



RESEARCH ARTICLES

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AIMS AND SCOPE

Sri Lanka is currently facing many transitions: economic, epidemiological, demographic, technological and social. The world economy too is evolving, with technological progress, economic crises and social upheavals demanding more and alternative economic analyses. Both these factors make it imperative for economists in Sri Lanka and overseas, among the academic community as well as practitioners, to focus on economic research and its dissemination. The Sri Lanka Journal of Economic Research (SLJER), the international journal of the Sri Lanka Forum of University Economists, seeks to fulfil this mandate.

The SLJER is a refereed bi-annual tri-lingual journal. It creates a space where research, particularly *policy related* research, can be disseminated and so contributes to the economic thinking in the country in this period. The critical evaluation of policy is essential if optimal use is to be made of the demographic window of opportunity. Equity and social welfare, the cornerstone of economic thinking in the country, and the challenges posed to such fundamentals by economic liberalization, globalization and technological progress make it vital to dwell on ideas and ideals, as well as to collate systematic evidence to support rational policy making. The aim of this journal then is to support such processes through dissemination and discussion.

The SLJER is open for publication of high-quality research outputs of scholars, researchers and practitioners in Economics and Development Policy, even though it primarily provides an opportunity for authors presenting papers at the Sri Lanka Economic Research Conference, the annual international symposium of the Sri Lanka Forum of University Economists to disseminate the outcomes of their research. Apart from the research articles the journal carries a special section titled 'Perspectives' which articulates alternative thinking and approaches to Economics. Book reviews are included as well.

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THE EFFECT OF TAX COMPOSITION ON INCOME INEQUALITY: SRI LANKAN EXPERIENCE

H R A C Thilanka

J G S Ranjith

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Abstract

The main purpose of this research paper is to identify the effect of tax composition and tax compliance among other variables on the income inequality in Sri Lanka. Taxes may affect income inequality depending on tax composition, progressivity and tax compliance. In the Sri Lankan context, the existing tax structure largely consists of indirect taxes and a higher level of tax non-compliance leading to a regressive tax system. Persistent high level income inequality and declining tax revenue buoyancy have been considerable issues experienced by the Sri Lanka government nearly over the last three decades that weakening fiscal operation and performance is an important empirical question to be addressed. This study adopts a time-series econometric method -- Johansen Cointegration and Vector Error Correction model to capture the long-run and dynamic relationships of selected variables. The data for the study were collected from Annual Reports and Economic and Social Statistics of Sri Lanka published by the Central Bank of Sri Lanka for the period of 1985 -2018. The key findings show a negative impact of direct taxes and a positive impact of indirect tax- VAT and tax non-compliance on income inequality. It suggests the necessity of broadening income tax base and strengthening tax compliance to reduce income inequality while improving buoyancy of tax revenues through best practices of taxation. Our findings provide more precise and feasible policy directives for the path to realize revenue-based fiscal consolidation with a more equitable and rationalized tax system in Sri Lanka. The impact on economic growth is not clear and left for future research.

Keywords: *Income Inequality, Tax Composition, Tax Non-compliance, Fiscal Policy, Direct Taxes, Indirect Taxes, Vector Error Correction Model*

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INTRODUCTION

Tax is an instrumental objective of fiscal policy. Conventional understanding is that taxes can be used to redistribute income and reduce inequality. Meanwhile, depending on the nature of the tax, it is differently felt as a tax burden by the taxpayer. The academic reflections in this regard have vastly focused on both statutory and economic incidence of taxes across different types of taxes. (e.g., tax composition and its effect on income distribution). Indirect taxes are generally regressive, while direct taxes are often progressive so that both types of taxes may lead to change in income distribution. Furthermore, tax composition affects net inequality in two ways: first, taxes have a different degree of progressiveness, and therefore tax composition is partly responsible for inequality. Second, tax composition affects economic incentives (e.g., labour market incentives, savings and investment), thereby it indirectly affects net inequality (Drucker, et al., 2017). Hence, the tax system is expected to play an important role for economic development and equity being a major part of fiscal operations.

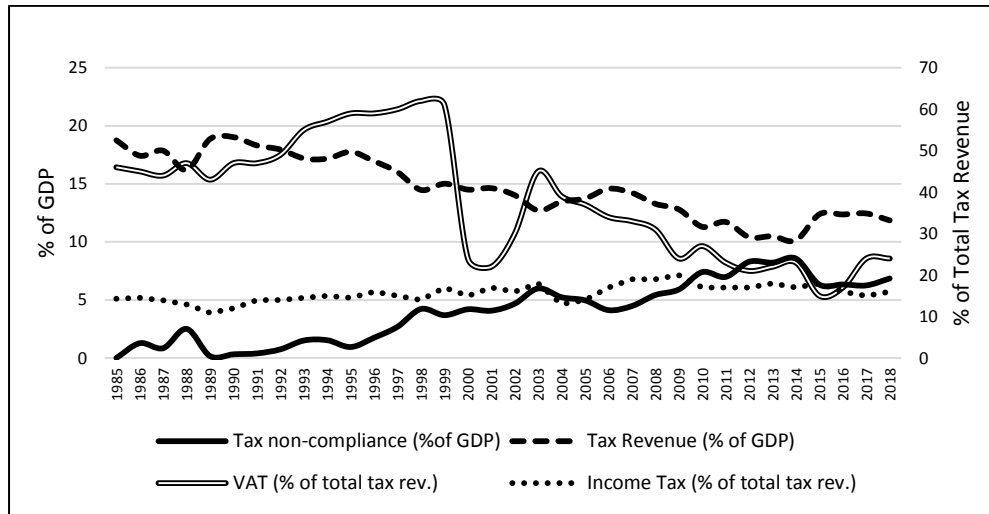
However, this aspect of taxation has been problematic over the last few decades in Sri Lanka as it does not deliver the potential tax revenue while maintaining a satisfactory level of tax compliance. In recent years, this issue in taxation has been focused with much debate among politicians, academic researchers, policy makers and practitioners. Nevertheless, each successive government faces this challenge that is detrimental to fiscal operation of the government, fairness of income distribution, efficiency and smooth economic stability.

Tax revenue in Sri Lanka largely consists of indirect taxes which accounts for about 82 percent of total tax revenue being the major source of financing public expenditures (CBSL, 2018). Direct taxes include personal income tax (PIT), pay-as-you-earn (PAYE) tax, corporate income tax and tax on interests. Moreover, taxes are levied by various regulatory authorities by virtue of the powers vested in them. According to the Inland Revenue Department (2018), income taxes amounted to 18 percent of the total tax revenue of the government, and indirect taxes on goods and services (VAT) amounted to 24 percent of the total tax revenue in 2018. Furthermore, income tax collection has been reduced by 7 percent, while indirect taxes have grown by a colossal 33 percent since 2015 (Ranasinghe, 2018). As it depicted in Figure 1, Sri Lanka has experienced declining of tax revenue as a percentage of GDP over the last three decades that has been closely associated with weaknesses of the tax structure and administration combined with various tax exemptions, tax avoidance and the non-compliance of taxes (Coomaraswamy, 2017).

According to the Figure 1, the non-compliance of taxes is in an increasing trend over the last three decades not only due to the weaknesses in the tax administration but also due to several other reasons such as growing informal sector businesses and

transactions, complexity in calculations and many discretionary tax measures in operation which lead to evade tax payments.

Figure 1: Tax Composition and Total Tax Revenue (1985 – 2018)



Source: Compiled by authors based on Annual Reports (various years), Central Bank of Sri Lanka. Colombo

The problematic aspect of the tax composition is clearly reflected from the tax incidence borne by each income category. For instance, the poorest 20 percent in the society pays as much as 13 percent and the poorest 10 percent pays as much as 23 percent of their income in the form of indirect taxes while the richest 10 percent pays less than 1 percent of their income as indirect taxes (Ranasinghe, 2018). This indicates that the tax system in Sri Lanka is highly regressive and more than 80 percent of total tax revenue is collected in the form of indirect taxes. Given that a larger share of the budget of low-income categories in the society is spent on essential consumption goods, the instrument is likely to increase and maintain persistently high-income inequality. Although this aspect of taxation is widely discussed and debated, still there are no clear insights, made by any systematic research, regarding the magnitude of the effect of tax composition and non-compliance on inequality for the consideration of much needed tax policy reforms to make Sri Lanka’s tax system more equitable. Therefore, based on the above background information, we attempted to achieve the following two main objectives:

- To identify the effect of tax composition on income inequality in Sri Lanka, the magnitudes of which would provide important insights for tax policy reforms to streamline tax structure and to make it more equitable by adjusting the share of direct and indirect taxes appropriately.
- Declining of tax revenue in relation to GDP growth in the recent decades in Sri Lanka partly attributes to non-compliance of taxes which would in turn lead to make the tax system more regressive. Thus, there is a felt need of rationalizing tax

administration and fiscal operation of the government. We attempt to explore the insights into this anomaly by identifying the effect of non-compliance of taxes and real GDP among other factors on income inequality in Sri Lanka.

The remainder of this paper is structured by the reviews of theoretical background, which underpins the distributional effects of a tax system, and extant empirical research findings that directs to explore the knowledge gap in section 2. Section 3 presents data and methodology with an econometric approach. Section 4 presents the results and discussion and section 5 concludes the paper with some policy relevant implications.

THEORETICAL BACKGROUND AND LITERATURE REVIEW

The theoretical underpinning of distributional effects of a tax system can be mainly explained by using tax incidence theory since the distribution of after-tax income is determined by the structure of the tax system and the level of tax in a country. "In a general way incidence theory is applied to distribution theory in which the focus is on how various tax regimes affect factor returns and commodity prices" (Mieszkowski, 1969: p. 1103). Under this theory, different aspects of effects are explained such as the incidence of partial commodity and factor taxes, interregional incidence, and dynamic incidence, and monopoly elements and incidence. With the evolution of empirical and theoretical work, an important development of the incidence analysis is that increasing use of general equilibrium techniques which provide a broader coverage for the analysis. However, the distributional effects of some taxes are ambiguous and not fairly straightforward due to the complexity of the impacts. Hence, scholars have followed tax incidence theory to explain the effects of taxes on income distribution under different circumstances considering different types of taxes.

Recently, the impact of tax composition on income inequality has gained interest among policy makers and academic researchers (Drucker, et. al., 2017; Adam, et. al., 2015; Chu, et. al., 2000). Among those, Drucker, et al., (2017) reveals that income taxes on individuals and non-recurrent property taxes are negatively correlated with inequality and economic growth; corporate tax impedes economic growth and has no clear impact on inequality; taxes on consumption increase both inequality and growth in developed countries.

Furthermore, fiscal policy reforms towards reliance more on indirect tax increase the income inequality causing income distribution to be more unequal in Latin America (Mahon and College, 2009; Amarante and Jiménez, 2016). A study on corporate tax shows that "statutory corporate income tax rates are strongly negatively associated with income inequality by controlling various other determinants of income distribution, while personal income tax rates have no impact on income inequality" (Immanuel, et al., 2012: p.1). However, progressivity of national income tax reduces inequality in observed income, but has a significantly smaller impact on actual inequality in selected

developed and developing countries (Duncan and Peter, 2016). Adam, et al., (2015) in their study on income inequality and the tax structure in relation to the evidence from developed and developing countries show that more unequal economies rely heavier on capital relative to labour income taxation. This relationship remains robust across various alternative measures of income inequality and most importantly through alternative political regimes. Moreover, tax-based consolidations reduce both market and disposable income inequality, but at the cost of a decrease in output in the short to medium run (Ciminelli, et al., 2017). Meanwhile, taxation has influenced the evolution of inequality in Latin America. In particular, it shows that both tax level and tax composition matter as determinants of income inequality. Income taxation influences the distribution mainly by reducing the distance between the middle class and the upper class. However, the effect is limited at the top of the distribution (Martorano, 2018). Likewise, another study conducted by Martinez-Vazquez, et al., (2012) revealed that progressive personal income taxes and corporate income taxes reduce income inequality in selected developed, developing and transition countries, but the effect of corporate income taxes is eroded away with the degree of globalization or openness. Also, it is demonstrated that indirect taxes adversely effect on income distribution.

The general consensus among welfare economists on increasing direct taxes such as income tax and property taxes would lead to reduced income inequality seems to be an obscure and a debatable fact. Evidence shows that a statistical test finds no meaningful relationship between progressivity and reduction of at-risk-of-poverty income inequality in European countries implying that it is impossible to find a clear and unambiguous relationship between progressivity of income tax and income inequality (Šilėnas, 2015). As Chu, et al., (2000) point out, tax policies in industrial countries reduce their Gini coefficients much more than their counterparts in developing countries. Therefore, it implies that developing countries could not use tax and transfer policies effectively to mitigate income inequality. By considering selected developed and developing countries, Lee (2005) shows that the state is more inclined to support the development of particular core industries or client populations in urban formal sectors through targeted taxation or transfer programs so that public sector expansion may translate into worse distributional outcomes in non- democracies or limited democracies. Based on the economy of the United States, Poterba (2007), shows that there are two main effects of tax policy on income distribution. The first involves the redistributive impact of taxes for a given pre-tax distribution of income and the second involves changes in the pre-tax distribution of income that are induced by taxpayers' behavioural responses to the tax system. Tax system, particularly with direct tax on wealth, has an important place in dealing with inequality that is a major concern in the policy making process (Auerbach and Hassett, 2015).

According to the Indonesian experience, the total consumption taxes cause the inequality to increase marginally. In particular, the larger of the taxes (VAT) has a

positive marginal impact on inequality, implying that the existing indirect tax system intensifies the issue of inequality. However, the smaller tobacco excise has a negative marginal impact on inequality in Indonesia (Jellema, et al., 2017). The structural changes in income inequality across states and territories in Australia is linked to different factors including favourable changes in tax policies, indicating that both state and federal governments play a crucial role in moderating income inequality. It is evident that raising income inequality has been addressed through income transfers to low-income earners, a mildly progressive tax system -- raising more tax in proportion to income from high-income earners than low- or middle-income earners (Ivanovski, et al., 2019).

Similarly, in advanced OECD economies, tax-based consolidations reduce income inequality, but at the cost of weaker economic activity. This implies that tax composition is a main factor in determining the intensity of the impact on inequality. As such, it is found that indirect taxes reduce income inequality by more than direct taxes possibly due to the operation of a positive labour supply channel. Agents in the labour markets are induced to increase their labour supply due to the incentives created by the higher prices of consumption basket through higher indirect taxes, leading to generate positive effects on the income distribution. This scenario particularly prevails among middle-aged women. In addition, personal income taxes affect the income inequality negatively, indicating that imposing taxes on individuals' income can increase the level of equal distribution of income without having significant negative effects on labour force participation (Gerber, et al., 2019; Gabriele, et al., 2019).

In the Sri Lankan context, the current tax system has encountered issues particularly, with low levels of tax revenue, securing a fair income distribution and tax compliance. Tax compliance is determined not only by tax policy as such, but also by other factors such as the taxpayer's image of the government, the perceived equity and fairness of the tax system, social attitudes to taxation and the level of effectiveness of the administration as well. To handle these problems effectively, as suggested by (Amirthalingam, 2013), the country should follow measures such as broadening the tax base, simplifying the tax rates and tax laws, reducing the numbers of taxes, facilitating voluntary compliance, improving tax administration, providing incentives to genuine taxpayers and tax officials. Meanwhile, Kesavarajah (2016) reveals that the higher level of income taxes, import taxes and other taxes affect negatively to the output growth, while domestic consumption tax (VAT) shows a significant positive impact on long term output growth. However, there is no clear direction as to how the current system of tax structure and composition effect income inequality.

Thus, empirical evidence on how tax composition affects income inequality varies depending on country specific factors as well. In particular, the tax composition is an influential factor in determining the income distribution in a country/region, where the governments' intervention is substantial, since imposing taxes has an incidence on the

taxpayers. However, the effects of tax compositions show mixed results by empirical findings and it mainly implies that direct and indirect taxes have negative, positive or neutral impacts on the income distribution depending on its context. However, a significant effect of the progressive tax system (direct taxes) or regressive tax system (indirect taxes) appears in mitigating/intensifying the level of unequal income distribution. As such, empirical evidence underpins the prevailing negative impact of direct taxes (e.g. personal income taxes) and positive impact of indirect taxes (e.g. taxes on consumption – VAT) on the income inequality with contextual differentiations; contrariwise this impact is different in some contexts, and even neutral with the effect of other-related factors such as labour market behaviours, resulting in ambiguous linkages. Therefore, investigating the empirical relationship between tax composition and income inequality pertaining to the Sri Lankan context is important in order to recommend clear policy directions to reduce the level of income inequality through robust tax policies.

It is evident from the literature review that there is a dearth of systematic research on the tax system and its effect on income inequality in the Sri Lankan context. Hence, identifying this relationship and its effect would explore important insights into the reasons for high- and persistent-income inequality in Sri Lanka over many decades. Currently, it does not seem to be socially justifiable when compared with the standards of South Asian countries. For instance, according to the World Population Review - Gini Index by 2020, the Index for South Asian countries are India 35.2, Pakistan 30.7 and Bangladesh 32.1 whereas Sri Lanka's is 39.2 being far from the South Asian regional income distribution standards.

Thus, high income inequality, as an indication of underdevelopment, should be examined for understanding the extent to which the tax policy in Sri Lanka has been contributed to make it high and persistent. If the results of this study uncover such a link, rationalizing the tax composition, broadening the tax bases and making the tax system simple, fair and efficient would be required to correct it. Hence, this research intends to fill that research gap by examining the effect of tax composition and tax non-compliance among other variables on the inequality of income in Sri Lanka.

DATA AND METHODOLOGY

Hypotheses

In line with the objectives of this research study, four null hypotheses can be set up for testing in the econometric model selected for this study as follows:

H₀₁: Income tax does not affect the income inequality

H₀₂: VAT does not affect the income inequality

H₀₃: Import duties do not affect the income inequality

H₀₄: Tax non-compliance and real GDP do not affect the income inequality

Since there are three types of taxes; income tax, VAT and import duties are included as tax composition, impact of each tax variable on income inequality is estimated, thereby testing the H_{01} , H_{02} and H_{03} hypotheses respectively. Mainly, the impact of each independent variable on the dependent variable is estimated as a long-run effect. As the next step, the existence of the dynamic relationships (long-run equilibrium and short-run relationships) is examined.

Data and Sources

This study uses annual time-series data for the period 1985-2018. The data were extracted from Annual Reports and Economic and Social Statistics of Sri Lanka, Central Bank of Sri Lanka for various years.

Model Specification and Estimation

This study adopts Johansen cointegration and Vector Error Correction model to capture the long-run and dynamic relationships of selected variables as in equations (1) and (2).

$$GINI_t = \beta_0 + \beta_1 ITX_t + \beta_2 VAT_t + \beta_3 ID_t + \beta_4 TNC_t + \beta_5 LNRGDP_t + u_t \dots \dots \dots (1)$$

$$GINI_t = \beta_0 - \beta_1 ITX_t + \beta_2 VAT_t + \beta_3 ID_t + \beta_4 TNC_t + \beta_5 LNRGDP_t$$

→ (Eq. 1 with hypothesized coef. signs) (2)

Where; variables GINI, ITX, VAT, ID, TNC and LNRGDP in equation (1) denote that Gini index (represents the income inequality), income tax, value added tax or goods and services tax and import duties which are presented as a percentage of the total tax revenue, tax non-compliance (the difference between potential tax revenue and actual tax revenue -- LKR Million) and logarithm of real GDP respectively. The u is the white noise error term; t is the time period (1985-2018); Gini index of household income values (coefficients) are multiplied by 100 to express it as a percentage. Moreover, with the introduction of VAT in 2002, GST was replaced with VAT for the consistency of data considered in the model. The variables which represent the tax composition in Sri Lanka, namely ITX, VAT and ID were selected based on a previous study conducted by Kesavarajah (2016). We hypothesized that ITX to be negatively related with income inequality whereas VAT and ID to be positively related with income inequality due to the regressivity of indirect taxes. TNC and LNRGDP are the newly added variables which can have an impact on the inequality, especially following the Kuznets hypothesis which observes that possible positive relationship between GDP growth and income inequality (first stage of the inverted U shape curve) in underdeveloped and developing countries (Todaro and Stephen, 2012). Also, tax non-compliance is mostly resulted by weaknesses in tax administration and structural problems in the tax system. Since this study adopts a time-series analysis, time period and number of observations are a matter of concerning. The study uses a data set containing annual data for 34 years, which is reasonably sufficient for the analysis. However, it is noted that the time period is constrained by availability of required data (e.g., data on Gini index and tax

composition). More specifically, only three variables (ITX, VAT, ID) are selected to represent the tax composition which consists of both direct and indirect taxes, while existing other types of taxes are not considered due to the unavailability of consistent data for the whole period, and taxes are imposed depending on the volume, which might not reflect the impact on the income distribution properly (e.g., excise duties).

As most time-series are non-stationary, spurious regression problem exists at most of the time. In order to avoid this problem, it has become a standard practice to begin the analysis with prior determination of unvaried properties of the time-series (Khan and Gill, 2009). A long run relationship can exist when series follow the same order of integration. Moreover, a combination of stationary series can be identified from a non-stationary series through co-integrating techniques. Tests which are related to co-integration mainly involve two steps, namely identifying the presence of non-stationary (unit root) and long-run relationship between variables.

In order to identify the existence of non-stationarity or unit root, some standard unit root tests can be followed such as Augmented Dickey- Fuller (ADF) test, Phillips-Perron (PP) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. This study used ADF and PP unit root tests. The general ADF test used is shown in equation (3).

$$\Delta X_t = \mu + \beta X_{t-1} + \sum_{j=1}^p \alpha_j \Delta X_{t-j} + \varepsilon_t \dots \dots \dots (3)$$

A co-integration test should be employed to ensure that a group of non-stationary series is co-integrated and the presence of a long run relationship. This study employed a VAR (Vector Auto Regressive) based cointegration tests using the methodology developed by Johansen (1991, 1995).

A VAR of order p can be written as follows in equation (4).

$$Y_t = A_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + B' X_t + \varepsilon_t \dots \dots \dots (4)$$

Where, Y_t is a k vector of non-stationary I (1) variables, X_t is a d-vector of deterministic variables, and ε_t is a vector of innovations.

For the purpose of finding out the short -run relationship between variables and long run equilibrium of the variables, Error correction model is employed. The tests which are related to co-integration mainly involve two steps namely identifying the presence of non-stationary (unit root) and long-run relationship between variables. As most time-series are non-stationary, spurious regression problems exist most of time and so that this problem should be avoided by employing proper unit root tests.

This study uses ADF and PP unit root tests in order to identify the existence of non-stationary or unit root. Next, Johansen cointegration is adopted to ensure whether a long-run relationship exists when series follow the same order of integration.

For finding out the short-run relationship between variables and long run equilibrium of the variables, Error Correction Model can be employed as given in equation (5).

$$\Delta Y_t = \alpha_t + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Phi_i^* \Delta Y_{t-i} + \varepsilon_t \dots \dots \dots (5)$$

Where, $\Pi = \alpha\beta'$; where α is coefficient of error correction term, β' ; (1×6) Vector of cointegrating coefficients, $Y_t = [GINI_t, ITX_t, VAT_t, ID_t, TNC_t, LNRGDP_t]$ ' vector of endogenous variables, Y_{t-1} is the lagged value of variables and ε_t is the white noise error term.

RESULTS AND DISCUSSION

Table 1 gives the descriptive statistics of each variable, which describe the basic features of the sample.

Table 1: Descriptive Statistics

| | GINI | ITX | VAT | ID | TNC* | RGDP |
|--------------|-------|-------|-------|-------|-----------|------------|
| Mean | 46.00 | 15.63 | 38.12 | 16.54 | 239387.50 | 1274550.00 |
| Median | 46.00 | 15.50 | 38.00 | 14.55 | 65658.00 | 973256.00 |
| Maximum | 49.00 | 20.00 | 62.00 | 31.40 | 989819.10 | 2846155.00 |
| Minimum | 43.00 | 10.90 | 15.00 | 5.00 | 0.00 | 478982.30 |
| Std. Dev. | 1.65 | 2.08 | 14.55 | 8.10 | 322045.50 | 752693.20 |
| Skewness | -0.20 | -0.02 | 0.15 | 0.39 | 1.14 | 0.83 |
| Kurtosis | 2.95 | 2.60 | 1.71 | 1.85 | 2.71 | 2.32 |
| Observations | 34 | 34 | 34 | 34 | 34 | 34 |

Note: GINI – Gini index of household income values (coefficients are multiplied by 100), ITX, VAT, ID -- income tax, value added tax or goods and services tax and import duties respectively, given as a percentage of the total tax revenue, TNC-- tax non-compliance (the difference between potential tax revenue and actual tax revenue -- LKR Million, RGDP – GDP (LKR Million) in real term

**As per the calculations, there is no difference between actual tax revenue and potential tax revenue in base year (1985).*

Source: Authors’ estimations based on Annual Reports and Economic and Statistics – Sri Lanka, Central Bank of Sri Lanka (Various Issues)

Table 2: Results of Unit Root Tests (ADF and PP – Trend and Intercept)

| Variables | Level | Level | 1 st Difference | 1 st Difference |
|-----------|--------|--------|----------------------------|----------------------------|
| | ADF | PP | ADF | PP |
| GINI | 0.3295 | 0.3017 | 0.0024* | 0.0026* |
| VAT | 0.2136 | 0.6545 | 0.0027* | 0.0000* |
| ID | 0.1834 | 0.2256 | 0.0000* | 0.0000* |
| ITX | 0.1086 | 0.1057 | 0.0000* | 0.0000* |
| TNC | 0.2147 | 0.8898 | 0.0041* | 0.0060* |
| LNRGDP | 0.9148 | 0.7286 | 0.0000* | 0.0000* |

*Note: * indicates 1 percent significance level and probability values are given in the table*

Source: Authors' estimations

ADF and PP unit root tests were carried out to identify the order of relevant variables as a prerequisite for cointegration test. Results of these tests show that all variables in the model are not stationary at level, but stationary at their first difference ensuring that variables are integrated in order [1(1)] (see Table 2). This requirement fulfils employing the Johansen cointegration test to identify the long-run relationship between the dependent variable and the independent variables of the model.

However, before proceeding with this estimation, it is required to conduct diagnostic tests as a pre-requisite for accurate estimations so that the main procedure of the data analysis is followed by these diagnostics tests and the results are in Table 3.

Table 3: Results Diagnostics Tests

| Test | Probability |
|---------------------------------|-------------|
| Serial Correlation (BG LM test) | 0.8348 |
| Ramsey RESET test | 0.1315 |
| Heteroskedasticity test (BPG) | 0.1317 |

Note: H_0 is not rejected at 5 percent significance level

Source: Authors' estimations

Results of diagnostic tests namely Breusch-Godfrey Serial Correlation LM Test, Ramsey RESET Test and Breusch-Pagan-Godfrey confirm that residuals are not serially correlated. Hence no specification error in the estimated model and disturbance term in the equation is homoscedastic respectively. Meanwhile, with regard to recursive estimates, CUSUM plot lies within the upper and lower critical bound at 5 percent significance level ensuring the stability of parameters.

The next step of the estimation is to identify the optimal lag length using lag length selection criteria; LR, FPE, AIC, SC and HQ. In this study, optimal lag length selection is based on the SC criterion which is shown in Table 4.

Table 4: Results of optimal lag length selection

| Lag | Log L | LR | FPE | AIC | SC | HQ |
|-----|---------|--------|-----------|--------|--------|--------|
| 0 | -93.49 | NA | 7.20e+12 | 46.63 | 46.91 | 46.72 |
| 1 | -559.01 | 206.2* | 1.07e+10 | 40.06 | 42.02* | 40.69* |
| 2 | -516.83 | 47.79 | 9.71e+09* | 39.65* | 43.29 | 40.82 |

*indicates lag order selected by the criterion

Source: Authors' estimations

As one cointegrating relation can be identified in the system of equation at 5 percent level of significance based on the trace statistics, it is indicated that there is a long run relationship between variables, and it was obtained by employing Johansen cointegrating test (see Table 5).

Table 5: Results of Johansen Cointegration Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|------------------------------|------------|--------------------|------------------------|---------|
| None * | 0.774797 | 114.5347 | 95.75366 | 0.0014 |
| At most 1 | 0.584835 | 69.81221 | 69.81889 | 0.0501 |
| At most 2 | 0.495800 | 43.43987 | 47.85613 | 0.1222 |
| At most 3 | 0.362729 | 22.89637 | 29.79707 | 0.2512 |
| At most 4 | 0.248294 | 9.379565 | 15.49471 | 0.3314 |
| At most 5 | 0.026874 | 0.817262 | 3.841466 | 0.3660 |

Trace test indicates 1 cointegrating eqn. (s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Source: Authors' estimations

Long-run relationship is shown in equation (6).

$$\begin{aligned}
 \text{GINI} = & 45.68665 - 0.864771\text{ITX}^* + 0.019307\text{VAT}^{**} + 0.111536\text{ID} + 1.205\text{TNC}^* \\
 & + 11.32254\text{LNRGDP}^* \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (6) \\
 & [-4.27161] \quad [1.95089] \quad [1.10008] \quad [4.84589] \quad [4.18968]
 \end{aligned}$$

Note: *, **, *** show significant at 1 percent, 5 percent and 10 percent level respectively. *t*-statistics are given in parenthesis

As per the results shown in equation (6), three null hypotheses are rejected of which H_{01} , H_{04} are rejected at 1 percent level and H_{02} , is rejected at 5 percent level, whereas H_{03} is not rejected indicating that import duties not being statistically significant as a variable but it has got the expected sign implying positive association of income inequality with import duties. As shown in equation (6), VAT, LNRGDP and TNC affect the income inequality positively, while ITX negatively affects in the long-run. In line with the objective of the study, tax composition is identified as an influential factor that affects income inequality in the long-run. As income tax negatively affects income inequality, this kind of direct taxes can be used to address the income distribution problem along with enhancing tax revenue. For instance, according to estimation results, 1 percent increase in the income tax will reduce the Gini index by 0.86 percent, with higher statistical precision. However, VAT affects the income inequality positively implying that tax on consumption goods adversely affects the income distribution of the country. This means that the households with relatively low-income categories will have to pay a greater percentage out of their income on tax which is a regressive effect as disposable income decreases disproportionately for low-income categories. As income tax negatively affects the income inequality, it can be used to minimize the income distribution problem along with broadening the tax base and streamlining tax administration with international best practices to raise tax revenue. These results are consistent with the findings of studies conducted by Mahon and College (2009), which confirm that indirect taxation intensifies the unequal income distribution, while Martorano (2018) reveals that income taxation reduces income gap among different income groups. However, these findings are not drawn by being on an in-depth time-series analysis, therefore our research and its findings with higher statistical precision fill the existing research gap of quantitative estimations helpful for tax policy reforms.

Moreover, real GDP positively affects the income inequality in the long-run implying the concept of Kuznets curve which explains the association of GDP growth of per capita income and inequality of income which is positive for underdeveloped and developing countries like Sri Lanka. Also, according to our estimation results, tax non-compliance affects positively in the long-run resulting in an increase in income inequality by 1.2 percent as a result of an increase in tax non-compliance by one unit. This implies that tax non-compliance intensifies the income inequality or tax compliance which can mitigate the issue of income inequality substantially so that when the gap between potential and actual tax revenue is greater it leads to a situation of a higher degree of tax non-compliance resulting in a higher income inequality in the society. This means tax non-compliance is a significant factor as a determinant of income inequality. Hence, tax administration, tax rules and simplification of the tax system need to be aligned with improving the rate of tax compliance for making the income distribution fairer.

Next, Vector Error Correction Model (VECM) was employed in order to find out the long-run equilibrium or Speed of Adjustment (see Table 6) and the short-run relationship.

Table 6: Long-run Equilibrium

| | |
|-------------------|--------------------------|
| Error Correction: | D(GINI) |
| CointEq1 | -0.741379* [-2.64311] |

*Note: *1 percent significance level, t-statistic values are given in the parentheses*

Source: Authors' calculations

According to the results, the error correction term is significant and shows the expected sign to bring to the long-run equilibrium at the speed of adjustment implying there is long-run equilibrium in the model. This means that 0.74 percent of equilibrium error is corrected for each year and the response variable (income inequality) moves towards the long-run equilibrium path. Moreover, all independent variables in the model do not affect income inequality in the short-run implying that there is no instance response of income inequality for the changes in the independent variables (see Table 7).

Table 7: Short-run Relationship

| D(ITX (-1)) | D(VAT (-1)) | D(ID (-1)) | D(TNC(-1)) | D(LNRGDP (-1)) |
|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| -0.97811 [-0.83564] | 0.04287 [1.31862] | 0.06356 [1.04016] | 0.91363 [0.38313] | 4.17683 [1.21216] |

Note: t-statistic values are given in the parentheses

Source: Authors' calculations

Furthermore, the results of this study shed some lights on necessary aspects for policy makers to draw attention on tax policy reforms. Although VAT remains as a main contributor to the government revenue, the current tax rate of 15 percent is high by South Asian countries standards. The tax policy and composition of taxes heavily depend on indirect taxes focusing on essential consumption goods for raising revenues with low cost of tax collection and administration. Hence, the current tax system seems appealing when the tax administration is weak, extreme in complexity and loosely defined fiscal management has resulted in many distortions, corruptions and irregularities. However, the consumption expenditure for low-income categories remains at high percentage out of their total income. This situation may also cause a weakening consumer demand for consumption due to low affordability and increasing income inequality. Thus, managing the fiscal operation is becoming extremely difficult due to the small size of the economy (GDP is 88 US \$ billion - current market prices -in

2018) with low economic growth. Furthermore, the government of Sri Lanka is a welfare state that spends substantially on education, health, subsidies and poverty alleviation programs. Therefore, improving fiscal operation of the government may indirectly benefit ordinary and poor segments of the society which in turn affects reducing income inequality. Therefore, remedial measures are broadening the income tax base and improving tax compliance, while reducing or (exempt) VAT for (essential) consumption and intermediary goods to stimulate the consumption and investment expenditures. For instance, China has fully implemented its VAT reforms appropriately since 2016 by introducing varying tax rates selectively for different tiers, broadening the tax base with a transparent and efficient tax system which has improved tax compliance. Therefore, the contribution to total tax revenue is high from VAT (around 46 percent even though tax rates are relatively lower than many other countries in the region (State Taxation Administration Annual Report, 2018).

Thus, empirical findings of this study fill the existing knowledge gap by identifying and measuring the substantial effects of tax composition and tax non-compliance on income inequality in the Sri Lankan context. It becomes conducive for policy reforms of which the focus would be increasing tax revenue while mitigating the issues of income redistribution. Moreover, the findings relating to tax composition are consistent with the empirical evidence regardless of some differences on the contextual basis. As such, negative effects from direct taxes and positive effects from the indirect taxes on income inequality are evident in the current academic discourses (Martorano, 2018; Jellema, et al., 2017; Amarante and Jiménez, 2016; Martinez-Vazquez, et. al., 2012; Mahon and College, 2009), indicating the consistency of the results of our study.

CONCLUSION AND POLICY RECOMMENDATIONS

The results of this study explore and develop the insights of the complex link between tax composition, tax non-compliance and income inequality. The findings of the study show a mix result with regard to tax composition that mainly consisted of negative impact of income tax and positive impact of VAT on income inequality in the long-run. Along with this, the study identified that tax non-compliance and logarithm of real GDP affects positively on income inequality as long-term effects in Sri Lanka. However, import duties are not statistically significant although it shows the hypothesized coefficient sign. This implies that income distribution is not sensitive to the changes in import duties substantially due to its nature of the imposition.

Based on the findings of the research, some policy recommendations can be made for the consideration of increasing tax revenues and minimizing persistent high-income inequality in Sri Lanka. The tax policy should not merely target achieving the required or estimated tax revenue regardless of the fairness of the incidence of taxes to make it less regressive. In order to achieve the results of our recommendations, structural reforms to tax composition, for example, 60 percent to 40 percent balance between

indirect and direct taxes respectively which is already suggested by Inland Revenue Act (IRA) in 2017 with the view of improving tax compliance, simplifying and broadening the tax base of the direct taxes, strengthening best practices of tax administration are the necessary measures to be taken. Furthermore, removing excessive tax incentives and modernizing rules related to cross-border transactions to address base erosion and combat tax avoidance and strengthening and clarifying existing powers of the Inland revenue Department (IRD) to improve enforcement are some of the institutional and administrative measures can be taken to improve tax compliance. In addition, Sri Lanka may need to be benchmarked to international best practices for improving the tax administration, fiscal management, while introducing reforms to tax composition vital for reducing income inequality. However, the trade-off between the government's objectives of revenue generation and income redistribution needs to be taken into consideration in this regard. The less focus on income redistribution by the existing regressive tax system requires making reforms in the tax system – moving towards a progressive tax system, thereby minimizing the collision between these two objectives.

Finally, we explore areas for further research along the effect of tax policy reforms suggested by this study aiming to increase tax revenues with less regressive tax composition on economic growth. Furthermore, this research can also be extended to measure the effect of our tax policy variables on different age groups of the population channel through labour market effect on income inequality and how they may react differently to tax rates and tax composition changes recommended by this study and introduced by the new Inland Revenue Act in 2017 as well.

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“FINTECH SERVICES” AND THE FUTURE OF FINANCIAL INTERMEDIATION: A REVIEW

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Abstract


The aim of this paper was to review existing literature on Fintech services and their potential impact on traditional financial intermediary practices. The review is significant and timely as banks and customers are gradually familiarizing with these services showing a significant growth of Fintech utilization in Sri Lanka in recent times. Utilizing a qualitative approach, the paper has examined two most significant usual practices of banks including: (a) banking practices on credit, deposits and capital raising and payment services, and (b) banking practices on clearing and settlement services, because of the emergence of two major Fintech services; namely, peer to peer (P2P) lending, and digital wallet and crypto currencies. The review considered both national and international studies on ‘Fintech’ adaptation in financial institutions. It is observed that there is no compelling threat from P2P lending to banking activities, in general, though there will be migration of lenders from banks to P2P platforms that will result in banks to lose some segments of customers in the future. The review also identified that growing usage of smartphones tends to replace physical wallets with digital wallets which will bring potential disruptions to traditional operations of the banking industry. Adoption of Fintech in the banking industry, however, will not result in a complete financial disintermediation given the monopolistic nature of money creation by the banks, and risky and unreliable nature of these innovations.

Keywords: *Fintech Services, Digital Platform, Mobile Application, Financial Intermediation, Financial Innovations*

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INTRODUCTION

With the advent of revolutionary technology-driven financial services¹, the entire financial sector started to reinvent itself to cope with growing demand for financial services of various business entities around the world. By definition, “Financial technology (Fintech) is a part of the process of evolving financial innovations, which has theoretically been risky but of value” (Thakor, 2012). As recently evident by a research of Chen et al., (2019), these services yield substantial value to investors. According to the report of Financial Stability Board of the Bank for International Settlement (BIS) (2017), Fintech is “technology enabled financial innovation that could result in a new business models, applications, processes, or products with an associated material effect on financial markets and institutions, and the provision of financial institutions”. Using these definitions, researchers have explained Fintech products and services under four categories i.e. (i) credit deposits and capital rising services, (ii) payments, clearings and settlements services, (iii) investment management services, and (iv) insurance (Pilkington, 2016).

Fintech is advantageous in promoting greater financial inclusion and helping reduce poverty among the underprivileged communities. Fintech products and services open the door for communities those who have been excluded from the regular financial institutions and the financial system itself. However, critics on this regard have argued that these innovators brought disruptions to the traditional financial intermediary services as it takes customers away from those institutions and dis-intermediating customers and institutions from their existing financial ties (GSMA 2015; PricewaterhouseCoopers, 2015). New technologies, like Bluetooth Low Energy, QR codes and near-field communications enhance easy operations and reduce cost of bank transactions and thereby disrupts the traditional players in the market. Nonetheless, some others have stressed that these new innovations add other layers to the system (Lin, 2015).

Some researchers have claimed that sudden upsurge of Fintech services is attributed to the 2008 global financial crisis (Blaseg and Koetter, 2015). According to a recent IMF study of He et al., (2017), the market value of public Fintech firms quadrupled since the financial crisis and it outperformed many other sectors. Losing trust on traditional banks, increasing the indebtedness of small-scale industries due to increase in debt service payments, strict financial and banking regulations in the aftermath of financial crisis might affect the formation of large start-ups of Fintech services. In addition, growth of the global capital market, well established technological infrastructure might also prompt demand for Fintech services. Especially the growing trade volumes of BRICS countries (Brazil, Russia, India, China, South Africa) is also one among many reasons for the Fintech start-ups in Asia and in the African countries. At present, India

¹ Combination of Finance and Technology services or Fintech services

is the leading country in Asia that uses Fintech services for its day-to-day business-related financial transactions. However, some research claims that part of this development was a result of the high cost of financial intermediation process of financial institutions. As shown in the estimation of Philippon (2014), the unit cost of financial intermediation only in the USA has remained at 2 percent over the past 130 years. Thus, Fintech gives promising services to reduce intermediation cost and improve the quality of financial services that enhances the customer welfare. Fuster et al., (2019) have provided evidence that Fintech services improve the productivity of mortgage lending.

Fintech is also known to be a crucial service to enhance financial inclusion among communities. The first use case is M-Pesa in Africa which was started by Vodafone’s Safaricom in Kenya. M-Pesa uses phones as a wallet and makes it possible for financial transactions to anywhere in Kenya (Ndung’u, 2017). In addition, recently popularized Alipay in China fulfils a greater customer satisfaction becoming a platform for online payments. Fintech industries enhance financial inclusion through several ways; such as, disaggregation of value chain and provide financial products directly to customers, opening platforms and capitalizing existing product’s customer base, risk assessments through digital data collection and there in identifying segments of customers and human-centred product designs. Basically, many of the core functions of traditional financial intermediary institutions can be done through these high-tech services. Fintech firms and their services are seemingly invading the market and provide user friendly services to the customers. Under this scenario, it is vital to discuss the potential risk and benefits of this new innovative technology services and their impact on traditional financial intermediary institutions i. e. banks, and the process is necessary to enhance Fintech adaptability of financial institutions and face the global competition.

Therefore, the purpose of this paper is to review existing literature on this newly emerged Fintech services and their impact on banks as a traditional financial intermediary institution. At this juncture, the paper focuses on the changes that take place in two main services of banks;

- (a) credit, deposits and capital raising services due to P2P lending
- (b) payment, clearing and settlement services due to digital wallet and Crypto currencies

It tries to identify the potential positive and negative consequences banks face due to these changes. The method of analysing the facts is in descriptive nature as the paper basically focuses on reviewing of emerging literature related to the particular issue. The rest of the paper is organized as follows. The next section provides a comprehensive review of the theoretical background of financial intermediation and financial innovations. The same section devotes to provide empirical evidence which identifies the potential threats and benefits of modern financial innovations on banking practices while discussing the different aspects of the development of Fintech services. A small

fraction is also devoted to discuss the usage of Fintech services in Sri Lanka in order to see the progress of utilization and potential challenges that Sri Lankan financial sector faces in general.

Finally, the paper summarizes findings collected from the previous literature related to the research question and explains possible avenues for future research on Fintech services.

THEORITICAL BACKGROUND

Financial System and Financial Innovations

Financial system is considered as one of the most integral part of the economic system, which consists of markets, institutions, instruments, regulations and financial services (Rose and Marquis, 2009). The importance of the financial system relies on its intermediary process which transfers funds from the surplus sector to the deficit sector (lenders to borrowers and investors). Financial system facilitates the flow of funds between various economic entities such as households, business firms, government and financial institutions and hence, described as an integrated part of the economic and social system (Pietrzak et al., 2008).

The dominant feature of the modern financial system is a rapid pace of innovations. The term 'innovation' describes the use of technology to create a new combination of products and services that generate the higher rate of return and thereby enhance the overall growth of the economy (Targalski, 2006).

This concept was first introduced by Schumpeter explaining six different groups of innovations namely; new products, new methods of production, new market, new source of supply of raw materials, new organizations and business entities, and new method of management (Dabic et al., 2011). Based on Schumpeter's explanation, OECD has reintroduced the concept of innovation focusing on four categories namely; product, process, marketing and business organization (OECD, 2005). Any new development of the aforementioned four categories is considered as innovations if they are applied by any market or organizational entities.

It is said that technological innovations and financial innovations are bound together and evolve together over time (Michalopoulos, Leaven, and Levine, 2009). That means on one side, financial innovation provide mechanisms to finance technological innovations. On the other side, owing to the advancement in technology, business entities need improved financial instruments and services. Thus, technological innovations and financial innovations seems interdependent. Financial innovations can be applied in two situations i.e., when the traditional financial solutions are no longer available, and when the cost associated with new developments are lower than the cost associated with the traditional solutions (Pantalone and Welch, 1987).

Theoretical aspect of financial innovation connects to both demand and supply sides. The demand-side theory of financial innovations indicates that the presence of market imperfections, asymmetric information and transaction cost is the main reason for the development of new financial products and services (Fabozzi and Modigliani, 2003). Owing to the facts, market participants continuously demand for solutions, hence innovators develop new instruments which enable a quick and easy transaction process for customers. Payments in online platforms, mobile-cash methods, and mobile banking apps are among such responsive innovations that reduce transaction costs. In addition, development in financial management and accountancy such as electronic ledger systems that come as adaptive innovations always avoid persistent distortions and inefficiencies in the financial markets.

Supply-side theory of financial innovations on the other hand, explains that financial institutions tend to develop new financial instruments in order to gain the competitive advantage to the firm. These come in various entities such as investments, savings, and finance and payments tools. These can be categorized as aggressive innovations while new development that protect the market situation and improve financial condition as a new form of risk management tools are called protective innovations (Blach, 2011; Fabozzi and Modigliani, 2003). Disregarding the theoretical differences, financial innovations occur due to internal needs and goals of financial institutions and firms and other market participants and as well as imperfections arise due to external economic challenges (Blach, 2011).

Financial Innovations and Financial Intermediation

Financial intermediation simply refers to the third party who acts in between borrowers and lenders. Traditional theories of financial intermediation developed based on the notions of asymmetric information and transaction cost. Normally, Lenders as well as borrowers (savers and investors) face difficulties when exchanging loans and funds due to market imperfections. People tend to make moral hazards and adverse selections. This is mainly caused through the absence of perfect information about the market (Lehman and Neuberger, 2001; Stiglitz and Weiss, 1983). Owing to these imperfections, transaction cost occurred (Campbell and Kracaw, 1980; Fama, 1980). However, in contrast to the asymmetric information approach, the transaction cost approach considers non-convexities in transaction technology, which transform one type of financial claim into another type. In this way they offer liquidity and diversification opportunities for financial assets (Pyle, 1971; Hellwig, 1991).

Regulatory factor approach on the other hand, claimed that financial intermediation is based on regulations which are imposed on money creation, savings, investments and other financial related transactions (Guttentag and Lindsay, 1968; Fama, 1980; Mankiw, 1986; Merton, 1995). As emphasized by them, these regulations affect solvency and liquidity of financial institutions. A study conducted by Diamond and

Rajan (2000), shows that banks' capital enhances its safety and ability of repayments. As shown in La Porta et al., (1998), financial regulations are very crucial for the development of the financial industry and they are exogenous to the industry.

Modern theory of financial intermediation specially focuses on financial intermediaries' ability of risk management and risk transformation. This risk management and transformation practice enhances the value creation process of financial intermediation. The concept of value creation first introduced by Porter (1985) in the theory of industrial organization arguing that transaction cost incurred to create value. Even though this concept is widely adapted in the management and business organizations, some researchers criticize that it is not used in the financial industry (Scholtens and Wensveen, 2003). However, there are some studies that explain the value creation process of banks, but they did not do in depth analysis explaining how banks engage in it in the intermediation process (Canals, 1993; Llewellyn, 1999). However, based on this value creation concept, Scholtens and Wensveen (2003) have argued that the value creation process of financial intermediaries arises through competition between the existing financial institutions and newly entered financial firms. As emphasized by them, this competition among firms leads to more innovations of new financial products and hybrid existing products with new features. By doing so, they produce different types of financial products that lead to create different markets. This market fragmentation helps lasting competition among financial firms and institutions and enhances their presence in the marketplace.

The aforementioned theories have revealed that the traditional financial intermediation and financial innovations appeared to have common objectives of minimizing market distortions, enhancing market competition and thereby creating a smooth-running economy. The only difference between the two is, in traditional processes, financial services deliver via intermediaries, but new financial innovations are capable of delivering the services directly to the consumers without any help of a middleman. This unique feature of modern financial innovations has changed the path of traditional financial intermediaries creating a challenging environment for them to exist in the market. In such a context, it is important to investigate those new innovations and the threat that they pose to traditional intermediary institutions and processes.

EMPIRICAL EVIDENCE

Fintech products and Services and their relationship to banking

At present, Fintech services are the demanding innovations in the world. Not only do they facilitate faster financial transactions, but they enhance assets diversifications as well. As shown in a study of Bank for International Settlement (BIS- 2018), Fintech can cover all forms of financial services, i.e., payments, transfers, clearing and settlements, intermediate and direct finance, risk and investment management through their

diversified apps. These services can be described under four categories² and is summarized in Table 1.

Table 1: Fintech Services by Sectors

| Fintech Landscape | | | | |
|---|---|---|--|------------------------------------|
| Technology Service | Mobile and internet | Distributed ledger | Machine learning and big data | Potential impact |
| Credit, Deposit and Capital raising services | Crowdfunding Mobile banking Peer-to peer lending | Block- chain, Smart contact | Services applications | “new form of financial inclusion |
| Payments, transfers, clearing and settlements | Mobile and online payments Cross-border transfers | Remittances | Know-your-customer applications Regtech | “New” forms of financial inclusion |
| Investment Management Services | Mobile banking Agent-based banking, Peer-to-peer lending | Trade finance Initial coin offerings | Credit scoring Risk management | “New” forms of financing |
| Insurance | Smart contracts, e-contracts | | Risk metrics Robo-advisor | “New” forms of insurance |

Source: BIS (2018), Awazu, L., and De Silva, P. (2018)

As emphasized by the aforementioned landscape, the potential impact of these services to the society could appear in three ways:

- (i) They enhance financial inclusion through facilitating digital transfers through mobile and online payment apps. This helps rural communities to access finance far better than that of traditional financial institutional methods.
- (ii) They create a new form of financing through the introduction of mobile banking, agent-based banking and peer-to peer lending. This makes faster access to credits in required amounts.
- (iii) Fintech services introduce cost effective risk management and risk transformation practices for investors. For instance, apps like smart contract and e-contract that replace lawyers. Thus, investors can transact without paying for a third party.

Fintech services compete with traditional financial institutions by providing advanced financial services through new technology. When technological equipment is available, they make financial transactions faster than traditional services. Therefore, some have

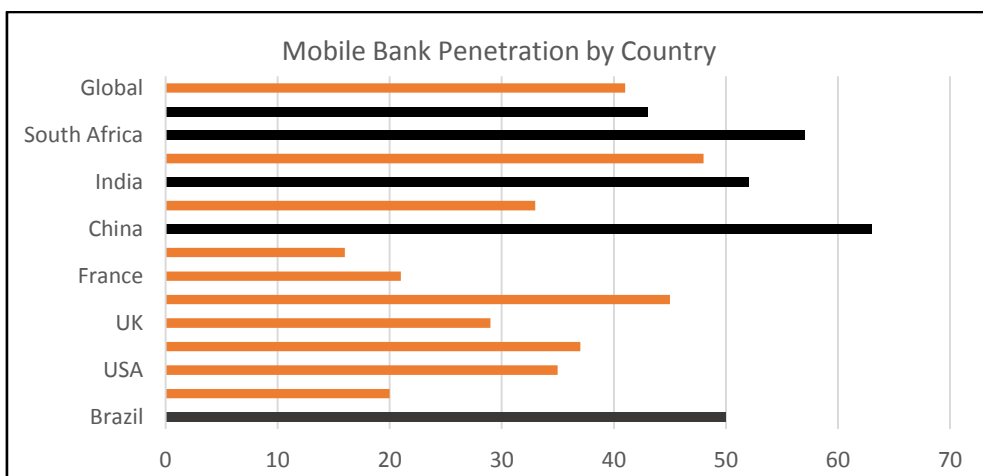
² Those four categories are explained in the introductory section of this paper.

argued that Fintech is the new paradigm for financial services (Arner et al., 2016). Since Fintech services industries operate in less regulatory environments, they can improve their products regularly and make them more user-friendly to customers. Owing to the continuous improvement, they can also make their services at low cost.

On the other hand, Fintech services can help traditional financial institutions to reduce their operational cost through facilitating online transactions of loans, deposits and other related cash transfers, bill payments and debt settlements. This cost effective and energy saving application methods help financial institutions to expand their services further within communities and borders. Among the Fintech services, mobile and online payments/transfers services have become the widely used services at present. Recently a survey has revealed that China has the highest rate of mobile banking usage in the world, while India is the highest among South Asians and Sweden takes the lead in Europe (Global Data, 2018). It has reported that the global proportion of frequent mobile banking users accounted for 3% growth from 39% in 2017 to 42% in 2018, but there was a significant regional variation in the usage. As shown in the report, some of the reasons for India to take the leading position are the demonetization process of Indian government and rapid growth of “Payment mobile wallet”. In Sweden it is due to the regulators' effort that encourages a cashless society.

However, the global average still is at 42 percent and surveys reported that security fears are a major barrier to adoption of online banking by consumers, and therefore, they have suggested that banks need to gear up their public education programs to overcome these concerns. Nonetheless, mobile banking apps statistics have projected that the mobile app market will generate revenue of \$581.9 billion from downloads in 2020 (Letić, 2020).

Figure 1: Percentage of Mobile Bank penetration by Country (at the end of 2018)



Source: Author’s calculations using data on mobile banking

In general, the utilization of mobile banking is high in BRICS countries in comparison to the others (refer to Figure 1). Perhaps, the utilization of Fintech services is high among emerging market economies (EMEs) due to less developed financial sectors, low level of financial inclusion, and an increasing interest in having smartphones and technological gadgets which younger generations adapt easily. This can be further proven by comparing the average age of mobile banking users as well. As shown by the data the majority of mobile banking users are around 30 to 40 years.

As shown in Table 2, the average age of mobile bank users ranges from lowest 30 years to highest 39 years. The lowest age records in India, while the highest from Europe. The age distribution represents the young working age population, which may in turn emphasizes the ability and the interest of having smart phones at this stage of life. These trends opened a path for Fintech services to catch the market.

Table 2: Percentage of the Average Age of Mobile Banking Use by Country

| America | | Europe | | Asia Pacific Countries | |
|---------|----|---------|----|------------------------|----|
| Brazil | 34 | Italy | 39 | Japan | 37 |
| Canada | 32 | Spain | 39 | China | 37 |
| USA | 32 | UK | 38 | Australia | 35 |
| | | Sweden | 39 | India | 30 |
| | | Germany | 37 | | |
| | | France | 36 | | |

Source: GlobalData.com

Especially in the rural sector in most EMEs and BRICS countries have long been suffering from insufficient financial services and difficulties in accessing credits for their entrepreneurial activities and therefore, the majority was left behind from the traditional financial institutions. This low degree of financial inclusion gave the opportunity to Fintech services to access communities and help to overcome their financial difficulties. Especially mobile banking and peer-to-peer lending services (like WeChat app, PayPal, BharatQR and Paytm) are very popular in most parts of Asia including China and India. These apps act as a third party between senders and receivers. These services help small and medium scale entrepreneurs to grow and thereby contribute to reduce rural poverty.

Credit, deposits and capital raising services – P2P Lending

As described above, it has been found that Fintech influence over traditional financial intermediary institutions is stronger on the areas of credits, deposits and capital raising services. However, when it comes to the P2P lending platform, it completely dis-

intermediate customers from traditional financial intermediary institutions, as the platform established direct lender- borrower contacts (Thakor, 2020). As shown by the study of Milne and Parboteeah (2016), since the financial crisis, P2P lending has become stronger in both the US and Europe. According to the report of the Statista (2017), P2P lending will grow from \$ 50 billion in 2016 to almost \$300 billion by 2022. The operation of P2P lending is simple as the platform accepts applications and analyses credit risk and makes available for interested parties to bid and directly contact the borrowers. There are no any banks in between to asset transformation. Thus, P2P is known as non-intermediated finance (Thakor, 2020).

It is said that in terms of breakdown of P2P lending, consumer lending is much cheaper than credit cards (Tom, 2017). However, most P2P lending is unsecured and regulatory burdens are much lighter than that on banks (Consumer International, 2017). Hence, studies claim that there is a negative shock to banks credit supply (Tang, 2019). As shown in the study, P2P lending competes with banks and gains comparative advantage when banks experience credit shortages. On the other hand, bank regulations also affect the rising demand for P2P lending. Especially, collateral requirements of banks play a major role here as borrowers and those who lack collateral may leave the bank and become a prime candidate of P2P lending platforms (Besanko and Thakor, 1987). In addition, lower consumer trust on banks have also been a responsible factor for rising P2P lending practices (Brostrom et al., 2018).

However, research suggests that the aggregate P2P lending volume is still very small compared with bank lending, even though P2P lending is rapidly growing. And also the growth of P2P lending becomes a threat to banks which have low capital margin. Big banks which are highly capitalized will not be threatened as competition leads to improved banks efficiency and profitability (Boyd and De Nicolo, 2005; Goetz, 2018). Thus, empirical evidence has suggested that there will not be a compelling threat from Fintech to financial system stability in general, but there will be migration of lenders from banks to P2P platforms where fewer people use the banking system and where the regulatory cost and risks are high. However, when considering deposit insurance and security of assets, banks will be in a leading position compared to those P2P lending platforms (Berger et al., 2016; Thakor, 2020). As shown by research, with this new challenge, banks will continue to upgrade the system in order to safeguard their position by establishing online lending platforms. Wells Fargo and Goldman Sachs are already in the process of building such facilities for banks (Thakor, 2020).

Payment, clearing and settlement services – Digital Wallet and Cryptocurrencies

The other question arose at the beginning of this paper was whether Fintech products and services overtake the payments and settlement function of banks. As described in the introductory section, innovative online payment/ money transfer platforms replace physical wallets to a digital one making convenient mode of transaction. These services

are widely used in countries which have small banking populations. Especially M-Pesa in Kenya is the best example for this digital wallet. Currently, it is operating not only for the payments but also lending and international remittance transfers as well (Consumer International, 2017). In addition, PayPal, Alipay in China, and online payment platforms such as Apple pay are very popular among communities at present. Growing smartphone usage replaces the physical wallet into a digital wallet in which all transactions can be made fast and conveniently.

Cryptocurrencies on the other hand replace fiat money to digital money that can be traded through digital platforms. Currently, Bitcoin is the most popular digital currency in the world, which comes with their own special unit of account and payment mode. Even though in the rural sector this will not be a big issue, but in the developed world, big investors are fascinated about those virtual currencies and therefore, invest more on them. This will eventually lead to rise in illegal financial activities and currency and financial bubbles (Carstens, 2018). Such conditions will ultimately lead to instability in the financial system. As shown in Foley et al. (2018), 46 percent of Bitcoin activity is illegal and they are mostly used in drug trafficking and other related activities. Cryptocurrencies also gain criticisms of not displaying the functions of money. Even though they act as a medium of exchange, it is not a stable source of value as research has found that fluctuations of Bitcoin are much bigger compared to the fiat money (Wolla, 2018). In addition, bitcoin is not considered as a legal tender with intrinsic value which accepts for all payments of transaction of goods and services (Merton, 2018). It does not have all attributes that fiat money has to use as a legal tender. The use of bitcoin represents a very small fraction of overall payments.

As emphasized by research, cryptocurrencies so far did not gain much attention compared to fiat money and government controlled digital currency. Therefore, it cannot be said that this new trend takes the central place of the financial markets, nor it deprives the commercial banks' ability to create money. The monopolistic nature of creation of money by the central bank cannot be replaced by such innovative features owing to their risky and unreliable nature.

Nonetheless, unavoidable circumstances such as, the failure of telecommunication may disrupt the operation of these services. In such cases, the traditional banking methods would be most useful. The danger of cyber-attacks and other related risks of fraudulent financial transactions also prevent the general public from using those digital platforms very often. As shown by Letić, (2020), mobile app fraud transactions have increased by over 600% since 2015. As shown by this leading research, mobile apps were the source of 39 percent of fraudulent online transactions. In such a way, 89% of digital fraud losses are due to account takeovers. In addition, frauds from mobile browsers accounted 77 percent in 2019 and the majority of attacks came in the form of Trojan horses, financial malware, brand abuse, or corrupted mobile browsers.

In addition, financial risks/credit risk is another drawback associated with Fintech services. Owing to less regulatory environment of these Fintech services, both creditors and debtors expose liquidity and credit risks. Moreover, since the Fintech industry doesn't consist of field experts on risk analysis, investors may invest in less liquid assets and face liquidity mismatch risks as well. Data privacy risks are the other most affected risk for Fintech users. These industries sometimes misuse customer data for their advantage and sometimes they sell private details of customers to third parties. This may in turn affect customers' personal lives and their perception of Fintech services. Therefore, unless the person has a wide knowledge of using those digital platforms, normal people will not use those services very often.

SRI LANKAN SCENARIO

Sri Lanka has a bank-based financial system which consists of two state banks and 24 other licensed commercial banks. In addition, there are licensed specialized banks, insurance & leasing companies, share market and licensed microfinance institutions playing a comprehensive role in providing financial services to the nation. The Central Bank of Sri Lanka assures the financial system stability while enhancing efficient financial intermediation to promote investment and economic growth.

Considering the degree of financial intermediation in Sri Lanka, it is still at a lower level compared to other regional counterparts. The degree of financial intermediation, as measured by the M2b money supply to GDP ratio (M2b/GDP), remains at 49 percent³. In addition, banks' credit supply to the private sector (private sector credits/GDP), another good measure for financial intermediation is also around 45 percent in Sri Lanka⁴.

Only 10 percent improvement is observed in this regard during the last four decades. There is still a large number of populations living in rural areas and urban slums who do not even have a bank account. Owing to compulsory savings of "Samurdhi"- the extensive social protection program in the country, and recently established farmers' insurance program and other related transfer programs, the aforementioned situation of the country has improved. Yet, still there are groups that are left behind. Thus, the financial sector in the country is not yet fully developed.

Therefore, compared to other countries in the world and the regional peers, utilization of Fintech services in Sri Lanka is also not satisfactory. It is still at the beginner's level. When it comes to going cashless, the situation in Sri Lanka is still disheartening. When considering the impact of credit and debit cards, although a large number of cards have been issued and being in circulation for many years, they have failed to make much

³ Author's calculations based on CBSL data

⁴ Author's calculations based on CBSL data

progress (De Silva, 2019). The mobile wallets operated by telcos and banks haven't significantly increased cashless transaction volumes either. The fact is that around 95 percent of all retail transactions in Sri Lanka are still cash-based (De Silva, 2019). Even in the rural parts of India people use QR code-based payments, Sri Lanka has yet to adopt these services in the country.

In general, the banking system in Sri Lanka is digitalized and most of them have internet banking facilities as well. However, very few banks adopt mobile banking services and related apps. For example, one of the leading state banks, Peoples' Bank, has a mobile banking app called “Peoples Wave” and it has become very popular among citizens in Sri Lanka. Almost everyone who has a Peoples' Bank account, has this app in their smartphones or personal computers and use it for their fund transfers and bill payments.

In addition, very recently Nations Trust Bank has unveiled “Nations Open API Banking” in Sri Lanka, which is very popular in Europe, aiming for openness and inclusivity, and as well as attracting new customers to the bank. Among the first users of the new offering in the supermarket chain, i.e., Keells Super, which will use FriMi branded application bundle provided by NTB to link its point of sale (POS) terminals to their bank account and customers (Andreasyan, 2018).

However, peer-to-peer payment platforms like PayPal, WeChat are not operating in Sri Lanka. Nonetheless, a couple of Fintech related forums are trying to work together with banks and other financial institutions to find out how Sri Lanka can adopt these services and ease cross border financial transactions. Recently, LankaClear Ltd. announced that they will launch an app called ‘JustPay’, on the objective of encouraging a less-cash society. As emphasized by them, the ‘JustPay’ system only requires a smartphone in the hands of the consumer. There will be no necessity for investments on infrastructure, such as POS terminals or even a smartphone on the merchant's end. Further, they have stressed that all what a merchant needs to know here is whether the customer's payment has been credited to his bank account. He would receive a SMS to his mobile phone indicating the final outcome. The Central Bank of Sri Lanka is also providing support, which helped in appointing a Fintech committee, as well as a sandbox committee, to encourage Fintech adaptations. Especially, “the regulatory sandbox” which the Central Bank has introduced is aiming to facilitate these Fintech services in a controlled environment and thereby reduce the risks associated with those services. Therefore, in the near future there will be more Fintech services utilization in Sri Lanka as well.

CONCLUSION

The objective of this paper was to review existing literature on Fintech services and their impact on traditional financial intermediary practices. The paper addressed the issue focusing on the changes that take place in credit, deposits and capital raising services and payment, clearing and settlement services of banks due to two major

Fintech services i .e. P2P lending and digital wallet and cryptocurrencies. When analysing the impact on the credit, deposit and capital raising services using a descriptive method, the paper discussed bank lending and P2P lending platforms and it has revealed that there will not be a compelling threat from Fintech to banks in general, but there will be migration of lenders from banks to P2P platforms where fewer people use banking system and where the regulatory cost and risks are high. In that case, banks will lose some segment of customers, but evidence has shown that banks will acquire the necessary technological skills to cope with the challenging environment in the near future. Fintech effect on payment, clearings and settlement services of banks was done by analysing the utilization of digital wallets and cryptocurrencies. Evidence revealed that growing smartphone usage replaced physical wallets to digital wallets in most parts of the world where there is a low banking population, and it will bring potential disruptions to banks in the future. However, the usage of cryptocurrencies will not be able to gain much success in financial markets compared to fiat money. Further the evidence has shown that the monopolistic nature of creation of money by the central bank cannot be replaced by such innovative features owing to their risky and unreliable nature. In this sense, opponents' argument that says Fintech services will lead to complete financial disintermediation, may fail as all facts and details related to Fintech innovations provide evidence that banks are in the process of acquiring skills to cope with the new challenge.

Considering Sri Lanka, even though it has a well-established banking network, there are still a large group of low-income families who do not incorporate into the system. Thus, the utilization of Fintech services is also still at a very low level. Therefore, in order to popularize the new trend among Sri Lankans, the government together with the Central Bank of Sri Lanka should take necessary policy measures and encourage financial institutions to adopt these new innovative services and thereby enhance financial inclusion in the country. These technological advancements like Fintech products and services would bring countless blessings especially when the world at its worst situations like pandemics and other related social calamities, where people are stuck at their homes and cannot connect with the world in person.

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An Analysis of the Enduring Factors of Road Traffic Accidents in Sri Lanka

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Abstract

The number of road accidents in Sri Lanka drastically increased over the last few decades, with high numbers of fatalities, grievous injuries, and property damage. It is important to analyse the most influential factors and root causes of the trends in road accidents. The main objective of this study is to investigate the effective and enduring factors that influence Grievous road traffic accidents in Sri Lanka from 1997 to 2017. According to the preliminary test results, the study analyses three main variables; Grievous Accidents, Operated Vehicles, and Road Length for model formulation. The study employs the Johansen Cointegration Test and Vector Error Correction Model to examine long-run relationships and short-run dynamics between the variables. The results show a positive relationship between the number of Operated Vehicles and Grievous Road Accidents in the long-run. The estimated coefficient is significant and consistent. Grievous Road Accidents are also positively related to Road Length, and the coefficient is significant and consistent. The elasticity of Road Length is very influential in the model. The study provides guidance to the relevant authorities in taking the necessary precautions by increasing awareness and concern for road safety measures to minimise the tragic consequences of road accidents in Sri Lanka.

Keywords: *Road Traffic, Vector Error Correction Model, Cointegration Test, Accident Trends, Error Correction Term*

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INTRODUCTION

Road accidents are now a disturbing phenomenon in the world, leading to the loss of thousands of lives and considerable damage to property. Therefore, many countries are keen to analyse the trends in their road accidents and to investigate the root causes of such occurrences in order to minimise these unexpected and tragic events and their consequences. According to the World Health Organization (WHO) estimates, 1.25 million people die every year due to road traffic accidents while 20 to 50 million persons suffer non-fatal injuries. Many sustain disabilities as a result of such injury.

The statistics reveal that in many countries the cost of road accidents accounts for up to 3 percent of their Gross Domestic Product (GDP). More than 90 percent of road accidents occur in low and middle-income countries with lower socioeconomic status. Road injuries are now the tenth leading cause of death globally and are predicted to become the seventh leading cause by 2030 unless remedial actions are taken to halt this disastrous trend (WHO, 2015). These figures emphasize the need for serious measures to be taken in order to reduce the recurrence of road accidents. Human error is the leading cause of road accidents and it is important to act responsibly in maintaining a reliable and safe transport system. The construction of safe roads and pavements, the enforcing of safe speed limits and road rules, and the use of safe vehicles are all key elements in the quest to eliminate fatal crashes and reduce serious injuries (WHO, 2015). Road accidents are now a major concern across the world, as they directly affect economic growth and development.

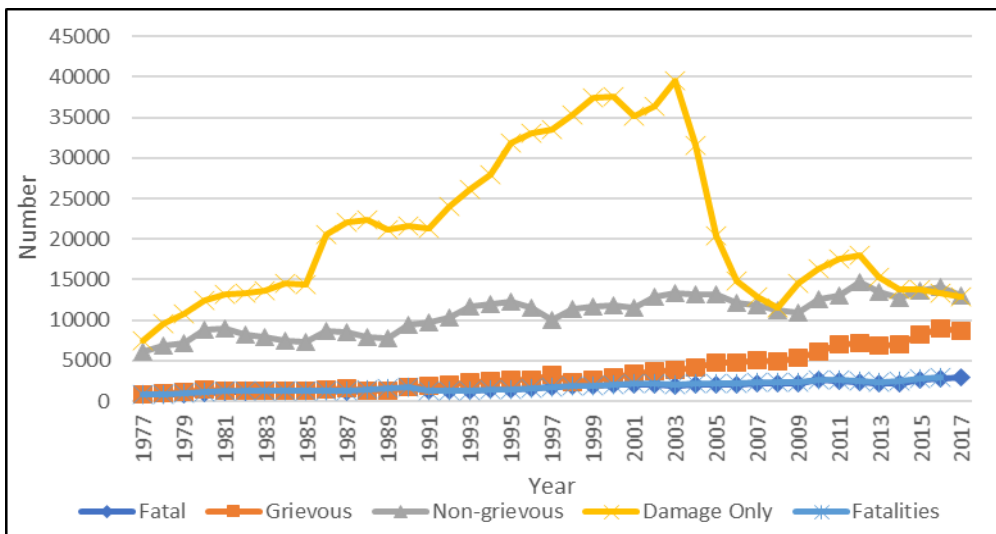
In Sri Lanka as elsewhere, road accidents are a serious issue, directly influencing public health and wellbeing by causing many disabilities as well as a great loss of life every year. Road accidents have thus become a significant social problem which should be highly alarming for every citizen and all concerned parties. Road accidents in Sri Lanka have also become a major problem from the perspective of the transportation sector, negatively affecting the sustainable development of the nation and causing massive losses to the economy. The economic cost of road accidents has been estimated at over Rs 10,000 million annually which is around 1 percent of Sri Lanka's GDP (Kumarage, 2003). Traffic police records (2017) in Sri Lanka revealed that on average six people die in road accidents every day while thousands of road accidents occur each week. As per the statistics, 1 in 45 deaths is caused by a road accident and the past trend in accidents reveals that the risk will be doubled for the next generation. Thus, it is vital to address the prevailing situation by taking corrective action immediately.

According to the road accident database maintained by the Traffic Police Headquarters, road accidents are categorised into four groups, i.e., fatal, grievous, non-grievous and damage only. Of these accidents, around 7 percent of total accidents are fatal while 23

percent are grievously injured. Non-grievous and damage only accidents are around 35 percent each during the last five decades (Traffic Police Records, 2017).

According to police statistics, there were 37,596 road accidents in Sri Lanka in 2017. Of these 2,962 were fatal while 8,666, 13,102, and 12,866 were reported as grievous, non-grievous and damage only accidents respectively. The number of road accidents has drastically increased over the last few decades, with high numbers of fatalities, grievous injuries, and property damage. Road fatalities have trebled during the last four decades and the age group between 21 and 30 years has become the most vulnerable category for fatalities in road accidents. In the road user categories, the drivers and riders are recorded as the highest number of those who are exposed to fatal accidents, accounting for 51.6 percent of the total fatalities (National Transport Statistics, 2017).

Figure 1: Road Accidents Trends in Sri Lanka



Source: Traffic Police Headquarters.

It is a significant fact that the number of grievous accidents including both fatal accidents and grievous injuries have trebled from 1977 to 2017, even though the number of non-grievous accidents does not show a significant increase during those four decades (Figure 1). “Damage only” accidents decreased remarkably during this period, from 33,481 in 1977 to 12,866 in 2017. As per previous studies, statistics pertaining to “damage only” accidents are unreliable because of their low reporting rate and those being subject to extraneous factors such as insurance requirements, the availability of police personnel for reporting, etc. (Kumarage et al., 2002).

As per the statistics of the Traffic Police database, the most important factor for road accidents in Sri Lanka is speedy, aggressive and negligent driving. Driving under the influence of alcohol and making errors of judgment are secondary reasons.

These factors only reflect the most significant causes of road accidents at a given specific time and do not reflect the long-term trend. In order to make long-term policy decisions relating to the prevention of road accidents, it is crucial to analyse the most influential factors and root causes of the trends in road accidents. For ascertaining the possible underlying causes for the trends in road accidents in Sri Lanka, it is important to study the relative trends under different socio-economic conditions, such as growth of population, degree of motorisation, improvement of roads and degree of urbanisation. The analysis by Kumarage et al., (2002) on trends in the growth rate of road accidents since 1980 revealed that all types of accidents reported in each have increased at a greater rate than the increase of population, but have remained lower than the growth in the fleet of vehicles.

Even though past research have focused on analysing the trend in comparison with the growth of accident-related variables, there is scant literature on Sri Lanka, and particularly on statistical and econometric analyses on trends in road traffic accidents and their long-term relationship. Hence, this study opted to focus on investigating the enduring factors that influence trends in road traffic accidents, using advanced statistical analysis. Since past researchers concluded that statistics on non-grievous accidents are unreliable due to the low rate of reporting to the police with insurance claims, whereas grievous accidents are almost always reported and are considered reliable for analysing road accidents, this study focused only on grievous road accidents in Sri Lanka.

Accordingly, the main objective of this study was to investigate the effective and enduring factors that influence grievous road traffic accidents in Sri Lanka. The study firstly identified the main factors of trends in road accidents using the knowledge acquired through the literature survey and brainstorming. Secondly, the study analysed these enduring factors and ascertained their significance in determining future trends in grievous road accidents in Sri Lanka. Thirdly, the study enabled offering guidelines for the necessary interventions and precautions to be taken by the relevant authorities to minimise the tragic consequences of road accidents in Sri Lanka.

LITERATURE REVIEW

Many researchers have investigated the trends of road accidents over the years, revealing the risk factors affecting the fluctuations of these dangerous events. Research conducted by Mouyid and Kunnawee (2008) to identify the factors in road accidents through in-depth accident analysis observed that in Thailand, road safety was directly influenced by the rising trend of motorisation driven by the improvement of socio-economic status of the Thai people. Through investigation of cases, they outlined the major risk factors of road accidents, namely, inaccurate risk assessment and late evasive action, the absence of street-light facilities, inadequate lane marking and visibility, which influence the increase in the severity of crashes and the injuries.

Atubi (2012) showed that road accidents are significantly associated with road length increases, presence of Road Safety Corps and population growth in Lagos State, Nigeria. According to Onakomaiya (1988), and Filani and Gbadamosi (2007), better quality highways would result in more accidents because drivers would be speeding more on good quality roads, leading to more frequent and fatal accidents. Adhikari (2016) conducted a research study to look at the trends in road traffic accidents on the Kathmandu-Bhaktapur road after the addition of lanes, and concluded that there was an increase in accidents immediately after the completion of road widening due to the drivers' unfamiliarity with the increased design speed and also due to unchanged behavior of pedestrians.

Abdul (2014), having conducted a study to identify factors causing severity of road accidents in Ghana, identified overloading of vehicles and disregarding road safety regulations being the most significantly associated variables with accident severity in the Northern Region. Research on suburban roads in Iran has found that insufficient road width and the level difference between roads and road shoulders cause frequency and severity of accidents (Khalili & Pakgozar, 2013). Banik et al. (2011) conducted a study on road accidents and safety in Sylhet Region of Bangladesh, and showed that rapid growth of road vehicles and growth of tourism caused severe road traffic accidents. The study conducted by Grimm & Treibich (2012) on determinants of road traffic crash fatalities across Indian states revealed that the rising motorisation, urbanisation and accompanying increase in the share of vulnerable road users act as major drivers of road traffic crash fatalities.

Dharmaratne and Jayatilleke (2015) conducted a study on road traffic accidents, injury and fatality trends in Sri Lanka from 1938 to 2013. They found that the fluctuations of accidents during this period were parallel to the country's political and economic development and that the number of crashes and injuries would increase when the number of vehicles grow, while it would decrease with better law enforcement, and greater penetration of the public transport system. Somasundaraswaran (2006), having conducted a study using statistics of road accidents during 1989-2005, revealed that the alarming rate of vehicle ownership combined with inadequacies in road network development to support the demand for transportation were the most significant reasons for the increased number of road accidents in Sri Lanka.

Kumarage et al., (2009) revealed that, over time, the vehicle fleet numbers and the number of accidents have steadily increased on Sri Lankan roads. The most likely reasons for the increasing trend in road accidents, according to that study, are the rapid increase in the amount of travel undertaken by the population, the shift from public transport to private vehicles (which are known to be unsafe modes for travel when compared to public transportation), weaknesses in traffic rules enforcement, poor road design and the lack of safety intervention and awareness programs.

It is frequently found in literature therefore that rapid motorisation, together with the expansion of the road network around the world, would create a high risk for all road users resulting in an increase in road accidents and injuries.

RESEARCH PROBLEM

In Sri Lanka, road accidents are a serious issue, directly influencing public health, wellbeing and the economy, causing many disabilities as well as loss of life every year. This problem has drastically increased over the last few decades, with increases in fatalities, grievous injuries and damage to property (Figure 1).

It is an important fact that grievous accidents (including both fatal accidents and grievous injuries) have trebled from 1977 to 2017, even though no significant increase in the number of non-grievous accidents could be observed during that period. Even though speeding and aggressive and careless driving, on the one hand, and driving under the influence of liquor and making errors of judgment, on the other, have been identified as primary and secondary causes as per the Traffic Police database, those factors merely indicate causes of road accidents at a given specific time. They do not reflect long-term trends. If frequency of grievous accidents are to be reduced in a sustainable manner, it is important to analyse the most influential factors and root causes behind trends in road accidents in the long run, and implement necessary preventive policies. It is this knowledge gap that was addressed through the present research.

OBJECTIVES

The main objective of this study was to investigate the important and enduring factors that influence the trends in grievous road traffic accidents in Sri Lanka.

Accordingly, the study was conducted with the objectives of (a) identifying the main factors influencing the trends in road accidents, using the knowledge gained from the literature survey and by brainstorming, (b) analysing these enduring factors to ascertain their significance, in order to determine the future trends of grievous road accidents in Sri Lanka, and (c) deriving guidelines that could be used by the relevant authorities in view of taking necessary action in relation to road safety, so that road accidents and their grievous consequences in Sri Lanka could be minimised in the long run.

METHODOLOGY

The study considered the fluctuations and trends in road accidents within a 20-year period from 1997 to 2017. The selected key influential factors relating to trends in road accidents were based on the literature survey and an in-depth analysis of the economic

variables and fluctuations in road accident numbers during this period. The dependent variable of the preliminary model was grievous accidents (including pedestrian accidents) (GA). Eight independent variables; population, operated vehicles, road investments, employments, GDP (constant), railway investments, per capita GDP and the road length were considered. According to the preliminary test results, the study analysed three main variables; Grievous Accidents (GA), Operated Vehicles (OV) and Road Length (RL) for model formulation. This study used secondary data acquired from the Traffic Police Headquarters, the National Budget Department and the Central Bank of Sri Lanka.

The level variables were found non-stationary and all the variables were cointegrated in the first difference [I(1) variables], thus, the Vector Error Correction Modelling (VECM) with the Cointegration test was used to find the long-term relationship and short-term dynamics among the variables. Original data (level data) of variables; GA, OV and RL were transformed into log form as LGA, LOV and LRL to linearise the data since Vector Auto Regression models (VAR Models) do not capture nonlinear elements.

Among several unit root tests found in the econometric literature, the most commonly used are the Dickey-Fuller (DF) test and the Augmented Dickey-Fuller (ADF) test. The ADF test, an extension of the DF test, was used to remove any structural effects (autocorrelation) in the time-series. The ADF Unit-root testing, was deployed to determine whether the data series were stationary or non-stationary (Annexure A). To examine the long-run relationship between the three variables, the Johansen Cointegration test was employed while running a VECM to find short-run dynamics among variables.

Hypothesis 1: There is a positive relationship between the number of operated vehicles and the number of road accidents

$$H_0: \varphi_1 = 0$$

$$H_1: \varphi_1 > 0$$

φ_1 = Operated vehicles coefficient of road accidents model (Should be positive)

Hypothesis 2: There is a positive relationship between RL and the number of road accidents

$$H_0: \varphi_2 = 0$$

$$H_1: \varphi_2 > 0$$

φ_2 = Road length coefficient of road accidents model (Should be positive)

The proposed model is expressed in the equation (1).

$$LGA_t = \varphi_0 + \varphi_1 LOV_t + \varphi_2 LRL_t + \varepsilon_t \dots\dots\dots(1)$$

where,

LGA = Log of Grievous Accidents including pedestrians' accidents

LOV = Log of number of Operated Vehicles

LRL = Log of Road Length

φ_0 = Autonomous Grievous Accidents

φ_1 = Operated Vehicles coefficient of accidents model

φ_2 = Road Length coefficient of road accidents model

ε = Error term

RESULTS AND DISCUSSION

ADF Test Results

The stationarity of each series was examined using the ADF unit root test including a constant. Unit root tests were conducted for each variable, LGA, LOV and LR, and no evidence was found to reject the null hypotheses. It means that all variables, at level, were non-stationary. The first differences were then considered, and the null hypothesis (that there would be a unit root for the first difference of all variables) was rejected at 1% and 5% significant levels, portraying that differenced variables were stationary. Therefore, ADF unit root test indicated that these variables would be integrated in the order of 1, [I (1)] and those would be suitable for a VECM through cointegration test to examine both long-run cointegration relationship and short-run dynamics. Table 1 reports the results of the unit root test performed on level variables and their first differences.

Table 1: ADF Test Results

| Variable | LGA | LOV | LRL |
|--|----------|----------|----------|
| ADF test statistics (in levels) | -1.44 | -1.21 | -1.01 |
| Critical values 5% | -3.05 | -3.02 | -3.02 |
| ADF test statistics for 1st differenced data | -4.09*** | -5.00*** | -7.99*** |
| Critical values 1% | -3.89 | -3.83 | -3.83 |

Note: *** Significant at 0.01 level.

Source: Authors' compilation.

Cointegration Test Results

VAR Lag Order Selection criteria indicated that variables with lag 1 could be used to perform regression (Annexure B). The Johansen test was performed using log likelihood ratios. A number of cointegrating relations were calculated assuming that there was no linear time trend. To determine the number of cointegrating vectors, both the Trace Test and the Maximum Eigenvalue Test were deployed.

Table 2 below reports the Maximum Eigenvalue results of the Cointegration test, using which, the null hypothesis of not having any cointegrating vectors ($r=0$) was tested against the alternative hypotheses of having one ($r=1$) or two ($r=2$) cointegrating vectors. According to the results of the Maximum Eigenvalue test, the null hypothesis of $r=1$ could not be rejected at 5% level of significance, thus suggesting that the variables were cointegrated, and that there would be one cointegrating relationship.

Table 2: Maximum Eigenvalue Test

| Hypothesized No. of CEs | Maximum Eigenvalue statistics | 0.05 Critical value | Prob |
|-------------------------|-------------------------------|---------------------|------|
| None** | 23.9 | 21.13 | 0.02 |
| At most 1 | 10.23 | 14.26 | 0.20 |
| At most 2** | 5.78 | 3.84 | 0.02 |

Note: ** Significant at 0.05 level.

Source: Authors' compilation.

Estimated Long-Run Model for Road Accidents

As per the results of VECM test, the estimated long-run model for road accidents is:

$$LGA_t = -8.88 + 0.40LOV_t + 1.13LRL_t + \varepsilon_t \quad \dots\dots\dots (2)$$

As per the proposed model, in the long-run, OV and RL showed a positive relationship with grievous road accidents. The estimated coefficients of both OV and RL emerged significant and consistent. Besides, “road length” elasticity of road accidents appeared very influential in the model. The results thus revealed that increases in the number of operated vehicles would increase road accidents in Sri Lanka. This finding is consistent with the outcomes of the previous study by Grimm & Treibich (2012), which also has concluded that rising motorisation was a major driver of road traffic accidents in India. The results also indicated that road accidents in Sri Lanka could be caused by increasing length of the road network (km). While there may be other factors (such as technical and safety standards) that cause accidents more than the road length itself, this result conforms to the outcomes of the research by Atubi (2012), which had found that road traffic accidents in Lagos State, Nigeria, increased with increases in road length.

Short-run Dynamics

According to the estimated VEC model, 0.66 percent of the disequilibrium (ε_{t-1}) in road accidents could be corrected towards equilibrium within a one-year period, which is a good rate of adjustment. Final VECM results are summarised in Table 3.

Table 3: Vector Error Correction Estimates

| Error Correction | D(LGA) | D(LOV) | D(LRL) |
|-------------------------|----------------------------|-------------------------|-------------------------|
| CointEq1 | -0.665628*** [-3.12389] | 0.100624 [0.35771] | 0.063665 [0.74276] |
| D(LGA(-1)) | 0.218003 [1.54157] | -0.346043 [-1.85352] | -0.098214 [-1.72647] |
| D(LOV(-1)) | -0.160406 [-0.86350] | 0.086510 [0.35276] | -0.033845 [-0.45292] |
| D(LRL(-1)) | -0.754216 [-1.37992] | -1.015515 [-1.40738] | -0.444732 [-2.02275] |
| C | 0.084636*** [3.89460] | 0.130825 [4.55999] | 0.030433 [3.48122] |
| Adj. R-squared | 0.254315 | 0.149749 | 0.337943 |

Note: *** Significant at 0.01 level.

Within parentheses are *t*-values.

CONCLUSION

The model results indicated that fatal and sever accidents could continue to increase when the number of operated vehicles and the road lengths increase. Accident reduction through a reduction of the number of operated vehicles could be achieved through promotion of public transportation and also through strategic introduction of transport demand management measures, as also suggested in literature. This would not only reduce road accidents, but also will help mitigate negative externalities such as pollution while saving foreign exchange through reduced fossil fuel imports.

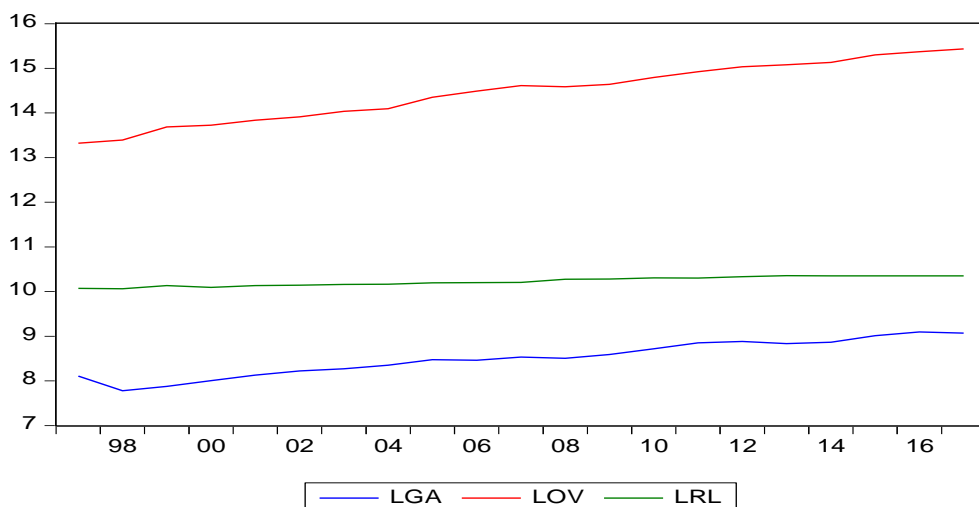
The finding to effect that increasing road lengths could increase road accidents, however, is curious, which indicates that investing on road network expansion alone is unlikely to be a viable solution for the problem of increasing road accidents. Such could even be treated counter-productive when perceiving the results of this study, because increasing road lengths could attract more vehicles on to roads, and expanded or widened roads could induce speed driving; both effects leading to grievous accidents. Therefore, care has to be taken to ensure technical standards of roads, maintenance programmes, provision of facilities for vulnerable road users and safety imperatives, when extending length of national road network. Moreover, policy makers may have to consider introducing awareness campaigns to enhance road safety, while imposing and enforcing rules and regulations in order to discourage and minimise unsafe driving practices and prevent use of technically unsound vehicles, in view of minimising road accidents in the long run.

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Annexure A

Unit Root Test



Annexure B

Lag Length Criteria

| VAR Lag Order Selection Criteria | | | | | | |
|---|----------|---------|-----------|---------------------------|----------|-----------|
| Endogenous variables: LGA, LOV, LRL | | | | | | |
| Exogenous variables: C | | | | | | |
| Date: 09/07/18 Time: 22:16 | | | | | | |
| Sample: 1997- 2017 | | | | Included observations: 20 | | |
| Lag | LogL | LR | FPE | AIC | SC | HQ |
| 0 | 59.56240 | NA | 7.02e-07 | -5.656 | -5.5069 | -5.62708 |
| 1 | 105.1232 | 72.897* | 1.84e-08* | -9.312* | -8.7149* | -9.19569* |
| * indicates lag order selected by the criterion | | | | | | |
| LR: sequential modified LR test statistic (each test at 5% level) | | | | | | |
| FPE: Final prediction error | | | | | | |
| AIC: Akaike information criterion | | | | | | |
| SC: Schwarz information criterion | | | | | | |
| HQ: Hannan-Quinn information criterion | | | | | | |

TOWARDS REFORMING SRI LANKA RAILWAYS: INSIGHTS FROM INTERNATIONAL EXPERIENCE AND INDUSTRY EXPERT OPINION

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Abstract

Growing of the automobile industry and the demand for personal car use and chronic financial deficits in the balance sheets of rail operators have significantly affected the rail industry deterioration since 1970. However, gradual rail reforms were carried out by many countries to eliminate financial and operational issues and to develop their rail transportation systems. Sri Lanka has more than 150 years of history in railway operations, yet it is still in a weak position in terms of the operational efficiency and the financial position. The main purpose of this paper is to explore the key issues and root causes for the operational and financial deficiencies of Sri Lanka Railways and identify the best reform model in the light of world rail reform experiences and rail industry experts' opinion. A semi-structured questionnaire was employed to interview twelve railway industry experts. Content analysis, Analytical Hierarchy Process (AHP) Method, and Policy Delphi Method were the main analytical techniques employed in the study. The results of the analysis showed that the vertical separation of the ownership between rail service operation and rail infrastructure provision is suitable for Sri Lanka Railways and, given the existing operational and financial characteristics, the reform steps should mostly be designed as in the case of the German- Sweden hybrid model of rail reforms.


Keywords: Railway Reforms, Operational Inefficiencies, Analytical Hierarchy Process, Policy Delphi Method, Sri Lanka Railways

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INTRODUCTION

The industrial revolutionary background along with the need for mass volumes of freight and passenger transportation led to railway industry innovations. Innovating diesel engines and electric engines were the turning points in railway industry and thereby rail as a main passenger and freight transportation mode were commenced in many countries in the whole world. However, since 1970, the railway industry has been impacted by the awakening of the automobile industry, and the rise in demand for personal car use and continuous chronic financial deficits in railways accounts. The rail network congestion, air pollution, and poor accessibility and the economic and the financial losses in passenger and freight transportation in rail industry were major issues that led to rail deterioration. Low market retention, lower investment, higher debt accumulation, poor coordination, and management are the major reasons that led governments to consider rail reforms.

Reforming or restructuring of railway organisations entails a vast scope and that might be regarded with existing assets, liabilities, organizational structure, recruitment, safety regulations, and technological aspects. Countries have taken the path of long-term stepwise rail reforms to avoid issues and developed rail transportation as a competitive transport mode over other modes. On a broad perspective, railway reforms were framed according to the country specific features such as the nature of transport system, the political context, the economic situation, the business and the regulatory environment, and the public sector continues to play a dominant role as infrastructure managers, and in some cases as service providers in a vertically integrated structure (Laurino, Ramella and Beria, 2015).

In 1864, the British introduced railways to Sri Lanka and the initial purpose of the rail establishments were to transport coffee, tea, and machinery from the hill country. Having institutionalized it as the Ceylon Railways in 1902 under Ceylon Government Railway Ordinance, it continues to operate as a government department under the Ministry of Transport featuring a vertically integrated governance structure.

The development of the plantation was expanded to the West, North-West and South-West and the railways were used to transport coconut, rubber, cinnamon (Sri Lanka Railways, 2020). When considering SLR's status quo, the Sri Lankan government retains the state-owned monopoly railway structure for both the infrastructure provision and the operational services. The infrastructure development, developing policies, implementing new mechanisms and structural changes in the railway transportation sector should be carried out through the Ministry of Transport. Acquisition and maintenance of moving assets such a locomotive and wagons, rail infrastructures track and platforms, signalling, and telecommunication, providing service to the movement of people, and freight are the primary functions of SLRs.

The railway industry in Sri Lanka has been significantly affected by road development and increased automobile use and the resulting competition in both the passenger and

freight sectors (United Nations, 2003). Over the time, several rail lines such as Opanayake via Rathnapura, Yatiyantota, and Nuwara Eliya were dismantled due to the high level of operational losses while the remaining lines also kept on continuing to lose market share. Even though Sri Lanka Railways (SLR) had significant issues in planning, operational, investment and budgeting, infrastructure management and safety, there were no significant reforms since 1983. The year marked the change of name of Ceylon Government Railway, (C.G.R.), to Sri Lanka Railways (S.L.R.). Until 1993, the 'Railways Authority Act' was passed to introduce greater commercial flexibility into SLR but was repealed in 2005 (The Government of Sri Lanka, 2005). The government of Sri Lanka still searches for the best options and strategies and considers alternative mechanisms to bring in investments in the form of Public-Private Partnerships (United Nations, 2003). One such initiative is the introduction of an Open Access Policy that enables private freight owners to use underutilized tracks with their own investment in operation and maintenance (United Nations, 2003).

SLR provides multiple passenger services categories such as long-distance, suburban, local train and intercity and express train services. SLR's average modal share for passengers is approximately 3.4% and it roughly carries 135 million of passengers annually (The Central Bank of Sri Lanka, 2019). Even though the total modal share is low, SLR contributes in carrying high passenger capacities in urban areas while relieving road congestion (Sri Lanka Railways, 2018). However, overcrowded railway

compartments are usually seen during peak times in the coastal line and the mainline in Sri Lanka Railways. SLR is one of the politicalized and unionized government enterprises and as a result, international assistance to SLR restructuring has been often negated (Asian Development Bank, 2007). This paper discusses several critical issues and root causes for the issues in SLR. The main aim of this paper is to propose a reform process for SLR through which managerial and operational issues and root causes could be handled better.

INTERNATIONAL EXPERIENCES IN RAILWAY REFORMS

Different countries have followed different organizational structures and business models to develop their railway industry. For instance, New Zealand, Mexico and Japan have vertically integrated rail management and operational systems while Sweden, UK and Germany have vertically separated railway systems. Rail liberalization and reshaping of the organizational structure have been carried out in many countries with several steps involved (Hilmola, Ujvari and Szekely, 2007). A review of these reforms and the post reform performances contribute to identify the steps, processes, the resulting governance structure concerning operational ownership, infrastructure ownership, land management, subsidization, regulatory level, labour management and evaluate the success of the reforms.

Japan Railway Reforms: The growth of motor vehicles, labour disputes, inappropriate service delivery and high fares have slowed down the growth and development of the rail industry in Japan in the early years. By 1987, the Japanese Railway had 25 trillion-yen debt as a long-term accumulation. Between the period 1960s to 1980s, the rail market share reduced from 30.8% to 13%. 400,000 workers with a strong unionized environment served the railways before the restructuring (Chen and Haynes, 2015; Kopicki and Thompson, 1995). A committee was appointed to study organizational restructuring and management reforms recommended to split the centralized structure including assets/liabilities. In 1897, JNR (Japan National Railways) was divided into six vertically integrated and regionally separated passenger rail companies and one for freight. Most of Japans' intercity rail lines (including Shinkansen), HSR (High-Speed Railways) commuter rail lines and other infrastructures are owned by the Japanese Rail group and some of them are fully privatized (e.g., JR East, JR Central, JR West and JR Kyushu (KJR)). JR Hokkaido (HJR), Shikoku (SJR), and Freight are still controlled and governed by The Japan Railway Construction, Transport and Technology Agency (JRTT). As railway infrastructures belong to railway operating companies, they had the market power in regional railway services (Kurosaki, 2018). HJR, SJR, and KJR were provided with financial support from the Management Stabilization Funds (MSF) as the rail companies cannot operate financially viable services without government subsidies (Kurosaki and Alexandersson, 2018). After the reforms, the service quality, punctuality, speed, accessibility, and labour productivity increased while reducing the amount of government subsidy offered. Negative consequences were such that profitable companies did not enhance the infrastructure development in the rural areas, and the passenger services in regional areas declined. Further, the operators had no interest in freight transportation, and only focused on profitable passenger rail lines. Even though the freight operating companies had access to the rail network, there were entry barriers such as the difficulty of getting the running schedules on tracks as rail tracks are fully occupied by passenger railway companies (Kopicki and Thompson, 1995).

Sweden Rail Reforms: Difficulties in reinvesting for infrastructure development, increasing incremental subsidies along with the time and closing rail lines due to high maintenance cost were the major causes for the restructuring railway industry in Sweden. Statens Järnvägar (SJ) is the Swedish State Railways operator that had to face comprehensive financial issues. Hence, the government of Sweden decided to change the organizational structure of the Swedish State Railways in 1986 (Kurosaki and Alexandersson, 2018). After 1988, the Swedish rail network was vertically separated. Sweden is the first country to restructure railways with vertical separation in Europe. Sweden followed the "road model" and was motivated to increase competitiveness by upgrading rail infrastructures. In 2000, SJ was reformed under four main market segments, namely (a) SJ AB (major passenger), (b) Green Cargo AB (major freight), (c) Jernhusen AB (railway stations, rail-related real estate) and (d) Euro Maint and Swemaint AB (rail infrastructure construction and maintenance). Banverket (established in 1988) is

the National Rail Administration which is responsible for tackling complementary operations and infrastructure maintenance. In 2009, the Swedish founded Transportstyrelsen (Swedish Transport Agency), the regulatory body for road and rail transport. The main functions of the regulatory body are enforcing the rules, issuing licenses and certificates, registering the change in ownership, managing congestion, and collecting vehicle taxes. In 2010, Sweden established 'Trafikverket' (The Swedish Transport Administration) which is responsible for long term planning of the transport system including rail, road, maritime and aviation. This entity handles 80% of the infrastructure management role of the Swedish Railways. The deregulation of freight railways also gradually took place in Sweden. Most of the regional services are now provided by the private operators and all the other services are provided by SJ. Sweden fully opened the railway passenger market for competition in 2010 (March, Wood, Railway and Bank, 2013). With the gradual opening of the rail market between the periods 2000 to 2010, Sweden's passenger-kilometre share has increased by 37% and the freight modal share has been increased by 19%. Therefore, both performance indicators showed positive outlook which was mainly due to railway reforms. The safety level has also increased significantly due to several new initiatives undertaken with rail reforms (Charanwanitwong and Fraszczyk, 2018).

British Rail Reforms: The reason for the restructuring of British railways is similar to the ones in Sweden. British Railways also was fully separated by dividing operational services and infrastructures. In 1994, Railtrack Company was established as a fully privatized, listed company. They had the ownership of tracks, signalling, level crossing, and stations. In 2002, Railtrack company was bankrupt and, later a new entity namely 'Network Rail' was established which is controlled by the government as a non-profit company. The Network Rail Company has the responsibility for operating the network, collecting track access charges, charging for the commercialization activities and being accountable for the performances. Scheduling and timetable management is also under the Network Rail Company.

ORR (Office of the Rail Regulator) was set up initially for economic regulations. But now, there are several tasks added to ORR such as regulation of safety, strategic planning, issuing of licenses by certifying safety, and giving approval for rolling stocks. Network access is given to operators through a competitive tendering process. The government offers a subsidy to profitless passenger operators. But, freight transportation is not franchised and there are no subsidies provided by the government (Charanwanitwong and Fraszczyk, 2018).

High labour productivity, high rail traffic for both passenger and freight services, effective resource utilization, higher industry output are major positive benefits of the restructuring railways in the UK (Finger, 2014). From 1992 to 2000, the passenger mileage has increased by 21% and freight ton mileage has increased by 19%. During the

post reform period, 2003-2013, rail passenger-kilometres increased with an average annual growth of 2%, while the real value of rail fares have increased at a steady rate between 1% and 2% per annum (Cartmell, 2016). Even though the UK has the most liberalized rail system in the world, it still massively depends on government subsidies (Cheng, 2010; Ozkan, Yanginlar and Kalayci, 2016). Nevertheless, UK rail privatization led to a 24% increase in planned passenger train services (since 2009), an increase in freight share by rail, and an increase in punctuality, reliability and the passenger satisfaction of the service (Department for Transport, 2019; Network Rail Limited, 2019).

German Rail Reforms: The main reasons for the rail restructuring in Japan, UK, and Sweden were common to the German railway restructuring. The German government removed the federal government ownership of its rail operation services in 1994 and re-established the rail operating body as joint-stock companies. At the first stage of the reform, the government-owned 100% of joint-stock company shares (Gangwar and Raghuram, 2017). The key milestones of the German railway reform include:

- Vertical separation between the rail infrastructure and service operation.
- The opening of the rail network for third parties and the introduction of a fare structure to track payments.
- Financial and contracting responsibility for regional passenger services to federal states (regionalization).
- Constitution of Federal Railway Agency for licensing and supervision.

In the first phase, German government separated commercial activities from the infrastructure provision. For that, 'Berliner Verkehrsbetriebe' also known as BEV, was established in 1994 and took over the long-term liabilities such as track development, maintenance, and signalling from DB and DR. As the next step, the DB and DR companies were merged and then DB and AG were created and it is a state-owned, joint-stock company for rail service provision. Labour productivity was increased by reducing excess labour and the BEV was responsible for dealing with them. Four separate DB AG entities were introduced to operate - long distance passenger plc, local passenger plc, good transport plc, and infrastructure plc. German railway reforms include the organizational separation, accounting separation, and the removal of cross-subsidization among divisions. As an independent entity, EBA oversees non-discriminatory access to rail tracks, technical supervision, and authorization of all railway operators in Germany (Gangwar and Raghuram, 2017). At the second stage of the reform, EBA added another entity to the DB AG namely, DB Station and Service.

In 2007, DB underwent specific reforms regarding its organization structure. Rail passenger transport and rail freight transport were organized under two distinctive organizations. In the third phase of the reform, German government partially privatized its DB Group. After the reform, the burden on taxpayers was reduced as subsidies were removed. The productivity and efficiency of the rail operation and services also significantly increased. At present, DB Schenker is one of the best rail freight facilitators

in the European rail sector. From 1994 to 2012, passenger-kilometres increased by 36% while freight transportation increased by 58%. Yet 90% of the rail market is dominated by DB AG and that adversely affected competition. Other private operators have less priority due to infrastructure dominance of DB AG and the cutting down of the subsidy which led to dismantling of the number of regional rail routes (Cheng, 2010; Gangwar and Raghuram, 2017). Hence, the subsidy continues to play a greater role in the sustainability of rail transport provision in Germany in a similar manner to the UK rail reforms.

French Rail Reforms: France undertook full separation of rail infrastructure from operations in 1997 creating a separate infrastructure company, RFR (Réseau Ferré de France) and another independent public body, SNCF (The Société Nationale des Chemins de Fer Français, which is France's national state-owned railway company), oversee track allocation and management (Friebel, Ivaldi and Vibes, 2010; Monami, 2000). The reform includes regional franchisee rail operators who operate passenger rail service regionally with leased or outright purchase rolling stock. The rail service operator, allotted to 6 regions determine the planning of passenger rail services and their coordination with the other modes in consultation with SNCF (Monami, 2000). Yet, all regional rail services are required to franchise services to the monopoly rail passenger operator SNCF (Nash, Smith, Crozet, Link and Nilsson, 2019).

Thailand Rail Reforms: Thailand has a state-owned monopoly railway structure that reveals common issues with a monopoly structure. In the last 30 years, Thailand heavily invested in road transport infrastructure development and, meanwhile, the share of railway industry contribution declined. The rail freight transport model share reduced from 9% to 2% from 2000 to 2013. 90% of passengers used a third-class train compartment and 70% of them were benefiting from subsidized train fares. Until 2005, SRT (State Railway of Thailand) could only cover the rail operating costs, and in 2013, 23% of losses were recorded (March et al., 2013). In this backdrop, Thai policy makers adopted European rail liberalization models as reference to reform SRT. Entry restriction on foreign operators, a fare scheme for the multiple service production and for the new entrants, a rail regulatory body under a government ministry, separation of the rail organization into several rail operating firms are main features of Thai railway reforms which are mainly aligned with German reform model (Charanwanitwong and Fraszczyk, 2018). Debt-free start with a new working capital, railway infrastructure ownership to the government while liberalizing rail services, independent government regulatory bodies for land and non-core assets management, horizontal separation and minimizing investment for HSR were the results of Thai Railway reforms (March et al., 2013).

China Railways Reforms: The government is the owner of the Chinese railway industry. China has over 130,000 km of railway length and in previous decades they rapidly established a High-Speed Rail (HSR) network and increased rail connectivity. The

booming economy, industrial development, government priority for the HSR network have positively affected China's railways. Newly deployed HSR systems and the existing rail systems are managed by old organizational structure which led to several management issues. Chronic financial debts, less system reliability in some areas, the monetary requirement for further developments are key issues in the China rail system (Cheng, 2010; Pittman, 2004). Since 1986 China has undertaken several rail reforms and yet those were not effective in mitigating the issues. The Ministry of Railway (MOR) centralized the managerial power and as a result, several management issues were found. There was also a minimum private sector participation in rail services. MOR supervised policy and regulatory functions – technical, planning, investment, financing, scheduling, rail administration, 18 Regional Rail Authorities and their running service operation, and infrastructure management entities. However, since 2013, China has significantly shifted towards restructuring policies. In 2013 railway reforms were introduced to develop railways as a market-oriented railway system. Private sector involvements, joint venture railway participation have begun since 2013 due to the extraordinary expansion of HSR. Reducing the role of government, and facilitating the companies to access the market were seen as effective solutions for the above issues (Yu, 2015). Railway reforms after 2013 include:

- Separating the government administration from enterprise management
- Dissolving MOR and separating the government functions from rail operations
- Separating the regulatory and administrative responsibilities from commercial operations
- Establishing MOT as the responsible authority for overall transport sector planning and development policies
- Establishing a new body for the rail; namely, State Rail Administration (SRA) which sets standards regarding technical sections, safety aspects, service quality and checks the corruption through the construction.
- Establishing China Railway Corporation for the commercial operation of the railway. Under the CRC, 18 Regional Rail Authorities are organized as conventional rail networks and train operators.

Indian Railways: Indian Railways has a vertically integrated organizational structure under the purview of the Ministry of Railways. Railway infrastructure and services are divided into geographically based zonal authorities and thereby allowing them to operate trains. Non-government railways also exist as joint ventures. Private sector investment in railways development is low. The government failed to provide rail service in a better way by fulfilling customer demand. Over the years, the modal share has dropped owing to poor service quality. Nevertheless, excessive labour, lack of safety, poor infrastructure, public service obligation, protection for competitiveness have been addressed recently by the initiated policies (Bogart and Chaudhary, 2012). Gangwar and Raghuram (2017) revealed that the German railway restructuring model should be followed by the Indian

railways with its industrial background. Separation of infrastructure and operation, open access to the private companies, restructuring the organization based on market segmentation, minimizing cross-subsidies among the variety of services and the regionalization of the financial responsibilities were observed as restructuring initiatives.

EU countries began to follow three major types of rail reform models and each mode has considerable differences. Swedish model completely separated state-owned organizations and opened it to fare competition. In German model, they have vertically separated organizations for train service and retained both infrastructure and operation mostly by the same holding company. Hence, the German model is not appropriate for the privatization due to the actual independence for capital allocation and charging activities, and the difficulty of management control of a large body (Link, 2016). Furthermore, the government is responsible for infrastructure planning and to the infrastructure development while service operation is under commercialized based or subsidized contractual basis (Grushevskaya, Notteboom and Shkliar, 2016). The French model comprises a separate infrastructure manager but one which in turn subcontracts much of its activity to the major operator. French model can be explained as a hybrid model version of holding company model (German) and vertically integrated model and was effective as the vertically integrated operator remains as a dominant firm in the market that has a fair degree of separation between infrastructure and operation and there is no real competition as separate subsidiaries within a holding company (SNCF) structure are deprived of the chance of entering new operators (Nash, 2008). Table 1 presents a comparison of reform models of Sweden, German and French including countries that followed their rail reforms concerning each model.

Table 1: European railway institutional frameworks

| Responsibilities | Swedish model (Complete Separation) | German model (Holding company model) | Fenech model (Separation of key power) |
|-------------------------------|--|--|--|
| Investment | S | (I) | S |
| Timetabling | S | (I) | S |
| Maintenance & renewal | S | (I) | I |
| Train control | S | (I) | I |
| Safety | S | (I) | I |
| Countries following the model | Britain / Finland / Denmark /Netherlands /Norway /Spain /Portugal /Slovakia /Lithuania | Austria / Belgium /Italy /Latvia /Greece /Poland /Latvia | Czech/Estonia /Hungary /Slovenia /Luxembourg |

S → separated.

I → integrated with the main operator under a contract from the infrastructure manager.

(I) → integrated with the main operator but in separate subsidiaries

Source: Based on (Nash, 2008; Finger, 2014)

Swedish model adopted a fully separated reform model under which separate entities are responsible for investment, timetabling, maintenance & renewal, train control and safety. German model of reform considered separate subsidiaries integrated with a main operator while in the French model, all functions are contracted under a main management unit.

There is a considerable additional cost involved throughout the separation of rail infrastructure from the service operation. But it is proved to be the best way to create some level of intra-modal competition effectively (European Commission, 2016). Several cross country and individual country case studies generally reported operational efficiency improvements after railway reforms and developing cost centre based restructuring is vital for improving operating efficiency for both infrastructure and human resource cost management (Asmild, Holvad, Hougaard and Kronborg, 2009). In particular, liberalization of rail passenger services in Germany, Sweden and Britain has led to a significant growth in the rail passenger market, including regional markets without requiring additional government subsidies (Nash et al., 2019).

RESEARCH METHODOLOGY

The methodological framework of the research includes four stages: (a) Thematic analysis of literature on world railway reforms, (b) Descriptive analysis of eight years of SLR operational and financial performances to identify trends. (c) Thematic analysis of interview data collected from a Delphi method-based interviews to identify the issues and derive expert opinion on reforms (d) an analysis of data collected from a questionnaire survey of industry experts using Analytical Hierarchy Process (AHP) to identify major issues in Sri Lanka Railways.

Rail restructuring models in Japan, Sweden, Germany, Great Britain, France, Thailand, China, and India (summarised in the Annexure - A) were reviewed to observe issues, restructuring steps, and outcomes, and to determine the key issues, past performance, past organization structure, reform process, current organization structure as well as the current performances. The reform processes and policy initiatives that were learned from world examples were used to develop the semi-structured questionnaire. In addition, eight years of SLR operational and financial performances collected from the reports of the Central Bank of Sri Lanka were analysed using descriptive statistics (CBSL, 2019). Delphi, TOPSIS, SWARA, AHP and Comparative analysis are the analysis methods found in literature on rail reforms. The Delphi method is useful when the research does not have a precise analytical technique to formulate a policy, develop priorities and forecast the future (Hasson et al., 2000). AHP and Delphi techniques were used for the study according to the following reasons.

- The lack of scientifically established findings, recommendations, or suggestions for rail reforms in Sri Lanka
- The ability to use a group of experts' consensuses on rail reforms in improving policies or predictions

- The ability to eliminate dominance
- The ability of participants to express their opinion freely and broadly

There is no clear theoretical framework or universal guidelines for the Delphi technique. The group of respondents can differ according to the topic of the research (Habibi, Sarafrazi and Izadyar, 2015). When the researcher recruits experts with different specialties, then the individual judgments of 5 and 10 experts are sufficient (Clayton, 1997). In this study, twelve experts were interviewed while covering all sub-departments of SLR. From the 2nd round, 8 experts were interviewed, who were also involved in the 1st round.

Content analysis of the interview data was carried out using NVivo software to identify major issues and root causes in the Sri Lanka railway industry. NVivo analysis was employed after the 1st round of the Policy Delphi method. Analytical Hierarchical Process (AHP) method was employed to derive the prominent reform possibilities. The purpose of using the AHP method was to determine prioritized reform areas in the Sri Lankan context. For this purpose, a survey was carried out with 12 industry experts (The sample includes 9 persons from top managerial positions in SLR, two former general managers and an academic). The paired comparison matrix (reciprocal matrix) with ten main criteria were derived after a thorough literature review. After completing the matrix, the consistency ratio was derived to validate the results. Based on the literature review carried out thematically and the findings of Delphi surveys and AHP, a comparative analysis was performed to identify industry issues that were common to SL and other countries before rail reforms and the degree of success in solving each issue after reform.

Design of the questionnaire and the interview script

In the first round, the questionnaire was developed as a semi-structured questionnaire which included open-ended questions with a 5-point Likert-Scale. A convenient sampling method and focus group technique were used to collect data from the railway industry experts. A 5-point Likert scale questionnaire was used for the 2nd round which was developed based on the results of the 1st round inputs and the result of the literature review. After executing the 2nd round, the experts' consensus was evaluated to determine the degree of experts' agreements with the statements expressing railway industry issues. Cronbach's alpha was used to measure the internal consistency and reliability of the data inputs.

Degree of consensus

Policy Delphi method transfers the facts derived from the opinion of the industry experts into a numeric scale from the 2nd round with minor changes to the statements in the questionnaire until the optimum consensus level of the experts reaches. There is no universal agreement to indicate sufficient consensus level. In this research, the consensus level was taken as 75% to 100%, and the consensus level is determined by the IQR

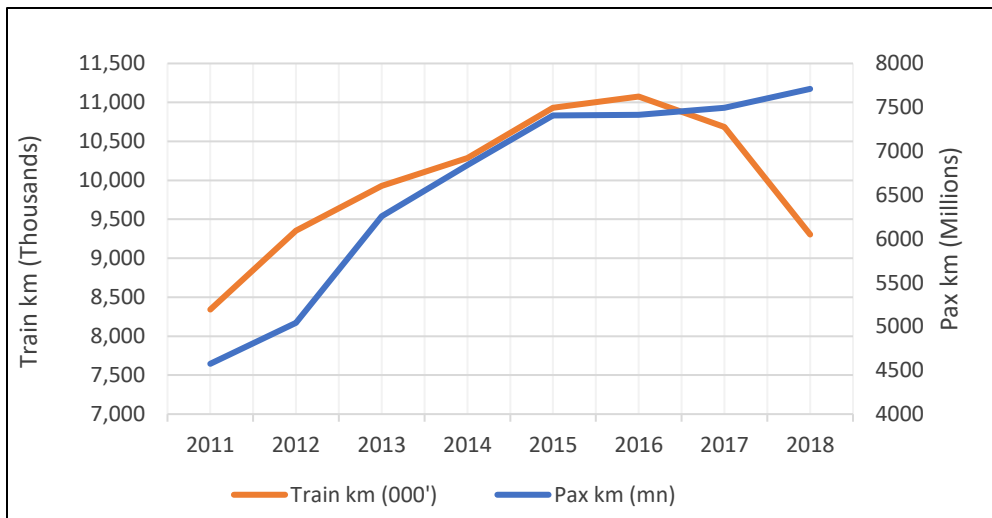
(Interquartile Range) (Clayton, 1997; Rayens and Hahn, 2000). If IQR is equal or less than one and greater than 0.75, then a particular statement has an acceptable consensus level. Otherwise, the process should be carried out until the optimum consensus for all the statements are obtained. A 5-point Likert rating has been used and ‘1’ represents strongly agreed psychometrics and 5 for the strong disagreement. Mean (average) of the statements exposes the average aggregate opinion of the participants and when the mean was less than 2.5 it was taken as the agreed statement and statements with above 2.5 were considered as a disagreed statement.

DATA ANALYSIS AND RESULTS

Operational and Financial performance analysis

According to the SLR performance reports for the last 5 years (2013-2017), SLR realized an increase in the passenger capacity by 6.0%. Yet, the overall model share has decreased. Figure 1 shows a drastic decline of the operating trains km since 2016. Even though operated trains km declined, the number of passenger-km has increased as the passenger demand per train has increased.

Figure 1: Decrease of train km and increase of pax

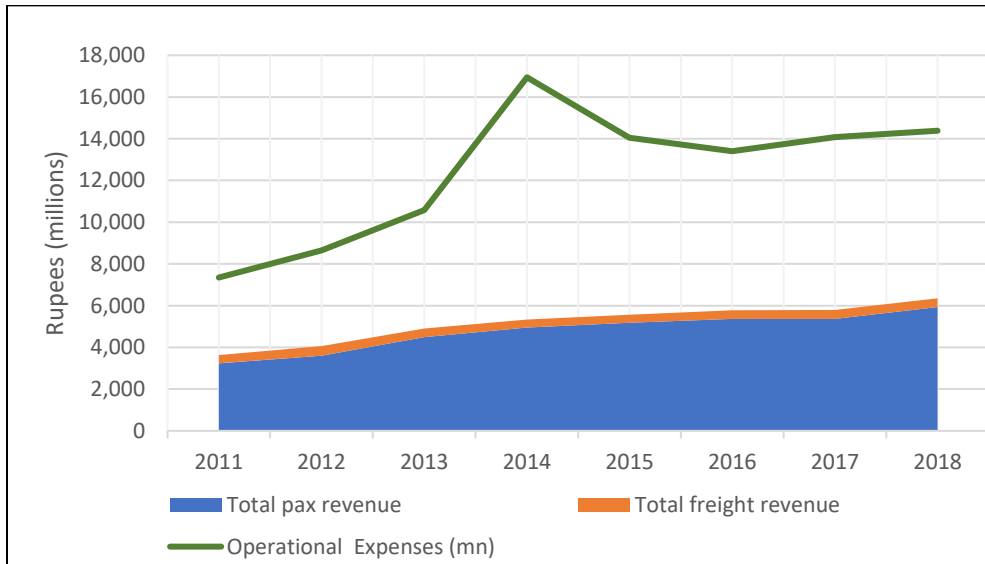


Source: Authors' illustration based on CBSL Report 2019 and Railway Performance Report 2018

The ratio between operating expenses to revenue is about 2.4 and SLR incurred a net loss of 7.6 billion in 2017. Although trains km operated have declined, the operational expenses demonstrated a sustained increase. Therefore, the actual loss is more than three times the revenue. Although passenger km is on the rise, the rise is offset by the higher increase in operational expenses. Hence, Sri Lanka railway currently operates under an operational period which demonstrates X-inefficiency. Figure 2 shows the past years' operational expenses and operational revenues. In 2018, there were more than 17,500

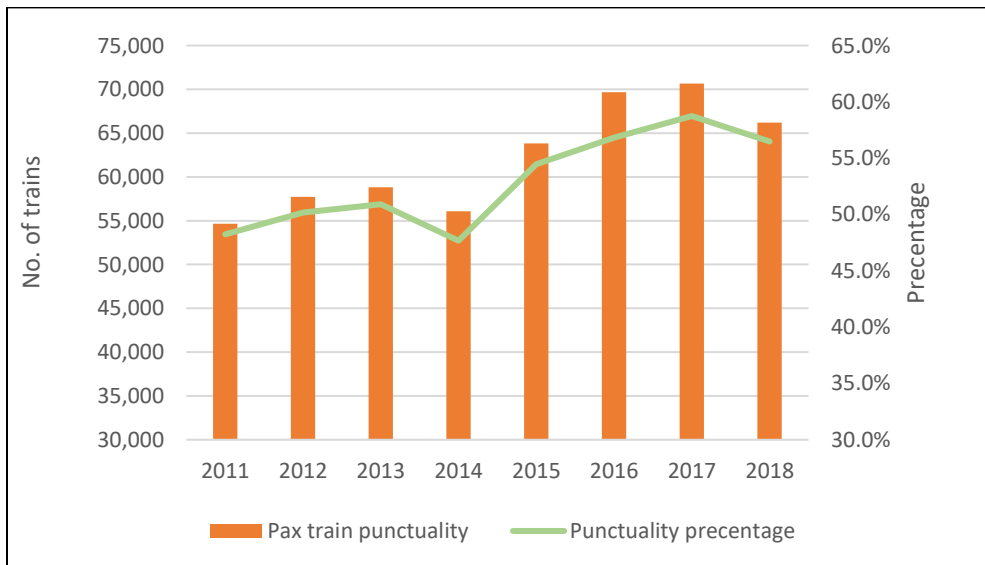
employees in the SLR. SLR's main revenue is generated through provision of train service operations and the rest of the incomes are negligible. Less comfort and lower punctuality are influential factors for passengers to shift from rail transport to road (Bandara and Rathnayake, 2019).

Figure 2: Operating costs and revenues



Source: Authors' illustration based on CBSL Report 2019 and Railway Performance Report 2018

Figure 3: Train punctuality

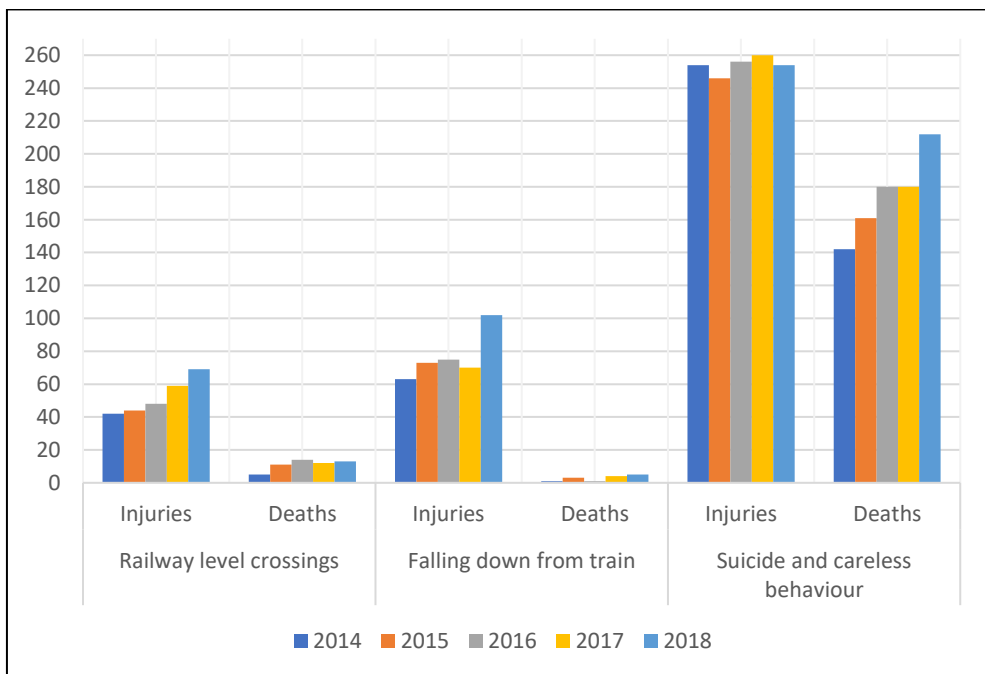


Source: Authors' illustration based on CBSL Report 2019 and Railway Performance Report 2018

The punctuality of the SLR is averagely 55%, and it could be visualized in the Figure 3 above. Outdated technology, older train fleets (more than 65% of locomotives are over 30 years old), outdated signalling systems and non-rehabilitated rail tracks are also reasons for frequent delays. The freight model share is even less than 0.4% (in 2018, rail freight carriage is 1.9 million tons). Mineral oil and cement are the major commodities that are transported by trains and there is no intermodal rail freight transportation.

Further, there were many rail accidents recorded over the last 5 years. Derailments, unsafe level crossing, overcrowded trains along with other sociological factors such as pedestrian behaviour (negligence) and erratic driving are the main causes of accidents. Figure 4 depicts the accidents and deaths involving railways during the last few years.

Figure 4: Railway accident (Deaths and Injuries)



Source: Authors' illustration based on CBSL Report 2019 and Railway Performance Report 2018

Key issues and the root causes impacting the performance of Sri Lanka Railways

The ‘Nvivo’ software was employed to analyse the data collected from the Delphi method-based interviews and to determine SLR’s key issues and root causes. By taking the highest frequent words from transcripts and then building parent nodes and child nodes by the software to count the relevant number of references, the root causes impacting the performance of Sri Lanka Railways were identified (refer to Annexure - B).

Pricing in SLR is observed as a key issue. Increasing reserved car ticket prices, having a separate pricing system for tourists, higher fine rates are the key issues identified by railway experts. According to the experts' opinions, outdated guidelines and the pricing system for the land properties should be changed. Further, a higher operational cost of running a train is a continuing issue with SLR. SLR must bear a high cost for the personnel emoluments and older train maintenance. Outdated signalling systems, lower traffic capacity, and frequent engine breakdowns are major causes of unreliable services. Adding to the major issues, political interference influences critical SLR activities such as construction projects, supplier evaluation as well as the recruitment process. Besides, lack of technical adaptation in the SLR operation remains a key issue. Lower level of digitalisation, and computerization of operational activities, older ticketing systems, poor usage of technology (like GPS, RFID) were stated by experts as technological issues. The connectivity of railways with other modes of transport and strategic nodes such as airports and seaports are a greater concern. There is no rail connectivity with seaport terminals which highly impacts the rail freight business in Sri Lanka. Besides, the rail stations are mostly located away from the main bus stations which inconveniences passengers and demonstrates lack of intermodal connectivity.

The experts view that SLR is unable to realise economies of scale in freight transport owing mainly to the non-existence of long hauls and non-existence of bulky transport. Therefore, due to double handling of operations, freight transport by rail might not be cost-effective for some commodities. The existing rail freight market is therefore limited to cement and petroleum. Rail freight business should be expanded to transport more varieties like containers, rice, flour, vegetable, and fertilizer. Industry experts viewed that, even though most of the warehouses are located nearby rail lines, there is no attractive business model and a mechanism to transport containers by trains. EU countries, Japan, Singapore, and most of the other ASIAN countries have developed their rail stations as commercialized hubs. Shops, retiring centres, bank facilities, and more relevant activities should be established in stations. Experts viewed that SLR has not attempted to improve such activities that could generate extra revenues. Thus, SLR has not benefited from value creation from its own property.

The most critical root cause for SLR administration complexity is the long procedures in assigning responsibilities. Bureaucratic structure of the organisation was also mentioned as a key issue. Outdated guidelines, procedures, and regulations in the procurements of rail equipment and mobile assets have led to lower the level of technological adaptation and performance in the industry. Furthermore, the procurement department faces difficulties in collaborating with other sub-departments and promptly fulfilling their requirements. Besides, the level of integration and collaboration with other public organizations is also in a weak position. External stakeholder collaboration such as with Urban Development Authority, Road Development Authority, Customs, and other

relevant authorities in the transport sector should be established before suggesting a railway reform plan.

Reform Considerations for Sri Lanka Railways

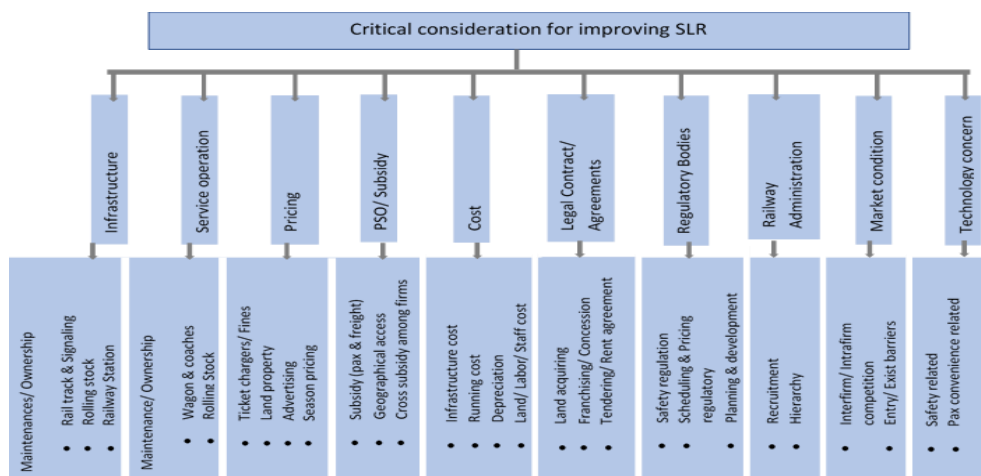
Ten major reform considerations were identified through the initial analysis of the AHP. All the considerations were prioritized by pair-wise comparison (Table 2). Sub-criteria were also mentioned as they clearly described the main criteria of the decision tree. AHP's second stage was employed to prioritize the main criteria (Figure 5).

Table 2: Scores for pairwise comparison for reform criteria

| Ranking Criteria | Infrastructure | Service operation | Pricing | PSO | Cost | Agreement | Regulatory bodies | Administration | Market | Technology. | Priority Vector |
|-------------------|----------------|-------------------|---------|------|------|-----------|-------------------|----------------|--------|-------------|-----------------|
| Infrastructure | 1.00 | 0.50 | 1.00 | 3.00 | 3.00 | 4.00 | 2.00 | 3.00 | 2.00 | 3.00 | 0.159 |
| Service operation | 2.00 | 1.00 | 2.00 | 3.00 | 3.00 | 3.00 | 2.00 | 3.00 | 1.00 | 5.00 | 0.190 |
| Pricing | 1.00 | 0.50 | 1.00 | 3.00 | 2.00 | 3.00 | 2.00 | 4.00 | 1.00 | 3.00 | 0.140 |
| PSO | 0.33 | 0.33 | 0.33 | 1.00 | 3.00 | 2.00 | 3.00 | 4.00 | 1.00 | 4.00 | 0.114 |
| Cost | 0.33 | 0.33 | 0.50 | 0.33 | 1.00 | 3.00 | 2.00 | 3.00 | 0.50 | 2.00 | 0.078 |
| Agreement | 0.25 | 0.33 | 0.33 | 0.50 | 0.33 | 1.00 | 0.25 | 2.00 | 0.50 | 2.00 | 0.048 |
| Regulatory bodies | 0.50 | 0.50 | 0.50 | 0.33 | 0.50 | 4.00 | 1.00 | 3.00 | 0.50 | 1.00 | 0.075 |
| Railway Admin. | 0.33 | 0.33 | 0.25 | 0.25 | 0.33 | 0.50 | 0.33 | 1.00 | 0.33 | 0.50 | 0.033 |
| Market condition | 0.50 | 1.00 | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 3.00 | 1.00 | 3.00 | 0.119 |
| Tech. concern | 0.33 | 0.20 | 0.33 | 0.25 | 0.50 | 0.50 | 1.00 | 2.00 | 0.33 | 1.00 | 0.043 |

Source: Authors' illustration based on Survey data

Figure 5: AHP Decision Tree



Source: Authors' illustration based on Survey data

Running service operations, infrastructure, pricing, and Public Service Obligations (PSO) received the maximum weight among others. Therefore, SLR needs to focus on such areas and change the existing policies therein. According to the AHP method; the critical ratio should be less than 0.1 to accept (Saaty, 1987). Thus, the results can be accepted due to the valid consistency ratio recorded as 0.089.

Based on the results of the Inter Quartile Range (IQR) and variance analysis, suitable rail reforms and policy initiatives were derived. Table 3 presents the final output of the determined policy statements, mean, median, variance and IQR. Most of the statements were accepted as they were developed by Delphi 01st round findings, and from the international experiences of rail reforms.

Table 3: Identified policy statements and IQR results

| | Policy | Mean | Med | Var | S.d. | Min | Max | IQR |
|-----|--|------|------|------|------|------|------|------|
| 1 | Restructuring the hierarchy and organization structure and reshape exists operational policy and infrastructure policy | 1.50 | 1.00 | 0.57 | 0.76 | 1.00 | 3.00 | 1.00 |
| 2 | Vertically separation between infrastructure and service operation | 1.50 | 1.00 | 0.57 | 0.76 | 1.00 | 3.00 | 1.00 |
| 3 | Government responsibility for the railway infrastructure and retaining the infrastructure ownership (If yes). | | | | | | | |
| 3.1 | <i>Rail track maintenance/ development, develop signalling system/ maintenance, stations maintenance, level crossing maintenance done by government</i> | 2.25 | 2.00 | 0.79 | 0.89 | 1.00 | 4.00 | 0.75 |
| 3.2 | <i>New separate department for strategic planning, infrastructure planning and technological improvement aspects</i> | 1.63 | 1.50 | 0.55 | 0.74 | 1.00 | 3.00 | 1.00 |
| 3.3 | <i>Introduce committee to check corruption in construction and procurement</i> | 2.13 | 2.00 | 0.41 | 0.64 | 1.00 | 3.00 | 0.75 |
| 3.4 | <i>Service guarantee policy apply for Infrastructure developments and procurement</i> | 1.63 | 1.50 | 0.55 | 0.74 | 1.00 | 3.00 | 1.00 |
| 4 | Retain the ownership of mechanical and technical departments with the government by introducing new policies. And service supply to the private operating companies. | 4.38 | 4.00 | 0.27 | 0.52 | 4.00 | 5.00 | 1.00 |
| 5 | Separate commercial activities from the long-term liabilities and establish new division to handle long term liabilities (Payment for excess labour after restructuring / accumulated debt payment / future debts) | 2.25 | 2.00 | 0.50 | 0.71 | 1.00 | 3.00 | 1.00 |

| | | | | | | | | |
|------|---|------|------|------|------|------|------|------|
| 6 | Introduce new entity for the operations of commercialized the railway services | 1.75 | 2.00 | 0.50 | 0.71 | 1.00 | 3.00 | 1.00 |
| 7 | Horizontal separation and establishment of several divisions of service operation (Multiple products with separate accounts) | 1.38 | 1.00 | 0.27 | 0.52 | 1.00 | 2.00 | 1.00 |
| 7.1 | <i>Suburban / Long distance / Regional passenger service/ goods / Special train as the multiproduct categories</i> | 4.50 | 4.50 | 0.29 | 0.53 | 4.00 | 5.00 | 1.00 |
| 8 | Opening rail network to 3rd parties (private sector) on track access fees with lower entering barriers (passenger transport companies involving) | 1.75 | 2.00 | 0.50 | 0.71 | 1.00 | 3.00 | 1.00 |
| 9 | Rolling stocks, wagon, coach leasing to the private sector | 1.88 | 2.00 | 0.41 | 0.64 | 1.00 | 3.00 | 0.75 |
| 10 | Opening rail network to the 3rd parties (pvt. sectors) for track access fees – freight transport | 2.25 | 2.00 | 1.07 | 1.04 | 1.00 | 4.00 | 1.75 |
| 11 | Accept cross subsidy in Government own multi product service operation | 4.13 | 4.00 | 0.70 | 0.83 | 3.00 | 5.00 | 1.75 |
| 12 | Network access from the competitive tendering process for the rolling stocks | 1.25 | 1.00 | 0.21 | 0.46 | 1.00 | 2.00 | 0.75 |
| 13 | Non-profit rail lines fully operated by the state-owned railway | 4.25 | 4.00 | 0.50 | 0.71 | 3.00 | 5.00 | 1.00 |
| 14 | Introducing an intermediate regulatory body to enforce rules, regulations | | | | | | | |
| 14.1 | <i>Licensing and certification, charging access fees, supervision of the quality of the service, tackle the conflict among rail operators</i> | 1.50 | 1.00 | 0.57 | 0.76 | 1.00 | 3.00 | 1.00 |
| 14.2 | <i>Independence safety regulatory body (by checking the condition of track and signalling & telecommunication, introducing technologies in safety aspects)</i> | 1.50 | 1.00 | 0.57 | 0.76 | 1.00 | 3.00 | 1.00 |
| 14.3 | <i>Implement separate body for Real estate management and retain owner ships with government (Develop land property, collecting rents, acting for illegal tenure)</i> | 1.50 | 1.50 | 0.29 | 0.53 | 1.00 | 2.00 | 1.00 |
| 14.4 | <i>Implement separate body for Real estate management and retain owner ships with Pvt sector</i> | 3.88 | 4.00 | 0.41 | 0.64 | 3.00 | 5.00 | 0.75 |
| 15 | New mechanism to end customer goods delivery by multimodal transportation. (By investing land freight carriages and handling equipment) | 3.75 | 4.00 | 0.21 | 0.46 | 3.00 | 4.00 | 0.75 |

Scale 1 = Strongly agree 5 = Strongly disagree

Source: Authors' illustration based on Survey data

In the 2nd round of AHP, data were gathered from 8 experts for the IQR analysis, and Cronbach's Alpha was used to measure the internal consistency. The alpha value was within the acceptable range and recorded as 0.715.

Survey participants strongly agreed to reform the SLR hierarchy and re-organise the structure to mitigate the existing operational issues. Presently, SLR has a vertically integrated structure, and the expert group consensus was to vertically separate the ownership between rail service operation and below-rail infrastructure.

All experts agreed that infrastructure ownership should be with the public entity to be established, and not transferred to private entities. The main reason is non-profit routes may not be maintained properly by private rail companies. Therefore, the rail track maintenance, further development, and extensions, signalling systems, station maintenance as well as rail crossing maintenance should continue under the public sector. However, the private sector can be involved in freight rail infrastructure development. Rail track, freight handling equipment can be owned and operated by private firms.

At present, three different sub-departments deal with the technological aspects of operational moving assets (Motive Power), infrastructures (Way & Works) and signalling (Signal & Telecommunication). Sri Lanka Rail industry is not aligned with the current advanced rail technologies. Therefore, it is necessary to include a separate new department for strategic planning, infrastructure planning and technological improvement aspects which may function beyond the roles of the existing Planning Unit headed by a Director (Planning). Still, there is no mechanism to check the ratio between service level improvement and capital investment. Thus, it is mandatory to introduce such key performance indicators to measure economic returns.

Sri Lanka is not in a favourable position in the global corruption index. The index explains that the government establishments are corrupted more than the private institutions. A specialised "transport regulator" is a necessity to inspect and identify corruption in the construction and procurement processes while checking the quality. Quality and Cost-based Selection (QCSB) methods can be applied by the procurement unit for the supplier selection process. Yet, a service guarantee should be initiated as a new policy and it is essential to update guidelines and regulations for procurement of goods and services meanwhile focusing on the advanced technologies. All the technical sub departments (Mechanical, Way and Work, Motive Power, Signalling and Telecommunication) and Units (Planning, Data Processing) of SLR should be involved with the private sector in the form of Public Private Partnership as per the consensus of the expert panel. When it is completely government-owned, the labour productivity decreases and the quality of the service gets lower as there is no performance measurement.

Presently SLR is not a commercially oriented transport services provider, and the existing pricing and operational policies are not aligned with commercialization principles even

though there is a sub department (Commercial Superintendent Sub Department). According to the expert group consensus, commercial activities should be separated from long-term infrastructure related liabilities which are now coming under the government Treasury and managed under an organization with corporate orientation and principles. This requires reforming the existing SLR organizational structure. Long term liabilities such as accumulated debt payment, labour compensation after reforms (because the excess employees at present), land acquisition payment should be done through a separate entity which may also own and supply tracks and signalling. Experts viewed that horizontal separation and establishing several divisions of service operations (multiple products with separate accounts) and minimizing the cross-subsidy among multiple product units should be major considerations under reforms. However, the existing service categories are not adequate in the market and need to have more service categories to match the passenger demand. The vertically integrated model lacks responsiveness to the market demand and the organization has no concern over competition and on the improvement of the service quality in terms of comfortability, reliability, punctuality, and accessibility which are major parameters affecting the demand for passenger and freight rail services. Yet, through the vertical separation method, 3rd party operators should have access to the network by paying access fees. Experts' aggregate view favours introducing competition for both freight and passenger operations with low barriers to entry. The government's rolling stocks, wagon, coach and tanks can be leased to the private sector. The competitive tendering process can be applied while giving market access to passenger train operating companies. Therefore, running time, running distance, coach capacity, service quality, and other operational aspects can be considered as standards in the tendering process and in the performance evaluation. Non-profit route access can be given to private operators and the government may subsidise such operations to close the financial gap. Although the budgetary burden on the government continued to remain as in the vertically integrated department model of management and operation, the relative improvement in service quality, increased passenger demand, service modernization and reduction in bureaucracy justify the efficiency of the subsidy. The subsidy under the departmental model as at present was used to finance operating losses. Further, it is also possible to set up a publicly owned company under the vertically separated operational model in the network as found in some of the countries in the EU such as Sweden and Netherland (Asmild et al., 2009). However, granting public subsidies has a significant negative effects on the operational efficiency, as experienced by a full integrated railway department such as SLR while the greater managerial autonomy provided by reforms tends to increase the efficiency (Oum, Waters and Yu, 1999).

There should be an intermediate independent body for licensing, service quality supervision as well as to handle the conflict among operators. According to the consensus among experts, safety regulations, safety guidelines and maintenance of the infrastructure should be handled by a separate public entity. Such a government entity should have the autonomy to execute supervision.

Further, land property management and non- core land management should also be regulated by a separate government entity. Property development, collecting rents, acting for illegal tenure and non-core businesses can be regulated by that entity.

Table 4: Comparative analysis of major issues present in the SLR, and the degree of success experienced by other countries in resolving them through rail reforms

| Major Issues Present in the Sri Lankan Railway system | Degree of Success in Fixing Issues after Railway Reforms | | | | | | | |
|---|---|-------------------|--------------------|-------------------|-------------------|--------------------|--------------------|-------------------|
| | Japan | Sweden | Britain | German | France | Thailand | China | India |
| Chronic financial deficits, Ineffectiveness in collecting revenues, Provision of services at below marginal cost | M | M | M | M | L | L | L | L |
| Overmanning, Unionization, Resistance to change | H | M | M | M | L | L | L | L |
| Low productivity (Passenger Model share and Freight model share) | M | H | L | H | L | M | H | H |
| Less Infrastructure & services development in rural area | L | L | M | M | M | L | M | M |
| Decrease of freight transport | L | H | M | M | L | L | M | M |
| Low service quality/ Congested services / Services have failed to respond to need | M | H | M | H | H | L | L | L |
| Lack of competition | H | H | H | M | L | L | L | L |
| Lack of strategic commitment | H | H | M | H | L | M | L | M |
| Low managerial and technical Efficiency/ Low Productivity | H | H | M | H | L | L | L | M |
| PSO and subsidy to the passenger | M | L | M | M | L | H | M | H |
| High political intervention (recruitment process, tendering, etc.) | H | H | M | M | L | L | L | L |
| Less safety in railway operation (Intermediation authority to inspect safety, Obsolete tracks, obsolete trains, lack of maintenances, unsafety cross-sections, less technological usage, issues in signalling and telecommunication systems | H | H | M | M | H | L | L | L |
| Less consideration of Environment (electrification, innovation etc.) | H | H | L | M | H | L | M | M |
| Management issues in planning and operations, less integration among divisions, not defined responsibilities | M | M | M | H | H | L | L | M |
| Management of real estate management (Develop land property, collecting rents, acting for illegal tenure) | M | M | M | H | H | L | L | L |
| | H=7** M=6 L=2 | H=9 M=4 L=2 | H=1 M=12 L=2 | H=6 M=9 L=0 | H=6 M=9 L=0 | H=1 M=2 L=12 | H=1 M=4 L=10 | H=2 M=6 L=7 |

Key: L = Less M = Moderate H = High **The number is the frequency

Source: Based on (Beria, Quinet, de Rus and Schulz, 2012; Bogart and Chaudhary, 2012; Cartmell, 2016; Charanwanitwong and Fraszczyk, 2018; Fitzov, 2017; Gangwar and Raghuram, 2017; Holvad, 2009; Kopicki and Thompson, 1995; March et al., 2013; Mizutani, Smith, Nash and Uranishi, 2015; Nash, 2008; Ozkan et al., 2016; Yu, 2015) and *data from industry expert interviews.

A successful railway restructuring should be a process with clearly defined steps. Most of the countries typically took time for their rail reforms, and the time length mostly correlated with the objectives. For example, Sweden's first significant reform was carried out in 1988 and opened the rail market for competition completely by 2010. Therefore, Sri Lanka cannot expect to hastily complete rail reform within three-four years. India, China and Thailand still have not reformed their railway structures and all those countries follow the German model to some extent. A thematic analysis performed using literature diagnosed the degree of success of rail reforms in fixing then persisted issues in selected countries. Table 4 above comparatively presents persistent issues in SLR, and the degree of success experienced by other countries in resolving them through their rail reforms.

According to Table 4, a higher level of reform success in fixing issues was observed with Swedish and the German restructuring models. Hence, Sri Lanka may learn and formulate a reform model characterized with elements of a German-Swedish hybrid model. Sri Lanka Railways may explore the possibility of vertically separating “below” rail (track management) and “above” rail (operators of trains and rolling stock) – dividing the ownership between service operation and infrastructure. German and Sweden's railways keep infrastructure ownership with the government. SLR can continue to be the responsible authority for the rail tracks and their maintenance, further development, extensions, signalling systems, station maintenance as well as rail crossing maintenance. However, it is mandatory to improve rail tracks and upgrade signal systems before opening the market to private operators (like in UK, Sweden, and German). The reason can be that the private companies are not inclined to agree to frequent cancellations and delays. Many countries like Sweden, Germany, and UK have promoted voluntary retirement schemes, and seized the recruitment process to increase labour productivity. The same can be applied in Sri Lanka as well to ease the excess workforce burden. Further, most of the non-profit routes are run by government rail companies in Germany and Sweden. The same model is suitable for Sri Lankan context as there are several rural services in operation. Horizontal separation and creation of multiple service products can increase the competitiveness of the rail market. The efficiency levels of rail operation in countries with only vertical separation do not significantly differ from countries without reforms. Hence, horizontal separation should also be undertaken to raise the operational, and cost efficiencies (Cantos, Pastor and Serrano, 2012).

In addition, Mizutani et al. (2015) found that vertical separation only increases costs in a denser network. Further Friebel et al. (2010) confirmed that rail restructuring with multiple reforms in a package undertaken sequentially led to efficiency improvement. SLR also should lease moving assets, passenger, and freight services to private sector operators and increase the operational and cost efficiencies. A separate accounting method for commercial activities to minimize the cross-subsidy among multiple services should be implemented and that can enhance the operational efficiency as inefficient cost centres can be identified. This is more advantageous as a fully separated model, both

vertically and horizontally provides non-discriminatory access to the network and cost transparency (Asmild et al., 2009). The Government can explore the possibility of establishing a separate regulator to deal with matters such as real estate management, non-core asset management, infrastructure safety, train licensing, scheduling, resolving conflicts and inspecting the quality of rail service providers, strategic planning and infrastructure development and technological supervision. The government should commit considerable investments during initial stages of reform as the rail infrastructure should be developed sufficiently before the vertical separation.

CONCLUSIONS, RESEARCH LIMITATION AND FUTURE RESEARCH

The purpose of this paper was to identify key issues and root causes for the operational and financial inefficiencies of Sri Lanka Railways and elaborate on the best reform structure in the light of rail industry expert opinion and lessons learnt from world rail reforms. Literature on rail reforms undertaken globally were reviewed, and reform characteristics, models and outcomes were identified. Secondary data on SLR operations were descriptively analysed to identify financial and operational issues. A semi-structured questionnaire developed based on literature was used to interview twelve railway industry experts. Analytical Hierarchy Process method, content analysis, and policy Delphi method were the main techniques employed in the analysis. The outcomes indicated that a vertical separation of the ownership between rail service operation and rail infrastructure provision is suitable for Sri Lanka Railways. Given the existing operational and financial characteristics, lessons learnt from other countries and the industry expert's opinions, the German-Swedish hybrid model appeared the most appropriate model for railway reforms in Sri Lanka.

The study has a few limitations. The perspectives of public policymakers are not represented in the expert interviews. Micro-level analysis on different divisions of Sri Lanka Railways is needed to evaluate and identify suitable business and operational models. Research should be carried out on technological adaptability, local railway technology development, and establishing regulatory framework in the railway system. Railway land and property development, management and related socio-economic issues are also important topics for future research.

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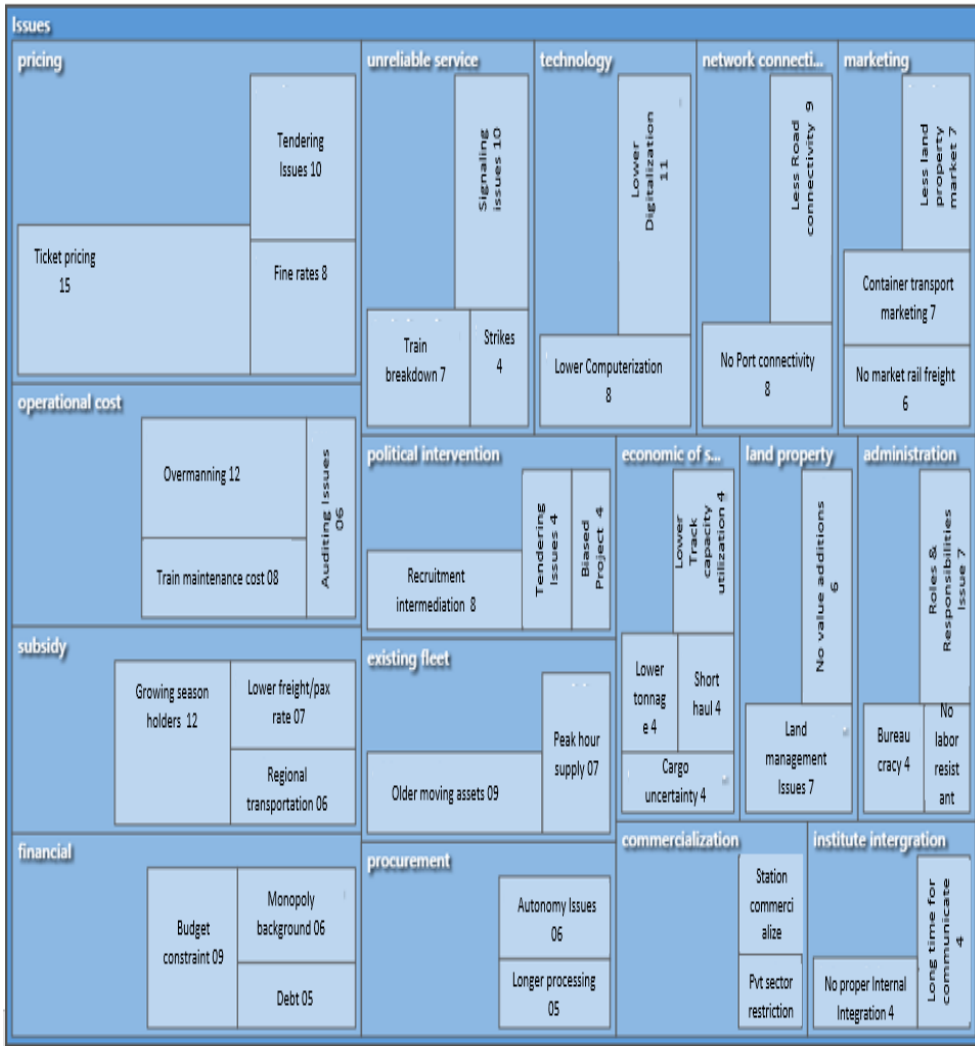
Annexure - A: Summary of the reform’s review of selected countries in the world

| Country | Operational ownership | Infra. ownership | Land management | Subsidy | Institutional arrangement | Labour |
|---------|---|---|--|---|---|---|
| Japan | Vertical integrated and regional separated pax railway. 3 pax companies and 01 freight railway company under JRJT in Government Act | Private companies | A separate entity to manage the land property. Private sector for management. | Significantly reduced subsidy, Competitive tendering process for non-profit routes | Separate construction and safety regulatory bodies. Clearing groups for responsible long-term debt, separate assets and regulate employees. Established a research and development unit | The autonomic system with high labour utilization |
| Sweden | Vertically separated. Freight and passenger both owned by the state. | 80% managed by state | A separate entity to manage land and stations. Fully owned by the Swedish Govt. | Competitive bidding when entering. Pax and freight subsidy reduced by 60% by 20 years | Separate institute for issue licenses and certificates of the register in ownership. Separate entity for safety reviews | Automated systems with high labour utilization |
| Britain | Vertical and horizontally separated. Franchised system for both freight and pax services. | Government control but private sector operators | Full owned by the government including value addition and marketing. | Competitive bidding when enter. Subsidy for pax train. Separate institute for handle subsidy. | An entity responsible for the safety, strategic planning, licensing, regulations, and investigations and economic regulations. | Pension obligation Semi-automated and labours |
| Germany | Vertical and horizontally separated. No cross-subsidy and completely separated accounting systems. | Government control but private sector operators | The State railway responsible for real estate and debts. Private sector for real estate management | Significantly reduced subsidy. The competitive tendering process for non-profit route | Independent entity for technical supervision- RegTP, the Federal Regulatory Agency. Separate entity for track maintenance and station maintenance. | Pension and high labour productivity |

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| Country | Operational ownership | Infra. ownership | Land management | Subsidy | Institutional arrangement | Labour |
|----------|---|---------------------------------|---|--|--|--|
| France | Vertical integrated two bodies with regional passenger services to regional authorities | Government (a public authority) | A public authority to manage land and stations. Fully owned by the govt | A strong growth in subsidies per train km in the regional market | A public authority responsible for track improvement and development, network investment choices and financing, and setting and collection of track use tariffs/ Independent regulatory agency (ARAF) and a safety authority (EPSF). | Pension obligation Semi-automated and labours |
| Thailand | Vertical integrated. Lower private sector ownership | Government | A new public organization for management | Highly subsidy to the passenger and freight | Separate body for the safety inspection | Labour intensive |
| China | Vertical integrated. Lower Private sector ownership | Government | Government-owned and no separate institute for management | Subsidized for local passengers | Separate bodies for corruption investigation and commercial operations. A separate entity to setting standards for the service quality. | Moderate labour productivity |
| India | Vertical integrated. Lower private sector ownership | Government | Government-owned and no separate institute for management | Highly subsidy to the passenger and freight | Separate body for the commercialized purposes | Labour intensive and low digitalization, computerization, and automation |

Annexure - B: NVivo output: Key issues and root causes of SLR



Source: Authors' illustration based on Survey data

ஆய்வுச்சுருக்கம்

இவ்வாய்வானது இலங்கையின் அரசு பொதுச்செலவிற்கும் அரசு வரி வருமானத்திற்கும் இடையிலான தொடர்பினைக் கண்டறிவதனை நோக்கமாகக் கொண்டுள்ளது. 1990-2017ம் ஆண்டு வரையான காலத்தொடர் தரவுகள் இவ்வாய்விற்காக பயன்படுத்தப்பட்டுள்ளன. இவ்வாய்வின் சார்ந்தமாறியாக அரசு பொதுச்செலவு எடுத்துக்கொள்ளப்பட்டுள்ளதுடன் அரசு வரி வருமானம், பணவீக்கம், அரசு பொதுப்படுகடன், சனத்தொகை போன்றவை சாரா மாறிகளாகவும் எடுத்துக்கொள்ளப்பட்டுள்ளது. இம் மாறிகளுக்கு இடையிலான தொடர்புகளைப் பரிசீலிப்பதற்காக வரைபடங்களும் அலகு மூல சோதனை, ஜோகான்சன் கூட்டு ஒருங்கிணைவு நுட்பம், வழச்சரிப்படுத்தல் மாதிரியுரு, காரணகாரியத்தொடர்பு போன்ற பொருளியலளவை நுட்பங்களும் பயன்படுத்தப்பட்டுள்ளன.

நீண்டகாலப் சோதனை மூலமாக அரசு பொதுச் செலவின் மீது அரசு வரி வருமானம், அரசு பொதுப்படுகடன் போன்ற மாறிகள் நேர்கணிதத் தொடர்பினையும் பணவீக்கம், சனத்தொகை போன்ற மாறிகள் எதிர்கணிதத் தொடர்பினையும் கொண்டுள்ளன எனக் கண்டறிப்பட்டுள்ளது. அரசு வரி வருமானத்தில் ஏற்படும் ஒரு வீத அதிகரிப்பு அரசு பொதுச் செலவில் சராசரி 6.756 வீத அதிகரிப்பையும் அரசு பொதுப்படுகடனானது ஒரு வீதத்தினால் அதிகரிக்கும் போது அரசு பொதுச் செலவில் சராசரி 2.182 வீத அதிகரிப்பையும் ஏற்படுத்தும். நுகர்வு விலைச் சுட்டெண்ணில் ஏற்படும் ஒரு வீத அதிகரிப்பு அரசு பொதுச் செலவினை சராசரியாக 3.497 வீதத்தால் குறைவடையச் செய்யும். அதேபோல் சனத்தொகையானது ஒரு வீதத்தினால் அதிகரிக்கும் போது அரசு பொதுச்செலவானது சராசரியாக 10.685 வீதத்தினால் குறைவடையும். நாட்டின் பொருளாதார முன்னேற்றத்தை ஏற்படுத்தும் வகையில் அரசு பொதுச்செலவு மற்றும் அரசு வரி வருமானம் தொடர்பான சிறந்த கொள்கைகளை நாட்டில் நடைமுறைப்படுத்துவது சிறப்பானதாகும்.

முதன்மைச் சொற்கள். அரசு பொதுச் செலவு, அரசு வரி வருமானம், பணவீக்கம், அரசு பொதுப்படுகடன், சனத்தொகை

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Abstract in English

This study is to find the relationship between government expenditure and government tax revenue in Sri Lanka, using time series data from 1990-2017. Public expenditure was used as the dependent variable in the model while tax revenue, inflation, public debt, and population were the independent variables considered. Stationarity of the time series was tested employing Augmented Dickey–Fuller (ADF) unit root. Johansen's maximum likelihood estimation of the parameters of a co-integrating equation was employed to examine long-run relationship between the variables. In addition, Granger causality test was performed to identify the causal relationship between public expenditure and selected independent variables. The results confirmed the existence of long-run relationship between the public expenditure and tax revenue. The presence of a unidirectional causality between government expenditure and tax revenue was revealed through the results. The study outcomes suggest the necessity of constructive policy decisions pertaining to government revenue and expenditure in view of promoting the Sri Lankan economy.

Keywords: Public Expenditure, Tax Revenue, Inflation, Public Debt, Population

அறிமுகம்

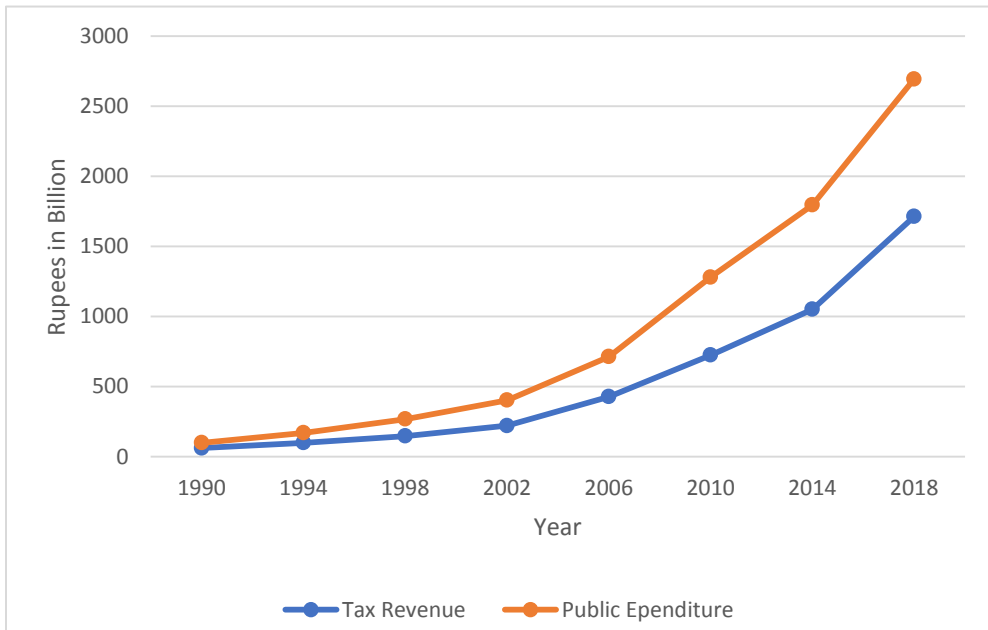
பேரினப்பொருளியல் என்பது பொருளாதார முறைமையின் நடவடிக்கையை அல்லது பொருளாதார மாறிகளை முழுமையாக நோக்கி ஆராய்வதாகும். அந்தவகையில் பேரினப்பொருளியலில் உள்ளடக்கப்படும் பல்வேறு காரணிகளுள் அரசு பொதுச் செலவு மற்றும் அரசு வரி வருமானம் என்பன மிக முக்கியமான காரணிகளாகும். இலங்கையைப் பொறுத்தவரையில் இன்றைய கால கட்டத்தில் அரசு பொதுச் செலவானது முன்னைய காலப்பகுதியை விட மிக வேகமாக அதிகரித்துக் கொண்டு செல்கின்றது. இவ்வாறு அரசு செலவின் அதிகரிப்பிற்கு நாட்டினுடைய அரசு வரி வருமானமே முக்கிய பங்கை வகிக்கின்றது எனலாம். ஏனெனில் வரி வருமானத்தின் மீள்பிரதியீடு அரசு செலவினம் எனக் கூறப்படுகின்றது. எனவே இலங்கையில் அரசு பொதுச் செலவிற்கும் அரசு வரி வருமானத்திற்கும் இடையிலான தொடர்பைக் கண்டறிவது மிக முக்கியமானதொன்றாகும்.

ஒரு நாட்டின் அரசாங்கம் மக்களின் வாழ்கைத் தரத்தைப் பேணுவதற்கும் வாழ்கைத் தரத்தைப் படிப்படியாக அதிகரிப்பதற்கும் செலவினை மேற்கொள்கின்றது. இதுவே அரசு பொதுச்செலவாகும் (பரமேஸ்வரன், 2013). அந்தவகையில் நாட்டுமக்களின் மெய்வருமானத்தை அதிகரிப்பதற்காக அரசு தனது செலவுகளை நேரடியாக மானியங்கள் மூலமாகவும் மறை முகமாக தொழில் வாய்ப்பு கொடுப்பனவுகளாகவும் மக்களுக்கு வழங்குகின்றது எனலாம். அரசு பொதுச் செலவுகளே அரசு பொது இறுதி நுகர்வுச் செலவுகள் எனவும் அழைக்கப்படுகின்றன. ஓர் அரசானது தனது ஆட்டில் எல்லைக்குள் வாழுகின்ற மக்களுக்கு சமூக நன்மையை ஏற்படுத்தும் நோக்குடன் செய்யப்படும் செலவுகளாக இவை காணப்படுகின்றன. 20 ஆம் நூற்றாண்டின் முற்பகுதியில் ஜான் மேனார்ட் கெயின்ஸ் என்பவர் பொருளாதாரத்தில் வருமான அளவையும் அதன் பரம்பலையும் தீர்மானிப்பதில் அரசு பொதுச் செலவீனங்களின் பங்கானது மிக முக்கியமானது என்கின்றார் (பரமேஸ்வரன், 2010).

இலங்கையானது அபிவிருத்தியடைந்து வருகின்ற நாடாகக் காணப்படுவதுடன் தற்காலத்தில் அரசு பொதுச் செலவானது மிகவும் தீவிரமாக அதிகரித்துக் கொண்டு செல்கின்ற போக்கை காட்டுகின்றது (வரைபடம் 1). 2009ஆம் ஆண்டிற்கு முற்பட்ட காலப்பகுதியான யுத்த காலப்பகுதியில் பாதுகாப்பு கருதி அரசு செலவானது அதிகமாகக் காணப்பட்டது. எனினும் 2009இற்கு பிற்பட்ட காலத்தில் யுத்தம் நிறைவு பெற்றும் அரசு செலவானது அதிகரித்தே காணப்படுகின்றது. 1977ம் ஆண்டு இலங்கைப் பொருளாதாரம் தாராளமயமாக்கப்பட்டதைத் தொடர்ந்து வர்த்தக அடிப்படையிலான இறக்குமதி அதிகரிப்பு, இயற்கை அனர்த்தம், யுத்தம் போன்றவற்றின் காரணமாக அரசு வரி வருமானமும் அரசு செலவும் முன்னைய ஆண்டுகளோடு ஒப்பிடுமிடத்து தொடர்ந்து அதிகரித்துக் கொண்டே செல்கின்றது. 2014ம் ஆண்டிற்கு பின்னர் இவ் அரசு செலவின் அதிகரிப்பானது 2009ம் ஆண்டோடு ஒப்பிடும் போது வரலாறு காணாத அளவிற்கு உயர் நிலையில் காணப்படுகின்றது. 2015இல் இடம் பெற்ற இருவகையான தேர்தல் முறைமையின் காரணமாகவும் அரசியல் தந்திரோபாயச் செயற்பாடுகளை முன்னெடுக்க மேற்கொள்ளப்பட்ட ஓய்வூதிய கொடுப்பனவு, கல்வி மீதான செலவீனம், சுகாதார மேம்பாட்டுத்திட்டங்கள், வீதி புனரமைப்புச் செயற்பாடுகள், ஊழிய சம்பள உயர்வு போன்ற விடயங்களில் ஏற்பட்ட அதிகரிப்பும் இவ் அரசு செலவின் அதிகரிப்பிற்கு காரணமாகின.

எனவே இலங்கையில் அரசு பொதுச் செலவீனத்தின் மீது அரசு வரி வருமானம் மற்றும் ஏனைய காரணிகளான பணவீக்கம், சனத்தொகை, அரசு பொதுப்புகடன் என்பன எத்தகைய தாக்கம் செலுத்துகின்றது என்பதைக் கண்டறிவதோடு இக்காரணிகளுக்கிடையிலான குறுங்கால மற்றும் நீண்டகாலத் தொடர்புகளைக் கண்டறிவதுடன், இக்காரணிகளுக்கிடையிலான காரணகாரியத் தொடர்பினையும் கண்டறிவதே இவ்வாய்வின் நோக்கமாகும்.

வரைபடம் 1: அரசு வருமானம் மற்றும் பொதுச் செலவின் போக்கு 1990-2018



மூலம்: இலங்கை மத்திய வங்கி ஆண்டறிக்கை (2019)

கடந்தகால ஆய்வுகளின் மீளாய்வு

அரசு பொதுச் செலவீனத்திற்கும் அரசு வரி வருமானத்திற்கும் இடையிலான தொடர்பு பற்றி பல்வேறு நாடுகளின் தரவுகளைக் கொண்டு பல்வேறு ஆய்வுகள் மேற்கொள்ளப்பட்டுள்ளன. அவற்றின் முடிவுகளாக இவ்விரு காரணிகளுக்குமிடையே குறுங்கால மற்றும் நீண்டகால தொடர்புகள் கண்டறியப்பட்டுள்ளன. அதேவேளை மாறுபட்ட முடிவுகளும் பெறப்பட்டுள்ளன. அதே போன்று அரசு பொதுச் செலவீனத்திற்கும் அரசு வரி வருமானத்திற்கும் இடையிலான ஒருவழி மற்றும் இருவழி காரணகாரியத்தொடர்பு உண்டு என்றும், சில ஆய்வுகள் காரணகாரியத்தொடர்பு காணப்படவில்லை எனவும் கண்டறிந்துள்ளது.

அந்தவகையில் Attari & Javed (2013) என்பவர்கள் பாக்கிஸ்தானில் 1980-2010 வரையான காலத்தொடர் தரவுகளை அடிப்படையாகக் கொண்டு பணவீக்கம், பொருளாதார வளர்ச்சி, அரசு பொதுச் செலவு ஆகிய காரணிகளுக்கு இடையிலான தொடர்பினை ADF அலகு மூலச்சோதனை, ARDL Model, Johansen Cointegration முறைகளைப் பயன்படுத்தி ஆராய்ந்தனர். இவர்களது ஆய்வின்படி அரசு செலவினம் நேர்மறையான புற விளைவுகளைக் கொண்டிருப்பதால் இவற்றிற்கிடையே நீண்டகாலத்தொடர்பு காணப்படுகின்றது என கண்டறியப்பட்டது. Ogbale & Momodu (2015) என்பவர்கள் 1970- 2011 வரையான 42 வருட காலத்தொடர் தரவுகளைப் பயன்படுத்தி நைஜீரியாவில் பணவீக்கத்திற்கும் அரசு செலவினத்திற்கும் இடையிலான தொடர்பு பற்றி ஆராய்ந்துள்ளனர். 1970 - 2010 வரையான வருடாந்த அடிப்படையிலான காலத்தொடர் தரவுகளைப் பயன்படுத்தி நைஜீரியாவில் செய்யப்பட்ட ஆய்வின் முடிவாக அரசு செலவினத்திற்கும் பணவீக்கத்திற்கும் இடையே எதிர்மறையான தொடர்பு காணப்படுவதாகக் கண்டறியப்பட்டுள்ளது (Olayungbo, 2013). அதேபோன்று மலேசிய நாட்டு தரவுகளை பயன்படுத்தி செய்யப்பட்ட ஆய்வின் மூலமும் அரசு வருமானத்திற்கும் செலவினத்திற்கும் இடையிலான நீண்ட காலத் தொடர்பு கண்டறியப்பட்டுள்ளது (Taha, 2008). இலங்கையில் 1977 - 2009 வரையான காலத்தொடர் தரவுகளைப் பயன்படுத்தி கூட்டு ஒருங்கிணைவு, வழச்சரிப்படுத்தல் போன்ற நுட்பமுறைகளின் அடிப்படையில் அரசு செலவிற்கும் அரசு வருமானத்திற்கும் இடையிலான தொடர்பு பற்றி Ravinthirakumaran (2011) என்பவர் ஆராய்ந்துள்ளார். ஆய்வின் முடிவானது இரண்டு மாறிகளுக்குமிடையில் நீண்டகாலச் சமனிலை காணப்படுவதாகக் குறிப்பிடுகின்றது.

அதுமட்டுமின்றி பல்வேறுபட்ட நாட்டு தரவுகளைப் பயன்படுத்தி பணவீக்கம், பொருளாதார வளர்ச்சி, அரசு செலவினம் ஆகியவற்றிற்கு இடையேயான காரணகாரியத்தொடர்பு பற்றியும் ஆய்வுகள் மேற்கொள்ளப்பட்டுள்ளன. Mehrara & Rezaei (2014) என்பவர்கள் ஈரான் நாட்டில் அரசு செலவிற்கும் அரசு வருமானத்திற்கும் இடையிலான தொடர்பு நிலை தொடர்பாக 1978-2011 வரையான வருடாந்த காலத்தொடர் தரவுகளைப் பயன்படுத்தி Granger Causality சோதனைகளின் அடிப்படையில் அரசு செலவு மற்றும் அரசுவருமானத்திற்கு இடையே ஒருவழி காரணகாரியத் தொடர்புள்ளதாக கண்டறிந்துள்ளனர். பாக்கிஸ்தான் நாட்டின் 1972-2007 வரையான காலத்தொடர் தரவுகளைப் பயன்படுத்தி செய்யப்பட்ட ஆய்வின் மூலமும் அரசு செலவு, அரசு வரி வருமானத்திற்கு இடையே ஒருவழி காரணகாரியத் தொடர்புள்ளதாக கண்டறிந்துள்ளனர் (Aisha & Khatoun, 2009). மலேசியாவில் 1970 - 2006 வரையான காலத்தொடர் தரவுகளை அடிப்படையாகக் கொண்டு Taha (2008) என்பவர் அரசு வருமானத்திற்கும் அரசு செலவிற்கும் இடையிலான இருவழிக் காரணகாரியத் தொடர்பு காணப்படுவதாக

கண்டறிந்துள்ளார். இவ்வாறாக இத்தலைப்பு தொடர்பாக பல்வேறு ஆய்வுகள் பல்வேறு நாடுகளின் தரவுகளைப் பயன்படுத்தி மேற்கொள்ளப்பட்டிருப்பதைக் காணலாம்.

ஆய்வு முறையியல்

இவ் ஆய்வில் இரண்டாம் நிலைத்தரவான 1990-2017 வரையான காலத்தொடர் தரவுகள் பயன்படுத்தப்பட்டுள்ளன. இங்கு காலத்தொடர் தரவுகளைப் பகுப்பாய்வு செய்யும் போது மாறிகளின் காலத்தொடர் போக்கு, மாறாத் தன்மைப் பரிசோதனை போன்றவற்றை மதிப்பிடுவது அவசியமானதாகும். அந்தவகையில் அலகு மூல சோதனையானது (Unit Root Test) மாறிகளின் காலத்தொடர் உடைமைகளைக் கண்டறிவதற்குப் பயன்படுத்தப்படும் முறையாகும்.

அத்துடன் இவ் ஆய்வின் பிரதான மற்றும் துணை நோக்கங்களை அடைந்து கொள்ளும் பொருட்டு சில பொருளியலளவை நுட்பங்களும் பயன்படுத்தப்பட்டுள்ளன. இங்கு வழிசீர்ப்படுத்தல் மாதிரியுரு (Error Correction Model), மற்றும் மாறிகளுக்கு இடையிலான நீண்டகால சமநிலைத் தொடர்பினை விளக்குவதற்கு ஜோகான்சன் ஒருங்கிணைவு (Johansen Co-integration Analysis) மற்றும் Granger Causality போன்ற முறைகளைப் பயன்படுத்தி ஆய்வானது பகுப்பாய்வு செய்யப்படுகின்றது.

பல்மாறி பிற்செலவு சமன்பாட்டில் அனைத்து மாறிகளும் இயற்கை மடக்கை வடிவத்திற்கு உருமாற்றம் செய்யப்பட்டுள்ளன. இங்கு அரசு பொதுச் செலவினை சாரந்த மாறியாகவும் அரசு வரி வருமானத்தை பிரதான சாரா மாறியாகவும் பணவீக்கம், அரசு பொதுபடுகடன், சனத்தொகை போன்றவற்றை துணை சாரா மாறியாகவும் கொண்டு சமன்பாடு உருவாக்கப்பட்டுள்ளது. இங்கு மாறிகள் அனைத்தும் இரண்டு வருடகால இடைவெளி கொண்டு (Lag2) பகுப்பாய்வு செய்யப்படுகின்றது. அத்துடன் அனைத்து மாறிகளும் அதனுடைய மடக்கை எடுக்கப்பட்ட தரவுகளின் அடிப்படையில் பகுப்பாய்வு செய்யப்படுகின்றது.

$$\ln exp_t = \beta_0 + \beta_1 \ln rev_t + \beta_2 \ln inf_t + \beta_3 \ln debt_t + \beta_4 \ln pop_t + U_t \dots \dots \dots (1)$$

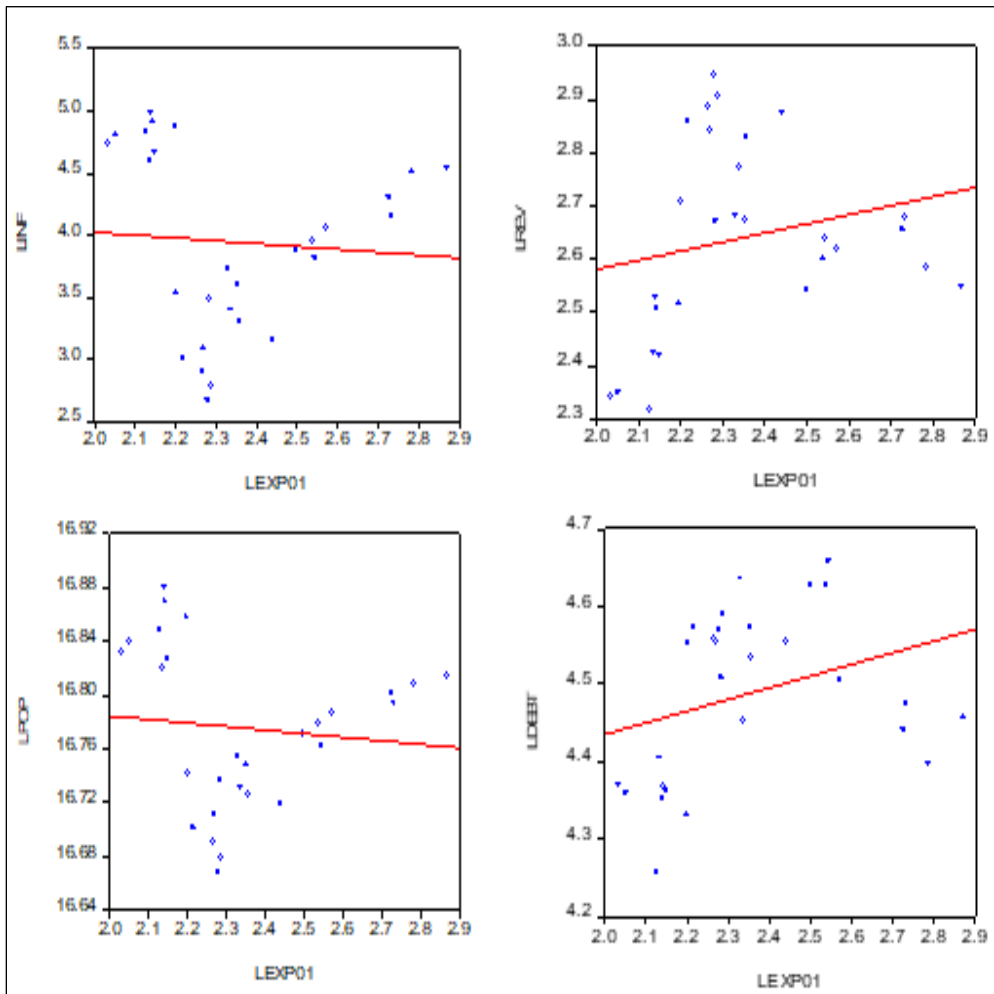
இவ்வாறாக பல்மாறி பிற்செலவு சமன்பாட்டின் மூலமாக அரசு பொதுச் செலவில் அரசு வரி வருமானம், பணவீக்கம் (CPI), அரசு பொதுபடுகடன், சனத்தொகை போன்ற சாரா மாறிகள் எத்தகைய தாக்கத்தை ஏற்படுத்துகின்றது என்பது மதிப்பீடு செய்யப்படுகின்றது.

ஆய்வின் முடிவுகள்

பொருளாதார மாறிகளுக்கு இடையே இருக்கும் தொடர்புகளை விளக்க பல்வேறு வரைபட முறைகள் காணப்பட்டாலும், மாறிகளின் பரம்பல் தன்மையை துல்லியமாக கண்டறிவதற்கு சிதறல் வரைபடங்கள் உதவுகின்றன. இவற்றின் மூலம் குறிப்பிட்ட காலப்பகுதியில் மாறிகள் எவ்வாறு பரம்பிக் காணப்படுகின்றன, இரண்டு மாறிகளும் ஒன்றுக்கொன்று நெருங்கிய தொடர்பு கொண்டுள்ளனவா எனக்கண்டு கொள்ளலாம். இரண்டு மாறிகளின் இணைவுத் தன்மையினையும், தொடர்பின் தன்மையினையும் ஒருங்கே கண்டுகொள்வதற்குப் பொருத்தமான வரைபடமுறையாக சிதறல் வரைபடம் காணப்படுகின்றது. இணைவு நேர்கணியமாக இருக்குமாயின் எல்லாப் புள்ளிகளும் நேர்ச்சரிவுள்ள கோட்டிற்கு அருகில் இருக்கும். மாறாக எதிர்கணியமாக இருப்பின் நேர்கோட்டிலிருந்து விலகி இருக்கும். இரண்டு மாறிகளுக்கு இடையில் இணைவு

இல்லாதபோது அதாவது பூச்சிய இணைவாகக் காணப்பட்டால் புள்ளிகள் சிதறிக் காணப்படும். ஆய்விற்காக தெரிவு செய்யப்பட்ட சார்ந்த மற்றும் சாரா மாறிகளுக்கிடையேயான தொடர்பு சிதறல் வரைபடம் 2 இல் காட்டப்பட்டுள்ளது. வரைபடம் 2 இனை நோக்கும் போது அரச பொதுச் செலவிற்கும் அரச வருமானம் மற்றும் அரச பொதுப்படுகடன் என்பவற்றிற்கிடையே நீண்ட காலத்தில் நேர்த்தொடர்பு நிலவுவதனைக் காணலாம். அதேவேளை பொதுச் செலவிற்கும் பணவீக்கம் மற்றும் சனத்தொகை என்பவற்றிற்கிடையே நீண்ட காலத்தில் எதிர் தொடர்பு நிலவுவதனைக் காணலாம்.

வரைபடம் 2: அரச பொதுச் செலவீனத்திற்கும் வருமானம், பணவீக்கம், அரச பொதுக்கடன் மற்றும் சனத்தொகை போன்றவற்றுக்கும் இடையிலான தொடர்புகள் (1990-2017)



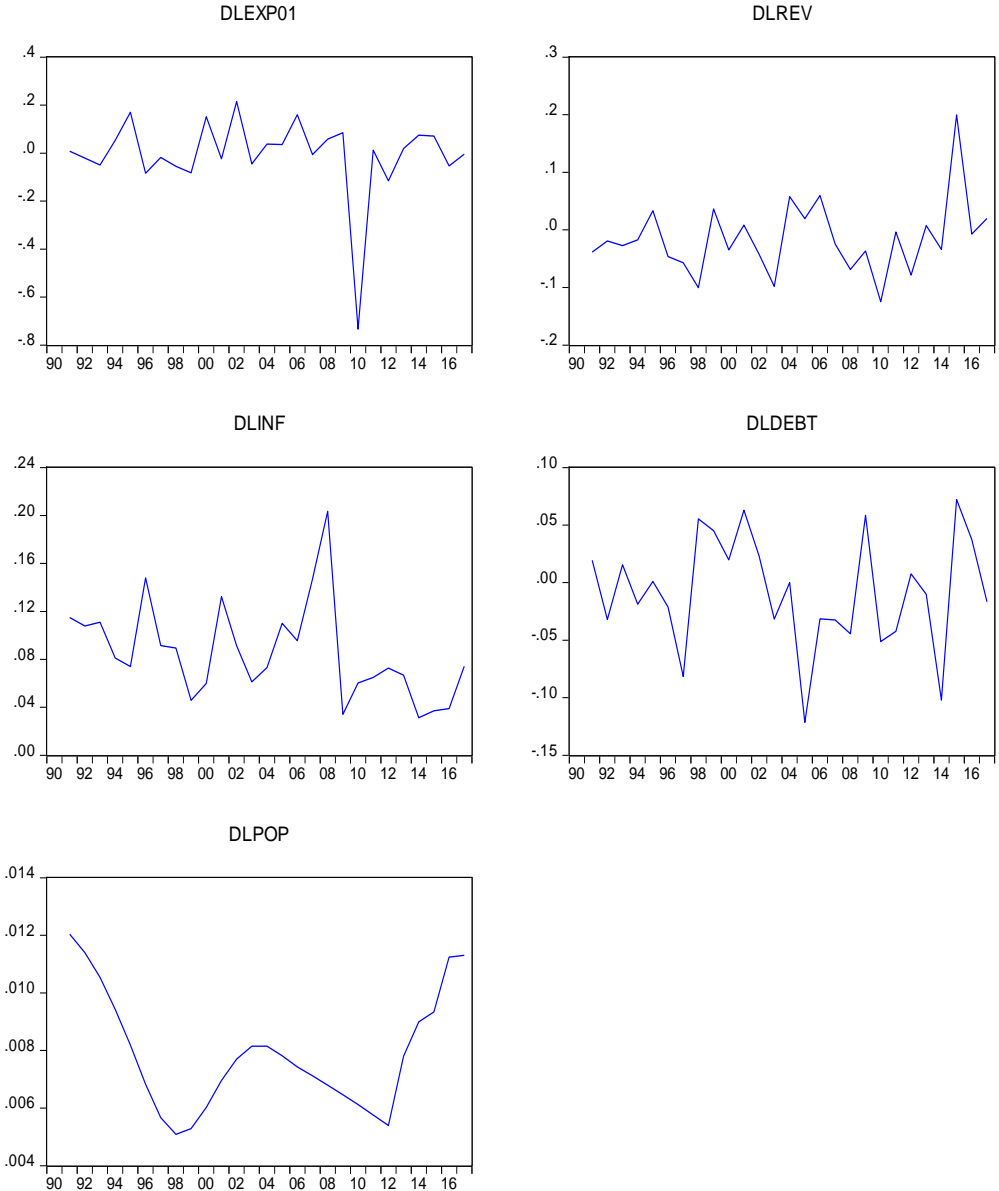
மூலம்: மத்திய வங்கி, ஆண்டறிக்கை- 1990-2017

குறிப்பு: LEXP01- அரச பொதுச் செலவீனம், LREV-அரச வருமானம், LINF-பணவீக்கம், LDEBT- அரச பொதுப்படுகடன், LPOP- சனத்தொகை

அலகு மூல சோதனைப் பெறுபேறுகள் (Unit root test results)

காலத்தொடர் தரவுகள் ஒவ்வொரு வருடத்துடனும் தொடர்பைக் கொண்டு காணப்படும், அதாவது முன்னைய வருடத்துடன் அடுத்த வருடமானது தொடர்பைக் கொண்டு காணப்படும். வரைபடம் 3 ஆனது காலத்தொடர் மாறிகளான அரசு பொதுச் செலவு, அரசு வரி வருமானம், பணவீக்கம், அரசு பொதுபடுகடன், சனத்தொகை ஆகியவற்றின் மடக்கை முதல் வித்தியாச மட்ட போக்கினை வரைபடம் மூலம் விளக்குகின்றது. இங்கு காலத்தொடர் மாறிகளின் வருடாந்த தளம்பல் போக்கு தொடர்பாக அவதானிக்க முடிகின்றது.

வரைபடம் 3: காலத்தொடர் மாறிகளின் மடக்கை முதல் வித்தியாசமட்ட போக்கு



மூலம்: காலத்தொடர் தரவுகளின் கணிப்பு

இவ்வாய்வில் பயன்படுத்தப்பட்டுள்ள மாறிகளின் நிலைத்த தன்மையுடைய பரிசோதிப்பதற்காக அலகு மூல ADF சோதனை மேற்கொள்ளப்பட்டுள்ளது.

H_0 : Non Stationary

H_1 : Stationary

5வீத பொருண்மை மட்டத்தில் முதலாம் மட்ட வித்தியாசத்தில் H_0 கருதுகோள் நிராகரிக்கப்படுவதால் அனைத்து மாறிகளும் முதலாம் மட்ட வித்தியாசத்தில் நிலைத்த தன்மை கொண்டனவாகவும் காணப்படுகின்றது.

அட்டவணை 1: அலகு மூல சோதனைப் பெறுபேறுகள்

| Variables | ADF Test | P –value | Stationary Decision | Order of integration |
|-------------------------------|----------------------------|----------|---------------------|----------------------|
| Government Expenditure(lnexp) | Level | 0.3541 | Non-Stationary | I(1) |
| | 1 st Difference | 0.0001 | Stationary | |
| Government Revenue(lnrev) | Level | 0.4460 | Non-Stationary | I(1) |
| | 1 st Difference | 0.0004 | Stationary | |
| Inflation(lninf) | Level | 0.2558 | Non-stationary | I(1) |
| | 1 st Difference | 0.0097 | Stationary | |
| Government Debt(lndebt) | Level | 0.7620 | Non-stationary | I(1) |
| | 1 st Difference | 0.0003 | Stationary | |
| Population(lnpop) | Level | 0.9982 | Non-stationary | I(1) |
| | 1 st Difference | 0.0147 | Stationary | |

மூலம்: காலத்தொடர் தரவுகளின் கணிப்பு

ஜோகான்சன் கூட்டு ஒருங்கிணைவுப் பரிசோதனைப் பெறுபேறுகள்

மாறிகளுக்கு இடையிலான ஒருங்கிணைவுத் தன்மையை மதிப்பிடுவதற்கு ஜோகான்சன் கூட்டு ஒருங்கிணைவு பரிசோதனை முறைமை பயன்படுத்தப்படுகின்றது. அரச பொதுச் செலவு, அரச வரி வருமானம், பணவீக்கம், அரச பொதுபடுகடன், சனத்தொகை போன்ற மாறிகளுக்கு இடையே காணப்படும் நீண்டகால சமநிலைத் தொடர்பினை அடையாளப் படுத்துவதற்கு இவ்வாய்வில் ஒருங்கிணைவு நுட்பம் பயன்படுத்தப்பட்டுள்ளது.

இலங்கையின் அரசு பொதுச்செலவீனத்திற்கும் அரசு வரி வருமானத்திற்கும் இடையிலான தொடர்பு

Ho: மாறிகளுக்கு இடையே கூட்டு ஒருங்கிணைவுத் தொடர்பு இல்லை

H1: மாறிகளுக்கு இடையே கூட்டு ஒருங்கிணைவுத் தொடர்பு உண்டு

இங்கு 0, 1, 2 வரிசைகளில் Trace Statistic பெறுமதியை விட Critical value பெறுமதியானது குறைவாக இருப்பதனால் எடுக்கோள் Ho மறுக்கப்பட்டு மாறிகளுக்கு இடையே கூட்டு ஒருங்கிணைவும் நீண்டகாலத் தொடர்பும் காணப்படுகின்றது என்ற எடுக்கோள் ஏற்றுக் கொள்ளப்படுகின்றது. இங்கு மூன்று கூட்டு ஒருங்கிணைவு காணப்படுவதைக் காணலாம்.

அட்டவணை 2: ஜோகான்சன் கூட்டு ஒருங்கிணைவுப் பரிசோதனைப் பெறுபேறுகள்

| Maximum rank | Eigenvalue | Trace Statistic | 5% Critical value | Lags | Prob. value |
|--------------|------------|-----------------|-------------------|------|-------------|
| 0 | 0.924613 | 137.27410 | 69.81889 | 2 | 0.0000 |
| 1 | 0.807388 | 72.64618 | 47.85613 | 2 | 0.0001 |
| 2 | 0.510587 | 31.46926 | 29.79707 | 2 | 0.0318 |
| 3 | 0.284352 | 13.60555 | 15.49471 | 2 | 0.0944 |
| 4 | 0.189136 | 5.24137 | 3.84146 | 2 | 0.0220 |

மூலம்: காலத்தொடர் தரவுகளின் கணிப்பு

நீண்டகால தொடர்பு

அரசு பொதுச்செலவிற்கும் தெரிவு செய்யப்பட்ட சாரா மாறிகளுக்கும் உள்ள நீண்டகால தொடர்பினை கண்டறிவதற்காக இயல்பாக்கப்பட்ட ஒருங்கிணைவுக் குணகப்பெறுமதி (Normalized cointegrating coefficients) கண்டறியப்பட்டுள்ளது. அவை சமன்பாடு 3 இல் காட்டப்பட்டுள்ளன. இங்கு சார்ந்த மாறியாக மடக்கை வடிவிலான அரசு பொதுச்செலவானது காணப்படுகின்றது. சாராமாறிகளாக மடக்கை வடிவிலான அரசு வரி வருமானம், பணவீக்கம், அரசு பொதுபடுகடன், சனத்தொகை என்பன காணப்படுகின்றன. அரசு பொதுச் செலவிற்கும் அரசு வரி வருமானம், அரசு பொதுபடுகடன் ஆகியவற்றுக்கு இடையில் நேர்கணியத் தொடர்பும் அரசு பொதுச் செலவிற்கும் பணவீக்கம், சனத்தொகை ஆகியவற்றுக்கு இடையில் எதிர்கணியத் தொடர்பும் காணப்படுகின்றது.

$$\ln \text{exp}_t = \beta_0 + \beta_1 \ln \text{rev}_t + \beta_2 \ln \text{inf}_t + \beta_3 \ln \text{debt}_t + \beta_4 \ln \text{pop}_t + U_t \text{-----}(2)$$

$$\ln \text{exp}_t = 144.171 + 6.756 \ln \text{rev}_t - 3.497 \ln \text{inf}_t + 2.182 \ln \text{debt}_t - 10.685 \ln \text{pop}_t \text{-----}(3)$$

சமன்பாட்டினை நோக்குவோமாயின் இங்கு வெட்டுத்துண்டாக 144.171 காணப்படுகின்றது. இதன் கருத்து என்னவெனில் எந்தவொரு காரணியும் செல்வாக்கு செலுத்தாத போது அரசு பொதுச்செலவு சராசரி பெறுமதி 144.171 ஆகக் காணப்படும் என்பதாகும். மேலும் அரசு வரி வருமானத்தில் ஏற்படும் ஒரு வீத அதிகரிப்பு சராசரி அரசு பொதுச் செலவில்

6.756 வீத அதிகரிப்பையும் அரசு பொதுப்பெருக்களானது ஒரு வீதத்தினால் அதிகரிக்கும் போது சராசரி அரசு பொதுச் செலவில் 2.182 வீத அதிகரிப்பையும் ஏற்படுத்தும். பணவீக்கமானது ஒரு வீதத்தால் அதிகரிக்கும் போது அரசு பொதுச் செலவானது 3.497 வீதத்தால் குறைவடையும். அதேபோல் சனத்தொகையானது ஒரு வீதத்தினால் அதிகரிக்கும் போது அரசு பொதுச்செலவானது 10.685 வீதத்தினால் குறைவடையும் எனலாம். மாறிகளையும் அவற்றின் குணகப்பெறுமதியையும் அட்டவணை 3 இல் காணலாம்.

அட்டவணை 3: நீண்டகாலப் இணைவுக் குணகப் பரிசோதனைப் பெறுபேறுகள்

| Variables | Coefficients | Standard error | T- Statistics |
|------------|--------------|----------------|---------------|
| lnexp (-1) | 1.000000 | | |
| lnrev(-1) | -6.755522 | 0.34784 | -19.4216 |
| lninf(-1) | 3.496958 | 0.36583 | 1.06329 |
| lndebt(-1) | -2.182369 | 0.13274 | -16.4415 |
| lnpop(-1) | 10.68533 | 3.80701 | 2.80675 |
| Constant | -144.1709 | | |

மூலம்: காலத்தொடர் தரவுகளின் கணிப்பு

வழுச்சரிப்படுத்தல் மாதிரி பெறுபேறுகள்

மாறிகளுக்கு இடையிலான குறுங்காலத் தொடர்பு மற்றும் நீண்டகாலச் சமநிலை போன்றவற்றைக் கண்டறியும் முகமாகப் பயன்படுத்தப்பட்ட ஆய்வு நுட்பமாக வழுச்சரிப்படுத்தல் மாதிரியுரு விளங்குகின்றது. நீண்டகால சமநிலையை அடைவதற்கு மாறிகளில் ஒவ்வொரு வருடமும் எந்த அளவினால் சரிப்படுத்தல் இடம்பெறுகின்றது என்பது இப்பொறிமுறை மூலம் மதிப்பிடப்பட்டுள்ளது. குறுங்காலத்தில் மாறிகள் சில விலகல்களைக் கொண்டிருக்கலாம். நீண்டகாலத்தில் இவை சரிப்படுத்தப்படலாம். இவ் வழுச்சரிப்படுத்தல் மாதிரியுருவானது குறுங்காலத் தொடர்பு, நீண்டகாலத் தொடர்பு, நீண்டகால சரிப்படுத்தல் என்பவற்றைக் கொண்டிருக்கும்.

அட்டவணை 4: வழுச்சரிப்படுத்தல் மாதிரி நீண்டகாலச் சமநிலை பெறுபேறுகள்

| Variables | Coefficients | Standard error | T-Statistics |
|-----------------|--------------|----------------|--------------|
| Δ lnexp | 0.090274 | 0.30757 | 0.29351 |
| Δ lnrev | 0.212688 | 0.09135 | 2.32829 |
| Δ lninf | -0.163247 | 0.08720 | -1.87219 |
| Δ lndebt | 0.001079 | 0.14572 | 0.00740 |
| Δ lnpop | 0.003500 | 0.00132 | 2.64416 |

மூலம்: காலத்தொடர் தரவுகளின் கணிப்பு

அட்டவணை 4 இல் காட்டப்பட்டுள்ளபடி அரசு பொதுச் செலவின் சரிப்படுத்தல் வேகக் குணகப் பெறுமதி 0.090274 காணப்படுவதுடன் புள்ளிவிபர ரீதியாகப் பொருண்மைத் தன்மையற்றதாகவும் காணப்படுகின்றது. அதாவது வழச் சரிப்படுத்தல் வேகக் குணகப் பெறுமதியானது நேர்கணியமாகவும் 0.05 ஐ விடக் கூடுதலாகவும் காணப்படுவதனால் புள்ளிவிபர ரீதியாகப் பொருண்மைத் தன்மையற்றதாகும். எனவே அரசு பொதுச் செலவின் மீது எதிர்பாராத விதமாக ஏதாவது அதிர்ச்சிகள் இடம்பெற்றால் அது நீண்ட காலத்தில் சமநிலையை நோக்கி நகரமாட்டாது என்பதைக் குறிக்கின்றது.

அதேபோன்று கடந்த கால அரசு பொதுச் செலவிற்கும் நிகழ்கால அரசு பொதுச் செலவிற்கும் இடையே புள்ளிவிபர ரீதியாகப் பொருண்மைத்தன்மை வாய்ந்த வகையில் எவ்வித தொடர்பும் காணப்படவில்லை என்பதை அட்டவணை 5 இன் முடிவுகளிலிருந்து கண்டு கொள்ளலாம். ஆனால் கடந்த கால பணவீக்க வீதங்களுக்கும் நிகழ்கால அரசு பொதுச் செலவிற்கும் இடையில் குறுங்காலத்தில் புள்ளி விபர ரீதியாகப் பொருண்மைத் தன்மை வாய்ந்த வகையில் நேர்கணியத் தொடர்பு காணப்படுகின்றது எனலாம். அதேபோல் கடந்த கால அரசு வரி வருமானத்தின் பெறுவனவுகளுக்கும் நிகழ்கால அரசு பொதுச் செலவிற்கும் இடையில் குறுங்காலத்தில் புள்ளி விபர ரீதியாகப் பொருண்மைத் தன்மை வாய்ந்த வகையில் நேர்கணியத் தொடர்பு காணப்படுகின்றது எனலாம். கடந்தகால அரசு பொதுபடுகடனுக்கும், கடந்தகால சனத்தொகைக்கும் நிகழ்கால அரசு பொதுச் செலவிற்கும் இடையே புள்ளிவிபர ரீதியாகப் பொருண்மைத்தன்மை வாய்ந்த வகையில் எவ்வித தொடர்பும் காணப்படவில்லை என்பதையும் அட்டவணை 5 இல் இருந்து கண்டுகொள்ளலாம்.

அட்டவணை 5: வழச்சரிப்படுத்தல் மாதிரி குறுங்காலப் பரிசோதனைப் பெறுபேறுகள்

| Variables | Coefficients | Standard Error | T- Statistics |
|------------------------------|--------------|----------------|---------------|
| $\Delta \ln \exp(-1)$ | 0.102683 | 0.34057 | 0.30150 |
| $\Delta \ln \text{rev}(-1)$ | 2.618422 | 1.38711 | 1.93356 |
| $\Delta \ln \text{inf}(-1)$ | 2.596091 | 1.46990 | 1.76617 |
| $\Delta \ln \text{debt}(-1)$ | -0.633704 | 1.26827 | -0.49966 |
| $\Delta \ln \text{pop}(-1)$ | 8.874753 | 60.0911 | 0.14769 |

மூலம்: காலத்தொடர் தரவுகளின் கணிப்பு

மாறிகளுக்கு இடையில் ஒருவழித் தொடர்பு காணப்படுகின்றதா அல்லது இருவழித் தொடர்பு காணப்படுகின்றதா என்பதை மதிப்பீடு செய்வதற்கு Granger காரண காரியச் சோதனை பயன்படுத்தப்படுகின்றது. இதற்கான எடுகோள்கள் பின்வருமாறு காணப்படுகின்றன.

H_0 : காரணகாரியத் தொடர்பைக் கொண்டிருக்கவில்லை

H_1 : காரணகாரியத் தொடர்பைக் கொண்டுள்ளது

அட்டவணை 6: Granger காரண காரியப் பரிசோதனைப் பெறுபேறுகள்

| Hypothesis | Lag | Probability | Results |
|-------------------------------------|-----|-------------|----------|
| DLREV does not Granger Cause DLEXP | 2 | 0.0482 | Rejected |
| DLEXP does not Granger Cause DLREV | 2 | 0.8597 | Accepted |
| DLINF does not Granger Cause DLEXP | 2 | 0.0012 | Rejected |
| DLEXP does not Granger Cause DLINF | 2 | 0.4570 | Accepted |
| DLDEBT does not Granger Cause DLEXP | 2 | 0.2340 | Accepted |
| DLEXP does not Granger Cause DLDEBT | 2 | 0.0326 | Rejected |
| DLPOP does not Granger Cause DLEXP | 2 | 0.0128 | Rejected |
| DLEXP does not Granger Cause DLPOP | 2 | 0.8236 | Accepted |
| DLINF does not Granger Cause DLREV | 2 | 0.0497 | Rejected |
| DLREV does not Granger Cause DLINF | 2 | 0.0214 | Rejected |
| DLDEBT does not Granger Cause DLREV | 2 | 0.3407 | Accepted |
| DLREV does not Granger Cause DLDEBT | 2 | 0.8568 | Accepted |
| DLPOP does not Granger Cause DLREV | 2 | 0.2624 | Accepted |
| DLREV does not Granger Cause DLPOP | 2 | 0.2657 | Accepted |
| DLDEBT does not Granger Cause DLINF | 2 | 0.8957 | Accepted |
| DLINF does not Granger Cause DLDEBT | 2 | 0.9816 | Accepted |
| DLPOP does not Granger Cause DLINF | 2 | 0.3536 | Accepted |
| DLINF does not Granger Cause DLPOP | 2 | 0.3965 | Accepted |
| DLPOP does not Granger Cause DLDEBT | 2 | 0.0182 | Rejected |
| DLDEBT does not Granger Cause DLPOP | 2 | 0.0920 | Accepted |

மூலம்: காலத்தொடர் தரவுகளின் கணிப்பு

இலங்கையின் அரசு பொதுச்செலவீனத்திற்கும் அரசு வரி வருமானத்திற்கும் இடையிலான தொடர்பு

அட்டவணை 6 இன்படி அரசு பொதுச் செலவிற்கும் அரசு வரி வருமானம், பணவீக்கம், அரசு பொதுபடுகடன், சனத்தொகை ஆகியவற்றுக்கு இடையில் ஒருபக்க காரண காரியத் தொடர்பும் பணவீக்கம் மற்றும் அரசு வரி வருமானம் ஆகியவற்றுக்கு இடையில் இருபக்க காரண காரியத் தொடர்பும் அரசு பொதுபடுகடன் மற்றும் சனத்தொகை ஆகியவற்றுக்கு இடையில் ஒருபக்க காரண காரியத் தொடர்பும் காணப்படுகின்றது என்பதை முடிவுகளில் இருந்து பெற்றுக்கொள்ளலாம்.

முடிவுரை

அரசு வரி வருமானமானது அரசு பொதுச் செலவினைத் தீர்மானிப்பதில் முக்கியமானதொரு மாறியாகும். அதேபோன்று அரசு பொதுச்செலவினைத் தீர்மானிப்பதில் பணவீக்கம், அரசுபொதுபடுகடன், சனத்தொகை போன்ற மாறிகளும் தாக்கம் செலுத்துகின்றன. இலங்கைப் பொருளாதாரத்தில் அரசு பொதுச் செலவிற்கும் அரசு வரி வருமானத்திற்கும் இடையில் தொடர்புள்ளதா என்பதைப் பொருளியலளவை நுட்பங்கள் மூலம் பகுப்பாய்வு செய்யும் நோக்குடன் இவ்வாய்வு மேற்கொள்ளப்பட்டமை குறிப்பிடத்தக்கதாகும். அதாவது அரசு பொதுச் செலவிற்கும் அரசு வரி வருமானம், பணவீக்கம், அரசு பொதுபடுகடன், சனத்தொகை போன்றவற்றிற்கும் இடையிலான தொடர்பினைத் தெளிவாகப் புரிந்து கொள்ளும் போது எதிர்கால கொள்கையாக்கங்களைச் சிறப்பற்ற மேற்கொள்ள முடியும்.

ஆய்வின் முடிவின் படி அரசு பொதுச்செலவும் அரசு வரி வருமானமும் புள்ளிவிபர ரீதியாக நேர்க்கணியத் தொடர்பினைக் கொண்டதாக அமைகின்றது. மேலும், ஜொகாச்சன் கூட்டு ஒருங்கிணைவுப் பகுப்பாய்வு பொருளியலளவை நுட்பமானது அரசு பொதுச்செலவு, அரசு வரி வருமானம், பணவீக்கம், அரசு பொதுபடுகடன், சனத்தொகை போன்ற ஐந்து மாறிகளுக்கும் இடையே மூன்று கூட்டு ஒருங்கிணைவுகள் காணப்படுகின்றன என்ற முடிவும் பெறப்பட்டது. அத்தோடு அரசு செலவு, அரசு வரி வருமானத்திற்கு இடையே ஒருவழி காரணகாரியத் தொடர்புள்ளதாக கண்டறியப்பட்டது. அதாவது அரசு வரி வருமானமானது அரசு பொதுச்செலவின் மீது காரணகாரியத் தொடர்பைக் கொண்டுள்ளது. மாறாக அரசு பொதுச் செலவானது அரசு வரி வருமானத்தின் மீது காரண காரியத் தொடர்பைக் கொண்டிருக்கவில்லை எனலாம்.

இன்றைய காலகட்டத்தில் சனத்தொகைப் பெருக்கம், நகரமயமாதல், போர்ச்சூழல், பாதுகாப்புச் செலவு, அறிவியல் வளர்ச்சி, பொருட்களின் விலையேற்றம், சமுதாயப்பணிகள், பொதுக்கடன் போன்ற பல்வேறு காரணங்களினால் அதிகரித்துச் செல்கின்ற அரசு பொதுச் செலவானது அரசு வரி வருமானத்தின் மூலமே பூர்த்தி செய்யப்படுகின்றது. அரசு பொதுச் செலவீடு தொடர்பில் ஓர் அரசு எவ்வளவு செலவிடலாம் என்பது அதனுடைய சூழ்நிலையை ஒட்டியது. இதனை அழகாக ஆல்பிரட் புச்லர் “செலவின் சரியான அளவு சமுதாயத்தின் ஆவல்களையும், தேவைகளையும், அரசின் செலவு விளைவுகளையும், செலவிட கிடைக்கும் வருவாயையும், மக்களின் வரி கொடுக்கும் விருப்பத்தையும், வரி விதிப்பில் இருக்கின்ற சமையையும், சமுதாயத்திலுள்ள மக்களையும், சாதனங்களையும், செல்வம், வருவாய் ஆகியவற்றின் பங்கிட்டுடையும், பொருளாதார வளர்ச்சி நிலையையும், மற்றைய மாற்றக்கூடியவற்றையும் ஒட்டியதாகும்” என்கிறார் (குருசாமி, 2004).

பொதுவாக அரசு பொதுச் செலவானது வினைத்திறனாக செயற்படுத்தப்படுவதன் மூலமாக ஒரு நாடானது பொருளாதார ரீதியில் வளர்ச்சி நிலையை நோக்கி

நகர்வடையும். அந்தவகையில் மக்களது நலன் கருதி மேற்கொள்ளப்படுகின்ற அரசு பொதுச் செலவானது உற்பத்தி நடவடிக்கைகளின் மீது முதலீடு செய்யப்படும் போதே அந்நாடானது வளர்ச்சிப் பாதையில் செல்லும். நாட்டில் பாதுகாப்பிற்கு மேற்கொள்ளும் செலவீடுகளைக் குறைப்பதன் மூலம் அந்நிதியினை நாட்டின் அபிவிருத்திச் செயற்பாடுகளில் முதலிடலாம். அதுமட்டுமின்றி நாட்டில் பொதுச் செலவினை வினைத்திறன் மிக்க வகையில் முன்னெடுத்துச் செல்வதற்கான வருமானம் தரும் வழிமுறைகளை விருத்தி செய்ய வேண்டும்.

இவ்வாய்வு தொடர்பான வரையறைகளை நிவர்த்தி செய்வதன் மூலமாக எதிர்காலத்தில் இவ்விடயம் தொடர்பான ஆய்வுகளை மேற்கொள்ள முடியும். அதாவது இவ்வாய்வானது அரசு வரி வருமானம், பணவீக்கம், அரசு பொதுபடுகடன், சனத்தொகை ஆகிய மாறிகளை மாத்திரம் கவனத்தில் கொள்கிறது. எனவே மொத்த உள்நாட்டு உற்பத்தி, வேலையின்மை, அரசியல் காரணிகள், திறந்த வர்த்தகம், பாதுகாப்புச் செலவு போன்றன கவனத்தில் கொள்ளப்படவில்லை. இம்மாறிகளும் அரசு பொதுச் செலவினைத் தீர்மானிப்பதில் முக்கிய பங்கு வகிப்பதோடு அரசு பொதுச் செலவோடு தொடர்புடையனவாகவும் காணப்படுகின்றது. எனவே இதனை ஆய்வு இடைவெளியாகக் கொண்டு எதிர்கால ஆய்வுகள் மேற்கொள்ளப்படலாம். அத்தோடு அரசு பொதுச் செலவின் மீது அரசு வரி அல்லாத வருமானமும் தாக்கம் செலுத்துவதனால் அரசு வரியல்லாத வருமானத்தையும் ஒரு காரணியாகக் கொண்டு பொருளியலளவைப் பகுப்பாய்வுகள் மேற்கொள்வதன் மூலம் எதிர்கால ஆய்வினை சிறப்பற்ற மேற்கொள்ளமுடியும்.

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SOCIAL MEDIA ADDICTION OF EMPLOYEES: DOES IT AFFECT LABOR SUPPLY?

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Abstract

The main objective of this research is to identify the impact of social media addiction on the labour supply of employees in Sri Lanka. The study covers 390 employees through a questionnaire survey. The study used the endogenous switching regression model for modelling average working hours per week day of social media addicts and non-addicts comparatively. Age, marital status, executive employment, type of social media and commuting distance to the workplace are the key factors associated with social media addiction of workers as in the selection function of the model. Working hours of social media addicts are affected by age, gender and executive employment while the working hours of non addicts are mainly affected by gender, marriage, executive employment, years of education and monthly net salary. Social media addiction of non addicts causes reduction of average hours of work per week day, while hours of work of social media addicts increase, if they have given up social media addiction. Institution specific policy insights are also proposed to increase the performance of employees.

Keywords: *Social Media Addiction, Employee Performances, Neoclassical Labour Leisure Model, Labour Supply*

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INTRODUCTION

Social media is a technological innovation that facilitates creativity, interaction and interoperability among online users (Berthon et al., 2012 in Okazaki and Taylor, 2013, p.56). It creates computer-generated platform to keep social relationships of employees allowing for a construction of public or semi-public profiles of users, viewing and sharing lists of user connections that allows to make new friends (Boyd and Ellison, 2008 in Aguenza et al., 2012, p.22; Balasuriya, 2015; Kietzmann et al.,2011). This creates three types of modifications in traditional computer-based communications including shifting desktop activities on to the web activities, shifting the value production of the firm on to the consumer and shifting the power of the firm on to the consumers (Berthon et al., 2012 in Okazaki and Taylor, 2013, p.56). Collaborative projects, blogs, user-generated content communities, social networking sites, virtual game worlds and virtual social worlds are classified as main components of social media, according to Kaplan and Haenlein (2010). Three types of social networking are further classified by Golder et.al (2007 in Kandiero et al., 2014, p.25) as ‘free-for-all’ social websites, professional websites and industry-specific websites.

Social media usage has been increasing rapidly in the world and people spend over 700 billion minutes per month on social media, according to Crescenzo (2009 in Kandiero et al, 2014, p.26-27). Worldwide social media sites further show that the most popular social media site is Facebook which started in 2004, followed by Pinterest and Twitter (Star counter, 2019). Facebook had 1.2 million users in 2006 and that has increased up to 21 million in 2007 (Needham and Company as cited in Spitzberg, 2006 in Ross et al., 2009, 578). It had 845 million users in 2012 globally recording the highest users from Europe (223 million users) while Asia comes the second (184 million) (Fach, 2012, in Aguenza et al., 2012, p.22-23).

Females have more tendencies for keeping Facebook accounts than men. Nearly half of the Facebook users (425 million users) are connected to the sites through their mobile phones and each of them have spent 20 minutes per visit in a Facebook site (Fach, 2012, in Aguenza et al., 2012, p.22-23). According to Nielsen (2010) social media accounts for one-quarter of internet activities in the world (in Aguenza et al, 2012, p.22-23). Percentage of using social media at least once a week is 55 among employees as revealed by Greenwald,2009 and Deloitte,2009 (in Aguenza et al., 2012, p.22). Over 80 million professionals in the world are using LinkedIn accounts (in Aguenza et al, 2012, p.22-23). 94 percent of undergraduates use social media to keep social ties as found by Ellison and colleagues (2007 in Ross et al, 2009). Not only the supply side of labor but also the firms use social media for different purposes such as promoting their brands. Twitter is popular among companies rather than Facebook (Barnes et al., 2012, in Okazaki and Taylor, 2013, p. 56). However, social media tendencies in the world have been diversifying rapidly in line with the rapid improvements in the sector of information technology.

Sri Lanka shows a higher tendency on social media usage while Facebook, LinkedIn and YouTube are the most popularly used social networking sites among IT professionals (Balasuriya, 2015). According to Rathnathilaka et al (2016), social network sites are accessed by more than half of the government workers (58 percent) in Sri Lanka more than once a day while 89.6 percent of them are using social media sites at least once a day. They spend more than one hour on social media sites per day at office on average (69.83 minutes) while female workers have more tendency for using social media (79.66 minutes) than men (60.48 minutes). The time difference of social media usage at office and at home is recorded as 3.32 minutes, indicating that a considerable proportion of government workers are using social media at work. They spent more than one hour at office on social media sites while spending only half an hour on official requirements of the job. The study further highlighted that approximately 46 minutes were wasted by a government employee in Sri Lanka for using social media at work for non-official tasks per day. Nearly two thirds of them use social media for the purposes of maintaining communications with friends (Rathnathilaka et al., 2016) and that is included as a part of their leisure activities. This creates controversies with the classical theories in labour economics.

The neo classical labour leisure model which presents the initial labour market decision making of an individual, basically allocates two-time utilities as labour and leisure as a very clear division. When the hours of work increase, the hours of leisure reduce accordingly (Kaufman, 1989). This substitution is clearly visible if the individuals enjoy only the physical leisure activities from outside of their workplace. However, when social media comes in as a virtual leisure activity during work, the basic concept of the neoclassical labour leisure model is challenged since this supports the workers to engage in personal activities while at work.

The extensions of neoclassical labour leisure models up to household models of labour supply include three-time utilities as market, non-market and leisure activities (Kaufman, 1989). Social media further affects the time allocation for non-market work. Simultaneously, there is a structural change in leisure activities by substituting physical leisure activities into social or virtual leisure activities. According to Kreiner (2006), social media bridges the boundaries of work and home, and this could affect the productivity of workers either positively or negatively. Since social media improves networking and reduces work stress that would lead to an enhancement of labour supply (Aguenza and Som, 2012; Fahmy, 2009) it also has the possibility to create negative impacts through reducing real working time (Peacock, 2008; Gaudian, 2009; Soron and Tarafd, 2015). However, the opinion of 38 percent of the employers towards social media is negative regarding their workers.

In line with the increasing global usage of social media, the Sri Lankan usage trend has also been increasing rapidly. While 5.5 million Sri Lankans have Facebook accounts according to Internet world stats (2018), computer literacy among people in the age group

of 5-69 is 29 percent while Digital literacy¹ is 42.4 percent according to a Sri Lanka Labour Force Survey (2018). Digital literacy among youth in the age group of 15-29 is relatively very high than the average level. Digital literacy of the age groups of 15-19, 20-24 and 25-29 are 73.9, 77.6 and 68.9 percent respectively while the percentages are relatively lower for older people (Table 1).

Table 1: Computer and Digital Literacy Rates by Age Groups – 2018

| Age | Computer Literacy Rate | Digital Literacy Rate |
|-------|------------------------|-----------------------|
| 5-9 | 12.4 | 24 |
| 10-14 | 39.5 | 50.1 |
| 15-19 | 60.8 | 73.9 |
| 20-24 | 58.7 | 77.6 |
| 25-29 | 47.9 | 68.9 |
| 30-34 | 37.5 | 58 |
| 35-39 | 27.5 | 47.3 |
| 40-49 | 20.9 | 35.9 |
| 50-59 | 11.7 | 20.3 |
| 60-69 | 6.1 | 10.1 |

Source: LFS, 2018, p.56

Hence, the problem of using social media at work would be a considerable issue in the productivity of employees, especially among the youth who are highly sensitive to the digital world at present and the situation would be severe in future with new birth cohorts. Therefore, the future labour market which deals with the digital world will face different challenges in assessing the productivity and performances of workers due to the impossibility of identifying actual hours of work under social media addiction.

The main objective of this research is to identify the impact of social media addiction on labour supply (average hours of work per week day) of workers in Sri Lanka. There are two specific objectives. The first is to make a comparison of labour supply differences between social media addicts and non-addicts, while simultaneously identifying the key factors associated with social media addiction. Secondly, the study seeks the responsiveness of predicted labour supply conditional to social media addiction (constrained to the switching behaviour of employees from social media addiction to non-addiction vs. non-addiction to addiction).

¹ “Digital literacy is defined if a person could use a computer, lap top, tablet or smartphone on his/her own. Digital literacy rate calculates as a proportion of above group as a percentage to the total population, (aged 5 – 69 years) of the country (LFS, 2018, p.54).”

LITERATURE REVIEW

Social Media Addiction in Economics

Marshall (1920) is the first economist who worked on habit or addiction in the economic aspects based on the taste for “good” music (Marshall, 1920; Stigler and Becker, 1977 in Cawley and Ruhm, 2012, p. 112). In this aspect, the utility function of the individual includes both current consumption and stock of past consumption. Three basic dimensions of addiction were identified by Marshall. The first, Reinforcement means that the marginal utility of current consumption increases with past consumption stock, which is called adjacent complementarity. The second is Tolerance, which indicates that stock of Past consumption reduces utility. It assumes that addiction is harmful. The third characteristic is Withdrawal, which indicates a positive marginal utility of current consumption (Cawley and Ruhm, 2012).

However, generally economic models of addiction can be divided into three basic categories: imperfectly rational models of addictive behaviour, models of myopic addictive behaviour, and models of rational addictive behaviour. Elster (1979); McKenzie (1979); Winston (1980), and Schelling (1978, 1980, 1984a, b in Chaloupka et al., 2003, p.74) are some economists who developed the imperfectly rational models of addictive behaviour assuming stable preferences with inconsistent short-run and long-run preferences. According to the Myopic Addiction Models, the individuals identify that their current active consumption is dependent on past consumption. However, when making the decision on current consumption, they neglect the impact of the current and past consumption on future consumption. Further, most of the economists who developed the Myopic Addiction Models assume that preference is endogenous and it changes according to the past consumption over time. Under the models of rational addictive behaviour, an important theory was developed by Becker and Murphy’s (1988) called a theory of Rational Addiction. According to them, harmful addiction is a consequence of two different processes, “tolerance” and “reinforcement”. Further, addictive consumption is “adjacent complementarity” due to reinforcement, indicating the amount of addiction goods consumed at different time periods is complement.

As a result, the current consumption of an addictive good is inversely related to its current price, past and future prices. In their model, the ratio of the long-run to short-run price effect increases as the degree of addiction increases. Also, they assume that utility depends on the current consumption and past consumption of the addictive good, and also the current consumption of all other goods. When considering the Determinants of social media addiction of individuals and its impact on employee productivity, determinants can generally be categorized into three categories such as, Demographic factors, Social factors and Economic factors.

Among the demographic factors, age is a significant predictor of peoples’ motivations to use social media. The study done by Leung (2013) has identified a positive relationship

between age and internet addiction. Moqbe (2012); Leftheriotis and Giannakos (2014); Charoensukmongkol (2014); Lumumba (2017); Eliringia (2017); Krishnan Nair (2017); Mugaza (2018); Morah (2018) and Shava and Chinyamurind (2018) recorded that a higher proportion of individuals within 21-35 years have mostly used various social media platforms. Andreassen et al (2014) concluded that there is a negative relationship between age and attitudes about personal uses of social network sites at work. This is in line with Skeels & Grudin, (2009) who identified that the use of Facebook or Myspace decreases with age and employees who are in the age group of 26-45 recorded the highest usage in social media. However, Wu et al (2013) and Alahmad et al (2018) identified that there is no statistically significant impact of age on social media usage. In the Sri Lankan context, Warnakula and Manickam (2010), Balasuriya and Jayalal (2015) and Senanayake and Senanayake (2016) identified that individuals who are in the young age group have mostly used social media for their personal and professional uses.

According to empirical evidence, most of the studies identified females as being more interested in the use of social media networks and spend more time than males (Acquisti and Gross, 2006; Lenhart, 2009; Thompson and Loughheed, 2012). This is in line with Charoensukmongkol (2014); Mwituria (2015); Weru (2015); Senanayake and Senanayake (2016); Lumumba (2017); Shava and Chinyamurind (2018) who explained that a higher proportion of females use and are addicted to social media than males. Similarly, different behaviours can also be identified based on the gender. For example, females use social media networks for social connections and for posting photographs while male use it for forming new relationships, learning and social identity gratifications (Joinson, 2008; Barker, 2009 and Muscanell and Guadagno, 2012). Similarly, Shabir et al (2014) also explained that females use social media networks for “relaxation” more than the males, whereas males use it for motives of “control” and “inclusion”. On the other hand, according to Soron and Tarafder (2015) males access social media at their workplaces while females use it during their leisure time. However, some studies have found that males are more addicted to social media (Moqbel, 2012; Leftheriotis and Giannakos, 2014; Eliringia, 2017 and Morah, 2018). Further, the studies done by Garrett and Danziger, 2008b; Henle, et al., 2009; Lim and Chen, 2009; Vitak, et al., 2011) identified males using social network sites during working hours than did females (in Andreassen et al, 2014, p.916). In the Sri Lankan context, Waranakula and Manickam, (2010) and Rathnayake and Rathnayake (2017) also identified that males are more addicted to social media than females.

Social media addiction can be determined by the marital status of the users. According to Soron and Tarafder (2015), unmarried people are more addicted to Facebook than married people. Further, they identified that the purpose of the use of social media varies with the marital status, indicating that married people use Facebook to connect with friends, upload photos and for news, while unmarried people use it for entertainment purposes such as playing online games and sharing academic information. Andreassen et al., (2014)

also found a positive relationship between marriage and attitudes about the personal use of social media at the workplace. However, Wu et al., (2013) found that marital status has no significant impacts on addiction to social networking sites.

When it comes to empirical evidence from past studies on the relationship between education and social media addiction, Andreassen et al (2014) have identified that educational level was positively related to the use of social network sites for personal purposes during working hours. This finding emphasized that people with higher socio-economic status are less bothered about losing their jobs or they pay more attention to maintain their social relationships for career development than those with lower socio-economic status. Further, Leung (2013) also concludes that there is a positive relationship between education and internet addiction. In the local context Rathnathilaka et al (2016) identified that education is not a significant factor to determine social media addiction or possession of a social media site account. However, Rathnayake and Rathnayake (2017) insist that the education levels have some impact on Facebook addiction.

Some researchers have attempted to reveal the relationship between social media addiction and economic factors such as occupation and income level of individuals. Wu et al., (2013) identified a significant impact of work status on addiction to social networking sites. Further, according to Anderson et al., (2014) both middle and top-level managers have positive attitudes about the use of social media for personal purposes at work than the employees who do not involve with managerial functions, because top level managers engage in more regular personal Internet use at work when compared to other employees. However, by contrast Hiltz (2008) and Rathnathilaka et al., (2016) identified that there is no significant relationships between occupation and the use of social media. Considering the relationship between income level and social media usage, Rathnayake and Rathnayake (2017) identified that there is an impact on income on Facebook addiction. The commuting distance to the workplace has been identified by Lachmann et al (2017) as another factor associated with internet addiction.

Based on the above studies, the age, gender, marital status, education, occupation characteristics, income and commuting distance will be used to identify the factors associated with social media addiction in the selection function.

Social Media Usage at Work and Employee Performances

While considering social media at workplace, many researchers have identified both the negative and positive aspects of social media at the workplace. Regarding the positive aspects, Fahmy (2009) shows that employees who do not use social media sites are 9% less productive than those who use social media sites (in Aguenza et al., 2012, p. 23). SNSs reduce the contact time of co-workers by cutting down unnecessary emails and instant messages among them and decrease the time spent on particular job tasks (in Rathnathilaka et al, 2016 p. 8). Further, it will help preserve stronger bonds among co-workers by enhancing the friendly work environment and it also indirectly leads towards

enhancing both job satisfaction and productivity (Diercksen et al, 2013; Mason, 2014; Steinfield et al., 2009 and Ichniowski and Shaw, 2005). Further Bennett, et al (2010) concluded that social networking tools enhance business benefits including morale, enhanced collective knowledge, increased productivity, and sharpened strategic focus and greater innovation. On the other hand Munene and Nyaribo (2013) pointed out employee social media participation develop informal learning, creation and sharing of knowledge, retention of organizational knowledge in searchable formats, effective use of computer aided communication technologies and innovations which leads to enhance the productivity of employees (as cited in Weru ,2105, p. 10). Furthermore, employees' knowledge, abilities, motivational levels and close association with the organization are increased by the social networking which leads employees' performance (Flynn, 2011). Moqbel et al (2013), Charoensukmongkol (2014) and König et al., (2014) have identified social media as an enabling tool that recovers from stress and stimulates the social connections that support the employees' work and manage the work life balance (in Chauhan, 2015 p.8). According to North (2010), Leidner et al (2010) and Moqbel et al (2013) employees have identified perceived social networking sites as being beneficial to their productivity (in Chauhan, 2015 p. 37).

Weru (2015) identified that employees' job performances were positively affected by social media by facilitating them to perform more efficiently at their work, support the organizing of special events at work and enhancing the connections with people who have similar skills and interests at work. This is in line with Brzozowski (2009), Steinfield et al., (2009), Dutta(2010), Leidner et al (2010), Subramaniam et al., (2013) and Kane (2015) who emphasized that social media improves communication and collaboration and connecting with expertise and enhances the knowledge sharing of digital content (in Chauhan, 2015 p. 37) Similarly, this also corroborates Kandiero et al., (2014) findings that indicated that workplace productivity is increased by enhancing the communication and collaboration of employees which helps in knowledge transfer.

Even though social media plays a key role in the modern workplace in the aspect of communication, marketing and recruiting new employees etc. social media usage may also lead to negative workplace outcomes. For example, due to social media addiction, about 70 percent of the internet usage at their workplace is not related to their job tasks (Michael, 2017 in Choi et al, 2019, p.249). According to Diercksen et al., (2013) more than half of the employees use social networks for their personal matters during working hours, thus incurring a cost of more than \$ 2.25 billion to the firm due to wasted time. This finding is confirmed by Gaille, 2017 in Choi et al., 2019, p. 249 indicating that if one thousand employees spend one hour on social media networks per day, then the annual loss to the organization could be \$ 35 million in the USA. Nucleus (2009); Rooksby, et al., (2009) and Accountemps (2010) also concluded that the use of social media networks hinder productivity (in Weru 2105, p. 6). According to Denyer et al., (2011) and Kane (2015) social media can adversely affect employees due to the negative

ties and relationship. Further, Labianca & Brass (2006) and Kane (2015) identified that even though those adverse relationships represent a very small proportion of all organization relationships, they cause a huge impact on employee performance than the positive relationships (in Chauhan, 2015 p, 38). Further, a study done by Choi et al., (2019) revealed that abusive supervision and work bullying are the main reasons for social media network addiction among employees. Further, they confirmed that employees' social media addiction leads to work-to-family conflicts and family-to-work conflicts. On the other hand, most of the studies argued that social media addiction not only affects productive time, information overload, role conflict, privacy risk, lack of productivity and low performance, but it also influences the physical and mental well-being of the employees (O'Murchu et al, 2004; D'Abate & Eddy 2007; Nucleus 2009; Rooksby et al., 2009; Shepherd, 2011; Moqbel et al., 2013; Griffiths et al., 2014; Ryan et al, 2014 in Priyadarshini et al., 2020, p.182). The qualitative study done by Priyadarshini et al., (2020) in India revealed that employees are unable to achieve their deadlines due to the excessive use of social media, as a result causing loss of productive time and engaging in non-related work tasks. By exploring their results further, they concluded that the social media addiction at their workplace leads to distraction from work. Employees pointed out that they were unable to control their social media usage, except during some occasions such as team meetings and discussion sessions with their superiors. The use of Facebook, Instagram, and WhatsApp applications are the main tools that cause distraction from work during working hours. On the other hand, employees tend to compromise their quality of work when they try to achieve their deadlines with the excessive use of social media at the same time.

In the Sri Lankan context, there are some studies which analyse the behaviour of employees on social network by using small samples [(Warnakula and Manickam (2010), Balasuriya and Jayalal (2015), Senanayake and Senanayake (2016) and Rathnathilaka et al., (2016)]. A mixed result can be identified by exploring the results of these studies. For example, Rathnathilaka et al (2016) found that the majority of government employees use social networks during working hours for their personal uses rather than professional uses, thus wasting the number of working hours. Further, he elaborated that government employees waste approximately 46 minutes per day due to spending more hours on social media than in completing their job tasks. Warnakula and Manickam (2010) also concluded that social networks cause an adverse effect on their office work because they spend more time on social media than expected. On the other hand, Senanayake and Senanayake (2016) identified that the use of online social networks impacts positively on employee performance. However, the study done by Balasuriya and Jayalal (2015) concluded that a strong correlation between job performance and the usage of social networking cannot be identified. This study is an attempt to gauge employee performance on the basis of work hours of the employees and the nature of the influence of social media addiction towards it.

METHODOLOGY

Primary data is the main source of data for the analysis. The total sample size was decided as 385 by the sample size calculation made by Krejcie and Morgan (1970)². A structural questionnaire is used to collect data. Since social media usage is high among the youth, the sample is drawn from the Facebook accounts of final year undergraduates in Economics of the Sabaragamuwa University of Sri Lanka in year 2018. Each student was advised to get a list of employed people from their Facebook accounts and to select 10 respondents using the systematic random sampling method. A total of 390 employees were selected (with additional five respondents) as the final sample to provide a questionnaire through a telephone survey.

This study allows a comparison between labour supply hours (average hours of work per week day) in the two contexts of addiction and non-addiction into social media, by a worker. The study uses average working hours per week day to represent labour supply as a working definition, due to the limitation of hiding accurate data by the employees on separate breakdown of actual and real working hours as a result of social media addiction. The working definition for social media addiction is based on the social media usage hours per day. The upper confidence interval for the variable of social media addiction is 3.476. The definition for a social media addict is defined as a person who used social media for more than 3.476 hours per day (Table 2).

Since the workers are reluctant to give accurate information on social media usage at work, hours of using social media per day has been used as a proxy and the above working definition was applied for that variable.

Table 2: Confidence Interval for Social Media Usage per Day

| Variable | Mean | Std. Err. | [95% Conf. | Interval] |
|----------------------------|-------|-----------|------------|-----------|
| Social media usage per day | 2.996 | 0.244 | 2.516 | 3.476 |

Source: Sample data, 2018

The study uses the endogenous switching regression model to make comparisons between labour supply of employees under two conditions of social media addiction and non-addiction as given below. The switching regression model has been used for the study because this allows to fit binary and the continuous parts of the regression simultaneously with consistent standard errors (Lokshin and Sajaia, 2004; Setboonsarng, et al., 2008).

² $s = \chi^2 NP(1 - P) \div d^2(N - 1) + \chi^2 P(1 - P)$, where, s = required sample size, χ^2 = the table value of chi-square for 1 df (3.841), N = the population size (Population size was decided based on the number of Facebook Accounts in Sri Lanka (5.5 million -Internet World Stats, 2018)), P = the population of proportion (0.5), d = the degree of accuracy expressed as a proportion (0.05)

If $\delta^T \mathbf{Z}_i + u_i > 0$ individual worker i addicts to social media is denoted by $SM_i = 1$

If $\delta^T \mathbf{Z}_i + u_i \leq 0$ individual worker i doesn't addict to social media, denoted by $SM_i = 0$

$$\text{Regime1: } y_{1i} = \alpha_1^T \mathbf{X}_{1i} + \varepsilon_{1i} \quad \text{if } SM_i = 1 \quad (01)$$

$$\text{Regime2: } y_{0i} = \alpha_0^T \mathbf{X}_{0i} + \varepsilon_{0i} \quad \text{if } SM_i = 0 \quad (02)$$

Where \mathbf{X}_{1i} and \mathbf{X}_{0i} are vectors of explanatory variables; y_{1i} and y_{0i} are dependent variables of labor supply measuring average hours of works per week day³ of social media addicts and non addicts. α_1 , α_0 and δ denote vectors of parameters.

$$\begin{pmatrix} u_i \\ \varepsilon_{1i} \\ \varepsilon_{0i} \end{pmatrix} \sim N_3 \left(\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \Sigma \right), \text{ where } \Sigma = \begin{pmatrix} \sigma_u^2 & \sigma_{1u} & \sigma_{2u} \\ \sigma_{1u} & \sigma_1^2 & \cdot \\ \sigma_{2u} & \cdot & \sigma_0^2 \end{pmatrix} \text{ and the covariance between}$$

ε_{1i} and ε_{2i} is not defined since y_{1i} and y_{0i} cannot be observed simultaneously.

After estimating the above parameters, the following calculations are made as post estimations of switching regression.

$$xb_{1i} = E(y_{1i} | \mathbf{x}_{1i}) = \alpha_1^T \mathbf{x}_{1i} \quad (03)$$

$$xb_{0i} = E(y_{0i} | \mathbf{x}_{0i}) = \alpha_0^T \mathbf{x}_{0i} \quad (04)$$

$$yc_{1-1i} = E(y_{1i} | SM_i = 1, \mathbf{x}_{1i}) = \alpha_1^T \mathbf{x}_{1i} + \sigma_1 \rho_1 f(\delta^T \mathbf{Z}_i) / F(\delta^T \mathbf{Z}_i) \quad (05)$$

$$yc_{1-0i} = E(y_{1i} | SM_i = 0, \mathbf{x}_{1i}) = \alpha_1^T \mathbf{x}_{1i} - \sigma_1 \rho_1 f(\delta^T \mathbf{Z}_i) / \{1 - F(\delta^T \mathbf{Z}_i)\} \quad (06)$$

$$yc_{0-1i} = E(y_{0i} | SM_i = 1, \mathbf{x}_{0i}) = \alpha_0^T \mathbf{x}_{0i} + \sigma_0 \rho_0 f(\delta^T \mathbf{Z}_i) / F(\delta^T \mathbf{Z}_i) \quad (07)$$

$$yc_{0-0i} = E(y_{0i} | SM_i = 0, \mathbf{x}_{0i}) = \alpha_0^T \mathbf{x}_{0i} - \sigma_0 \rho_0 f(\delta^T \mathbf{Z}_i) / \{1 - F(\delta^T \mathbf{Z}_i)\} \quad (08)$$

Where x_{1i} denotes all explanatory variables for social media addicts, x_{0i} denotes all explanatory variables for social media non-addicts. xb_{1i} represents the unconditional expectation of hours of work for social media addict; xb_{0i} represents the unconditional expectation of hours of work for social media non-addict, yc_{1-1i} represents the conditional expectations of hours of work for social media addict with social media addiction; yc_{1-0i} represents the conditional expectations of hours of work of social media addict without social media addiction; yc_{0-1i} represents the conditional expectations hours of work for social media non-addict with the addiction of social media; yc_{0-0i} represents the conditional expectations of hours of work for social media non-addict with the non-addiction of social media; σ_1 and σ_0 denotes standard errors of ε_{1i} and ε_{0i} . ρ_1 denotes the correlation coefficient between ε_{1i} and u_i , while ρ_0 = correlation coefficient between ε_{0i} and u_i . $f(\cdot)$ denotes a normal density function and $F[\cdot]$ denotes cumulative normal distribution (Setboonsarng, et al., 2008).

³ Study uses five-week days to measure work hours per day to keep consistency in average work hour calculations between workers in both government and private sectors.

RESULTS AND DISCUSSION

The first part of this section discusses the descriptive analysis that represents the relationship between employees' working characteristics, some demographic factors with social media addiction. The results of the switching regression model will be discussed in the next section. Results of the endogenous switching regression model analyses the first specific objective while the post estimation of the model further discusses the second specific objective under this section.

Table 3 shows that the majority of employees use social media to maintain their social relationships and connections and there is a lack of evidence of the use of social media for work- or job-related tasks. Further, updating news and current events and posting comments and opinions are recorded as the second and third important purposes respectively among the social media users.

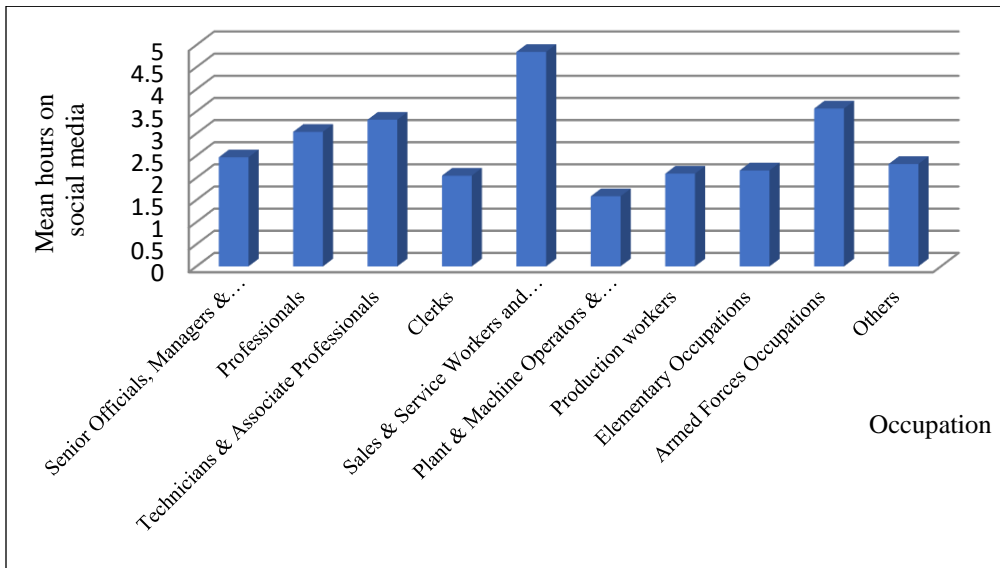
Table 3: Purpose of Using Social Media

| Purpose | % |
|---|----------|
| To maintain relationships with friends | 46.41 |
| Up to date with news and current events | 8.21 |
| To share my opinions / comments | 7.18 |
| To find funny and entertaining contents | 6.92 |
| To share photos and videos | 5.90 |
| To fill up spare time | 4.62 |
| General networking with others | 2.31 |
| To search buying products | 3.08 |
| To meet new people | 2.05 |
| For purposes of marketing products | 1.03 |
| To find out employment information | 1.28 |
| Other | 0.77 |

Source: Sample data, 2018

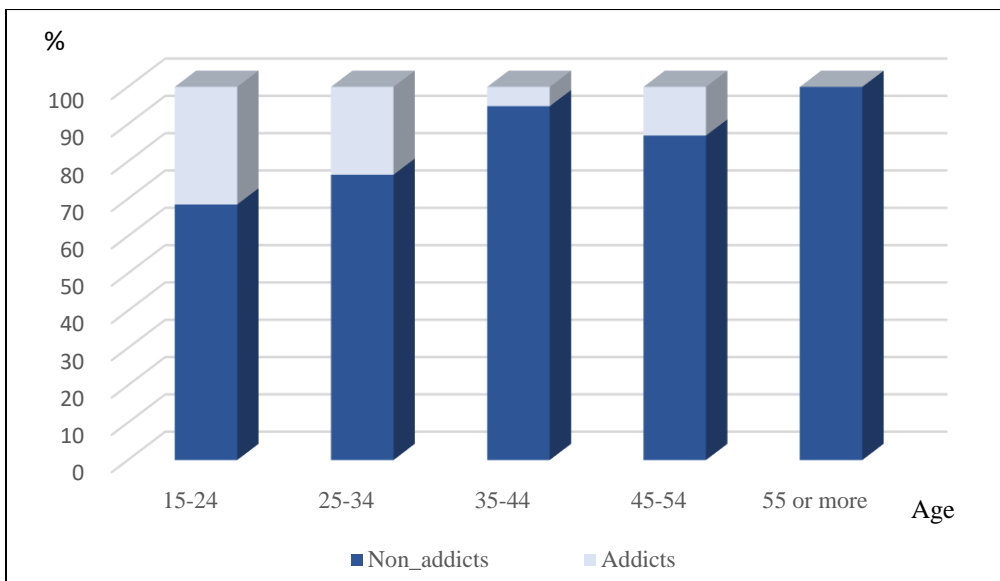
Figure 1 shows that employees who work as sales and service personnel and proprietors spend more time on social media and it is around 4.8 hours per day. The second and third importance goes to employees in the armed forces occupations, technicians and associate professionals. The least time spent on social media is recorded among the employees who are engaged as plant and machine operators and in the assemblers' category, and it is around 1.5 hours per day.

Figure 1: Time on social media and occupation (Mean Hours)



Source: Sample data, 2018

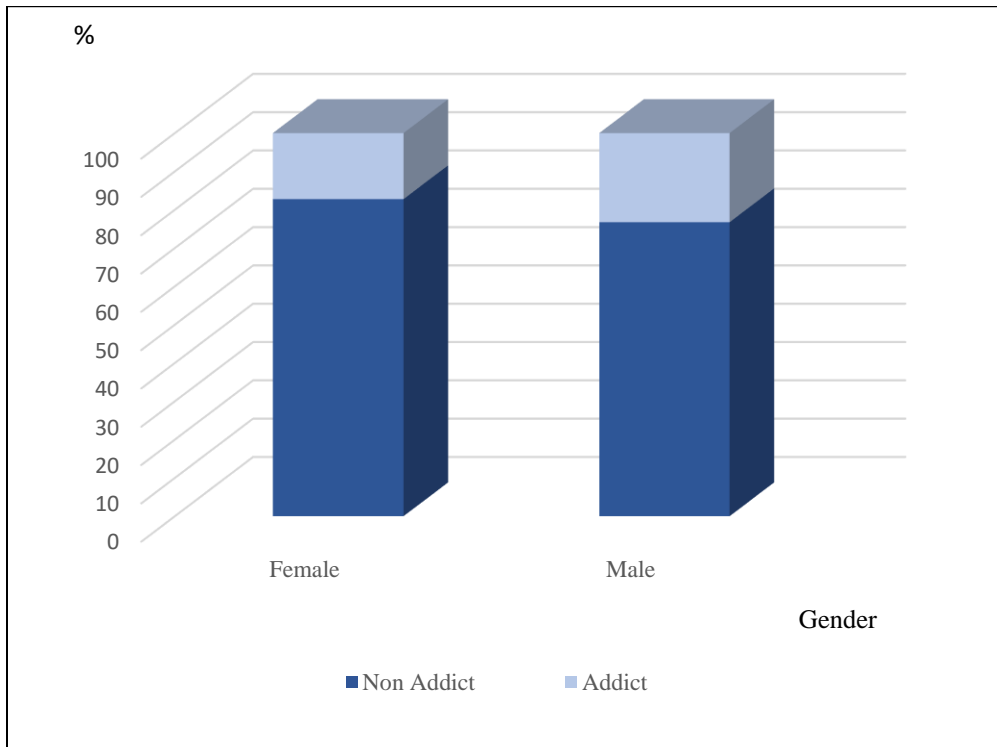
Figure 2: Social media addiction and age



Source: Sample data, 2018

When considering the social media addiction and demographic factors of employees, the addiction of social media significantly decreases with the age. The highest addiction was recorded among the employees who are in the 15-24 age groups (Figure 2). When considering the gender aspects of social media usage, male employees are more addictive to social media than the female (Figure 3).

Figure 3: Social media addiction and gender



Source: Sample data, 2018

Table 4 presents the means and proportions of the variables used for the switching regression model. The average work hours per week day are 8.6. The majority of the sample is relatively youth since the average age is 30 years old. Majority of the sample is male and executive workers. Government sector proportion is lower than the private sector. Most of the members in the sample possess more than the GCE Advanced level education. According to the definition of the study as presented in the methodology, 21 representing the sample were addicted to social media. The majority of the sample is permanent workers. Since the sample is derived using Facebook users, 200 representing this sample have Facebook accounts. In addition to Facebook accounts, the majority use YouTube and WhatsApp as well.

Endogenous switching regression model (Table 5) has identified significant factors associated with social media addiction in the selection function.

According to the selection function the negative relationship between age and social media addiction was found by the study and that is in line with the table of digital literacy reported in Sri Lankan Labour Force Survey (2018) as given in Table 1 and the findings of Senanayake and Senanayake, (2016), Warnakula and Manickam, (2010) and Balasuriya and Jayalal (2015). The attitude towards social media turns negative when age increases, as found by Andreassen et al., (2014).

Table 4: Means and Proportions of the Variables

| Variables | Mean/Proportion |
|--|------------------------|
| Average working hours in weekdays | 8.652 |
| Age | 30.694 |
| Gender (Being Male) (d) | 0.626 |
| Marital Status (Being Married) (d) | 0.436 |
| Being an Executive Worker ⁴ (d) | 0.603 |
| Being a Government Worker (d) | 0.465 |
| Years of education | 14.629 |
| Monthly net salary in thousands | 40.424 |
| Social Media Addiction (>3.476) (d) | 0.205 |
| Using WhatsApp (d) | 0.761 |
| Using Instagram (d) | 0.244 |
| Using YouTube (d) | 0.797 |
| Using virtual social world/games (d) | 0.169 |
| Distance to work | 32.350 |

Note: (d) denotes for dummy variables and proportions were calculated for all dummy variables

Source: Author Constructed

Although previous studies have found different positive and negative associations with social media usage, Gender is an insignificant factor regarding social media addiction in Sri Lanka according to the selection function of this study.

Being a married person has a significant positive relationship with social media addiction and this finding is in line with Andreassen et al., (2014). Social networking enhances with marriage and the possibility of using social media at work could enhance as a result of the marriage of the employee. Executive employees' possibility for social media addiction is high according to this study and Andreassen et al., (2014) also have established a positive association with the attitudes towards social media among top level managers.

Using YouTube and Instagram by the selected Facebook users in the sample has a significant positive relationship with social media addiction. The tendency of using Facebook and YouTube is high among social media users in Sri Lanka according to Balasuriya and Jayalal (2015).

⁴This includes managerial employees, professionals and associate professionals.

Table 5: Endogenous Switching Regression

| Variables | Coef. | Std. Err. | z | P>z |
|--|-----------------|------------------|-----------|-------|
| workinghours_1(social media addicts) | | | | |
| Age | 0.161 | 0.079 | 2.040 | 0.042 |
| Being Male(d) | 1.250 | 0.732 | 1.710 | 0.088 |
| Being Married(d) | -0.168 | 0.831 | -0.200 | 0.840 |
| Being an Executive Employee(d) | -1.650 | 0.742 | -2.220 | 0.026 |
| Being Government Worker(d) | 0.067 | 0.695 | 0.100 | 0.924 |
| Years of Education | -0.149 | 0.140 | -1.070 | 0.286 |
| Monthly Net Salary in Thousands | 0.010 | 0.014 | 0.680 | 0.494 |
| Constant | 10.590 | 2.373 | 4.460 | 0.000 |
| workinghours_0 (social media non-addicts) | | | | |
| Age | 0.013 | 0.018 | 0.700 | 0.484 |
| Being Male(d) | 0.822 | 0.259 | 3.170 | 0.002 |
| Being Married(d) | -0.642 | 0.292 | -2.200 | 0.028 |
| Being an Executive Employee(d) | -0.852 | 0.271 | -3.140 | 0.002 |
| Being Government Worker(d) | -0.186 | 0.263 | -0.710 | 0.479 |
| Years of Education | -0.115 | 0.054 | -2.130 | 0.033 |
| Monthly Net Salary in Thousands | 0.019 | 0.006 | 3.450 | 0.001 |
| Constant | 8.849 | 0.861 | 10.270 | 0.000 |
| Selection Function | | | | |
| Social Media Addiction (3.476 hours or more at social media) | | | | |
| Age | -0.047 | 0.016 | -3.020 | 0.003 |
| Being male(d) | -0.039 | 0.170 | -0.230 | 0.817 |
| Being married(d) | 0.446 | 0.187 | 2.390 | 0.017 |
| Being an executive employee(d) | 0.288 | 0.170 | 1.690 | 0.091 |
| Being government worker(d) | -0.062 | 0.160 | -0.380 | 0.701 |
| Years of education | -0.007 | 0.033 | -0.200 | 0.838 |
| Monthly net salary in thousands | -0.002 | 0.003 | -0.620 | 0.536 |
| Using WhatsApp*(d) | 0.103 | 0.161 | 0.640 | 0.520 |
| Using Instagram*(d) | 0.337 | 0.122 | 2.750 | 0.006 |
| Using YouTube*(d) | 0.449 | 0.151 | 2.960 | 0.003 |
| Using virtual social world*(d) | 0.025 | 0.126 | 0.200 | 0.844 |
| Distance for the workplace | 0.006 | 0.001 | 6.620 | 0.000 |
| Constant | -0.309 | 0.601 | -0.510 | 0.607 |
| /lns1 | 0.767 | 0.047 | 16.340 | 0.000 |
| /lns2 | 1.312 | 0.160 | 8.180 | 0.000 |
| /r1 | -1.787 | 0.277 | -6.450 | 0.000 |
| /r2 | -1.585 | 0.421 | -3.770 | 0.000 |
| sigma_1 | 2.154 | 0.101 | | |
| sigma_2 | 3.712 | 0.595 | | |
| rho_1 | -0.945 | 0.029 | | |
| rho_2 | -0.919 | 0.065 | | |
| LR test of indep. eqns.: | chi2(2) = 60.59 | | | |
| Number of obs = | 385 | Prob > chi2 = | 0 | |
| Wald chi2(7) = | 64.33 | Log Likelihood = | -943.4897 | |

Note: (d) denotes for dummy variables and proportions were calculated for all dummy variables.

*These modes of social media were used by respondents in addition to their Facebook accounts.

Source: Author Constructed

The increasing distance to workplaces increases the commuting time and thus causes an increase in social media addiction. This was significantly proved by the positive relationship between distance and social media addiction of this study. According to Lachmann et al., (2017), there is a positive association between high stress levels due to high commuting time and internet addiction. The positive relationship between distance and social media addiction is acceptable in the sense of reducing stress levels of travelling for this study as well.

Based on the selection of social media addicts and non-addicts, a comparison of hours of work per weekday was modelled and the findings are presented in Table 5. Hours of work among social media addicts is determined by several factors. Increasing age causes an increase in hours of work among social media addicts. The key reason for this positive relationship is that more than 90 percent of the social media addicts in the sample are less than 35 years old. Therefore, most of them are in the age of their squeezed life cycle and are in the beginning of their employment, thus showing a positive association between the age and working hours. Since they are not from the very high age group, they do not enjoy the reduction of work hours due to biological deprivation and other seniority benefits. This young age would automatically increase the unconditional average work hours of social media addicts than the non addicts.

Male workers have higher working hours than the base category for both social media addicts and non-addicts. Generally, females have fewer working hours due to the triple burden of productive, reproductive and socially productive work. Marriage also shows a significant negative relationship with working hours of social media non addicts. Nearly 40 percent of the social media non addicts are females. Increasing household chores and family responsibilities due to marriage causes the reduction in the number of work hours.

Executive employees have a negative relationship with work hours for both social media addicts and non addicts. According to Kaufman (1989), professionals are willing to work less since they draw a fixed salary. The negative relationship with work hours for them is higher for social media addicts than the social media non addicts.

Years of education are a significant factor in determining hours of work among social media non-addicts and it has a significant negative relationship with work hours. Most of the higher educated workers are occupied in white collar employment with lesser number of working hours while most of the lower educated workers are occupied in unskilled or informal work settings with less opportunities and facilities for social media usage. Workers with high monthly net salary and average work hours have significant positive relationships for social media non-addicts.

Based on the post estimation derived using the endogenous switching regression model, it has been found that unconditional expectations of average hours of work by social media addicts is relatively higher than the social media non addicts (Table 6).

Table 6: Post Estimation of Endogenous Switching Regression Model

| Post Estimations | Obs | Mean | Std. Dev. | Min | Max |
|-------------------------|------------|-------------|------------------|------------|------------|
| psel | 387 | 0.217 | 0.152 | 0.002 | 0.941 |
| xb1 | 390 | 13.474 | 1.621 | 10.319 | 19.164 |
| xb0 | 390 | 7.975 | 0.921 | 5.820 | 10.610 |
| yc1_1 | 80 | 8.888 | 1.594 | 5.696 | 13.791 |
| yc1_0 | 307 | 14.731 | 1.403 | 11.462 | 19.311 |
| yc0_1 | 80 | 5.617 | 1.192 | 2.830 | 8.265 |
| yc0_0 | 307 | 8.620 | 0.982 | 6.351 | 12.781 |
| mills1 | 387 | 1.466 | 0.448 | 0.125 | 3.147 |
| mills0 | 387 | 0.373 | 0.247 | 0.007 | 1.994 |

Note: Names of the Post Estimation variables were explained in Methodology from equation 3-8.

Source: Author Constructed

The low average age of social media addicts could be the key reason for that, since they are at the early stage of their careers as explained earlier. The most important factor is to identify their reactions on average working hours per week day conditional to the social media addiction. Endogenous switching regression facilitates the making of a conditional prediction on this. If a social media addict becomes a non-addict, his conditionally predicted average working hours could increase as a result of giving up the social media addiction. If social media non-addicts get addicted to social media, their working hours will reduce; whereas if they continue as non-addicts their working hours will increase.

Hence, the study found that average working hours per week day reduces due to social media addiction, which aligned with the many other previous studies.

According to the above findings, the study contributes new knowledge of Social media addiction and labour supply in Sri Lanka in two ways. This study allows a comparison of the determinants of average work hours of employees conditional to social media addiction. Secondly, it has drawn two types of predictions using post estimations of the endogenous switching regression model as unconditional and conditional average work hours of employees. Although unconditional hours are high for social media addicts, the average work hours per day will change if they have given up or have been newly addicted to social media.

CONCLUSIONS AND POLICY INSIGHTS

The study concludes that the social media addiction is negatively affected by age while being married, being an executive employee, using Instagram or YouTube in addition to Facebook and the distance to the workplace have positively affected social media addiction. The higher tendency for social media usage among executives could be used to promote social networking and other positive outcomes through social media. YouTube is the most common method of using social media by employees among the sample and that could be restricted with the support of the network managers of the organization. Increasing commuting time has been identified as a key reason for social media addiction. Encouraging workers to follow online training programs during their travel is one possible way to improve their skills positively during the commuting time.

Average work hours of week day of social media addicts are positively affected by age and gender (being male employees) while being an executive employee has a negative relationship with hours. Being male and receiving a monthly net salary are positively related with the labour supply of social media non-addicts, whereas being married, being an executive employee and years of education have a negative impact on hours of work among them. Existence of lower working hours for higher educated groups and executive employees are aligned with the human capital theories. However, the reduction of working hours among executive employees for social media addicts is higher than social media non addicts. Therefore, Executive officers too should be properly monitored on their performances by the human resource management of the organization.

The second specific objective concludes that although the unconditional average working hours are high for social media addicts due to the young age sub group, their working hours will increase if they escape from the addiction to social media. Also, if social media non addicts get addicted then their labour supply too will reduce. Therefore, human resource managers should develop a social media policy for their organization to avoid its negative influences on the performance of their human capital. Jennings et al (2014), Cairo (2014) also highlighted the importance of a social media policy for an organization in their studies. That should explain the limitations of social media usage and the guidelines for the things they should avoid. Human resource management could arrange alternative leisure events to reduce the work stress of their employees. Rather than totally prohibiting the social media usage, human resource managers could consider allowing social media for a short duration at work, as a refreshment tool to avoid work stress in a way that workers will not get addicted to it. This would improve the maximum capacity utilization of workers of the organizations.

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PERSPECTIVE

PRODUCTIVITY OF AGRI-FOOD SECTOR OF SRI LANKA: THE STORY UNSEEN, UNFOLDED OR UNTOLD

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Abstract

The agriculture sector in Sri Lanka has been perceived by a large proportion of politicians, policy makers, scientists, academia, and general public as a sector with “low productivity”. Yet, once the contribution of food and related industries are added, the Agri-Food Sector (AFS) is highly productive and vibrant, just as much as in any economy. Therefore, the political leadership should be aware of the contributions made by the AFS and be cautious in interpreting the productivity estimates made by various agencies, especially on the productivity of agriculture, forestry and fisheries sector in Sri Lanka. Further, the size of the AFS of Sri Lankan economy and the contributions of overall AFS and the sub-sectors, i.e., agriculture, food manufacturing and food service, should be taken into account if contribution to the Gross Domestic Product and to employment is to be more accurately perceived. Identification of productivity of different sub-sectors together with the constraints to improve productivity, would help the government of Sri Lanka in developing strategies to make the process of economic development proceed further and faster.

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INTRODUCTION

“Employing about one fourth of the workforce in agriculture that produces less than one tenth of the Gross Domestic Product (GDP)”, is a sentiment expressed repeatedly by a large proportion of politicians, policy makers, scientists, academia, and general public targeting the agriculture sector of Sri Lanka to highlight its low productivity. Such an expression, no doubt, would lead to demoralize key stakeholders in the sector and losing confidence of potential investors. Assessment of performance of sub-sectors in the economy is important for a country to identify the interventions needed when remedying any issue blocking its path for development. Clear identification of the boundaries and the use of correct “yards of measurement” for different components are important to bring the decision-makers and policy-makers on to a common table of negotiations in order to discuss about the country’s economy.

Before expressing concerns on the low-productivity of agriculture using statistics reported in the National Accounts, it is important to reiterate what agriculture entails. In the System of National Accounts (SNA)¹, agriculture sector covers only crop and livestock production, and it is listed along with fisheries and forestry sub-sectors, while the food manufacturing and food services are listed under industry and services sectors, respectively. However, the Agri-Food Sector (AFS) is a composite sector consisting crop and livestock production, food manufacturing and food services. If the productivity of AFS is to be assessed, then the value of production and employment in the AFS should be used in the computation. Such information, however, is not directly reported in government publications. Hence, the interested parties tend to do computations of the productivity of the ‘Agriculture, Forestry and Fishing’ sector using available but incomplete information. The outcome of such calculations will not reflect the actual scenario of the contribution and share of AFS to the GDP owing to misrepresentation of facts thus, providing incorrect basis in designing and execution of the development agenda of the country.

The actual contribution and role of AFS in an economy are different to those of agriculture. It is proclaimed that high employment in agriculture is a characteristic of ‘under-development’, while growing employment in food manufacturing and food services is a sign of ‘development’. The objective of this paper is to approximate the economic size, employment and labour productivity of AFS of the Sri Lankan economy using existing but unexploited official statistics of the government of Sri Lanka.

The remaining sections of this paper are organized as follows. The second section presents the concept of structural transformation in the process of economic development. The third section highlights the concept and measurement of productivity. Computations

¹The System of National Accounts (SNA) is the internationally agreed standard set of recommendations on how to compile measures of economic activity.

of labour productivity of different sub-sectors using data reported by the Department of Census and Statistics (DCS) are presented in the fourth section. Finally, the paper argues the need to use a different classification system to better depict the contribution and role of AFS of the economy of Sri Lanka.

LABOR PRODUCTIVITY, STRUCTURAL TRANSFORMATION AND ECONOMIC DEVELOPMENT

Changes across Agriculture, Industry and Services Sectors

The questions of how low-income primitive economies transform into prosperous and more sophisticated economies and the role that the agriculture sector plays in this evolution have been a subject of inquiries by many academics, development workers, policy makers and politicians throughout the world over many centuries. Though the debates and controversies still exist, the findings of both theoretical and empirical studies clearly show that a structural transformation of the economies occurs during the process of economic development. It is clear that the agriculture sector, which held lion's shares of both GDP and employment during the early stages of development of many countries, would shrink as economies move along the path of development. This phenomenon is associated with a relative rise in contributions made by the industry and services sectors.

Sir Arthur Lewis, the Nobel Laureate for Economic Sciences in 1979, presented the dual-sector model to provide a theoretical explanation to the above phenomenon. This model was based on labour productivity in different sectors (Arthur 1954). He postulated an economy consisting of two sectors; a low-productive agriculture sector and a high-productive industry sector. Agriculture has surplus labour, i.e., marginal productivity of labour is either negligible, zero or negative, and hence the exit of labour does not affect its production. During the structural transformation, surplus labour moves out from the agriculture sector to the industry sector. Thus, the latter will expand and make profits that will be re-invested in the same sector. This creates a further increase in demand for labour by the industrial sector. Labour will continue to move out of agriculture until values of the marginal productivities of agriculture and industry sectors become equal. This process leads to economic growth and is associated with a large share of the industry in the GDP and employment.

The Clark-Fisher hypothesis, proposed by Colin Clark and Allen Fisher, highlights the emergence of a services sector after industrialization. It also supports the concept of structural transformation, and argues that the majority of the labour force tends to work in the services sector as countries develop (Karaalp-Orhana, 2019).

It should be noted that the premise of those arguments lies in the relative sizes rather than absolute sizes of different sub-sectors of an economy as it undergoes a structural transformation. It does not indicate a reduction in absolute size of the agriculture sector; rather it will and can grow in size along with the growth of the total economy. For

example, when the size of the agriculture sector in USA increased from US\$ 59 billion in 1970 [Gross Value Added (GVA), 2015 prices] to US\$ 184 billion in 2018 (GVA, 2015 prices), its contribution to GDP decreased from 1.13% to 0.93% during the same period (FAOSTAT, 2020). In Sri Lanka, too, the economic size of the agriculture sector grew though its relative size reduced over time (Figure A1 - annexed).

Structural Transformation within Agri-Food Sector

During the process of development, a dietary transformation also takes place from unprocessed, subsistence staples to processed, purchased non-staples (Pingali, 2004). The urban consumers with rising incomes demand more nutritious, healthy, convenient, processed and safe food, making food consumption an adventurous experience. This rising demand expands food manufacturing and food services sectors and creates jobs for those who exit from agriculture.

This results in an increased contribution from food manufacturing and food services to the AFS with economic development.

As stated earlier, the size of the AFS in economies is not visible in national accounts of many countries. However, some approximations have been made by various analysts, to this effect. Even in developed economies, the size of AFS is relatively large though their agriculture sectors are small.

The agriculture sector of the USA has contributed 0.6% to the GDP while that of AFS, which adds the contribution of food and related industries (Note: AFS of the USA consists of food and beverage manufacturing; food and beverage stores; food services and eating and drinking places; textiles, apparel, and leather products; and forestry and fishing), was 5.2% of the GDP in 2019. The Agri-Food Canada (2017) also states that the contribution of AFS to the Canadian GDP was 6.7% in 2016, of which, the food retail and wholesale industry accounted for the largest share (1.8%), followed by the food, beverage and tobacco (FBT) processing industry (1.7%). Brazil considers four components in AFS and defines it as the agribusiness sector, i.e. (a) inputs to agriculture, (b) agriculture, (c) agriculture-based industry, and (d) final distribution. In 2017, the contribution of the agribusiness sector to the GDP of Brazil was as high as 19% (PwC, 2019).

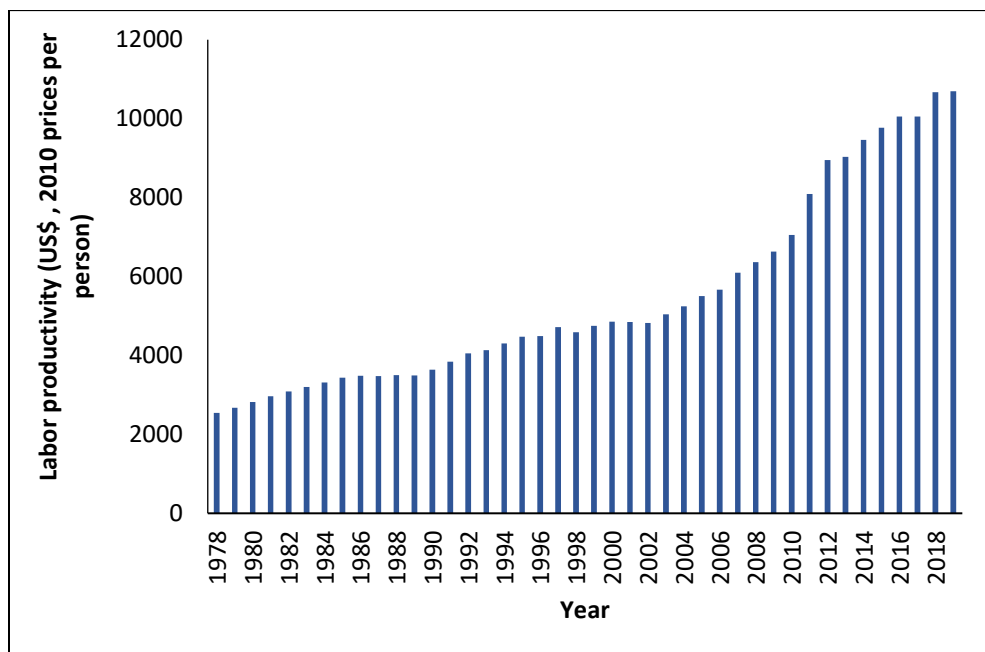
Estimates in the developing world, using the limited data available, indicate that the share of the AFS in GDP ranges between about 30% in lower-middle-income countries such as Bangladesh, Egypt, Indonesia, and Viet Nam, and 40-60% in Myanmar and low-income countries in Africa (south of the Sahara). The share of midstream of the AFS is already substantial, i.e., between 19% in India Niger and Egypt and 57% in Egypt, and is growing (Herrendorf and Schoellman, 2015). Christiaensen et al. (2020) reported that the AFS constitutes 10%, 31% and 80% of employment and the agriculture sectors provides employment to 2%, 15% and 73% of the labour force in USA (high-income), Brazil (Middle-income) and Eastern and Southern African countries (low-income), respectively.

A similar pattern was observed by Davis and Goldberg (1957) with respect to employment in AFS. They indicated that though employment in agriculture is reduced, an increase in employment in the food industry and procurement sector can be observed along with technological improvements. According to recent findings of Reardon et al. (2019), a large number of small and medium-sized enterprises (SMEs) in transportation, processing, and distribution enter the industry with food system transformation, as food processing, distribution, and services tend to be more labour-intensive. The labour productivity is relatively high in these sectors and food manufacturing industries have a large potential for creating non-farm employment.

Structural Transformation and labour productivity in the Sri Lankan economy

Figure 1 illustrates how the labour productivity in Sri Lanka has changed during 1978-2019 in terms of output per worker. The data clearly show that over the years, Sri Lankan economy has become increasingly efficient in using its labour.

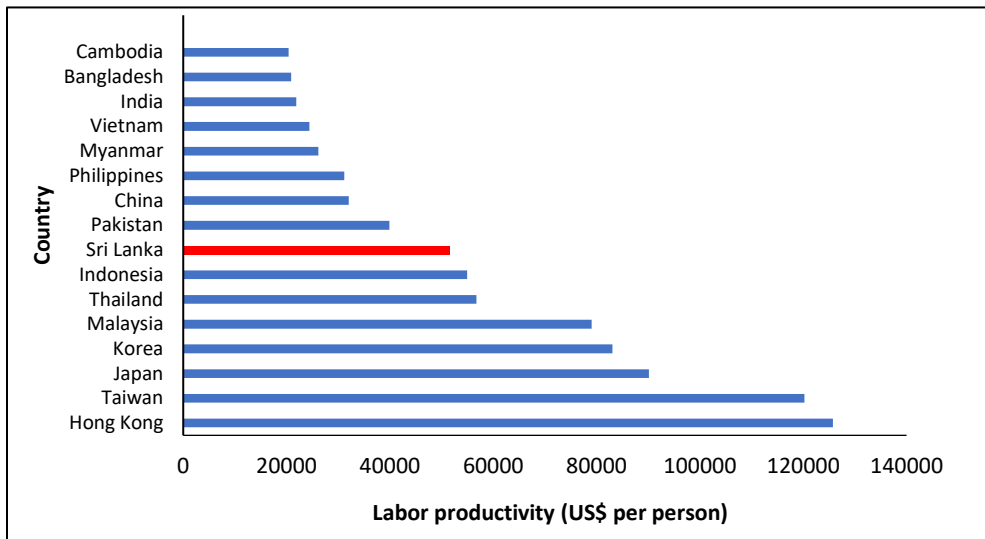
Figure 1: Labour productivity in US\$ per person employed (at constant prices 2010) during 1978-2019



Source: Author’s calculations using data presented by the APO, DCS 2020a, World Bank 2020; FAOSTAT, 2020

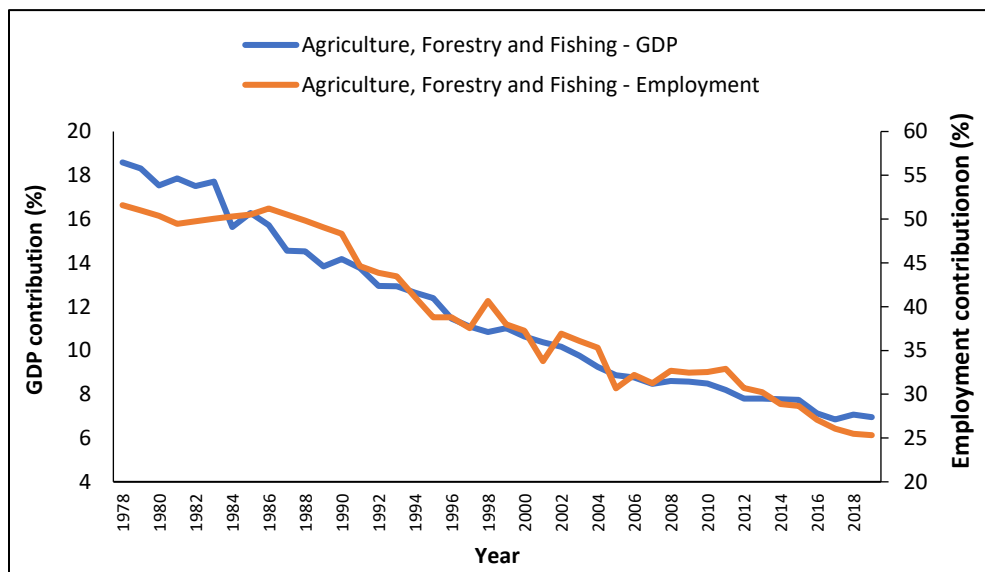
Figure 2 illustrates the relative position of Sri Lanka in the Asian region in 2017 in terms of labour productivity. Undoubtedly, Sri Lanka is the best performer in the South Asian region. However, the performance is below par compared to that of the advanced economies in the region.

Figure 2: Labour productivity in 2017 in different countries (US\$ per person employed) (using, reference year 2017)



Source: Authors' calculation using data presented by the APO 2020

Figure 3: Contribution of the Agriculture to the GDP and Share of Agriculture in Employment: 1978-2019



Source: Authors' calculations using data presented by the APO 2020; DCS 2020a; World Bank 2020; FAOSTAT 2020

Figure 3 above illustrates the GDP contribution by the agriculture sector and share of workers in the sector during 1978-2019 as per the statistics reported by the Asian Productivity Organization (APO 2020). The relative shares imply that the agriculture

sector contributes only 7%² to the economy, while employing 25% of the labour force of the country in 2019.

A simple computation of labour productivity in Sri Lanka using the GDP contributions and employment data published by the Department of Census and Statistics in 2019 are shown in Table 1. The labour productivity levels of the agriculture sector are thus 0.33, and that the industry and services sectors are 3.48 and 4.44 times more labour productive, respectively, compared to the agriculture sector.

Table 1: Gross Value Added, Employment and Labour productivity by sector in Sri Lanka, 2019.

| Variable | Agriculture, forestry and fishing | Industry | Services |
|--|---|-----------|-----------|
| Gross Value Added (LKR. Mn) | 687,857 | 2,608,211 | 5,680,757 |
| Employment (No. of Persons) | 2,071,940 | 2,258,421 | 3,850,219 |
| Labour productivity (LKR. Mn per Person) | 0.33 | 1.15 | 1.48 |

Source: DCS, 2020a, 2020b

These results, if used as they are, indicate that the agriculture sector in combination with forestry and fishing is not competitive enough making the sector un-attractive for investments or to get incentivized by the policy makers.

Two caveats can be identified in the above calculation, which used value of production as the numerator and number of workers as the denominator, have made the results “not-so-acceptable”. The first is the way that the numerator has been computed. According to the classification adopted, ‘Agriculture, Forestry and Fishing’ is defined as the production of plants, animals, fish and forestry products. The large inter-sectoral connections of agriculture, commonly known as AFS, i.e., raw material supply, food processing, and food services, have not been considered under the agriculture sector but are listed under industry or services in the above calculation (Table 1). The second is the way that the denominator has been computed. Agricultural employment is largely informal and part-time³. The reported employment data include a large number of workers who have claimed agriculture as their primary employment (DCS, 2019).

² GDP at constant prices, (2010 reference year)

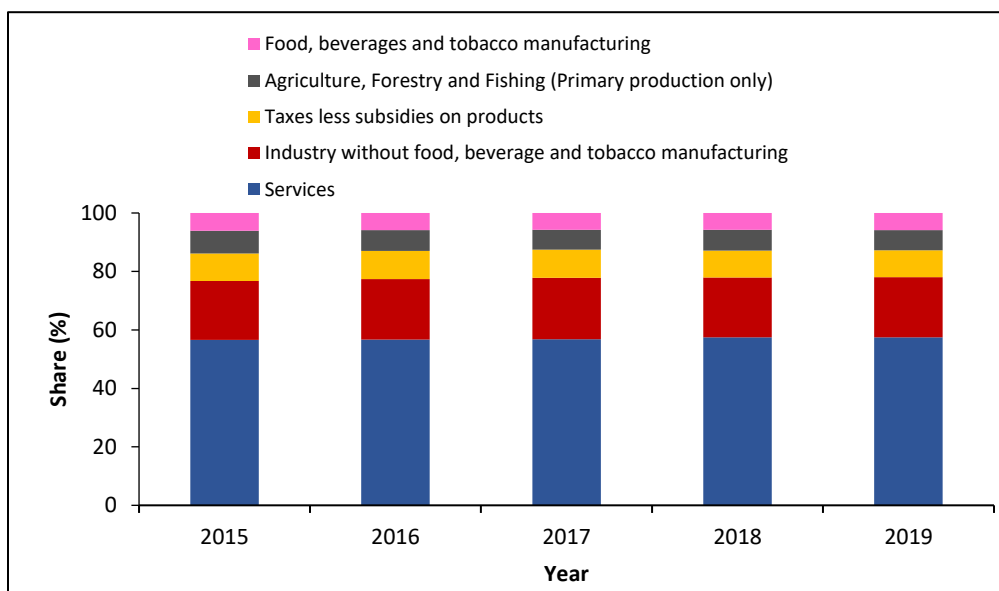
³ It should be noted that 89% of the workers in the agricultural sector in Sri Lanka is engaged in informal sector occupations, which is characterized by irregular and part time work (DCS, 2019). As a result, the employment figures expressed in man-days can be an over-estimation of the actual number of workers in the sector.

Thus, we attempted to highlight the significance of AFS in the Sri Lankan economy, and to re-compute productivity in the agriculture sector with and without incorporating the food processing sector. In computing the above, we used two types of employment statistics presented by the DCS of Sri Lanka, i.e., conventional and alternative.

ECONOMIC SIZE OF THE AGRI-FOOD SECTOR IN SRI LANKA

Following the SNA, as proposed by the United Nations Statistics Division, Sri Lanka reports only the primary production of crops and livestock in determining the growth and contribution of the sector to the GDP. We argued that in setting development targets and prioritizing investment options, due consideration should be given to the growth and contribution of sectors that are inherently linked to agriculture sector. In this context, we defined AFS as “agriculture and manufacturing of food, beverages and tobacco”. This definition, though under-estimates the total contribution of AFS defined in the previous sections, enable us to show the relative size of each the components listed under industry using published information. Figure 4 summarizes the shares of four economic activities namely, (1) services, (2) industry without food, beverage and tobacco manufacturing, (3) food, beverage and tobacco manufacturing and (4) agriculture. The last two sectors largely reflect economic activities of the agribusiness sectors, which was not-so-transparent in national accounts. Based on authors’ calculations, the total agriculture sector comprising of (3) and (4) above has contributed to approximately 13% to the GDP of Sri Lanka during 2015-2019, as opposed to low contribution reflected by the conventional calculations considering sub-sector (4) alone.

Figure 4: Share of selected economic activities to the GDP (2015-2019)



Source: Authors’ calculation using data presented by the DCS, 2020b

EMPLOYMENT IN AGRICULTURE: IS IT INFLATED IN CONVENTIONAL STATISTICS?

The DCS is the official source for employment data in Sri Lanka. Conventionally, the DCS treats the preceding week of the survey week as the reference period. The individuals, who worked at least one hour during the reference period, are treated as paid employees, employers, own-account workers or contributing family workers as employed (DCS, 2020b). This also includes individuals with a job but not at work during the reference period. The employment statistics presented and used in this paper up to this section, is based on the statistics of the DCS under the above definition.

Interestingly, the Labour Survey Reports released by the DCS also presents “alternative estimates”. In the alternative estimates, persons who work only for 20 hours or more per week are considered to be employed while contributing family workers have not been considered as employed. Those contributing family workers who were reported to seek some other work are considered as unemployed and the rest of the unpaid family workers are considered as economically inactive (not in the labour force). Hence, only the (a) paid employees (b) employers and (c) own-account workers are considered to be employed by the DCS.

Table 2 presents the employment in agriculture sector in conventional statistics vis-à-vis employment according to alternative statistics. It is clear that the measurements made using conventional estimates are smaller than those made using alternative estimates.

Table 2: Employment in Agriculture, Industry and Services as reported by conventional estimates and alternative estimates (number of workers)

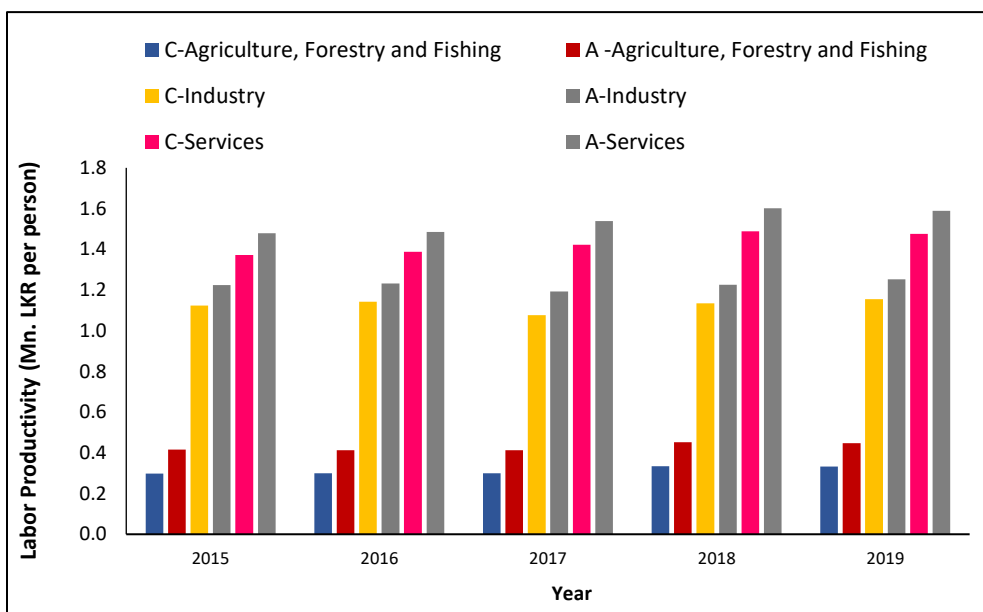
| Year | Conventional Estimates (Number) | | | | Alternative Estimates (Number) | | | |
|-------------------|---------------------------------|-----------|-----------|-----------|--------------------------------|-----------|-----------|-----------|
| | AFF* | Industry | Services | Total | AFF | Industry | Services | Total |
| 2015 | 2,244,547 | 2,018,171 | 3,568,258 | 7,830,976 | 1,609,226 | 1,853,056 | 3,310,615 | 6,772,896 |
| 2016 | 2,153,874 | 2,097,503 | 3,696,306 | 7,947,683 | 1,563,142 | 1,946,231 | 3,453,599 | 6,962,973 |
| 2017 | 2,140,185 | 2,331,494 | 3,736,500 | 8,208,179 | 1,555,527 | 2,105,515 | 3,455,334 | 7,116,376 |
| 2018 | 2,043,698 | 2,239,262 | 3,732,206 | 8,015,166 | 1,513,837 | 2,072,274 | 3,470,295 | 7,056,406 |
| 2019 ⁴ | 2,071,940 | 2,258,421 | 3,850,332 | 8,180,693 | 1,538,804 | 2,083,645 | 3,575,934 | 7,198,383 |

*AFF: Agriculture, Forestry and Fishing, Source: DCS, Sri Lanka (2020a, 2016b)

⁴ Based on the employment data during the first, second and third quarters as reported in the Labor Force Survey of the DCS (2020a).

Figure 5 illustrates the relative sizes of labour productivities when different estimates are used as the employment in the respective sub-sector, i.e., conventional (C) and alternative (A). As Marambe (2019) reported, a marginal increase in labour productivity can be observed from 2015 to 2018 when computed using conventional statistics. It is clear from Figure 5 that labour productivities computed using alternative statistics are always higher than what is computed using conventional statistics and it is the highest for agriculture (on average, they are 37%, 9% and 8% higher for agriculture, industry and services, respectively).

Figure 5: Labour productivity in Sri Lanka using alternative definitions for employment.



*Note: C-Agriculture = conventional estimate for agriculture sector;
 A-agriculture = alternate estimate for agriculture sector;
 C-Industry = conventional estimate for industry sector;
 A-Industry = alternate estimate for industry sector;
 C-services = conventional estimate for services sector;
 A-Services = alternate estimate for services sector*

Source: Author’s calculations using data presented by the DCS, 2020a, 2020b and 2016b

EMPLOYMENT IN FOOD MANUFACTURING: LIMITATIONS IN EXISTING SOURCES

A number of government publications provide a few estimates pertaining to employment in the food, beverage and tobacco sector. Table 3 provides the nature of estimates provided in each report. Some differences and similarities in the methodologies adopted in different study reports cited in Table 3 below were noted.

Table 3: Employment in Food Manufacturing and Related Industries in Sri Lanka

| Source | Coverage | Data availability | Number of workers (year)* |
|--|--|-------------------|--|
| Sri Lanka Labor Force Survey (LFS) – Annual Report | Manufacturing Sector Employment | Annual | All manufacturing: 1,504,314 (2019) |
| Annual Survey of Industries (ASI) | Industrial establishments with 5 or more persons engaged | Annual | All manufacturing: 1,400,830 Food: 332,828 Beverage: 10,461 Tobacco: 8,342 (2017) |
| Economic Census | Non-agricultural enterprises in the formal sector | 2013/2014 | All manufacturing: 860,075 Food: 198,342 Beverage: 9,878 Tobacco: 5,690 (2013/14) |
| Economic Census | Non-agricultural enterprises in the informal sector | 2013/2014 | All manufacturing: 465,380 Food: 111,440 Beverage: 983 Tobacco: 1,732 (2013/14) |

**The year for which employment figures are presented is in parenthesis*

Even though both Sri Lanka Labour Force Survey (LFS) and Annual Survey of Industries (ASI) are conducted by the DCS as annual sample surveys, the ASI covers only the establishments with more than five employees. Therefore, the total employment in manufacturing reported by the LFS is larger and more accurate than that of the ASI.

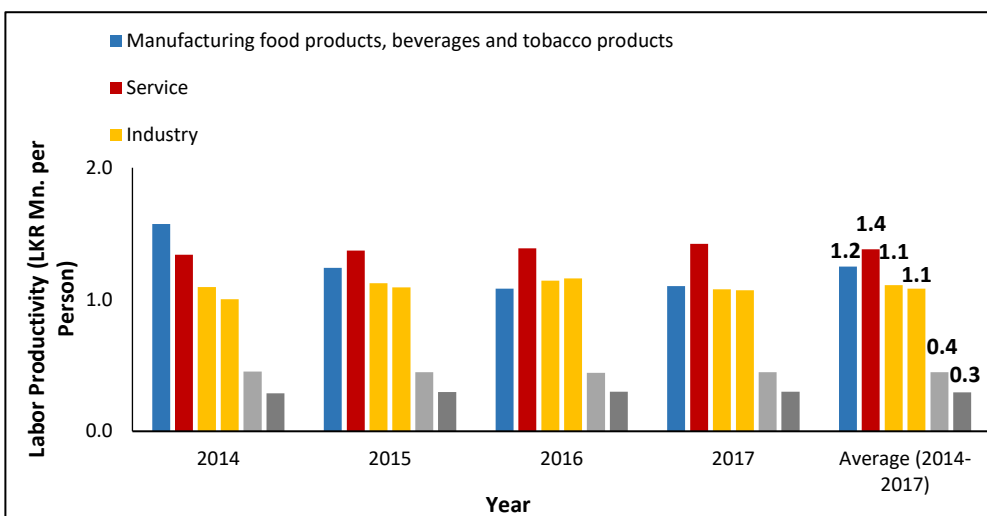
The Economic Census conducted in 2013/14, though available for a single year, provides the best estimate of employment in the food manufacturing industries, which sums to 328,065 (it was 213,910 in formal industries and 114,155 in informal industries), while the sample survey report of ASI conducted in 2014 shows an employment of 236,899. This indicates an under-estimation of 27.79% in the ASI data.

LABOR PRODUCTIVITY OF THE AGRI-FOOD SECTOR OF SRI LANKA: THE UNTOLD, UNFOLDED OR UNSEEN ESTIMATES OBTAINED USING OFFICIAL STATISTICS OF THE DEPARTMENT OF CENSUS AND STATISTICS

A ‘back of the envelope’ calculation was done in this study using the GDP contribution and the employment of agriculture and manufacturing of the food, beverage and tobacco sector of Sri Lanka. As the GDP contribution of the food service sectors is not directly

reported in the SNA of Sri Lanka, the AFS was narrowly defined in this study as the sum of the above two sectors. The estimate of employment provided by the ASI were inflated by 28% in calculating labour productivity to account for employment in establishments with less than five workers.

Figure 6: Labour productivity of different sub-sectors of the Sri Lankan Economy; 2014-2017



Note: constant GDP (Base year 2010) is used in the calculate the labour productivities are also expressed in constant values and hence they should be treated as indices

Source: Authors' calculation using data presented in DCS 2015, 2016a, 2016b, 2017, 2018, 2019. The calculations were done using the most recent employment data reported in ASI, i.e., for the period 2014-2017. The results clearly show that productivity of the AFS was much larger than that of 'agriculture, forestry and fishing' sector, which is a fact, but not explicitly presented in official government statistics (Figure 6 above and Table A1). This result is driven by the estimate of the manufacturing of food, beverages and tobacco sector, which is more productive than that of the average industry sector. It should be noted that the conventional statistics of employment has been used in the calculation of productivity measures illustrated in Figure 5. If "alternative estimates" were used, the productivity of the AFS would be even higher than what is presented in Figure 6.

THE LEARNING POINTS AND RECOMMENDATIONS

The AFS is a vibrant sector in any economy and Sri Lanka is no exception. The agriculture sector contribution in Sri Lanka has recorded as 7% to the GDP. However, once the contribution of food and related industries are added (Food, beverages and tobacco manufacturing), this share of agriculture sector increased to 13% of the GDP in 2019 and is highly productive. The "Agriculture, Forestry & Fishing + Manufacturing of Food, Beverages & Tobacco" is thus, a more justifiable indicator of the relative contribution of the overall agriculture sector to the economy of Sri Lanka.

The political leadership should be aware of the contributions made by the AFS and be cautious in interpreting the productivity estimates made by various agencies, especially on the productivity of agriculture, forestry and fisheries sector in Sri Lanka. Further computations are to be performed to accurately measure the size of the AFS of the Sri Lankan economy and to measure employment by number of hours of work (instead of number of man days), to identify the highly productive sub-sectors within the AFS and the actual contribution of the total AFS. More detailed data are required to identify the contributions of overall AFS and sub-sectors of agriculture, food manufacturing and food service sector of the economy to GDP and employment.

Identification of productivity of different sub-sectors together with the constraints to improve productivity, could help the national government in developing strategies to overcome the constraints and make the process of economic development proceed further and faster. Experience in other countries demonstrate that the infrastructure and policy investments help the private sector in driving agricultural productivity, opening up markets, and facilitating increased private investment in the manufacturing and services components of AFS, which provides a greater contribution as a country develops, while regulating through government bodies (AGRA, 2019). Roads link farmers to input and output markets, while strengthening the key nodal points in the city region food systems and public investment helps connecting farmers' products to where the demand is. As the processing sector grows, it will create value addition and markets, but will need and seek more raw material supply. An overall policy and regulatory framework would help support this continuum of AFS in Sri Lanka.

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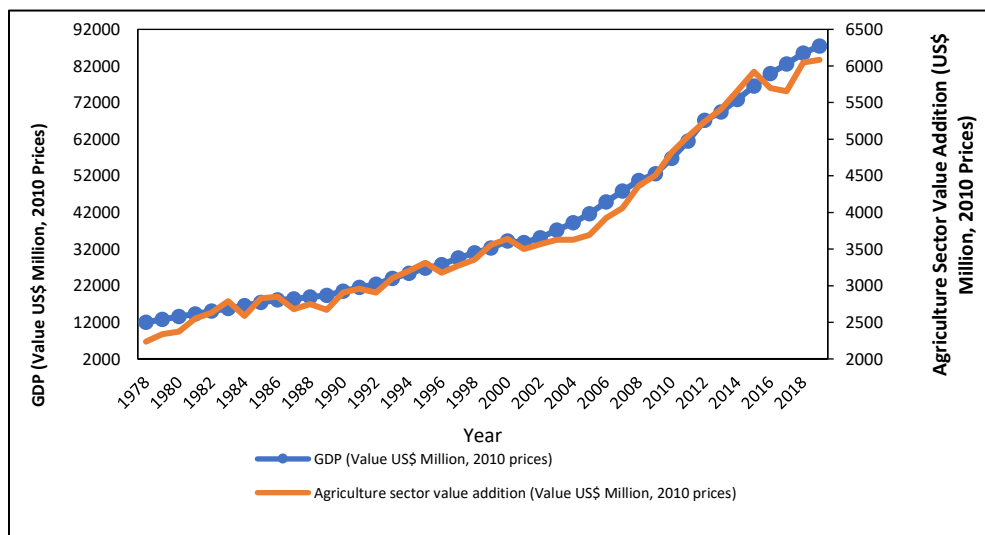
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Annexure

Figure A1: Growth of agriculture economy vis-a-vis total economy of Sri Lanka: 1978-2019



Source: APO (2020)

Table A1: Gross Value Added (GVA)* and employment by production sector during 2014-2017

| Economic activity | 2014 | | 2015 | | 2016 | | 2017 | |
|--|-----------|--------------|-----------|--------------|-----------|--------------|-----------|--------------|
| | GVA | Labour force | GVA | Labour force | GVA | Labour force | GVA | Labour force |
| Agriculture, Forestry and Fishing | 639,695 | 2,222,859 | 669,724 | 2,244,547 | 644,654 | 2,153,874 | 642,159 | 2,140,185 |
| Manufacturing food products, beverages and tobacco products | 513,960 | 326,921 | 528,821 | 426,000 | 529,786 | 489,087 | 534,923 | 485,251 |
| Industry | 2,218,710 | 2,027,426 | 2,267,725 | 2,018,171 | 2,396,832 | 2,097,503 | 2,509,421 | 2,331,494 |
| Industry without manufacturing food products, beverages and tobacco products | 1,704,750 | 1,700,505 | 1,738,904 | 1,592,171 | 1,867,046 | 1,608,416 | 1,974,497 | 1,846,243 |
| Service | 4,618,501 | 3,450,205 | 4,894,717 | 3,568,258 | 5,127,615 | 3,696,306 | 5,313,434 | 3,736,500 |
| Agri-Food Sector | 1,153,655 | 2,549,779 | 1,198,545 | 2,670,547 | 1,174,440 | 2,642,961 | 1,177,082 | 2,625,435 |

*GVA is constant prices (2010 = 100) LKR Mn.

Source: Department of Census and Statistics, Various years

BOOK REVIEW

BOOK REVIEW



Jeff Madura:
***International Financial
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Jeff Madura has written numerous books and articles in the field of Finance, and the focus in the current work is on “International Financial Management”, which bridges the gap between theory and practice related to Financial Management in the international context by coupling an unrivalled and in-depth theoretical foundation with practical applications. Thirteen new editions have assembled upon the first edition of this masterpiece published in 1986, providing many new theoretical concepts and practical developments that substantially enhance the contribution of the book. To acquire a comprehensive understanding about application of finance concepts in the international perspective, this book requires to be used as a complementary work together with other books on Corporate Finance as it is necessary to have a theoretical background about the fundamental concepts and principles in finance.

It is apparent that this book is intended to deliver a far-reaching reportage of timely information and contemporary acumen built upon the fundamental principles, which are essential for someone to prosper in today’s global business environment. This intention of the author has remained unchanged from the initial edition of the book, and the reader-friendly style of writing enriched with clear explanations ensures that the content is thought-provoking and easily understood by the reader. With an emphasis on the role of contemporary multinational corporations in the business world, the author encourages managers to make decisions and to apply concepts with a proper understanding about the logic behind such principles.

In reviewing the book, it is required to scrutinize its organizational structure, especially to evaluate the way in which Madura achieves the intended objective of the book.

International Financial Management is a 752-page book which consists of five sections, each of which carries several linked chapters, and the chapters are arranged in a highly reader-friendly manner, carefully maintaining the link and connectivity among them.

The macro economic framework required for a detailed understanding in international financial management has been developed in the first two sections of the text. The Section one from Chapter one through Chapter five of the book focusses on International Financial Environment, in which Madura provides an overview about international flow of funds, international financial markets and determination of exchange rates, and further, he develops in this section a strong foundation which succours the reader in understanding advanced theories built upon these fundamentals. Application of currency derivatives by multinational corporations is discussed with special attention on the use of currency derivatives to hedge exposure to exchange rate risk.

In section two, the author elaborates the behaviour of exchange rates and the critical relationships associated with exchange rates based on the basic knowledge given through the first section of the book. Further, in this section, he focuses on the nature of government influence on the exchange rates and the impact of such influence on the economic conditions of a country. It is followed by the discussion on relationships between foreign currencies and the discrepancies that occur within the foreign exchange market. The theories on the impact of inflation and interest rates on the exchange rate are explained with a focus on how these relationships affect the value of the corporation which ultimately relates to the objective of those corporations.

Based on the macro level understanding developed, the remaining sections of the text focus on discussing micro level managerial aspects of international financial management. Section three elucidates on exchange rate risk management by concentrating on different activities involved, including approaches used to forecast exchange rates, measuring exposure to exchange rate fluctuations and managing of such exchange rate exposures. Functions involved in managing long term assets and liabilities of multinational corporations is extensively addressed through section four and it explains the factors that affect international investments and costs of financing those investments as well. An overview of the techniques through which multinational corporations can gain benefits from international business is discussed initially, and it is followed by complications involved. Further, the writer elaborates on the reasons which cause multinational capital budgeting to be more complex than the evaluation of domestic projects, and he clearly demonstrates the steps that need to be followed when evaluating international projects together with the adjustments to incorporate country risks associated with the projects. In the latter part of the section, the writer emphasizes on capital structure decisions and cost of capital of cross boarder investments. The management of long-term assets is discussed prior to the management of long-term liabilities as the financing decision depends on the investment decision in a corporation, and the integration between investment and financing decisions is emphasized.

The final section of the book addresses the management of short-term assets and liabilities by multinational corporations, and it elaborates on various aspects including procedures used by multinational corporations to finance international trade, sources of short-term funds, short term financing decisions, optimization of cash flows and short-term investment decisions. The self-contained nature of each chapter enables the rearrangement of chapters to facilitate learning and discussions. The flow of many chapters has been reorganized in the 13th version of the book to improve readability and several aspects including balance of payments format, manipulation of exchange rates, value at risk and black markets for currencies are also updated.

The book follows a systematic approach where each chapter is presented according to a formal structure which highlights the intended learning outcomes at the beginning together with an introduction to the expanses covered within the chapter. The content of each chapter is logically arranged by elaborating on the complexities upon understanding provided through simple concepts and principles presented at the beginning of each chapter and are remarkably designed to ensure the achievement of the learning outcomes specified at the beginning. Each chapter is finally summarized providing an opportunity to recall the concepts learnt within the chapter. Real world examples, instructive diagrams, self-tests, review questions and case studies provided in each chapter ensure an all-inclusive learning experience to the reader.

The book encourages readers to think beyond the skyline by providing web links and allowing them to explore novel information. Controversial matters are presented in the “Point/ Counter-point” section together with opposing arguments, which helps to enhance the critical thinking ability of readers, and it enables them to think out of the box. An incredible feature which familiarizes the reader with practical application of the concepts learnt is the “Boardroom discussion” presented in almost all the chapters and it stimulates the reader to think as a board member of a multinational corporation. “Running your MNC”, on the other hand, encourages the reader to assume himself in the role of an entrepreneur to develop his own multinational corporation. Spreadsheet applications are entrenched in the chapters and the author has used these computations to support the reader to easily understand the complex concepts while enhancing analytical skills. Moreover, each section includes an integrated case study covering all the chapters within the section, thus facilitating holistic comprehension.

Following the contemporary tradition of books of similar magnitude, International Financial Management is equipped with a CD which includes study support features to facilitate teaching and learning experience. The CD includes well-prepared PowerPoint presentations on all the chapters, which facilitate effective conveyance and acknowledgement of the content. The model answers provided for review questions and case studies enable readers to improve and substantiate their answers. Further, the several multiple-choice questions included together with the answers empower the readers to comprehend the content discussed within each chapter.

Enriched with all these features, International Financial Management by Jeff Madura is masterfully written, and it is a comprehensive and a highly useful source for lecturers, undergraduates, post-graduates and practitioners to methodically grasp the concepts of Financial Management applications in multinational businesses. More importantly, the book explains the concepts more with a finance flavour than from an economic perspective, thus becoming a promising piece of work for the learners in the field of finance. In every edition of the book is further enriched with current research, developments, trends and emerging issues in the field thereby contributing to generation of new knowledge. Thus, for anyone interested in understanding concepts and theories in international financial management, this book by Jeff Madura can be recommended as an ideal source and a masterpiece.

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GUIDELINES FOR CONTRIBUTORS FOR THE VOLUME 9 – ISSUE 1

THE SLJER

Sri Lanka Journal of Economic Research (SLJER) is a refereed international journal, published biannually by the Sri Lanka Forum of University Economists (SLFUE). It considers manuscripts of sufficiently high-quality research outputs in the field of Economics and related areas, for publication, while giving priority to those manuscripts developed based on papers presented at the Sri Lanka Economic Research Conference (SLERC), the annual international research symposium of the SLFUE. In addition to research articles, the Journal accepts manuscripts of short essays on economic and development policy perspectives and also book reviews.

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