urban sector							
Western	1.000	1.783	3.158	4.976	8.159	9.905	11.577
Central	0.870	1.719	3.117	4.749	7.430	8.613	15.517
Southern	0.941	1.523	2.808	4.189	7.937	9.266	14.820
North Western	1.006	1.454	2.830	4.380	7.897	8.112	15.146
North Central	0.883	1.479	2.914	4.831	8.013	8.753	13.424
Sabaragamuwa	1.064	1.627	2.931	4.244	7.833	9.061	14.329
Uva	0.982	1.608	2.907	4.242	8.349	8.700	14.349
Rural sector							
Western	0.958	1.590	2.817	4.418	7.849	10.246	16.469
Central	0.963	1.495	2.736	3.985	7.301	9.049	13.619
Southern	0.945	1.367	2.582	3.962	6.877	9.121	17.788
North Western	0.923	1.381	2.556	3.848	6.786	9.025	14.129
North Central	0.955	1.355	2.605	3.759	6.303	9.001	13.553
Sabaragamuwa	0.996	1.390	2.636	3.673	6.470	8.989	12.661
Uva	0.908	1.450	2.682	3.980	7.115	11.577	13.529

Table 4: Test Results for Significant Differences in Regional Prices in Each Year 1980-2010

Year	Urban Sector		Rural Sector	
	F^*	Prob> F	F^*	Prob> F
1980	0.98	0.4345	0.19	0.9809
1985	0.90	0.4917	0.42	0.8668
1990	0.30	0.9367	0.15	0.9892
1995	0.73	0.6260	0.41	0.8719
2002	0.18	0.9817	0.67	0.6769
2007	0.54	0.7757	2.26	0.0350
2010	0.28	0.9487	2.58	0.0172

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Examining the Trade-off between Inflation and Unemployment Rate in the Long Run in Sri Lanka: Parametric and Non-Parametric Econometric Investigations

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***Keywords**: Inflation, Unemployment, Non-Parametric, Co-integration, Causality*

Introduction

Inflation and unemployment are two macroeconomic issues interpreted as twin evils of macroeconomics. Both variables are elements of the Misery index. The Misery index in recent years has become a prime indicator used in political debate. These issues have captivated the minds of many researchers and politicians.William Phillips pointed out a trade –off relationship between unemployment and inflation. The statistical and economic relationship between inflation and unemployment has been a central focus for macroeconomists and policymakers since the publication of Phillips' (1958) seminal paper. Besides having a theoretical importance, the relationship between these variables (the Phillips curve) carries important policy as well as political implications. Central banks tend to develop their monetary policies in such a way that would enable them to keep inflation as low as possible. However, the dilemma is that if an inverse relationship between inflation and unemployment exists, then central banks would be able to maintain low inflation rates only by means of high unemployment. Thus, the hard choice would be between having a combination of low-inflation and high-unemployment or vice versa.

In the above context, the statistical and economic relationship has remained an important consideration for decision-makers and the central banks. This trade-off relationship remains a necessary building block of business cycle theory. Since then a sizeable theoretical and empirical literature has backed up the

stable trade-off between these variables. However, Friedman(1968), argued against the stable trade-off hypothesis. He further argued that the traditional trade-off relationship between these variables (Phillips curve) could only be a "short term" trade–off sustainable only over a certain period. No trade off relationship between these variables in the long run. The convex Phillips curve exists only in the short run under which Friedman and Phelps argued that the rate of change in unemployment did not only reflect regular actual inflation but also expected inflation. Based on the above argument, they concluded that there was no trade-off between these variables in the long run.

Mankiw(2000) states that the trade-off between inflation and unemployment is inexorable and mysterious. Karanassou and Snower (2002) argued that the long run relationship between these variables is downward sloping. Granger and Jeon (2009) found that there was a weak causation from unemployment to inflation. This tradeoff remains a controversial topic among economists, but most economists today accept the idea that there is a short run trade-off between inflation and unemployment. Data on unemployment and inflation over the last six decades in many countries show a more complicated relationship than the simple short run Phillips curve. It may be a Phillips curl.

The main research question of this study is "Whether a trade-off relationship exists between unemployment and inflation in the long run in Sri Lanka?" There is a large and growing body of empirical literature on this relationship. However, there has been a lack of in-depth studies on this relationship in developing countries, in particular in Sri Lanka.

Objective

The main objective of this study is to test the existence of long term trade-off between inflation rate and unemployment rate in Sri Lanka.

Methodology

Data: the variables used in this study are consumer price index (CPI), wage index, unemployment rate and gross domestic product. This study covers the

period 1963-2012. Consumer price Index and Unemployment rate data are collected from various issues of the Annual Report, Central Bank of Sri Lanka, Economic and Social Statistics of Sri Lanka 2012, and the Consumer Finances and Socio Economic Survey Reports. The CPI-based inflation rate, wage inflation rate and GDP growth rate are calculated using the log difference formula.

$$\pi = [\ln(P_t) - \ln(P_{t-1})]*100$$

where, P is the index variable.

This study uses advanced econometric techniques (nonparametric and parametric) to examine the trade-off relationship between inflation and unemployment in Sri Lanka. First, we employed nonparametric approach graphical methods, Simple Scatter plots, Confidence Ellipse, Scatter with Kernel Fit, scatter Nearest Neighbor Fit to explore the relationship. Then, parametric econometric techniques- co-integration analysis, Error Correction Model and, causality analysis are employed to investigate the relationship. Error correction model allows testing for the existence of an underlying link between variables, as well as for short run adjustments between variables, including adjustments to achieve the co-integration relationship. Impulse response function is employed to show the effects of shocks on the adjustment path of inflation.

The simple specification of the above relationship could be estimated using the following equation: $INF_t = \alpha_0 + \beta_1 UE_{t-1} + \varepsilon_t$ where $\alpha_0$is constant and $\beta_1$is slope coefficient. INF_t is the inflation rate in the year t, UE_t is the unemployment rate in the year t and ε_t is the error term.

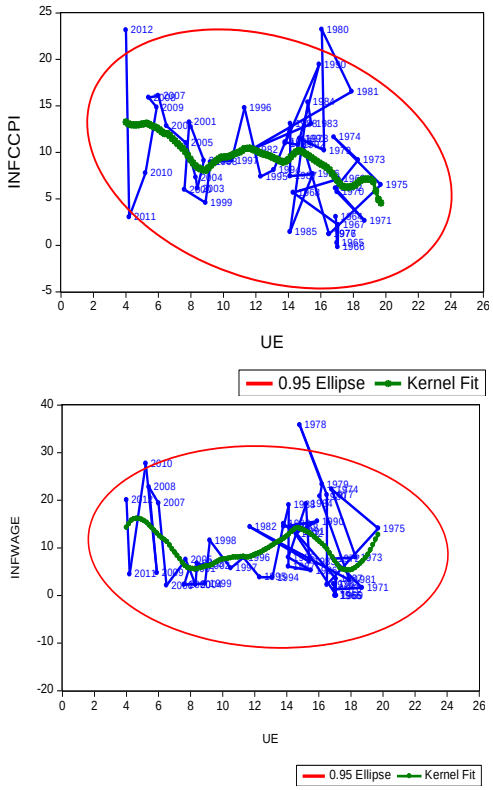
The novelty of this paper is uncovering the long term time path of the underlying relationship between unemployment rate and inflation rate using nonparametric and parametric techniques using Sri Lankan data.

Results

Results show a more complicated relationship than the simple short run Phillips curve. In this study, simple scatter plot does not explicitly provide the direction

of relationship between these variables. Therefore, we used advanced techniques, nonparametric methods, such as confidence ellipse, scatter with Nearest Neighbor Fit and scatter with Kernel fit which showed a weak and downward sloping and non-linear relationship between inflation rate and unemployment rate. This negative and nonlinear relationship confirms Phillips basic findings. Kernel fit shows that the curve has a convex and concave shape. Sacrifice ratio between those variables also changes over the period.

Figure1: Trade-off between CCPI-INF &UEFigure2:Trade-off between Wage-INF &UE

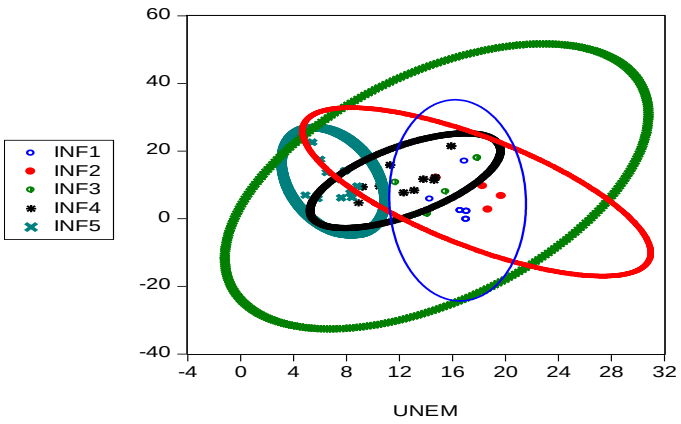


Inflation rate is having upward trend till 1980s then downward trend. Unemployment rate is declining very marginally till 1980s then it gradually declined. Compared to unemployment rate, there have been more fluctuations in inflation rate.

The above confidence ellipses with Kernel fit show a possible nonlinear trade-off between inflation rate and unemployment rate. The curvature is changing convexity in some periods and concavity in others.

The sample period is divided into 5 periods which were not predetermined but based on specific direction of the relationship between these variables. This study try to explore what data says. The confidence ellipse investigation shows that the type of relationship between inflation rate and unemployment rate in these sample periods is not the same. The direction of relationship varies as seen from the piecewise confidence ellipse display. One can see in the first, second and fifth periods there are negative relationship between these variables. During the third and fourth periods, there are positive relationships between these variables. A close look at the data shows that there have been in fact several distinct curves over the study periods.

Figure 3: Piecewise confidence ellipse analysis



In the long run, during the period of 1963-2012, the variables are negatively related and the equilibrium time path is nonlinear. Nonparametric regression methods are used to identify the long run path. The Kernel regression fit and the Nearest Neighbor Fit both indicate that there is a consistent negative relationship between the rate of inflation and the rate of unemployment. These non-parametric regression fit graphs show explicitly the trade-off relationship which contradicts the Milton Friedman argument of a vertical Phillips curve.

In parametric analysis, we employ the Augmented Dickey-Fuller (ADF) test and Phillips–Perron test to test the stationarity of the series incorporated in the study. The ADF and PP test results are given below in Table-1,INF (CPI) and INF (wage) and UE are non-stationary in the case of no intercept and no trend model for the level series and stationary at first difference.

Table 1: Unit root results

	LEVEL			FIRST DIFFERENCE	
Variables	ADF statistics	PP test statistics		ADF statistics	PP Statistics
INFL(cpi)	-1.84(0.06)	-1.53(0.11)		-8.99(0.00)	-14.50(0.00)
INFL(wage)	-0.54(0.47)	-1.79(0.06)		-8.14(0.00)	-18.82(0.00)
UE	-2.22(0.20)	-2.20(0.20)		-4.21(0.00)	-4.21(0.00)

(P values are in parenthesis)

Following the visual experiment, we employed the co-integration technique to explore the relationship in the long run context. Consider the co-integrating regression as $INF_t = \alpha + \beta UE_t + \varepsilon_t$ where α is constant and β is slope coefficient, INF_t is CPI inflation rate in the year t, UE_t is the unemployment rate in the year t and ε_t is the error term. The Newey and West HAC method is employed to estimate the coefficient of covariance, using a non-pre whitened Bartlett Kernel with Newey-West band with the value of bandwidth specified as 4. The estimated co-integrating equation is $INF_t = 14.98 - 0.434UE_{t-1}$. The slope coefficient 't' statistic is -6.71 with p-value 0.000.

The ADF test and PP test are performed for residual series $\hat{u}_t$ estimated from a co-integrating regression of the form given above. As the ADF (-4.425) and PP (-4.317) statistics(absolute) for co-integrating residuals are greater than the relevant critical values at 5% levels, null hypothesis of unit root is rejected at

5% level. It indicates that unemployment and inflation series are co-integrated and have a long run equilibrium path. The long run equilibrium path indicates that there is a long run trade off relationship between inflation rate and unemployment rate.

The estimated wage inflation equation is $\text{Infwage}_t = 10.6 - 0.034\text{UE}_{t-1}$. Wage inflation estimate indicates the negative relationship between inflation and unemployment. It is statistically not significant. This may be due to the wage index not covering all the sectors. Board wage indices were used to calculate wage inflation. The Engle –Granger co-integration analysis showed that the estimate of the coefficient of UE is negative and statistically significantly different from zero. The ADF test for the residual of the estimated equation confirms that wage rate and unemployment are co-integrated. Wage inflation and CPI inflation analysis both showed that there is a trade-off between these variables in the long run in Sri Lanka. The slope coefficient β represents the degree of responsiveness of wages or prices to labour market disequilibrium. We analyzed wage inflation and CPI inflation with unemployment separately. Both results showed trade off relationships in the long run.

The error correction model (CCPI INF) results show the model is adequate as F test statistics is 10.13 with p-value 0.0007. The adjustment coefficient (-0.623) of error correction term is statistically significant at the 5 % level and has expected sign (negative). It suggests that 62 percent of the deviations from the equilibrium are corrected each year. Inflation will tend to move downwards in the direction of equilibrium.

The coefficient of error correction term is less than 1, which indicates the stability of the system. The short run impact of unemployment on CCP inflation is -0.35 with p value 0.000. The statistical significance of adjustment coefficient indicates that unemployment Granger causes inflation in the long run. The short run impact of unemployment on CCP inflation is -0.35 which is statistically significant (p value 0.000.)

The results of Granger causality test suggest that unemployment is a useful predictor of inflation. The estimated Granger causality F statistic (4.25) is

statistically significant at 5 percent level.This study uses impulse response function as an additional check of the co-integration test's findings. If the initial response of inflation rate to a unit shock in unemployment is negative and dies out over the time then the response of inflation to the shock has effectively been dissipated.

Cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) tests using recursive residuals are performed to examine the stability of the long run parameters. As the plots of the statistics for both tests lie within the critical bounds set for the 5 percent level, the hypothesis, the regression equation is correctly specified is not rejected. It proves parameter stability. Residual diagnostics concerning autocorrelation, heteroscedasticity and normality indicate that the results are robust.

Conclusion

This study found that there was a negative and long run stable relationship between inflation and unemployment during the sample period. The visual investigation, co-integration regression analysis proved that there is a significant trade-off in the long run during the overall sample period. Results indicate that there is a statistical evidence to support for long term trade-off between unemployment rate and inflation rate in Sri Lanka. Anatole Kaletsky, Chairman ofThe Institute for New Economic Thinking, New York, says that vertical Phillips curve does not exist in the long run in UK and there is an elastic Phillips curve (horizontal).The results of this study is consistent with his argument.

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Effectiveness of the Interest Rate Channel for Controlling Price Levelin the Sri Lankan Context

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***Keywords**: Interest Rate Channel, Price Level, Co-integration Test, Vector ErrorCorrection Test, Unit Root Test*

Introduction

The aim of this study is to examine the effectiveness of interest rate channel as a main monetary transmission channel to control the price levels in Sri Lanka. The conduct of monetary policy serves as common ground for discussion of the specific policies called for in particular situations. The central elements of this consent are that the instrument of monetary policy ought to be the short term interest rate, that policy should be focused on the control of inflation, and that inflation can be reduced by increasing short term interest rates.

In the monetary policy literature, there is a view that monetary transmission mechanisms operate more effectively in the periods when price stability is achieved (Gali, 2008). Most economists agree that in the long run, output (GDP) is fixed and any changes in the money supply only cause prices to change. But in the short run, changes in the money supply can affect the actual production of goods and services because prices and wages usually do not adjust immediately. This is why monetary policy is a meaningful policy tool for achieving both inflation and growth objectives. A central bank should be able to adjust its policy interest rate carefully to achieve its inflation target to a level which is steady with growth objectives of the economy. The relationship between the monetary policy decisions and changes in the level of output and price level of the economy is explained by the monetary policy transmission mechanism. According to Mishkin (1996) the monetary transmission mechanism with interest rate channels had been a standard feature in the literature for over sixty years going back to the period of Keynes and it is the primary mechanism at work in conventional macroeconomic models.

Thiessen (1998) describes that Monetary Transmission Mechanism takes place in four stages. First, Central Bank actions affect short term interest rates via the banking sector liquidity. In the second step these short term interest rates affect other interest rates and exchange rates. In the third step interest rates and exchange rates affect aggregate economic activities such as consumption, investment and national income. At the last the aggregate demand and supply affect inflation. Dakila and Paraso (2004) also describe these stages of transmission mechanism as the interest rate channel.

There is a doubt whether Sri Lanka could perform monetary policy targets through the interest rate operations. If the interest rate channel of monetary policy is effective in Sri Lanka, interest rate could be able to control inflation and to maintain economic growth.

Objectives

To test whether empirical evidence on the effectiveness of interest rate transmission channel to control price level in the Sri Lankan context accords with the existing theoretical explanations. The other objectives are to to test the effects of money supply, income and exchange rate on the price level (To test the credit channel and exchange rate channel)

Methodology

The variables include in the inflation model used to estimate are Consumer Price Index (CPI) as price indicator, Nominal broad money supply (M2) as money supply indicator, Real GDP (RGDP) as income indicator, Fixed Deposit Rate (For one year) (FDR) as interest rate indicator, and nominal exchange rate (ER). Annual data of the period 1978 -2009 are used for the study and the sources of data are the Central bank Of Sri Lanka and International Financial Statistics (IFS) of International Monetary Fund.

Generally macroeconomic time series data has the feature of non-stationary and co-integration methodology should be employed to examine the long run

relationship among the variables. A good time series modeling should describe both short-run dynamics and the long-run equilibrium simultaneously. In this manner, the study employs an econometric technique of co-integration and error correction modeling (ECM) to estimate more sophisticated relationships.

VAR method does not capture non-linear elements that exist with certainty in level variables because a VAR is a linear model. For this testing purpose, the original data of all series: CPI, RGDP, FDR, ER and M2 were transformed to log.

The Expected long run model

According to the above theoretical and empirical discussion presented in the literature survey, the long run investment function for Sri Lanka can be specified in the following manner;

$$LCPI = \beta_0 + \beta_1 LM2 - \beta_2 LRGDP - \beta_3 LFDR + \beta_4 LER + \mu 2_{t-1}$$

β_0 - Constant of inflation function

β_1 – Money elasticity of inflation (Expected to be positive)

β_2 – Income elasticity of inflation (Expected to be negative) (As the output)

β_3 - Interest rate elasticity of inflation (Expected to be negative)

β_4 - Exchange Rate elasticity of inflation (Expected to be positive)

$\mu 2_{t-1}$ – Deviation of inflation from the long run equilibrium in the previous year.

Results

Stationarity of each series was tested using the Augmented Dicky Fuller (ADF) unit root test including a constant, and ADF unit root test indicate that these variables are integrated of order 1, [I(1)].

Co-integration test for inflation model

Johansson co-integration methodology would be conducted to test whether there are any long run relationships among the set of non-stationary variables. This test confirmed that the variables are co-integrated and there is one co-integrating equation at the 0.05 significant levels.

Table 02: Results of Johansson Co-integration Test

Hyphothesized No of CE(s)	**Eigen value**	Likelihood Ratio	5 Percent Critical value	1 Percent Critical value
None **	0.790917	90.39025	68.52	76.07
At most 1	0.534743	43.43960	47.21	54.46
At most 2	0.379326	20.48462	29.68	35.65
At most 3	0.166456	6.176133	15.41	20.04
At most 4	0.023521	0.714070	3.76	6.65

* denotes rejection of the hypothesis at the 0.05 level

Estimated Long Run Inflation Model

The long run equilibrium equation of inflation, estimated by the co-integration methodology is given below.

$LCPI = -1.51 + 0.59LM2 - 0.28\ LRGDP + 0.13LFDR + 0.45\ LER + \mu 2_{t-1}$

(-13.1238) (2.66855) (-5.21984)(-7.12245)

This estimated coefficient of interest rate is significant but inconsistent. Other three coefficients estimated in the long run inflation model are statistically significant and consistent.

Short run dynamics of inflation

The results of vector error correction model for inflation, which was done to analyze the short run dynamics of the system, prove that inflation would not be adjusted in the short run. Inflation has a long run relationship with other related variables but not short run dynamics in the system.

Conclusion

According to the data, higher interest rate leads higher price level. Higher interest rates lead people to save money in the fixed deposits in the Sri Lankan experience. With higher interest rates and higher savings would leads to raise

money creation activities of the commercial banks due to higher liquidity of the banks. In the meanwhile higher investment and consumption lead higher price level. This result indicates that the credit channel of the transmission mechanism of monetary policy is more effective than the interest rate channel to achieve price stability as well as the growth stability, in relation to Sri Lanka.

A positive innovation of income or output leads lower price level in the long run. A higher exchange rate leads to raise domestic prices in one hand due to importation of goods and other hand higher aggregate demand with higher export earnings. If Central bank can control exchange rate through the monetary aggregates as a monetary policy tool, the exchange rate transmission channel of monetary policy also would be more effective than the interest rate channel in Sri Lanka.

Price level has a long run relationship with other related variables in the system but not short run dynamics.

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An Empirical Study on the Effects of Real Effective Exchange Rate on Balance of Trade in Sri Lanka

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Keywords: *Real Effective Exchange Rate, Balance of Trade, Error Correction Model, Impulse Response Function, Cumulative Sum of the Recursive Residuals*

Introduction

The exchange rate has been one of the most deliberated issues together with theory and practice. In times of global economic integration, countries are progressively influenced by movements in their exchange rates according to the currencies of their trading partners. One of the main characteristics of the global currency system is that the dynamics of the exchange rates which is often pervasive. There are two noticeable indicators to measure these fluctuations: the nominal effective exchange rate (NEER) and the real effective exchange rate (REER). In order to obtain a useful aggregate measure of exchange rate fluctuations, an effective exchange rate combines various bilateral rates into a single indicator. While empirical evidence finds only a weak relationship between the Nominal Exchange Rate and the Balance of Trade in Sri Lanka, in this paper, we propose an explanation of this phenomenon in the Real Effective Exchange Rate consignment. The real effective exchange rate is one of the most important indicators of an economy's international competitiveness and it is an indicator of general movements of a country's exchange rate against all other currencies. Particularly a trend appreciation of the real effective exchange rate is considered unfavorable for the growth of export and import competing industries. This paper describes in detail the impact of real effective exchange rate alignment on trade balance in Sri Lanka by using its 10 major trading partners. We have formalized the trading partners by calculating the trade share of 10 countries. In particular the top 10 trading partners are: USA, India, UK,

Singapore, Japan, Germany, Hong Kong, Iran, China and Saudi Arabia. In addition, therefore, the nominal effective exchange rate (NEER) and real effective exchange rates (REER) indices are constructed.

The academic consensus, based on the seminal work of De Silva (1998) has found that the exchange rate policy after 1977 has improved the trade balance but has failed to stimulate real output at least in the short run. It has also been confirmed by D.S.Wijesinghe (1988) who surveyed that depreciation has been instrumental in making a favorable impact on the trade balance during the study period except for the years 1971, 1979 and 1985. In substance to W.T.K.Perera (2009 has investigated that there was no specific pattern for the trade balance between Sri Lanka and its trading partners in response to the change in real exchange rate, and none of the cases supported the J-curve.

Empirically, it has been found that trade in goods tends to be inelastic in the short term, as it takes time to change consuming patterns and trade contracts (Bahmani-Oskoee & Ratha,2004). Thus, the Marshall–Lerner condition is not met, and devaluation is likely to worsen the trade balance initially. In the long term, consumers will adjust to the new prices, and trade balance will improve. This effect is called the J-curve effect. It is widely believed that the short run effect of exchange rate depreciation on trade balance is different from the long run. In the short run, first, the trade balance deteriorates before resulting in an improvement, suggesting a J-curve pattern. In this context the findings are directly come up with the Nominal and Real Exchange rates but not with the effective exchange rates. Though models with the exchange rate are common in the literature, they have not been used to analyze the REER. This study attempts to experience all these relationships with the Nominal and Real Effective Exchange Rate and accordingly to fill the time gap.

Objectives

The main objective of this paper is to provide a comprehensive account of the methodological framework to calculate its set of effective exchange rates and to measure its impact on the balance of trade in Sri Lanka. Accordingly, it is strived to:

i. Analyze the time series properties of the variables used in this study,
ii. Understand the behavior of the variables in Sri Lanka,
iii. Analyze the short run and long run effect of effective exchange rate changes on the trade balance,
iv. Investigate the existence of Marshal Learner condition, the J curve ideal and
v. To suggest some policy implications.

Methodology

This section describes the methodology behind the effective exchange rates and its impact on Balance of Trade. Taking economic theory and data constraints into account, it presents the options available for constructing the nominal and real effective exchange rates of the Sri Lankan Rupee. In particular, the study period of this study is 1977-2012. 35 annual observations are employed. Data come from the Central Bank (CBSL) Annual Reports, IMF Publications and *Econstat* data of the World Bank. All the data are in US Dollar Billions.The basic variables in this study are exports and imports. These are used to derive all the other concepts related to the study. As the first trade share has been calculated. The following formula is used.

$$TS_i = \frac{X_i + M_i}{X + M} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.1.)$$

where TS: Trade Share, i: partner countries (i=1, 2….10)

The total exports and imports to the each country are divided by the domestic total exports and imports. Using the equation (2.1) trade share for each 10 trading partners are calculated.

Real exchange rates are thus calculated as a nominal exchange rate adjusted for the different rates of inflation.

$$RER_i = ER_i \left[\frac{CPI_i}{CPI_{SL}} \right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.2)$$

Where, CPI_{SL} is the domestic CPI, CPI_i is the foreign CPI and ER is the nominal exchange rate

The NEER is the weighted average of major bilateral nominal exchange rates. The weights are usually based on the trade shares, reflecting the relative importance of each of the major currencies, Consumer Price Index (CPI).

NEER Index is usually computed to reflect the changes in the foreign currency value of the domestic currency against a basket of currencies, which are important to the economy.

$$NEER_i = \prod_{i=1}^{10} ER_i^{w_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.3)$$

where ERi is the nominal exchange rate of major trading partner i^{th}country and w is the trade share of each country.

The average increase in prices (inflation) is measured using a price index (CCPI). The REER is the real effective exchange rate, taking into account variations of exchange rates and inflation differentials of major trading partner countries.

As the inflation rate in each country is assumed to broadly indicate the trends in domestic costs of production, the REER is expected to reflect foreign competitiveness of domestic products, given the rise in domestic prices.

$$REER_i = \prod_{i=1}^{10} RER_i^{w_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.4)$$

where RER_i is the real exchange index, $REER_i$ is the real effective exchange rate index, W_i =weights

In the calculation of these variables, Colombo Consumer Price Index, Consumer Price Indices of major 10 trading partners, Exchange rates of those trading partners, GDP of those partners are used. This paper also notes the impact of REER changes on BOP by a tested hypothesis;

H_0: Effective Exchange Rate Changes do not affect the Trade balance.

H_1: Effective Exchange Rate depreciation improves the trade balance.

To understand the behavior of the variables graphical methods and summary statistics are used. The Unit Root Test is employed to investigate the time series properties of the variables. To test for stationary of a series we have used Augmented Dickey Fuller (ADF) test and Phillip Perron (PP) test. The Engle-Granger co-integration test is employed to investigate the long run relationship. To study the short run dynamics of Trade balance, the Error Correction Model is employed. The Granger-causality test is used to examine the direction of causal relationship between these variables. Impulse Response Function is used to measure the trade balance behavior due to the external shocks. This test is used to identify the trade balance behavior due to the external shocks to real

effective exchange rate. A country' trade balance behavior is built into a reduced form function which was developed and exercised by Rose and Yellen (1989) and Rose(1991), Bahmani-Oskooee(1991). The reduced form equation for the trade balance is specified as follows: $TB = f(RDI, FRI, REER)$ as a function of the real effective exchange rate and the domestic and foreign real income. All variables are transformed to natural logarithm. A log-linear specification of the statistical model can be stated as follows:

$$\ln TB = \beta_0 + \beta_1 \ln REER + \beta_2 \ln RDI + \beta_3 \ln RFI + \varepsilon_t \ldots\ldots\ldots\ldots (2.5)$$

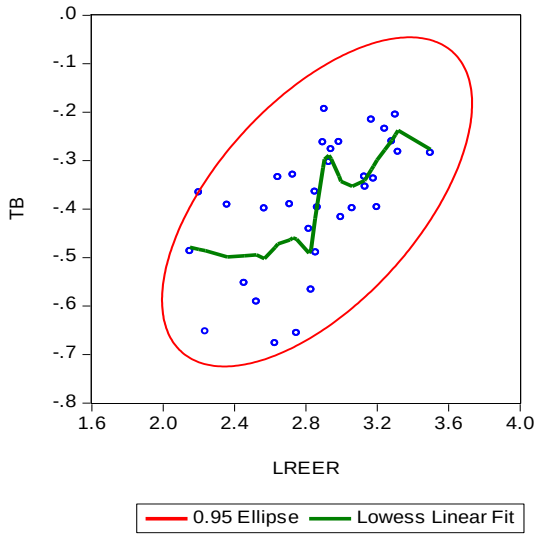
where lnTB=ln(X/M), implies logarithm of exports to imports, X=exports and M=imports. lnRER, InRDI, and InRFI are the logarithms of real effective exchange rates, real domestic income and real foreign income respectively.

Results

After controlling for other structural and policy variables, the results lend support to the hypothesis that the real effective exchange rate was a key fundamental behind the post-1970seconomy in Sri Lanka. The impact of exchange rate policy (depreciation) of Sri Lankan Rupee on the Trade Balance in the long run and short run has been examined by using the real effective exchange rate, employing data for Sri Lanka and its 10 major trading partners.
The confidence ellipse in Figure 1 indicate that the relationship between LREER and LTB are negatively related. This indicates that when REER is increasing (depreciating) TB balance in absolute terms is decreasing (improving). However, after some level, REER does not improve TB because price-and income-inelastic imports items (such as essential items like food, oil...) play an important role in our TB.

When REER increases (depreciates) TB improves, decreasing the trade deficit. This indicates that REER is an appropriate tool to correct TB deficit problem.

Figure 1: Association between REER vs. TB



The unit root test is first done in order to identify the order of the series. The test results are given in the table 1.

Table 1: Unit Root Test

	ADF statistics (p values)	
	Level	First difference
LnTB	-1.329(0.604)	-6.292(0.000)
LnREER	-0.663(0.842)	-7.228(0.000)
LnRDI	-1.094(0.706)	-5.641(0.0001)
LnFI	-2.199(0.210)	-4.515(0.001)

The results of unit root test (ADF) indicated that all variables are non-stationary at level and they are stationary at first differences. Based on these results, we employed co-integration analysis. The residual estimated from co-integration regression equation is tested for stationarity. According to ADF test results (ADF stat=-5.208(p=0.0002)) the estimated residual is stationary. This indicates that LTB, LRDI and LRFI are co-integrated. Estimated equation is given below:

$$\ln TB = -3.038 + 0.297 \ln REER + 0.141 \ln RDI - 0.028 \ln RFI$$

$$\text{p value} \quad (0.0003) \qquad (0.0039) \qquad (0.029) \qquad (0.816)$$

According to the results of this equation, real domestic income has significant impact on the trade balance. When national income is raises the resident demand increase. Sri Lanka is dependent on imports which is consists consumption goods and intermediate capital goods. REER variable is also highly significant. This implies that in the long run, the real depreciation has a significant positive impact on trade balance. This indicates that depreciation in REER improves trade balance in the long run. Real foreign income is not statistically significant in influencing trade balance in Sri Lanka. The reasons may be due that our exports are income inelastic items. The results of Error correction model are given below. This model explains two parts of dynamics, the impact effect and the error correction process.

$$d\ln TB = -0.009 + 0.073 d\ln REER + 0.0.155 d\ln RDI - 0.097 d\ln RFI - 0.879 resd - 1)$$

$$pvalue \quad (0.649) \quad (0.354) \quad (0.698) \quad (0.467) \quad (0.000)$$

Short run dynamics suggests that REER, RDI and RFI are not significant influencing trade balance in the short run. The impact of these variables takes several lags such as decision, delivery, replacement, and production following a real depreciation. The error correction term is highly significant and has the expected negative sign. This indicates the TB adjustment back to the long run equilibrium path. 88% of the disequilibrium (actual TB –long run equilibrium path of TB) is corrected each year. This significant adjustment coefficient indicates that REER has long run causal impact on TB. Granger causality test results indicate that REER helps to predict the future values of ΔTB(Wald F statistic=4.292, p value=0.024). CUSUM test (cumulative sum of the recursive residuals) was employed to evaluate the stability of the parameters in the model. CUSUM plot and CUSUM of squares plot indicates that at 5 % significance level the parameters in the model used in our study are statistically stable where recursive residuals are within the two standard error bounds.

According to the residual diagnostic tests the short run model appeared to be well behaved with a white noise error term (Jarque-Bera statistic=1.07, (0.582). The Ho: normality assumption was not rejected which means the residual is normal. Further, Breusch-Pagan-Godfrey test revealed that there is no heteroscedasticity (F=0.78, (0.546), n*R2 -3.32(0.506)).According to test statistic, the null hypothesis is rejected implying there is no heteroscedasticity. According to the Breusch-Godfrey serial correlation test, there is no serial

correlation problem. (LM statistics F=0.522(0.598), X^2=1.15, (0.562)). These residual diagnostic test results prove the results of this study are robust.

The Engle-Granger test attested that the real effective exchange rate and nominal effective exchange rate do not influence the trade balance in the long run. The Error Correction Mechanism perceived the absence of a short run relationship between REER and NEER and the trade balance. The Granger Causality test confirms that the exchange rate does not have an effect on the Trade Balance, implying that the Marshal- Learner Condition does not hold in Sri Lanka. No evidence is found for the existence of a J curve ideal and it is not applicable to any of the exchange rates. Finally it can be asserted that the Real Effective Exchange Rate or the Nominal Effective Exchange Rate cannot generate a significant impact on the trade balance in Sri Lanka.

Conclusion and Policy Recommendations

This paper provides a detailed update of the methodology for calculating Rupee Effective Exchange Rates. In particular, it explains modifications in the methodology that have been introduced over the last decade regarding the impact of exchange rate changes on Balance of Trade in Sri Lanka. Consequently, the paper presents possible avenues for further enhancing the impact of Real Effective Exchange Rate on Balance of Trade in Sri Lanka. Accordingly, the exchange rate policy is effective in Sri Lanka only in the long run. In order to improve the trade balance in the short run, Sri Lanka has to follow some other methods such as import control policy, quota systems etc.Tax policies can be adoptedin order to reduce imports andto increase the government revenue. Since the imports are facing an inelastic demand curve, imposing taxes on these items will generate a higher income to the government.

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කොටස් මිල හා විදේශ විනිමය අනුපාතිකය අතර සම්බන්ධතාවඃ (ශ්‍රී ලංකාව ඇසුරින් කෙරෙන අධ්‍යයනයක්)

එම්.ජී.එච්. හර්ෂණී සහ ඕ.ජී. දයාරත්න බණ්ඩා

ආර්ථික විද්‍යා හා සංඛ්‍යාන දෙපාර්තමේන්තුව, පේරාදෙණිය විශ්වවිද්‍යාලය, ශ්‍රී ලංකාව

මූල පදඃ *කොටස් මිල, විදේශ විනිමය අනුපාතිකය, වාෂ්පශීලීතාව (Volatility), GARCHක්‍රමවේදය*

හැඳින්වීම

කොටස් මිල හා විදේශ විනිමය අනුපාතිකය අතර සබඳතාවක් පවතී ද යන්න මෙම අධ්‍යයනයෙන් පරීක්ෂා කරන ලදී. 1970 දී බ්‍රිටින්වුඩ් ක්‍රමය බිඳ වැටීමෙන් පසුව ගෝලීය වශයෙනුත්, 1997 නැගෙනහිර ආසියානු අර්බුදයෙන් පසු ආසියාවේ ද මෙම ගැටලුව සඳහා ඉහළ අවධානයක් යොමු විය. ආසියානු අර්බුදය අතරතුර බලපෑමට ලක් වූ රටවල මුදල් හා කොටස් වෙළඳපොළ අවුල් සහගත බවක් දක්නට ලැබිණ (Abdalla & Victor 1997)'

කොටස් මිල හා විනිමය අනුපාතික අතර සබඳතාවක් පවතී නම්, කොටස් වෙළඳපොළ අර්බුද විනිමය අනුපාතිකය භාවිතයෙන් වැළැක්විය හැකිය. විනිමය අනුපාතික සංචලන කොටස් මිල සංචලන සඳහා හේතු වේ නම්, දේශීය ආර්ථික හා මූල්‍ය ප්‍රතිපත්ති කොටස් වෙළඳපොළ ස්ථායීකරණයට ඉලක්ක කර ගත හැකිය. කොටස් මිල, විනිමය අනුපාතිකයට බලපායි නම්, විදේශ විනිමය ප්‍රතිපත්ති සම්පාදනයේ දී ප්‍රතිපත්ති සම්පාදකයන්ට කොටස් වෙළඳපොළ හැසිරීම උපයෝගී කර ගැනීමට හැකි වීමත් නිසා මෙම අධ්‍යයනය වැදගත් වනු ඇත.

කොටස් මිල හා විනිමය අනුපාතික අතර සබඳතාවක් තිබේද යන ගැටලුව සඳහා න්‍යායාත්මක හා ආනුභවික පර්යේෂණ තුළින් පිළිතුරු සෙවීමේ දී කරන ලද න්‍යායාත්මක හා ආනුභවික පර්යේෂණ බොහෝ ප්‍රමාණයක් සංවර්ධනය වෙමින් පවතින රටවලට වඩා සංවර්ධිත රටවලට අදාලව සිදු කර ඇති නමුත් ප්‍රතිඵල පිළිබඳ මෙතෙක් ඒකමතිකභාවයකට පැමිණ නැත. කළඹ ආයෝජන සමතුලිත ප්‍රවේශයට අනුව, කොටස් මිල ඉහළ යෑම දේශීය ආයෝජකයන්ගේ ධනය වර්ධනය කරයි. ඉන් මුදල් ඉල්ලුම වැඩි කරන නිසා අවසානයේ දී ඉහළපොලී අනුපාතයක් තීරණය වේ. එවිට විදේශ ප්‍රාග්ධනය රට තුළට ගලා ඒම් තුළින් දේශීය මුදල් අතිප්‍රමාණය වේ (Muhammad and Abdul 2002).

සම්ප්‍රදායික ප්‍රවේශය අනුව විනිමය අනුපාතික සංචලන, කොටස් වෙළඳපොළ උච්චාවචන ඇති කිරීමට හේතු වේ. විනිමය අනුපාතික අවප්‍රමාණය, අනාගත උද්ධමන අපේක්ෂා ඇති කරන අතර ආයෝජකයන් උද්ධමනය සෘණාත්මකව දකී. එමනිසා ආයෝජකයන් මුදල් හා කොටස්වල ආයෝජනය ප්‍රතික්ෂේප කරන අතර කොටස් මත වූ ආයෝජන විකුණන බැවින් කොටස් මිල පහත වැටේ. එමෙන්ම මුදල් අවප්‍රමාණය ආනයන ප්‍රමුඛ කර්මාන්තවල කොටස් මිල පහත යාමට ද හා අපනයන ප්‍රමුඛ කර්මාන්තවල කොටස් මිල ඉහළ යාමට ද හේතු වේ (Aydemir and Erdal 2008).

අරමුණු

මෙම අධ්‍යයනයේ අරමුණු ලෙස කොටස් මිල හා විනිමය අනුපාතිකය අතර සම්බන්ධතාව නිමානය කිරීම, හේතුඵල සබඳතාවක් පවතී නම් එම සබඳතාවේ දිශානතිය හඳුනා ගැනීම සහ සබඳතාවක් නොමැති නම් ඊට හේතු පැහැදිලි කිරීම දැක්විය හැකිය.

ක්‍රමවේදය

මෙම අධ්‍යයනය සමස්ත කොටස් මිල දර්ශකයේ (ASPI), හා ඇ.එ.ජ. ඩොලර් : ශ්‍රී ලංකා රුපියල් විනිමය අනුපාතිකයේ 1985 ජනවාරි සිට 2011 දෙසැම්බර් දක්වා දෛනික දත්ත මත පදනම් වේ.
විස්තරාත්මක සංඛ්‍යානය මඟින් මෙන්ම කාලශ්‍රේණි ආර්ථිකමිතික ක්‍රමවේදයන් දත්ත විශ්ලේෂණයේ දී භාවිතා කෙරේ. දත්තවල ස්ථායීතාව KPSS- (Kwiatkowski–Phillips–Schmidt–Shin)mÍËdj u`.skao" GARCH- (Generalized Autoregressive Conditional Heteroscedasticity) ක්‍රමවේදය මඟින් දත්තවල වාෂ්පශීලීතාවද,Eviews මෘදුකාංගය භාවිතයෙන් නිමානය කර ඇත.

විනිමය අනුපාතිකය ස්වායත්ත විචල්‍යය වූ විට GARCH වාෂ්පශීලීතා සමීකරණය

$$\sigma^2_t = \alpha + \beta\, \varepsilon^2_{t-1} + \gamma\sigma^2_{t-1} + \delta\, \mathbf{exrate}_t$$ fõ'

මෙහිσ^2_tමඟින් මෙම කාල පරිච්ඡේදයේ කොටස් මිලෙහි විචලතාව ද,αමඟින් දත්ත වල දිගු කාලීන සාමාන්‍ය විචලතාව ද, ε^2_{t-1} මඟින් පෙර කාල පරිච්ඡේදයේ දෝෂ පදයේ වර්ගය ද, σ^2_{t-1} මඟින් පෙර කාල පරිච්ඡේදයේ කොටස් මිලෙහි විචලතාව ද, $\mathbf{exrate}_t$ මඟින් මෙම කාල පරිච්ඡේදයේ දී විනිමය අනුපාතිකය ද, දැක්වේ.
සමස්ත කොටස් මිල දර්ශකය ස්වායත්ත විචල්‍යය වූ විට GARCH වාෂ්පශීලීතා සමීකරණය

$\sigma^2_t = \alpha + \beta \varepsilon^2_{t-1} + \gamma\sigma^2_{t-1} + \beta\ aspi_t$ වේ.

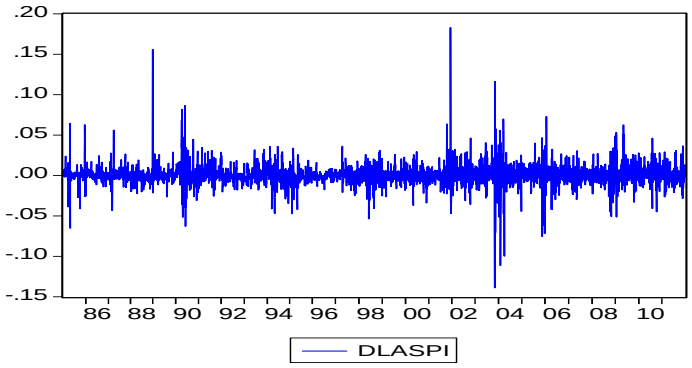
මෙහි σ^2_t මඟින් මෙම කාල පරිච්ඡේදයේ විනිමය අනුපාතිකයේ විචලතාව ද, α මඟින් දත්ත වල දිගු කාලීන සාමාන්‍ය විචලතාව ද, ε^2_{t-1} මඟින් පෙර කාල පරිච්ඡේදයේ දෝෂ පදයේ වර්ගය ද, σ^2_{t-1} මඟින් පෙර කාල පරිච්ඡේදයේ විනිමය අනුපාතිකයේ විචලතාව ද, $aspi_t$ මඟින් මෙම කාල පරිච්ඡේදයේ දී කොටස් මිල ද, දැක්වේ (Janhuba 2010)'

අධ්‍යයන ප්‍රතිඵල

සමස්ත කොටස් මිල දර්ශක අගය 1985 සිට 2009 දක්වා කාලය තුළ 90-3000 අගය පරාසය තුළ පැවතිණ. 2009 න් පසු සමස්ත කොටස් මිල දර්ශක අගය සීඝ්‍ර වර්ධනයක් පෙන්නුම් කළ අතර සම්මත අපගමනය ඉහළ අගයක් ගැනීම නිසා කොටස් වෙළඳපොළ ඉහළ වාෂ්පශීලීතාවකින් යුක්තව ක්‍රියාත්මක සමස්ත විය. කොටස් මිල දර්ශකයේ කුටිකතාව හා වක්‍රිමය ඉහළ ධන අගයන් ගැනීම නිසා පසුගිය කාල පරිච්ඡේදයේ දී කොටස් වෙළඳපොළ ඉහළ කාර්යක්ෂමතාවකින් යුක්තව ක්‍රියාත්මක වූ බව නිගමනය කළ හැකිය. විනිමය අනුපාතිකය නියැදි කාල පරිච්ඡේදය තුළ 20 හා 120 පරාසය තුළ දී මන්දගමී වර්ධනයක් පෙන්නුම් කළ අතර විනිමය අනුපාතිකයේ දැඩි වාෂ්පශීලීතාවක් දක්නට නොලැබෙන බව සම්මත අපගමනය පහළ අගයක් ගැනීමෙන් නිගමනය කළ හැකිය. ප්‍රස්ථාරය 1 හා 2 මඟින් අධ්‍යයනය කරනු ලබන විචල්‍යයන්හි වාෂ්පශීලීතාව පෙන්නුම් කෙරේ.

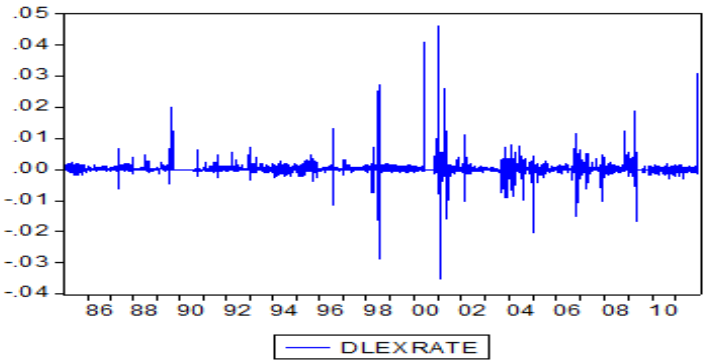
GARCH ක්‍රමවේදය අනුව සමස්ත කොටස් මිල දර්ශකය සඳහා GARCH සංගුණකය 1.000111ක් ද විනිමය අනුපාතිකයේ GARCH සංගුණකය 1.000019 ක් ද වන බැවින් දත්ත ශ්‍රේණියේ විෂමප්‍රවිචලතාව (Heteroscedasticity) පවතී. දත්ත ශ්‍රේණිවල AC හා Q-stat අගයන් පරීක්ෂා කිරීමෙන් විචල්‍යයන්හි ශ්‍රේණිමය ස්වසහසම්බන්ධතාව පවතින බව ගම්‍ය වූයෙන් ARCH ක්‍රියාවලියක් දත්තවල පවතින බව තහවුරු විය.

ප්‍රස්ථාරය 1: පළමු සාවස්ථ අවස්ථාවට පරිවර්තනය කරන ලද කොටස් මිල දර්ශකයේ දෛනික දත්ත



මූලාශ්‍රය: කොළඹ කොටස් වෙළඳ පොළ

ප්‍රස්ථාරය 2: පළමු සාවස්ථ අවස්ථාවට පරිවර්තනය කරන ලද විනිමයඅනුපාතිකයේ දෛනික දත්ත



මූලාශ්‍රය: ශ්‍රී ලංකා මහ බැංකුව

KPSS ඒකක මූල පරීක්ෂාව අනුව කොටස් මිල පළමු සාවස්ථ අවස්ථාවේදී 10% වෙසෙසියා මට්ටමේදී ද විනිමය අනුපාතිකය පළමු සාවස්ථ අවස්ථාවේදී 1% වෙසෙසියා මට්ටමේදී ද ස්ථායී වේ. පළමු සාවස්ථ අවස්ථාවට පරිවර්තනය කරන ලද දත්ත මඟින් නිමානය කරන ලද GARCH ප්‍රතිඵල අනුව $\beta+\gamma$ අගය 1 ට ආසන්න වීම නිසා ARCH හා GARCH ප්‍රතිඵල පවතී. ඒ අනුව කොටස් මිලෙහි විචලතාව සඳහා පෙර කාල පරිච්ඡේදයේ දෝෂ පදයේ වර්ගය 0.493052 කින්ද, පෙර කාල පරිච්ඡේදයේ කොටස් මිලෙහි විචලතාව 0.400025 කින්ද මෙම කාල පරිච්ඡේදයේ විනිමය අනුපාතිකය 0.000398 කින්ද බලපෑම් කරයි.

GARCH වාෂ්පශීලීතා සමීකරණය සඳහා විනිමය අනුපාතිකය ස්වායත්ත විචල්‍යය වූ විට කොටස් මිල මත විනිමය අනුපාතිකයේ බලපෑම තක්සේරු කිරීමේ දී වගුව 1 අනුව අධ්‍යයන ප්‍රතිඵල කොටස් වෙළඳපොළ වාෂ්පශීලීතාව/ උච්චාවචන සඳහා විනිමය අනුපාතිකයේ බලපෑම තරමක් හේතුකාරක වන බව පෙන්වයි. විනිමය අනුපාතික සංගුණකය0.000398 ක් ලෙස ධන අගයක් ගැනීම තුළින් මුදල් අවප්‍රමාණයක් කොටස් මිල ඉහළ නැංවීමට සුළු වශයෙන් හේතු වේ. මෙය අපනයන ප්‍රමුඛ කර්මාන්තවල කොටස් මිල තීරණ වීම සමඟ සංගත වේ.

වගුව 1: GARCH ක්‍රමවේදයේ ප්‍රතිඵල

	කොටස් මිල මත විනිමය අනුපාතිකයේ බලපෑම	විනිමය අනුපාතිකය මත කොටස් මිල බලපෑම
β	0.493052	0.164000
γ	0.400025	0.596571
δ	0.000398	0.000138
Z- සංඛ්‍යාතිය	12.89713	53.20617
සම්භාවිතාව	0.000000	0.000000
DW සංඛ්‍යාතිය	1.380620	2.296536

මූලාශ්‍රය: කතුවරයාගේ නිමානයන්

GARCH වාෂ්පශීලීතා සමීකරණය සඳහා කොටස් මිල ස්වායත්ත විචල්‍යය සේ ගෙන විනිමය අනුපාතිකය සඳහාකොටස් මිල ඇති කරනු ලබන බලපෑම තක්සේරු කිරීමේ දී වගුව 1 අධ්‍යයන ප්‍රතිඵල අනුව විනිමය අනුපාතිකයේ විචලතාව සඳහා පෙර කාල පරිච්ඡේදයේ දෝෂ පදයේ වර්ගය 0.164 කින් ද, පෙර කාල පරිච්ඡේදයේ විනිමය අනුපාතිකයේ විචලතාව 0.596571 කින්ද,කොටස් මිල සංගුණකය 0.000138 කින් ද බලපෑම් කරයි. කොටස් මිල සංගුණකය ධන අගයක් ගැනීම නිසා කොටස් මිල ඉහළ යාම විනිමය අනුපාතික ක්ෂය වීමට ද කොටස් මිල පහළ යාම විනිමය අනුපාතිකය අතිප්‍රමාණයකට ද හේතු විය යුතුය. නමුත් මෙම ගම්‍යතාව ද ඉතා දුබල බලපෑමක්

වන අතරම න්‍යායන් සමඟ ද අසංගත වේ. කළඹ ආයෝජන න්‍යාය අනුව කොටස් මිල ඉහළ යාම විනිමය අනුපාතිකඅතිප්‍රමාණයට හේතු වේ. මෑත කාලීනව කොටස් වෙළඳපොළ උත්පාතයක් පැවතිය දී විනිමය අනුපාතිකය ක්‍ෂය වීමක් නිරීක්‍ෂණය කළ හැකි වුවත් කොටස් මිල ඉහළ යාම නිසා විනිමය අනුපාතික ක්‍ෂයවන බවට නිගමනය කළ නොහැකිය. විනිමය අනුපාතික වෙනත් සාධක මත රඳා පවතී. කොටස් මිල ඉහළ යාමෙන් ප්‍රාග්ධන ගලා ඒම් පැවතිය ද බොහෝ දුරට ගෙවුම් ශේෂය අනුව විනිමය අනුපාතික තීරණය වේ.

නිගමන හා ප්‍රතිපත්ති ඇඟවීම්

කොටස් මිල හා විනිමය අනුපාතිකය අතර අන්‍යෝන්‍ය සබඳතාව පිළිබඳ කරන ලද අධ්‍යයනය විශ්ලේෂණය කිරීමේ දී සළකා බලනු ලැබූ විචල්‍යයන් අතර ශක්තිමත් සබඳතාවක් ශ්‍රී ලංකාවේ පවතින බව නිගමනය කළ නොහැකිය. නමුත් කොටස් මිල තීරණය වීමට විනිමය අනුපාතිකය සුළු හෝ බලපෑමක් කරන බැවින් අපනයන ප්‍රමුඛ කර්මාන්තවල කොටස්හි ආයෝජකයන් තාර්කිකව සිය ආයෝජන තීරණ ගැනීමේ දී පවතින විනිමය අනුපාතිකයේ හැසිරීම පිළිබඳ සැලකිළිමත් වීම වැදගත් වනු ඇත.
ශ්‍රී ලංකාවේ කොටස් මිල හා විනිමය අනුපාතිකය තීරණය වීමට බලපානු ලබන සාධක මොනවා ද යන්න පිළිබඳ අධ්‍යයනය කිරීම කොටස් වෙළඳපොළ ප්‍රවර්ධනයට හා විනිමය අනුපාතික ස්ථායීකරණයට වැදගත් වේ.

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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Industry and Transport

Food Safety Responsiveness of Bottled Water Manufacturers: An Empirical Investigation

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Introduction

The accessibility, safety and provision of drinking water are some of the most focused upon concerns the world over. The provision of clean drinking water has long remained part of State-based utility provision in most countries in the form of "tap water" or through natural water reserves such as wells, rivers and lakes. Nevertheless, the rise of the bottled water industry has shifted this situation drastically in many countries.

By standard definition, bottled water is drinking water packaged in bottles for individual consumption and retail sale; this water can be spring water, purified water drawn from natural wells or in some regions glacial water. The global bottled water market grew by 5.2% in 2011 to reach a value of $135,064.4 million, while market volumes grew by 5.3% to reach 205,902.8 million liters. Within the Asia-Pacific region the value of the bottled water market grew by 10% in 2011 to reach $25,075.3 million, while the market grew by 8.9% to 43,156.2 million liters (Marketline, 2013).

The growth of the global bottled water industry is reflective of the Sri Lankan situation, where according to unofficial sources there are over 100 brands of

bottled drinking water, marketed by various manufacturers available in the open market throughout the island. Quality control and assurance systems in the food sector are one form of market institution intended to produce safe food and reduce food-borne illnesses. As such the quality and safety of bottled water needs to be assessed like any other food category. In terms of the regulatory environment, under the Food Act No. 26 of 1980 per Gazette No. 1420/4 of 21st November 2005, i.e. from around mid-May, 2006, "no person is allowed to: a) bottle or package natural mineral water or drinking water; or b) import and distribute bottled or packaged natural mineral water or drinking water," without obtaining a certificate of registration from the Chief Food Authority of the Ministry of Health.

This process of registration of "bottled drinking water" with the Health Ministry is a mandatory requirement for the sale of imported as well as locally manufactured bottled water in the local market. The issue of the product certification mark which is known as the "SLS Mark" by the Sri Lanka Standard Institution (SLSI) is a voluntary process, independent of the above registration procedure. This voluntary scheme for obtaining the "SLS Mark" is conducted by the SLSI, based on the primary requirement that the particular product complies with the relevant Sri Lanka standard specifications for the product; SLS 894:2003 - specification for bottled (packaged) drinking water and SLS 1038:2003 - specification for natural mineral water (Wijesekara, 2007).

Objective

As an industry, the question arises whether bottled water manufacturers would voluntarily move on to adopt enhanced food safety meta systems such as Hazard Analysis Critical Control Point (HACCP) and ISO 22000 as the next step or whether regulation needs to come into play to improve the standards of food safety. This gives rise to the economic research issue of exploring firm responsiveness to demand for such advanced systems and thus investigate empirically firm level incentives and constraints for bottled drinking water manufacturers to adopt enhanced food safety controls. The objective of this study is to examine the relative importance of economic incentives, constraints

and firm characteristics in differentiating firms with a higher propensity to adopt HACCP from those with the least propensity to do so.

Methodology

Based on the level of HACCP adoption firms were divided into two categories, as 'Embracers' (EMB) or 'Deferrers' (DEF). A comprehensive review of food economics literature was undertaken and nine individual incentives identified at firm level were selected for the study (Jayasinghe-Mudalige and Henson, 2006). Seven constraints that firms face when implementing HACCP were identified (Herath and Henson, 2010). Firm characteristics that differentiate HACCP adopters from non-adopters, and seven hypothetical negative perceptions made by managers in bottled water manufacturing firms with regard to HACCP were considered to see the relative importance of each aspect towards HACCP adoption.

According to the list revised on 01st February 2013 by the food control administration unit in Sri Lanka, 61 bottled drinking water manufacturing firms representing 77 brands with valid registrations were selected for the study. A structured questionnaire was developed utilizing the information gathered through a series of discussions held with quality assurance managers of the firms and inspection of manufacturing facilities. Both personal interviews with the QA managers and a postal survey were used to collect data during January to March 2013. A total of 30 usable questionnaires were returned, yielding a response rate of 49 per cent. The managers were asked to respond to each incentive and constraint according to a five-point Likert scale ranging from "very important" (5) to "very unimportant" (1) and each of the statements under negative perceptions according to a five point Likert scale ranging from "very true" (5) to "not at all true" (1).

Discriminate Analysis (DA) involves deriving a variate. The discriminant variate is the linear combination of the two (or more) independent variables that will discriminate best between the objects in the groups defined *a priori*. There are several purposes of DA; one of the most common rationale for application

here is to investigate differences between groups on the basis of the attributes of the cases, indicating which attributes contribute most to group separation (Hair et al., 2006).

Results

Only 30 per cent firms were HACCP 'Embracers' and the other 70 per cent were HACCP 'Deferrers'. 67 per cent of the respondents in the sample were small scale and the majority represented the domestic market only.

In the DA for firm characteristics the Canonical Correlation of 0.67 indicates that 0.45 or 45% of variance in the dependent variable can be explained by the independent variables. The Wilk's Lambda test was also significant with p-value 0.000 showing that there was a statistical significance of the discriminatory power of the discriminant function. Univariate ANOVA indicated that rank mean of firm size has a significant difference between group means while vintage, water source, major markets, and sales strategy showed an insignificant difference. The DL for the firm size exceeded ±0.40 threshold. This indicated that firm size can be used to discriminate among EMB and DEF.

In the DA for incentives the Canonical Correlation of 0.66 indicates that 0.43 or 43% of variance in the dependent variable can be explained by the independent variables. The Wilk's Lambda test was also significant with p-value 0.000 showing that there is a statistical significance of the discriminatory power of the discriminant function. Univariate ANOVA indicated that rank mean of SLR showed a significant difference between group means. Since CST, HRE, TCH, REP, CPR, EGR, AGR and LBL showed an insignificant difference between two groups, they cannot be used to differentiate EMB from DEF for HACCP. Since DL for the SLR exceeded ±0.04 threshold it was the most important incentive that differentiated EMB from DEF. According to the discriminant coefficient for SLR there was a positive relationship between SLR and the level of HACCP adoption.

Table 1: Summary of Interpretive Measures of DA

Variables	Wilks' Lambda Value	Univariate F Ratio		Discriminant Coefficients		Discrimin-ant Loadings (DL)
		F value	Sig.	Unstandardised	Standardised	
Firm Characteristics						
Vintage	0.969	0.884	0.355	NI	NI	-0.270
Firm size	0.786	7.636	0.010	2.237	0.968	0.792
Water source	0.971	0.845	0.366	NI	NI	0.264
Major markets	0.952	1.400	0.247	NI	NI	0.339
Sales strategy	0.976	0.687	0.414	NI	NI	0.238
Economic Incentives						
CST	0.938	1.843	0.185	NI	NI	0.503
REP	0.940	1.792	0.191	NI	NI	0.496
TCE	0.890	3.470	0.073	NI	NI	0.691
SLR	0.859	4.586	0.041	0.545	0.466	0.794
HRE	0.897	3.211	0.084	NI	NI	0.665
CPR	0.955	1.312	0.262	NI	NI	0.425
EGR	0.958	1.222	0.278	NI	NI	-0.410
AGR	0.958	1.222	0.278	NI	NI	-0.410
LBL	0.971	0.847	0.365	NI	NI	0.341
Constraints						
To retain staff	0.987	0.362	0.552	NI	NI	-0.100
Negative attitudes	0.788	7.553	0.010	-1.272	-1.420	-0.456
Inflexibilities with process	0.998	0.062	0.805	NI	NI	-0.041
To renovate plant	0.942	1.721	0.200	NI	NI	-0.218
Lack of information	0.997	0.083	0.775	NI	NI	0.048
Lack of financial support	0.804	6.830	0.014	-1.387	-0.909	-0.434
Lack of space	0.999	0.015	0.904	NI	NI	-0.020
NI = Not included in estimated discriminant function						

In the DA for constraints the Canonical Correlation of 0.75 indicates that 0.56 or 56% of variance in the dependent variable can be explained by the independent variables. The Wilk's Lambda test was also significant with p-

value 0.005 showing that there is statistical significance of the discriminatory power of the discriminant function. Univariate ANOVA indicated that rank mean for "Negative attitudes" and "Lack of financial support" have a significant difference between group means. Since the other five constraints showed an insignificant difference between two groups they cannot be used to differentiate EMB from DEF.

Top two box reporting was used to see the relative importance of negative perceptions made by managers in bottled water manufacturing firms about HACCP. Statements namely: "High cost of maintaining certification"; "For us SLS standard is very much enough"; "Certification does not have an impact on profitability"; "Certification having low value among customers" had high levels of top two box scores and HACCP 'Deferrers' were the majority who have given highest top two box scores for all attitudinal statements.

Conclusions and Policy Implications

The outcome of analysis implies that large firms are more likely to adopt advanced food safety controls and that sales revenue was the major incentive for a firm to adopt HACCP. Major barriers faced by the firms include lack of finance and negative attitudes of the employees. Further, the low demand for food safety standards and lack of customer awareness about the HACCP played a significant role as the reason for the slow progress in the adoption of HACCP by the industry.

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Technical Efficiency of Rice Millers under Alternative Technologies: A Case Study in Gampaha District

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Keywords: *Rice milling Industry, Technical Efficiency, Stochastic Production Frontier*

Introduction

The Rice Milling Survey conducted in 2006 by the Hector Kobbekaduwa Agrarian Research and Training Institute of Sri Lanka has revealed that the majority of rice millers in the country do not utilize high tech machineries. It was estimated that only about 3.99%, 19.60% and 1.40% of the millers possess dryers, elevators and color separators respectively.

Objectives

The overall objective of this study is to evaluate the extent to which the utilization of high tech machinery affects the technical efficiency of the rice milling industry in Sri Lanka. The specific objectives are to estimate technical efficiency of different groups of rice millers and to evaluate the determinants of technical inefficiencies among millers.

Methodology

The stochastic frontier production model, as proposed by Aigner*et al.,* (1977) and Meeusen and Van den Broeck (1977), was used as the analytical tool. The following specification was estimated.

$$LnY_i = \beta_o + \beta_1 lnX_{1i} + \beta_2 lnX_{2i} + \beta_3 lnX_{3i} + \beta_4 lnX_{4i} + V_i - U_i$$

where,

Y = Normalized rice output

X_1=Normalized paddy input

X_2 = Electricity cost (Rs /month)

X_3 = Labor (man days/month)

X_4 = Milling capacity

V_i=Independently and identically distributed random error term $N(0,\sigma_v^2)$

U_i=Non-negative random variable which was independently and identically distributed as $N(0, \sigma_u^2)$, defined as half normal distribution.

$|U_i|$ reflects the technical efficiency relative to the frontier. $|U_i| = 0$ for a firm whose production lies on the frontier and $|U_i| > 0$ for a firm whose production lies below the frontier.

The following technical inefficiency model was estimated in order to determine the factors affecting the inefficiency based on Battese and Coelli (1995).

$$U_i = \delta_o + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + W_i$$

where,

Z_1 = Experience of the mill owner/manager

Z_2 = Years of schooling

Z_3= Age of the mill (years)

Z_4=Dummy for the availability of dryer

Z_5=Dummy for the availability of elevator

Z_6=Dummy for the availability of color separator

W_i=Unobservable random error

Data required for the estimation was gathered using a questionnaire survey conducted among 63 rice millers located in *Marandagamula* in *Gampaha* District, which is one of the major rice processing areas in Sri Lanka, in July 2012.

Results and Discussion

The analysis of data revealed that the majority of the rice millers (36.5%) in the sample were in the age category of 41-50 years. The participation of the younger generation (age below 30 years) in the industry was marginal (6.35%). About 88.9% of the millers had school education above grade eight and those who had ordinary level and advanced level education were 31.75% and 26.98% respectively. About 46.03% of rice millers had 16-25 years of experience in the industry whereas 28.58% of the millers had 6 to 15 years of experience.

As far as the technology usage is concerned all the millers owned both de-stoners and polishers as they are necessary for maintaining the minimum quality of processed rice. About 93.65% of rice millers used steel hullers for de-hulling of rice. Although the availability of primary machinery types was evenly distributed, the capital intensive equipment that are required for production of high volumes such as dryers, elevators and colour separators were unevenly distributed. About half of the millers (49.20%) had dryer facilities while elevators were available with only 36.50% of millers. Furthermore, only about 7.93% of large scale millers possessed the colour separation technology.

The estimates of the Cobb-Douglas stochastic production function are given in table 1 below. They indicate that the level of rice output is determined by the amount of paddy input, electricity expenditure and labour usage. The mean technical efficiency for the sample was 0.978 suggesting that disparity across millers with respect to milling efficiency of paddy to rice is marginal. Table 2 presents a comparison of technical efficiency scores among different groups of millers. Contrary to the expectation, the results indicate that there is no significant difference in technical efficiency between the millers with advanced machineries and millers without such machineries.

Conclusion

This analysis clearly demonstrates that the milling efficiency does not significantly vary across rice millers in Maradagahmulla area. The millers with less advanced technologies are enjoying the same level of technical efficiencies

compared to those with highly advanced technologies and the existence of small disparities in milling efficiencies can be explained using socio-demographic factors more than the technologies adopted by them.

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Appendix:

Table 1: Estimates of the Stochastic Frontier Production Function and Technical Efficiency Effect Model

Category	Mean Efficiency Score	Unpaired t-statistic	Mean gross marketing margin	Unpaired t-statistic
a. Millers with monthly output ≤ 50	0.963	.03(a-b)	7.31	- 0.44 (a-b)
b. Millers with monthly output ≥50	0.962		7.81	
c. Millers without dryers	0.980	-0.76(c-d)	7.25	-0.48(c-d)
d. Millers with dryers	0.977		7.79	
e. Millers without elevators	0.981	-1.50(e-f)	7.42	**-0.21(**e-f)
f. Millers with elevators	0.975		7.67	
g. Millers without color separators	0.980	-1.44(g-h)	7.41	**-0.64(**g-h)
h. Millers with color separators	0.971		8.73	

** Significant at 0.05; t statistics are within bracket

Table 2: Mean Comparison for Efficiency Scores in Stochastic Frontier

Estimates of stochastic Cobb-Douglas production function							
Variable	OLS estimates		MLE estimates		Determinants of the inefficiency in technical efficiency effect model		
	Coefficient	Standard Error	Coefficient	Standard error	Variable	Coefficient	Standard error
Intercept	-1.636** (-10.365)	0.158	-1.678** (-10.531)	0.159	Experience (years)	-0.003** (3.022)	0.001
Paddy input	0.365** (5.843)	0.063	0.353** (6.409)	0.055	Years of schooling	0.004** (2.699)	0.002
Electricity expenditure	0.594** (9.455)	0.063	0.607** (10.265)	0.059	Age of the mill (years)	-0.003 (-1.499)	0.002
Labour usage	0.063** (2.596)	0.024	0.078** (2.970)	0.026	Availability of dryer	0.034 (1.084)	0.032
Daily milling capacity	0.025 (0.840)	0.030	0.023 (0.834)	0.027	Availability Elevator	0.001 (0.043)	0.028
					Availability Color separator	0.025 (1.102)	0.023

Transport Modal Deployment for Petroleum Haulage In Sri Lanka: A Linear Programming Optimisation Analysis

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Keyword : *Rail and Road Transportation, Linear Programming, Optimization, Emissions*

Introduction

Provision of mobility of people and goods is an essential ingredient of economic development. The growth process is influenced by the efficacy of product and factor movement as the timely serving of markets at competitive cost provides the necessary foundation to succeed in a highly demanding business environment. The country's socio-economic development process would be dampened if the necessary demand for transportation is not met. However, the transport sector is also associated with significant negative externalities, which have the potential of eating into at least a part of the growth impetus generated. For instance, the transport sector consumes nearly three-fourths of petroleum imports to Sri Lanka, and is therefore responsible for a significant drainage of foreign exchange and for causing traffic congestion and pollution.

Thus, as per the sustainability model built on the three pillars of Economy, Society and Environment by Munasinghe (2007), the challenge faced by the emerging nations is the provision of mobility required by the economy and the society with the greatest possible efficiency and least possible negative externalities.

The present study focuses on this issue of transport optimization in relation to petroleum bulk distribution in Sri Lanka.

Objectives

The research was conducted with a view to appraising the optimality of the present modality of bulk transportation of petroleum from the Kolonnawa central terminal to nine regional distribution centres which are accessible by both road and rail modes of transport. As such, the study objectives consisted of determining its cost efficiency, and an examination of whether better modal structures could be defined in order to reduce economic resource costs as well as negative externalities.

Methodology

A number of attempts to solve the question of oil industry and petroleum transportation related problems using linear programming are found in the literature[1]. Among them are models developed by Aronofsky et al (1963), bi-level mixed-integer programming exercise by Lukač et al (2001), and work done by Hunjet et al (2003) on production-transportation modeling. The linear programming model described below draws on these experiences, and was solved for minimisation of overall costs, yielding the optimum modal split between rail and road transportation under various possible scenarios.

Objective function: Min $C = \sum_{j=1}^{2} \sum_{i=1}^{n} d_{ij} W_{ij} c_{ij}$

Subject to:

$W_{bj} + W_{tj} \geq W_j$ (9 constraints for 9 destinations) ⟶ 1

Required Train capacity $\leq$ Available capacity ⟶ 2

$W_{tj} \geq (a).W_j$ (9 constraints for 9 destinations) ⟶ 3

$W_{bj} \geq (a).W_j$ (9 Constraints for 9 destinations) ⟶ 4

$W_{bi} \geq 0$ and $W_{ti} \geq 0$ ⟶ 5

where, **C** is the overall cost of distribution and c_{ij} is the cost of transportation to j^{th} destination by i^{th} mode. W_{ij} stands for the tonnage transported to j^{th}

[1] F.I. Hitchaxic developed the basic transportation problem in 1941, and was solved as an answer to complex business problem in 1951 when George B. Dantzig applied the concept of Linear Programming in solving the Transportation models.

destination by i^{th} mode, and d_{ij} represents the distance to j^{th} by i^{th} mode. In this exercise, i ranges from 1 to 2 representing the two basic modes of petroleum bulk distribution, namely the bowser and the train, and j varies from 1 to 9 representing the nine different regional storage destinations. The coefficient "a" represents the minimum percentage each mode is strategically assigned in order to ensure security of delivery, where "a" would be 0% under the unrestricted optimisation model. Quantity and cost data pertaining to bulk transportation of petroleum for the period from 2006 to 2010 were sourced from the Ceylon Petroleum Storage Terminals Ltd, and the data on costs of rail transportation and capacity constraints therein were obtained from the Sri Lanka Railways.

Results

Table 1 compares the current railway modal share against those yielded through linear programming optimization under three different strategic scenarios, namely (a) the unrestricted scenario, (b) the scenario where a minimum share of 5% would be carried by each mode, and (c) the scenario where the rail transportation modal share would be not less than the current railway modal share.

The resultant optimized modal structure favors significantly greater amounts of petroleum transported by rail to low country destinations, thus indicating the possibility of securing significantly greater economics by rail transportation compared to road based transport. For instance, the optimum model does not pick up the bowser mode for any of the low country destinations for which the current average railway modal share is below 40%.

It should be noted that the railway mode for up-country destinations is not be picked up by the optimization model except under the scenario in which a minimum railway modal share is imposed as a constraint. This is because the up-country haulage by train does not generate sufficient economies of scale owing to the fact that only a limited tonnage could be pulled along the incline by a given capacity of motive power. Longer rail route lengths and terrain characteristics requiring loads to be pulled up to over 6200 feet above sea level

before climbing down again to reach the destinations, make rail transportation least attractive to destinations such as Haputale or Badulla.

Table 5: Railway Modal Share in Petroleum Bulk Distribution : Current vs optimized structures

Destination	Railway Modal Share (%)			
	Present (2010)	Scenario I (Unrestricted Model)	Scenario II [5% Min Share for each mode]	Scenario III [Min railway share at current level]
Matara	0	100	95	100
Galle	95	100	95	100
Peradeniya	21	0	5	21
Kotagala	7	0	5	7
Haputale	45	0	5	45
Badulla	27	0	5	27
Kurunegala	19	100	95	100
Anuradhapura	36	100	95	100
Batticaloa	97	100	95	100

Source : Authors' estimates

The analytical results also enable us to assess the resource economics that could be realised by reduced consumption of fuel for petroleum bulk transportation. Reduced consumption of fuel to bulk transport refined petroleum products would invariably mean lesser combustion emissions, thus lesser environmental pollution. This environmental effectiveness of the optimised model shares could also be estimated based on the emissivity ratios worked out in the Initial National Communication Report under the United Nations Convention on Climate Change in 2000.

For instance, a saving of fuel in excess of one million litres of diesel (or Rs 115 million worth of resources at current market prices) could have been achieved in the year 2010 by following the optimised modal split under the scenario where a minimum of 5% of the total demand at each regional distribution centre would have to be supplied by each competing mode (to ensure security of

supply). This would be even more if the optimisation results under the "unrestricted" modal shares are taken into comparison (Table 2).

Table 2: Fuel Combustion Emission Savings Potential – Unrestricted Optimization

	Present Structure	Modeled structure (unrestricted optimization)	Saving Potential (Per Year)
Fuel consumption	3.99 Mn litres	2.82 Mn litres	1.17 Mn litres (29%)
Fuel Cost Savings per Year (at Rs 115 per litre)			Rs 135 Mn
Environmental Damage Reduction : Total Quantity of Emissions that could be avoided of which CO_2 Emissions only (in which, Carbon content)			 3967 Tonnes 3100 Tonnes (850 Tonnes)

Source : Authors' estimates based on the emissivity ratios worked out for in the Initial National Communication under the UN Convention on Climate Change – 2000.

Conclusions and Policy Implications

The results of the study lead us to conclude that the current transport modal utilisation structure in petroleum bulk transportation in Sri Lanka is far from optimal. The railway system is heavily under-utilised even within its existing capacity of service provision, and not utilising the railway's full potential costs the economy significantly in terms of resource wastage and environmental pollution impact. It also indicates that more intensified usage of rail haulage for petroleum transport, particularly in the flat terrain, will yield significant environmental and economic benefits to the nation.

The study was also successful in demonstrating that sustainability in relation to transportation need not be at the expense of profitability. There is scope for improving the operational economics of both the petroleum industry and the Sri

Lanka Railways, while pursuing sustainability oriented policies, which could very well co-exist as win-win strategies.

Therefore, a framework to drive the economy towards a sustainable petroleum transportation modal structure through both compulsions and incentives could be recommended. In this respect, removal of fiscal and other biases against the railway sector may be envisaged. In the medium to long run, it may also be necessary to boost the facilities and technical capabilities of the Sri Lanka Railway, enabling it to shoulder greater responsibility in petroleum transportation.

Perhaps the most significant follow-up to this research is to enquire if the principles discussed here can be applied to other freight transportation activities that utilise highly polluting, road-based transport. The train's potential as an environmentally less harmful and economically more efficient large-scale public transportation mode may be applicable to transportation of freight in general, not only petroleum. Therefore, strategic intervention into shifting freight transportation from road to rail could be warranted. While conceding that there will always be a role for road transportation, a systematic shift towards rail transportation could contribute towards our striving for an efficient, cleaner, and greener nation.

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Technical Efficiency of Sri Lankan Desiccated Coconut Industry: A Data Envelopment Analysis

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Introduction

The Desiccated Coconut (DC) export sector is an important sub-sector the Sri Lankan economy in terms of its foreign exchange earning capacity and employment generation. However, mainly due high cost of production there is belief in the industry has a little scope to further enhance its profitability.

Objectives

This study examined technical efficiency and managerial aspects of Sri Lankan DC industry. It will enhance identification of the source where improvement can be made.

Methodology

The analysis used Data Envelopment Analysis (DEA) to measure the technical efficiency to evaluate the performance of a set of peer entities called Decision Making Units (DMUs) which convert multiple inputs into multiple outputs (Charnes, et al, 1978). The definition of a DMU is generic and flexible. Recent years have seen a great variety of applications of DEA for use in evaluating the performances of many different kinds of entities engaged in many different activities in many different contexts in many different countries (Coelli et al 2005). Technical efficiency essentially measures the gap between the possible

outputs, or the best practice and actual output of a firm. Technical efficiency demonstrates the extent to which the observed firms' performance approaches its potential or the so call best practices. Constant returns to scale (CRS) is only appropriate when DMU's are operating at optimal scale. In imperfect competition,the extension of CRS-DEA model to account for variable return to scale (VRS) situations is suitable. Use of CRS under imperfect competition will result in measure of technical efficiency which are confounded by scale efficiency (SE).

The primary data were collected from 55 DC mills, during the period of January – March 2013 through a structured questionnaire. Total DC output, total byproduct output were used as output factors while number of workers, value of fixed asserts, raw material usage were used as input factors. The computer program DEAP developed by Coelli (1996) was applied. Analysis of variance and regressions analysis were employed to test the relevant hypotheses.

Results

Table 01: Summary of Input-oriented Technical Efficiency of Sri Lankan DC Mills

Technical Efficiency	**CRS**	**VRS**	**Scale**
Mean	0.8412	0.946	0.889
St. Dev.	0.099	0.0606	0.078

The analysis yielded the technical efficiency score of each of the DC mills considered. Overall technical efficiency of Sri Lankan desiccated coconut manufacturing industry was found as 0.8412 under Constant Return to Scale (CRS) assumption. This implies that on average, there is a possibility to reduce the use of all inputs by 15.88 % without reduction of output levels. The computed mean technical efficiency with Variable Returns of Scale assumption was higher than that of CRS option which was 0.9460.

The VRS and CRS technical efficiencies (Banker, et al 1984) were used to obtain the scale efficiencies of each of the DC mills. The mean scale efficiency was 0.8890 and this implies that on an average the actual scale of production has diverged from the most productive scale size by 11.1%.

Table 02: Summary of Technical Efficiency of Sri Lankan DC mills

	Modernized mills			**Semi-modernized mills**			**Traditional mills**		
TE	CRS	VRS	Scale	CRS	VRS	Scale	CRS	VRS	Scale
Mean	0.903	0.968	0.932	0.817	0.941	0.868	0.779	0.915	0.850
S.D	0.086	0.052	0.067	0.095	0.053	0.077	0.070	0.070	0.067

Note: CRS = technical efficiency from CRS DEA, VRS = technical efficiency from VRS DEA, scale = scale efficiency = CRS/VRS

One-way analysis of variance revealed that technical efficiency values of traditional, semi modernized mills and modernized mill were significantly different (at P=0.05) between CRS and Scale efficiency values. Highest technical efficiency values showed in modernized mills and these were significantly different with CRS technical efficiency and scale efficiency values. Mean efficiency ranking shows that the modernized mills were more efficient than semi-modernized and traditional mills.

Regression analysis revealed that age of management, business objective, mill capacity and category of mill had significant positive relationships with technical efficiency of Sri Lankan DC mills.

Conclusion

Given the limited resources, effective utilization of production inputs would allow Sri Lanka to increase efficiency of DC industry. By improving management practices and introducing sound technology for manufacturing process, the DC industry performance could be improved. Proper training and development plan will help to improve industry performance by enhancing management skills of mill management.

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Estimation of Demand and Supply of Pulpwood: Artificial Neural Network

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Key words: *Paper industry, Demand supply gap, Pulpwood, Forecasted value and Artificial Neural Network*

Introduction

The current global paper and paperboard demand is 402 million tonnes (MT) per annum and there are more than 7745 mills producing 192 MT of pulp. The paper demand has doubled in 20 years from 242.79 MT in 1990 to 402 MT in 2011-12. The paper production is projected at 521 MT per annum in 2021 (Kulkarni, 2008). Asia produces nearly 177 MT (44%) and the rest of the world produces 225 MT (56%). The per capita consumption of paper in India was only 9.3 kg in 2011 as against 42 kg in China, 22 kg in Indonesia, 25 kg in Malaysia, 250 kg in Japan and 325 kg in the USA. The demand for paper is strongly linked with GDP growth (Khan, 2012). In 2012, there were nearly 800 paper mills in India, out of which 26 were wood-based and face challenges of short supply. The annual pulp production of 1.9 MT consumes 6.8 MT of raw wood, of which nearly 20 per cent are supplied from natural forests through government sources, and the remaining 80 per cent is supplied from Trees Outside Forest (TOF) area, especially from farmers' lands (Kulkarni, 2012). In Tamil Nadu, Tamil Nadu Newsprint and Papers Ltd (TNPL) at Karur and Seshasayee Paper Board (SPB) at Erode are major pulpwood based paper industries that use predominantly hardwoods like eucalyptus, casuarina and miscellaneous wood as raw material. Due to the stringent forest policy, low productivity of forest cover, higher derived demand of pulpwood and higher installation capacity of industries, the supply (0.5 MT to 0.6MT) is not able to

cope with the spiraling demand for raw material (8 lakh tonnes). This has led to a wider gap in demand and supply, which hampers the growth of the industries.

Objectives

The objective of this study is to assess the future demand for and supply of raw materials for paper industries in Tamil Nadu.

Methodology

The demand, supply of raw materials, installing capacity, area of captive plantation and paper production from two industries were collected during the period 2003 to 2012. The quantity of an input demanded is a function of the price of the input, price of other inputs, and price of output for a profit maximizing industry. The quantity of pulpwood supply is a function of output price, input prices and technology.

i. **Trend Analysis:** In order to analyze the forecast of demand and supply of pulpwood, compound growth rates were computed using the method of least squares by fitting the semi – logarithmic function: $\mathbf{Y_t = ab^t}$, where, Y_t = dependent variable (demand / supply), t = time element which takes the value 1, 2, 3, ……. N, a = intercept term, b = (1+r) and r is the compound growth rate and e_t = error term. In the logarithmic form, the function can be expressed as log Y_t = log a + t log b; log a and log b were obtained using ordinary least squares procedures and the R^2 was computed to test the goodness of fit. (Antilog b - 1) x 100 gave the per cent growth rate. Future year = Present year * (1+ r) ^{n}, where r = Growth rate and n = Number of Years. The Minitab package was used to carry out a trend analysis, which generated a time series plot that showed the fitted trend equation.

The other forms of the trend models are Linear trend : $Y_t = a + bt$, Quadratic trend : $Y_t = a + bt + ct^2$, Exponential growth trend : $Y_t = \mathbf{ae^{bt}}$, where Y_t = trend values at time t, a = intercept parameter, b and c = slope parameters , e = exponential term , t = time period. A seasonal trend was computed by a

regression and compared based on the goodness of fit by R^2, standard error and MAPE. From the best performing trend curve demand and supply were forecast up to 2020 and evaluated for accuracy.

ii. **Artificial Neural Network:** The neural architecture consisted of three or more layers, i.e. input layer, output layer and hidden layer. The function form of the network is $\boldsymbol{Y_j = f(w_{ij}, X_{ij})}$, where Y_j is the output of node j, f (w_{ij}, X_{ij}) is the transfer function, W_{ij} the connection weight between node j and node i in the lower layer and X_{ij} is the input signal from the node i in the lower layer to node j. The iterative process was repeated n times to get the highest R square.

Results

The annual compound growth rate (CGR) of pulpwood demand was 15.41 per cent and future demand of pulpwood would be 1.18 MT in 2015-16 and 2.42 MT in 2020-21. Based on a 15.46 per cent growth rate of supply, the future pulpwood supply would be 1.12 MT and 2.29 MT in 2015-16 and 2020-21 respectively. Based on trend analysis, the quadratic model was the best fit among CGR, linear and exponential models, because it had lower MAPE value. Based on the quadratic fit, demand, supply and demand-supply gap would be 1.19 MT, 1.05 MT and 0.15 MT respectively in 2015-16 and 2.01 MT, 1.68 MT and 0.33 MT respectively in 2020 -21.

Based on the outcome of the Artificial Neural Network (ANN) model, forecast value of pulpwood demand is 0.87 MT and 1.19 MT in 2015-16 and 2020-21, respectively. The supply would be 0.76 MT and 0.95 MT in 2015-16 and 2020-21 respectively. The demand-supply gap of raw materials would be 0.11 MT and 0.24 MT in 2015-16 and 2020-21. Among all above methods, ANN was the best method, because it had higher $R^2$and the lowest error than the quadratic model.

Table.1: Forecast Demand and Supply of Pulpwood for Paper Industries in Tamil Nadu

(MT)

Year	CGR			Linear			Quadratic			Exponential			ANN		
	D	S	G	D	S	G	D	S	G	D	S	G	D	S	G
2013-14	0.89	0.84	0.05	0.83	0.77	0.06	0.94	0.84	0.10	0.94	0.88	0.06	0.78	0.69	0.09
2014-15	1.03	0.97	0.06	0.89	0.83	0.07	1.06	0.94	0.12	1.08	1.02	0.06	0.89	0.77	0.12
2015-16	1.18	1.12	0.07	0.96	0.89	0.07	1.19	1.05	0.15	1.25	1.18	0.07	0.87	0.76	0.11
2016-17	1.37	1.29	0.08	1.03	0.95	0.08	1.34	1.16	0.18	1.44	1.36	0.09	0.97	0.86	0.11
2017-18	1.58	1.49	0.09	1.09	1.01	0.08	1.49	1.28	0.21	1.67	1.57	0.10	0.97	0.85	0.11
2018-19	1.82	1.72	0.10	1.16	1.07	0.09	1.65	1.41	0.25	1.92	1.81	0.11	1.07	0.95	0.12
2019-20	2.10	1.98	0.12	1.22	1.13	0.09	1.83	1.54	0.28	2.22	2.09	0.13	1.07	0.95	0.12
2020-21	2.42	2.29	0.13	1.29	1.19	0.10	2.01	1.68	0.33	2.56	2.41	0.15	1.19	0.95	0.24

D-Demand; S-Supply; G-Demand and Supply Gap

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Conclusion and Policy Implications

The forecast demand-supply gap of pulpwood for pulpwood based paper industries during 2015-16 and 2020-21 would be nearly 0.24-0.33 MT. In order to bridge the gap, the industries could produce additional raw material by promoting the resourceful captive plantation and the farm forestry area (TOF) of 1000 – 1200 hectares per year with profitable business models. Tree crops of 3 to 4 year rotation can be raised to meet out the demand and supply gap of pulpwood.

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Sri Lanka's Maritime Hub Vision: An Analysis of Potentially Supportive Factors

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Keywords: *Ports in Sri Lanka, Geographic Advantage, Maritime Hub, Determinants*

Introduction

Sri Lanka's geo-positioning is very strategic. Being at the southern tip of the only land mass extending towards the Indian Ocean between the Arabian and Malayan peninsulas, this strategic geographical positioning is naturally expected to give Sri Lanka an added competitive edge to develop herself as an Asian maritime hub. The development of the Port of Colombo as the main hub port in the region in the 19th and early 20th Centuries also was largely facilitated by this competitive advantage of strategic positioning.

However, this dominant maritime position of Sri Lanka was seen gradually eroding over the years, particularly since the latter half of the 20thcentury. Colombo has gradually lost its attraction for marine traffic (Ratnayake and Wijeratne, 2012)[2] and has drifted down in the international ranking from 27th position in 2007 to 29th position in 2011[3] , and from 16th position among container ports in 1996 to 18th position by 2010[4]. This is a major concern at a

[2]Colombo port ranked in the fifth place in the British Empire in the terms of the shipping tonnage entering a port and "Colombo was considered the "greatest artificial harbor in the world". From the beginning of the late 1950s the port was known for delays and almost lost the hitherto maintained regional transshipment status (Ratnayake and Wijeratne: 2012, pp 360).

[3] Ranked by American Association of Ports Authorities

[4] UNCTAD ranking

time when the policy makers postulate regaining the maritime hub status, and is a paradox in face of the country's natural geo-positioning advantage which could hardly be matched by any competing regional port.

It is this paradoxical position that the present study focused on, and it attempted to examine the factorsthat facilitate a port to realise hub status, and maintain it.

Objectives

The above mentioned loss of comparative attraction faced by the Port of Colombo in spite of its unparalleled geo-positioning advantage could mean a number of adverse factors being active, ranging from internal operational features deterring away shipping lines, to possible emergence of more attractive competitor ports in the region. The geo-positioning advantage being just one among such determinants, it becomes strategically important to identify the most influential factors and how Colombo Port's position would be viewed by the shipping lines in relation to those determinants.

The objectives of the present research therefore include, studying the current situation of the Colombo Port and its evolution, understanding the factors that may support Sri Lanka developing as a regional naval hub, appraising those factors in their order of importance in view of understanding as to what extent such factors would influencesuccess in a competitive environment and help sustain the competitive edge, and also to recommend as to how those vital and critical factors could be stimulated by way of implementing an appropriate policy framework.

Methodology

The research adopted the "Stated Preference" methodology to identify the important criteria which could make a seaport a maritime hub. Models based on this technique are generally well accepted as methods for eliciting consumer responses to multi-attribute stimuli (Boxall, et al., 1996), and could be found used in marketing, environmental valuation and transportation related research.

A survey was conducted among 40 respondents associated with 20 out of the top 25 shipping companies of the world[5] in view of obtaining the perceived reasons for shipping lines to call at a port, and also to figure out what among those high priority attributes Sri Lanka could develop. The information thus gathered were categorised, grouped and presented in tabular and graphical forms so that the salient features could be observed. Average rank assigned to each factor, and the percentage of respondents assigning such rank, were used as indices in the comparative analysis.

The study also gathered relevant information and data from secondary sources such as the Sri Lanka Ports Authority (SLPA), Sri Lanka Customs (SLC), and Ceylon Association of Ships Agents (CASA) in order to reveal the patterns of cargo volumes handled by the Colombo Port over the years. The corresponding data pertaining to other competing ports (Singapore, Dubai and Nava Sheva) were sourced from published data.

Results

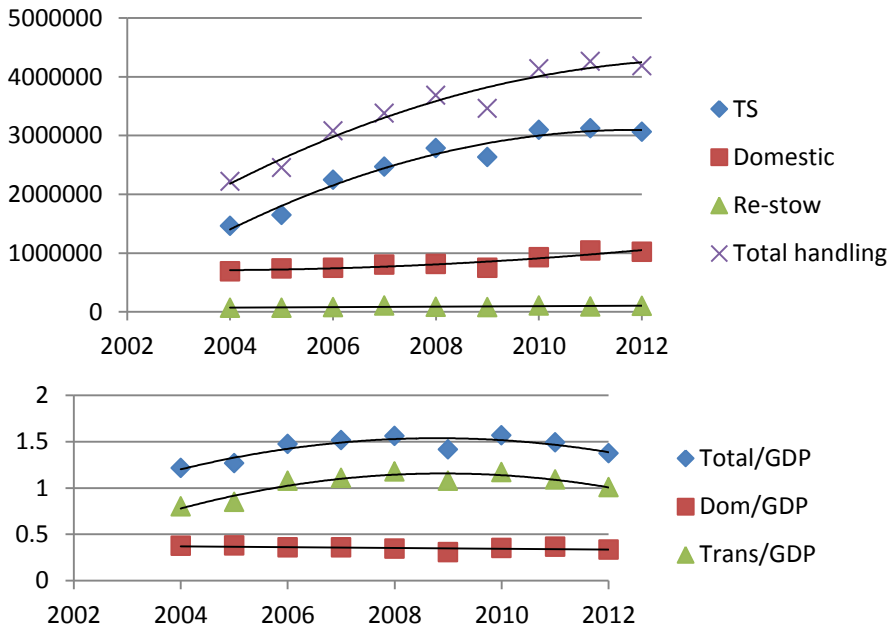
Figure 1 depicts trends of transhipment container volumes, domestics imports and exports cargo volumes including empty containers, re-stow[6] movements and total container volumes handled at the Port of Colombo for the period of 2004- 2012.

Figure 1 (A) indicates that the transhipment business has slowed down in absolute terms during the recent years, while the total volumes continued to grow pulled by the growth of "domestic volumes". Since the small size of the domestic economy is grossly inadequate (unlike in a larger economy such as India or China) to push, on its own import export trade volumes, the shipping demand for Colombo Port to the scales of a vibrant regional naval hub, this decline in transhipment volumes is a serious issue of concern. Even the

[5] World ranking of www.alphaliner.com
[6] Making a change to space in vessel where cargo is stowed originally

volumes driven by the domestic economy as a ratio of Sri Lanka's GDP appears to have been reducing since 2010 onwards[7], as depicted in the Figure 1(B).

Figure 1: Analytical Presentation of Container Volume handling trends at the Colombo Port



Therefore, it is clear that a more concerted effort would be necessary to attract transhipment volumes to Sri Lanka if the naval hub objective is to be realised.

The survey conducted among shipping companies became useful in this context in order to identify the factors that influence shipping lines to call at a particular hub port, and thereby to identify strategic gaps Sri Lankan Ports might have to fill to attract more shipping lines. The Table 1 summarises the ten most important elements out of 21 factors, in their order of importance, as identified by the average ranks assigned to them by the shipping lines.

[7] indicating either inadequate proportionate growth of import-export volumes, or growth of economic sectors increasingly not dependent on foreign trade, or both

The most outstanding priority, as expressed by the shipping lines, would be the transhipment volume itself. It is noteworthy that 82% of the respondents have ranked this as the most important determinant, and the remaining 18% also have included this factor among the five most important determinants. The availability of feeder network to cover all destinations/origins (5th priority) and frequency of feeders (8th priority), which fall under the Transhipment Network category, also were found identified among the ten most important determinants. This indicates that a port being already a "hub" gives it a distinct advantage over the newly developing competitors to further consolidate its hub status.

Table 1: Ten Most Important Factors and their Rankings

Factor	Nature	Percentage	Responded
		as 1st Priority	among first 5 priorities
Transhipment volume potential of the Port	Transhipment network	82%	100%
Availability of on-arrival berthing (window)	Port efficiency/capacity	9%	91%
Domestic volume potential of the Port	Domestic trade	9%	82%
Operational productivity (Gantry moves per hour)	Port efficiency/capacity	0%	82%
Feeder network availability to cover all destinations/origins	Transhipment network	0%	27%
Deviation time from main sea route	Geographic location	0%	36%
Time taken to berth/unberth ships	Port efficiency/capacity	0%	36%
Frequency of feeders	Transhipment network	0%	18%
Port handling/stevedoring costs	Port Charges / costs	0%	18%
Port navigational costs	Port Charges	0%	0%

Availability of on-arrival berthing emerged as the second most important determinant with 9% of the respondents ranking it as the most important and

91% including it within the five most important determinants. Together with this factor, two others, namely Gantry Moves per hour (4th priority) and Time taken to berth/unberth ships (7th priority), could be identified as related to Port capacity and/or efficiency.

Domestic Volume potential turned out to be the third most important factor with 9% of the respondents ranking it as the most important determinant while 82% of them including it among the first five priorities. This is a clear comparative disadvantage Sri Lanka has owing to its small size of the domestic economy.

Deviation time from the main sea route was identified as the fifth most important factor with 36% of the respondents including it among the top five, though none had ranked it as the most important priority. Among South Asian Ports, the Colombo Port has the shortest deviation time from the main sea route. Hambantota Port is even closer. Thus, Sri Lanka should exploit this advantage to the maximum.

A noteworthy revelation in this study is the relatively low importance the shipping lines appeared assigning to cost-related factors associated with a hub Port. The only two cost related factors namely, Handling/Stevedoring Costs and Port Navigational Costs, which qualified to be included among the top ten most important determinants, came in as the last two in the priority order. Further, only Handling/Stevedoring Costs were found ranked among the first five factors, and that again was by a mere 18% of the respondents. Further, as evidenced in the Table 3, only 43% of the seven identified Cost-related factors were ranked among the top ten determinants by at least half of the survey respondents.

Table 2: Relative Importance of Factor Categories as assigned by at least 50% of the respondents

Factor Category	Number of Factors	Ranked as 1st Priority	Ranked among top 5	Ranked among top 10
Transhipment Network	3	33%	33%	100 %
Domestic Demand	1		100 %	100 %
Port Capacity /Efficiency	6		33%	50%
Geographic Location Advantage	1			100 %
Charges/costs	7			43%
Availability of Competitive Supplies	3			

This is an interesting finding, which could explain why several ports, which are relatively more expensive in their service provision, have managed to grow fast as regional hubs. Their relative competitiveness in service provision efficiency might possibly have overridden their cost disadvantages.

Conclusion and Policy Recommendations

Theresults of the study suggest that the geo-positioning advantage of being strategically located at close proximity to the East-West main sea route in the Indian Ocean with more than 16 ports which could be economically fed by sea, though important, could not alone pull Sri Lanka to develop herself as a maritime hub. Emphasis should be given to other revealed determinants, particularly the port efficiency/capacity related factors. Sri Lanka, having already taken significant strides to develop infrastructure capacity, should focus on improving efficiency of port operations as well. On-arrival berthing window, improved Gantry moves per hour, and faster berthing/unberthing of ships, which are facilitated through capacity expanding investment, should be further ensured by Port operational efficiency enhancement.

Policies should be geared up so that (a) the existing shipping lines would maintain and further improve capacity served at Sri Lankan Ports, (b) the

services of lost customers would be reinstated, and (c) the new markets which are ‘potential, yet untouched’ would be penetrated through provision of attractive/efficient services. This would also enable maintenance of the existing networks, which, being the highest ranked priority revealed by the survey, would promote the “snow ball” effectof attracting more shipping lines, and encouraging more feeders through better linked mainline operations, and thereby further expanding the “hub-and-spoke” Network.

While Sri Lanka has an edge over most of her competitors with regard to the existing transhipment network, this revealed “snow ball” effect also indicate the possibility of fast developing regional ports such as Nava Sheva posing a serious threat to Sri Lanka in regaining and consolidating the maritime hub status. This may also constitute an argument in support of developing the Hambantota Port also as a container port enabling the country to offer shipping lines port facilities with further shortened deviating time, uncongested and efficient service delivery and possibly with competitive costs as well. Such might tilt the “snow ball” effect advantage towards Sri Lanka and away from her competitors in view of becoming a regional maritime hub.

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Banking and Finance

Trends in International Capital Flows and the Prospects for Renminbi Internationalization: What Lies Ahead?

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Keywords: *Financial integration, Cross border capital flows, Reference currency, Financial openness.*

Introduction

Emerging markets economies (EMEs) are increasingly integrating into the global financial markets as is evident from the rising stocks of assets and liabilities. A wave of financial globalization since the mid-1980s has been marked by a surge in capital flows among industrial countries and more notably, between industrial and developing countries (Kose, et al. 2006). Financial globalization has the potential to increase global welfare by efficiently allocating financial resources and enabling countries to spread the risk. Increased interconnectedness between financial markets of countries has however created channels through which monetary shocks can spread across the globe. This however has made macroeconomic management more challenging and difficult due to transmission of monetary shocks resulting in currency appreciation, credit-and asset price boom-and-bust cycles and reversals in capital flows (OECD, 2011). The recent financial crisis has provided sufficient evidence of the pitfalls of a sudden reversal of large capital flows and its deleterious effects on global economies. The Mundell-Fleming model constitutes the theoretical basis for studying international capital flows with a view to understand the effectiveness of the "impossible trinity trilemma"

Objectives

Financial globalization refers to the growing global linkages through cross border financial flows. The purpose of this paper is to a) examine the progress and trend in international capital flows with special reference to capital flows in

China. The study also examines the b) determinants of capital flows in china and the degree of financial openness as a "sine qua non" for the internationalization of the Renminbi. In light of the current socio-political demands and challenges that lie ahead, the paper will evaluate) the expectations and prospects for Renminbi internationalization.

Methodology

Data from official sources (IMF-IFS, CEIC data source, SAFE & PBOC)and regional study reports (ADB) are examined to assess the recent progress and trend in international capital flows and the inherent volatility of cross border financial capital flows. The data of the empirical finding are presented in the stylized form. The Quinn-Toyoda index will be used to measure the degree of financial openness of the capital and current accounts in China. Four types of capital flows namely 1) FDI outflows 2) FDI Inflows 3) Portfolio inflows 4) Portfolio outflows are examined to measure the extent of capital flows. Other indices for the measure of financial openness are the degree of stock market capitalization (as a share of GDP), financial market deepening and trade openness. The 12thFive Year Plan -to be discussed at the third plenum of the 18th Chinese Communist Party Congress in November 2013- should provide policy insights for further internationalizing the Renminbi.

Results

Capital flows have grown significantly over the last two decades in both size and volatility, especially inflows to emerging markets (IMF 2013). In 2010, net capital inflows to the top ten borrowers increased by an average of over 80 percent. China received 30 percent of the aggregate net capital inflows to all developing countries, while the share of BRIC's countries was 58 percent (W.B. Global Development Finance-2012). FDI remained the single largest component of capital flows to developing countries and the overwhelming share of FDI inflows went to china, which rose by 62 percent. Forbes (2010) estimates that capital account opening could raise China's exposures to the U.S. equity markets. Since mid-2005, the REER of RMB has appreciated by 35

percent (IMF2013) although the stock price index has decreased by 30 percent from 2010 to May 2013.Capital account openness and stock market capitalization help to better facilitate FDI and outward portfolio transactions (Dong He, et al. 2012).

Conclusions

The integration of EME's into the global financial system is associated with an increase in the scale of international capital flows over the medium and long term. China is becoming more financially integrated with the rest of the world. 7 of 10 East Asian Countries track the Renminbi more closely than the USD as a "Reference Currency" (Subramanian et al. 2012). Renminbi settlement in cross border trade and currency swap arrangements with Central Banks of trading partners have significantly increased over the years (SWIFT-2012). In 2010, under the QFII (Qualified Foreign Institutional Investor) program, the amount of dollar investment for foreigners has been raised from $30 billion to $80 billion (U.S. Department of Treasury-2013). China has used reserve requirements, higher interest rates, tighter prudential measures, direct administrative limits and currency intervention to moderate credit growth. However,the real estate market in China is susceptible to cyclical swings. Capital account opening in China will likely be followed by substantial gross portfolio flows as global and domestic portfolio holdings adjust. Outflows of portfolio investment could offset pressures for reserve accumulation from net FDI or other investment inflows or current account surpluses. China's 12th Five Year Plan has pledged to accelerate capital account liberalization. It can be said that the domestic socio-political environment and global geo-political forces would influence the prospects and pace for Renminbi internationalization (Kurien et al-2013).

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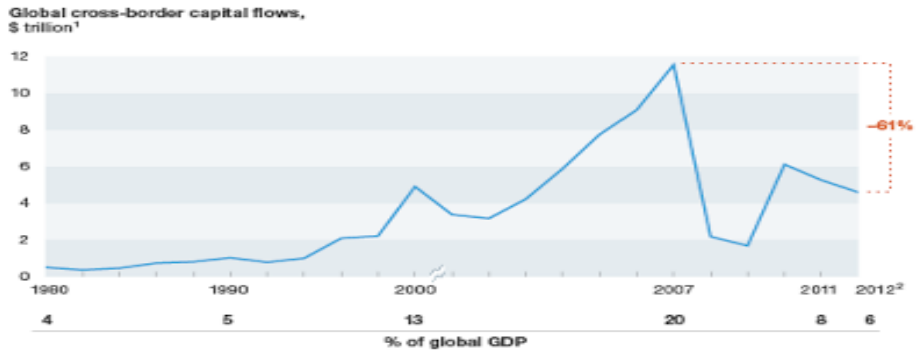
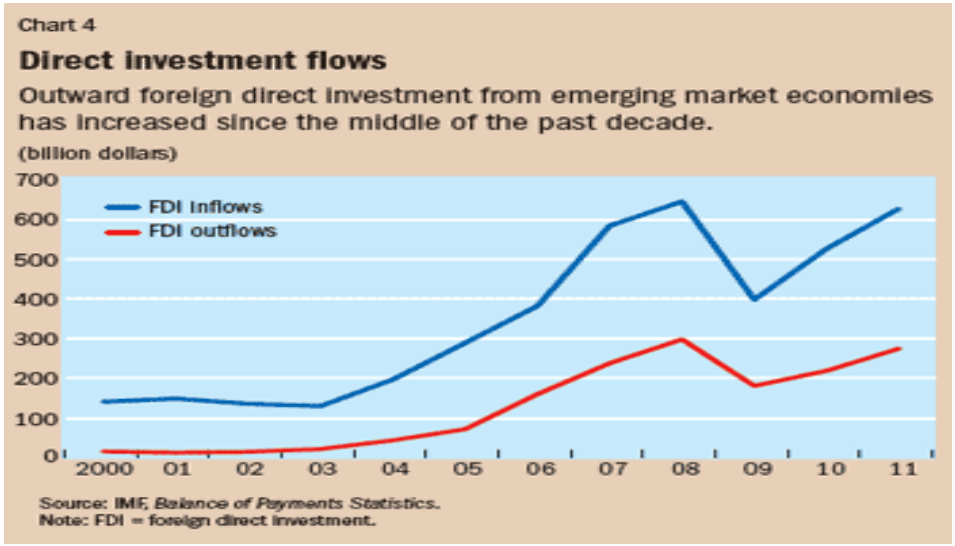
Appendix 1:

Cross-border capital flows fell sharply in 2008 and today remain more than 60 percent below their precrisis peak.



[1]Based on constant 2011 exchange rates; includes foreign direct investment, purchases of foreign bonds and equities, and cross-border loans and deposits.
[2]Estimate based on data through latest available quarter (Q3 for major developed economies, Q2 for all others). For countries without quarterly data, we use trends from the Institute of International Finance.
Source: International Monetary Fund (IMF) balance-of-payments figures; the Institute of International Finance (IIF); McKinsey Global Institute analysis

Figure 2



Information Technology and Its Effects on Banking Services: A Study Done in Kandy City Limit, Sri Lanka

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Keywords: *Information Technology based service, Customer satisfaction, Service quality, SERVQUAL, Personal interaction.*

Introduction

Information Technology (IT) has invaded almost all the industries from day-to-day sales to complicated and expensive Rover missions on Mars. IT has already been occupied its position in the business world where once it is failed it will cripple the solid performances of the entire organization. As in many service industries, in financial sector IT based service systems are considered as an essential tool for a service provider to remain competitive (Lovelock et al., 2004). Therefore, much researchhas been conducted to investigate the effectiveness in IT based services in banking sector in improving service quality (Idowu et al., 2002: Zhu et al., 2002).SERVQUAL model is a service quality framework to measure the gap between customer expectations and experience (Parasuraman et al., 1988).

In the Sri Lankan context banking sector tend to use more and more IT based services to attract customers, to achieve customer satisfaction and improve financial performances. The rate of adopting IT based services in Private Banks is higher than the rate of State Banks.

Objectives

1. To find the gap between customers' expected and experienced IT based service quality of the selected four banks in Kandy Municipality area.
2. To find whether the IT based service quality of banks differs in state and private banks.

Methodology

We selected two state banks and two private banks operating within the Kandy Municipality Area. We distributed questionnaires for customers.The questionnaire had four main sections: 1) the demography of the sample, 2) SERVQUAL model modified for IT based service quality: tangibility, reliability,responsiveness, assurance, empathy 3)agreement for IT based service features: ease of use, time conservation, convenience, privacy, accuracy, multifunctional and 4) IT experienced factors: self-control, comfort and personnel interaction in using IT. A pre-test was conducted by distributing the questionnaire for 30 customers and it was adjusted before the standard questionnaire was distributed among customers.The structure of the questionnaires was both open ended and itemized ranking scale of 1-7; i.e. from Strongly Disagree to Strongly Agree. In total there were 400 customers for this study through questionnaires, which accounted 100 for each bank. The questionnaire was distributed at 9.00 am to 1.00 pm during working days. Interviews were conducted for bank employees in order to obtain information on the IT service options available in each bank and their advantages.

In this research Analysis of Variance (ANOVA) was used to test the significance difference of expected and experienced IT based service quality levels in the four banks using SERVQUAL dimensions.

Results

We looked atthe gap between customers' expected vs.experiencedIT based service quality levels in the four banks using SERVQUAL dimensions. Higher

gap represents lower quality of IT based services. The customers' IT based service quality expectations were higher than their experienced IT based service quality in all the four banks. The highest IT based service quality was observed in Private bank 1 and followed by State Bank 2 and Private Bank 2 and then State Bank 1, respectively. Private Bank 1 had come closer to the customers expected level (Figure 1), as denoted by the low service quality gap (expected – experienced). Bank 1 used many number of IT services such as E-exchange, telephone banking, online banking and mobile reload etc.Even though Bank 1 uses many number of IT based services than any other selected bank, their consideration on Empathy was also very high compared to others. Empathy factor had been highly considered by customers of all the selected banks (Figure 2). It proved that the customers were expecting more human interaction when they're dealing with the IT facilities in banks although they have self-control and comfort in using IT.

We looked at the relationship of the IT based service quality gap received by SERVQUAL dimensions to the scores given by customers for agreement for IT based service features.The relationship was poor. This implied that the customers did not give much credibility for the statement: 'IT associated features increase services quality', even though early research show that IT carries important features that could increase service quality and has contributed to the service quality of the banks.

Conclusion

All the four banks had not reached the customer's expected IT based service quality. Private bank 1 which had the highest number of IT based services showed the highest IT based service quality among four banks. However, availability of IT services was not the only motive factor for customer satisfaction; customers need personal interactions when they deal with the IT services of the bank.

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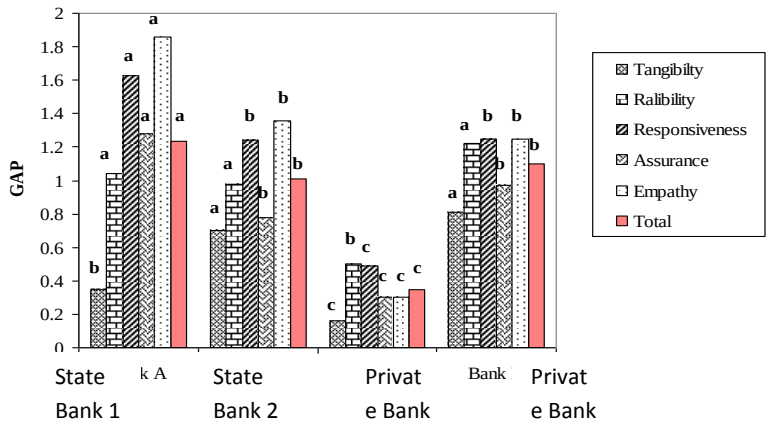
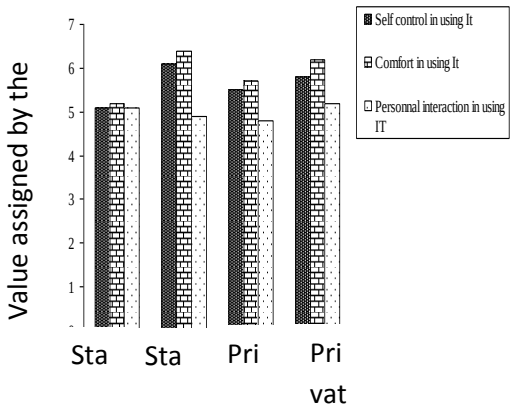
Appendix:

Figure 1: Gap between expected and perceived levels of SERQUAL dimensions and over-all service quality derived from SERVQUAL dimensions.



(Bars denoted by same letter in each dimension showed no significant difference among banks at $p>0.05$)

Figure 2: Customers' evaluation of the experiences in using IT based banking service in four banks. (The scale was 1-7 and the value increased with agreeing with the feature)



A Statistical Assessment on the Status of Loyalty of Customers of Commercial Banks on the Context of Financial Failures in Sri Lanka

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Keywords: *Customer Loyalty, Commercial Banks, Financial Failure, Customer Satisfaction, Statistical Assessment*

Introduction

The Financial sector expanded whilst remaining stable despite challenging market conditions both globally and domestically and continued to support the growth momentum in the economy. The Banking sector is the dominant sub sector within the financial sector. In Sri Lankan situation banking sector has two main categories. They are Licensed Commercial Bank (LCBs) and Licensed Specialized Bank (LSBs). In 2012, there were 24 licensed commercial banks and 9 licensed specialized bank in Sri Lankan banking sector (Central Bank Annual Report 2012). By the end of 2012, a total of 33 banks comprising 21 domestic banks (including 9 licensed specialized banks) and 12 branches of foreign banks continued to have operations in Sri Lanka while expanding the banking network of their banks and introducing new diverse banking solutions to attract the new customers.

There are many factors that cause to the customer movements from the commercial banks in the context of Sri Lankan financial market. Among such factors 'customer loyalty' would be the most influencing factor that directly impacts on the customer movements from commercial banks. Therefore, it is important to know the factors that impact on the customer loyalty and the ways of retaining customer's loyalty on commercial banks in Sri Lanka in the context of financial failures.

At present, relating customers' loyalty on commercial bank in Sri Lanka continued to be resilient in the challenging environment of the global financial crisis and emerging world economic downturn, higher domestic interest rates and the impact of the failures of some unauthorized financial business. The financial services industry grew at more moderate level during the last few years, in response to the tighter monetary policy.

The Central Bank took decisive action to arrange the rescue of commercial banks that experienced liquidity problems due to the failure of Credit Card Company associated with the Ceylinco Group. Since the last few months of 2011, some regulated financial companies have been experiencing high deposit withdrawals and liquidity pressures consequent to the failure business. A special support for finance and leasing companies by the government and the Central Bank is being implemented to address this problem.

Objectives

The objective of this study is to understand the financial market in Sri Lanka and identify the factors which determined the people's loyalty on commercial banks and on their services. This study is conducted mainly from the perspective of identifying the current Sri Lankan financial market situation and future trends. This study will be useful to the investors and the public, thinking of may be making future investment decisions in a secured and stable institution.

Methodology

This study is designed with a convenient sample of 150 customers, who were selected from various commercial banks of Sri Lanka. A cross-sectional survey was set-up with interviewer administrated questionnaire. Primary qualitative information on loyalty, mainly focusing with eleven characteristics scaled on 5-points, was recorded. A convenience sample of 150 commercial bank customers of Western province had been chosen for the study. Statistical analytical

techniques such as correlation coefficient and qualitative ordinal scaling assessment techniques were adopted to draw the results.

The eleven qualitative aspects employed as statistical assessments and explored in this study through the questionnaire are defined below:

Stability Consideration / Loyalty grown up: Theseaspects are vital when the customers are searching for any service organization to accomplish their service needs and wants. This is because they are looking at fair return for their investment.

Willingness to refer dealing banks / Confidence on Government bank / Confidence on Private bank / Relationship Marinating: These aspects are used regarding the customer's responses and are based on their current satisfactory level towards government and non-government commercial banks, and relationship with the bank.

Overall Quality of the bank: This aspect measures the Commercial bank's response to the customer's request and bank's higher service qualities.

Attractiveness for higher return: People have experienced more problems from many unauthorized financial institutions which offer higher return for customer's investments. This aspect addresses whether the customers are still expects the higher returns rather than security of their investment.

Duties perform by central bank/Government supervision on the bank/Awareness of the Authorization: The Central Bank of Sri Lanka is the authorized authority in supervision of all the financial transactions and the financial institutional activities. One of the main responsibilities of the central bank is to make the public awareness about the secured investment opportunities in the market place. People's ideas about the government supervisions and activities were examined and evaluated through theseaspects.

The Scalability of the Qualitative Items: The ordinal scale used or defined to quantify the above eleven qualitative responses of the study are of 5 point

Likert scale. This defined as from the weakest responses to strongest responses. The quantities assigned are as follows:

1 – Very weak	: Not satisfied	: Very poor response
2 – Weak	: Ignorant	: Poor response
3 – Moderate	: Indifference	: Indifference
4 – Strong	: Satisfied	: Good response
5 – Very strong	:Highly satisfied	: Very good response

Results

The sample of 150 customers selected and interviewed in this study are classified against various commercial banks in Sri Lanka and given in the following table (Table 1). These sampled customers have mainly maintained their deposits and other assets in the respective commercial banks compared to their involvement in the other banks.

Table 1: Customer's Distribution against Commercial Banks

Bank Name	**Number of Customers**	**%**
Peoples Bank	38	25.33
Bank of Ceylon	60	40.00
NSB	8	05.33
Sampath Bank	12	08.00
Commercial Bank	6	04.00
HNB	12	08.00
HSBC	3	02.00
Nation Trust Bank	6	04.00
Seylan Bank	5	03.33

Our sample was constructed with random selection of individuals, but the total number of customers 150 was fixed conveniently. The classification shows that the majority of the customers are coming from the state's banks. Altogether

about 70 percent of the customers are from People's Bank, Bank of Ceylon and National Savings Bank. The rest of about 30 percent are from the private banking sector.

Overall perusal of the 150 questionnaire using comparative description highlighted the following: More than 90% of the respondents are dealing at least with one government commercial bank and at the same time they are dealing with other private commercial banks also. But they are having more confidence towards the government banks than non-government financial institutions. More than 90% of respondents believe that People's Bank, Bank of Ceylon and National Savings Bank are very much stable in the market place, because they are under the control of Sri Lankan Government. But Commercial Bank, Hatton National Bank, National Development Bank and HSBC Bank have come forward by overcoming other private commercial banks in terms of current market performance and by creating top of mind awareness in consumers mind through their promotional campaigns.

The eleven qualitative self-assessments of the 150 customers as instituted through the interviewer administrated questionnaire were classified using 5 point qualitative scale and compiled to see the inherent structural results. The following table (Table 2) produces the summary of the information of the eleven characteristics of loyalty by qualitative scales.

This table generally shows that none of the customers have totally disagreed on the eleven loyalty characteristics. Further, very few customers except on 'Government supervision on the banks' have responded that the said loyalty characteristics are less important. This result reveals that the selected eleven characteristics are conceptually meaningful to study the loyalty of the customers in the financial markets in Sri Lanka.

Table 2: Self-assessment of different characteristics of loyalty (n=150)

Characteristics (Items) of Customer Loyalty	Very Strong	Strong	Mode -rate	Not much	Not at all	Average Score
(Scale of Qualitative Items)	(5)	(4)	(3)	(2)	(1)	
1. Stability consideration	30	102	18	0	0	4.08
2. Willingness to refer dealing bank	30	90	30	0	0	4.00
3. Confidence on Government bank	60	78	12	0	0	4.32
4. Confidence on Private bank	30	42	78	0	0	3.68
5. Relationship Marinating	66	66	18	0	0	4.32
6. Loyalty grown-up	6	54	78	12	0	3.36
7. Overall Quality of the bank	48	78	24	0	0	4.16
8. Attractiveness for higher returns	30	36	72	12	0	3.56
9. Duties perform by central bank	0	36	102	0	0	3.00
10. Government supervision on the bank	0	60	90	36	0	3.88
11. Awareness of the Authorization	0	42	72	12	0	2.72

The characteristic ‘Loyalty grown-up’ was further subjected to verification of dependence with four other selected characteristics which are ‘Stability consideration’, ‘Government supervision’, ‘Overall quality’ and ‘Relationship marinating’. The relationships among these characteristics were analyzed using correlation analysis. The following table shows the results (Table 3)

Table 3: Correlation Co-efficient between Loyalty Grown-up with other Characters (n=150)

Variables	Loyalty Gr	Stab. Con.	Gov. Sup.	Ov. Qual.	Rel. Mar.
Loyalty Grown-up	1				
Stability Consideration	0.595986	1			
Government supervision	0.434495	-0.032909	1		
Overall quality	0.365206	0.099075	0.065584	1	
Relationship marinating	0.351838	0.634151	0.031536	-0.098338	1

Considering the coefficient of correlation of 'Loyalty Grown-up' with the above mentioned four characteristics of interest, as given in the first column of the above table, we see that the customer satisfaction (stability consideration) has higher relationship with loyalty grown-up compared to the other three characteristics. Further, the 'government supervision' has moderate relationship with loyalty grown-up. However, as noted in the same column of the above table we could see that the other two characteristics have low correlations which show less importance for consideration in verifying the loyalty grown-up.

Conclusions and Recommendations

After the current financial failures people have given more attention towards the security of their funds and the confidence of their financial institutions in selecting their financial institutions rather going towards the institutions which offer higher returns. Every respondent has taken at least one service or the facility from their dealing commercial banks including Deposits, Facilities, Loans, Current Accounts and Pawning. Most of the respondents are very keen on considering the stability of the commercial banks before they are making transactions with those institutions. 20% of the respondents are very strongly considering the stability of the institutions and 68% are strongly considering it.

More than 82% of the government banks' customers are willing to recommend their banks to other in the context of security offered and rest of the government banks customers do not like to do that in terms of service quality and the service efficiency. However after the Golden Key Credit Card Scam and the Seylan

Bank Issue Customers loyalty and the confidence in non-government financial institutions has reduced. As a result of this, customers have transferred their funds to government commercial banks from those non-government institutions.

90% of the respondents are satisfied with the confidence maintained by the government commercial banks. But in terms of service quality and the service efficiency respondents gave their preference towards to private commercial banks. Most of the respondents explained that non-government commercial banks are always offer good customer service and maintaining close relationship with them than government institutions. Over last 12 months respondents' loyalty towards the government banks has increased rapidly where loyalty towards the non-government banks has decreased due to some failures and the frauds done by some authorized financial institutions in the market place. In the current context customers are not going towards higher returns because they have understood that for higher returns they have to take higher risk. With current financial failures customers are going towards qualitative factors like Security, Confidence and relationship.

Satisfaction is the most important factor behind loyalty. In order to create and retain loyalty customer base as well satisfied customers, banks should emphasize especially on service quality and Security aspects in the context of current financial failures. On the basis of literature and findings of the study it can argued that security dimensions have great impact on satisfaction and loyalty (via service quality and security) can help bank to perform well. As the results support the earlier research some recommendations can be made on the basis of the finding and if the banks follow them on a trial basis they might get benefit from it. In this regard bank follows some of them on a trial basis they might get benefit from it.

In this regard we suggest that the following steps could be taken by the administrators of the financial institutions concerned: Commercial banks are service oriented and people-intensive sector. Customer always deserves better quality service as well as good manner, empathy, and so on. To comply with this bank should monitor their activities as well as their employees in order to

make a positive impression on customers in the context of service quality and security aspects. Our study reveals that various problems occurred in the service delivery process and these are considered as the elements of dissatisfaction. In this context, commercial banks should try to find out the reasons of complain and also try to minimize it by providing proper training to the staff. Again bank can take some initiatives to find out what customers really expect from them.

Customers should be loyal to the bank employees and vice-versa. On the other hand this will make loyal customers towards a particular organization. Provide banking employees with training, development and other customer service resources and they'll qualify to provide exceptional professional customer service. Ultimately both parties will become satisfactory create the loyal customer base. Commercial banks should always shows and inform their trustworthiness to customers. This can be showed through publishing their financial stability reports, complying with Central Bank rules and regulations, maintaining sufficient liquid assets base and maintaining closer customer relationship. Many people view customer's complaints as negative signs for a business. If it can make good use of customers complains, it can be an actual advantage to organization. Finding out why the customer is not satisfied with banking product or service, compensate them and make improvement changes to products/services immediately.

Banks should have contacts with customers after they have consumed products and services. This can be done in a post-out survey from, follow-up call or simply an email survey form. Because once the transaction was done among the two parties, it will not close. In a competitive environment after sales service is must. Otherwise organizations will lose lot of future sales. This is to remind them of the existence of the company and that bank still remembers them. In return, they will value the company. It's also a way to keep in touch and strengthen the relationship with existing clients.

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Demand for Electronic Banking in Sri Lanka: Analysis of Demographic Factors

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Keywords: *E-banking, Banking in Sri Lanka, Demographic Analysis, Sampath Bank*

Introduction

Applications of information and communication technology concepts, techniques, policies and implementation strategies to banking services have become a subject of fundamental importance and concern to all banks and a prerequisite for local and global competitiveness. The advances in technology have played an important role in improving service delivery standards in the banking industry. According to Daniel (1999) Electronic banking (E-banking) is providing the customers their banking information via diversified delivery channels that can be accessed through different technological devices; i.e. a computer or a cell phone with built in browser utility or telephone or any other digital technology. In Sri Lanka, E-banking was first introduced by *Sampath Bank* in 1988. They started by networking all the branches enabling the customers to access accounts at any branch. ATM cards enabled customers to withdraw money from teller machines throughout the day. This revolutionized the banking industry in Sri Lanka.

Objective

The objective of this research is to examine and analyze the impact of selected demographic variables on the demand for E-banking in Sri Lanka. This study focuses on most of the E-banking services except ATM cards. This is because previous related research in Sri Lanka had focused on the acceptability of ATM cards as being the most popular E-banking services offered by Sri Lanka banks. However, there appears to be a dearth of research to determine the factors affecting the acceptance of other E-banking services. This gap will be filled by this research effort.

Methodology

The research utilized both primary and secondary data. Primary data were collected through the distribution of 140 questionnaires to a convenient sample of customers of the selected bank. Secondary data were gathered by referring annual reports and the official website of the selected bank. The questionnaire was pre-tested with a few customers to ensure the accuracy of the questions. Demand for E-banking was used as the dependent variable and the eight dimensions of the demand were used as the independent variables. The Logit model for ungrouped binary data was utilized to analyze the significance of these variables for the demand of e-banking in Sri Lanka. The model is as follows:

$$DB = f\,(GE, AG, NF, ED, EK, ES, JP, IN)$$

where,

DB=Demand for E-banking, GE = Gender, AG = Age, NF = Number of family Members, ED = Educational background, EK = English knowledge, ES = Employment sector, JP = Job position, and IN = Income. Thus,

$DB_i=L_i=[P_i/(1-P_i)] =\alpha+ {}_1GE_i+ß_2AG_i+ß_3NF_i+ß_4ED_i+ß_5EK_i+ß_6ES_i+ß_7JP_i+ß_8IN_i +e_i$

Data were analyzed using E-views.

Results

The sample consisted of 50 E-banking users and 50 non E-banking users at *Sampath Bank*. Out of 50 users 16 were female. Twenty females were included in the sample of 50 non-users. Average age of the sample was 36 years and the average monthly income was Rs.60,450. Response for the questionnaire distributed was high among the E-banking users. Most of the E-banking customers at the bank are below 40 years of age. Distribution of age of the non E-banking users at *Sampath Bank* is different from the distribution of E-banking users at the bank. Skewness value of 0.03 represents a symmetric distribution of the age of non E-banking users at the bank. Number of family members for the sample of non E-banking users is symmetrically distributed. Majority of the E banking users are first degree holders and the rest have qualifications equivalent to a technical diploma or above. Most of the non E-banking customers do not possess a basic degree. Majority of the E-banking customers have a 'good' level of English knowledge. English knowledge of the non E-banking users at the bank fall below the category of 'good' and very few customers were found under the category of 'good' and 'excellent'.

All the members in the sample of E-banking users were senior executive or above. However, for non E-banking users, majority of the sample members were under the category of junior managers and below. Clerical staff members could not found in the sample of E-banking users and there were few clerical staff members for the sample of non E-banking users. The average income of the E-banking users was Rs. 77,800 and that for non-E banking users was Rs. 43,100. The difference of average income between the two groups of customers

at the bank is about Rs. 34,000. Majority of the E-banking customers had been using the E-banking facility for between one to three years. Influence from the bank to promote E-banking is at a very low level. Majority of the customers use the services two to six times per week. Most of the E-banking customers do not have a significant concern about the risk factor. The perception of fifty percent of the sample on the risk factor was neutral.

Table 1: Summary output of the Logit Model

Dependent Variable: DB
Method: ML - Binary Logit (Quadratic hill climbing)
Date: 03/03/13 Time: 10:05
Sample: 1 100
Included observations: 100
Convergence achieved after 8 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.	.
GE	-0.829128	1.103680	-0.751240	0.4525	
AG	-0.189422	0.077236	-2.452504	0.0142	
NF	-0.998671	0.612995	-1.629168	0.1033	
ED	0.610582	0.580724	1.051414	0.2931	
EK	1.862042	0.636361	2.926077	0.0034	
ES	0.624987	0.724350	0.862824	0.3882	
JP	-0.979717	0.622628	-1.573521	0.1156	
IN	9.75E-05	3.25E-05	3.002061	0.0027	
C	-0.969619	5.325528	-0.182070	0.8555	.

Mean dependent var	0.500000	S.D. dependent var	0.502519
S.E. of regression	0.218845	Akaike info criterion	0.502417
Sum squared resid	4.358258	Schwarz criterion	0.736882
Log likelihood	-16.12085	Hannan-Quinn criter.	0.597309
Restr. log likelihood	-69.31472	Avg. log likelihood	-0.161209
LR statistic (8 df)	106.3877	McFadden R-squared	0.767425
Probability (LR stat)	0.000000		
Obs with Dep=0	50	Total obs	100
Obs with Dep=1	50		

Source: Survey data (2013)

Conclusion and Policy Implications

E-banking can offer speedier, quicker and dependable services to the customers for which they may be relatively satisfied than that of the traditional system of banking. E-banking not only generates latest viable return, it can serve customers better. The customers of banks today are not concerned as much about the safety of their funds as much as increased returns on their investments. They demand efficient, fast and convenient services. E-banking reduces transaction costs and saves time. E-banking customers are increasing worldwide but its adoption is very low in Sri Lanka. In Sri Lanka, banks as the E-banking service providers and customers as the beneficiaries, are still not making the real use of E-banking adequately. The majority of E-banking customers are employed in the private sector. Only very few customers are employed in the government sector. The number of government sector employers is significant in the sample of non E-banking users. The most important awareness factors of E-banking are 'friends' and 'self awareness'. Level of English knowledge, educational background, employment sector and income positively affect the demand for E-banking at *Sampath Bank*.

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Impact of Credit Card Usage on Consumers' Expenditure Pattern (With Special Reference to Galle Four Gravets DS Division)

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Keywords: *Credit Card, Purchasing Habits, Expenditure, Multiple Regression Model, Consumer Behavior*

Introduction

In the background of the unprecedented innovations of information and communication technology together with the liberalization of the financial sector, electronic applications are emerging all around the world. This technological development does not exclude any sector in the society and make significant impact on the transaction process. As a result of that credit card has become to the society as a financial instrument. At the same time the Sri Lankan financial institutions are also innovatively introduced customer centric products and services drastically reducing transaction times. Therefore these institutions have introduced an entire gamut of financial services. It makes a considerable influence on transaction process. As a result of that credit card has become more popular among people by making the transaction easier. It is an efficient payment tool for daily shopping and payment needs. The credit card users can spend future's money today (Chirapanda and Yoopetch, 2008).

The theoretical background of this study is the consumer behavior in the credit card market. Consumer behavior is the study of individuals, groups, or organizations and the processes they use to select, secure, and dispose of products, services, experiences, or ideas to satisfy needs and the impacts that these processes have on the consumer and society. It blends elements from psychology, sociology, social anthropology and economics.

Consumer behaves in different ways in the credit card market. The literature identifies demographic and socio-economic characteristics of credit card users as significant predictors of practices in the use of credit cards. Some of the demographic and socio-economic characteristics were found to be significant in describing consumer credit card ownership and usage practices are age, gender, marital status, the level of education, the number of dependents in the family, monthly income, the length of credit card ownership and debt ceiling.

After issuing a credit card with a suitable credit limit according to the card holder financial needs and ability, they can use card to make purchases. Therefore their usage has gone up dramatically all over the world. Credit card usage in Sri Lanka is also increasing significantly with parallel to the global situation. Total number of credit cards in use was 862,340 in 2011 indicating that 10.8% increase compare to the 2010 (Central Bank of Sri Lanka, 2012).This is further evidenced by high increase in the volume of electronic point of sales outlets and reward schemes and incentives offered by credit card issuer to promote credit card usage (Central Bank of Sri Lanka,, 2008).People use more money when using credit card compared to cash purchases (Soman, D. 2003). People also spend less when look at their expenses in detail. Credit cards are all set to make a definite impact on life style of people (Pangigraphy 1999). They also allow consumers to satisfy their needs without waiting (Tunali and Tatoglu, 2000). Therefore such benefit can change consumer habits and change spending.

Considering the significance of the study, many researchers have address the various aspects regarding the credit card usage, there were very few attempts to identify the relationship between credit card usage and expenditure pattern. Considering Sri Lanka very limited researches have done related to this area. Therefore identify the link between the credit card usage and its' impact on expenditure pattern is important. Therefore this research was also designed to identify the impact of credit card usage on consumers' expenditure pattern.

Objectives

The main objective of this study is to identify the impact of credit card usage on consumers' expenditure pattern. The specific objectives of the study are: (i) do identify the effects of socio economic factors on monthly credit card expenditure; (ii) to examine the impact of credit card features on monthly credit card expenditure of the card holders; and (iii) to find out the payment practices of the card holders.

Methodology

Primary data were obtained through the interview method by using the questionnaires. Therefore 100 respondents were selected in Galle Four Gravets DS division in Galle district using random sampling method. Secondary data were collected mainly from Bank records, Annual reports, Internet, Magazine, Journals and books etc. The multiple regression model used to analyze the data is:

$$Q= \beta_0+ \beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \beta_4X_4+ \beta_5X_5+ \beta_6X_6+ \beta_7X_7 + u_i$$

The dependant variable was the monthly credit card expenditure. Independent variables were socio economic characteristics of the card holder such as income, Age, education ect.

Results and Discussion

Figure 01: Types of purchases using credit

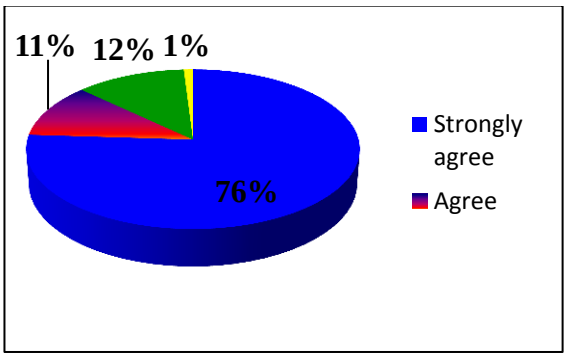


Figure 2: Impact of Credit Card Usage to Increase Spending

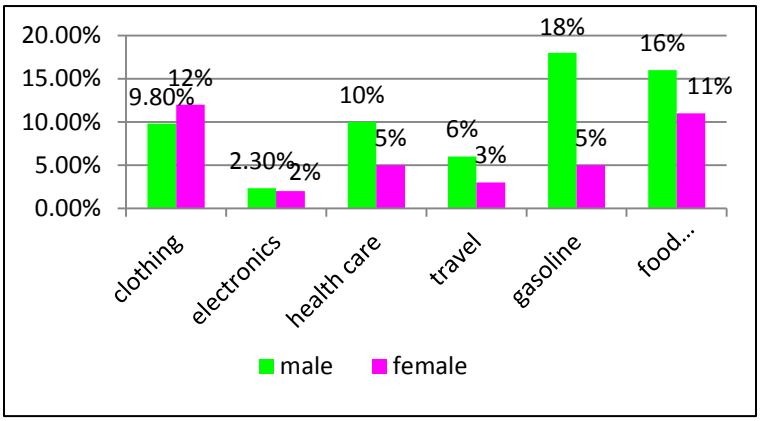
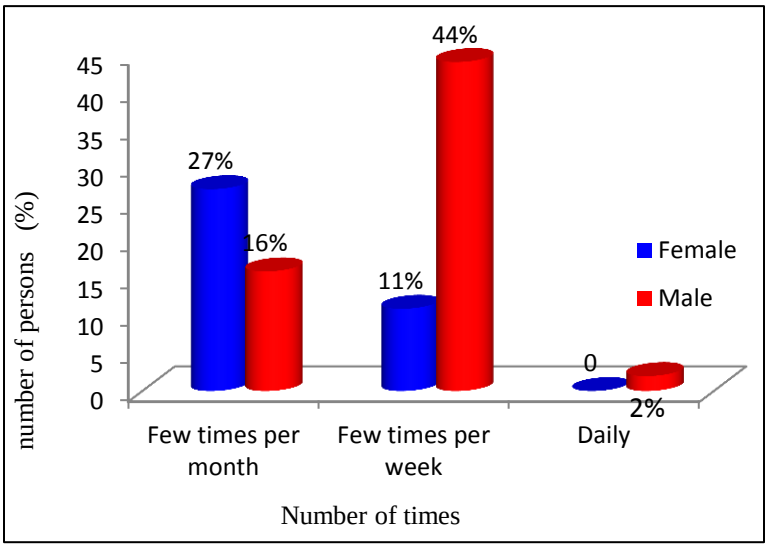


Figure 03: Number of times the credit card used



The regression equation was

$$Q = 46479.3 + 0.499X_1 + 4451.783X_2 + 4521.221X_3 + 3322.37X_4 + 183.21X_5 - 3694.84X_6 - 5756.53X_7$$

Considering the goodness of fit (R^2) of the model was 73%.

Monthly income, number of dependence, number of credit card holders within a family and leaves take per month were significant factors for monthly credit card expenditure. Marital status, total number of credit cards owned, length of ownership and income level were significant factor to determine the card holders' Payment practices. Credit limit, credit card usage frequency and total number of credits cards owned were significant credit card features. Most people (79%) would not consider about the price of the product when they used their card for transactions. The current community mostly used their credit card for food consumption which was recorded 27%, followed by gasoline as 23%.

Conclusion and Policy Recommendations

There was a difference in the monthly expenditure after using the credit card which means that caused to increase the spending level of a family. Monthly income, number of dependence, number of credit card holders within a family and leaves take per month were significant socio-economic factors in determining the monthly expenditure on credit card. There was a significant relationship between the Credit limit, number of times credit card used and total number of credit cards owned with monthly credit card expenditure. For instance, Themba & Tumedi, (2012) identified that total number of credits cards owned have a significant impact on monthly credit card expenditure. Card holders' marital status, total credit cards owned, length of ownership and income level were significant factors in determining the payment preferences of them. With regard to the payment preferences, several previous researches (Chen & Devaney, 2001; Kim & Devaney, 2001; Jirotmontree, (2010) found total credit cards owned and monthly income level were significant factors in determining the payment preferences of them. Considering the policy recommendations the government should promote the awareness programs to emphasize the gravity of unplanned spending and debt trap. As well as its' needed to expand the places that accepted credit card as a payment tool. Its' needed to introduce new technology to the credit card market specially to the retailers to provide better services to the credit card users.

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Substitutability of Automated Teller Machines for Tellers: With Special Reference to Bank of Ceylon

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Keywords: *Automated Teller Machines, Tellers, Constant Elasticity of Substitution.*

Introduction

It is widely discussed that the technology can be substituted for labour and hence reduces the employment opportunities for the people. Automated Teller Machines (ATMs) are located by the banks at convenient places such as at the airports, railway stations and not only at the bank's premises. ATMs were created for both marketing and operations implications.

Dunne et. al. (1996) have examined the relationship between technology and secular changes and cyclical dynamics concluding that technology could be used for nonproductive labour share or technology could substitute for labour while Rugambina (1994) has investigated perceptual and demographic variable to unearth factors that are more important for the usage of ATMs. Kumar et.al (2011) explained that ATMs are substitute for tellers. Attention for the substitutability of the teller and ATMs has become the area that has not been covered by the previous researchers. Therefore researcher selected that area by following Kumar et.al (2011).According to the evidence of the researches showed that investments on ATMs have generated bothpositive and negative impacts towards the bank.

Objective

Research has been conducted in both customer and institutional point of view. In organizational point of view, investments on automated systems based on Information Technology (IT) generate positive impact on the performance of the organization (Dunne et. al., 1996and Kumar et.al,2011). Customer satisfaction has examined with technology and found that customers are more satisfied with technological interventions than human interventions (Rugambina, 1994). Rifkin (2009) carried out a research from the point of view of employees and identified their preferences towards technology based systems and they have demonstrated that job opportunities have been eliminated by technology.Productive contribution of automated systems based on IT have been examined (Wilson, 1995 as cited by Kumar et.al, 2011) and found that productive contribution of IT is insufficiently small. Rifkin (2009) explained that technological innovations rapidly eliminate the work opportunities.

Thus, the objective of the research paper is to measure the degree of substitution of ATMs for number of tellers by the Bank of Ceylon(BOC), Sri Lanka.

Methodology

The study uses annual secondary time series data from 1990 to 2011 and employs a generalized form of the production function(Constant Elasticity of Substitutability production function) for following reasons.

i. Elasticity of substitution between parameters is constant on their domains.
ii. This allows to easily identifying the relationship between ATMs and Tellers.
iii. This approach has clearly defined the degree of substitutability between ATMs and tellers.

Thus, the Constant Elasticity of Substitution (CES) production function is defined as,

$$F = f(A,T) = [\alpha A^{\rho} + (1-\alpha)T^{\rho}]^{1/\rho} \quad \text{..... (1)}$$

where,

A is the number of ATMs, T is number of Tellers, α is the share parameter and ρ is the degree of substitutability between the inputs.

Partially differentiating the function, final double log linear function is derived as follows,

$$log\left(\frac{A}{T}\right) = \frac{1}{(\rho-1)} * log\left(\frac{1-\alpha}{\alpha}\right) + \frac{1}{(\rho-1)} * log\left(\frac{P_A}{P_T}\right) \quad \text{..... (2)}$$

where,

P_A is the cost per ATM and P_T is the cost per teller.

In order to estimate the above double log linear function following log linear regression model has been used.

$$log\, NR = \beta_1 + \beta_2\, log\, CR \quad \text{..... (3)}$$

where,

NR is the number of ATMs to number of tellers, CR is the cost per ATM to cost per teller, β_1 is the constant term and β_2 is the extent to which a change in the cost per ATM to cost per teller changes the number of ATMs to number of tellers.

Time series datarelated to ATMs are available from 1990 as BOC formally introduced ATMs to their customers in 1990. Researcher has adopted 22 observations from 1990 to 2011. Increasing in the number of observations would provide a robust result, but at the moment it is not possible.

Results

Table 1: Results of the Unit Root Test

Variable	t - statistic	Prob.
$log\ NR$	-4.720298	0.0013**
$log\ CR$	-6.084946	0.0392*

Notes: ** and * indicate significant levels at 1% and 5% respectively

Source: Authors calculation using E-views 7.

According to the results of the Augmented Dickey–Fuller test, both Log CR and Log NR are stationary and therefore they are used for analysis (Table 01).

Table 2: Results of the Log Linear Regression Model

Variable	Coefficient	SE	t-statistic	Prob.
Intercept	-0.115758	0.097532	-1.18687	0.0492*
Cost per ATM/Cost per teller	-1.361964	0.143446	-9.32914	0.0230*

Note: * indicates the significant level at 5%.

R-squared	0.813141	Adjusted R-squared	0.803799
Sum Squared Resid	1.269394	Prob. (F-Statistic)	0.021000
Durbin - Watson stat.	1.473309		

According to the analysis, all are significant at 5 percent level. One percent increase in the cost per ATM to cost per teller, decrease 1.36 percent in the number of ATM to number of teller. 81.31 percent of variation of the dependent variable is explained by the independent variable. For 22 observations and one explanatory variable, d_L= 1.24 and d_U = 1.43 at the 5 percent level. Thus, no autocorrelation is present in this model.

Comparison of CES production function with other cases

Case 1: Cobb–Douglasproduction function

CES production function (equation 2) could be converted into a Cobb-Douglas production function, in the limit when $\rho \to 0$ .As this expresses the linear substitution, setting $\rho = 0$in the limits, the derived function is,

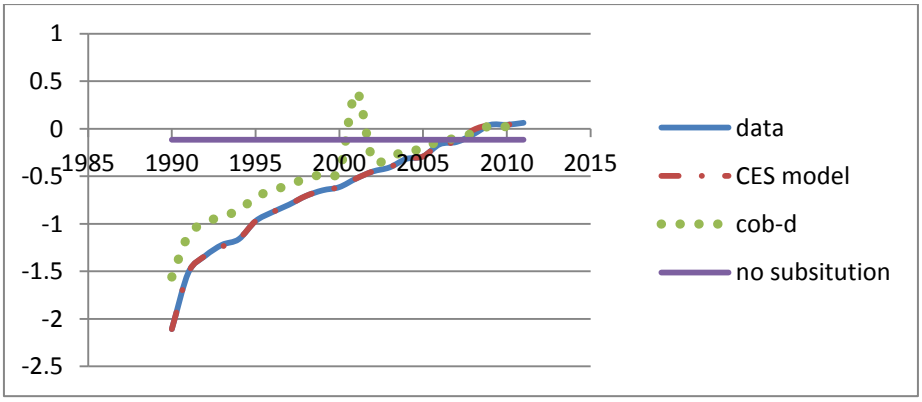
$$F = f(A,T) = ZA^{\alpha}T^{(1-\alpha)} \quad \text{..... (4)}$$

The calculated Cobb–Douglas production function received sum squared residual of 1.470454. The obtained sum squared residual in CES function is 1.2694. Therefore it is denotes that CES production function explains better than Cobb-Douglas production function.

Case 2: No substitution

CES production function (equation 2) could be used to depict the situation of no substitution, in the limit when $\to -\alpha$. Setting$\rho = -\alpha$ in the limits, obtained the constant term of the Leontief production function. The obtained sum squared residual in CES function is 1.2694 while in the case of no substitution it is 9.51, which depicts that CES production function is more appropriate to conduct the analysis

Figure 1: Log NR (number of ATMs/ number of tellers): Data, CES Production Function, Cobb-Douglas Production Function and No Substitutability.



Under that case constant value of log NR has been obtained and following figure shows the graphical presentation of the log NR with other cases.

Estimation of the degree of substitutability between ATM and Teller (ρ)

Considering equation 2, one can derive, the elasticity of substitution as

$$\beta_2 = \frac{1}{(\rho-1)} \quad \text{..... (5)}$$

Solving equation 5 forρ,

$$\rho = \frac{1}{\beta_2} + 1 \quad \text{..... (6)}$$

According to regression result, β_2= -1.36 and therefore, the value of ρ is 0.26. Thus, the degree of substitutability between ATM and teller is 0.26.

Conclusion and Policy Recommendation

As per the results of the study, one automated teller machine can replace 0.26 tellers.According to the findings of the Kumar et.al (2011) degree of substitutability between teller and ATM is 0.56. Chang and Schorfheide (2003) as cited by Kumar et.al (2011) have reported 0.4 substitutability of technology in household sector. This depicts that ATMs were not perfectly substitute for teller because the degree of substitutability is less than one.

The degree of substitutability is between 0.4 and 0.6 for previous researches, but in the research it is 0.26. The reason is that previous researches have been done for household and agricultural sector, but the research has been carried out in financial sector.

This study is an original work in terms of the data and application with regard to the selected bank and country. The researcher could not find any research done with respect to any Sri Lankan bank.

Decreasing cost per ATM than cost per teller was the one of the major reason to the expansion of ATMs. These require identifying new or enhancing policies regarding the employment and investment in ATMs.As any increase in ATMs

cause a threat to employment opportunities in the bank and these would add to the unemployment in Sri Lanka, thereby, dampening the economic growth. Therefore, there is a necessity in providing training facilities to the existing staff and expanding the activities in the bank, so that they can be safely shifted to new areas. Apart from thattechnological innovations would help the productivity of the bank, thereby increasing the growth in Sri Lankathe bank has to invest in technological innovations (ATMs). Thus, there exists a necessity of a proper redistribution policy so that the bank and country will both be benefited.

Findings of the study could be generalized to a similar bank that has similar characteristics to Bank of Ceylon and further exertion are to be done in order to generalize the scenario into different contexts.

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Human Capital and Labour

Resistance towards Entrepreneurship by Private Undergraduates

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Introduction

Entrepreneurship has been a growing phenomenon in the global context due to changes in lifestyles and attitudes of people. However, there are countries that see entrepreneurship as a risky or even the least preferred option for employment, out of which Sri Lanka in most instances has been such a country. The intention behind this particular study is to check on the resistance towards entrepreneurship by undergraduates of private universities.

According to Gamage and Wijesooriya, (2012:14), there are 46 private higher education institutions in Sri Lanka. The number of graduates produced by the Sri Lankan private sector higher education industry has gradually increased in the years 2008-10. This also could imply that the need and demand for private higher education is on the rise.

Whereas the percentage of private graduate output in terms of the total graduates produced is only 14%, while the majority is accounted for by the public sector of the industry. It is also seen that most graduates from the private sector come out of the IT stream that comprises approximately of 57%.

When considering unemployment figures and their issues, self employment could be one of the key factors for the reduction in the levels of unemployment in the country; this is where resistance towards entrepreneurship become relevant.

In relation to the status of employment of employed people in Sri Lanka in the year 2011, private employees are in the majority of 40.5%, where the percentage of own account workers accounted for 31.5%. At the outset it may

give an impression that the second preference for individuals in terms of employment after private employment is for entrepreneurship. However, the majority of this 31.5% of entrepreneurs are employed in the agriculture sector of the country. In the case of own account workers, more weightage exists in the agricultural sector implying that lesser number of entrepreneurs represent the industrial and service sectors. Due to lower penetration of entrepreneurship in the industrial and services sectors it is more likely to increase unemployment. Therefore it could be said that high level of entrepreneurial resistance of undergraduates in Sri Lanka causes a lower participation of entrepreneurship in industry and service sectors of the country.

The research problem identified in this case study is that the lower penetration of entrepreneurship in the industrial and services sectors may not assist to reduce unemployment levels in Sri Lanka. Based on the literature, the research questions can be formed as:

(i) What is the level of resistance towards entrepreneurship of private undergraduates in Sri Lanka?"

(ii) What factors associate with the level of resistance towards entrepreneurship of private undergraduates in Sri Lanka?"

(iii) What is the direction of relationship of those factors towards entrepreneurial resistance?"

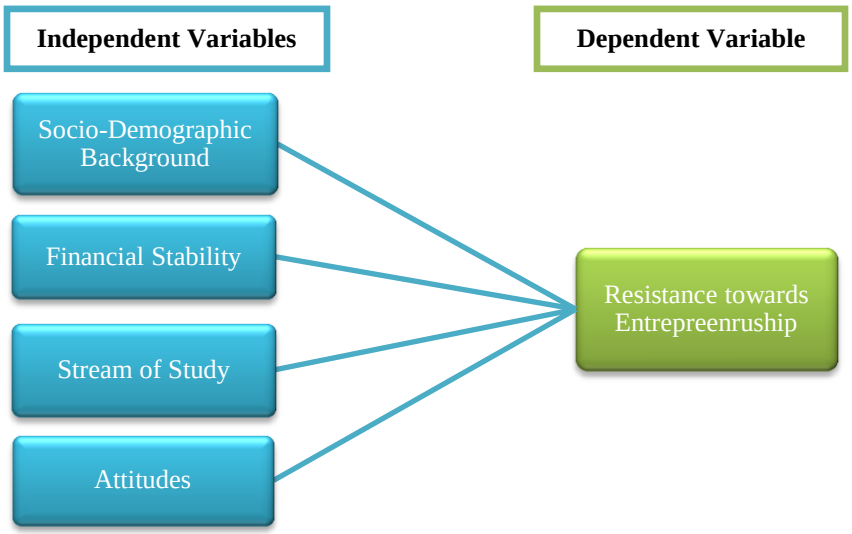
Objective

The objectives of the study are to identify the level of resistance towards entrepreneurship of private sector university undergraduates, identify the factors affecting such resistance and to find the direction of relationship of those factors with resistance towards self-employment.

Methodology

Conceptual Framework

This is a framework that provides a basis in which to determine the relationship between the independent and dependent variables and also to assess the impact of the independent variables on the dependent variable illustrated below:



Hypothesis

The following set of hypotheses (see appendix 1) has been derived from the conceptual framework in order to prove the relationship between the each indicator (from each independent variable) towards the dependent variable. There is a possibility that the variables may have no relationship between each other (null hypothesis) or vice versa. This is established in the section of data analysis.

Data Analysis

Three institutes- Imperial Institute of Higher Education (IIHE), Asia Pacific Institute of Information Technology (APIIT) American National College (ANC) were identified for the survey to undertake this study. One hundred and fifty questionnaires were distributed to respondents where each institute was provided with fifty questionnaires each.

The study was undertaken under descriptive and inferential analysis using SPSS. A descriptive study includes the basic analysis of general information through pie charts, bar charts and frequency tables whereas the inferential analysis of data would consist of statistical tools chi-square test and cross tabulations.

Findings of Study

Descriptive Analysis

It was identified that the majority of respondents are males (54%). Also most of the undergraduates are aged between the 20-25 age category whilst 113 of them represent the Western province of the country. With regard to the dependent variable of resistance towards entrepreneurship, both male and female prefer the private sector most and self-employment being the second most preferred choice of employment. Another unique response gathered was that females have more preference towards public sector employment when compared to males.

In terms of constraints that the respondents face in relation of self-employment, a cross-tabulation was formed for each type of constraint against gender of the respondent. Through such formation of cross tabulation it was found out that in general capital investment was seen as the most common constraint where it accounted to 83 undergraduates, out of which 53 were males. Most females thought that lack of knowledge, fear of failure and cultural barriers were major constraints in taking up self-employment, that too with regard to cultural barriers out of the 26 counts around 80% of respondents were females. A notable fact was also that out of the 150 respondents only two respondents believed that there is no constraint of any sort.

Inferential Analysis

This includes an analysis of data using the chi-square test and cross tabulation in order to assess the relationship between the independent variables and the dependent variable identified in the conceptual framework of this study. The chi-square test was used to identify if any association existed between the indicators and the dependent variable, where significance below 0.05 implies that an association existed. The cross tabulation was incorporated to identify the direction of relationship of such association, where in each case where a significance existed, the direction of relationship was found positive. For an example, as household income increased the level of resistance towards entrepreneurship increased. The same applies to the indicator of ability to

allocate funds for the degree program, indicator of attitude and the indicator of risk taking ability from the independent variable of Attitude.

Conclusion

In conclusion, it could be said that factors namely of Financial Stability and Attitude consisted of indicators that had an association with resistance towards entrepreneurship by private undergraduates whereas other factors like Socio-Demographic Background and Stream of Study did not possess any sort of relationship with the dependent variable. However, these may not be the only factors that could be considered to have an association with the dependent variable. Other external factors could be identified through further future research on this topic.

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Appendix 1:

Socio-Demographic Background

Indicators	**Significance of relationship**	**Direction of relationship**
Age	Insignificant (p> 0.05)	N/A
Family Job Status	Insignificant (p> 0.05)	N/A

Financial Stability

Indicators	**Significance of relationship**	**Direction of relationship**
Household Income	Significant (p< 0.05)	Positive
Steady Family Income	Insignificant (p> 0.05)	N/A
Fund Allocation	Significant (p<0.05)	Positive
Personal Expenses	Insignificant (p>0.05)	N/A

Stream of Study Attitude

Indica:	**Significance of relationship**	**Direction of relationship**
Stream of Study	Insignificant (p> 0.05)	N/A
Affiliation	Insignificant (p> 0.05)	N/A
Corporate Exposure	Insignificant (p> 0.05)	N/A
Entrepreneurial Modules	Insignificant (p> 0.05)	N/A

Indicators	**Significance of relationship**	**Direction of relationship**
Attitude	Significant (p<0.05)	Positive
Need	Insignificant (p> 0.05)	N/A
Personality	Insignificant (p> 0.05)	N/A
Level of patience and tolerance	Insignificant (p> 0.05)	N/A
Level of innovation	Insignificant (p> 0.05)	N/A
Risk	Significant (p<0.05)	Positive

Appendix 2:

Socio-Demographic Background

Hypothesis 1:

H0a: There is no relationship between *Age* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H1: *Age* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 2:

H0b: There is no relationship between *Family Job Status* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H2: *Family Job Status* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Financial Stability

Hypothesis 3:

H0c: There is no relationship between *Household Income* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H3: *Household Income* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 4:

H0d: There is no relationship between *Steady Family Income* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H4: *Steady Family Income* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 5:

H0e: There is no relationship between *Fund Allocation* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H5: *Fund Allocation* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 6:

H0f: There is no relationship between *Personal Expenses* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H6: *Personal Expenses* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Stream of Study

Hypothesis 7:

H0g: There is no relationship between *Stream of Study* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H7: *Stream of Study* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 8:

H0h: There is no relationship between *Affiliation* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H8: *Affiliation* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 9:

H0i: There is no relationship between *Corporate Exposure* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H9: *Corporate Exposure* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 10:

H0j: There is no relationship between *Entrepreneurial Modules* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H10: *Entrepreneurial Modules* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Attitude

Hypothesis 11:

H0k: There is no relationship between *Attitude* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H11: *Attitude* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 12:

H0l: There is no relationship between *Need* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H12: *Need* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 13:

H0m: There is no relationship between *Personality* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H13: *Personality* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 14:

H0n: There is no relationship between *Level of Patience and Tolerance* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H14: *Level of Patience and Tolerance* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 15:

H0o: There is no relationship between *Level of Innovation* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H15: *Level of Innovation* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Hypothesis 16:

H0p: There is no relationship between *Risk Taking Ability* and the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

H16: *Risk Taking Ability* is associated with the *Resistance towards entrepreneurship* of private university undergraduates in the Western Province.

Determining Factors of State University Arts Graduates' Employability inSri Lanka

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Keywords: *Determining Factors, Employability, Arts Graduates*

Introduction

Education and relevant skills are considered as necessary conditions for good labor market outcomes for individuals. Over the past decade, the number of students at higher education level has more than doubled in Sri Lanka (University Grants Commission, 2012). One of the main purposesof entering higher education, especially for university education, is to gain a suitable job with good compensation. But most university students are unable to find appropriate jobsin the job market (Central Bank 2010). With the rapid changes in job market, employers have been very much concernedto recruit capable employees with vast experience, skills, knowledge and attitudes thereby they can make the maximum benefits from them.Generally, higher level of education and longer tenure are expected to have a positive impact on employability. Mincer (1991) assumed that employees that have long years of education are able to find suitable jobs easily However, Groot and Maasen (2000) found that education has no significant impact in making workers more employable.In this scenario, global level universities are very much concerned with graduate employability as a means of overcoming the problem of graduate employment. So it is important to be in the position of being employable by being equipped with the determining skills or factors which leads to employability.

Employability is commonly seen as one of the indicators of the rapid changes associated with the globalization era of the past two decades. Employment and employability is not thesame thing and should be differentiated (Lee, 2002). Being employed means having a job and being employable means having the qualities needed to maintain employment and development in the workplace.

Nevertheless the theory of employability can be difficult to identify due to many factors that contribute to the idea of being employable. According to the research conducted by Hillage and Pollard (1998) in UK, "Employability is about being capable of getting and keeping fulfilling work". They proposed that employability consists of four main elements named "employability assets, deployment, presentation and finally external assets" (Pool and Swell 2007).

Further, Billing (2003) adds employers want employees who are "effective communicators, problem solvers and critical thinkers, and can work well within a team" (Billing, 2003). Amongst the numerous listings which identify the skills and attributes sought by employers, AGCAS Employability Briefing (2003), suggests the most important are: "motivation and enthusiasm, interpersonal skills, team working, oral communication, flexibility and adaptability, initiative, productivity, problem solving, planning and organization, managing own development and written communication" (HEA, 2006).Coldstream (1991) pointed out the communication and teamwork skills as some of the employers' expected characteristics of graduates. Strobart (1991) mentioned broad skills such as analytical, creativity, mathematical knowledge, literacy, motivation and leadership qualities of graduates are considerable factors in job market (Gunawardena,1997).

For the private sector employments manual/social/intellectual skills, knowledge, understanding and attitudes are some requirements (Cole, 1993). According to the "Pedagogy for Employability Group" (2004), they have been provide a list derived from research carried out over the last 25 years and suggested that employers expect generic skills have been developed in graduates and it included, creativity, flexibility, willingness to learn, working in a team, good oral communication, numeracy, time management and so on (Pool and Sewell, 2007). As per the survey conducted by the Chamber of Commerce in Sri Lanka in 1999 has mentioned that 'the ability for effective communication skills along with English, ability of interpersonal relationships, ability of leading a team and getting the results within a short time, ability of prioritization of work; initiation of work and intention of its development, open, proactive and pragmatic mind, computer literacy, ability of logical and rational thinking, general knowledge and personal hygiene and office and social

etiquette' as expected attributes and qualities by the employers from the graduates in addition to their academic qualifications. It can be argued that these factors cannot be developed by academic learning and evaluation methods.

Objectives of the Study

The study was aimed to identify the determining factors ofstate university graduates employability.

Research Methodology

This study was designed to identify the factors which significantly influenced to the employability based on literature.Employers were asked to respond to the statements using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (StronglyAgree). Additionally respondents were instructed to rate the level of importance of each items listed pertaining to employability skills. The population for the study consisted of 50 recruitment officers/ managers from private companies in Colombo district. The data was collected by distributing questionnaires and expertise interviews. Questionnaire was developed based on the knowledge gained from past studies conducted by international and local researches, institutes and applied only the most suitable variables for the Sri Lankan context. In the literature, the most commonly referred to individual resources that are of significance for employability are knowledge, skills and practice. Statistical treatment of the data included the use of the Statistical Package for Social Sciences (SPSS).Descriptive statistics were used to organize, summarize and describe the collected data. In addition Chronbach's Alpha was used for assessing the reliability of the questionnaire scored with aLikert-type scale.

Results and Discussion

This study was designed to provide informationregarding the factorsdetermining employability skills of Arts graduates in Sri

Lanka.Respondents were asked to express their agreement with the significance of each factor as its impact on employability. Questions were designed to get information about the factors of employability that are expected to follow university education. 15 factors were stated under three main components named, knowledge, skills and practice. Each factor was tested through a statement.

The reliability of the questionnaire was tested by using Cronbach's Alpha and result was presented as indicated below. According to the rules of thumb provided by George and Mallery (2003), > .7 value of Cronbach's Alpha specify the reliability of the given questionnaire.

Overall Reliability of the Questionnaire is:
Chronbach's Alpha = 0.72
Number of questions = 15

Table 2: Profile of Respondents

Items		Frequency	Percentage (%)
Gender	Male	37	74
	Female	13	26
Education Level	Certificate	-	-
	Diploma	7	14
	Bachelor's Degree	31	62
	Masters and Above	12	24
Current Position Level	Executive	38	76
	Senior Management	12	24
Working Experience	Less than Two	-	-
(Years)	Two – Four	15	30
	Four – Six	25	50
	More than Six	10	20

Source: Survey, 2013

The demographic items of the study are presented in the below table 2, "profile of respondents". Out of these respondents, 74% of respondents were male whilemain 26% were female. As for education level, it is found that most of the respondents were degree holders and executives. These respondents held

various types of bachelors' degrees from local and foreign universities. Also 50% of respondents were well experienced in their professions.

Respondents express their level of agreement with the given factors separately that they found as determining factors of graduates employability in Sri Lanka. Mean values expressed by study for each element under main three factors and rank of importance of each element according to the opinion of employers given in Table 3. These ranks were used to identify the significance of each factor in order to emphasize employers' choice on determining factors.

Questions on the knowledge of graduates basically focused on four factors. Table 3 shows the responses of all 50 employers on each factor.

Table.3.Descriptive Statistics on Knowledge of Graduates

Factors		Mean	Median	Mode	Std. Deviation	Rank
Field specific theoretical knowledge	K N O W L E D G E	3.76	4	4	.847	4
Grade of the degree		2.94	3	2	.935	2
Specialized in one subject area		2.98	3	4	1.000	3
Num. of researches done during the University period		2.88	3	2	1.154	1

Rank; 1= Least Important 4= Most Important

As per the ranking "Field specific theoretical knowledge" rankedas the most important factor that majority of respondents placed their agreement as a determining factor under employability. Respondents expressed their level of agreements of graduates skills based on their experiences of recruitment and working with graduate employees. According to the below table 4, mean,median and standard deviation values for employers responses are fluctuated in between 2.80and 3.76.

Table 4: Skills of Graduates

Factors		Mean	Median	Mode	Std. D:	Rank
Oral and written communication skills in English		3.56	4	4	.907	5
Extra-curricular activities in the university (Adoptability)		2.90	3	3	.707	2
Ranks / Positions hold in University committees / clubs (Decision Making)	S K I L L S	3.66	4	4	.930	6
Num. of events organized in the University (Organization & Planning)		3.32	3	2	1.205	3
Active participation in student union activities (Leadership)		2.80	3	2	1.010	1
Familiarity with Information Technology		3.43	3.5	4	.895	4
Sport colors / team membership (Team Working)		3.76	4	4	.870	7

Rank: 1= Least Important, 7=Most Important

As shown in Table 5, it is reported that the mean values of 'obtaining field training as a part of a degree program' and 'working experience during the university period' were ranked as determining factors of graduate employability.

According to the results of the study, it can be concluded that the some factors under three componentswere identified as determining factors for employability of graduates. By its names those factors were'Field specific theoretical knowledge andSpecialized in one subject area' under "knowledge" component, 'Sport colors / team membership (Team Working), Ranks / Positions hold in Universitycommittees / clubs (Decision Making), Oral and written communication skills in English' under "skill" component and 'Obtaining field training as a part of the degree program, Working experiences during theuniversity period' under "practice" component. Nevertheless the mean values of the mentioned factors are close to the "agree" level of respondents as determine factors of graduates' employability

Table 5: Descriptive Statistics on Obtained Training and Work Experience of the Graduates

Factors		Mean	Median	Mode	Std. D:	Rank
Completing degree within the given period (3 - 4)	P R A C T I C E	3.42	4	4	1.062	2
Obtaining field training as a part of the degree program		4.30	4	5	.707	4
Having external professional courses parallel to the degree program		3.18	3	3	.720	1
Working experiences during the university period		3.98	4	4	.892	3

Rank; 1=Least Important 4=Most Important

Conclusion

Especially the factors under "practice" component reported as the most significant throughout all the factors tested by the study. However the ultimate outcome of the study illustrates majority of the private sector employers give their first priority to professionals having training and experience with field specific theoretical knowledge and decision making, team working skills.

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A Comparative Study of Demand in Medical Care for Non-Communicable Diseases: Western vs. Alternative (With Special Reference to Arogya Hospital and Siddhayurvedini Ayurvedic Care Institute inGampaha)

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Keywords: *Non communicable Diseases, Western and Alternative Medical Care*

Introduction

Medical care is an input to the production of health. The importance of health has been recognized as a form of human capital for producing income and performing other activities (Grossman, 2000). People get treatment for their health problems under western medicine as well as complementary and alternative medicine. Western medicine can be identified as the most widespread and modern medical care system in the world. Complementary and alternative medicine refers to a variety of health practices as *Siddha*, *Ayurveda*, *Unani*, homeopathy, acupuncture, herbs, yoga etc.

According to Grossman (1972), health demand consists of two elements, viz. consumption effect and investment effect. Considering consumption, health makes people feel better and yields utility while investment increases the number of healthy days to work and to earn income. Further, three hypotheses concerning the impact of age, education and wage rate on the demand for health were examined by Grossman. A higher elasticity of demand will cause a huge decrease in the optimal stock of health with age while the demand for medical care rises with the wage. As for education, the more educated people would demand more health but less medical care.

Wagstaff (1986) conceptualized individual demand for health as based on the indifference map, the health production function and abudget constraint. In this view an individual likes to attain the highest indifference curve because it offers more consumption for a given level of health. The relationship between health inputs and health output is represented by a health production function, which is positive. The budget constraint indicates that individuals have only limited income to finance their health production and consumption activities.

In an empirical study, Acton (1975) found that high income earners are more likely to use the private sector medical care. Further he concluded that being a male, having health insurance by a family member and the distance to the service provider were significant factors related to demand in western medical care. Conversely Feng (2007) estimated the effect of medical insurance as not being significant for demand in western medical care. Some studies found a strong association between demand for western medical care and education (Fabbri&Monfurdini, 2002; Sahn, 2003; Sarah, 2004). Considering the gender and demand for medical care some researchers concluded that females are more likely to demand medical care (Miller, 1990; Eisenberg, 1991; Blais et al., 1997; Votova, 2003; Arcury et al., 2006).Regarding religion, Bello (2005) found that there was an inverse relationship with alternative medical care and religion. Age was identified as a significant factor in demand for alternative medical care by Zhang, 2006; Grants, 2007 and Sahn, 2009.Peter (1982) and Sandra (2002) concluded that residence sector affects demand for western medical care.

Further, Guethlin et al (2009) found a significant association between alternative medical care and employment status.Upchurch &Chyu (2004), Wade (2008), Metcalfe (2010) and Herman et al (2004) showed that there was a strong relationship between illness factors and demand for medical care. According to Zhang (2006),Guethlin et al (2009),Kanodia et al (2010) and Chang et al (2011),side effects and health beliefs affect the demand for medical care.

In the Sri Lankan context, with the rapid ageing of the population, there is a growing trend of non-communicable diseases. Most people tend to use these

two systems for non-communicable diseases such as asthma, cholesterol, hypertension, and arthritis. Demand for medical care of non-communicable diseases can be vary according to socio-cultural, demographic, health and economic factors. Therefore, to tackle the problem of non-communicable diseases it is important to identify the demand for western medicine and alternative medicine. Currently, there is a need for research into the development of alternative medicine in Sri Lanka and it will be helped for policy makers in the health sector.

Objective

The main objective of this study is to identify the comparative demand in medical care between western and alternative medicine related to non-communicable diseases.

Methodology

The primary data was collected from *Arogya* private hospital and *Siddhayurvedini*Ayurvedic care institute inGampaha. A systematic sample of was drawn of 100patients suffering from the non-communicable diseases, diabetes, arthritis, blood pressure and cholesterol. A Binary logistic regression model was estimated to distinguish the factors that affect demand for alternative and western medical care.

Result and Discussion

The results of the binary logistic regression are summarized below. According to the best fit logistic regression model, region of the residence and education are significant regarding the demand for western medical care.

As far as the sector of residence is concerned, by taking the urban sector as the reference category, a patient living in the rural area shows a demand forWestern medical care which is less than 0.109 times (72.8%) that of a patient living in

the urban sector. This finding is consistent with the findings of Peter (1982) and Sandra (2002).

Table 1: Model with Demand for Medical Care

Variable	**B**	**P value**	**Exp (B)**	**Reference category**
Residential Sector		0.01		Urban
Rural	-2.215	0.002	0.109	
Semi urban	0.138	0.831	1.148	
Education level		0.031		Degree
No schooling	-3.560	0.035	0.028	
5 years	-1.222	0.466	0.295	
8 years	-3.400	0.006	0.033	
10 years	-0.821	0.636	0.440	
11 years	-1.205	0.333	0.300	
13 years	-1.581	0.187	0.206	
Constant	3.205	0.005	24.647	

Dependent variable: Demand for western or alternative medical care
Source: Sample survey, 2013

The Education level also affects demand forWestern medical care; it decreases by 0.028 times (41.1%) for a patient with no schooling relative to those with a degree. The demand for western medical care decreases by 0.033 times (45.05%) for a patient with eight years' education.Education was identified as a significant factor in thedemand for medical care by Acton (1975). Conversely, Feng et al. (2007) found that lower educated people have a higher demand for medical care. When people have a high education level, they have better awareness of medical care;therefore they tend to have a higher demand for westernmedical care. Similar to this finding, Sarah et al. (2004) found that there is a significant association between education level and demand for private western medical care.

Conclusion and policy implications

The incidence of non-communicable diseases is a burning health issue in Sri Lanka. Most people tend to use both western and alternative medical care. According to this study, the sector of residence and the education level are statistically significant in determining medical care demand for non-communicable diseases.

In Sri Lanka, the cost of alternative medical care is not covered by the insurance system. It is better to introduce a health insurance scheme for alternative medical care. It will be very helpful to increase the demand for alternative medical care and decrease the cost of medical care in the long run.

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The Statistical Relationship between Marriage Payments and Muslims Education in Sri Lanka - Evidence from Ampara and Kandy District

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Key Words: Groom Price, Bride price, Human Capital, Marriage market and Regression

Introduction

Payments between families at the time of marriage are common practice in South Asia and also many areas in Sri Lanka. These payments can be substantial enough to affect the wealth distribution of the society, human capital and social problems.

The marriage payments come in various forms and sizes but can be classified into 'Groom price or Dowry' and 'Bride price or in Islamic term Mahr'. Groom price normally means given gift to the groom or his family either in cash or in kind by the bride family during marriage time. Bride price means gift given to bride either in cash or in kind by groom during the marriage. The influence of groom price is extremely higher than bride price to the society's human capital in Sri Lanka. Groom price is very high in North, Eastern and South Eastern Province and bride price is very high in most of the Muslim areas in Kandy and Kurunegala district. Compared with other Muslim area in Sri Lanka, groom price is very high in Ampara Muslim area and bride price is very high in Akkuruna Muslim area. Groom price has risen sharply in year by year in north eastern province in recently.

Marriage payments are one of the leading socio economic issues in South Asian region even in Sri Lanka. However, there are very few literature available in this field. Rao (1993), Sen (1998) and Anderson (2003) accepted that human capital was the main determinants of groom price. Sharma and Frijters (2007) argued that there were positive relationship between groom price and female human capital, especially level of education in Patna in India. The endogenous growth theory indicated that growth of human capital leads to economic growth of a country in the long run (Cortrightimpresa, 2001). In Sri Lanka there were no published studies about this linkage. Therefore, this study intends to fill this gap in economic literature.

Objectives

The objective of this study is to investigate the statistical linkage between marriage payments and Muslims education in Sri Lanka.

Methods

Data for this study have been collected by participated interview and questionnaire method. The list of marriage couples in 2011 and 2012 has been taken from Muslim wedding registrar in each village. In that list, 10 percentage of sample, particularly 50 families in each village in Ampara district, namely, Sainthamarudu, Addalaichanai and Akkarappathu and 120 families in Akkuruna have been selected conveniently by the researcher to this study. Researcher and assistants interviewed newly marriage couples, parents and family members to obtain detail information of wedding, dowry, Mahr, education, professional qualifications, properties, salary and family members. Components of payments (Jewelry, paddy land, house and house land, vehicles and money) have been transformed into monetary term using 2011 and 2012 year prices.

Graphical analysis is used to identify the underlying relationship between the selected variables. Confidence ellipse is used to identify the association between the variables.

E-Views and Minitab statistical softwares have been used for data analysis. This study is focusing to investigate the relationship between marriage payments and education level.

The Chi-square statistics used to find the association between marriage payments and level of education.

Anderson (2004) used demand-supply model to estimate the equilibrium groom price in the marriage market and he employed regression method to estimate the model. These studies also pursued regression method and demand side model to estimate the relationship. In the marriage market in Eastern province in Sri Lanka, only groom have economic value but bride does not Groom price is different from bride price. Similarly, determinants of groom price and determinants of bride price are not identical. Therefore, two different models are employed to estimate the determinants of groom price and bride price.

The model to identify the main determinants of groom price is developed by following way,

$$GP = f(AD,\ MS_g, MS_{gf}, MS_b, NS_b, P_{bf},\ PQ_G, PQ_B)$$

The model to identify the main determinants of bride price is developed by following way,

$$BP = f(AD,\ MS_g,\ MS_{bf},\ A_b,\ P_g,\ NS_b, PQ_G)$$

Where, GP: Groom Price / Dowry, BP: Bride Price, PQ: Professional Qualifications, MS_g: Monthly salary of groom, MSb monthly salary of bride, MS_{bf}: Monthly income of bride father, NS_b: Number of sisters in bride, A: attractiveness of bride and P: property owned by bride family and groom.

Ordinary least square method is used to estimate the parameters and dummy variables used to explain the professional qualifications.

Findings

Confidence ellipse indicates that in Ampara district, very high positive relationship between groom price and education level of groom (Figure -1A) and there is relatively very low positive relationship between groom price and education level of bride (Figure 1B). However, Confidence ellipses for bride price and level of education of groom (Figure 2 A) and also bride price and level of education of bride (Figure 2 B) do not show significant relationship in Akkuruna.

Figure 1: Association between Dowry and Education levels in Ampara

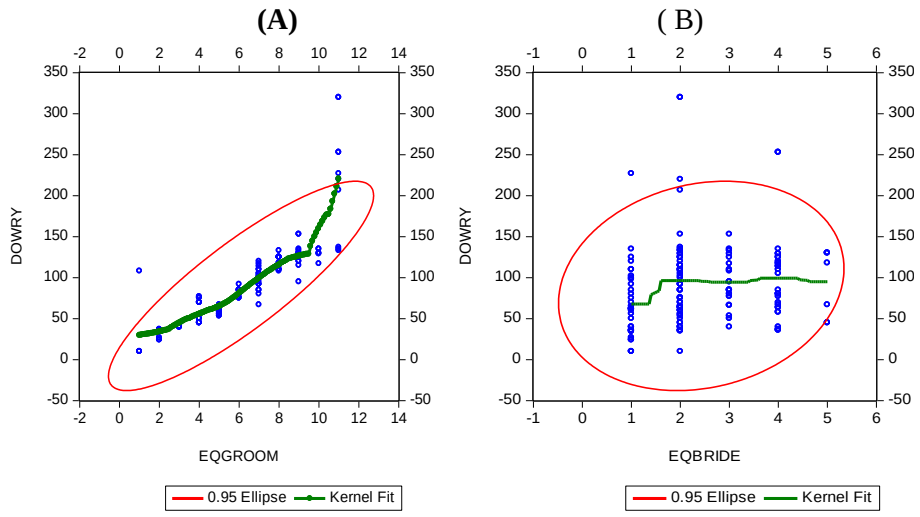
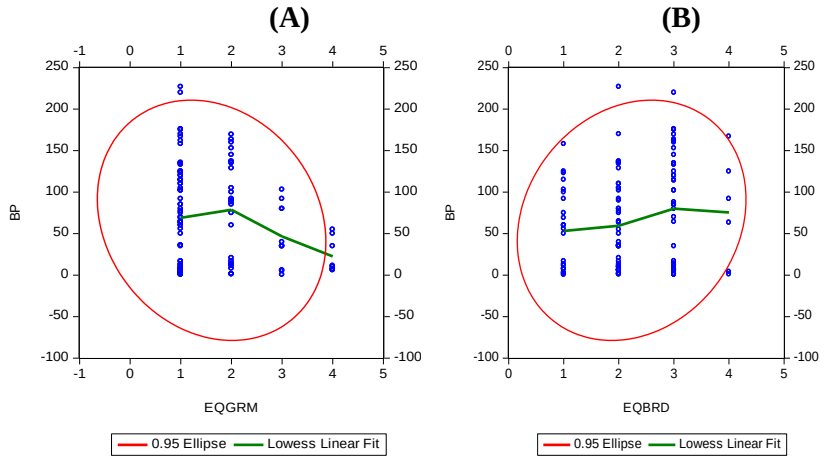


Figure 1: Association between Bride Price and Education levels in Akuruna



Regression analysis results[8] indicate that, 'R' square for groom price model is 0.78 and 'R' square for bride price model 0.62. Moreover, residuals diagnostic measures support to the robust results. Correlation coefficient between independent variables is close to zero. And also, these correlation coefficients are not statistically significant. Findings of this study indicate that there are several factors highly statistically significant to determine groom price. Grooms professional qualifications (P = 0.000)[9] is highly positively influences to the groom price in Ampara district. Similarly, there are several factors influences to determine bride price in Akkuruna. However, Educational qualification of groom (P = 0.12037) or bride (P = 0.21808) do not show any influences to determine bride price.

The empirical investigation indicate that in some case the average amount of dowry given to groom is approximately 100 time greater than bride's fathers average monthly income. Moreover, females are interested to increase their educational qualifications to obtain a suitable job to collect groom price for

[8] Owing to space constraints, we only present graphs relating to groom price from the survey in Ampara district and bride price from the survey in Akuruna. However, we describe regression results for both places in the text.

[9] Significant Value

their wedding. These findings clearly indicate that there is a strong statistical linkage between groom price and Muslims education but bride price does not.

Conclusion

Today, most of the families are falling under pressure to find appropriate partner for their daughters. Sometimes they need to pay huge price to buy suitable husband for their daughter. Professional qualifications and educational qualifications of groom play a significant role to determine groom price. Females also interestingly involve increasing their levels of education to collect dowry. Compared with other part of Sri Lanka, literacy rate of Muslim men and Women is very high in Ampara district. Finally, groom price is significantly positively influences on human capital of Muslims in Sri Lanka. However, groom price causes several harmful effects on wealth distribution of society and females social values.

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ශ්‍රී ලංකාවේ සේවා වියුක්තිය කෙරෙහි අතාත්වික වැටුප් අපේක්ෂණවල බලපෑම

දිලෙනි ගුණවර්ධන[1] සහ සුසිල් චමින්ද නවරත්න[2]

[1]ආර්ථික විද්‍යා හා සංඛ්‍යාන විද්‍යා දෙපාර්තමේන්තුව
පේරාදෙණිය විශ්වවිද්‍යාලය, පේරාදෙණිය
[2]මධ්‍යම පරිසර අධිකාරිය, බත්තරමුල්ල

මූලිකපද: *සේවා වියුක්තිය, අතාත්වික වැටුප් අපේක්ෂණ කල්පිතය, තත්‍ය වැටුප, අපේක්ෂිත වැටුප, සම්මත හෙක්මන් ක්‍රමවේදය.*

හැඳින්වීම

ශ්‍රී ලංකාවේ ඉහළ සේවා වියුක්තියට බලපාන හේතු සාධක පිළිබඳව සිදුකර ඇති පර්යේෂණවලදී විවිධ කල්පිතයන් හඳුන්වාදී ඇත.එම කල්පිතයන් අතර කුසලතා නොගැලපීමේ කල්පිතය (ILO 1971), පෙළ ගැසීමේ කල්පිතය සහ අතාත්වික අපේක්ෂණ කල්පිතය (ILO 1971) වැදගත් වේ.

කුසලතා නොගැලපීමේ කල්පිතයෙන් (Skill Mismatch Hypothesis)හැඟවෙන්නේ අධ්‍යාපනයක් ලද පුද්ගලයින් තමන්ගේ හැකියාවන්වලට වඩා ඉහළ මට්ටමේ හොඳ රැකියාවක් අපේක්ෂා කරන බවය (Rama 2003). මෙම කුසලතා නොගැලපීම, රැකියා අපේක්ෂා කරන්නන්ගේ හැකියාවන් සහ සේවා යෝජකයින්ගේ අවශ්‍යතා අතරත් සහ පුද්ගලයින් අපේක්ෂා කරන රැකියා සහ වෙළඳපොලෙහි සත්‍ය වශයෙන් පවතින රැකියා අතරත් පවතී (Lakshman 2002).පෙළ ගැසීමේ කල්පිතයෙන් (Queuing Hypothesis) සේවා වියුක්ත පුද්ගයින් හොඳ රැකියා බලාපොරොත්තුවීම නිසා රැකියා සඳහා පෙළ ගැසීමක් නිර්මාණය වන බව අදහස් වේ.

අතාත්වික අපේක්ෂණ කල්පිතයෙන් (Unrealistic Expectation Hypothesis) අදහස් කරන්නේ සේවා වියුක්තිකයින්ගේ රැකියා සම්බන්ධ පවතින අපේක්ෂණ වෙළඳපොල යථාර්ථයන් සමඟ නොගැලපීම නිසා ඉහළ සේවා වියුක්තියකට එය හේතුවන බවය. මෙහිදී වැටුප් යන සාධකය මත පමණක් පදනම්ව ගොඩනගා ඇති අතාත්වික වැටුප් අපේක්ෂණ කල්පිතයෙන්(Unrealistic Wage Expectation Hypothesis) ඉහළ අධ්‍යාපනයක් ලැබූවන් වෙළඳපොලෙහි ගෙවන වැටුපට වඩා වැඩි වැටුපක් සහිත රැකියා අපේක්ෂා කිරීම,ඉහළ සේවා වියුක්තියකට හේතුවන බව අදහස් වේ. 1971දී අතාත්වික අපේක්ෂණ කල්පිතය පිළිබඳ අන්තර්ජාතික කම්කරු සංවිධානය මුලින්ම

අදහස් දක්වා ඇත(ILO 1971). ඒ පිළිබඳ නැවත සලකා බැලීමක්Rama (2003)විසින් සිදුකර ඇත. සේවා වියුක්තිකයින්ගේ අපේක්ෂිත වැටුප සේවා නියුක්තිකයින්ගේ තත්‍ය වැටුප ඉක්මවා යයියන උපකල්පනය යටතේ 1995 ශ්‍රම බලකායේ වැටුප් සම්බන්ධ දත්ත පරීක්ෂාකර Rama (2003) අතාත්වික අපේක්ෂණ කල්පිතය ප්‍රතික්ෂේප කර ඇත. 1995 දත්ත මත අතාත්වික අපේක්ෂණ කල්පිතය සම්බන්ධව Rama ට ලැබුණු ප්‍රතිඵලවලට වඩා වෙනස් ප්‍රතිඵල වර්තමානයේ පැවතිය හැකිය. 2009ශ්‍රම බලකා සමීක්ෂණයේ නියැදියේ ප්‍රමාණය 1995 වර්ෂයට සාපේක්ෂව වැඩි කර ඇත. යොදගත් ප්‍රශ්නාවලියද යාවත්කාලීන කර ඇත. එමනිසා 2009 දත්ත යොදාගනිමින් මෙම කල්පිතය නැවත පරීක්ෂා කිරීම වැදගත් අධ්‍යයනයක් වනු ඇත.

අරමුණු

ශ්‍රී ලංකාවේ සේවා වියුක්තියට අතාත්වික වැටුප් අපේක්ෂණ බලපාන්නේද? යන්න පරීක්ෂා කිරීම මෙම අධ්‍යයනයේ මූලික අරමුණ වේ. පෞද්ගලික අංශය තුළත් ස්ත්‍රී සහ පුරුෂ කාණ්ඩ අතරත්ඉහත කල්පිතය වෙන් වෙන් වශයෙන් පරීක්ෂා කිරීමසහ වැටුප් සමඟ ඉංග්‍රීසි සාක්ෂරතාව දක්වන සම්බන්ධතාවය විශ්ලේෂණය කිරීම ද්විතීක අරමුණු වේ.

ක්‍රමවේදය

අතාත්වික වැටුප් අපේක්ෂණයක් පවතී නම් සේවා වියුක්තිකයින්ගේ අපේක්ෂිත වැටුප(W_E)සේවා නියුක්තිකයින්ගේ තත්‍ය වැටුප(W_A)ඉක්මවා යයි, යන උපකල්පනය යටතේ 2009 ශ්‍රම බලකා සමීක්ෂණයට අදාළ වැටුප් පිළිබඳ දත්ත පරීක්ෂා කරයි. ඒ සඳහා වයස, ස්ත්‍රී-පුරුෂභාවය, අධ්‍යාපන මට්ටම, ඉංග්‍රීසි සාක්ෂරතාව, අංශය, ගෘහමූලිකයාට ඇති ඥාති සම්බන්ධතාව, ජනවර්ගය සහ පළාත යනවිචල්‍යයන්හි ශ්‍රිතයක් ලෙස තත්‍ය වැටුප සහ අපේක්ෂිත වැටුප යොදාගෙන ප්‍රතිපායන ආදර්ශ ගොඩනගා ඇත. මෙම අධ්‍යයනය තුළසම්මත හෙක්මන් ක්‍රමවේදය (Standard Heckman Method)සහ අඩුතම වර්ග නිමාණක ක්‍රමය (Ordinary Least Squares-OLS)යටතේ බහු රේඛීය ප්‍රතිපායන ආදර්ශය (Multiple-linear Regression Model) භාවිතා කර ඇත.සම්මත හෙක්මන් ක්‍රමවේදය යටතේ නියැදිය තෝරා ගැනීමේදී ඇතිවිය හැකි දෝෂ වලක්වා ගැනීමේ අරමුණින් හඳුනාගැනීමේ විචල්‍යයන් ලෙස කුටුම්භයේ තරම, කුටුම්භයක සිටින ළමයින්ගේ අනුපාතය සහ කුටුම්භයක සිටින වැඩිහිටි අනුපාතය ලෙස විචල්‍යයන් තුනක් යොදාගෙන ඇත.

1 අපේක්ෂිත වැටුප සඳහා ප්‍රතිපායන සමීකරණය

අපේක්ෂිත වැටුප(W_E) = β_{0E} + $\beta_{1E}age_i$ + $\beta_{2E}sex_i$ + $\beta_{3E}education_i$+$\beta_{4E}literacy_i$ + $\beta_{5E}sector_i$ + $\beta_{6E}relationship_i$ + $\beta_{7E}ethnicity_i$ + $\beta_{8E}province$ + u_i

2 තත්‍ය වැටුප සඳහා ප්‍රතිපායන සමීකරණය

තත්‍ය වැටුප(W_A) = β_{0A} + $\beta_{1A}age_i$ + $\beta_{2A}sex_i$ + $\beta_{3A}education_i$+$\beta_{4A}literacy_i$ + $\beta_{5A}sector_i$ + $\beta_{6A}relationship_i$ + $\beta_{7A}ethnicity_i$ + $\beta_{8A}province_i$ +u_1

3 තත්‍ය වැටුප සඳහා තේරීමේ සමීකරණය (Selection equation)

δ_{0A}+ δ_{1A}*size of household*$_i$+ δ_{2A}*fraction of children*$_i$+δ_{3A}*fraction of old*$_i$+ $\delta_{4A}age_i$ + $\delta_{5A}sex_i$ +$\delta_{6A}education_i$+ $\delta_{7A}literacy_i$ + $\delta_{8A}sector_i$+$\delta_{9A}relationship_i$ + $\delta_{10A}ethnicity_i$ + $\delta_{11A}province_i$ + u_2> 0

βසහδමඟින් අදාළ විචල්‍යයන්හි බෑවුම් සංගුණකයන් දi මඟින් සේවා වියුක්ත/සේවා නියුක්ත පුද්ගලයාත් නියෝජනය වේ.uමඟින් විපතන පදනිරූපනයකරයි.මෙම අධ්‍යයනය සඳහා 2009 වර්ෂයට අදාළව ජනලේඛන හා සංඛ්‍යා ලේඛන දෙපාර්තමේන්තුව මඟින් සිදු කරන ලද ශ්‍රම බලකා සමීක්ෂණයට අදාළ කාර්තු හතරෙහි දත්ත යොදාගෙන ඇත. සමීක්ෂණයට භාජනය කළ නියැදියේ ප්‍රමාණය (උතුරු පළාත හැර) නිවාස ඒකක 20,260 කි.

ප්‍රතිඵල

ප්‍රතිපායන ආදර්ශ සඳහා පරායත්ත විචල්‍යයන් ලෙස සේවා නියුක්තිකයින්ගේ මාසික තත්‍ය වැටුපේ (රුපියල්) ලඝු අගයත් සේවා වියුක්තිකයින්ගේ අවම මාසික අපේක්ෂිත වැටුපේ (රුපියල්) ලඝු අගයත් යොදාගෙන ඇත. ස්වායත්ත විචල්‍යයන් ලෙස පුද්ගලයෙකුගේ වයස, වයසේ වර්ගය, ස්ත්‍රී අනුව්‍යාජ විචල්‍යය (පදනම් කාණ්ඩය පුරුෂ), පුද්ගලයින් ලබා ඇති අධ්‍යාපන මට්ටම් (පදනම් කාණ්ඩය පාසල් නොගිය පිරිස), ඉංග්‍රීසි සාක්ෂරතාවය (පදනම් කාණ්ඩය ඉංග්‍රීසි ලිවීමට හා කියවීමට හැකියාවක් නොමැති පිරිස), අංශය (පදනම් අංශය නාගරික අංශය), ගෘහමූලිකයාට ඇති ඥාති සම්බන්ධතාවය (පදනම් කාණ්ඩය ගෘහමූලික), ජනවර්ගයට (පදනම් කාණ්ඩය සිංහල) සහ පුද්ගලයෙකු පදිංචි පළාත (පදනම් පළාත බස්නාහිර) යොදාගෙන ඇත.

වගුව 1: තත්‍ය වැටුප් සහ අපේක්ෂිත වැටුප්වලට අදාළ ප්‍රතිපායන ප්‍රතිඵල

ස්වායත්ත විචල්‍යයන්	සමස්ත සේවා නියුක්තිකයින්ගේ තත්‍ය වැටුප	සමස්ත සේවා නියුක්තිකයින්ගේ අපේක්ෂිත වැටුප	පෞද්ගලික අංශයේ සේවා නියුක්තිකයින්ගේ තත්‍ය වැටුප	පෞද්ගලික අංශයේ රැකියා අපේක්ෂා කරන සේවා නියුක්තිකයින්ගේ අපේක්ෂිත වැටුප	ස්ත්‍රී		පුරුෂ	
					තත්‍ය වැටුප	අපේක්ෂිත වැටුප	තත්‍ය වැටුප	අපේක්ෂිත වැටුප
වයස (අවුරුදු)	.0437*** (16.71)	.0401*** (4.87)	.0470*** (14.45)	.0564*** (2.80)	.0300*** (6.27)	.01535 (1.15)	.0558*** (12.57)	.0610*** (5.14)
වයසේ වර්ගය (වයස × වයස)	-.0005*** (-16.03)	-.0005*** (-4.49)	-.0006*** (-15.05)	-.0008*** (-2.99)	-.0003*** (-4.77)	-.0002 (-1.04)	-.0007*** (-10.15)	-.0008*** (-4.73)
ස්ත්‍රී	-.360*** (-31.20)	-.2342*** (-9.54)	-.3941*** (-27.53)	-.3183*** (-3.72)	-	-	-	-
1-5 දක්වා අධ්‍යාපනය ලැබූ	.0099 (0.40)	.3636** (2.22)	-.0102 (-0.31)	.8810*** (3.34)	.0266 (0.68)	.4065 (1.61)	-.0077 (-0.18)	.2462 (1.04)
6-8 දක්වා අධ්‍යාපනය ලැබූ	.1499*** (5.80)	.2767* (1.73)	.0957*** (2.80)	.4999* (1.91)	.1402*** (3.15)	.4094 (1.59)	.1391*** (3.19)	.2004 (0.89)
9-10 දක්වා අධ්‍යාපනය ලැබූ	.3163*** (12.47)	.2910* (1.90)	.1921*** (5.72)	.4829* (1.92)	.4116*** (9.17)	.2594 (1.04)	.2618*** (5.59)	.2689 (1.25)
අ.පො.ස (සා/පෙළ)	.5554*** (20.65)	.3812** (2.47)	.3099*** (8.63)	.6909*** (2.63)	.7684*** (17.34)	.3572 (1.42)	.4608*** (10.24)	.3569 (1.64)
අ.පො.ස (උ/පෙළ)	.8097*** (29.03)	.4574*** (2.96)	.5013*** (13.06)	.9169*** (3.27)	.9539*** (20.78)	.4553* (1.81)	.7017*** (16.56)	.4053* (1.85)
උපාධි හෝ ඊට ඉහළ	1.231*** (37.91)	.7195*** (4.47)	1.246*** (22.97)	1.832*** (5.18)	1.262*** (19.57)	.6851*** (2.65)	1.230*** (19.11)	.7943*** (3.35)
ඉංග්‍රීසි සාක්ෂරතාව	.1669*** (12.09)	.0852*** (3.05)	.2155*** (11.44)	.2133* (1.89)	.1546*** (6.03)	.0680** (2.07)	.1905*** (9.07)	.1132** (2.33)
ග්‍රාමීය අංශය	-.0788 (-5.77)	.0418 (1.16)	-.0751*** (-4.27)	.2102* (1.71)	-.0979*** (-3.76)	.0402 (0.83)	-.068*** (-3.89)	.0382 (0.71)
වතු අංශය	-.0827*** (-3.37)	-.1316 (-1.34)	-.0403 (-1.32)	-.0659 (-0.23)	-.1218** (-2.29)	-.0921 (-0.69)	-.0126 (-0.20)	-.1400 (-0.97)
බිරිඳ හෝ ස්වාමියා	-.0059*** (-0.37)	-.1018 (-1.43)	-.1034*** (-4.84)	-.4069** (-2.04)	.0936*** (3.12)	-.0318 (-0.32)	.0302 (0.74)	-.1254 (-0.74)
දුව හෝ පුතා	-.0987*** (-7.18)	-.0230 (-0.40)	-.0804*** -4.50	-.0660 (-0.48)	-.0678** (-2.10)	.0388 (0.40)	-.104*** (-6.09)	-.0190 (-0.25)
වෙනත් ඥාතීන්	-.0413*** (-2.60)	.0119 (0.19)	-.0697*** (-3.49)	.3329** (2.03)	.0115 (0.36)	-.0037 (-0.04)	-.0274 (-1.02)	.1268 (1.41)
ජනවර්ගයන්ට සහ පළාත්වලට අදාළ අනුව්‍යාජ විචල්‍යයන්	ඇතුළත්ය	ඇතුළත්ය	ඇතුළත්ය	ඇතුළත්ය	ඇතුළත්ය	ඇතුළත්ය	ඇතුළත්ය	ඇතුළත්ය
යොදාගත් ප්‍රතිපායන ආදර්ශය (Regrission Module)	OLS	OLS	OLS	OLS	Heckman Model	OLS	Heckman Model	OLS
නිරීක්ෂණ ගණන (n)	15376	1179	8463	189	5078	636	10298	543
Censored observations					[4168]		[6955]	
නිර්ණන සංගුණකය (R^2)	0.4063	0.2087	0.3776	0.5334		0.1898		0.2179
χ^2					5753.19		5964.21	
					z-අගයන්	t- අගයන්	z-අගයන්	t- අගයන්

සටහන : 2009 වර්ෂයේ ශ්‍රම බලකා සමීක්ෂණයේ පළමු, දෙවන, තෙවන සහ සිව්වන කාර්තු හතරට අදාළ දත්ත භාවිතයෙන් නිමාණය කරනලද Z හෝ T අගයන් වරහන් තුළ දක්වා ඇත. සංඛ්‍යානමය වශයෙන් වෙසෙසි බැවුම් සංගුණකයන් 10%, 5% සහ 1% යන වෙසෙසි මට්ටම් සඳහා පිළිවලින් තරු එක, තරු දෙක සහ තරු තුන මගින් නිරූපනය කර ඇත.

වගුව 1 ට අනුව අනෙකුත් සාධක ස්ථාවරව තිබියදී පාසල් නොගිය පුද්ගලයෙකුට සාපේක්ෂව 9 වසරේ සිට 10 වසර, අ.පො.ස. (සා/පෙළ), අ.පො.ස. (උ/පෙළ) සහ උපාධිධාරී හෝ ඊට ඉහළ අධ්‍යාපනයක් ලැබූ පුද්ගලයෙකු වීම නිසා අපේක්ෂිත

වැටුපට වඩා තත්‍ය වැටුප ඉහළ යයි. 2009 ශ්‍රම බලකා සමීක්ෂණ දත්ත අනුව තහවුරු වන්නේ පුද්ගලයෙකු ලබන අධ්‍යාපනය අපේක්ෂිත වැටුප ඉහළයාමට වඩා තත්‍ය වැටුප ඉහළයාම කෙරෙහි සංඛ්‍යානමය වශයෙන් වෙසෙසි බලපෑමක් ඇති කරන බවය. ඒ අනුව අතාත්වික වැටුප් අපේක්ෂණයක් පවතී නම්, අපේක්ෂිත වැටුප තත්‍ය වැටුප ඉක්මවා යා යුතුය; යන උපකල්පනය සනාථ නොවේ. එමනිසා ශ්‍රී ලංකාවේ සේවා වියුක්තියට අතාත්වික අපේක්ෂණවල බලපෑමක් පවතී යන කල්පිතය ප්‍රතික්ෂේප වේ.ස්ත්‍රී සහ පුරුෂ ඛාණ්ඩ සඳහා කල්පිතය වෙන වෙනම පරීක්ෂා කිරීමේදී අ.පො.ස. (උ/පෙළ) සහ උපාධිධාරී හෝ ඊට ඉහළ අධ්‍යාපනයක් ලැබූවන් අතර අපේක්ෂිත වැටුප ඉහළයාමට වඩා තත්‍ය වැටුප ඉහළ යන බව පැහැදිලි වේ. ඒ තුළින් ගම්‍ය වන්නේ අතාත්වික වැටුප් අපේක්ෂණ කල්පිතය ස්ත්‍රී-පුරුෂ බාණ්ඩ සඳහා වෙනම වෙනම පරීක්ෂා කළද එය සනාථ කිරීමට ප්‍රමාණයවත් සාක්ෂි නොමැති බවය. නමුත් පෞද්ගලික අංශයේ සේවා නියුක්තිකයින්ගේ තත්‍ය වැටුප් සහ පෞද්ගලික අංශයේ රැකියා අපේක්ෂා කරන සේවා වියුක්තිකයින්ගේ අපේක්ෂිත වැටුප් පරීක්ෂා කිරීමේදී තත්‍ය වැටුපට වඩා අපේක්ෂිත වැටුප ඉහළයාම කෙරෙහි වෙසෙසි බලපෑමක් ඇති නිසා සේවා වියුක්තියට අතාත්වික අපේක්ෂණවල බලපෑමක් පවතී යන කල්පිතය සනාථ වේ.

ඉංග්‍රීසි භාෂාව ලිවීමට සහ කියවීමට හැකියාවක් නොමැති අයෙකුට සාපේක්ෂව එම හැකියාව සහිත අයෙකුවීම නිසා තත්‍ය වැටුප මෙන්ම අපේක්ෂිත වැටුපද ඉහළ යයි. අපේක්ෂිත වැටුපේ ඉහළයාමට වඩා තත්‍ය වැටුපේ ඉහළයාම කෙරෙහි ඉංග්‍රීසි සාක්ෂරතාවවැඩි වශයෙන් බලපා ඇත. ඒ තුළින් ශ්‍රී ලංකාව තුළ ඉංග්‍රීසි සාක්ෂරතාවය සඳහා වෙළඳපොල විසින් කරන ගෙවීම අපේක්ෂිත ප්‍රමාණයට වඩා වැඩි බව තහවුරු වේ.

නිගමන

2009 ශ්‍රම බලකා සමීක්ෂණයේ දත්ත අනුව අධ්‍යාපනය මඟින් තත්‍ය වැටුප සහ අපේක්ෂිත වැටුප මත කරන බලපෑම සන්සන්දනය කිරීමෙන් අතාත්වික වැටුප් අපේක්ෂණ කල්පිතය ප්‍රතික්ෂේප කර ඇත. ස්ත්‍රී-පුරුෂ කාණ්ඩ සඳහාවෙන් වෙන්ව පරීක්ෂා කළද අතාත්වික වැටුප් අපේක්ෂණ කල්පිතය පිළිගැනීම සඳහා සාක්ෂි නොමැත.නමුත් පෞද්ගලික අංශය තුළ පමණක් සේවා වියුක්තියට අතාත්වික අපේක්ෂණවල බලපෑමක් පවතී යන කල්පිතය සනාථ වේ.ශ්‍රී ලංකාව තුළ ඉංග්‍රීසි සාක්ෂරතාව සඳහා වෙළඳපොල ගෙවීම අපේක්ෂිත ප්‍රමාණයට වඩා ඉහළය. එමනිසා රැකියා අපේක්ෂා කරන්නන් තුළ ඉංග්‍රීසි සාක්ෂරතාවය වර්ධනය කිරීම සේවා වියුක්තිය පහළ දැමීමට අනුගමනය කළහැකි වැදගත් ක්‍රියාමාර්ගයක් වනු ඇත.

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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වයස්ගත ජනගහනයේ ශ්‍රම සැපයුම තීරණය වීම කෙරෙහි බලපාන සාදකථන: (බුලත්සිංහල ප්‍රාදේශීය ලේකම් කොට්ඨාශය ඇසුරින්)

ඩී. එන්. එල්. ලක්මාලි සහ එම්. ඩී. ජේ. ඩබ්ලිව් විජේසිංහ

ආර්ථික විද්‍යා හා සංඛ්‍යාන විද්‍යා අධ්‍යනාංශය
ශ්‍රී ලංකා සබරගමුව විශ්වවිද්‍යාලය

මූලපද: *වයස්ගත ජනගහනය, ශ්‍රම සැපයුම, ප්‍රවර්ධන ප්‍රතිපාදන ආකෘතිය.*

හැඳින්වීම

එක්සත් ජාතීන්ගේ ඇස්තමේන්තුවලට අනුව 1980 ගණන්වල සිට වේගවත් වයස්ගත වීමේ ක්‍රියාවලියක් සිදුවන ආසියාවේ ප්‍රධාන රට වන්නේ ශ්‍රී ලංකාවයි. 2025 වර්ෂය වනවිට මෙම වයස්ගත ජනගහනය 25%ක් වනු ඇතැයි ද, 2050 වර්ෂයේදී 50%ක් වනු ඇතැයිද පුරෝකථනය කර ඇත. එබැවින් ජනගහන වියපත්වීමේ ගැටළුව ප්‍රබල බලපෑම් සහගත ක්‍රියාවලියක් ලෙස වර්තමානයේදී හඳුනාගෙන ඇත.

ශ්‍රී ලංකාවේ ජනගහනය සම්බන්ධයෙන් ඇතිවූ කැපී පෙනෙනම වෙනස වන්නේ වයස්ගත ජනගහනය වැඩි වීමත් සමඟම ශ්‍රම හමුදාවෙහි සිටින වයස්ගත ශ්‍රමිකයන්ගේ ප්‍රතිශතය ක්‍රමයෙන් ඉහළ යාමයි. වයස්ගත ජනගහනයේ ප්‍රතිශතය වැඩිවීමත් සමඟම එය රටක ශ්‍රම හමුදාවට කෙසේ බලපාන්නේද සහ ඔවුන්ගේ ශ්‍රම සැපයුම තීරණය වීමට බලපාන සාධක පිළිබඳ සලකා බැලිය යුතු වන්නේ එය ආර්ථිකය හා සෘජුව සම්බන්ධවන බැවිනි.ශ්‍රී ලංකාවේ මෙම වියපත් වූවන්ගේ ආර්ථික සුරක්ෂිතතාවය අවම මට්ටමක පවතින අතර ශ්‍රම සහභාගිත්වය ඉහළ නැංවීම මඟින් ආර්ථික සුරක්ෂිතතාවය ලබාගැනීම ඉතාමත් වැදගත් වේ.

Bill (2005)වයස්ගත පුද්ගලයන්ගේ ශ්‍රම සැපයුම තීරණය වීමට බලපෑ සාධක, ප්‍රධාන වශයෙන් කොටස් 04ක් යටතේ දක්වා ඇත. එනම් වයස්ගත පුද්ගලයන්ගේ වැඩ කිරීමට ඇති කැමැත්ත, ව්‍යක්තීය පළපුරුද්ද, පුද්ගල ලක්ෂණයන් සහ සේවා ස්ථානයේ ඇති පහසුකම් වයස්ගත පුද්ගලයන්ගේ ශ්‍රම සැපයුම තීරණය වීම කෙරෙහි බලපානු ලබන බව පෙන්වා දී ඇත. තවද Vodopivecසහ Arunatilake(2008)සිදුකළ පර්යේෂණයට අනුව වයස්ගත පුද්ගලයන්ගේ සේවා නියුක්තිය උදෙසා අනිවාර්ය විශ්‍රාම යෑමේ රෙගුලාසි බලපෑම් කරන බවත් වයස්ගත පුද්ගලයන්ගේ ශ්‍රම බලකා සහභාගිත්වය වර්ධනය කිරීම උදෙසා වඩා නම්‍යශීලි විශ්‍රාම යෑමේ ප්‍රතිපත්තියක් සකස් කළ යුතු බව පෙන්වා දී ඇත.

තවද විවාහක වයස්ගත පුරුෂයන්ගේ ශ්‍රම සැපයුම තීරණය වීම උදෙසා බලපානු ලබන සාධක පිළිබඳ Chuangසහ Jennjou(2009) සිදුකර ඇති පර්යේෂණයට අනුව විවාහක වයස්ගත පුරුෂයන්ගේ ශ්‍රම සැපයුම තීරණය වීම උදෙසා බලපානු ලබන සාධක ලෙස විවාහක වයස්ගත පුද්ගලයන්ගේ ශ්‍රම සැපයුම බිරිඳගේ සේවා නියුක්තිය, ඔහුගේ අධ්‍යාපන මට්ටම, වයස, දරුවන් සංඛ්‍යාව බිරිඳගේ අධ්‍යාපන මට්ටම යන සාධක මත රඳා පවතින බව මොවුන් විසින් පෙන්වා දී ඇත.අඩු අධ්‍යාපනයක් ලබා ඇති වයස්ගත පුද්ගලයන්ගේ සේවා නියුක්ත වීමට කැමැත්තක් දැක්වුවද ආර්ථික අවපාත තත්වයක් වැනි අවස්ථාවකදී ශ්‍රම වෙළඳපළ තුළ ඔවුන්හට ඉවත්වීමට සිදුවන බවත් මෙවැනි කළු කරපටි හෝ අඩු අධ්‍යාපනයක් ලබා ඇති ශ්‍රමිකයන්ගේ ආර්ථික සුරක්ෂිතතාවය උදෙසා ප්‍රතිපත්ති සකස් කළ යුතු බව මෙම පර්යේෂකයන් විසින් පෙන්වා දී ඇත.

වයස්ගත පුද්ගලයන්ගේ ශ්‍රම සැපයුම තම දරුවන් යැපීම් කටයුතු සඳහා මුදලක් ලබා දීම මත රඳා පවතින බව Nguyen, et al., (2012) සිදුකළ පර්යේෂණයට අනුව පෙන්වා දී ඇති අතර මෙහිදී ඔවුන් වයස්ගත පුද්ගලයන් සඳහා ප්‍රමාණවත් විශ්‍රාම වැටුපක් නොපවතී යැයි උපකල්පනය කර ඇත. යැපීම් කටයුතු සඳහා දරුවන් විසින් මුදල් ලබාදෙන වයස්ගත පුද්ගලයන්ගේ ශ්‍රම සැපයුම දරුවන්ගෙන් මුදලක් නොලැබෙන දෙමාපියන්ගේ ශ්‍රම සැපයුමට සාපේක්ෂව අඩු අගයක් ගන්නා අතර මූල්‍ය නොවන ප්‍රතිලාභ මත එනම් තෘප්තිය වැනි සාධක මත ඔවුන්ගේ ශ්‍රම සැපයුම රඳා පවතින බව මෙම පර්යේෂකයන් විසින් පෙන්වා දී ඇත. තවද සංවර්ධනය වෙමින් පවතින රටවල්වල වයස්ගත දෙමාපියන්ගේ සේවා නියුක්තිය අඩු වීම කෙරෙහි දරුවන් සමඟ එකට ජීවත් වීම සහ දරුවන්ගෙන් ලැබෙන සංක්‍රාම මුදල් හේතු වී ඇති බවLisa සහ Deborah(2005) සිදුකළ පර්යේෂණයට අනුව පෙන්වා දී ඇත.

අධ්‍යයනයේ අරමුණ

ශ්‍රී ලංකාවේ වයස්ගත කණ්ඩායම් වලශ්‍රම සැපයුම තීරණය වීම කෙරෙහි බලපාන සාධක පිළිබඳ අධ්‍යයනය කිරීම මෙම අධ්‍යයනයේ මූලික අරමුණ විය.

ක්‍රමවේදය

මෙම පර්යේෂණයට අදාලව බස්නාහිර පළාතේ, කළුතර දිස්ත්‍රික්කයේ, බුලත්සිංහල ප්‍රාදේශීය ලේකම් කොට්ඨාශයට අයත් ග්‍රාමසේවා වසම් හයක් ග්‍රාමීය, නාගරික, වතු යන අංශ තුන ආවරණය වන පරිදි වයස්ගත පුද්ගලයන් 150ක නියැදියක් ස්තෘත නියැදීම හා සරල සසම්භාවී නියැදීම මඟින් තෝරා එම නියැදියට ප්‍රශ්නාවලි යොමු කිරීම මගින් හා සම්මුඛ සාකච්ඡා ක්‍රමය මඟින් ප්‍රාථමික දත්ත රැස්කර ගන්නා ලදී. වයස්ගත පුස්ගලයන් සේවා නියුක්ත වීම හෝ නොවීම කෙරෙහි බලපා ඇති සාධක

හඳුනා ගැනීම සඳහා ප්‍රවර්ධන (Logit) ප්‍රතිපායන ආකෘතිය භාවිත කරමින් දත්ත විශ්ලේෂණය සිදුකර ඇත.

$$\text{Logit (Px)} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n^{xn}$$

Px=සේවා නියුක්ත වීම හෝ නොවීම

X_i =සේවා නියුක්ත වීම හෝ නොවීම කෙරෙහි බලපා ඇති ආර්ථික,සමාජ හා භූගෝලීය සාධක

ප්‍රතිඵල විශ්ලේෂණය

දත්ත විශ්ලේෂණයේ දී ගොඩනගා ගත් පූර්ණ ප්‍රතිඵල සහිත සුදුසුම ප්‍රවර්ධන ප්‍රතිපායන ආකෘතිය පහත වේ.

$$logit(\text{Px}) = 1.832 - 2.246X_1 - 1.854X_2 + 0.426X_3 - 1.176X_4 - 1.094X_5$$

ඉහතවගුවට අනුව ප්‍රවර්ධන ප්‍රතිපායන ආකෘතිය යටතේ වයස්ගත පුද්ගලයින්ගේ සේවා නියුක්තිය තීරණය වීමසඳහා බලපානු ලබන සාධක ලෙස පුද්ගලයින්ගේ වයස,ඔවුන්ගේ ශ්‍රම නොවන ආදායම සහ ස්ත්‍රී පුරුෂ භාවය යන විචල්‍යයන් වෙසෙසියාත්මක මට්ටමක පවතී.

වයස අවුරුදු 85 ට වැඩි පුද්ගලයින්ගේ සේවා නියුක්තියට සාපේක්ෂව වයස අවුරුදු 65-74 පුද්ගලයින්ගේ සේවා නියුක්තිය 0.166 වාරයකින් එනම් 53% ක සම්භාවිතාවයකින් ද වයස අවුරුදු 75-84 පුද්ගලයින්ගේ සේවා නියුක්තිය 0.157 වාරයකින් එනම් 49% ක සම්භාවිතාවයකින් ද සේවා නියුක්තිය ඉහළ යාමක් සිදුවේ. වයස්ගත පුද්ගලයන්ගේ සේවා නියුක්තිය ශ්‍රම නොවන ආදායම් තත්වය මත රඳා පවතින අතර ශ්‍රම නොවන ආදායම් තත්වය වැඩි වීමත් සමඟ විවේකය සඳහා ඉල්ලුම ක්‍රමයෙන් වැඩි වී ඇත. ශ්‍රම නොවන ආදායම 10000+ අතර ප්‍රමාණයක් ලබන පුද්ගලයෙකුට සාපේක්ෂව ශ්‍රම නොවන ආදායම 0-5000 අතර ප්‍රමාණයක් ලබන පුද්ගලයෙකුගේ සේවා නියුක්තිය 1.531 වාරයකින් එනම් 90% සම්භාවිතාවයකින් ඉහළයාමක් දක්නට ලැබේ.

වගු අංක 1: වයස්ගත පුද්ගලයන්ගේ සේවා නියුක්තිය සඳහා බලපානු ලබන සාධක හඳුනාගැනීම සඳහා සුදුසුම ප්‍රමාණවත් ප්‍රවර්ධන ප්‍රතිපායන ආකෘතියේ ප්‍රතිඵල.

විචල්‍යය	පරාමිති	ඛණ්ඩාංකය	Wald	DF	P –value	Exp(B)	Odd Ratio%	Reference Category
A	වයස		19.947	2	.000			වයස 85+
	වයස(65-74)(X_1)	-2.246	16.956	1	.000	.166	53	
	වයස(75-84) (X_2)	-1.854	12.602	1	.000	.157	49	
B	ශ්‍රම නොවන ආදායම		9.123	2	.010			10000+
	0 - 5000 අතර (X_3)	0.426	2.680	1	.102	1.531	90	
	5000 - 10000 අතර (X_4)	-1.176	.250	1	.617	0.308	65	
C	ස්ත්‍රී පුරුෂ භාවය (X_5)	-1.094	6.220	1	.013	.335	68	ස්ත්‍රී
	නියතය	1.832	5.512	1	.019	6.248		

මූලාශ්‍රය:නියැදි සමීක්ෂණය, 2013

වයස්ගත පුද්ගලයින්ගේ සේවා නියුක්තිය තීරණය වීමසඳහා බලපානු ලබන ස්ත්‍රී පුරුෂ භාවය පිළිබඳ සළකා බැලීමේදී වයස්ගත ස්ත්‍රී අයට සාපේක්ෂව පුරුෂයින් සේවා නියුක්ත වීම 0.335 වාරයකින් එනම් 68% සම්භාවිතාවයකින් ඉහළ ගොස් තිබේ. එනම් වයස්ගත පුරුෂයින් අතර ඉහළ සේවා නියුක්ති තත්වයක් දැකිය හැකිය.

නිගමන සහ යෝජනා

ශ්‍රී ලංකාවේ වියපත් වූවන්ගේ ආර්ථික සුරක්ෂිතතාවය අවම මට්ටමක පවතින අතර ශ්‍රම සහභාගිත්වය ඉහළ නැංවීම මඟින් ආර්ථික සුරක්ෂිතතාවය ලබාගැනීම ඉතාමත් වැදගත් වේ. මෙම හේතුව නිසාම ශ්‍රී ලංකාවේ වයස්ගත පුද්ගලයන්ගේ ශ්‍රම සැපයුම

තීරණය වීම සඳහා බලපාන සාධක හඳුනාගනිමින් වයස්ගත පුද්ගලයන්ගේ ශ්‍රම සැපයුමේ වර්තමාන තත්ත්වය හඳුනා ගැනීම මෙම අධ්‍යයනයේ අරමුණු විය. මෙම අධ්‍යයනයට අනුව ප්‍රවර්ධන ප්‍රතිපාදන ආකෘති විශ්ලේෂණයෙන් පසු ශ්‍රම සැපයුම කෙරෙහි බලපානු ලබන සාධක ඇතුළත් සුදුසුම ආකෘතිය සඳහා පුද්ගලයාගේ වයස, ස්ත්‍රී පුරුෂ භාවය සහ ශ්‍රම නොවන ආදායම් තත්වය යන සාධකයන් අන්තර්ගත විය. වයස්ගත පුද්ගලයන්ගේ ආර්ථික සුරක්ෂිතතාවය උදෙසා රජය මඟින් ලබාදෙන සංක්‍රාම මුදල් සමඟම ආර්ථික කටයුත්තකට දායකකර ගැනීමට අවශ්‍ය පුහුණු වැඩසටහන්, සේවා නියුක්තියට ඇවැසි සියළු පහසුකම් දීපව්‍යාප්තව වර්ධනය කළ යුතුය. වයස්ගත පුද්ගලයන්ගේ වැටුප් සඳහා අවම වැටුප් ප්‍රතිපත්ති ක්‍රියාත්මක කිරීම හා ස්වයං රැකියා වල නියුක්ත වීමට කැමැත්තක් ඇති වයස්ගත පුද්ගලයන් සඳහා අවශ්‍ය පුහුණු, මූල්‍ය, තාක්ෂණික සහයන් ලබාදිය යුතුය.වයස්ගත පුද්ගලයන් උදෙසා නම්‍යශීලි වැඩ පැය ගණන් හඳුන්වා දීමට, අනිවාර්ය විශ්‍රාම යෑම් ක්‍රමය වෙනුවට නම්‍යශීලි විශ්‍රාම යෑම් ක්‍රමයක් හඳුන්වා දීමට, පෞද්ගලික අංශය දිරිමත් කිරීම මඟින් වයස්ගත පුද්ගලයන්ගේ සේවා නියුක්තිය වර්ධනය කර ගත හැක.

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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சுகாதாரச் செலவு, கல்விச் செலவு, பொருளாதார வளர்ச்சி என்பவற்றுக்கிடையிலான நீண்டகால இயங்குநிலைத் தொடர்பு: இலங்கையிலிருந்து பெறப்பட்ட சான்றுகள்

த. சசிவதனி[1] மற்றும் செ.சிவராஜசிங்கம்[2]

[1] பொருளியல மற்றும், சமூக விஞ்ஞானத்துறை
இலங்கைத் தென்கிழக்குப் பல்கலைக்கழகம்.

[2] பொருளியல் மற்றும் புள்ளிவிபரவியல் துறை
பேராதனைப் பல்கலைக்கழகம். இலங்கை

முதன்மைச் சொற்கள்: *பொருளாதார வளர்ச்சி, கல்விக்கான செலவு, சுகாதாரச் செலவு*

அறிமுகம்

மனித மூலதன ஆக்கத்தில் கல்வி, சுகாதார செலவுகள் முக்கிய இடம்பெறுகின்றன. ஒரு நாட்டின் ஒட்டு மொத்த பொருளாதார செயலாற்றத்தினை விளக்குவதற்கு பொருளாதார வளர்ச்சியானது ஒரு முக்கியமான குறிகாட்டியாகக் கருதப்படுகின்றது. ஒரு நாட்டின் நிலைபேறான (*Integration), அலகு மூலச் சோதனை* பொருளாதார அபிவிருத்திக்கு உயர் பொருளாதார வளர்ச்சியுடன், சாதகமான பொருளாதாரக் கட்டமைப்பு மாற்றம், குறைந்த வேலையின்மை வீதம், குறைந்த பணவீக்கம், வருமானப் பங்கீட்டில் காணப்படும் சமமின்மையை இயன்றளவு குறைத்தல், வறுமைக் குறைப்பு, சமூக நலக் குறிகாட்டிகளில் மேம்பட்ட நிலையை அடைதல் என்பனவும் முக்கியமானவையாகும். அந்தவகையில் கல்வி, சுகாதாரம் ஆகிய இரண்டும் பொருளாதார வளர்ச்சிக்கும் பொருளாதார அபிவிருத்திக்கும் முக்கிய பங்காற்றுகின்றன (மத்திய வங்கி, 2000).

அரச செலவுக்கும் பொருளாதார வளர்ச்சிக்குமிடையிலான நீண்டகால தொடர்பு பற்றி பொருளியல் கோட்பாடுகளில் விளக்கப்பட்டுள்ளன. கெயின்சியவாதிகளின் கருத்துப்படி குறுகிய காலத்தில் பொதுச் செலவு அதிகரிப்பானது பொருளாதாரத்தில் பல்வேறு வகைகளில் நேர்க்கணிய பங்களிப்பை ஆற்றுகின்றது. மேலும், ஒரு நாட்டில் தலைக்குரிய வருமானம் அதிகரிக்கும் போது அரசாங்கமானது மக்களுக்கான செலவை அதிகரிக்கின்றது என்ற Wagerஇன் வாதத்தில் ஒரு நாட்டின் தலா வருமானம் அதிகரிக்கும்போது அரசானது பொதுச் செலவினை உயர்த்தும் என குறிப்பிட்டுள்ளார். இந்தவகையில், பொருளாதார வளர்ச்சிக்கும் அரசின் செலவிற்குமிடையில் மறைமுகமான காரண காரியத்தொடர்பு காணப்படுகின்றது எனவும்

குறிப்பிடுகின்றார். 1960களில் School of HumanCapitalஇனால், கல்விக்கும், சுகாதாரத்திற்குமான செலவு பொருளாதார அபிவிருத்திக்கான ஒரு முதலீடாக அமைகின்றது என முன்மொழியப்பட்டது. கல்விக்கும் சுகாதாரத்திற்குமான செலவு அகவய வளர்ச்சிக் (Endogenous Growth Theory) கோட்பாட்டில் பின்வருமாறு நியாயப்படுத்தப்படுகிறது. தொழிநுட்ப முன்னேற்றமானது உற்பத்தியாற்றலில் அதிகரிப்பையும் வளர்ச்சி வீதத்தில் அதிகரிப்பையும் ஏற்படுத்துகின்றது. இந்த கோட்பாட்டின்படி மனித முதலீட்டிலான அதிகரிப்பு நீண்ட காலத்தில் பொருளாதார வளர்ச்சியை ஏற்படுத்தும் எனக் குறிப்பிடுகின்றது (Cortright, 2001).

பொருளாதார வளர்ச்சிக்கும், கல்வி செலவு, சுகாதாரம் மீதான செலவுக்குமிடையில் நீண்டகால இயங்கு நிலைதொடர்புகள் பற்றி பல ஆய்வுகள் மேற்கொள்ளப்பட்டுள்ளபோதும், இம்மாறிகளுக்கிடையிலான தொடர்பு பற்றி இலங்கையை மையப்படுத்திய ஆய்வுகள் குறைவாகவே காணப்படுகின்றன. Asghar Reza மற்றும் SumanValeecha (2002); Naveed Wahid Awan, Syed Manzoor H Shad, மற்றும் Hina Rasheed (2012) போன்றோர் பாகிஸ்தானை மையப்படுத்திய பொருளாதார வளர்ச்சியில் கல்வித் துறையின் தாக்கம் என்ற ஆய்வுகளில் பொருளாதார வளர்ச்சிக்கும் கல்விக்குமிடையில் நேர்த்தொடர்பு காணப்படுவதாக குறிப்பிடுகின்றனர். மேலும் Mohammad Shahid Hassan மற்றும் Rukhsana Kalim (2012) என்பவர்களின் ஆய்வில் கல்வி, சுகாதாரம், பொருளாதார வளர்ச்சி என்பவற்றுக்மிடையிலான மும்முனைத் தொடர்பு என்ற பாகிஸ்தானை மையப்படுத்திய காலத்தொடர் ஆய்வில் இம்மூன்று மாறிகளுக்குமிடையில் நேர்த்தொடர்பு காணப்படுகின்றது எனவும் மனித மூலதன விருத்திக்கு கல்விச் செலவு, சுகாதாரச் செலவு என்பன பொருளுள்ள வகையில் செல்வாக்குச் செலுத்துகின்றது எனவும் குறிப்பிடப்படுகின்றது. இதுவரையில், இலங்கையில் இம்மாறிகளுக்கிடையிலான நீண்டகால இயங்குநிலைத் தொடர்பு பற்றி பொருளியலளவை அடிப்படையில் போதுமான ஆய்வுகள் மேற்கொள்ளப்படவில்லை. இந்த இடைவெளியை இந்த ஆய்வு நிரப்ப முற்படுகின்றது.

நோக்கம்

இவ்வாய்வின் பிரதான நோக்கம் அரசின் சுகாதாரச் செலவு, கல்வி மீதான செலவு, பொருளாதார வளர்ச்சி என்பவற்றுக்கிடையில் புள்ளிவிபர ரீதியான நீண்டகால சமநிலைத் தொடர்பினை (Cointegration) ஆராய்தலாகும்.

ஆய்வு முறையியல்

இவ்வாய்வில் மாறிகளாக மொத்த உள்நாட்டு உற்பத்தி, மொத்தி, உள்நாட்டு உற்பத்திச் சுருக்கி, சுகாதாரச் செலவீனம், கல்விச் செலவீனம், குடித்தொகை என்பன பயன்படுத்தப்படுகின்றன. தரவுகள் மத்திய வங்கியின் பல்வேறு

ஆண்டறிக்கைகளிலிருந்து பெறப்பட்டுள்ளன. இவ்வாய்வில் 1952-2011 வரையான, 60 ஆண்டு காலப்பகுதியினை அடிப்படையாகக் கொண்டு முடிவுகள் பெறப்பட்டுள்ளனன. மெய் மொத்த உள்நாட்டு உற்பத்தியானது மொத்த உள்நாட்டு உற்பத்திச் சுருக்கியைக் கொண்டு கணிப்பிடப்பட்டுள்ளதோடு, தலா கல்விச் செலவு, தலா சுகாதாரச் செலவு, குடித்தொகை எனடபன சாரா மாறிகளாக பயன்படுத்தப்பட்டுள்ளன. நெகிழ்ச்சி குணகங்களை கணிப்பதற்காக மாறிகள் மடக்கை வடிவிற்கு உருமாற்றம் செய்யப்பட்டுள்ளன.

இந்த ஆய்வில் மாறிகளின் அடிப்படைப் பண்புகளை இனங்காண்பதற்கு வரைபட ரீதியான பகுப்பாய்வு முறை பயன்படுத்தப்பட்டுள்ளது. கோட்டு வரைபடம், சிதறல் வரைபடத்துடனான நீள் வளைய வரைபடம், கேணல் பொருத்துகை என்பன மாறிகளுக்கிடையிலான தொடர்புகளை ஆராய பயன்படுத்தப்பட்டுள்ளன. மாறிகளின் காலத்தொடர் உடைமைகளை இனம் காண்பதற்கு அலகு மூலச் சோதனை (Unit – root test) பயன்படுத்தப்பட்டுள்ளது. அலகு மூல (ADF) சோதனையின் சமன்பாட்டு வடிவம் பின்வருமாறு தரப்படுகின்றது.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t$$

இணை ஒன்றுபடுதல் நுட்பம் (Co-Integration Technique), வழு சரிப்படுத்தல் மாதிரியுரு (Error–Correction Model), கிறஞ்சரின் காரண காரிய பகுப்பாய்வு (Granger Causality Analysis) ஆகிய நுட்ப முறைகள் இவ் ஆய்வின் பொருளியலளவை பகுப்பாய்விற்கு பயன்படுத்தப்பட்டுள்ளன. இணை ஒன்றுபடுதல் நுட்பம் (Co-Integration Technique) மாறிகளுக்கிடையிலான நீண்டகாலத் தொடர்பினை அறிவதற்கும், வழு சரிப்படுத்தல் மாதிரியுரு (Error–Correction Model) மாறிகளுக்கிடையிலான குறுங்கால நடத்தையினை விளக்குவதற்கும் சமநிலையில்லாத வழுக்களின் நடத்தையினை ஆராய்வதற்கும் பயன்படுத்தப்படுகின்றது. கிறஞ்சரின் காரண காரிய பகுப்பாய்வு (Granger Causality Analysis) மாறிகளுக்கிடையிலான காரண காரியத் தொடர்பின் திசையினை அறிவதற்கும் மாறிகளின் எதிர்வு கூறலுக்கும் பயன்படுத்தப்படுகின்றது.

பொருளாதார வளர்ச்சிக் கோட்பாடுகளில் அக அகவய (உள்ளக) வளர்ச்சிக் (Endogenous Growth Theory) கோட்பாடு முக்கியமானது. ஆக (உள்ளக) வளர்ச்சிக் கோட்பாடு மனித மூலதனமானது பொருளாதார வளர்ச்சியினைத் தீர்மானிக்கின்ற முக்கிய காரணியாகும் என குறிப்பிடுகின்றது. மனித மூலதனத்தை தீர்மானிக்கின்ற காரணிகளுள் கல்விச் செலவும், சுகாதாரச் செலவும் முக்கிய காரணியாகும். ஆகவே, பொருளாதார வளர்ச்சி, சுகாதாரச் செலவு, கல்விச் செலவு என்பவற்றுக்கிடையிலான தொடர்பு பின்வருமாறு உருப்படுத்தப்படுகின்றது.

$$EG_t = AED^{\beta_1} Heal^{\beta_2} e^u$$

இதன் மடக்கை உருமாற்ற வடிவம் பின்வருமாறு

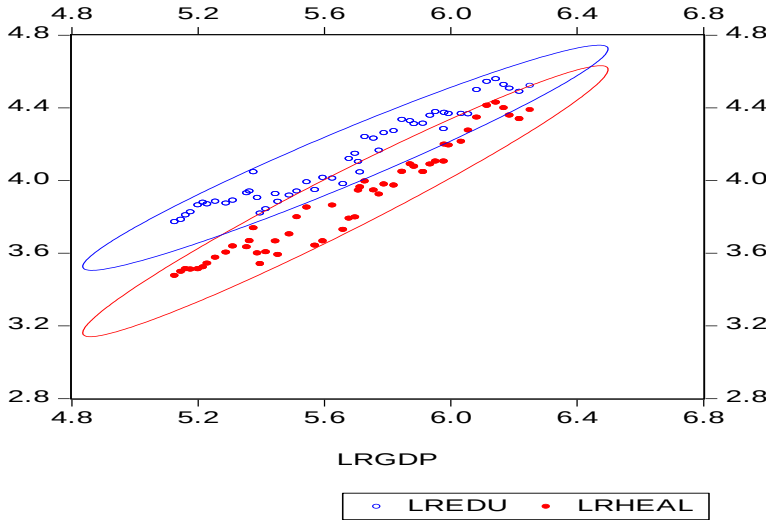
$$\ln EG = \beta_0 + \beta_1 \ln ED + \beta_2 \ln Heal + u_t$$

இந்த மாதிரியுரு அகவய (உள்ளக) வளர்ச்சிக் (Endogenous Growth Theory) கோட்பாட்டினை அடிப்படையாகக் கொண்டு உருவாக்கப்பட்டுள்ளது. இந்த கோட்பாட்டின்படி தொழிநுட்ப முன்னேற்றமானது உற்பத்தியாற்றலில் அதிகரிப்பையும் வளர்ச்சி வீதத்தில் அதிகரிப்பையும் ஏற்படுத்துகின்றது. அதேவேளை மனித முதலீட்டிலான அதிகரிப்பு நீண்ட காலத்தில் பொருளாதார வளர்ச்சியை ஏற்படுத்தும் எனவும் சுட்டிக் காட்டுகின்றது. மாறிகள் தலா அளவு வடிவில் பயன்படுத்தப்படுவதால் ஊழியம் ஒரு காரணியாக எமது மாதிரியுருவில் சேர்க்கப்படவில்லை.

பெறுபேறுகள்

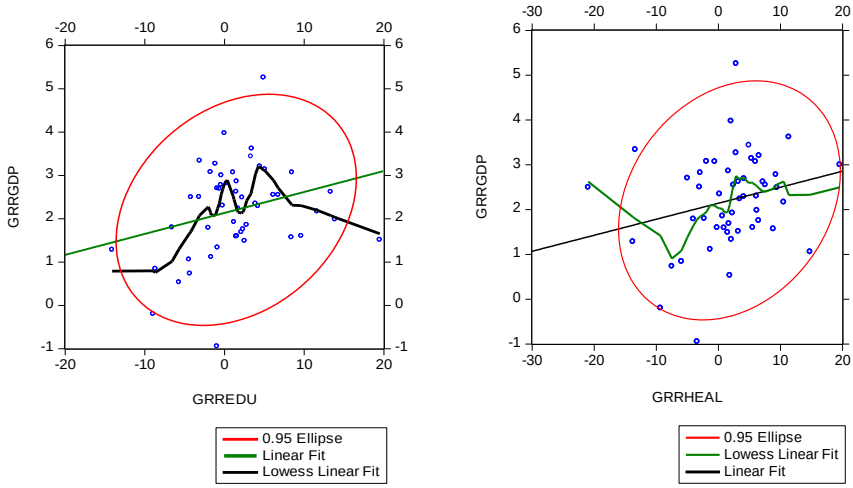
தலா மெய் தேசிய உற்பத்திக்கும் தலா கல்விச் செலவுக்கும் தலா சுகாதாரச் செலவுக்குமிடையில் நேர்த் தொடர்பு காணப்படுவதாக நம்பிக்கை நீள் வரைய வரைபடம் காட்டுகின்றது. நம்பிக்கை நீள் வரைய வரைபடத்தின்படி பொருளாதார வளர்ச்சிக்கும் இவ்விரு மாறிகளுக்குமிடையில் நேர்கணியத் தொடர்பு காணப்படுகின்றது. இதனை வரைபடம் 1 காட்டுகின்றது.

வரைபடம் 1: நம்பிக்கை நீள் வளைய வரைபடம்
(கல்வி, சுகாதாரம், பொருளாதார வளர்ச்சி)



கேணல் பொருத்துகை வரைபடத்தின் படி (வரைபடம் 2) கல்விக்கான செலவு வளர்ச்சிக்கும் பொருளாதார வளர்ச்சிக்குமிடையில் நேர்த்தொடர்பு காணப்படுவதுடன் பொருளாதார வளர்ச்சிக்கும் சுகாதார செலவு வளர்ச்சிக்குமிடையில் ஓரளவு தொடர்பு காணப்படுகின்றது.

வரைப்படம் 2: கேணல் பொருத்துகை (கல்வி, சுகாதாரம், பொருளாதார வளர்ச்சி



பின்வருமாறு தரப்படும் அலகு மூல சோதனை பெறுபேறுகளின் படி LPHEAL, LPED, LPRGDP என்பன ஒருங்கிணைக்கப்பட்ட வரிசை ஒன்று, I(1)இனைக்கொண்டு காணப்படுகின்றன. அலகு மூல சோதனையின் சோதனையின் பெறுபேறுகள் பின்வருமாறு:

அட்டவணை 1: ADF புள்ளிவிபரம்

Variable	Level	Difference
LPRGDP	-1.78091 (0.7014)	-9.194229 (0.0000)
LPHEAL	-2.061131 (0.5561)	-9.762206 (0.0000)
LPED	-2.009830 (0.5839)	-8.388052 (0.0000)

ADF model = with trent and intercept

மதிப்பிடப்பட்ட நீண்ட கால சமநிலைத் தொடர்புக்கான சமன்பாடு:

$$LPRGDP = 8.729 + 0.164LPED_{t-1} + 0.134LPHEAL_{t-1} + 0.810AR(1)$$

t - value	(100.90)	(4.76)	(4.16)	(8.85)
P value	(0.000)	(0.000)	(0.0001)	(0.000)

தன்னிணைவுப் பிரச்சினையை தீர்ப்பதற்காக AR(1) உறுப்பு சேர்க்கப்பட்டுள்ளது. மேற்படி பெறுபேறுகளின் படி நீண்டகாலத் தொடர்புச் சமன்பாட்டில் இருந்து பெறப்பட்ட வழுத் தொடரானது (Co-integration Regression residual), அலகு மூல சோதனை (ADF) மூலம், ஒருங்கிணைக்கப்பட்ட வரிசை பூச்சியம் I(0), எனவும், நீண்ட காலத்தில் நிலையான இடை மாறற்றிறன் என்பவற்றைக் கொண்ட தொடராகவும் உள்ளது என காட்டப்பட்டுள்ளது. ஆகவே Engle Granger முறையின் படி மொத்த உள்நாட்டு உற்பத்தி, சுகாதாரச் செலவு, கல்விச் செலவு ஆகிய மூன்று மாறிகளும் நீண்டகாலத் சமநிலைத் தொடர்பைக் கொண்டு காணப்படுகின்றன.

அட்டவணை 2: கிரேன்ஜ்சர் சோதனையின் முடிவுகள்

Pairwise Granger Causality Tests
Date: 10/25/13 Time: 13:04
Sample: 1952 2011
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LPHEAL does not Granger Cause LPED	58	6.14609	**0.0040**
LPED does not Granger Cause LPHEAL		1.91979	0.1567
LPRGDP does not Granger Cause LPED	58	4.03462	**0.0234**
LPED does not Granger Cause LPRGDP		0.29129	0.7485
LPRGDP does not Granger Cause LPHEAL	58	8.10980	**0.0008**
LPHEAL does not Granger Cause LPRGDP		0.70736	0.4975

ஏங்கில் கிறஞ்சர் இணை ஒன்றுபடுதல் பிற்செலவு (Engle-Granger Co-integration Regression) ஆய்வின் பெறுபேறுகளின் படி மொத்த உள்நாட்டு உற்பத்தி, சுகாதாரம், கல்வி என்பன நீண்டகால சமநிலைத் தொடர்பினைக் கொண்டிருக்கின்றன. இம்மாதிரி உருவின்படி கல்விச் செலவு சார் தலா மொத்த உள்நாட்டு நெகிழ்ச்சிக் குணகம் 0.1643 ஆகவும் சுகாதார செலவு சார் தலா மொத்த உள்நாட்டு நெகிழ்ச்சிக் குணகம் 0.1342 ஆகவும் காணப்படுவதுடன் பொருளாதார வளர்ச்சியினைத் தீர்மானிப்பதில் இவ்விரு மாறிகளும் 1% பொருளுண்மை மட்டத்தில் புள்ளிவிபரவியல் ரீதியாக பொருளுள்ள வகையில் செல்வாக்குச் செலுத்துகின்றன.

மொத்த உள்நாட்டு உற்பத்தியிருந்து சுகாதாரத்திற்கு பொருளுள்ள வகையில் காரணகாரியத் தொடர்பு உண்டு. அதேபோல் சுகாதாரத்துக்கும் கல்விக்கும் பொருளுள்ள வகையில் காரணகாரியத் தொடர்பு உண்டு.

மொத்த உள்நாட்டு உற்பத்தி மீது, சுகாதாரச் செலவு, கல்விச் செலவு பொருளுள்ள வகையில் காரணகாரியத் தொடர்பினைக் கொண்டிருக்கவில்லை. இவை நீண்டகாலத்தில் தான் தாக்கத்தினை ஏற்படுத்தவல்லன.

முடிவுரை

ஆய்வின் பெறுபேறுகளின்படி இலங்கையின் பொருளாதார வளர்ச்சியினைத் தீர்மானிப்பதில் கல்வி, சுகாதாரம் என்பன பொருளுள்ள வகையில் செல்வாக்குச் செலுத்துகின்றன. ஆயினும் இலங்கை அரசாங்கமானது மொத்த செலவில் கல்வி, சுகாதாரம் என்பவற்றுக்கான செலவீட்டினை அதிகரிப்பதன் மூலம் மனித மூலதனத்தினை அதிகரித்து மொத்த உள்நாட்டு உற்பத்தியினை அதிகரித்து நாட்டின் பொருளாதார வளர்ச்சி, அபிவிருத்தி என்பவற்றில் நிலைத்து நிற்கும் வளர்ச்சியினை எய்தமுடியும்.

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Environment and Development

Economic Valuation of Public Park: The Case of Peradeniya Royal Botanical Garden in Sri Lanka

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Keywords: *Non-market benefits, Economic Valuation, Travel Cost Method, Consumer Surplus*

Introduction

Man-made natural parks established for recreational and scientific purposes provide a foundation for in ex-situ conservation of flora and fauna contribute to human well-being by granting benefits through amenity services. Increasing demand create on environmental resources in Sri Lanka by the local and foreign people for recreational purposes, emphasis the economic and environmental analysis in order to ensure sustainable use of such resources. Peradeniya Royal Botanical Garden located at Kandy in Sri Lanka is one of the public nature parks highly demanded by local and foreign visitors.

The economic value estimated (Ratnayaka and Kariyawasam, 2002) for this park is outdated and there is a need to value the park with current information in order to draw new policy plans and management strategies. The objective of this study is to estimate the recreational economic value of PRBG using Travel Cost Method (TCM). The results could play a significant role in generating valuable economic information for policy makers and public park managements to place suitable management plans in maintaining quality of public parks and conserving natural resources under the man-made ex-situ environment in association with the preference of society to maximize recreational utility

Theoretical Framework

Economically efficient resource management of public parks is critical issues which requires knowledge of the flow of park benefits and costs, including non-market benefits (Mathieu, et. al., 2003). The demand and supply of recreational sites established based on environmental resources do not go through the market mechanism because of its characteristics of market failure. The indirect methods, using non-use values of environmental resources could be derive demand function for such resources which provide a theoretical base to estimate economic value of public park services based on user's benefit through an approach that called Travel Cost Method (TCM). The TCM uses individuals' recreational expenditures as a basis for estimating the value of non-market goods (Clawson and Knetsch, 1966).

Methodology

The travel cost method is used to estimate economic use values associated with sites that are used for recreation. The simple TCM model for recreation site can be defined by Trip Generation Function such as: VR = f(TC, Xi). Where; VR = Visitation Rate; TC - Travel cost; Xi - socio-economic variables of the visitor. While there is several approachs to TCM, the Zonal Travel Cost Approach (ZTCA) is used to estimate a value for recreational services of the site as a whole. ZTCA is applied by collecting information on the number of visits to the site from different distances considering that the travel and time costs increase with distances. This information allows the research to calculate the number of visits "purchased" at different "prices". This information is used to construct the demand function for PRBG and to estimate the consumer surplus i.e. economic value generated through recreational services of the site.

Hence, the Zonal Demand Function is defined as $ZVR_j = V_j/N_j = f(TC_j, X_j)$. Where, ZVR_j is visitation rate of zone *j*, which is calculated as V_j/N_j (calculated as visits per 1,000 population in zone *j*), V_j is number of visits made from zone *j to PRBG*, N_j = Number total population of zone *j in* study year, TC_j is total travel cost incurred to a person to travel from the zone j to PRBG and X_j is socio economic variables of the visitors of zone j. The functional demand model

for this study include Visitation Rate (VR) as dependent variable and the "Total Travel Cost" (TC) and "Income" (I) of the visitor (represents the as socio-economic characteristics of the visitors) are as the independent variables, thus the model is: $VR_i = \beta_0 + \beta_1 TTC_j + \beta_2 I_j + u_i$.

The economic value of recreational benefits of an environmental amenity can be then be estimated the area under the demand curve and the price paid for purchase of the amenity (Alvarez and Larkin, 2010) and thus, known as consumer surplus (CS) for a zone. Zonal consumer surplus for a particular zone j (CS_j) can be measured as below:

$$\mathbf{CS_j} = \int_{\mathbf{TCj}}^{\mathbf{TCmax}} [\hat{\beta}_0 + \hat{\beta}_1 TTC_j + \hat{\beta}_2 I_j] \partial \mathrm{TC}$$

Then, the total economic value (TEV) of PRBG can be estimated summing the CS estimated for 20 zones (j=1…..n). Thus, the TEV i.e. the Total Consumer Surplus (TCS) of Zone j is:

$$\mathbf{TEV = TCS} = \sum_{j=1}^{20} [\int_{\mathbf{TCj}}^{\mathbf{TCmax}} [\hat{\beta}_0 + \hat{\beta}_1 TTC_j + \hat{\beta}_2 I_j] \partial \mathbf{TC}]$$

The necessary data was collected by a social survey conducted among the visitors to the PRBG during the months of May and June, 2012 and the secondary information was gathered using official records of PRBG. The sample of the study is 250 local visitors visited to the site and those were selected randomly. Sample was categorized into 20 groups and which are identified as zones representing the different distance.

Results and Discussion

In order to identify the best fitting model, different functional form as suggested by Navurud and Mungatana (1994) using a GLS approach were tested. The model yielded parameter estimates whose signs adhere to economic theory resulting in the parameter estimate for the travel cost variable is negative and statistically significant at 5% significant level, indicating that as travel cost increases, the visitation rate to the PRBG is decreases. The parameter estimate for income is positive but insignificant, indicating that income does not influence on visitation rate. Goodness of fit measure R^2 is 0.6962. DW statistics shows that there is no autocorrelation in the model. Thus, appropriate and best fitted demand function for PRBG estimated is: VR = 114.2386 – 0.033522*TC + 0.0000369I. This model yield down-ward sloping demand curve between visitation rate and travel cost which adhere to derive the consumer surplus function in order to estimate the economic value of the PRBG.

Table 1: Model Estimation Regression Results

Variable	Coefficient	St. Dev	t-statistics	Probability
Constant	114.2386	26.978	4.2344	0.0006
Travel Cost (TC)	-0.33522*	0.0055	-6.0565	0.0000
Income (I)	3.69E-05	0.0007	0.0560	0.9560

* - Significant at 5% level

R^2 == 69.62%, F-statistics = 19.4795, P-value = 0.000, D-WS =1.9711

The estimated TEV of PRBG for local visitors those visited to the site from 20 zones (districts) for a year is Rs. 881.68 million (Rs. 881,679,851.30). This value indicates that the users of the PRBG gain considerable benefits in several ways by spending a minimum amount as entrance fee. It reveals that the users gain much more than what they pay to visit the site. The comparison of economic value estimated by this study with the annual recreational value of 239.78 million estimated by Ratnayaka and Kariyawasam in 2002 shows that there is 267.7% increase in economic value during last ten years. This study

further reveals that annual increment in economic value of PRBG is 64.19 million.

Conclusion and Recommendation

This study concludes that the present minimum economic value of the PRBG is Rs. 881.68 million. Since, non-use values, visit of the foreigners, and the use of science and education purposes are included, the TEV value could be higher than the estimated value in this study. It also further focus that the demand for the recreational services provided by the PRBG has present a trend in continuously increasing due to increasing in visitation rate to the site. So if the visitation rate drops the value of the garden also will drop. It is further reveals that visiting rate of the people living in closer zone (with short distance) is higher than the people from longer distance.

Improvement in facilities of drinking water, toilet, rest rooms; expending the education services; extending the services time; and more publicity about the site are to be considered to increase the visitation rate in future. The visitors to the site willing to pay much higher price to enter the site, if the management of PRBG is improve the quality of services provided to them; and willing to develop the recreational site more attractive and ecologically sustainable. The funds thus generated through various services provided by the PRBG should be allocated more to improve the health standard, recreational service and environmental quality of the site which is much lower now. In this regard, sustainable and an effective fund allocation mechanism need to be developed to protect the valuable natural assets base and to add the economic value of the recreation site.

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Effects of Environmental Regulations on South Asian Food and Agricultural Exports: A Gravity Analysis

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Keywords: *Environmental Regulation, Theoretical Gravity Model, South Asia, Food and Agricultural Trade*

Introduction

Established welfare gains of free trade have led to its embracement by many nations at the current time despite the occasional dissenting voice based on pessimism. South Asian countries joined this trend with the formation of a regional trade block under the banner of "South Asian Association of Regional Cooperation" (SAARC). However, as intra and inter-regional trade did not reach levels comparable with other regional trade blocks, several empirical studies were undertaken to determine the causes.

One aspect of bilateral trade flows is the effects of environmental regulations, the study of which has led to a considerable literature. The Gravity model of trade is the key ex-post econometric technique used in such studies. Among them, Costantini and Crespi (2008) incorporated environmental regulation with a mixture of direct and proxy measures such as CO_2 emissions and current environmental protection expenditures - both of the public and the private sectors - to measure the effects of environmental regulations on the export dynamics of energy technologies in the context of the European Union and OECD countries. However the effects of environmental regulation on South Asian exports are not fully addressed in the literature.

Objective

This particular study investigates the effects of environmental regulations on food and agricultural trade of four South Asian nations; Bangladesh, India, Pakistan and Sri Lanka. The main objective of this study is to assess the effects of environmental regulations on agricultural export flow of the South Asian countries. The specific objective of the study is to estimate a gravity equation incorporating the stringency of environmental regulation as an explanatory variable with a better econometric specification to avoid possible biases.

Methodology

The Gravity model has alternative specifications due to perceived shortcomings in any given model. As the unobservable multilateral trade resistance (MTR) is not accounted for in the Intuitive Gravity model, the applied literature has focused on theoretically grounded Gravity models since Anderson and Van Wincoop (2003). Even though the fixed effects model of Anderson and Van Wincoop (2003) provides consistent estimation of the theoretical Gravity model with country fixed effects, any variable that is collinear with fixed effects cannot be included in the model. The Baier and Bergstrand (2009) methodology provides an alternative approach making it possible to consistently estimate a theoretical Gravity model that includes variables that vary by exporter or importer but not bilaterally. Following the above methodology, this study adopts the following gravity model.

$$\begin{aligned} \boldsymbol{ln\, EXPORT_{ijt}} \;=\; & \boldsymbol{\beta_0 + \beta_1 ln\, GDP_{it} + \beta_2 lnGDP_{jt}} \\ & \boldsymbol{+ \beta_3 ln\, WeightedDIST_{ij} + \beta_4 lnPOP_{it} \;+\; \beta_5 lnPOP_{jt}} \\ & \boldsymbol{+ \beta_6 SC_{it} + \beta_7 SC_{jt} + \beta_9 D_t + U_{ij}} \end{aligned}$$

where ln denotes the natural logarithm, *i* and *j* denotes the exporting country and the importing country respectively, and t denotes the time period (year). $EXPORT_{ijt}$ is the agricultural and food export flow from country *i* to its trading partner *j* in the year *t*. GDP_{it} and GDP_{jt} are the Gross Domestic Product of the two countries in year *t*. $DIST_{ij}$ is the geographical distance between the two

countries.The trade cost variable distance becomes Weighted $DIST_{ij}$ after adopting the Baier and Bergstrand (2009) procedure. POP_{it} and POP_{jt} are the population of the two countries in year t. SC_{it} and SC_{jt} denote strictness of environmental regulation of exporters and importers in year t which is denoted by a proxy measure. D stands for the year dummy and U_{ijt} is the Error term. Following the recommendations in the literature since Santos Silva and Tenreyo (2006), this study handles the zero trade flows with the Poisson pseudo–maximum likelihood estimation technique.

The bilateral exports data were retrieved from Trade Map for the years from 2003 to 2007 for South Asian Countries and major trading partners. Data on GDP and population were taken from the World Economic Outlook Database of the International Monetary Fund (IMF) and Distance was obtained from the CEPII database. This study used the Environmental Performance Index (EPI) developed by the Yale Center for Environmental Law and Policy and Center for International Earth Science Information Network of Columbia University in collaboration with the World Economic Forum and the Joint Research Centre of the European Commission as a proxy to capture the environmental stringency.

Results

In both estimates (OLS and Poisson), GDP variables have positive and highly significant effects on the value of agricultural exports. The results indicate that an increase in GDP of the exporting country by 1% will increase the value of exports by a value more than 1% whereas for the importing country's GDP, the increase in value of trade is less than 1%. The coefficients for the Weighted $DIST_{ij}$ variable are negative and 0.126% and 0.137% and significant at 1% level in the specifications. POPi and POPj show the expected negative coefficients in OLS and Poisson. This indicates that the countries with large populations tend to be more self-reliant. Most importantly, the variable of interest in this study, which is the stringency of environmental regulation, has the expected signs and is consistent in both estimations. Coefficients of the EPI of the importing country are negative and significant at 1% level in both specifications. When there is a 1% change in the EPI of the importing country the change in the value of the exports is 0.4% according to OLS and 0.25% in Poisson model.

Table 1: Results of the econometric estimation with models OLS and Poisson

Variable	OLS Estimates	Poisson Estimates
ln_gdp_exporter	2.794***	1.378***
	(11.95)	(4.31)
ln_gdp_importer	0.936***	0.831***
	(25.89)	(13.58)
ln_weighted_distance	-0.126***	-0.137***
	(-12.73)	(-9.46)
ln_population exporter	-1.458***	-0.218
	(-4.94)	(-0.57)
ln_population importer	-0.030	-0.171**
	(-0.71)	(-2.86)
epi_exporter	0.128***	0.125***
	(4.98)	(4.33)
epi_importer	-0.040***	-0.025***
	(-7.43)	(-4.02)
year_2004	-0.452**	-0.251
	(-3.44)	(-1.64)
year_2005	-0.743***	-0.351**
	(-5.27)	(-2.00)
year_2006	-1.079***	-0.540***
	(-7.40)	(-3.21)
year_2007	-1.414***	-0.730***
	(-8.90)	(-3.50)
Constant	10.456***	12.896***
	(6.39)	(6.11)
R squared	0.51	
Pseudo R squared		0.71
No of observations	2078	2540

***significant at 1% level; **significant at 5% level; *significant at 10%level; t statistics

Note: The Poisson model estimated had a Pseudo R squared of 0.70.
are within brackets

Like abobe, a 1% change in the EPI of the exporting country changes the value of the exports by 1.28% according to OLS and 1.25% in Poisson model. The year dummy in the models have the negative coefficients. In the OLS model when compared to the year 2003, in 2004 there is a 36.4% (exp[-0.452]-1= -0.364) negative effect on exports. Similarly, compared to 2003 the other years show a decline in the export value of agricultural goods. In the OLS estimation of the explanatory variables account for 50% of the observed variation in the data.

Conclusion and Policy Implications

The results revealed that the higher Environmental Stringencies of the importers adversely affect the Food and Agricultural Trade of the South Asian countries considered in this study. Hence, the findings of this study suggest that for enhanced inter and intra-regional trade of the SAARC region, focusing on conventional trade facilitation measures is not enough and more attention should be paid to the environmental regulatory framework.

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Economics of Composting Municipal Solid Waste: An Analysis of the Experiment at Weligama

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***Keywords**: Municipal solid waste management, Environmental safeguarding, Composting, Eonomic viability*

Introduction

Managing municipal solid waste has become a significant problem faced by the local authorities in Sri Lanka. A total of 6400 tons of waste is collected daily in Sri Lanka, of which 57% is from the Western Province. Municipal Councils such as the Colombo Municipal Council record a per capita waste generation of around 0.65 - 0.85 kg/day, while the Urban Councils and *Pradesheeya Sabhas* produce around 0.45 - 0.65 kg per person day and 0.20 – 0.45 kg per person per day of waste, respectively. Accordingly, the monthly collection of garbage at an average Urban Council is around 500-600 tons (UNEP, 2001)[10].

Urbanization of human settlements, currently witnessed in Sri Lanka, has significantly aggravated this problem of solid waste management. The ongoing increase in population coupled with increase in per capita income, has transformed the issue into a different scale (with disproportionately heavy generation of waste) and to a technological complexity (with changed composition of waste). Local authorities, statutorily responsible for the management of waste generated within their respective boundaries, are currently practicing "open dumping" as a means of getting rid of waste, in spite of the hazardous health and environmental impacts associated with that methodology.

[10] The State of Environment Report-2001,UNEP.

Open dumping uses vast extents of valuable municipal land with high opportunity cost. Open dumps also generate leachate, released from the decomposed waste, which causes changes in permeability, bearing capacity, porosity, degree of saturation, and alkalinity of soil (Pilapitiya, 2012)[11]. In addition, open dumpsites release Methane and Carbon Dioxide leading to air pollution as well (Pilapitiya, 2012). A case study conducted at one of the former municipal landfill sites in Sri Lanka has also shown that the ground water has become unacceptably acidic and the Chemical Oxygen Demand level of samples obtained from the vicinity far exceeded the tolerable limits (Bandara and Hettiaratchi, 2010).

In this light, it is widely accepted that a proper municipal waste management system should be implemented. The most commonly advocated alternatives, namely the "incineration" and "sanitary land filling", though they appear attractive for developed countries, are found unsuitable for developing countries such as Sri Lanka due to the fact that their waste is not easily incinerated. This is both owing to the overwhelmingly high organic composition of waste, and to the lack of adequate financial resources for sanitary land filling - which is highly capital intensive – at local authority level.

Composting becomes an alternative solution in this milieu, particularly because the technology involved suits the characteristics of our municipal waste, which is still largely organic. However, composting is still a small scale activity practiced in the rural agricultural dwellings, and large scale implementation of municipal waste composting is yet to be seen in Sri Lanka, except at a few isolated local authorities. The economics of municipal waste composting is therefore largely unknown, which in turn constitutes a missing link in the decision chain preventing local authorities considering composting as an option they could adopt in dealing with the problem of managing their waste.

[11] This research was enriched by the information and technical guidance provided by Dr. Sumith Pilapitiya, Environmental specialist, The World Bank, whose contributions are hereby thankfully acknowledged.

Objectives

The present study intends to fill this research gap of not having adequate information pertaining to the economics of municipal solid waste composting. The study examines costs and potential benefits associated with the operation and its feasibility through both financial and economic angles. It assesses the practicalities of composting through studying the various models of composting that have been developed, including the case of waste composting at the *Weligama* Urban Council. Finally, the study aims at making policy recommendations for the adoption by authorities in view of making the Sri Lankan urban environment greener and healthier.

Methodology

The study adopted the Benefit-Cost Appraisal methodology. Financial appraisals were conducted to find the attractiveness of composting as an alternative waste management method for municipalities, while an economic analysis was performed to understand the viability of the technology from the national economic viewpoint.

Technical and operational information and the cost data required for the analysis were gathered from secondary sources, while interviews with municipal officials, officials of the United Nations Environment Programme, experts in the field of solid waste management, and the officials of the "Pilisaru" Project[12] of the Central Environment Authority of Sri Lanka, were conducted to gather primary data.

The study examined the two models available for the purpose, namely (a) the technical proposal made by the central authorities (Project Officers, 2012), and (b) the case of the *Weligama* Urban Council[13], both to accommodate

[12] A special project intending to solve the solid waste problem in Sri Lanka within the next 5 years

[13] *Weligama* Urban Council has practically adopted composting technology to treat their solid waste.

approximately 18 tonnes of solid waste per day, in order to evolve comparative viability parameters and to shed light on possible strategies towards composting municipal waste in Sri Lanka.

Results

As per the technical proposal, a composting facility to manage 18 tonnes of municipal waste per day would need Rs 23 Mn as initial investment to procure machinery and to develop the facility, while the model developed by the *Weligama* UC could be implemented with a capital outlay of Rs 11 Mn.

An efficient composting facility should produce approximately one-fifth of waste input as compost (Pilapitiya, 2012), but it was observed that the composting project at *Weligama* produced only 1-1.5 tonnes per day (approximately 43 tonnes per month) of compost out of 18 tonnes of daily waste input.

Therefore, it appears that the *Weligama* plant, though installed at a much less capital investment compared to the technical proposal, is operated much below the expected output generating efficiency. The revenue earned by *Weligama* UC through selling compost amounts to approximately Rs 370,000 per month, reflecting an average selling price of Rs 8,500 per tonne of compost.

The two models studied were subject to Benefit-Cost appraisal, separately from "financial" and "economic" perspectives.

In appraising economic viability, the foreign exchange savings potential of compost by substituting for imported fertilizer at a 1:4 ratio was used to reflect the economic benefits of compost produced, while shadow values[14] were used instead of market-based costs and benefits to screen off local market distortions.

[14] Shadow Price Conversion Factors of 1.1, 1.2 and 1 were used to convert the market values of investment, variable costs and fixed Cost, respectively.

Opportunity cost of funds of 15% per annum was used in discounting revenue and cost streams in the financial appraisal, while a 10% rate was used in discounting benefits and costs in the economic analysis. The results of these analyses are summarized in the Table 1.

Table 6: Summary of Benefit-Cost Appraisal Results

	Financial Appraisal		Economic Appraisal	
	Estimated Technical Model	Model implemented at *Weligama*	Estimated Technical Model	Model implemented at *Weligama*
Waste handling capacity of the Facility(MT/day)	18	18	18	18
Investment (Rs Million)	23 (Market value)	11 (Market value)	25.3 (Economic value)	12.1 (Economic value)
Compost Output (MT /day)	3	1.44	3	1.44
Variable cost (Rs Million per Year)	3.024	1.452	3.629	1.742
Fixed Cost (Rs Million per Year)	3.42	3.42	3.42	3.42
Net Benefit Flow (Rs Million per annum)	3.287	0.0857	8.352	2.517
Net Present Value (Rs Million)	(6.504)*	(10.57)*	26.02**	3.37**

Note: *at 15% discount factor; **at 10% discount factor
Source: Authors' Estimations

It is clear from the above analysis that both models subject to appraisal are financially not feasible to the investing agencies. This explains why composting of waste is not developed as a commercial venture. However, both models appear "viable" from a national economic view-point, indicating the potential net benefits the nation could secure through waste composting. The technical model is offering a higher Economic Net Present Value than the model adopted

by *Weligama* Urban Council, even though the initial investment involved in the latter is much less, apparently owing to its poorer productivity in generating output.

The study examined the viability break-even contours of municipal waste composting at financial and economic perspectives in order to perceive the relative positioning of the two models with regard to their viability. The minimum compost output that would enable viability of composting operation at varying levels of initial capital outlay was thus established, in which the relative positioning of the two models could be positioned.

Figure 1: Break-even Contours applicable for Municipal Waste Composting

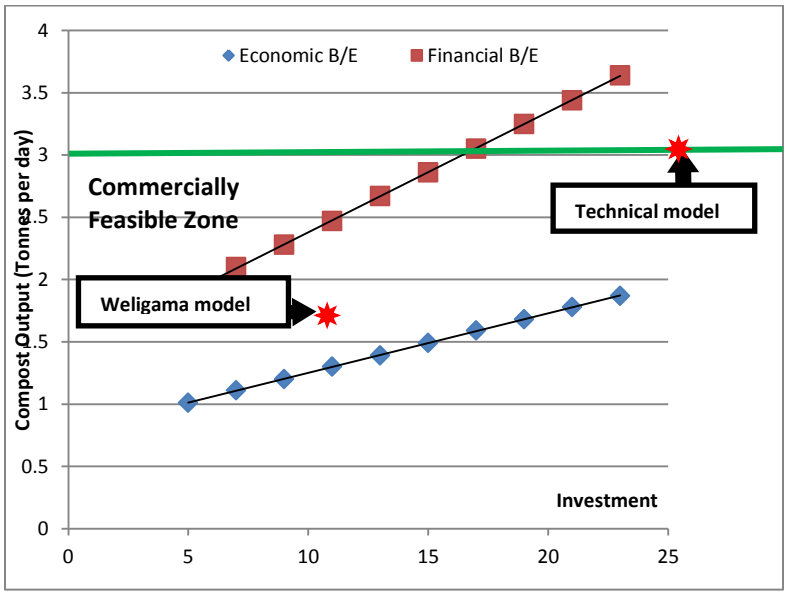

Figure 1 shows that both models (the model adopted by *Weligama* UC and the technical proposal) position themselves above the economic viability break-even contour, but below the financial viability break-even contour. Therefore, while both models are economically justifiable, they are financially unattractive to investors, giving rise to a typical case for State intervention.

The *Weligama* model, however, offers the possibility of achieving even the financial viability, as there is ample space in the "feasible zone" below the maximum output threshold where it could be positioned if the plant's productivity could be improved. For instance, an output level of approximately 2.5 tonnes of compost using 18 tonnes of waste (approximately 60% increase of productivity, but still 16% less than the maximum output capacity) would enable the Weligama model to reach the financial viability level. It might be interesting also to note that there is scope for the Weligama model to further increase its investment, if such enables better technology, yielding incremental productivity more than compensating the incremental investment incurred, and still position itself above the financial viability zone.

This possibility, however, does not exist in the case of the technical proposal, where the required output level for financial viability lies above the maximum achievable productivity threshold. Therefore, a local authority adopting the model represented by the technical proposal will require Governmental subsidies, unless they could find out a way to reduce initial capital outlay to at least below Rs 17 Million.

Conclusions

Composting is a nationally attractive and practically implementable solution for the municipal waste management problem in Sri Lanka. It is technically feasible, as successfully demonstrated by the *Weligama* Urban Council, and is justifiable from the national economic view-point, as evidenced from the appraisal results of both models subject to analysis in this study, even without taking into account the environmental and other social benefits associated with it.

Having appraised at different levels of investment and compost productivity, it can be concluded that the *Weligama* model has the scope of reaching commercially viable status as well, if compost productivity of its facility could be improved further. In that light, the necessity or desirability of State intervention becomes contestable as any such assistance might eliminate the incentives for productivity enhancement. Instead, encouragements could be

offered to pursue further research and development based on *Weligama* experiment, to arrive at an optimum combination of plant productivity and the required capital outlay.

Regarding the technically estimated model, the situation is different. No further productivity enhancement could be envisaged as the present appraisal has already assumed compost production at the plant's maximum output capacity. Therefore, the technically estimated model would not be able to reach the financially viable threshold unless its initial investment requirement could be reduced, and in such a situation, the necessity for State assistance would become unavoidable.

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Public Economics

Dynamic Inter Relationship between Military Expenditure and Economic Growth in Sri Lanka

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***Keywords**: Military expenditure, Economic growth, Error correction Model, confidence ellipse*

Introduction

Military expenditure (ME)shows a drastic increaseover the last three decades in Sri Lanka. The government is spending large and increasing amounts on military. It has increased 98% from 1983 to 1995, (1983-Rs.979.1m and 1995-Rs.39100m). During the study period, Sri Lanka spent 2 to 5 percent of its GDP on defense. The share of military expenditure in total government expenditure was 9 % as an average during the study period. The shares of military expenditure to public debt, budget deficit, government expenditure and GDP recordan increasing trend. It has a positive statistically significant correlation with those variables. Military expenditure has exceededthe health and education expenditure since 1984 which contributes directly to human capital improvement.

Therefore, the impact of military expenditure in Sri Lankan economy is an important area to research. Theories of economic impact and military expenditure consist of both positive and negative features. There exist a number of channels such as resource allocation and mobilization, organization of production, sociopolitical structure and external relationsthrough which defense spending has a negative impact on economic growth while there are some beneficial effects whereby additional military expenditure can promote economic development through spin-offs. Security is expected to contribute welfare enhancement.Numerous studies have investigated the relationship between military expenditure and economic growth. Neoclassical theoriesidentify the importance of the military expenditure as “a rational actor

which balances the opportunity cost and security benefits in order to maximize the social welfare function", (Pieroni, 2010). Dunne & others (2005) identified "mainstream growth literature has not found military expenditure to be a significant determinant of growth, much of the defense economics literature has found significant effects" But, there is much controversy in the literature over whether military expenditure is associated with higher or lower economic growth.

Statistical evidence for OECD countries indicates that military expenditure has a substantial negative effect on capital formation and consequently significantly reduces growth rates even when "spin-off" effectsare allowed for (Smilth, 1977, 1978, 1980). In contrast, for less developing countries (LDCs) the statistical evidence seems to indicate that there is positive correlation between ME and the growth rate(Benoit, 1973, 1978).These facts point to the need for case-specific studies using time-series data for individual countries. In this context, this study seeks to contribute to the literature by investigating the effects of military expenditure on economic growth in SriLanka.The economic growth and defense expenditure in Sri Lanka is a relatively under-researched area.Researchers have mainly focused on descriptive analysis and have tried to measure the cost of war rather than discovering a nexus between defense expenditure and economic growth.

There exist no econometric analyses on the dynamic relationship between Military expenditure and Economic Growth in Sri Lanka about which this research paper is analyzing. However Ganegodage and Rambaldi, 2011discovered a strong negative impact through their research based on Cobb-Douglas production function whileWijeweera and Webb (2009) using Benoit hypothesis finds a minimum positive impact on the GDP compared to non-military spending. Analysis undertaken in this study strives to discover the direction of causal relationship between the military expenditure and economic growth in Sri Lanka based on the Harrod-Domar growth model, while providing useful findings to policy makers in the development of long term solution to the problem of high-defense expenditure.

Objective

The main objective of this study is to investigate the dynamic inter-relationship between military expenditure and economic growth for the period of 1970 - 2012.

Methodology

In this study, Sri Lanka Annual Time Series data for the period from 1970-2012 are used to investigate the dynamic relationship between defense expenditure and economic growth rate. Economic growth (EG) is measured by the growth rate of gross domestic product. The data on military expenditure are obtained from the Stockholm International Peace Research Institute (SIPRI) and from various annual reports of central bank, Sri Lanka. GDP data, military expenditures (ME), net foreign capital inflows (FCI) and national savings as a share of GDP (SAV) are also collected from Central Bank Reports. The incremental capital output ratios (IOCR) are derived using GDP and gross capital formation data over time. For the ease of analysis, data were transformed into log form.

Numerical descriptive statistics and graphical displays - Scatter diagrams, Line graphs, Kernel fit and confidence ellipse diagramsare usedto describe dynamic behavior of the relationship between the military expenditure and economic growth. Furthermore, the Augmented Dickey Fuller test (ADF) and Phillips Perron (PP)tests areused to test the order of the time series.Co-integration technique (Engle-Granger) is employed to study the long run equilibrium relationship between growth and military expenditure. The error correction model is used to describe short run behavior of the variables and estimate the adjustment speed error correction.The Standard Granger Causality testis used to see the direction of causal relationship between military expenditure and economic growth.

Based onHarrod-Domar capital centered growth equation, we derive the model for Co-integration analysis. We estimate the following statistical model for Cointegration analysis:

$$EG = \beta_0 + \beta_1 LIOCR + \beta_2 LME + \beta_3 SAV + \beta_4 FCI + \varepsilon_t$$

WhereIOCR is Incremental capital output ratio, FCI is foreign capital inflow, ME is military expenditure, and SAV is savings. We included the savings ratios in addition to the FCI in order to depict the impact of savings on the GDP.IOCR used in the model to measure the marginal amount of investment capital which is necessary for an entity to generate the next unit of production.

Results

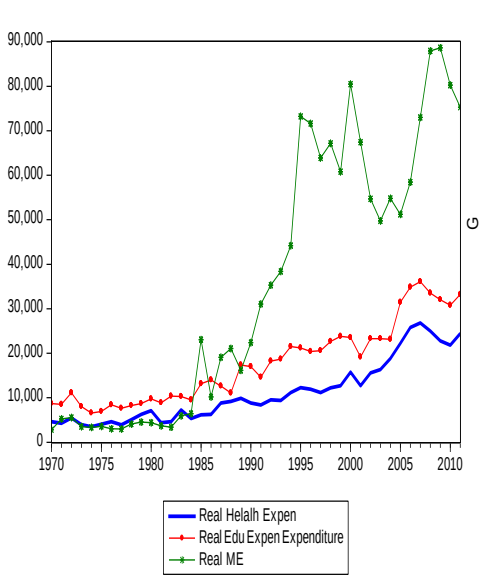
The estimated sample moments which are mean, variance and standard deviation provide a preliminary description of the properties of the sample. The average growth rate had been around 4.87% in the last 43 yearsinSri Lanka. However, the average change of the military expenditure has increased at a higher rate thanthe economic growth rates. The military expenditure has a relativelylarge variance than the other variables, except the savings. Since, 1983 military expenditure increased significantly. Although, the savings ratioshowsa large variance the variance of the LIOCR and FCI shows relatively less variance during the time period.

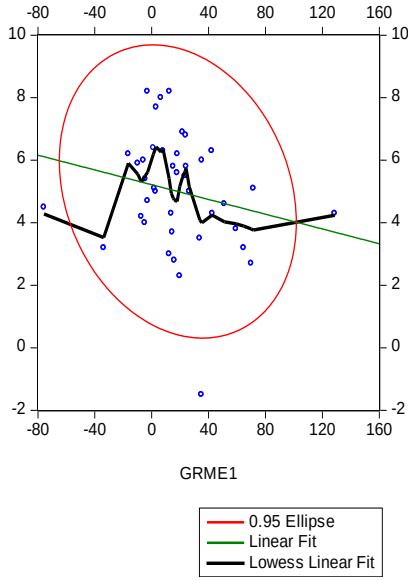
Table 1: Descriptive Statistics

	EG	LIOCR	LME	FCI	SAV
Mean	4.872093	9.616135	8.764212	0.942558	17.93023
Median	5.000000	9.708742	9.350102	0.960000	17.80000
Std. Dev.	1.943772	1.765602	2.556818	0.778570	4.371364

Figure1 shows the increasing military expenditure over time and it started to exceed education and health expenditure from 1984. Figure 2 shows the negative association between ME growth with a one year lag and economic growth. Local polynomial regression for the two series with bandwidth based on nearest neighbors (Loess Fit (Nearest Neighbor fit)) and linear regression fit indicate the negative relationship between these variables.

Figure1: The behavior of ME, EDU, Health Expenditure Figure2: Association between ME an EG





The unit root test results indicate that the log of the incremental capital output ratio, log of the military expenditure, net foreign capital inflows and savings ratios are integrated at order one, I (1). Hence, each variable are stationary at its first difference. The estimated cointegrating equation is given below,

$$EG = -5.26 + 2.05LIOCR_{t-2} - 1.58LME_{t-1} + 0.06FCI_{t-1} + 0.256SAV_{t-1}$$
$$\text{p - value}\ (0.052)\quad (0.0049)\quad (0.0020)\qquad (0.8950)\qquad (0.0124)$$

Augmented Dickey Fuller and PP tests are used to test the stationary of the residual of the co integration regression. As the residual is stationary (ADF test statistic P value = 0.00), the variables are co integrated.For LME, FCI, and SAV variable, we used with one lag and for the LIOCR, used two lags. Lag values are selected based on AIC criteria. All the independent variables other than the

FCI are statistically significant at the 5 % level of significance. The regression model (F test) is significant at 1% level of significance.Log of the military expenditure variable found a strong negative relationship with the economic growth rate which is significant at 1% level of significance. Log of the incremental capital output ratio, savings and net foreign capital inflows have a positive impact on the economic growth rate. Although FCI variable is insignificant at all the levels of significance, LIOCR is statistically significant at the 1 % level of significance and SAV is significant at the 5 % level.

The CUSUM (cumulative sum of the recursive residuals) test of parameter stability indicates that the estimated parameters of the model are stable over the sample period. The estimation of an error correction model shows that there are two systematic effects of the changes of EG of the dependent variable. The first effect is the instantaneous multiplier effect ($\beta_2 \Delta LME_t$). The second effect concerns deviations from the long run equilibrium relation. Short run adjustment coefficient is statistically significant at 5% level. It shows that 0.95 % of the deviation of the actual economic growth from its long run equilibrium level is corrected each year. The negative sign shows the stability of the system. EG tends to move downward in the direction of equilibrium. In the short run SAV is significant. LME is also statistically significant at the 10 % level. Military expenditure affects economic growth negatively even in the short run. The estimated Error correction model,ECM, which is derived from the estimated cointegrated equation, is given below.

$$\Delta EG_t = 2.298\Delta LIOCR_{t-2} - 1.486\Delta LME_{t-1} + 0.259\Delta FCI_{t-1} + 0.321SAV_{t-1} - 0.959\Delta \mathrm{Re}sid_t$$

P value (0.1924) (0.0700) (0.3255) (0.0494) (0.00)

Granger Causality analysis results indicate that military expenditure cause economic growth negatively. Therefore, military expenditure is a useful predictor of economic growth. It implies that by reducing military expenditure and increasing other government expenditures such as education, health which induce human capital, we can increase economic growth. The Granger causality statistic F=5.68, is significant at 5% level.

Conclusions

This paper represents a preliminary attempt at exploring the impacts of military expenditure on economic growth. The data set covers the period 1970 – 2012. The results of the Granger causality test show that there is a unidirectional feedback between the military expenditure and economic growth. Co-integration and error correction models showa log of military expendituresnegatively related to EG in long run. Savings ratio, incremental output capital ratio and net foreign capital inflows are positively integrated. All the variables are statistically significant, other than the FCI. The results of this study indicate that military expenditure must be reduced and it is better divert those funds to more economically productive sectors.

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A Theoretical Base for National Defence as a Public Good

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Keywords: *National Defence, Public good, Social transformation, Saturated point, Social system*

Introduction

National defence is a public good and it is the first priority of governments in the contemporary world. In the allocation of resources, threats to national security would see national defence getting relatively more resources, incurring an opportunity cost of other public as well as private goods. Yet, theoretically, it is difficult to explain the relationship of national defence to the economy (Jayawardena 2011; Acemoglu 2005; Sandler and Hartley1996; Chan 1985). Empirical studies of economics of defence indicate both negative and positive economic implications of national defence (Jayawardena 2011).Therefore, there is a need to strengthen the theoretical base of national defence as a public good that enables us to explain whether defence spending is economically productive or not.

The rationale for national defence as a public good in comparison with other public and private goods is not yet theoretically clear. Therefore, the questions of "how much of resources should be allocated to national defence" and "what is its value addition to GDP" need theoretical explanations. Such explanations enable us to distinguish between the different sizes of national defence over different countries and over different time periods.

An economy is comprised of the government sector and the private sector. The government sector includes the subsectors of defence and non defence (Feder 1983; Ram 1986). The non defence and private sectors are basically civilian

sectors. The theoretical bases of non-defence sectors of both government and private sectors are clear in their economic linkages compared with defence as a component of government. Despite the weak theoretical structure, all States have to maintain national defence to provide the necessary conditions for day to day economic activities of both government and non-government sectors of the economy (Jayawardena, 2011; 2012).

This paper first explores existing concepts and theories and secondly scrutinizes the empirical evidence available in the literature of economics of national defence. This exploration indicates a need to deconstruct existing social transformation models that enable us to develop an alternative social transformation model to explain the scope of national defence as a public good and its relationship with an economy.

The research questions which the study focuses on are:

i. What is the theory behind national defence?
ii. Why some countries are under conflicting cycles and some other countries show a smooth social transformation?
iii. What is the saturation point of national defence?

Objectives

The objective of the study is to identify a rational explanation of national defence as a public good, and specifically, to

i. Describe the different levels of social transformation stages
ii. Describe how national defence saturates in an economy

Methodology

An inductive approach was adopted. I first explored the literature on the economics of national defence and social transformation. The literature witnesses the epistemological problem of national defence as a public good (Chan 1985). The existing social transformation models of Hegel, Karl Marx and the social contract theory of John Locke have not given attention to national

defence. Here, in this study I address the epistemological gap with respect to national defence in the background knowledge on social transformation, and identify a new model that can explain the basis of national defence. In developing the model, the human epistemological capacity, the ontological nature and the ethnological behavior were also given consideration. Focusing on the determinants of national defence, their relationship with political economy and human behavior at both individual and collective level, a holistic approach with an emphasis on discourse analysis is used to develop the model of social transformation (Castles 2001).

Results

Social Transformation and National Defence

National defence and social transformation are closely linked with each other. Social transformation is a debated topic and has therefore been viewed by different philosophers in different ways, under different paradigms, for example the explanation of human behavior and society by different philosophers. According to Hegel[15], consciousness is the prime factor that affects life. As Karl Marx argued life affects consciousness. According to Max Webber subjective information can be rationalized through objective analyses and thus historical information can be generalized. Accordingly human behavior was viewed by Max Webber differently from Karl Marx. Marx in his transformation model has identified five stages of society[16] (Haralambos with Heald 2010). These explanations do not allow national defence to be fitted in as a government activity and therefore, existing knowledge on the relationship between national defence and economy has not been adequate to explain the economic roots of

[15]Hegel believed that reality is irrational incomprehensible and is only a abstract construction of mind. If the values are valid universally such historical observations are to the objective standard and therefore epistemologically acceptable. The analysis was based on moral psychology and Philosophical Anthropology.Kant viewed moral action as simultaneously principled and self-disciplined *and* expressive of genuine freedom and autonomy.It is an instrumental control of the self and the world. It's a kind of degenerates into organized egoism.Kant and of Weber are really the same. One was a philosopher and the other a sociologist, but there… the difference ends" [Gellner 1974, 184].Growing self-consciousness or "intellectualization gives the same meaning.

[16] Tribal form, Primitive communism, Feudal or state ownership of production, capitalism or capitalist society and finally the communism or the communist society

national defence. In this study, having accepted the concept of paradigm shift[17], the social transformation that explains the role of national defence as a public good in the modern society is explained. Here, it also considers the inter and intra political economy relationship of the domestic society and the global scenarios (Castles 2001).

Social Transformation Model

Here firstly, the State structure is identified as government sector and private sector. The government sector again is identified as defence and non defence (Jayawardena 2012). The dynamic processes of these sectors depend on inter and intra level activities of each sector at individual level and at collective level. The action and reaction in society are formed within the background in which different socio economic, political and technological factors and other factors are interact exogenously (See Figure 2). These exogenous variables are continuously reformed by epistemological, ontological and ethnological dynamics in a society. Here the reformation can be either in favour of or against the mission of the components of the state structure depending on the reinforcements of the intervening factors of exogenous variables. Therefore, whether the social transformation has a tendency towards a conflicting episode or a tendency for smooth transformation dependson the people's capacity to engineer and re-engineer the socio-economic, political and other factors via epistemological, ontological and ethnological dynamics in the society. If the reinforcements are pro-conflict and violent, transformation in society can be badly affected and as a consequence national defence needs to expand to control the conflict in society that could lead to violence and militant activities. If national defence functions effectively the conflicting conditions and extremism

[17]According to Thomas Kuhn, the epistemological modification, the moral values of societies are evolved along with the time. He says, first, a description of how values for theory choice are transmitted from one generation of scientists to another, second, a description of how scientists with diversity in their configuration of desiderata for theory choice converge upon a single normal science paradigm after a period of scientific revolution, third, a description of how the transformation from one period of normal science to the next through a span of scientific revolution takes place as a consequence of the differential survival of only some but not all configurations of desiderata for theory choice(Kuhn, 1974, p. 297).

can be controlled while creating necessary conditions for peace. Such a control can be maintained if society can be transformed with appropriate epistemological, ontological and ethnological reinforcements that can undo the distorted value system which has led to the conflicts and violence. In order to sustain the smooth conditions in the society with a saturated level of national defence, effective and efficient national defence as a component of government along with appropriate social agreements supported by legal structures are required. If the society is not able to maintain such a smooth social system, the surrounding factors with negative reinforcement of epistemological, ontological and ethnological dynamics can lead to another repeated conflicting cycle (refer to Figure 3)

Figure 1: Social Transformation

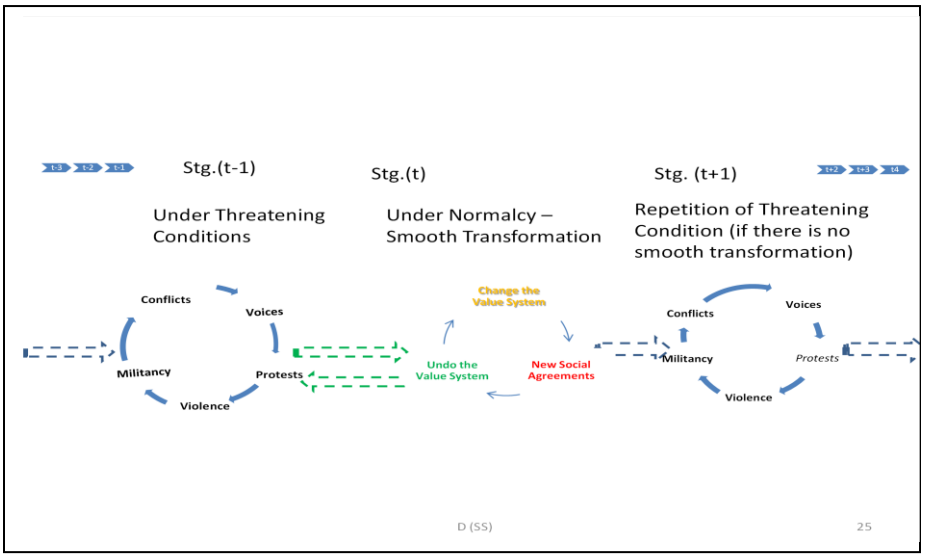


Figure 1 indicates three selected social transformation cycles, out of a large number of similar transformational cycles in the past and the future. The transformational cycle in the center is a cycle of normalcy which is an outcome of a conflict cycle that is reinforced positively by the factors in the socioeconomic, natural and other manmade environments through epistemological, ontological and ethnological dynamics. Figure 2 indicates the possibility of a conflicting cycle that could be an outcome of negatively

reformed factors in the vicinity of the cycle. On the contrary Figure 3 indicates the possibility of a normalcy cycle which is an outcome of positively reinforced factors.

Figure 2: Conflicting Cycle Leading to Threat on National Security of a Country

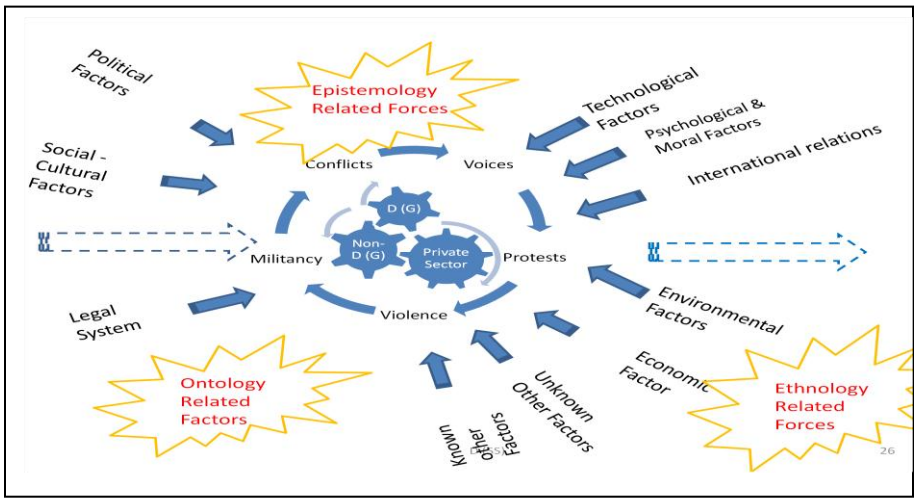
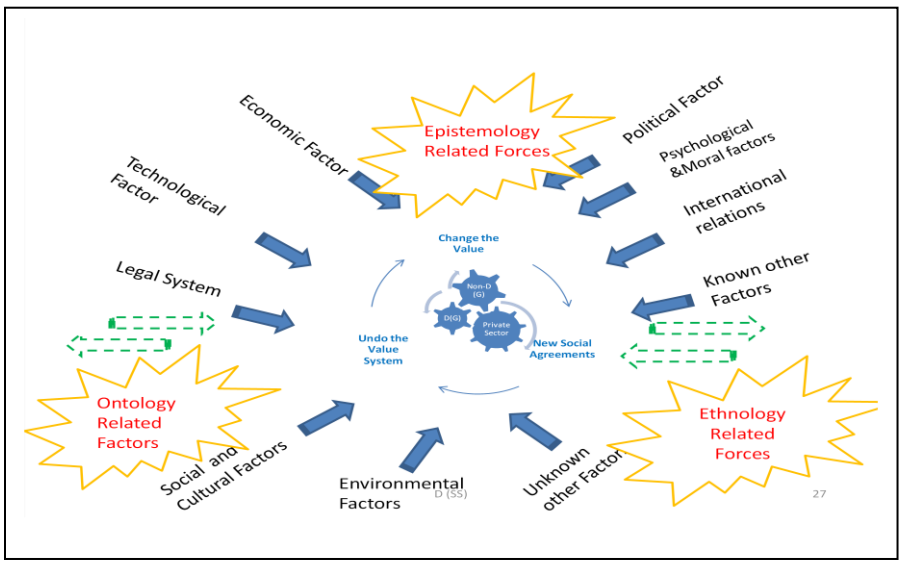


Figure 3: Smooth Social System with a Normalcy that guarantee the national security of a country



Conclusion

The social transformational models in the classical, neo classical and modern explanations have not been able to give a consistent rational explanation to national defence and its relationship with the socioeconomic structures of an economy. The alternative analysis proposed in this study enables us to explain national defence and its relationship with other state structures and the transformation of national defence along with the changes of the political economy that are associated with changing socioeconomic and political dynamics. Accordingly, during the conflicting cyclical episodes national defence becomes significant. If the conflict cycle can be transformed to normalcy with appropriate reinforcements, national defence is also automatically transformed to its saturated point. Therefore, under such conditions we can conclude that national defence could reach the optimum level under the assumption that the normalcy condition is maintained continuously.

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Economic Effectiveness of the Devolution of Power to Provincial Councils in Sri Lanka: A Resource Productivity Analysis

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Keywords: *Devolution, Recurrent expenditure intensity, Personnel emolument overhead, Supplementary investment, ICOR*

Introduction

Devolution of power in Sri Lanka was a heavily debated subject ever since the introduction of the Provincial Council system in 1988 based on the 13th Amendment to the Constitution.[18] Diverse opinions are expressed regarding its usefulness, and also with respect to future action. Some argue for much deeper devolution of power to Provincial Councils (commonly referred to as 13+) in response to demands for more "autonomy" by the Northern political forces, while some others demand for the complete abolition of the Provincial Council system upon the fear that it would eventually threaten the unitary status of the country's political administration. Several others suggest continuing with the system, but with further constitutional amendments to remove some of its provisions.

It is a fact that Sri Lanka's devolution was politically motivated, and therefore, it is unclear as to whether the economic incentives for devolved management of the affairs of the nation were given due consideration. According to literature, fiscal decentralisation may lead to economic efficiency, cost efficiency, accountability and resource mobilisation; but reaping these benefits, require the prior existence of significant local administrative capacity, responsive officials,substantial discretionary financial control and geographic incentives (such as large land areas and distantly spread regional activities) which could

[18] Through the Provincial Councils Act No 42 of 1987.

offer scope for saving on administration and coordination costs (Bird andVaillancourt, 1998).

Unfortunately, the research that has hitherto been conducted on the Sri Lankan case of devolution have been mainly on the political aspects and do not entail a significant analysis on these economic and developmental aspects of devolution[19]. Economics of provincial management in general, and the impact of Provincial Councils on the country's overall resource utilisation efficiency in particular, have not yet been adequately appraised.

Objectives

The present research was conducted with the objective of appraising the fiscal impact of devolution in Sri Lanka. It focuses particularly on the behavior of the economy's overall fiscal expenditure efficiency, before and after the establishment of Provincial Councils, in order to derive lessons for future. At the same time, the research would also contribute towards enriching the discussion on further devolution based on the 13th Amendment.

Methodology

The research approached the question via appraising the recurrent and capital expenditure patterns of Sri Lanka's economic activity before and after the coming into effect of the Provincial Council system. The economic effectiveness of the provincial management structure was examined on the premise that there would be administrative cost efficiencies to gain, such as advantages of geographic proximity to user communities (Bird et al, 1998) and the possibility of area specific service production without having to bear undue communication, networking or chain-of-command related costs considered to be inherent in centralised or unitary management of public service provision.

[19]One rare exception is the study conducted at the Institute of Policy Studies by Waidyasekara (2004), which points out several inherent weaknesses and deficiencies of the "fiscal devolution" activity that has assumed importance in Sri Lanka for political reasons in the context of the ethnic crisis.

Such advantages, if any, would reflect in a reduced level of recurrent expenditure intensities after the devolution, compared to those before.

When analysing the relative recurrent and capital expenditures, care was taken to include only those comparable expenditure headings. This was because an inclusion of those expenses on activities that are not performed by the Provincial Councils (such as defence, foreign debt service payments or financial allocations to Provincial Councils) would make the analytical bases incomparable.

The analysis was performed using secondary data, sourced from the Annual Reports of the Central Bank of Sri Lanka, the Ministry of Finance and Planning, and the National Finance Commission.

The period from 1981 to 2012 was included in statistical comparisons where the data pertaining to the period after 1990 were considered to be reflecting post-devolution patterns, as separate financial data pertaining to Provincial Councils were not available until 1990, even though the Provincial Council system came into effect in 1988[20].

Graphical observation of comparative trends, analysis of recurrent and capital expenditure ratios, statistical comparison of averages, regression analysis and an investment productivity appraisal were used as analytical methods.

Analysis and Results

The first and foremost observation that emerged through comparative analysis of expenditure patterns was that the Provincial Councils have been overwhelmingly dependent on Government grants. Only around 22% of the total expenditure, in average, has been met through the "revenues" earned by the Provincial Councils, andover 78% of recurrent expenditure and nearly 91%

[20]According to the National Finance Commission sources, provincial financial management came into effect only by 1990, and no statutes were available until then forsuch an activity.

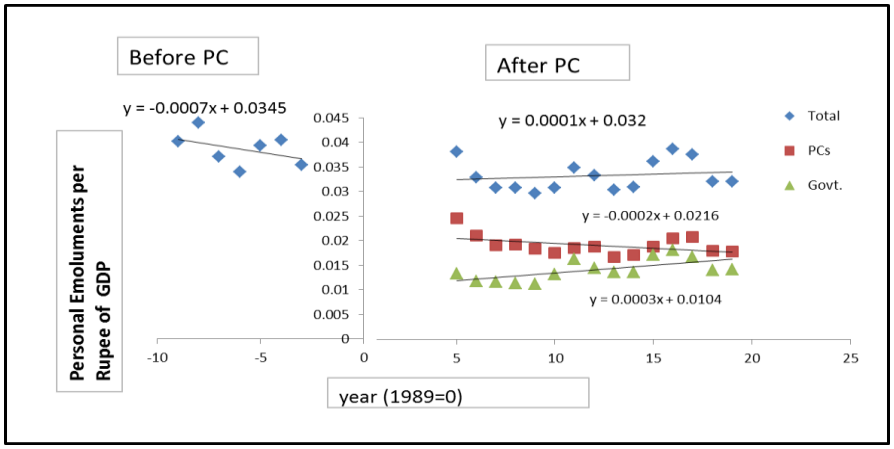
of the capital expenditure of the Provincial Councils have been shouldered by the national Government allocations (see Table 1 in Appendix).

It is also noticeable that the Provincial Councils, in several years, have invested less than the capital grants received from the national coffers, pointing at the possibility of meeting recurrent expenditures through capital votes granted at the expense of intended development effort.

The information also reflects the disproportionately high share of recurrent expenditure in the Provincial Councils (nearly 85% of the total expenditure). This, together with the overwhelmingly dominant share of personnel emoluments in recurrent expenditures of the Provincial Councils (nearly 80%), leads to hypothesize either (a) an excessive bureaucratic over-burden in the provincial management, or (b) a skewed devolution of functions by the 13th amendment where more "bureaucratic intensive" service-oriented activities have been devolved to Provincial Councils, while more development oriented functions are retained with the national Government.

This question was further examined through a comparative analysis of bureaucratic expenses of the nation before and after the establishment of provincial councils, the results of which are depicted in the Figure 1.

Figure 1: Evolution of Personnel Emoluments as a Share of GDP



Source : Author's calculations

The analysis enables several interesting observations. Firstly, the overall "bureaucratic intensity" of the country's economic activity does not appear to have significantly changed when the averages before and after the devolution are observed.This reflects that the management of public affairs, over the years, has been unable to secure the normal economies of scale advantage that would naturally be associated with a growing economic system, let alone gaining any significant "devolution specific" administrative cost efficiency advantage associated with the introduction of the Provincial Council system. This could possibly be a demonstration of the absence of necessary conditions, such as geographic advantages, sparsely dispersed regions and their sufficiently long distances from administrative and economic centres (Bird and Vaillancourt, 1998), or an inadequacy of any such devolution or decentralisation specific advantages to compenste for otherwise "growing inefficiencies" in the evolving public management system.

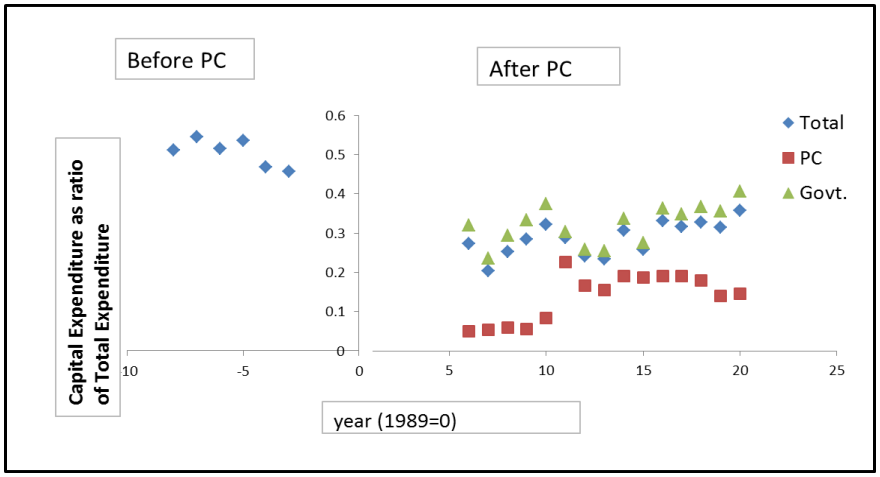
Secondly, the observation that there had effectively been a "declining trend" in the overall bureaucratic intensity of the country's economic activity prior to the introduction of the Provincil Council system, which appears to have been reversed thereafter[21], would tend to hold the process of devolution accountable for such an unfavourable trend, possibly owing to the "adverse effects of devolution", such as wasteful duplication of basic functions, inefficiencies, or equity-related drawbacks, discussed by Rodriguez-Pose and Gill (2005). However, the gradually declining trend observed in the Provincial administration's share of the economy's bureaucratic intensity, together with the reverse trend visible in the Government's share, paves the way to preliminarily infer that the central administration is more likely to be plagued with such "adverse effects" ever since the introduction of the devolved system of management, than the Provincial administration itself.

The above evidence, coupled with the observation that the provincial administration had a much larger share (over 60%) of the overall bureaucratic intensity of the economy in the earlier phases of devolution, suggest thatthe

[21] For the sake of comparability, the analysis was confined to the period underinternal insurgency.

process of devolution in Sri Lanka has largely been neutral in terms of the economy's overall bureaucratic overhead expenditure, and that it has been nothing but a "handing over" to provincial councils of a heavily service oriented set of functions (thus, "skewed" separation of functions) hitherto undertaken by the Government, together with their relevant administrative and managerial apparatus, supporting the hypothesis (b) above. These public services are now made to be delivered through the same Governmental apparatus, but under a devolved administration, and arguably with an increasing degree of duplicity (indicated by the increasing trend of the overall economy's and national Government's share of the bureaucratic intensity),and also with an additional administrative overhead burden of running apex political and administrative apparatus at the provincial level, accounting for nearly 6% of the total expenditure of the Provincial Councils[22], or 0.15% of the economy's Gross Domestic Product.

Figure 2: Evolution of Capital:Total Expenditure Ratio



[22]Those "devolved public service functions" would have to be delivered with or without devolution, and therefore, the recurrent expenditure on running those service delivery apparatus could not be avoided even if such are centrally administered. However, the administrative expenditure on running the apex political and administrative overhead of the provincial management (nearly 6% of the total expenditure of the provincial councils) could arguably be "saved" if Provincial Councils were not to be.

The capital expenditure patterns of the Provincial Councils, on the other hand, indicate a different picture when examined in proportion to total expenditures incurred, with a significant breakdown of the "investment share" of overall public spending since the coming into effect of Provincial Councils (Figure 2).

The national Government appearing to invest much more per rupee of total spending compared to the Provincial Councils could be a result of the unbalanced structure of functional devolution in which highly service intensive activities were devolved while retaining the development oriented functions at the centre. But, such reasoning could not explain the overall reduction of investment intensity inthe economy's public expenditure.

This was further studied through an Ordinary Least Square regression analysis where the investment intensity of the overall public spending (Provincial Councils and the national Government together) was examined. In this analysis, the national political orientation towards "State interventionism" was represented by the fiscal deficit ratio the successive Governments chose to run[23], while the effects of "internal insurgency" and "devolution" conjunctures were examined by introducing two dummy variables.

$$KEI = K + A\,(FDR) + B\,(D_1) + C\,(D_2)$$

where,

KEI: Capital expenditure share of the total public spending

FDR: National Fiscal Deficit as a ratio of GDP

D_1: Devolution dummy (=0 without PCs, =1 with PCs)

D_2: Insurgency dummy (=0 when in peace, =1 when under insurgency)

[23]A national political regime willing to run high budget deficits could spend more on public investment than a political regime with neo-liberal ideology. This effect was captured by the introduction of budget deficit ratio as an explanatory variable, which was also proven significant in the regression analysis.

Table 2: Results of the OLS Regression Analysis

Dependent Variable: KEI
Method: Least Square — Durbin-Watson Index = 1.75
Sample: Annual data from 1981 to 2012 — Included observations: 32
Adjusted R-squared = 0.871745 — F-statistic = 63.43842

Variable	Coefficient	Std. Error	t-Statistic	Probability
Constant	0.661300	0.049441	13.37564	0.0000
FDR	-0.011288	0.004203	-2.685732	0.0120
Devolution Dummy	-0.184412	0.017852	-10.33012	0.0000
Insurgency Dummy	-0.093358	0.015524	-6.013771	0.0000

As per the results of the regression analysis summarised in the Table 2 above, the R^2 and t-statistics confirm that nearly 87% of capital to total public expenditure ratio is explained by the selected independent variables and all three variables have statistically significant effect on the overall investment intensity of public spending. Also, the results confirm the previous observation made in the graphical examination that the devolution has had a significant negative impact oninvestment orientation of the country's overall public spending. Accordingly18 cents more would be invested per each rupee publicly spent, if the Provincial Council system did not exist.

This enables estimation of the additional growth impetus under the hypothetical condition of the absence of Provincial Councils, where the public investment would increase with no augmentation of the overall fiscal burden. For instance, an18.4% growth of investment intensity of public expenditure would mean a supplementary public investment ratio in the economy of 2.3%, which would generate an additional economic growth impetus of approximately 51% under

the prevailing average level of Sri Lanka's Incremental Capital Output Ratio[24] of 4.4.

It is therefore evident that devolution of power to Provincial Councils has been economically detrimental in relation to public investment. Though the causes of this negative effect are not examined in the current analysis, it might be that the effects of devolution have forced the nation to forfeit any advantages that the centralised economy may have enjoyed (Bird and Vaillancourt, 1998).

Conclusions

Based on the above analytical results, the study leads to the conclusions that (a) the provincial management in Sri Lanka has been overwhelmingly dependent on the grants received from the National Government indicating that one of the widely recognised conditions for successful devolution, namely the control over its own finances, has been quasi absent, (b) the process has not generated any administrative cost savings that are generally expected through economically rational devolution,(c) the management of public funds in favour of capital formation has been negatively impacted during the post-devolution period, (d) an abolition of the Provincial Council system could generate an additional GDP growth push of over halfa percent,subject to deployment of the supplementary investment potential in development ventures not less productive than what is reflected by the prevailing ICOR of the economy.The process of devolution in Sri Lanka through the establishment of Provincial Councils cannot therefore be concluded as having sufficient economic justification.

[24]ICOR = Incremental Capital Output Ratio= $I/\Delta Y = (I/Y) / (\Delta Y/Y)$ = Investment ratio / GDP Growth rate. Sri Lanka's ICOR over the past 5 years being approximately 4.4 (authors' estimates based on the data published in the Annual Reports of the Central Bank of Sri Lanka), each 4.4% growth of the Investment ratio would give rise to 1% additional GDP growth impetus.

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Table 1: Evolution of Recurrent and Capital Expenditures of the Provincial Councils

Year	Total revenue earned by PCs (Rs.mn)	Total expenditure of PCs (Rs.mn)		Central Governmrnt Grants to PCs (Rs.mn)		Govnt. recurrent grants as a % of total PCs recurrent expenditure	Govnt. Capital grants as a % of total PCs capital expenditure
		Recurrent	Capital	Recurrent	Capital		
1990	-	9,999	1927.7	9,999	1927.7	100.0	100.0
1991	2,018	12849.5	2113.7	10831.38	2113.7	84.3	100.0
1992	3,002	14597.7	2013.7	11595.25	2013.7	79.4	100.0
1993	3,550	17262.1	2156.6	13711.96	2156.6	79.4	100.0
1994	4,000	19885	2192.5	15885.151	2192.5	79.9	100.0
1995	4,440	19,795	1,057	14,066	1,222	71.1	115.6
1996	4,884	20,941	1,187	15,831	842	75.6	70.9
1997	5,395	22,055	1,400	16,855	1,493	76.4	106.6
1998	6,002	25,230	1,506	19,194	1,400	76.1	93.0
1999	6,993	26,284	2,433	21,122	1,665	80.4	68.4
2000	7,534	28,856	8,472	23,220	8,323	80.5	98.2
2001	8,674	33,425	6,669	24,699	6,249	73.9	93.7
2002	9,366	38,268	7,000	30,574	7,342	79.9	104.9
2003	11,625	39,800	9,423	30,462	7,370	76.5	78.2
2004	13,522	46,308	10,656	35,892	9,956	77.5	93.4
2005	16,133	59,132	13,878	47,107	12,588	79.7	90.7
2006	19,481	76,428	18,043	62,342	16,687	81.6	92.5
2007	25,868	92,721	20,346	70,742	17,575	76.3	86.4
2008	31,368	103,199	16,812	76,773	12,169	74.4	72.4
2009	29,433	111,336	18,924	77,386	16,613	69.5	87.8
2010	36,829	119,162	26,329	85,299	21,733	71.6	82.5
2011	40,990	129,600	27,773	94,603	21,780	73.0	78.4
2012	47,410	136,153	23,363	91,892	20,214	67.5	86.5
Average	**15387.2**	**52316.8**	**9812.0**	**39134.0**	**8505.4**	**77.6**	**91.3**

Source: National Finance Commission Annual Report (2004) CBSL Annual Reports (1995-2012)

Empowering Local Governments in Sri Lanka: Learning from Japanese Experience

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Keywords: Japanese local government, Sri Lanka, Municipalities, Governance and Development, Central-Local RelationJEL Classification: H1, H2, H7,

Introduction

Decentralisation of political, fiscal and administrative responsibilities to local governments is perhaps one of the most important governance and institutional restructuring processes towards empowering local government in Sri Lanka. The local government plays an important role in delivering public services because it is the closest administrative unit to the people (Scott and Alam, 2011). It also serves as the most democratic administrative unit because local residents can participate in the decision-making process (CLAIR, 2008). Moreover, it is market friendly because individual choice is given due consideration, and the needs and concerns of citizens are addressed (Owens and Panella, 1991; Scott and Alam, 2011).

Adam Smith in his Wealth of Nations (1776) argues that in a market economy, resources are allocated through the decentralised decision of many households and firms as they interact in markets. And therefore, if local governments are empowered, they promote the wellbeing of local citizens taken into their private choices. The World Bank (2004: p. 1) further argues that wellbeing can be improved "by putting poor people at the centre of service provision; by enabling them to monitor and discipline service providers, by amplifying their voice in policy making, and by strengthening the incentives for providers to serve the poor". All these advocates support market preserving decentralised system of government (or local autonomy) which constitutes democracy, subsidiarity, and fiscal responsibility(Mochida, 2008; Backhaus, 2012). Decentralisation in Sri

Lanka has long way to go and it is quite complicated and sensitive to political regimes that are intent on empowering the central government, rather than local or peripheral governments.The current public local governments in Sri Lanka seem to be inconsistent, centralised, politicised and not-so-efficient system.

The notion of devolving power to local regions, as indicated in the 13th amendment to the Sri Lankan constitution and also as recommended by the Lessons Learnt and Reconciliation Commission (LLRC), needs comprehensive understanding given the vision and mission of political leaders of the country. Therefore, there is indeed a strong need, particularly in the post-war conflict, to formulate policies for reconciliation, peace building and development at all levels-local, provincial and national.

Objectives

Considering the developmental, governance and conciliatory needs and the sensitivity of central-local relations, this paper has the following aims: (a) to examines local government systems in Japan and Sri Lanka; (b) to propose a viable, effective, and autonomous local level administrative unit for Sri Lanka; (b) and to identify the role and functions of the proposed administrative unit.

Methodology

Our methodology is mainly based on qualitative approach as we could not under take quantitative technique because it was difficult to find relevant data relating to governance and development at local level. We did many field visits and undertook extensive interviews in Japan and Sri Lanka with a view to get first-hand information of current local government systemsand their roles in delivering services and development to the local community. Our field tours in Japan include Minami Uonuma City, Niigata Prefectural Government Office, Yamato Town Office, Shiozawa Town Office, and UonumaTown Office.

In Sri Lanka, we undertook many field visits and interviews covering Eastern, Southern, and Western Provinces of Sri Lanka. Other meetings include officials

of the Ministry of Finance and Planning, Finance Commission, Central Bank, PradeshiyaSaba and Divisional Secretaries. We also benefited from informal meetings and discussions with more than 35 Sri Lankan students who are/were studying at the International University of Japan (IUJ) under Japanese Government scholarships. Many of them are government officers from Sri Lanka Administrative Service, Accounting Service, and Planning Service with first-hand experience in local governments.Those filed tours, interviews together with the extensive literature survey facilitated our research process to identify an appropriate institutional unit for empowering local governments. Furthermore, this paper is based on a three year research project (2011 April-2014 March) the author undertook with the funding support from the Japanese Government through Grant-in-Aid Science Research and research done together with Sri Lankan students at IUJ.

Results

This paper discusses local government systems in Sri Lanka and Japan and proposes a proper public local government unit for Sri Lanka. And the finding suggests that current local governments PradeshiyaSaba (PS) and Divisional Secretariat (DS) in Sri Lanka lack clarity and division of functions. This has resulted in confusion, inefficiency and conflicts among regional political leaders and government officials. We also find that in Japan, decentralisation of fiscal allocation to local governments through Local Allocation Tax Programme (LATP) implemented since the 1950s have contributed to governance and development at local level. Empirical evidence suggest that empowering the local government through decentralization is currently been implemented in over 80 per cent of developing countries.

Conclusion and Policy Recommendation

Critically analysing the benefits of the Japanese local government system and the limitations and strengths of the current Sri Lankan systems, this study proposes merging PSs and DSsto create one local administrative unit that is close to local citizens. The merged unit may be called a Divisional

Administrative Unit (DAU) or any other suitable name, and its geographic scope can be the same as that of the current corresponding DS. The proposed DAU contains an executive and a legislative branch. Public participation and democratic representation in local administration and regional development underlie our proposed local administration system. In addition to the right to elect their representatives, people should enjoy the right to direct participation in local administration and developmental activities. Such a right safeguards the rule of law, democratic values, ethnic harmony, and market elements. We believe that our proposed local administrative unit plays a vital role in empowering and improving the livelihood of local citizens.

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Electoral Promises, Institutions, Constitutional Provisions& the Role of the Government: An economic Analysis of the 1978 Constitution of Sri Lanka

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***Keywords**: Institutions, constitutional economics, economic analysis of law.*

Introduction

Kautilya (370 B.C–283 B.C.) in his economic teachings identified the importance of institutions that result in good governance which leads to economic prosperity. Acemoglu and Robinson,2012 identify institutions as receiving major attention in modern day economics literature, as being a factor behind some countries being poor while countries with similar resources are richer. Accordingly "Inclusive Institutions" make some parts of the world richer while "Extractive Institutions" make the rest poor. Thus proper institutions - in other words inclusive institutions - are the secret behind sustainable economic growth and prosperity.

Theory suggests that separation of power is greater under the presidential regime than other regimes. This leads to lower rent extraction and less corruption. Presidentialism is identified as a system of government where a head of government is also head of state, in contrast to a system where the president is the head of state while the prime minister is the head of the government. Economic literature suggests that such a system reduces rent under better democratic conditions and hurts economic performance under worse democratic conditions (Persson and Tabellini, 2004). District magnitude is defined as the number of representatives elected from a given district to the legislative body. District magnitudeaffects rent extraction by politicians. When

the magnitude is more, voters can select honest candidates form their preferred ideology and oust the dishonest. When it comes to a single candidate, provided there is one candidate representing each ideology for one district, voters have no option to oust the dishonest (Myerson, 1999). Under plurality rule voters cast their vote for individual candidates of political parties. In contrast, under the proportional system voters choose candidates from a particular party. Persson and Tabellini (2004) point out that in proportional representation the tendency for politicians to behave well is comparatively less when compared to the Plurality rule. In proportional representation the rent extraction is believed to be more.

We look into constitutional history and electoral promises made (promises regarding constitutional changes) by each candidate in presidential elections, and their actual commitment to keep in line with the promised constitutional changes. These pre-election promises are considered as the "needs identified by the presidential candidate" and this will be compared with the "actual constitutionals amendments" (seeappendix: Table 1 and 2)

The main contribution of this paper is to demonstrate why countries like Sri Lanka need to strengthen inclusive institutions through constitutional reforms in order to maintain sustainable economic growth, peace and political stability.

Objectives

The main objective of this paper is to investigate the role of constitutional reforms in achieving prosperity through inclusive economic and political institutions.This paper attempts to identify the manner in which institutions weresubjected to dilution throughout the constitutional history of Sri Lanka. Further this paper attempts to identify the manner in which an electoral promise identifies the best practice. This paper identifies the optimal constitutional provisions for Sri Lanka, using the benchmark formulated using the economic literature on best constitutional provisions.

Methodology

The paper adopts an economic-analysis-of-law (lexonomic) approach, embedded in the second best efficiency criteria, following the tradition of Mishan, 1981. The approach adopted is one of "comparative institutional analysis in positive constitutional economics".Accordingly, the paperformulates a benchmark of optimal constitutional provisions based on the existing literatureon economic effects of constitutional provisions. In other words the best constitutional provision for economic prosperity will be identified and a benchmark formulated.This analysis thus compares and contrasts the current constitutional provisions (1978 constitution of Sri Lanka) with the theoretically optimal benchmark. Further as part of the analysis, in this paper we investigate theconstitutional history of Sri Lanka and compare the 1972 and 1948 constitutions with that of 1978, in order to figure out whether the provisions have improved or not, throughout the constitutional history of Sri Lanka. This comparison is an economic evaluation of the constitutional provisions of the 1946, 1972 and 1978 constitutions of Sri Lanka. We look at electoral promises made by the candidate who won the particular election. We compare their promises with actual implementation after winning the election.

Results

Electoral promises do identify the optimal provisions that are needed for the country. Yet promises were hardly kept. In the past three presidential elections from 1994 to 2010 (Table 2), the candidate who won the election has identified the optimal constitutional provisions that are best suited for inclusive institutions in a pre-election context. However the promises are not kept in the post-election era. On the other hand there is no proper mechanism that makes politicians liable to keep their promises (in contrast to most Scandinavian constitutional provisions) or to prevent the constitution form unexpected changes which were not mentioned inactual electoral promises (e.g. the 18th Amendment to the constitution).Economically optimal constitutional provisions were visible in the 1946 and 1972 constitutions, compared to the 1978 constitution (Table 1).

Conclusion and Policy Implications

Inclusive institutions are key to economic prosperity. Throughout economic history scholars have identified the importance of institutions that set the stage for economic prosperity. By comparing the benchmark provisions and the actual provisions of the 1978, 1972 and 1946 constitutions, this paper identifies the manner in which constitutional provisions for inclusive institutions have been eradicated in Sri Lanka throughout the history. In other words, the deviations from the benchmark provisions are minimal in the 1946 constitution, while the deviations are more in the 1972 constitution. In contrast to both of those constitutions the 1978 constitution deviates by a large measure from the theoretically optimal benchmark, indicating a loss of the inclusive nature of the constitutional law in Sri Lanka, as far the provisions for economic betterment is concerned.

However pre-election promises portray a different picture. Economically more optimal provision has been identified in the presidential elections held from 1994 to 2010. However, lack of political commitment to keep the promised provisions is widely seen when we compare the pre-election and post-election conduct.

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Appendix:

Table 1: Comparison of Constitutions

Constitution **Aspect**	**(1946) Soulbury**	**1972**	**1978**
Electoral system	Purely Majoritarian (with provisions for minorities)	Purely Majoritarian	Purely proportional
Nature of electoral districts	Smaller	Smaller	Larger
Legislative body	Bicameral parliament (senate and the house of representatives)	Single cameral (National State Assemblée) (NSA)	Single cameral (parliament)
Head of State	Governor-General	Non-executive president	Executive president
Head of Government.	Prime Minister	Prime Minister	Executive president
Accountability (Head of Government. to the Parliament)	Prime minister accountable/questioned	Prime minister accountable/questioned	President not accountable to the parliament not bound to answer the parliament
Independent Judiciary/public service	Judiciary/public service under control of the independent commissions	Judiciary/public service under control of the National state Assemblée and the minister	Under the control of the commission appointed by the president (

			after the 18th amendment)
Judicial control over legislation	Introduction of constitutional court	Legislation approved by the NSA cannot be questioned by judiciary	Legislation approved by parliament cannot be questioned in courts.
Basic human rights	No proper remedies available in case of violation of such human rights.	Inclusion of statements on basic rights and freedom	More detailed inclusion of human rights and clear mechanism in case of violation
Decisions of courts over legislator	Decision of the Constitutional court may bind the speaker	Decisions of the constitutional courts upon reference bind the speaker	Judiciary cannot bind the binds the speaker nor the parliament
Legislation process	Tripartite legislative process. (with House of representatives, senate, Governor-general)	National state Assemblée as the solve legislative body	Only parliament engage in law making process

Source: Constitutions of Sri Lanka (1946, 1972 & 1946)