

Department of Economics and Statistics  
Faculty of Arts, University of Peradeniya, Sri Lanka.



**8<sup>th</sup> PERADENIYA INTERNATIONAL  
ECONOMICS RESEARCH SYMPOSIUM - 2020**

**PROCEEDINGS**  
Volume VIII

10<sup>th</sup> DECEMBER, 2020

CONFERENCE HALL  
POSTGRADUATE INSTITUTE OF HUMANITIES AND SOCIAL SCIENCES (PGIHS)  
UNIVERSITY OF PERADENIYA, SRI LANKA



P  
I  
E  
R  
S



**Organized by**  
Department of Economics and Statistics  
Faculty of Arts, University of Peradeniya, Sri Lanka

**Collaborative Partner**  
South Asian University  
New Delhi, India



PIERS - 2020

## ACKNOWLEDGEMENTS FOR THE SPONSORS



Postgraduate Institute of Humanities and Social Sciences (PGIHS)  
and  
Faculty of Arts  
University of Peradeniya, Sri Lanka



**PIERS - 2020**

# **PROCEEDINGS**

**Volume VIII**

**8<sup>TH</sup> PERADENIYA INTERNATIONAL ECONOMICS RESEARCH  
SYMPOSIUM (PIERS) – 2020**

Organized by  
**Department of Economics and Statistics, Faculty of Arts  
University of Peradeniya, Sri Lanka**

Collaborative Partner  
**South Asian University, India**

on  
**10<sup>th</sup> December 2020**

at  
**Postgraduate Institute of Humanities and Social Sciences (PGIHS)  
University of Peradeniya  
Sri Lanka**



Copyright © December 2020

DEPARTMENT OF ECONOMICS AND STATISTICS  
FACULTY OF ARTS, UNIVERSITY OF PERADENIYA  
SRI LANKA

PROCEEDINGS OF THE PERADENIYA INTERNATIONAL ECONOMICS  
RESEARCH SYMPOSIUM (PIERS) – 2020

ISSN: 2386 - 1568

ISBN: 978-955-589-297-1

**Published by**

Department of Economics and Statistics,  
Faculty of Arts, University of Peradeniya,  
Peradeniya,  
Sri Lanka.

Tel: +94 812 392622

E-mail: [pierspera2013@gmail.com](mailto:pierspera2013@gmail.com)

Web: <http://arts.pdn.ac.lk/econ/persweb/>

All rights reserved. No parts of this publication may be reproduced, stored in a retrieval system, transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission of the publisher.

**Printed by**

Sanduni Offset Printers (Pvt) Ltd.,

4/1, Goodshed Road,

Sarasavi Uyana, Peradeniya.

Tel: +94 812 387777 E-mail: [sandunioffset@gmail.com](mailto:sandunioffset@gmail.com)

# **8<sup>TH</sup> PERADENIYA INTERNATIONAL ECONOMICS RESEARCH SYMPOSIUM - 2020**



**PIERS - 2020**

## **PROCEEDINGS**

**Volume VIII**

### **EDITORIAL COMMITTEE**

**Cheif-editor:**

Dr. T. Vinayagathan

**Members:**

Prof. Wasantha Athukorala  
Prof. S.J.S. de Mel  
Prof. H.M.W.A. Herath  
Dr. C.R. Abayasekara  
Dr. A.D.H.K. Kankanamge

**Editorial Assistants:**

Ms. K.A.N.I. Kariapperuma  
Ms. A.J.F Shifaniya

**Editorial Advisory Panel:**

Prof. J. M. A. Jayawickrama  
Prof. S. Vijesandiran  
Dr. Muditha Karunarathna

## CONTENTS

	Page
<i>Message from the Vice Chancellor, University of Peradeniya, Sri Lanka</i>	ix
<i>Message from the Deputy Vice Chancellor, University of Peradeniya, Sri Lanka</i>	x
<i>Message from the Dean, Faculty of Arts, University of Peradeniya, Sri Lanka</i>	xi
<i>Message from the Dean, Faculty of Economics, South Asian University, India</i>	xii
<i>Message from the Head, Department of Economics and Statistics, Faculty of Arts, University of Peradeniya, Sri Lanka</i>	xiii
<i>Message from the Chairperson, PIERS – 2020</i>	xiv
<i>Message from the Coordinator, PIERS – 2020</i>	xv
<i>Organizing Committee</i>	xviii
<i>Panel of Reviewers</i>	xix
<i>Programme Agenda</i>	xx
<b>Keynote Address</b>	
Post COVID Economy of Sri Lanka: Challenges and Opportunities <i>Mr. Luxman Siriwardena</i> <i>Executive Director, Pathfinder Foundation, Sri Lanka</i>	xxxix
<b>Extended Abstracts</b>	
An Economic Evaluation of Fertilizer Subsidy on Paddy Production in Sri Lanka <i>M. P. S. S. Sisirakumara, Muditha Karunaratna and Wasantha Athukorala</i>	3
The Impact of External Debt on Foreign Direct Investment in Sri Lanka <i>A.M.K. Weerakoon and S. Vijesandiran</i>	8
An Analysis of Household Rice Expenditure Patterns in Urban, Rural and Estate Sectors in Sri Lanka: Using MPE Approach <i>N.J.C. Paraneetharan, John Nigel and T. Vinayagathan</i>	14
An Empirical Analysis of Current Account Determinants in Sri Lanka <i>R. M. M. Mayoshi and T. N. Vidanage</i>	19



# **8<sup>TH</sup> PERADENIYA INTERNATIONAL ECONOMICS RESEARCH SYMPOSIUM - 2020**



**PIERS - 2020**

## **PROCEEDINGS**

**Volume VIII**

### **EDITORIAL COMMITTEE**

**Cheif-editor:**

Dr. T. Vinayagathan

**Members:**

Prof. Wasantha Athukorala  
Prof. S.J.S. de Mel  
Prof. H.M.W.A. Herath  
Dr. C.R. Abayasekara  
Dr. A.D.H.K. Kankanamge

**Editorial Assistants:**

Ms. K.A.N.I. Kariapperuma  
Ms. A.J.F Shifaniya

**Editorial Advisory Panel:**

Prof. J. M. A. Jayawickrama  
Prof. S. Vijesandiran  
Dr. Muditha Karunarathna



## **MESSAGE FROM THE VICE CHANCELLOR**

**University of Peradeniya**

It is indeed a pleasure to write this message on the occasion of the 8<sup>th</sup> Peradeniya University International Economics Research Symposium (PIERS) – 2020 to be held on 10<sup>th</sup> December 2020. Although there are many hurdles and restrictions related to prevailing pandemic situation the symposium in this year is a remarkable achievement which focuses on the facing of economic and social challenges in the context of Covid 19.

I have no doubt that this symposium will create a valuable platform for economic researchers from international and national level to discuss their research findings, share the new knowledge and exchange their views. Also the virtual mode of the conference in this year would be a new experience to both organizers and presenters of the symposium. The constructive feedback that the researcher would gather from deliberations may pave the way to new frontiers in research.

On behalf of the University of Peradeniya, I wish to express my deep gratitude to the distinguished speakers at this symposium and take this opportunity to compliment the Chairman and the Organizing Committee who had an enormous task at their hands in organizing this event at a crucial environment to make a great success.

I welcome all participants and presenters to the University of Peradeniya and wish their participation at PIERS 2020, a memorable and rewarding experience.

**Professor Upul B. Dissanayake**

Vice-Chancellor

University of Peradeniya

Sri Lanka



**MESSAGE FROM THE DEPUTY VICE  
CHANCELLOR**

**University of Peradeniya**

It is with great pleasure that I send this message for the 8<sup>th</sup> Peradeniya International Economics Research Symposium. This year the PIERS is going to be held with a great difficulty amidst Covid-19 pandemic. I must appreciate the courage and the efforts of the organizing committee in taking the whole responsibility in organizing this event through all the barriers. It is indeed a pleasure to see the continuation in 2020 as well since this is an important annual event in the calendar of the Faculty of Arts, University of Peradeniya.

University of Peradeniya is well known for its research quality and impact, international reputation with high global ranking achievements. The University is productively engaged in nourishing the aspirations and values of the academia. Research symposia of this nature provide platforms for both the local and international researchers to present their research findings and to make further refinement of their knowledge through fruitful discussions. This is a great opportunity offered by the Department of Economics and Statistics and I hope all the in-house and on-line participants will make the maximum use of the symposium.

I wish to congratulate the Head of the Department of Economics and Statistics, and the organizers of this Symposium for the excellent job done.

Thank you.

**Prof. S. H. P. Parakrama Karunaratne**

Deputy Vice Chancellor

University of Peradeniya

Sri Lanka.



## **MESSAGE FROM THE DEAN**

### **Faculty of Arts, University of Peradeniya**

I am honoured to convey this message of appreciation to the PIERS-2020 organized by the Department of Economics and Statistics, Faculty of Arts, University of Peradeniya. In the context of the health challenges posed by the Covid-19 pandemic, the hosting of this kind of an annual event in the conventional mode of conferences would have been extremely difficult and challenging. I would like to, especially, appreciate the Department for taking the initiative and working hard to organize the conference in this difficult circumstance. I would like to assure the Department of Economics and Statistics my fullest support and assistance to make the PIERS-2020 a success.

At times of crisis like this, conventional wisdoms of the existence of mankind and the nature of human societies gets challenged and questioned. The Covid-19 pandemic appears to be the biggest threat from the nature to the existence of humankind for centuries. The invisible enemy of coronavirus has changed the society, economy, and international relations, and some economic sectors and industries have been completely wiped out which will never reemerged. It has permanently changed the nature and scope of human relationships. The Covid-19 pandemic has taught us a crucial lesson that there is no natural space for differences of various cultural and religious beliefs in defense against the pandemic. Only the science and equal individual and social responses will persist that will find a defense against the pandemic. Every human being irrespective of their cultures, religious beliefs, and social structures appear to face the same level of threat and risk from Covid-19. This takes us to the principle that only the universal rights and liberties that are established on the principle of one law to everybody is going to sustain. Therefore, we, as humankind, are compelled to relook at our teachings and philosophies about the economy, cultures, society, religious beliefs as well as survival strategies of humankind for existence. All kind of sacred and non-sacred ideas need to be critiqued to create this true equal space for the humankind. In this context, I hope the PIERS-2020 will address some of the serious economic challenges triggered and propagated by the Covid-19 pandemic.

I wish the PIERS-2020 a great success.

Professor OG Dayaratna-Banda

The Dean, Faculty of Arts, University of Peradeniya



**MESSAGE FROM THE DEAN**

**Faculty of Economics,  
South Asian University, India**

All of us are quite aware that the entire world is currently confronting an unprecedented COVID-19 health crisis, which is devastatingly affecting all segments of society. At the point when most activities are either halted or advancing gradually because of this crisis, the endeavors of organising team members of the Department of Economics and Statistics, University of Peradeniya, Sri Lanka, to organise the PIERS-2020 conference in virtual mode are really commendable and truly exemplary. The Faculty of Economics, South Asian University, India, is pleased to go about as a shared accomplice for this event. The conference programme has been planned very meticulously and incorporates both technical sessions and invited paper presentations. I hope that activities at this conference will keep the human spirit for learning alive. On behalf of the Faculty of Economics at South Asian University, I wish the success of the PIERS-2020.

Professor Sunil Kumar  
Dean, Faculty of Economics  
South Asian University  
India.



## MESSAGE FROM THE HEAD

### **Department of Economics and Statistics University of Peradeniya**

I am honored to send this message of congratulations and appreciation for the 8<sup>th</sup> Peradeniya International Economics Research Symposium (PIERS 2020) jointly organized by the Department of Economics and Statistics, Faculty of Arts, University of Peradeniya, Sri Lanka and South Asian University (SAU), New Delhi, India. The Department of Economics & Statistics, University of Peradeniya is the pioneer institute in economic education and research in Sri Lanka established in 1952 and successfully conducted seven annual economic research conferences since in 2013. The 8<sup>th</sup> PIERS is planned to be held on 10<sup>th</sup> December 2020 under theme of “Stimulation economic Growth to face economic and social challenges during and post – Covid 19”. The pandemic is expected to plunge most countries into recession in 2020, with per capita income contracting in largest fraction of the countries globally. The PIERS 2020 with its foreign collaborators mainly focuses the South Asian Economic Development issues under pressure of Covid 19 pandemic within the Global context.

The quality of higher education provided by universities influence by the contribution of knowledge enhanced through research. Therefore, promoting the research-teaching nexus of the university education system with the participation of local and foreign experts; academics, researchers, development practitioners and policy makers are expected to result better outcomes among university students and academics. The 8<sup>th</sup> PIERS is expected to provide broader opportunities for interactions among local and foreign academics, researchers, policy makers, public officials and postgraduate and undergraduate students in sharpening their knowledge and research experiences. I hope that 2020 PIERS too generates new knowledge in economics through research presentation that will contribute to global sustainable development under pressure of Covid 19 pandemic via integrating the economic dynamics of sub-national economy of Sri Lanka as well as other countries.

While I congratulate the foreign and local delegates from various countries and institutions, presenters and the organizing committee, I wish for the PIERS 2020 all success.

Professor H. M. W. Ariyaratna Herath  
Head, Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka



## **MESSAGE FROM THE CHAIRPERSON**

**Department of Economics and Statistics  
University of Peradeniya**

I am indeed honored to send this message of congratulations and appreciation for the 8<sup>th</sup> Peradeniya International Economics Research Symposium (PIERS 2020) as a person initiated this research conference in 2013 and the Chairperson for PIERS 2020. The Department of Economics & Statistics is the pioneer institution in economic education and research established in 1942 and successfully conducted past seven annual economic research conferences. The 8<sup>th</sup> PIERS is planned to hold on 10<sup>th</sup> December 2020 mainly focusing online mode due to prevailing COVID-19 crisis under the Theme: “Stimulating economic growth to face economic and social challenges during and post - COVID 19”.

The main purpose of this event is improve the quality of higher education through developing and dissemination new knowledge through research and dialogue with the participation of local foreign experts; academics, researchers and policy makers expected to results better outcomes among university students and academics. The 8<sup>th</sup> PIERS also as the previous events, is expected to provide wider opportunities for interactions among local and foreign Academics, Researchers, Policy Makers, Public Officials and Postgraduate and Undergraduate Students in sharpening their knowledge and research experiences through face to face and online interactions

While I am congratulating the foreign delegates, presenters and Participants of PIERS 2020, especially thanks to Prof. HMWA Hereath, Head the Department of Economics and Statistics, Prof. J.G. Sri Ranjith, the Coordinator of PIERS - 2020 and the members of organizing committee for organizing PIERS 2020 without-time brake even under the COVID-19 crisis in the country. I also thank to Prof Upul B. Dissanayake the Vice Chancellor, University of Peradeniya. Prof. O.G Dayaratne Banda, the Dean faculty of Arts, University of Peradeniya for their support and the permission granted to conduct this event.

I wish all the Success for PIERS 2020.

Professor S. Vijesandiran  
Chairperson-PIERS 2020  
Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Peradeniya, Sri Lanka



**MESSAGE FROM THE COORDINATOR**  
**Department of Economics and Statistics**  
**University of Peradeniya**

It is with great pleasure and pride as the coordinator, I write this message for the proceedings of the 8<sup>th</sup> conference of the Peradeniya International Economics Research Symposium (PIERS – 2020), Peradeniya organized by the Department of Economics and Statistics, University of Peradeniya under the theme ‘Stimulating economic growth to face economic and social challenges during and post COVID 19’, scheduled to be held on 10<sup>th</sup> of December 2020.

This year symposium is organized by the Department of Economics & Statistics, University of Peradeniya, Sri Lanka with the collaboration of the South Asian University (SAU), New Delhi, India, to provide a forum for local and foreign researchers, academics and graduate students in Economics in particular to present their research findings, discuss, exchange and share the knowledge gained for policy making and practice.

We sincerely encourage academics/professionals/practitioners of prestigious institutions to participate in our symposium, as this would be an ideal forum to discuss and exchange views upon the contemporary economic challenges locally and globally amidst the outbreak of Covid 19’ pandemic. Due to the current socializing and travel restrictions, and institutional hygienic standards to be maintained, the local participants from restricted areas and foreign participants in particular will be given the opportunity to connect with the symposium via online presentations. Furthermore, because of the good reputation and collaborative moves of the symposium, this year we received a large number of extended abstracts. Nevertheless, considering the time restrictions of the symposium we decided to limit the number of technical sessions and thus reviewers were compelled to select high quality research papers only. I thank and appreciate all the researchers for their motivation and endeavor to send their research papers to the symposium.

On behalf of the organizing committee, I take this opportunity to extend my sincere thanks to the Vice Chancellor, the Deputy Vice Chancellor and the Dean Faculty of Arts, University of Peradeniya; Dean Faculty of Economics, South Asian University, India for their collaboration for the symposium. Furthermore, I thank the Keynote speaker Mr. Lakshman Siriwardena, Executive Director, Pathfinder

Foundation for accepting our invitation to deliver the Keynote speech in the symposium. My special thanks go to senior academic staff members who reviewed abstracts and accepted our invitation to extend their support chairing technical sessions. I would like to express my sincere gratitude to the Chairperson of PIERS – 2020 and the Head, Department of Economics and Statistics, University of Peradeniya for their guidance and cooperation extended to me in organizing this event timely and successfully. I also express my gratitude to all the members of the organizing committee, external reviewers and support staff, my colleagues in the department for their willingly and untiringly extended support.

I also extend my sincere thanks to the authors and presenters without whom this event would not be a success. I would like to express my appreciation to the sponsors of the PIERS – 2020 which mainly consist of Postgraduate Institute of Humanities and Social (PGIHS). I am truly grateful to the members of the editorial committee for their fullest support to complete the proceedings correctly and timely. Furthermore, I thank the Director – PGIHS, Assistant Registrar and the Senior Assistant Bursar, of the Faculty of Arts for their cooperation and fullest support extended to this event. I thank the Chief Medical Officer of the University for providing us with health guidelines to be maintained as Covid prevention measures and many other university administrative officers for their immense help in arranging the symposium logistics and various other facilities and services without which this event would not have been a success. While extending my sincere thanks to all who devoted their time and effort to make the symposium a reality and success, I welcome the national and international research community for the symposium.

I wish everyone a productive, intellectually inspiring memorable symposium!

**Prof. J. G. Sri Ranjith**

Coordinator/PIERS – 2020

Department of Economics and Statistics

University of Peradeniya

**8<sup>th</sup> Peradeniya International Economics Research Symposium  
PIERS – 2020**

**ORGANIZING COMMITTEE**

**Advisor:**

Prof. H.M.W.A. Herath

*Head, Department of Economics and Statistics, University of Peradeniya, Sri Lanka*

**Chairperson:**

Prof. S. Vijesandiran

*Department of Economics and Statistics, University of Peradeniya, Sri Lanka*

**Coordinator:**

Prof. J. G. Sri Ranjith

*Department of Economics and Statistics, University of Peradeniya, Sri Lanka*

**Joint Secretaries:**

Ms. K. A. N. I. Kariyapperuma

Ms. A. J. F. Shifaniya

**Members – Department of Economics and Statistics:**

Prof. H. M. W. A. Herath (Head)

Prof. O.G. Dayaratna Banda

Prof. D. N. B. Gunewardena

Prof. Wasantha Athukorala

Prof. S. Vijesandiran

Prof. S. J. S. de Mel

Dr. C. R. Abayasekara

Ms. S. Rajendran

Dr. A. D. H. K. Kankanamge

Dr. Muditha Karunarathna

Dr. T. Vinayagathan

Ms. W. M. T. Jayamali

Mr. A. S. G. S. Bandara

Mr. D. M. S. M. Dissanayaka

Ms. A. J. F. Shifaniya

Mr. E. U. Jayarathna

Ms. M. R. Anushya

Prof. A.S. P. Abhayarathne

Prof. J. M. A. Jayawickrama

Prof. W. L. P. Perera

Prof. S. Sivarajasingham

Prof. M. B. Ranathilaka

Prof. J. G. Sri Ranjith.

Mr. T. Rajeswaran

Ms. A.V.K. Madhavie

Dr. S. S. K. B. M. Dorabawila

Dr. T. N. Vidanage

Mr. A. N. Thattil

Ms. K. H. I. S. Hettiarachchi

Ms. K. Kumudhini

Ms. S. Mathusha

Ms. K. A. N. I. Kariyapperuma

Ms. S. Kapilarathna

Mr. J.G.W.S. Nishantha

**8th Peradeniya International Economics Research Symposium  
PIERS – 2020**

**PANEL OF REVIEWERS**

**Department of Economics and Statistics, University of Peradeniya**

Prof. Wasantha Athukorala

Prof. S. Vijesandiran

Prof. S. Sivarajasingham

Prof. M.B. Ranathilaka

Prof. H.M.W.A. Herath

Prof. J. G. Sri Ranjith

Prof. S.J.S. de Mel

Dr. C.R. Abayasekara

Dr. S.S.K.B.M. Dorabawila

Dr. A.D.H.K. Kankanamge

Dr. Muditha Karunarathna

Mr. T. Rajeswaran

Ms. A.V.K. Madhavi

Ms. S. Rajendran

Dr. T. N. Vidanage

Dr. T. Vinayagathan

Mr. Kalpa Rajapakshe

**SLIIT Business School**

**Sri Lanka Institute of Information Technology**

Dr. M.D.R.K. Jayathilaka

# PROGRAMME AGENDA



## PIERS - 2020

### Inauguration

**Date: 10<sup>th</sup> December, 2020**

**Venue: Conference Hall, PGIHS**

- 08.30 a.m. *Registration of Participants*
- 09.00 a.m. *Arrival of the Chief Guest*
- 09.05 a.m. *Lighting of the Oil Lamp*
- 09.10 a.m. *Welcome Address by **Prof. S. Vijesandiran**  
Chairperson, PIERs 2020*
- 09.15 a.m. *Opening Remarks by **Prof. H. M. W. A. Herath**  
Head, Department of Economics and Statistics, University of Peradeniya*
- 09.20 a.m. *Address by **Prof. O. G. Dayaratna Banda**  
Dean, Faculty of Arts, University of Peradeniya*
- 09.30 a.m. *Address by **Prof. S. H. P. Parakrama Karunaratne**  
Deputy Vice Chancellor, University of Peradeniya, Sri Lanka*
- 09.35 a.m. *Highlights and Releasing of the Proceedings of PIERs – 2020*
- 09.45 a.m. *Address by Chief Guest **Prof. Upul B. Dissanayake**  
Vice Chancellor, University of Peradeniya, Sri Lanka*
- 09.55 a.m. *Keynote Address by **Mr. Luxman Siriwardena**  
Executive Director, Pathfinder Foundation*
- 10.15 a.m. *Vote of Thanks by **Prof. J. G. Sri Ranjith**  
Coordinator, PIERs - 2020*
- 10.20 a.m. *Refreshments*

**10<sup>th</sup> DECEMBER, 2020**

**TECHNICAL SESSIONS: SESSION SUMMARY**

*11.00 a.m.-12.30 p.m.* **Technical Sessions I – IV**

- Session I** - Theme : COVID-19 and the Economy
- Session II** - Theme : International Economics and Finance
- Session III** - Theme : Growth and Development
- Session IV** - Theme : Human Capital and Project Management

*12.30 p.m.* *Lunch*

*01.30 p.m. – 2.30 p.m.* **Technical Sessions V – VIII**

- Session V** - Theme : Agriculture and Farm Efficiency
- Session VI** - Theme : International Trade and Finance
- Session VII** - Theme : Investment and Development
- Session VIII** - Theme : Trade and Tourism

*02.40 p.m – 3.10 p.m.* **Invited Speech**

*Dr. Muditha Karunarathna*

*Department of Economics and Statistics, Faculty of Arts,*

*University of Peradeniya, Sri Lanka*

*03.15 p.m. – 4.15 p.m.* **Closing Session**

**Technical Session I: COVID-19 and Impact on Economy**

Time: 11.00 a.m. – 12.30 p.m.

Venue: Room No. 207, First Floor, PGIHS

**Chairperson: Dr. C. R. Abayasekara**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka*

**Discussant: Dr. T. N. Vidanage**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka*

*11.00 a.m. – 11.05 a.m.* Opening Remarks by Chairperson

*11.05 a.m. – 12.05 p.m.* Presentations:

1. The Impact of COVID-19 on Tourism Sector MSEs and its Resilience: A Case Study of Arugam Bay- Sri Lanka  
***J. Sujeeva***
2. A Study of Emergency Learning-Teaching Methods (ELTM) Implemented by the Stakeholders of Kandy Educational Zone (KEZ) during COVID-19 Pandemic  
***R. Gangahagedara, Wasantha Athukorala and Mditha Karunarathna***
3. Impact of COVID 19 on Own Account Workers in Sri Lanka  
***D. N. Ranawaka and I. S. Thennakoon***
4. The Deepening Crisis of Global Capitalism in the Age of COVID-19: Why Marx was Right?  
***Kalpa Rajapaksha***

*12.05 p.m. – 12.20 p.m.* Remarks by the Discussant

*12.20 p.m. – 12.30 p.m.* Closing Remarks by the Chairperson

---

**Technical Session II: International Economics and Finance**

Time: 11.00 a.m. – 12.30 p.m.

Venue: Room No. 301, Conference Hall, Second Floor, PGIHS

**Chairperson: Prof. S. J. S. de Mel**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka*

**Discussant: Dr. T. Vinayagathan**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka.*

*11.00 a.m. – 11.05 a.m.* Opening Remarks by Chairperson

*11.05 a.m. – 12.05 p.m.* Presentations:

1. An Empirical Analysis of Current Account Determinants in Sri Lanka  
**R. M. M. Mayoshi and T. N. Vidanage**
2. An Investigation of Factors Affecting the Exchange Rate in Sri Lanka  
**S.Mathusha**
3. The Relationship between Sustainability Reporting and Financial Performance of Listed Companies in Sri Lanka  
**W.A.P.L. Sandali, W.K.N.C. Gunathilake, M.G.C.D. Deshapriya, M.A.C. Nirman, A.A. Lokeshwara and R.S. Weeraratna**
4. The Twin Deficits Hypothesis in Sri Lanka: An Econometric Analysis  
**A.J.F. Shifaniya and T. Rajeswaran**

*12.05 p.m. – 12.20 p.m.* Remarks by the Discussant

*12.20 p.m. – 12.30 p.m.* Closing Remarks by the Chairperson

**Technical Session III: Growth and Development**

Time: 11.00 a.m. – 12.30 p.m.

Venue: Room No. 208, First Floor, PGIHS

**Chairperson: Senior Prof. A. S. P. Abhayaratne**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka*

**Discussant: Prof. H. M. W. A. Herath**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka*

*11.00 a.m. – 11.05 a.m.* Opening Remarks by Chairperson

*11.05 a.m. – 12.05 p.m.* Presentations:

1. Differences in Household Savings Across Socio Economic and Demographic Characteristics of Sri Lankan Households: Evidence from Household Survey Data 2016  
*A.G.I.Amalka, A.H.M.S.K. Jayasinghe, K.P.U. Jayarathne, T.K. Palihawadana and M.D.R.K. Jayathilaka*
2. Economic Implications of Unpaid Domestic and Care Work of Women  
*Irshad Sreenthaj*
3. A Silver Lining in the Dark Clouds: Stimulating Economic Growth by Promoting Tea-Based Radical Innovations in Sri Lanka  
*H.M.C.G Pilapitiya and Saliya De Silva*
4. Impact of Regional Infrastructure Facilities on Provincial GDP in Sri Lanka  
*R. C. Jayatissa and T L Navaratne*

*12.05 p.m. – 12.20 p.m.* Remarks by the Discussant

*12.20 p.m. – 12.30 p.m.* Closing Remarks by the Chairperson

---

**Technical Session IV: Human Capital and Project Management**

Time: 11.00 a.m. – 12.30 p.m.

Venue: Room No. 106, Ground Floor, PGIHS

**Chairperson: Prof. M. B. Ranathilaka**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka*

**Discussant: Prof. J. G. Sri Ranjith**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka*

*11.00 a.m. – 11.05 a.m.* Opening Remarks by Chairperson

*11.05 a.m. – 12.05 p.m.* Presentations:

1. Japanese Technical Intern Training Program: A Way to Develop Human Capital in South East Asia  
*Peemmaphat Buarapha and Saliya De Silva*
2. Cost Benefit Analysis of Solar Power Electricity Consumption in Katugasthota Municipal Area  
*M.M.D.V. Bandara and Muditha Karunarathna*
3. Cost Pricing of Private versus Government Biochemistry Laboratory Tests in Sri Lanka  
*K. H. I. S. Hettiarachchi, S. S. K. B. M. Dorabawila and D. Dissanayake*
4. The Impact of the Organizational Mission Drift on its Employee Effort  
*D.I.J. Samaranayake and S. Banuri*

*12.05 p.m. – 12.20 p.m.* Remarks by the Discussant

*12.20 p.m. – 12.30 p.m.* Closing Remarks by the Chairperson

### **Technical Session V: Agriculture and Farm Efficiency**

Time: 01.30 p.m. – 02.45 p.m.

Venue: Room No. 106, Ground Floor, PGIHS

**Chairperson: Prof. Gunathilaka Herath**

*Visiting Fellow, PGIA, Faculty of Agriculture,  
University of Peradeniya, Sri Lanka*

**Discussant: Dr. A. D. H. K. Kankanamge**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka*

01.30 p.m. – 01.35 p.m. Opening Remarks by Chairperson

01.35 p.m. – 02.20 p.m. Presentations:

1. An Analysis of Household Rice Expenditure patterns in Urban, Rural and Estate Sectors in Sri Lanka: Using MPE Approach  
*N.J.C. Paraneetharan, J. Nigel and T. Vinayagathan*
2. An Economic Evaluation of Fertilizer Subsidy on Paddy Production in Sri Lanka  
*M. P. S. S. Sisirakumara, Muditha Karunaratna and Wasantha Athukorala*
3. Overcoming Economic Impact due to Rainfall Variability in Mahailuppallama by Using Gamma Distribution  
*K.A.N.L. Kuruppuarachchi, L.H.P. Gunaratne and K.H.M.S. Premalal*

02.20 p.m. – 02.35 p.m. Remarks by the Discussant

02.35 p.m. – 02.45 p.m. Closing Remarks by the Chairperson

---

### **Technical Session VI: International Trade and Finance**

Time: 01.30 p.m. – 02.45 p.m.

Venue : Room No. 301, Conference Hall, Second Floor, PGIHS

**Chairperson: Prof. S. Vijesandiran**

*Department of Economics and Statistics, Faculty of Arts  
University of Peradeniya, Sri Lanka*

**Discussant : Dr. T. Vinayagathan**

*Department of Economics and Statistics, Faculty of Arts,  
University of Peradeniya, Sri Lanka*

01.30 p.m. – 01.35 p.m. Opening Remarks by Chairperson

01.35 p.m. – 02.20 p.m. Presentations:

1. Effects of Non-Tariff Measures on Fruit Exports from Afghanistan: A Gravity Analysis  
*S. Sahibzada and J. Weerahewa*
2. An Empirical Analysis of the Effects of Fiscal Policy on Stock and Bond Markets in Sri Lanka  
*D.M.S.M. Dissanayaka*
3. Impact of Macroeconomic Variables on Stock Market Performance in Sri Lanka  
*W. M. T. Jayamali*

02.20 p.m. – 02.35 p.m. Remarks by the Discussant

02.35 p.m. – 02.45 p.m. Closing Remarks by the Chairperson

---

### **Technical Session VII: Investment and Development**

Time: 01.30 p.m. – 02.45 p.m.

Venue: Room No. 207, First Floor, PGIHS

**Chairperson: Prof. N.D. Samarawickrama**

*Council Member,*

*University of Peradeniya, Sri Lanka*

**Discussant: Dr. S. S. K. B. M. Dorabawila**

*Department of Economics and Statistics, Faculty of Arts,*

*University of Peradeniya, Sri Lanka.*

01.30 p.m. – 01.35 p.m. Opening Remarks by Chairperson

01.35 p.m. – 02.20 p.m. Presentations:

1. The Impact of External Debt on Foreign Direct Investment in Sri Lanka  
*A.M.K. Weerakoon and S. Vijesandiran*
2. Institutional Determinants of Domestic Investment: A GMM Panel Data Analysis  
*Mirwais Parsa and Soumya Datta*
3. Impact of Economic Growth on Income inequality: A Case Study of Sri Lanka  
*K.A.N.I. Kariyapperuma*

02.20 p.m. – 02.35 p.m. Remarks by the Discussant

02.35 p.m. – 02.45 p.m. Closing Remarks by the Chairperson

---

### **Technical Session VIII: Trade and Tourism**

Time: 01.30 p.m. – 02.45 p.m.

Venue: Room No. 208, First Floor, PGIHS

**Chairperson: Prof. D. N. B. Gunewardena**

*Department of Economics and Statistics, Faculty of Arts,*

*University of Peradeniya, Sri Lanka*

**Discussant: Dr. Muditha Karunarathna**

*Department of Economics and Statistics, Faculty of Arts,*

*University of Peradeniya, Sri Lanka*

01.30 p.m. – 01.35 p.m. Opening Remarks by Chairperson

01.35 p.m. – 02.20 p.m. Presentations:

1. A Political Economic Analysis of the Sri Lanka-Singapore Free Trade Agreement  
*A.S.G.S. Bandara and K.D.M.S.B. Wijerathna*
2. The Dynamic and Causal Relationship between Tourism and Economic Growth in Sri Lanka  
*K. Kumudhini*
3. Violent Protests and Transitional Regimes: Empirical Evidence from Arab Spring  
*Tariq Basir and Soumya Datta*

02.20 p.m. – 02.35 p.m. Remarks by the Discussant

02.35 p.m. – 22.45 p.m. Closing Remarks by the Chairperson

---

## **CLOSING SESSION**

**Time: 03.15 p.m. – 04.15 p.m.**

**Venue: Conference Hall, 2<sup>nd</sup> Floor, PGIHS**

**Chairperson: Prof. S. Vijasandiran**

*Chair, PIERS - 2020*

*Department of Economics and Statistics, Faculty of Arts,*

*University of Peradeniya, Sri Lanka*

- 03.15 p.m.*      Opening remarks by Chairperson
- 03.20 p.m.*      Awarding of Certificates
- 03.30 p.m.*      Concluding Remarks & Evaluation
- 03.40 p.m.*      Vote of Thanks: ***Prof. H.M.W.A. Herath***  
*(Advisor, PIERS – 2020)*  
*Head, Department of Economics and Statistics*
- 03.50 p.m.*      Refreshments
- 04.15 p.m.*      End of Symposium

## **Global Economy and Local Policy Challenges: Options for Foreign Debt Management**

Dear all, good morning,

Let me begin with extending my sincere thanks to Prof. Ari Herath and his team for organizing this very significant research conference and especially for inviting me to be the keynote speaker. Let me also congratulate you for being able to organize this International Research Conference amid the challenges of the current COVID 19 spread. Of course, Peradeniya University has always have been at the forefront of being able to undertake challenges of this nature invariably coming out with great success.

Prof. Herath suggested to me that the timely topic for this key note address is “**Post-pandemic Economic Revival in Sri Lanka: Challenges, Opportunities and Alternative Policy Perspectives**”

Let me, at the very outset accept the fact that the current economic situation and related social outcomes are globally, as well as locally, gloomy and a return to normalcy in the short run is unimaginable. The entire world is going through an unprecedented health crisis which has driven the almost all countries other than China into negative economic growth. As we all are aware, social distancing and shutting down of factories and other work places, lockdowns and other travel restrictions are all contributing to a drastic reduction of production and delivery of services at all levels. Whatever the scale of operation, ranging from multinationals to our smallest road-side businesses, all have been negatively affected.

**Table 1: Overview of the World Economic Outlook Projections, October, 2020**

	2019	Projections		Difference from June 2020 WEO Update <sup>1</sup>	
		2020	2021	2020	2021
<b>World Output</b>	<b>2.8</b>	<b>-4.4</b>	<b>5.2</b>	<b>0.8</b>	<b>-0.2</b>
<b>Advanced Economies</b>	<b>1.7</b>	<b>-5.8</b>	<b>3.9</b>	<b>2.3</b>	<b>-0.9</b>
United States	2.2	-4.3	3.1	3.7	-1.4
Euro Area	1.3	-8.3	5.2	1.9	-0.8
Germany	0.6	-6.0	4.2	1.8	-1.2
France	1.5	-9.8	6.0	2.7	-1.3
Italy	0.3	-10.6	5.2	2.2	-1.1
Spain	2.0	-12.8	7.2	0.0	0.9
Japan	0.7	-5.3	2.3	0.5	-0.1
United Kingdom	1.5	-9.8	5.9	0.4	-0.4
Canada	1.7	-7.1	5.2	1.3	0.3
Other Advanced Economies <sup>2</sup>	1.7	-3.8	3.6	1.1	-0.6
<b>Emerging Market and Developing Economies</b>	<b>3.7</b>	<b>-3.3</b>	<b>6.0</b>	<b>-0.2</b>	<b>0.2</b>
Emerging and Developing Asia	5.5	-1.7	8.0	-0.9	0.6
China	6.1	1.9	8.2	0.9	0.0
India <sup>3</sup>	4.2	-10.3	8.8	-5.8	2.8
ASEAN-5 <sup>4</sup>	4.9	-3.4	6.2	-1.4	0.0
Emerging and Developing Europe	2.1	-4.6	3.9	1.2	-0.3
Russia	1.3	-4.1	2.8	2.5	-1.3
Latin America and the Caribbean	0.0	-8.1	3.6	1.3	-0.1
Brazil	1.1	-5.8	2.8	3.3	-0.8
Mexico	-0.3	-9.0	3.5	1.5	0.2
Middle East and Central Asia	1.4	-4.1	3.0	0.4	-0.5
Saudi Arabia	0.3	-5.4	3.1	1.4	0.0
Sub-Saharan Africa	3.2	-3.0	3.1	0.2	-0.3
Nigeria	2.2	-4.3	1.7	1.1	-0.9
South Africa	0.2	-8.0	3.0	0.0	-0.5

**Source: IMF staff estimates, World Economic Outlook, October, 2020 update**

As clearly indicated in the data, this drastic and unprecedented economic setback in almost all the countries of the world was due to the pandemic related lockdowns, resulting in disruption of global value chains. Of course, the past few years prior to the pandemic economic disruptions created by the US military interventions and trade wars were driving the world into an economic and political uncertainties.

At the very beginning of the pandemic, China, which was considered to be the manufacturing hub of the world, was affected disrupting the consumption of raw materials, supply of intermediate and final products as well as consumer demand. Within a few weeks all advanced economies, as we all know, were confronting much more serious disruptions than China. As

indicated in the above table, only China has escaped from falling to negative growth. The most recent IMF report indicates that the global economy is climbing out of the depths to which it had plummeted during the Great Lockdown in April. But with the COVID 19 pandemic continuing to spread through new spikes, many countries have slowed down reopening or resorted to partial lockdowns from time to time. While recovery in China, which I consider as a 'Miracle of the Miracles', has been much speedier than western economies expected. The growth seen in these economies during 3Q2020 has lost momentum. The prospect of the global economy returning back to pre-pandemic activity levels has been experiencing many setbacks. The IMF has indicated that global GDP at the end of 2021 would still be 6.5 percent lower than it was in January 2020, before the pandemic began to affect economic activity around the world. This forecast was made before the recent spikes in COVID-19.

### **Overview of Sri Lankan Economy: Still Suffering from Pre-Pandemic and Pandemic Disruptions**

The Sri Lankan economy, which experienced much lower rate of growth than its potential in 2018 and 2019 aggravated by the crisis due to 19<sup>th</sup> amendment to the constitution and Easter Sunday bombings, is now encountering ongoing challenges due to the outbreak of COVID 19. According to the most current Central Bank of Sri Lanka (CBSL) reports, our economy contracted by 1.6% in the first quarter of 2020, year-on-year basis reflecting the combined effect of the spread of COVID 19 virus locally and the slowdown in global economic activities.

Despite this unprecedented health and economic shock, the recovery of economic activity was promoted and facilitated by the prompt and extensive response of the government and the Central Bank. The government machinery was directly mobilised to provide assistance to meet the immediate needs of the disadvantaged segment of the population, while the health and military establishments were well deployed to take control of the spread of COVID 19. Government and the Central Bank measures, included a series of monetary easing policies, including multiple reductions of interest rates and the Statutory Reserve Ratio (SRR) as well as

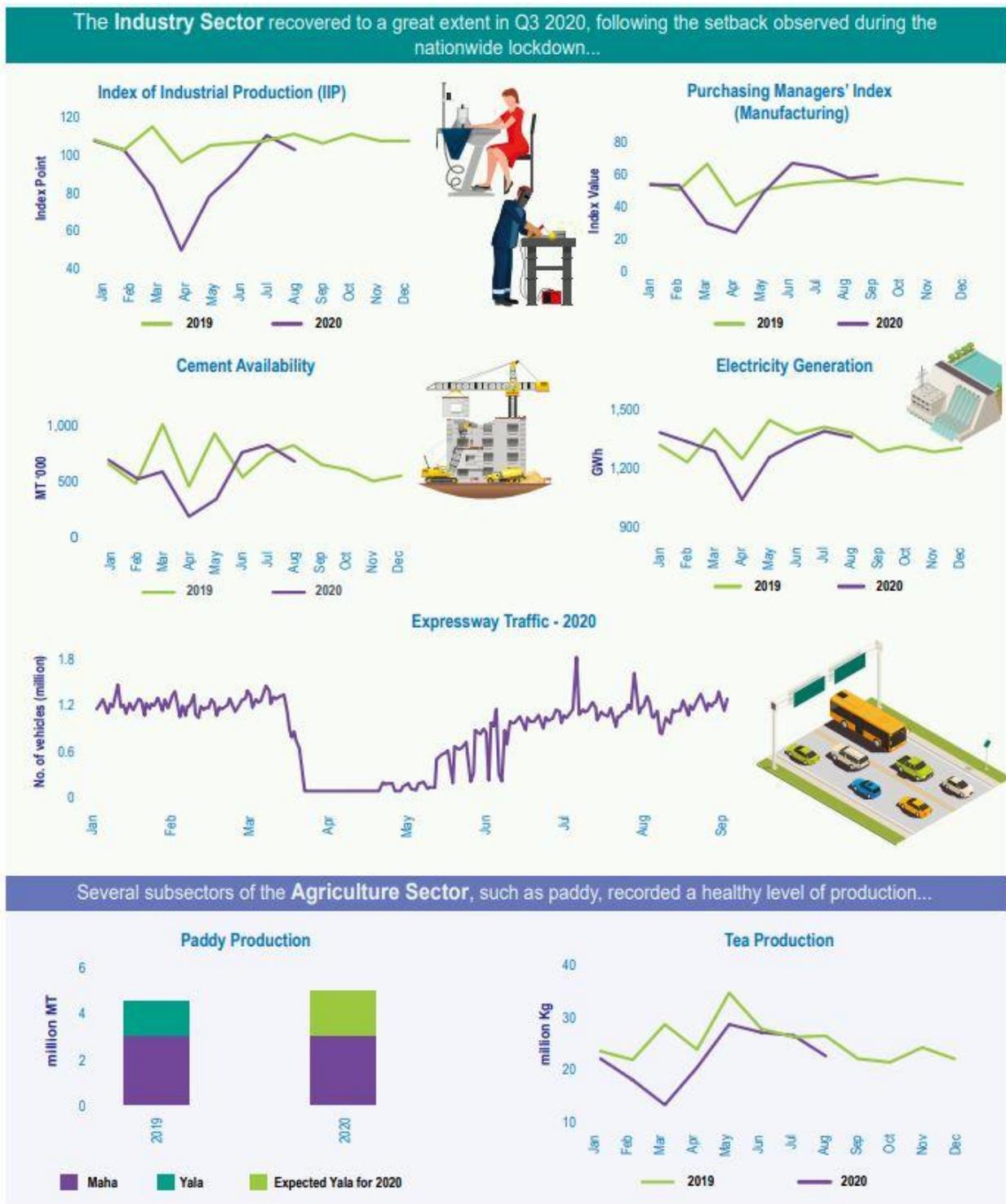
debt moratoria, concessional (Saubagya) loans and a partial guarantee by the government. These measures resulted in ample liquidity in the market and a lowering of borrowing costs.

The government, which was aware of the issues relating to external stability even prior to the COVID 19 setbacks, immediately introduced a set of measures to take charge of the situation. The external sector, which was severely affected at the initial stage of the pandemic, rebounded with the improvement in the trade balance, a revival of workers remittances and stabilizing the exchange rate. External sector stability was further ensured by the restrictions placed on non-essential (big-ticket) imports, such as motor vehicles. Low petroleum prices in the global market was also helpful. These outcomes helped to offset the reduction of foreign exchange earnings from sectors such as tourism.

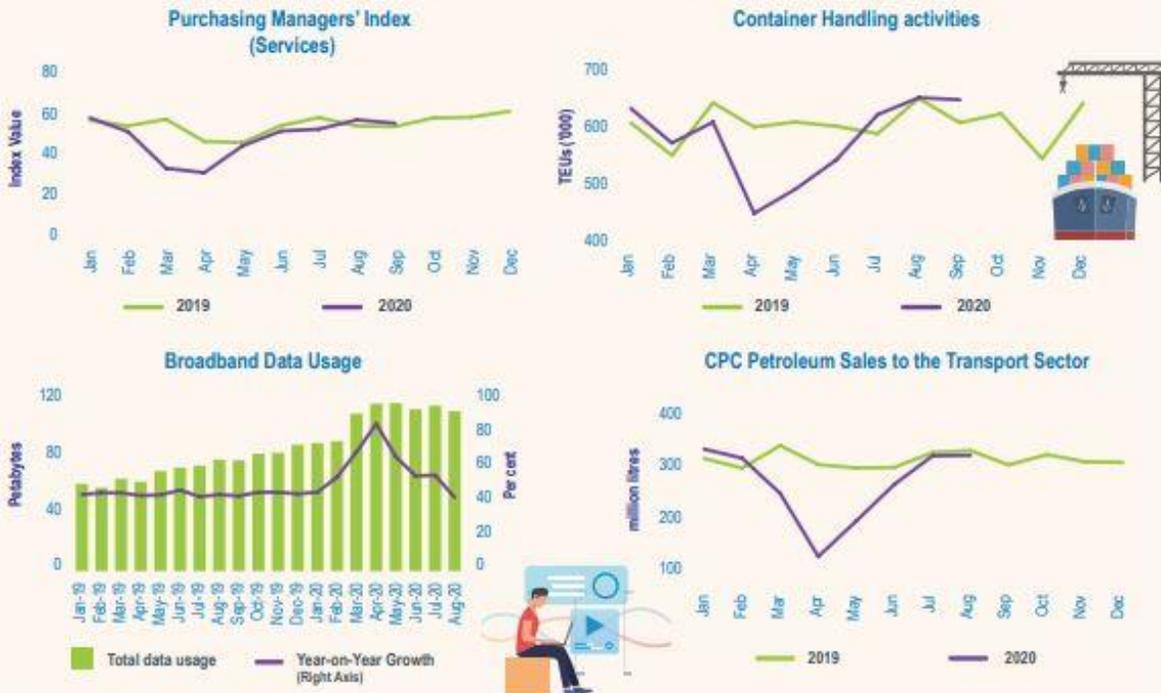
Although these adjustments will be helpful in achieving the short- and medium-term recovery of the economy, it is also necessary to promote an increase in goods and services exports and the attraction of foreign direct investments. At the same time, taking advantage of the opportunities created due to import restrictions, local agricultural and industrial enterprises need to respond speedily and efficiently

The graphic presentation of the recovery of the Sri Lankan economy presented in a recent CBSL report using high frequency data is reproduced here, which is better than writing many paragraphs.

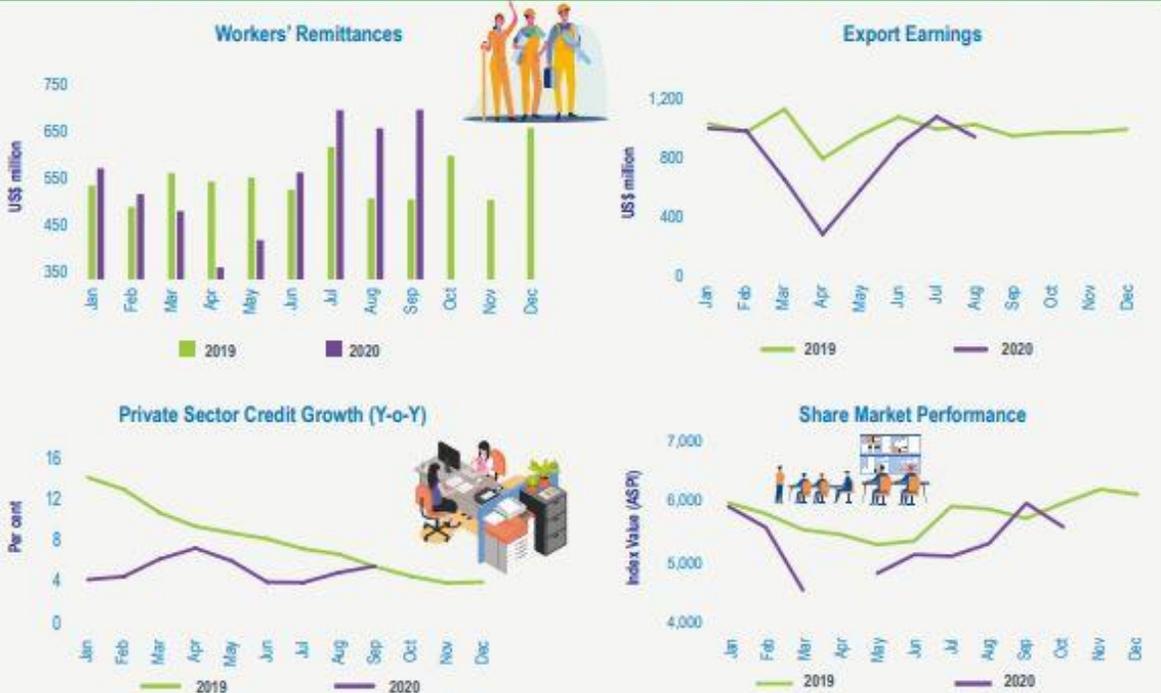
**Figure 1: Recovery of the Sri Lankan Economy**



Most activities in the **Services Sector** reached pre-pandemic levels by Q3 2020, despite the immediate impact of the pandemic...



A broad based recovery was also observed in **Other Macroeconomic Indicators** during Q3 2020...



Sources: Central Bank of Sri Lanka, Ceylon Electricity Board, Ceylon Petroleum Corporation, Colombo Stock Exchange, Department of Agriculture, Department of Census and Statistics, Road Development Authority, Sri Lanka Customs, Sri Lanka Ports Authority, Sri Lanka Tea Board and industry participants

Source: CBSL Reports, 2020; Recent Economic Developments: Highlights of 2020 and Prospects for 2021

## Sri Lanka's current and Impending Economic Challenges

The setback due to the pandemic has aggravated some of the perennial macro-economic and sectoral problems. For example, borrowing and accumulating external debts has been a practice of successive governments since 1978, which was the year of partial liberalization of the economy. During the early periods, when Sri Lanka was considered a low-income country, we were entitled to substantial grant aid as well as concessionary finances.

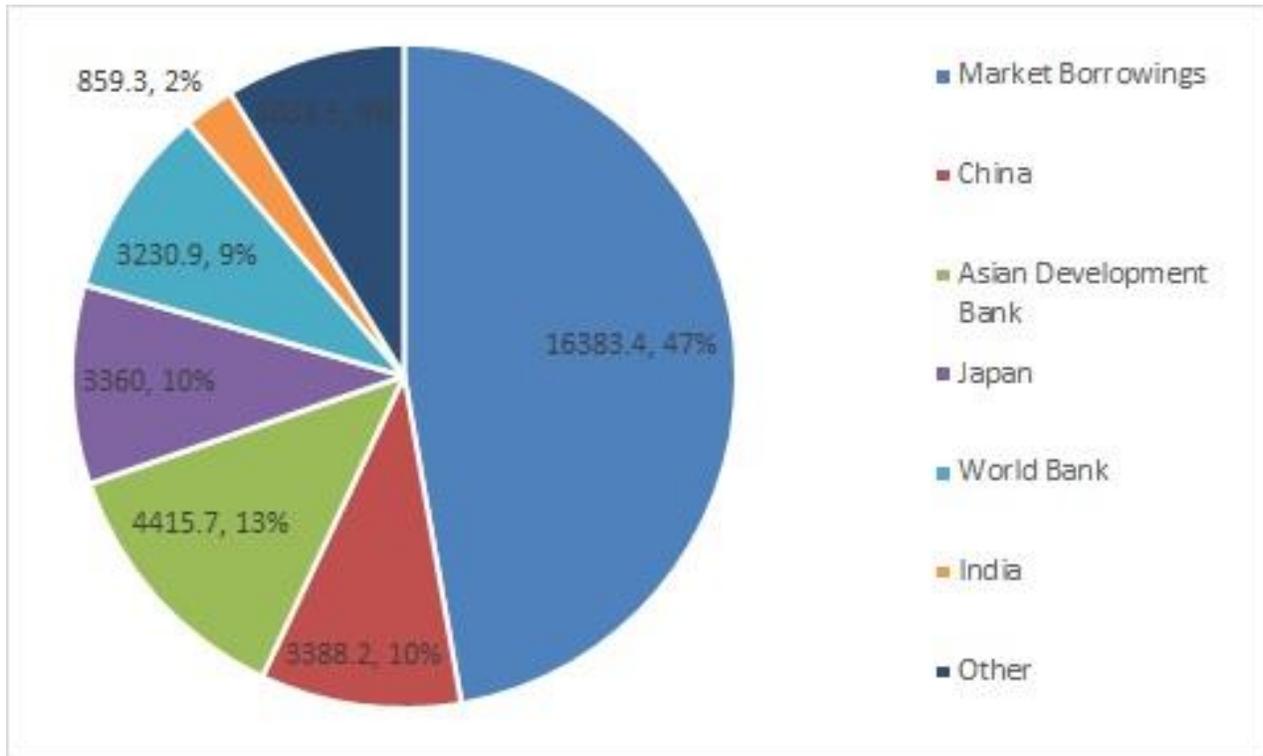
This relatively low interest facilities and lenient conditionalities provided incentives for the successive governments to keep borrowing for many development projects, from bi-lateral and multi-lateral lending agencies, irrespective of their inflated costs. In most of these cases, financial benefits also spill over to our politicians, bureaucrats, and technocrats. Notwithstanding such leakages, most of these foreign funded projects increased the availability of more sophisticated infrastructure and utilities in sectors such as, electricity, highways, drinking and irrigation water, as well as the Colombo port and airport. In addition, education, agriculture and health were the prime targets of both Sri Lankan policy makers and donors/lenders.

There was a period that Sri Lanka was termed as “**a Donor Darling**”. However, since we attained lower-middle income country status, concessionary funding has not been available and therefore, most borrowings have been at commercial or near commercial lending rates. In this context, the country has accumulated over US\$ 34.7bn debt<sup>1</sup>. These borrowings have been for development projects, import of consumption items and direct budgetary support to meet current expenditure, including debt servicing. The current debt situation is depicted in the following chart.

---

<sup>1</sup> Foreign Debt stock by Major Lenders, in US \$ Million, External Resources Department (ERD), Ministry of Finance of Sri Lanka 2019. See more; [http://www.erd.gov.lk/index.php?option=com\\_content&view=article&id=102&Itemid=308&lang=en](http://www.erd.gov.lk/index.php?option=com_content&view=article&id=102&Itemid=308&lang=en)

**Figure 2: Foreign Debt Stock by Major Lenders (US\$ million) as end of 2019**



**Source: External Resources Department (ERD), Ministry of Finance of Sri Lanka 2019**

At the moment, one of the most critical challenge for the current administration is managing the sustainability of Sri Lanka’s debt while meeting the current level of foreign exchange requirements and hopefully implementing necessary development projects.

While the selected so-called development projects are funded by the traditional multilateral donors; World Bank and ADB as well as bilateral lending institutions such as JICA, US-AID and similar institutions in China and European countries, the rates of lending are equal or closer to the market rates. Borrowing through International Sovereign Bonds (ISB), which became a practice since 2007, has recently become the most serious challenge for the current government to ensure sustainability of debt management.

Today, I want to bring this particular issue to this distinguished academic gathering consisting of academics of the economic discipline, graduate students and other budding economists.

That is, how should we manage the debt sustainability of Sri Lanka, which has been severely undermined by the COVID 19 pandemic that has pushed almost the entire world into a recession.

Conventional policy-makers, academics and consultants' recommendation for many emerging markets and developing countries, is to seek the refuge of, first, the International Monetary Fund, and then turn to other multilateral and bilateral lenders, while qualifying for accessing the International Sovereign Bond Market. According to this prescription, without the support and blessing of the IMF, we have no way of securing sufficient funding for our balance of payment requirements or development-oriented projects.

As an IMF program is likely to require some form of debt reduction to meet the Fund's debt sustainability parameters, you may perhaps understand, that this approach is not even to reduce the severity of the debt problem but for reducing the burden over the next few years by extending maturities probably supported by some 'Grace Period'. The bottom line will be that Sri Lanka will continue to have challenging debt dynamics which I would like to call it as '**IMF/ISB DEBT TRAP**' as long as we fail to achieve substantial export and FDI increase. We will merely be postponing the problem unless we can accelerate growth by increasing production of tradable which will earn or save foreign exchange.

Debt trap was caused by poor fiscal outcomes over many years and IMF/ISB debt was incurred to meet deficit financing. Some economists who are faithful followers of IMF Policy Prescriptions identified the IMF/ISB Debt Trap as the symptoms not causes of the problem.

In my presentation today, the most pertinent and decisive issue to raise is, what should be the policy recommendations of our learned academics and students who are in this distinguished gathering? Please, however, know that, if the country decided to go to the IMF, they will provide funding as Balance of Payment support subject to certain conditionalities which are very likely to include: removal of subsidies, total removal of import controls; both tariffs and non-tariffs, non-strategic assets privatization, removal of price controls and many such measures of government interventions.

Many, if not all these adjustments will be painful to the ordinary citizens and therefore, difficult to sell politically. If Sri Lanka for that matter, any other country in our predicament is not willing to go through an IMF austerity program with its stringent conditionalities, what are the options available for them. Let's discuss what appears to be the economic management strategy of the

current government. With the lockdown of the world economies and disruption of global value-chains, Sri Lankan government was compelled to 'Close the Economy' to some degree. Subsequently, the government policy makers seem to be implanting fairly well-managed import management and associated measures to ensure enhanced foreign exchange savings. But import controls were selective targeting non-essential 'big-ticket' items.

In order to prevent further deterioration of the debt situation the government seems to be reducing new borrowings for implementation of the so-called development projects. Both acceding to IMF austerity program, as well as, controls imposed by the government will have contractionary impact on the local economy. Of course, second option will reduce the confidence of markets, foreign investors and even some local enterprises. Generally, IMF programs are sold to a government in-need of Balance of Payment Support on the basis that IMF approval would pave the way for the country to achieve a higher sovereign rating and investor confidence.

My question to the audience is, as learned economists, professionals and potential advisors, are we in a position to develop necessary concepts, theories or models suggesting an alternative development strategy for Sri Lanka in order to overcome the current difficulties and attain a sustainable growth path. Can we come up with a strategy which will cause less pain than an IMF program to the people of Sri Lanka have more positive outcomes in terms of output, employment and incomes?

Unfortunately, over my 45-year career in the public and private sectors in Sri Lanka, I have rarely seen a Sri Lankan policy maker or an academic develop or attempt to develop alternative development concepts or strategies instead of repeating what they have learned in the local or foreign universities.

In conclusion, let me quote from my recently published article which hopefully will pave a way for a vibrant discourse in this prestigious academic institution, the University of Peradeniya.

*“Whatever the reasons are, instead of thinking independently on their own they parrot their mentors in the west for short-term gains like easy recognition and self-fulfillment continuing the vicious circle and perpetuating the misery of their people. Irony is that when a solution is needed the only thing our experts are capable of doing is seeking refuge in programs of multilateral lending agencies. Dear distinguish friends as you may be already aware that, Sri Lanka has already gone under 16-IMF Programs. This reminds us the famous saying attributed to Einstein that “insanity is doing the same thing over and over again and expecting different results”.*

---

## **An Economic Evaluation of Fertilizer Subsidy on Paddy Production in Sri Lanka**

**M. P. S. S. Sisirakumara, Muditha Karunarathna  
and Wasantha Athukorala**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Keywords:** *Fertilizer subsidy; Paddy production; Relative advantage;  
Sri Lanka*

### **Introduction**

The rice sector plays an important role in the domestic agriculture of Sri Lanka. During the period 2000-2019, annual average contribution of rice farming to agricultural GDP of the country was 20 per cent (Central Bank of Sri Lanka, 2019). The rice sector had been facing unprecedented challenges in Sri Lanka since the early 1960s, such as stagnant yield, diminishing income due to escalation of costs of production, and abandonment of rice lands (Athukorala et al. 2012). These issues were mainly due to low productivity. From the late 1960s to early 1970s the government identified the need to increase productivity of rice farming. Subsidies played an important role in increasing productivity. Besides food security, the government subsidy programmes in a developing country also targets poverty alleviation, rural development, and increased revenue.

The Government of Sri Lanka has entered the chemical fertilizer market since 1962 with the introduction of a fertilizer subsidy scheme. At present, paddy cultivation in Sri Lanka largely depends on subsidies which are not highlighted in policy discussions. Fertilizer subsidy is the most controversial input subsidy program provided for paddy farming. It was initiated in 1962 with the introduction of High Yielding Varieties (HIVs) during the Green Revolution. At present fertilizer subsidies on paddy farming account approximately 50% of the overall use of chemical fertilizer in the country and it is approximately Rs. 40 billion in value (Central Bank of Sri Lanka 2018). Given this background, this study focused on identifying the relative advantage of the fertilizer subsidy scheme of paddy in Sri Lanka.

## Objectives

The main objective of the study was to investigate the relative advantage of the fertilizer subsidy scheme among different districts in Sri Lanka. It is also sought identify the cost and benefit of giving a fertilizer subsidy to paddy farmers in the country.

## Methodology

This study used secondary data on paddy production and the fertilizer subsidy in Sri Lanka between 2005 and 2019 which includes all 25 districts. Main variables used in this analysis were total paddy production (MT), fertilizer subsidy expenditure (Rs / billion), value of total paddy production (Rs / billion) and land extent cultivated (hectares). This study used panel data techniques. The pooled OLS model is given by Equation 1.

$$Y_{it} = \beta_0 + \beta_1 F_{it} + \beta_2 L_{it} + \beta_3 D_1 + \beta_4 D_2 + \beta_5 D_3 + v_{it} \quad (1)$$

Where,  $i = 1, 2, \dots, 25$  (districts);  $t = 2005, \dots, 2019$  (year);  $L$  = cultivated land area;  $F$  = Expenditure on fertilizer subsidies;  $D_1$  = dummy variable (1 if Yala season, 0 otherwise);  $D_2$  = dummy variable (1 if dry zone, 0 otherwise);  $D_3$  = dummy variable (1 if Intermediary zone, 0 otherwise);  $Y_{it}$  = dependent variable which is the average production by each district in year  $t$ ,  $\beta_0$  =  $Y$  intercept across all district.  $v_{it}$  = white noise error term.

Study also used random effects model given by Equation 2,

$$Y_{it} = \beta_0 + \beta_1 F_{it} + \beta_2 L_{it} + \beta_3 D_1 + \beta_4 D_2 + \beta_5 D_3 + w_{it} \quad (2)$$

Where,  $w_{it} = \mu_i + v_{it}$  with  $\mu_i$  being unobservable household effects, in particularly, unobservable district effects lie precisely in  $\mu_i$ .

## Results and Discussion

Table 1 show that there is not much difference between the two seasons (Yala and Maha) and other climatic zones. According to average cultivated land areas, intermediate and dry zone are slightly larger by extent than the other regions, but the data show that the extent of land has no effect on paddy productivity. The wet zone reported the lowest average cultivated extent, but paddy productivity (kg/ha) is almost the same as in other zones. The lowest average fertilizer expenditure was identified from the wet zone.

Table 1: Average Figures with Different Seasons and Climatic Zones

Variable	Yala Season	Maha Season	Dry Zone	Wet Zone	Intermediate Zone
Paddy Yield (Kg/ha)	3,983	3,871	4,173	3,418	4,402
Land Area (ha)	26,271	14,875	27,566	8337	29,043
Fertilizer Expenditure (Rs/ MT)	934	512	982	284	1,007

Note: All the information related to paddy yield and cultivated land area are taken from the website of Department of Census and Statistics in Sri Lanka.

As a part of the analysis, we estimated the tolerable level of output for each year (see Table 2 below). The purpose of this calculation is to identify the effectiveness of providing a fertilizer subsidy for paddy production in Sri Lanka. A wide variation between years was observed due to changes in the subsidy amount granted. Total government expenditure on subsidy as a per cent of total value of the paddy output varies from 9 % to 36 % over the study period.

Table 2: Tolerable Level of Output of Paddy for Yala / Maha Season

Year	Subsidy as a % of total value of the paddy	Deduction Ratio (Yala)	Deduction Ratio (Maha)
2005	21.52	78	78
2006	23.59	79	78
2007	22.84	78	75
2008	17.70	84	88
2009	15.38	81	88
2010	14.72	84	88
2011	16.79	85	85
2012	18.61	76	78
2013	9.48	90	88
2014	20.90	80	80
2015	16.14	84	83
2016	18.85	59	40
2017	36.14	66	62
2018	22.62	70	71

Note: Deduction Ratio is estimated based on the total cost of fertilizer subsidies and total value of paddy output in the country in each season.

When estimating the panel data model, we first tested for the correlation of unobservable individual district effects and determinants of average

production of paddy. For this purpose we used the Hausman test. This tests the null hypothesis for non-existence of correlation between unobservable individual effects and determinants of the average yield, against the alternative hypothesis of the existence of correlation. If the null hypothesis is not rejected, we can conclude that the correlation is not relevant and therefore a panel model of random effects is the most appropriate way of carrying out the analysis. In this study we first ran the pooled OLS fixed effects and then the random effects model incorporating all variables. Based on the various tests including the Hausman test, the latter model was selected and estimated after controlling for different variables.

The results of the random effects model are reported in Table 3. We also estimated the different versions of the models by controlling for different variables. Accordingly, in Table 3, model 1 (M1) includes only the fertilizer subsidy variables, model 2 (M2) includes cultivated land area related variables in addition to the fertilizer variable and we include the dummy variables in model 3 (M3). When comparing results between different models, it is clear that most parameter estimates of all the models are statistically significant, indicating their importance in rice production in Sri Lanka.

Table 3: The Results of the Random Effects Model

Variables	M1	M2	M3
Fertilizer subsidies (F)	0.888*** (0.021)	0.177*** (0.000)	0.170*** (0.019)
Cultivated land area (L)		0.807*** (0.019)	0.807** (0.019)
D1			-0.010 (0.018)
D2			0.141*** (0.018)
D3			0.179*** (0.026)
Constant	-3.060*** (0.126)	-0.214* (0.129)	-0.238* (0.125)
Observations	677	677	677
R-squared within	0.393	0.823	0.823
Between	0.974	0.971	0.986
Overall	0.866	0.948	0.962

Note: Standard errors in parentheses. \*\*\*, \*\*, and \* denote 1%, 5 % and 10 % levels of significance respectively.

The fertilizer subsidy variable is significant in all the specifications of the models and takes the expected sign. However, it becomes clear, as expected, that the effect of fertilizer subsidies is gradually decreasing when more variables are introduced into the model. The coefficient value of this variable becomes gradually lower.

## **Conclusion**

The result of the study shows that while there is a significant variation of total paddy production, the ratio between the value of total fertilizer subsidies and the value of total rice production in the country varies from 9 % to 36 % during the study period. Furthermore, panel data regression results confirm that total fertilizer subsidies, cultivated land area and regional variation have significant impacts on total paddy production in the country. The results of this study will help the government to understand the effectiveness of the existing subsidy program and design a more appropriate as well as targeted system in the future.

## **References**

- Bowler, I. R. (1976). Spatial responses to agricultural subsidies in England and Wales. *The Royal Geographical Society*, 8(3), 225-229.
- Ekanayake, H. K. J. (2005). The impact of fertilizer subsidy on paddy cultivation in Sri Lanka. Central Bank of Sri Lanka, Staff Series, 36. Colombo.
- Herath, H., Gunawardhana, E. and Wikramasinghe, W. (2013). The Impact of Ketha Aruna Fertilizer Subsidy Program Use and Paddy production in Sri Lanka. *Tropical agricultural research*, 25 (1), 14-26.
- Sing, R. (2004). The development of seed fertilizer technology in Indian rice agriculture. *Agricultural history society*, 68(1), 20-53.

## **The Impact of External Debt on Foreign Direct Investment in Sri Lanka**

**A.M.K. Weerakoon<sup>1</sup> and S.Vijesandiran<sup>2</sup>**

*<sup>1, 2</sup> Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Keywords:** *Foreign direct investment; External debt; ARDL Model*

### **Introduction**

Foreign Direct Investment (FDI) is an important avenue to earn foreign exchange, resolve the external debt problem, and promote economic growth. The literature has revealed that FDI is influenced mainly by external debt and also other factors such as inflation rate, interest rate, and trade openness (Muzurura, 2016). A high level of external debt results in harmful effects on an economy by reallocating FDI from productive investment to resolving external debt issues (Krugman, 1988). Hence, the relationship between external debt and FDI is considered an important factor since the developing countries are highly dependent on foreign debt to accelerate economic growth and fulfill their development needs (Mugambi, 2016).

In Sri Lanka, the Government's debt to GDP ratio was increased by 76.9% while FDI was increased by only 17.3% in 2017 while in 2018, the foreign debt recorded one of the largest increases since 1977 (Central Bank of Sri Lanka, 2018). It is noted that attracting FDI is an essential strategy to earn foreign reserves to pay the external debt and solve the public debt problem in Sri Lanka. Therefore, finding solutions to maintain public debt and attract FDI becomes an issue of high concern in the country. However, the relationship between external debt and FDI has not been explored widely in Sri Lanka. Hence, this research attempts to examine the impact of external debt on FDI and expected to provide a very important role in the current public debt problem as well as FDI flows in Sri Lanka.

### **Objectives**

The overall objective of this study is to analyze the impact of external debt on foreign direct investment in Sri Lanka.

## Methodology

The Neoclassical Theory of FDI (Solow, 1956) and the Theory of Debt Overhang (Krugman, 1988) is used to develop the research framework for this study. In this study, Time series data from 1978 to 2017 are used and the sources of data are from the Central Bank of Sri Lanka and World Development Indicators of the World Bank Report of 2018. The study adopted Foreign Direct Investment (FDI) as the dependent variable; and External Debt (EXD), Interest Rate (INT), Inflation Rate (INF), and Openness of the Economy (OPN) are taken as independent variables to develop the following functional form:

$$FDI = f(EXD, INT, INF, OPN) \quad (1)$$

The above model has transformed into a Multiple Linear Regression Model (MLRM) as given below:

$$FDI_t = \beta_0 + \beta_1 EXD_t + \beta_2 INT_t + \beta_3 INF_t + \beta_4 OPN_t + \varepsilon_t \quad (2)$$

Two variables in the above model were transformed into natural logarithm Form (NLF), which are Foreign Direct Investment (lnFDI) and External Debt (lnEXD). The model is given below:

$$\ln FDI_t = \beta_0 + \beta_1 \ln EXD_t + \beta_2 INT_t + \beta_3 INF_t + \beta_4 OPN_t + \varepsilon_t \quad (3)$$

The study used the Augmented Dickey-Fuller (ADF) test to check for the stationarity of variables and Akaike Information Criteria (AIC) to select the optimum number of lags. Result of the ADF tests revealed that the order of integration are mixed (see Table 1 in appendix) with I(0) and I(1), which suggests the use of Auto-Regressive Distributed Lag (ARDL) model to estimate the parameters. The result of AIC advocates the use of ARDL (1,1,0,0,0) model as the best model among top 20 models. Therefore, ARDL Bounds testing approach was used to test for cointegration between the variables. Hence, the ARDL model derived for this study is given below:

$$\begin{aligned} \Delta \ln FDI_t = & \beta_0 + \beta_1 \ln FDI_{t-1} + \beta_2 \ln EXD_{t-1} + \beta_3 INT_{t-1} + \beta_4 INF_{t-1} + \\ & \beta_5 OPN_{t-1} + \sum_{i=1}^{q_1} \alpha_{1i} \Delta \ln FDI_{t-i} + \sum_{i=0}^{q_2} \alpha_{2i} \Delta \ln EXD_{t-i} + \\ & \sum_{i=0}^{q_3} \alpha_{3i} \Delta INT_{t-i} + \sum_{i=0}^{q_4} \alpha_{4i} \Delta INF_{t-i} + \sum_{i=0}^{q_5} \alpha_{5i} \Delta OPN_{t-i} + u_i \quad (4) \end{aligned}$$

This study also adopted the Error Correction version of the ARDL model to test the short-run relationship between the variables as well as to find the long-run adjustment. Data were analyzed using Excel and E-views software.

## **Results and Discussion**

Correlation analysis confirmed the absence of multicollinearity problems among the independent variables. Model fitting tests concluded that the residuals of the model are normally distributed, with absence of autocorrelation, heteroscedasticity, and omitted variables issues in the model. Thus, it was proved that the model was free of specification errors, and the CUSUM test showed that the model is dynamically stable and accurate at the 95% confidence level (See Figure 1 in Appendix). The table below presents the results of the Bounds test of the ARDL model.

Table 2: Results of the Bounds Test

Test Statistic	Value	Significance.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	9.844109	10%	2.2	3.09
K	4	5%	2.56	3.49
		1%	3.29	4.37

The above results revealed that there is co-integration among the variables included in the model. The results of the long-run relationship (see Table 3 below) implied that external debt has a significant and positive impact on foreign direct investment at 1% significance level, i.e., 1 percent increase in external debt induce foreign direct investment by 144 percent in the long-run. Further, the interest rate has a significant negative impact on FDI while inflation and openness have a significant positive impact on FDI.

Table 3: Long run Results of the ARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEXD	1.440012	0.134220	10.72878	(0.0000)***
INT	-0.066530	0.027020	-2.462272	(0.0194)**
INF	0.042089	0.020487	2.054451	(0.0482)**
OPN	0.031717	0.010446	3.036388	(0.0047)***

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

The table below shows the results of the short run dynamic relationship and long run adjustment of the selected ARDL model.

Table 4: Results of Error Correction Model (ECM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.137295	0.139897	0.981401	0.3342
D(LFDI(-1))	0.024503	0.171586	0.142801	0.8874
D(LEXD)	0.758619	1.182608	0.641480	0.5261
D(LEXD(-1))	-1.106473	1.072601	-1.031580	0.3105
D(INT)	-0.049099	0.028384	-1.729805	0.0939*
D(INF)	0.020034	0.013900	1.441226	0.1599
D(OPN)	0.030797	0.019099	1.612489	0.1173
ECT(-1)	-0.291148	0.225929	-1.288671	0.2074
R-squared	0.228989	Mean dependent var		0.088891
Adj R-squared	0.049087	S.D. dependent var		0.490545

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

The above results revealed that none of the regressor in the model have a significant impact on foreign direct investment at 5% level of significance in the short-run. The speed of adjustment coefficient depicts an adjustment towards steady state line with the speed of 29.11% in each period one period after the exogenous shocks. The findings of this study are in line with some of the earlier studies by Abala (2014); and Wabwalaba (2017) who found a positive relationship between external debt and foreign direct investment.

## Conclusion

This study identified that external debt has a positive impact on FDI while other variables also have a significant impact on FDI in the long-run, but none of the variables have a significant impact on FDI in the short-run in Sri Lanka. The study confirms the positive contribution of the external debt to enhance FDI in Sri Lanka. Hence, it is recommended that external debt be well-managed and should be invested in viable projects which lead to earning higher-level returns, that could be used for future debt servicing and promote investment by attracting more FDI and accelerate the economic growth in Sri Lanka.

## References

- Abala D.O. (2014). Foreign direct investment and economic growth: An empirical analysis of Kenyan data. *DBA Africa Management Review*. 4(1), 62-83.
- Central Bank of Sri Lanka, (2018). Annual Report, Central Bank of Sri Lanka: Colombo.
- Krugman, P. (1988). Financing vs. Forgiving a debt overhang. *Journal of Development*. 29, 253-68.
- Mugambi, P. K. (2016). The impact of external debt service on foreign direct investment inflows in Kenya (1980-2014). *European Journal of Economics, Law and Politics, ELP edition*. 4(3), 1-45.
- Muzurura, J. (2016). Determinants of foreign direct investment (FDI) in Zimbabwe: What factors matter? *Research in Business and Economics Journal*. 11, 1-20.

## Appendix

Table 1: Results of the Unit Root Test

Test Types	Variables	ADF test		PP test	
		Intercept	Trend & Intercept	Intercept	Trend & Intercept
Level	LFDI	0.8070	0.0062***	0.8043	0.0040***
	LEXD	0.9395	0.7448	0.9301	0.2147
	INF	0.0009***	0.0005***	0.0010***	0.0005***
	INT	0.1054	0.0356**	0.0959	0.2572
	OPN	0.7768	0.8372	0.7476	0.8023
1 <sup>st</sup> Difference	LFDI	0.0000***	0.0000***	0.0001***	0.0000***
	LEXD	0.0000***	0.0000***	0.0000***	0.0000***
	INF	0.0000***	0.0000***	0.0001***	0.0000***
	INT	0.0000***	0.0001***	0.0000***	0.0000***
	OPN	0.0000***	0.0003***	0.0001***	0.0003***

Note:\*, \*\* and \*\*\* indicate rejection of null hypothesis at 10%, 5% and 1% respectively.

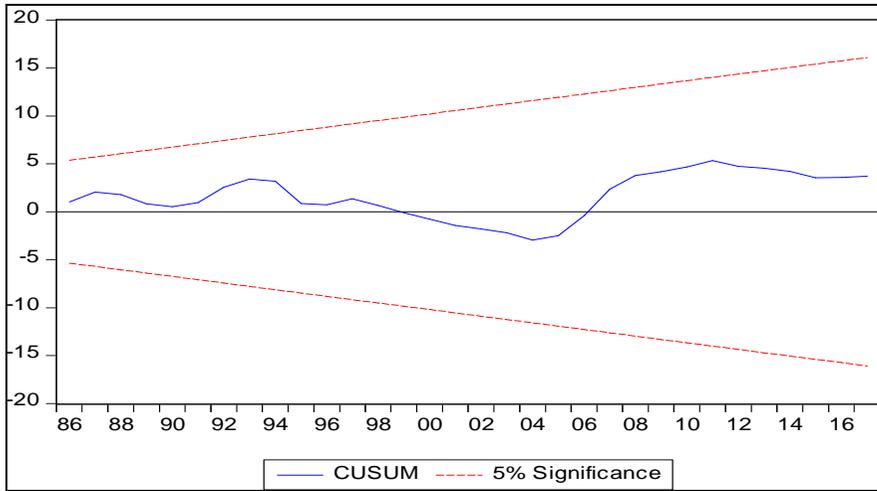


Figure 1: Results of the CUSUM Test

## **An analysis of Household Rice Expenditure Patterns in Urban, Rural and Estate Sectors in Sri Lanka: Using MPE Approach**

**N.J.C. Paraneetharan<sup>1</sup>, John Nigel<sup>2</sup> and T. Vinayagathan<sup>3</sup>**

*<sup>1</sup>PGIHS, University of Peradeniya, Sri Lanka*

*<sup>2,3</sup> Department of Economics and Statistics, University of Peradeniya, Sri Lanka*

**Keywords:** *MPE approach; Rice expenditure pattern; Linear regression; Magnitude*

### **Introduction**

Analysis of household food expenditure patterns is considered an important indicator of economic development in a country, especially meaningful in developing countries where the food expenditure account is a relatively large share of household income (Dunne & Edkins, 2005). Marginal Propensity to Expend (MPE) is a tool to analyse household food expenditure pattern. It measures the proportion of any increment of income that the household desires to spend on consumption. MPE indicates the type of relationship between income and expenditure on a particular food item and provides support for Engel's curve (Haavelmo, 1947).

MPE of a food expenditure function shows how households react differently when income changes. This is defined as the ratio of the change in expenditure on a food item to change in household total income. It is simply the slope of the response curve and the marginal response of consumption to changes in income. MPE of food items can be used to compare consumer behavior between sectors and is relevant to judge the pattern of additional demand (Langemeier & Patrick, 1990).

### **Objectives**

The objective of this study is to examine monthly household rice expenditure patterns in the urban, rural and estate sectors of Sri Lanka.

## Methodology

This study used last four of the HIES data sets for the periods 2006/07, 2009/2010, 2012/13, and 2016, in the districts of Badulla, Kandy, Nuwara-Eliya and Ratnapura. These four districts have at least 5% of the population from each of the rural, urban and estate sectors. The total sample size was 13,881 households of which 2010 urban, 8508 rural and 3363 from estate households were selected based on the two-stage stratified sampling method of Neymann allocation. The survey was conducted by the Department of Census and Statistics over a period of 12 consecutive months of weekly consumption of nine rice varieties in the market such as white kekulu normal, white kekulu samba, red kekulu normal, red kekulu samba, samba, nadu red, nadu white, basmathi and several other rice varieties. Weighted average prices were estimated for each rice variety.

A basic food expenditure function includes expenditure on food items as the regressand and income as the only explanatory variable. Here the total household expenditures are used as a proxy for income because income data generally suffer from measurement errors and may also include a transitory component of income (Burney & Khan, 1991). So, the household monthly rice expenditure equation can be written as:

$$\ln RE = \beta_0 + \beta_1 \ln TI + u \quad (1)$$

Where, RE – Total monthly rice expenditure per household; TI – Total monthly income per household;  $\beta_0$  and  $\beta_1$  are the unknown parameters to be estimated and  $u$  is a stochastic error term.

Based on King and Byerlee (1978) MPE can be derived from equation (1) and written as:

$$\text{Marginal Propensity to Expend (MPE)} = \beta_1 = \frac{\Delta \ln(RE)}{\Delta \ln(TI)}$$

## Results and Discussion

Figure 1 below depicts estimated magnitude of the MPE on rice declining in all three sectors when household income increases. Magnitudes of MPE on rice are  $6.72 \times 10^{-8}$ ,  $6.20 \times 10^{-8}$  &  $2.94 \times 10^{-8}$  for estate, rural and urban sectors respectively. There is a larger difference in the magnitude of MPE between

estate and urban sector. However magnitudes of MPE are almost similar in rural and estate sectors at each income level. The magnitude of MPE in estate households was higher than in other sectors at all income levels. This indicates that households in the estate sector show highly responsive rice consumption (elastic) to changes in income. Likewise, urban and rural sector households show low and medium responsiveness in rice consumption respectively to changes in income.

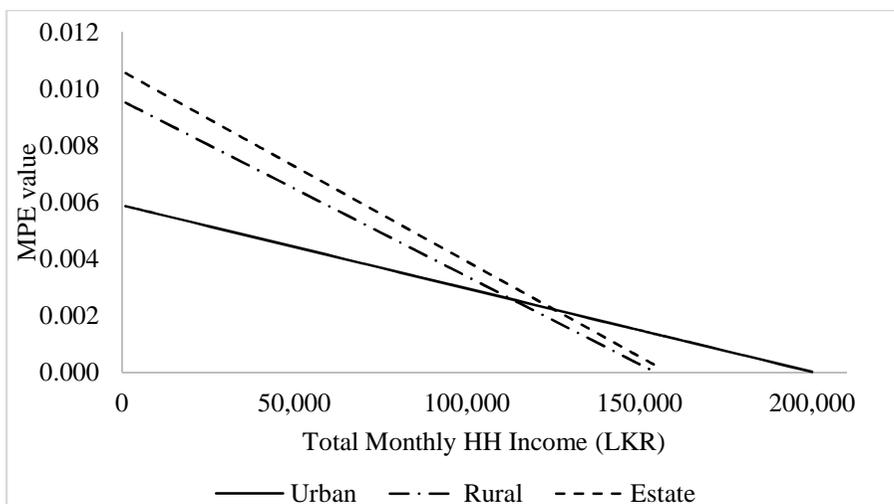


Figure 1: Marginal Propensity to Expend of Rice

The difference between magnitude of MPE on rice between rural and estate sectors is seen to be very small and decreasing as monthly income increases. However, high income estate households show relatively higher MPE value indicating higher responsiveness in rice consumption to income changes.

The difference between urban and estate sectors is greater than the difference between estate and rural sectors. The magnitude of MPE on rice is lower in higher income level households in the urban sector even though there is a trend for this difference to decrease. The declining behavior of the magnitude of MPE on rice is smooth and regular in all sectors. Estate sector having low availability of income sources and hence with low income, a change in income would cause higher responsiveness in rice consumption, which implies much of their income is spent on food items like rice. But, urban households' monthly earnings as well as earning opportunities are very high compared to other sectors, so that responsiveness to rice consumption is low.

## **Conclusion**

The findings show a decreasing MPE with respect to income all three sectors related to different rice varieties. Among the sectors, highest impact on rice consumption is in the estate sector when household income increases. So, compared to other sectors the estate sector is highly responsive to food consumption as their income increases. Urban sector households demonstrate the lowest impact of income on rice consumption.

It is also observed that there was considerable variation in MPE across income levels. The highest, lowest and medium level variations of MPE were found in the estate, urban and rural sectors respectively. The higher MPE variation was found among low income receipt of the estate sector. The lower income sector spends a substantially higher incremental total income on rice consumption than the higher income sector. It means that the incremental total expenditure on food in estate households is higher than in rural and urban sector households. The results of this study suggest that income-oriented policies are important to achieve better food consumption in all sectors to reduce the problem of unbalanced diets. In addition, complementary policies are necessary.

If there are sudden shocks like COVID 19, the occurred the total economy is changed due to instability of the market situation. It means increased consumer demand of food-supply cannot reach due to less productivity. Further research is required in these lines.

## **References**

- Burney, N. A. and Khan, A. H. (1991). Household consumption patterns in Pakistan: An urban rural comparison using micro data. *The Pakistan Development Review*. 30, 145-171.
- Dunne, P. and Edkins, B. (2005). The demand for food in South Africa, *Economics Society South Africa Conference*, Durban.
- Haavelmo, T. (1947). Family expenditures and the Marginal Propensity to Consume, *Econometrica*. 15, 335-341
- King, R. P. and Byerlee, D. (1978). Factor intensities and locational linkages of rural consumption patterns in Sierra Leone. *American Journal of Agricultural Economics*, 60(2), 197 – 206.
- Langemeier, M. R. and Patrick, G.F. (1990). Farmers' marginal propensity to consume: An application to Illinois Grain Farms. *American Journal of Agricultural Economics*. 72(2), 309–316.

## **An Empirical Analysis of Current Account Determinants in Sri Lanka**

**R. M. M. Mayoshi<sup>1</sup> and T. N. Vidanage<sup>2</sup>**

<sup>1</sup>*Department of Marketing, Faculty of Economic Sciences and Business Administration, Transilvania University of Brasov, Romania*

<sup>2</sup>*Department of Economics and Statistics, Faculty of Arts, University of Peradeniya, Sri Lanka.*

**Keywords:** *Current account balance; RGDP; Trade; ARDL Model*

### **Introduction**

The current account balance of a country is considered as one of the primary determinants of the future development of the economy. The behaviour of the current account balance represents important information about economic performance. Increasing current account imbalances negatively influence economic performance and a current account surplus positively influences economic performance. The current account balance is influenced by various factors such as economic growth, budget deficit, exchange rate, foreign direct investment, trade openness, inflation rate etc. Sri Lanka's current account has posted a continuous deficit over past periods. In 2018, it recorded a value of -2,813 million US dollars. It has also fluctuated substantially in recent years. Sri Lanka got affected badly after the global financial crisis due to the widening trade deficit and sharp fall in remittances inflows.

In the literature, several studies give different predictions about the elements determining the current account balance and the sign and magnitude of the relationships between current account fluctuations and its determinants. The current account balance can be affected by the domestic output level. According to the elasticity approach, there is a positive association of domestic output with the capital account and a negative link with the current account. The absorption approach states that there is a positive link of domestic output with the current account. Net foreign assets can influence current account balance in two ways. From the saving-investment perspective, an increase in the foreign income flow has a positive effect on

current account balance. In a flexible exchange rate regime, the sum of the current account and capital account must be equal to zero as an economy can afford a higher trade deficit up to an extended period with a high level of net foreign assets and remain solvent. This leads to a negative relationship between net foreign assets and the current account.

Trade openness is likely to be negatively related to the current account, because an economy open to more international trade with less trade restrictions, tends to attract more foreign capital. There are two ways in which the exchange rate can affect the current account. One is the saving-investment perspective that relates it negatively to the current account balance of an economy and other one is the consumption-smoothing hypothesis that relates positively to the current account balance. According to the study of Fayaz and Sandeep (2016), the application of the Johansen Cointegration test indicates the existence of a long-run equilibrium relationship between the current account and gross domestic product, net foreign assets, real effective exchange rate, trade openness and wholesale price index, implying that India's current account is influenced by these factors. The study concluded that net foreign assets and wholesale price index have a positive significant relationship with the current account balance, while trade openness and real exchange rate have a negative relationship with the current account balance in the long run. The results of VECM indicate that only the real effective exchange rate and gross domestic product have a statistically significantly impact on current account balance. However, there is no study that examines the main determinants of Sri Lanka's current account balance using recent data and advanced econometric techniques. Thus, this study tries to bridge this gap.

## **Objectives**

The objective of this paper is to examine both long-run and short-run impacts of various economic determinants on Sri Lanka's current account balance.

## **Methodology**

This study is based on secondary sources of data from Central Bank of Sri Lankan annual reports and World Development Indicator of the World Bank data base for the period 1991 to 2018. The regression model was constructed

using some selected variables following the study conducted by Fayaz and Sandeep (2016), and  $i$  as follows:

$$CAB_t = \beta_0 + \beta_1 RGDP_t + \beta_2 EXR_t + \beta_3 NFA_t + \beta_4 TO_t + \beta_5 WPI_t + u_t \quad (1)$$

Where, CAB: Current Account Balance (dependent variable); independent variables are RGDP: Real Gross Domestic Product; EXR: Exchange Rate; NFA: Net Foreign Assets; TO: Trade Openness<sup>1</sup> and WPI: Wholesale Price Index.  $u$  is the white noise error term and the subscript  $t$  indicates time.

As the first step of the estimation procedure, the study employed Augmented Dickey-Fuller (ADF) unit root test technique to check the stationarity of variables and Akaike Information Criteria (AIC) to select an optimum number of lags. Once we confirmed the order of integration, the Autoregressive Distributed Lag (ARDL) Bound testing approach was used to determine cointegration and the long - run relationship between variables. Error correction version of the ARDL model was employed to examine the short run relationship between variables and long run adjustment. In addition, diagnostic tests were conducted to check whether the results are robust and the CUSUM test was conducted to check the stability of the model.

## Results and Discussion

The results of the ADF test (see Table 1 in Appendix) revealed that variables are stationary at combination of  $I(0)$  and  $I(1)$ . Akaike Information Criteria (AIC) advocate the use of ARDL (1, 1, 0, 0, 0, 1) model for this analysis. The results of ARDL Bounds test (see Table 2 in Appendix) confirmed the existence of cointegrating relationship between variables, which suggest there should be long run relationship among the variables included in this study.

Table 1: Results of Long- run Relationships (Dependent variable: CAB)

Constant	RGDP	TO	WPI	NFA	EXR
-40.56	5.67E-8	-25.78	-0.37	3.63E-12	0.41
(0.09)*	(0.04)**	(0.02)**	(0.01)**	(0.31)	(0.01)**

<sup>1</sup> TO measured as the summation of import and export of total goods and services divided by gross domestic product.

Note: Probability values are given in parenthesis. \*, \*\*, and \*\*\* indicate variables are significant at 1%, 5% and 10% level of significance respectively.

According to the long-run coefficients, real gross domestic product (RGDP) has a positive and statistically significant relationship with the current account balance, indicating that an increase in RGDP can improve the current account balance (i.e., will decrease the deficit). The absorption approach states that a favourable or unfavourable balance in the current account depends on the absorption level when the growth of output is faster than that of domestic absorption, then the economy exports to the other countries. This situation creates a positive relationship between RGDP and current account balance. The exchange rate has a positive and statistically significant impact on current account balance, which is inconsistent with the common finding in the empirical literature. This could be explained by the smooth consumption hypothesis. In response to an increased exchange rate, an open economy would prefer to run a current account surplus and invest abroad rather than allow consumption to increase (Fayaz and Sandeep 2016). Coefficient of net foreign asset variable is positive but insignificant. It indicates that net foreign assets cannot significantly explain the variation in current account balance. Trade openness has a negative and statistically significant impact on current account balance. This conclusion is similar to the findings of Sarkar (1994) and Chinn & Prasad (2003). Further, wholesale price index affects CAB negatively and significantly in the long run.

Table 2: Results of Error Correction Representation of ARDL Model

Panel A: Short-run Coefficients						
Lag	$\Delta$ CAB	$\Delta$ RGDP	$\Delta$ TO	$\Delta$ WPI	$\Delta$ NFA	$\Delta$ EXR
0		-3.28E-08 (0.191)	-23.3805 (0.003)*	-0.3251 (0.002)***	4.75E-12 (0.059)*	-0.0448 (0.731)
1	0.2108 (0.215)	7.13E-08 (0.036)**				0.3785 (0.038)**
Panel B: Error Correction Representation						
ECT(-1)= -0.7901(0.008)*						

Note: Probability values are given in parenthesis. \*, \*\*, and \*\*\* indicate variables are significant at 10%, 5% and 1% level of significance respectively.

The above results explain that the previous year's real GDP has a positive and statistically significant impact on current account balance, indicating that an increase in last year's real GDP can improve the current account balance.

Trade openness, wholesale price index and exchange rate have negative and significant effects on the current account balance. However, a prior period net foreign asset has a positive and significant impact on the current account balance while the previous year' exchange rate affects negatively on it in the short run. From the saving-investment perspective, an increase in the foreign income flow has a positive effect on current account balance. This conclusion is similar to Fayaz and Sandeep's (2016) findings. The coefficient of error correction term is negative and significant implying that the current account balance model can get back to the long-run steady state line at the speed of 79.01 % one period after the exogenous shock.

Table 3: Results of Diagnostic Tests

Types of Test	Probability value
Serial correlation (BG LM Test)	0.3437
Functional Form ( Ramsey's RESET test)	0.5174
Normality (Jarque-Bera)	0.9439
Heteroscedasticity (BPG test)	0.9837

Results of diagnostic tests confirm that the model is free from serial correlation and heteroscedasticity. Moreover, the functional form is correct and stochastic residuals are normally distributed. The recursive estimates, Cumulative Sum (CUSUM) and CUSUM of square plots lie within the upper and lower critical bounds at 5% significance level, which implies that the selected model is stable.

## Conclusion

The results explain that real gross domestic product can increase the current account balance both in the long-run and in the short-run. The exchange rate can increase the current account balance as per the smooth consumption hypothesis and trade openness is negatively related to the current account balance both in the long-run and in the short-run, because an economy, opened more to international trade with less trade restrictions, tends to be more attractive to foreign capital and thus causes a decrease in current account balance. From the saving-investment perspective, an increase in the foreign income flow has a positive effect on the current account balance in short-run but net foreign assets cannot significantly explain the variation in current account balance in the long-run. The study suggests that in order to

reduce the deficit in the current account, foreign dependency should be reduced and the exports of goods and services as well as domestic savings, increased.

## References

- Chinn, M. D., and Prasad, E. S. (2003). Medium term determinants of current accounts in industrial and developing countries: An empirical exploration. *Journal of International Economics*, 59, 47-76.
- Fayaz, M., and Sandeep, K. B. (2016). Trends, Pattern and Determinants of Indian Current Account Deficit. *Applied Econometrics and International Development*, 16(1), 167-186.
- Sarkar, P. (1994). India's balance of payment and exchange rate behaviour since 1971: A new approach. *Economic and Political Weekly*, 29(1), 43-48.

## Appendix

Table1: ADF Unit-root Test

Variables	Level		1 <sup>st</sup> Difference		Order of integration
	Intercept	Trends & Intercept	Intercept	Trends & Intercept	
CAB	-4.4237***	-4.5438***	-5.2419***	-5.1172***	I(0) I(1)
GDP	-1.0473	-1.2787	-4.2014***	-4.2775***	I(1)
EXR	0.8077	-1.9254	-5.3221***	-5.3971***	I(1)
TO	-0.6016	-2.3101	-4.6113***	-4.6870***	I(1)
NFA	-2.3564	-2.3825	-5.6544***	-5.5579***	I(1)
WPI	1.7916	-1.6218	-2.7497**	-5.0035***	I(1)

Notes: ADF test statistics are given in table. \*, \*\*and \*\*\* denote the statistical significance at the 10%, 5% and 1% level respectively and

Table 2: Results of F- Bounds Test

F-Bond test	95% Level of Confidence		90% Level of Confidence	
F- Statistics	Lower Bound	Upper Bound	Lower Bound	Upper Bound
7.1417	2.39	3.38	2.08	3

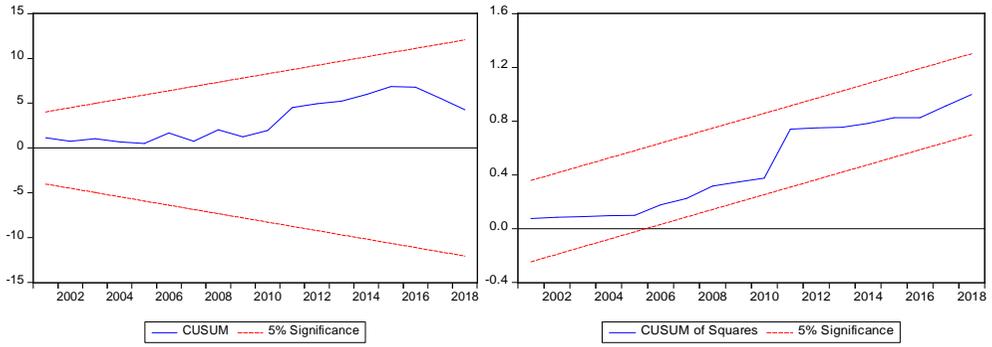


Figure 1: (CUSUM) and CUSUM of Square Plots

**Differences in Household Savings across Socio-Economic and Demographic Characteristics of Sri Lankan Households: Evidence from Household Survey Data 2016**

**A.G.I. Amalka, A.H.M.S.K. Jayasinghe, K.P.U. Jayarathne,  
T.K. Palihawadana and M.D.R.K. Jayathilaka**

*SLIIT Business School, Sri Lanka Institute of Information Technology,  
Sri Lanka*

**Keywords:** *Analysis of variance; Households; Saving behaviour; Socio-economic factors*

**Introduction**

The outbreak of the coronavirus (COVID-19) pandemic has significantly interrupted the daily activities of households, while companies have commenced downsizing, thus hampering the income sources of many individuals as well as households (International Monetary Fund, 2020). Setting aside ‘three to six months’, living expenses is encouraged as a precaution. However, though the emphasis on saving is high, many households struggle to fulfil their basic needs and wants. Savings can be defined as “a flow variable that refers to the accumulation of assets and debts over a specific period” (Nyhus, 2018, p. 208).

As a developing country, Sri Lanka has recorded a gross saving of USD 24.14bn in 2019, which is significantly lower than other developing countries such as Thailand and South Korea. These countries boast of a gross saving of USD 171.08bn and USD 561.51bn respectively (The World Bank, 2019). Further, Gross Domestic Savings in Sri Lanka as a percentage of Gross Domestic Product (GDP) from 2010 to 2019 has been fluctuating in the range of 15.2% to 27.2%. Lastly, the household savings rate has marginally decreased from 21.3% in 2019 to 20% (forecast) in 2020 (Trading Economics, 2020).

Unlike prior studies that are limited to a local geographical context, this study is extensive as it covers the population of the entire country. Therefore, the findings of the study will contribute to bridging the empirical research

gap by discussing the differences in the level of savings across different socio-economic and demographic characteristics of households in Sri Lanka.

### **Objectives**

The main aim of this study is to investigate and identify differences in the level of savings, by analysing the mean per capita and mean total savings, based on socio-economic and demographic characteristics amongst households in Sri Lanka.

### **Methodology**

The study is based on the latest available data of the Household Income and Expenditure Survey (HIES) which was carried out in 2016, by the Department of Census and Statistics (DCS) of Sri Lanka, with a sample population of 21,756 households. The results were generated using STATA 12 software and analysed using the data analysis tool one-way Analysis of Variance (One-Way ANOVA), which is used to compare more than three independent groups, in order to identify if there is a statistically significant difference between the identified independent groups.

### **Results and Discussion**

Table 1 depicts the descriptive statistics associated with the population. When considering the level of education, the highest per capita mean value was recorded from people/households who had completed education upto tertiary level and the lowest from people/households who had completed their education upto primary level. In contrast, an existing study revealed that households with no schooling background exhibited the highest rate of saving compared to those with primary and secondary education (Poon and Hon, 2015).

In terms of marital status, the results revealed that the mean total expenditure of divorced households (SLRs.49,903.88) is lower than that of the married households (SLRs.59,641.82). Therefore, the highest mean value for per capita saving as well as total saving was recorded from the households who are divorced, while the lowest was from the households who are never married.

Table 1: Mean Per Capita Saving and Mean Total Saving

Variable*	Mean Per Capita Saving	Mean Total Saving
<u>Level of Education</u>		
No Schooling	1369.86	6363.02
Primary	543.06	3019.78
Secondary	1131.99	5131.48
Tertiary	8441.36	33963.83
Special Education	4150.66	17736.63
<u>Marital Status</u>		
Never Married	875.82	4239.64
Married	1346.80	6212.22
Widowed	1267.64	4950.39
Divorced	4528.02	12598.64
Separated	1977.59	6446.51
<u>Age Level</u>		
15-24	684.10	3652.80
25-39	1596.84	7243.80
40-65	1514.75	6535.18
66+	1778.40	7157.69
<u>Employment Status</u>		
Unemployed	434.61	2620.90
Government	4640.68	18435.89
Semi Government	3236.47	11939.89
Private	2449.23	10226.51
Employer**	5515.29	18588.71
Own Account Worker***	1355.62	6001.51
Unpaid Family worker	1051.41	5203.94
<u>Gender</u>		
Male	1354.51	5910.17
Female	980.22	4757.80

Note: \*\*\* denotes self-employed, \*\* denotes employs other people, \* denotes household head.

According to Poon and Hon (2015), it is stated that due to the increase of parental responsibility, the rate of saving in married households is considered to be higher; therefore the never married households with no parental responsibilities tend to spend more rather than focusing on saving.

The results on employment status show that the households which are employers accounted for the highest per capita mean value while the

unemployed households accounted for the lowest. The highest per capita saving has been recorded by those who are in the above 66 age group and the lowest in the age group 15-24. Furthermore, males have recorded the highest savings whereas females tend to save less than the males.

Table 2 shows the generated ANOVA results of mean per capita saving and mean total saving of households.

Table 2: Results of One Way ANOVA

Rs.*	Mean	Std Dev	F	Prob>F
<u>Level of Education</u>				
Per capita saving	1155.48	15287.75	134.98	0.0001
Total saving	5297.38	62143.71	125.63	0.0001
<u>Marital Status</u>				
Per capita saving	1155.48	15287.75	8.76	0.0001
Total saving	5297.38	62143.71	5.88	0.0001
<u>Age Level</u>				
Per capita saving	1155.48	15287.75	25.68	0.0001
Total saving	5297.38	62143.71	21.16	0.0001
<u>Employment Status</u>				
Per capita saving	1155.48	15287.75	79.87	0.0001
Total saving	5297.38	62143.71	65.25	0.0001
<u>Gender</u>				
Per capita saving	1155.48	15287.75	12.38	0.0044
Total saving	5297.38	62143.71	7.10	0.0077

Note: \* denotes household head.

Table 2 shows that households in each education level have a different mean per capita saving. Therefore, the level of education has a statistically significant impact on the level of saving amongst the population. Accordingly, there are differences in savings across socio-economic and demographic characteristics such as level of education, marital status, age level, gender and employment status which have a statistically significant impact towards the level of saving as well.

## Conclusion

In conclusion, it can be stated that households who have completed their studies up to a tertiary level, are divorced, employers, males and aged above 66 years tend to save more than other households. Socio-economic and demographic variables such as the level of education, marital status, age level, employment status and gender have a statistically proven significant impact towards the level of saving. As an action plan, it is recommended that the government and non-government institutions take necessary steps to encourage households to educate themselves, provide concessions for female households, households in the labour force, and introduce policies for empowering the self-employed and employees of other sectors to manage their finances, which would enable them to cope with any precautionary and unanticipated situation that would arise in the future.

## References

- International Monetary Fund, (2020). Policy Responses to COVID-19 [online], Available at: <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19> [Accessed: 14<sup>th</sup> September 2020]
- Nyhus, E. K. (2018). Saving Behaviour: Economic and Psychological Approaches. In R. Ranyard (Ed.), *Economic Psychology* (1<sup>st</sup> ed), 206-221: John Wiley & Sons Ltd.
- Poon, C.C., and Hon, T.Y. (2015). Household Savings in Hong Kong: A Statistical Analysis. *Journal of Family and Economic Issues*, 36 (3), 353-368.
- The World Bank (2019). *Gross Savings (current US\$)* [Online], Available at: <https://data.worldbank.org/indicator/NY.GNS.ICTR.CD>
- Trading Economics (2020). Sri Lanka Household Saving Ratio [online], Available at: <https://tradingeconomics.com/sri-lanka/personal-savings>

## **A Silver Lining in the Dark Clouds: Stimulating Economic Growth by Promoting Tea-Based Radical Innovations in Sri Lanka**

**H.M.C.G. Pilapitiya<sup>1&2</sup> and Saliya De Silva<sup>3</sup>**

*<sup>1</sup>Tea Research Institute, Sri Lanka*

*<sup>2</sup>Graduate School of Science and Engineering, Saga University, Japan*

*<sup>3</sup>Faculty of Economics, Saga University, Japan*

**Keywords:** *Silver lining; Dark clouds; Economic growth; Innovation; Sri Lanka*

### **Introduction**

Scientific evidence has proved anti-viral, anti-carcinogenic and anti-diabetic properties in tea (*Camellia sinensis*) due to the presence of high levels of antioxidants (Modder *et.al*, 2002). However, the major tea producing countries including Sri Lanka paid less attention to such properties until the covid-19 pandemic hit the world boosting demand for black tea in Sri Lanka with a FOB price hike of 15%. In 2018, Sri Lanka was the third largest tea exporter in the world, accounting for 14.7% of total global tea exports. Nearly 60% of this tea was exported in primary processed bulk form. Bulk tea is sold at lower prices than value-added tea forms. For instance, in 2018, the average price of Sri Lankan bulk tea was 4.01 US\$/kg, while the average prices for tea bags and tea packets were 8.18 US\$/kg and 4.47 US\$/kg respectively. During the last five years (2014-2018) Sri Lanka earned only 4.83 US\$/kg, comparatively lower than non-tea producing countries such as Poland, which earned US\$10.13/kg; Germany, US\$9.55/kg; and the UK, US\$7.18/kg). These developed nations were already capitalizing on producing tea-based innovations (e.g. confectionaries, tea wine, pharmaceuticals and cosmetics in Japan, Poland, Germany, and UK) using raw materials mostly imported from tea producing countries such as Sri Lanka (Koch *et al.*, 2019). We see this as a missed opportunity for tea producing countries. Product innovations based on tea can be categorized basically into two types: 1) incremental innovations (e.g. - flavoring, bagging, packeting) and 2) radical innovations (tea concentrate, tea cordial, tea-based confectionary).

Innovation has two basic dynamic impacts; 1) make upward shift in the production function, and 2) increase economic efficiency for the industry as a whole due to creative destruction (Baumor 2002; as cited by Sengupta, 2014). This study is based on resource-based view of innovation (Lockett *et al.*, 2001) and social cognitive factors of innovation (Wood *et al.*, 1989). Empirical findings on determinants of radical innovations in food and beverage industry are mostly based on the US and Europe limiting the practical implementation to an industry in developing countries. Therefore, this study aims to contribute to minimize this research gap.

### **Objectives**

Under above background, the objectives of this study were 1) to identify the impact of producing tea-based radical innovations on firm performance and 2) to identify the determinants of producing tea-based radical innovations in Sri Lanka.

### **Methodology**

Our study population was tea exporting firms involved in innovation in Sri Lanka in 2019 (N=180). We randomly selected 43 (24%) exporting firms based on their average annual export volume. We collected primary and secondary data through a questionnaire survey and interviews with all 43 CEOs and/or COOs in August-September, 2019.

To achieve the first objective, we divided all 43 firms into two groups: 1) firms who had produced at least one tea-based new product (new to the firm) for commercial purposes within the last five years (2014-2018) 2) firms who had not produced tea-based innovations. The mean values of the sales gain for the two groups were tested by Mann-Whitney U test to examine if there was a significant difference in the sales gain due to producing radical innovations. To achieve the second objective, we conducted a binary logistic regression where our dependent variable was producing radical innovations (yes/no) vs. the independent variables: firm's age, number of executives (as a proxy for firm's size), number of food technologists, number of tea technology graduates, CIM/CIMA qualified officers, level of education of CEO, experience of CEO, Science and Technology qualification of CEO, having contacts with TRI, and the number of export destinations. We

observed significant correlations between these independent variables, and therefore followed a factor analysis to reduce the number of variables and to create a set of orthogonal variables.

## Results and Discussion

Tea-based radical innovations, defined as products developed through intense change of the tea green leaf, produced by the sample firms for commercial purposes during 2014-2018 include the following two groups with the number of firms in brackets:

- a. Oolong tea (4), Silver tips and golden tips (3), Hand crafted tea (3), Gold plated tea (1), Ceylon green tea (2), Ceylon matcha (2), Compressed tea (2)
- b. Tea aroma (1), Tea concentrate (3), Matcha energy drink (2), Bubble tea (1), Ready to Drink tea (3), Tea biscuit (1), Tea cordial (1), Tea premix (2), Instant tea (3), Tea stick (1)

The average sales value of Rs. 1660.51/kg of firms producing radical innovations ( $n=19$ ) was significantly higher than that of (average = Rs. 1066.94/kg) firms that did not produce any radical innovations ( $n=24$ ) (Mann-Whitney  $U = 92$ ;  $p = 0.001$ ).

Table 1: Factor Analysis Matrix

Factor	Factor interpretation (% variance)	Loading	Variables included
<b>1</b>	Firm Strategy (40.84)	0.911	No. of executives
		0.903	No. of food technologists
		0.855	No. of destinations
		0.758	No. of CIM/CIMA qualified officers
<b>2</b>	Firm Resources (19.40)	0.825	Experience of the CEO
		0.718	Resources
		-0.704	Level of education of CEO
<b>3</b>	Tea Technology (11.62)	0.836	No. of tea technologists

Note: Kaiser-Meyer-Olkin measure (KMO=0.742) proves that factor analysis is appropriate to analyze the correlation matrix. Chi square for Bartlett's test of sphericity is 162.98 ( $p=0.000$ ) at 36 degree of freedom.

The extracted three factors together explained 71.8% of the total variance. Factor analysis reduced eight variables to three main factors (Firm strategy, Firm resources, No of tea technology graduates) (Table 2).

The  $\chi^2$  for logistic regression (overall model) is significant over the intercept only model (null model),  $\chi^2 (5) = 21.88$  ( $p=0.001$ ). The  $\chi^2 (8)$  for Hosmer-Lemeshow test is insignificant ( $p=0.434$ ) suggesting the model fit to the data (see Table 2).

Table 2: Determinants of Producing Tea-based Radical Innovations

Variable	Beta	S.E.	Wald	df	Sig.	Exp(B)
Firm Strategy	0.128	0.433	0.087	1	0.768	1.136
Firm Resources	1.137*	0.489	5.405	1	0.020	3.119
CEO's science and technology qualifications (yes)	2.316*	1.038	4.977	1	0.026	10.134
TRI contacts (yes)	-0.886	1.049	0.713	1	0.398	0.412
No. of tea technology graduates	0.998*	0.434	5.281	1	0.022	2.714
Constant	-1.267*	0.602	4.422	1	0.035*	0.282
Test			X <sup>2</sup>		df	p
Overall model			21.88*		5	0.001
Score test			17.88*		5	0.003
Goodness of fit – Hosmer & Lemeshow test			7.99		8	0.434

Note: \* represents variables are significant at 5% significance level.

Firm Resources, CEO's background in Science and technology and contribution of tea technology graduates are significant and positive towards producing radical innovations. Many radical innovations begin at the tea field (e.g. hand-crafted tea, oolong tea, Ceylon matcha, compressed tea etc.). However, there are only 12 firms (28%) that have integrated or at least have direct links with tea plantations or processing factories. In our sample, 10 CEOs (23%) are either Science/technology graduates or they had followed tea technology or processing course within their tenure. Although the contribution of tea technology graduates towards radical innovation is significant, we observed only 16 (37%) firms recruited tea technology graduates.

## Conclusion

Our study revealed a statistically significant impact of producing radical innovations towards tea exporting firms' sales gains. Also, we found that cognitive factors of the CEO (education and experience), resource integration and contribution of tea technology graduates as significant determinants of producing radical innovations. In macro scale, we strongly recommend ceasing the motivations towards bulk tea exports and make innovation a priority. For that, we suggest the active contribution of well-experienced tea professionals (CEOs) in Sri Lanka. Establishing a strong link between universities and research institutes to provide scientific base for innovation would be beneficial. We recommend make more room to expose the tea technology and value addition graduates to industry during their undergraduate tenure and establish mechanism to link them directly to firms upon graduation.

## References

- Baumor, (2014). "Innovation Models" in Sengupta, J. (2014) *Theory of innovation-a new paradigm of growth*, Springer International Publication, 44-48.
- Koch, W., Zagorska, J., Marzec, Z., and Kukula-Koch, W. (2019). Applications of Tea (*Camellia sinensis*) and its active constituents in cosmetics, *Molecules*, 24 (23), 4277
- Lockett, A., Thompson, S. (2001). The resource based view and economics, *Journal of Management*, 27 (6), 723-754.
- Modder, W. W, D., and Amarakoon, A. M. T. (2002). Awareness of the link between tea and health, in *Tea and Health*, Tea Research Institute of Sri Lanka, Talawakelle, Sri Lanka, 1-6.
- Wood, R., and Bandura, A. (1989). Social cognitive theory of organizational management, *Academy Management Review*, 14(3), 361-384.

## **Overcoming Economic Impact of Rainfall Variability in Mahailuppallama by Using Gamma Distribution**

**K.A.N.L. Kuruppuarachchi<sup>1\*</sup>, L.H.P. Gunaratne<sup>2</sup>  
and K.H.M.S. Premalal<sup>3</sup>**

<sup>1</sup>*Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka*

<sup>2</sup>*Department of Agricultural Economics & Business Management, Faculty of Agriculture, University of Peradeniya, Sri Lanka*

<sup>3</sup>*Association of Disaster Risk Management Professionals (ADriMP), Sri Lanka*

***Keywords:*** *Agriculture; Economic impact; Gamma distribution; Rainfall*

### **Introduction**

Climate change is a major factor that significantly affects the world economy with extreme changes in climatic variables such as precipitation, temperature, winds, relative humidity etc. Agriculture is an economic endeavor that depends on both climatic and weather situations on which its extremes direct to failure in agronomic activities switching deficit in the economy. Parallel circumstance exists in Sri Lanka, where the primary income source is agriculture.

With the high geographic and climatic variability in Sri Lanka, different kinds of crops are cultivated in different regions, harmonizing their unique characteristics of topography and climate. The mean annual rainfall in Sri Lanka varies from under 900mm to over 5000mm from the driest part to the wettest part. The 3 climatic zones that have been classified according to the mean annual rainfall are further divided into 46 Agro-ecological regions having different amount of rainfall.

Crops, cultivars and implementation of agronomic practices are planned as per the forecast climatic variables all over the country. In addition to that, irrigation planning is executed mainly considering rainfall where irrigated farming is performed. Thus, rainfall variability is crucial in agricultural activity, water management, food security and energy production. According

to the annual reports of Central Bank of Sri Lanka from 2010 to 2019, paddy production in *yala* season of 2012, 2014, 2017, 2018 and 2019 has declined due to the drought conditions existing in those years whereas it has increased in 2010, 2011, 2013, 2015, 2016 and 2018 due to the favorable weather conditions and proper irrigation planning. It generates fluctuations in the economy since mainly drought conditions prevail in the Dry Zone, where paddy production is concentrated in Sri Lanka. Therefore, realization of rainfall distribution is vital in order to accomplish proper policy planning, decision making and risk management.

Hence, location specific range and likelihood of rainfall is essential in achieving those strategies. Therefore, modeling of rainfall variability with probability distribution is a useful tool. The information regarding rainfall accumulation in time and space for an area and the foundation for fitting and testing distribution models is given by historical rainfall data (Husak et al., 2007). Along with that the gamma distribution has been recommended as the best fitted distribution in order to describe the annual, monthly or seasonal rainfall (Aksoy, 1999; Sen and Eljadid, 1999; Husak et al., 2007; Sivajothi and Karthikeyan, 2016).

## Objectives

The primary objective of this study is to estimate the parameters of the gamma probability distribution and explain the monthly rainfall variability in the location.

## Methodology

The daily rainfall data for the 40 years from 1980 to 2019 of Mahailuppallama (80.47°N of longitude and 8.12°E of latitude) was obtained where agricultural activities are carried out at research level, farmer level and industry level. The missing values were filled with parallel time point of the recent past. Monthly data were employed for the analysis. For the non-zero monthly rainfall data, probability distribution function of two parameter Gamma distribution (equation 1) was constructed. The complete gamma function is given by equation 2.

$$f(x) = \frac{(x/\beta)^{\alpha-1} e^{-x/\beta}}{\beta \Gamma(\alpha)} \quad (1)$$

$$\Gamma(\alpha) = \int_0^{\infty} e^{-t} t^{\alpha-1} dt \quad (2)$$

The two parameters are: shape parameters ( $\alpha$ ) which determine the skewness of the distribution and scale parameter ( $\beta$ ) that determines the spread of the values. These two parameters are estimated through maximum likelihood estimation. For that the value of A (equation 3) is to be determined which is then used to calculate  $\alpha$  (equation 4) followed by  $\beta$  (equation 5) (Thom, 1958).

$$A = \ln(\bar{x}) - \frac{\sum_{i=1}^{n_p} \ln(x_i)}{n_p} \quad (3)$$

$$\hat{\alpha} = \frac{1}{4A} \left( 1 + \sqrt{1 + \frac{4A}{3}} \right) \quad (4)$$

$$\hat{\beta} = \frac{\bar{x}}{\hat{\alpha}} \quad (5)$$

Where,  $x_i$  is non-zero values of the rainfall data and  $\bar{x}$  is the arithmetic mean of the non-zero values.

The mean of the distribution is  $\alpha\beta$  whereas  $\alpha\beta^2$  is the variance that was used to explain the rainfall distribution. In order to test the goodness of fit of the fitted distribution, Kolmogorov-Smirnov (KS) test was performed comparing empirical cumulative probability and theoretical cumulative probability. The 'D' that is the KS test statistics and p values were recorded. 'D' is defined as the largest vertical difference between theoretical empirical cumulative distribution function (Sivajothi and Karthikeyan, 2016). The rejection level of 0.01 was used and the null hypothesis was theoretical distribution performs adequately in modeling the historical value for the given month at give location.

## Results and Discussion

Gamma parameters and results of the KS test in particular for the months in Mahailuppallama are given in table 1.  $\alpha$  values are less than one which means that the gamma distribution is strongly skewed to the right. And the distribution is highly squeezing as  $\beta$  values are larger. The mean rainfalls with standard deviations (SD) in separate stations are presented in the same table as the estimates of the rainfall of a particular month. Relatively dry periods have a higher shape parameter and a lower scale parameter.

Table 1: Gamma Distribution Parameters, Mean and SD of the Rainfall and Results of the KS Test for Mahailuppallama

Month	$\alpha$	$\beta$	Mean	SD	D	p value
January	0.36	258.74	93.53	155.56	0.25	0.16
February	0.46	205.39	93.57	138.63	0.18	0.57
March	0.27	303.06	82.80	158.41	0.33	0.03
April	0.10	1729.63	172.71	546.56	0.68	0.00
May	0.32	359.34	115.83	204.02	0.28	0.10
June	0.44	40.21	17.85	26.79	0.13	0.91
July	0.68	42.50	28.91	35.05	0.23	0.26
August	0.88	46.07	40.49	43.19	0.35	0.01
September	0.31	316.55	98.43	176.52	0.28	0.10
October	0.07	3939.27	268.43	1028.30	0.75	0.00
November	0.04	5958.40	264.53	1255.45	0.83	0.00
December	0.12	1622.20	195.05	562.50	0.63	0.00

The values of D are relatively small, supporting not rejecting the null hypothesis. The p values are greater than 0.01 except for the months of April, October, November and December which also supports non-rejection of the null hypothesis.

## Conclusions

According to the results, the empirical rainfall distribution is represented by the gamma distribution adequately for Mahailuppallama in most of the cases. Further, it implies that, when the deviation of rainfall is higher from the mean, it is difficult to project the future since such cases do not follow specific theories. The joint interpretation of monthly shape parameters and scale parameters conveys the distribution of values in the modeled rainfall data in a particular location for a qualitative assessment of the amount and stability of rainfall throughout the season. Likelihood of receiving rainfall amount obtained by the parameters will give the estimation of rainfall in a month at a location, thereby implementation of agronomic practices and water management can be strategically planned.

Since at present in Sri Lanka, this kind of theoretical distribution has not been taken into account for drawing climatological implications, the finding of the study will support forecasting scenarios with policy implication and decision making in order to avoid crop loss affected by farmers and diminish the overall economic loss occurring due to the forthcoming rainfall. Hence,

modeling rainfall is of paramount importance since rainfall variability has been identified as a major cause of fluctuations in crop production in the Dry Zone.

## **References**

- Aksoy, H. (2000). Use of gamma distribution in hydrological analysis. *Turkish Journal of Engineering and Environmental Sciences*, 24(6), 419-428.
- Husak, G. J., Michaelsen, J. and Funk, C. (2007). Use of the gamma distribution to represent monthly rainfall in Africa for drought monitoring applications. *International Journal of Climatology: A Journal of the Royal Meteorological Society*, 27(7), 935-944.
- ŞEN, Z. and Eljadid, A. G. (1999). Rainfall distribution function for Libya and rainfall prediction. *Hydrological Sciences Journal*, 44(5), 665-680.
- Sivajothi, R. and Karthikeyan, K. (2016). Analysis of monthly rainfall data prediction for change of economic environment in Pampadumpara using Gamma distribution. *Research Journal of Pharmacy and Technology*, 9(9), 1477-1482.
- Thom, H. C. (1958). A note on the gamma distribution. *Monthly Weather Review*, 86(4), 117-122.

## **An Investigation of Factors Affecting the Exchange Rate in Sri Lanka**

**S. Mathusha**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Keywords:** *ARDL approach; Cointegration; Exchange rate*

### **Introduction**

The exchange rate is defined as the number of units of domestic currency that are needed to buy one unit of foreign currency. It plays a vital role in a country's level of trade, which is critical to every free market economy in the world. This is because changes in exchange rates have pervasive effects on prices, wages, interest rates, production levels, and employment opportunities. Further, depreciation and appreciation of the exchange rate affect the economy in different ways. In general, appreciation of a country's currency lowers the inflation and domestic prices of imports. Also, the burden on foreign debt becomes less. Lower import prices will encourage imports and worsen the country's trade balance. Exporters will be discouraged by the reduction in their income in domestic currency. Depreciation will have the opposite effect. For these reasons, exchange rate is the most watched economic measure of any country.

In Sri Lanka, during the fixed exchange rate period, the currency was devalued from Rs. 4.76 per US\$ at the end of 1950 to Rs.15.56 at the end of 1977. After commencing the managed float exchange rate regime, it further depreciated to Rs. 80.06 at the end of 2000. Immediately after the flexible exchange rate regime, the exchange rate depreciated from Rs.93.16 at the end of 2001 to Rs. 182 at the end of 2019. These changes reflect a 415% depreciation during the managed float period of 22 years (nearly 19% per year) and 102% depreciation during the flexible exchange rate system of 18 years (nearly 6% per year) so far. The total currency depreciation is nearly 941% in 40 years of managed and flexible float period which is nearly 23.5% per year on average (www. daily news.lk, 2020). However, it is difficult to identify particular reasons for such different rates of currency depreciation.

There are many studies showing the relationship between the exchange rate and its determinants for a number of countries. According to Saeed et al. (2012) stock of money and foreign exchange reserve balance positively contribute to exchange rate appreciation in Pakistan. Further, debt and political instability affect it negatively. Venkatesan and Ponnamma (2017) found that foreign direct investment, Gross Domestic Saving and inflation contribute negatively to the exchange rate in India. Meanwhile, current account deficit and interest rate positively affect the exchange rate. Rajakaruna (2010) has investigated the factors that affect exchange rate fluctuation in Sri Lanka. The study revealed a negative relationship between exchange rate and inflation, interest rate, remittance and terms of trade. In addition, it identified a positive relationship between the exchange rate and net foreign purchase.

However, none of the previous studies have considered the relationship between exchange rate and its determinants using the ARDL Bound testing approach in Sri Lanka. Further, this is the first study to include foreign direct investment net inflow, public debt and consumer price index as explanatory variables when estimating factors that affect the exchange rate. These motivate to fill this gap in literature. Further, findings of this study would help policymakers to adopt appropriate strategies and policies regarding exchange rate in Sri Lanka.

### **Objective**

The primary objective of this study is to investigate the main factors that affect the exchange rate in Sri Lanka.

### **Methodology**

This study covers the Annual data of Sri Lanka over the period 1977 – 2018. Data for the exchange rate (ER), interest rate (IR), current account deficit (CAD) and public debt (PBD) were extracted from Annual Reports of the Central Bank of Sri Lanka, while those for consumer price index (CPI), foreign direct investment net inflow (FDINI) and remittance (REM) were obtained from World Development Indicators of the World Bank data base. All variables, except IR, were transformed into a natural logarithm. ADF and PP unit root test methods were adapted to test the stationarity property of the

series. Akaike Information Criterion (AIC) is applied to determine the optimal lag length of each series. The empirical model was formulated based on the literature as given below:

$$LER_t = \beta_0 + LFDINI_t + LPBD_t + LREM_t + IR_t + LCAD_t + LCPI_t + U_t \quad (1)$$

Where,  $U_t$  is the white noise error term,  $t = 1, 2, 3, \dots, T$ .

Autoregressive Distributed Lag (ARDL) Bound testing procedure developed by Pearsan et al. (2001) was employed to find out whether there is cointegration and the long - run relationship between variables. Error correction version of ARDL model was adopted to examine the short – run relationship between variables and long – run adjustment. In addition, diagnostic tests were conducted to check whether the results are robust and Cumulative Sum (CUSUM) test was conducted to check the stability of the model.

**Results and Discussion**

According to the results of ADF and PP unit root tests, IR is stationary at level while the other variables of the model are stationary at their 1<sup>st</sup> difference, implying that variables are integrated in order zero (IR) and order one (LER, LCAD, LFDINI, LPBD, LREM and LCPI). Therefore the ARDL model was used. Akaike Information Criteria (AIC) advocates use of ARDL (4, 1, 3, 1, 2, 1, 0) model for the analysis. As a prerequisite for accurate estimation, diagnostic tests were employed and results are given in Table 1

Table 1: The results of Diagnostic Tests

Test	Probability
Normality (Jarque – Bera Test)	0.6956
Serial Correlation (BG LM Test )	0.7928
Omitted Variables (Ramsey RESET Test)	0.7626
Heteroskedasticity (BPG Test)	0.3946

Results of the above mentioned diagnostic tests confirm that residuals are distributed normally, residuals are not serially correlated, there is no specification error in the estimated model and disturbance term in the equation is homoscedastic. Meanwhile, recursive estimates of CUSUM plot lies within the upper and lower critical Bounds at 5% significance level, so

that the stability of parameters is established. As the next step of estimation, the results of the Bound test shows that the F – statistic is 3.79. This exceeds the critical value of upper bound 3.28 and confirms a long-run relationship. The long - run results of the corresponding ARDL model are presented in Table 2 below:

Table 2: Results of Long run Relationship (Dependent Variable: LER)

Cons	LFDINI	LPBD	LREM	IR	LCAD	LCPI
-7.412	-0.108***	0.499***	-0.259**	-0.032***	0.079***	0.548***
(-8.751)	(-3.105)	(5.0127)	(-2.701)	(-2.939)	(3.359)	(2.943)

Note: t – statistics are given in parenthesis. \*, \*\* and \*\*\* show significance at 10%, 5% and 1% level respectively.

As expected by the monetary approach to balance of payments theory and similar to the existing study, (Venkadesan and Ponnamma, 2017) CAD positively and significantly affects the exchange rate in the long run. This implies that increasing CAD causes exchange rate depreciation in Sri Lanka. Meanwhile, CPI is the main factor that largely affects ER in the long run. When CPI increases by 1 percent, the ER increases by 0.548 percent, holding others fixed. This reflects a high inflation rate reducing the value of currency and encouraging exchange rate depreciation. PBD is the next variable that largely affects the exchange rate in the long run. When PBD increases by 1 percent, the ER increases by 0.499 percent, holding others fixed. Sri Lanka’s past experience reflects a continuous budget deficit which encourages the government to rely on public debt to fulfill the deficit. Therefore, continuous increase in public debt causes currency depreciation. As expected by the theory and some of the empirical findings (Venkatesan and Ponnamma, 2017; Manurya, 2017) FDINI negatively affects the exchange rate in the long run, which means an increase in FDINI induces appreciation of the currency. Likewise, IR and REM negatively and significantly impact on the exchange rate in the long run.

Next, the results of the short - run dynamic and long - run adjustment coefficient are presented in Table 3. Accordingly, lagged, three and four period lagged values of the ER positively and significantly affects the exchange rate in the short run. Moreover, current value of FDINI negatively affects the ER while current value of CAD positively affects the ER. Lagged values of FDINI and IR have a negative and significant impact on the ER.

Current and lagged values of PBD have a positive and significant impact on the ER in the short run. Moreover, ECT (-1) carries an expected negative sign, which is highly significant, which illustrates that there is an adjustment toward a steady - state line in the long run one period after the exogenous shock; i.e. about 60.29 % of disequilibrium in the ER is corrected every year one period after the exogenous shocks.

Table 3: Results of Short run Relationship and Long run Adjustment

Panel A: Short – run Coefficient Estimates		$R^2 = 84.54$			
Dependent Variable: LER					
Lag Order	0	1	2	3	4
$\Delta$ LER		0.852*** (4.187)	-0.238 (-1.552)	0.496*** (2.925)	0.553*** (3.843)
$\Delta$ LFDINI	-0.030** (-2.196)	-0.039*** (-3.178)			
$\Delta$ LPBD	0.521*** (3.850)	0.380** (2.370)	0.346** (2.480)	0.313** (2.351)	
$\Delta$ LREM	-0.004 (-0.038)	-0.168 (-1.597)			
$\Delta$ IR	0.001 (0.311)	-0.011** (-2.396)	-0.012** (-2.490)		
$\Delta$ LCAD	0.023 (1.925)	0.042*** (3.591)			
$\Delta$ LCPI	-0.011 (-1.159)				
Panel B: Error Correction Representation					
ECT (-1) = -0.6029 (-6.444)***					

Note: t – statistics are given in parentheses. \*, \*\*and \*\*\* show significance at 10%, 5% and 1% level respectively.

## Conclusion

The main objective of this study was to identify the factors that affect the exchange rate in Sri Lanka. To achieve this objective, time series data for the period 1977 – 2018 were used. The selected ARDL model passes all the diagnostic tests and the stability test. The result of the ARDL Bound test implies that there exists a co - integrating relationship between the variables. According to the long run results consumer price index and public debt largely affect the exchange rate in Sri Lanka. Meanwhile, the current account deficit also positively affects the exchange rate in the long run, whereas REM and IR have negative impacts on the exchange rate. In addition, FDINI

negatively affects the exchange rate whereas PBD positively and significantly affects the exchange rate in the short run. Therefore, proper management of public debt, consumer price index, and current account deficit is necessary to increase the value of rupee against USD. Further, the study emphasizes the necessity of foreign direct investment net inflow, remittance inflow and high level of interest rate to increase the value of the rupee against USD. Moreover, policymakers can develop appropriate macroeconomic and monetary policies, by taking into account these factors that affect the exchange rate in the short run and in the long run.

## **References**

- Manurya, S. (2017). Factors affecting exchange rate and its impact on economy of India. *Asian Journal of Research in Business Economics and Management*. 7(8), 324 – 347.
- Rajakaruna, S. H. I. (2010). An investigation on factors affecting exchange rate fluctuation in Sri Lanka. *Staff Studies (Central Bank of Sri Lanka)*, 7(1), 69 – 100.
- Sadeed, A., Awan, R. U., Sial, H. M. R., and Sher, F. (2012). An econometric analysis of determinants of exchange rate in Pakistan. *International Journal of Business and Social Science*. 3(6), 184 – 196.
- Venkatesan, T., and Ponnamma, M. S. (2017). An analysis of macroeconomic factors affecting foreign exchange rate. *Journal of Management*. 8(1), 21 – 29.

## **Impact of COVID 19 on Own Account Workers in Sri Lanka**

**D.N. Ranawaka<sup>1</sup> and I.S. Thennakoon<sup>2</sup>**

*<sup>1, 2</sup> Centre for Poverty Analysis, Sri Lanka*

**Keywords:** *COVID 19; Own account workers; Entrepreneurs; Sri Lanka*

### **Introduction**

Entrepreneurs (hereafter defined as own account workers) are vital to the economy especially in the case of poverty alleviation and reducing inequalities in a post-war climate in a country. After slow recovery from the Easter Sunday attacks, COVID 19 is like a second wave of tsunami to the Sri Lankan economy. With a workforce of 8.6 million consisting of 64.5% males and 35.5% females (DCS, 2020), the economy faces a setback due to the onset of COVID 19. According to the World Economic Forum, start-ups had terminated more than 70% of their full-time employee contracts during the pandemic and more than 40% of the start-ups will have cash to run the business only for just less than three months (WEF, 2020). While the global lens indicates insecurity of the startups and small-scale businesses, the Centre for Poverty Analysis (CEPA) attempts to investigate the national level impact on own-account workers during the time of COVID 19 lockdown.

CEPA studied the livelihoods of 400+ households across 23 districts to understand the effects of COVID 19 on them. We were unable to make the survey representative due to data collection restrictions. In this paper, we will be analyzing the impact of COVID 19 on own account workers at three levels; the economic impact, COVID 19 and its impact on household activities and perceptions on economic burden in the household.

### **Objectives**

The objective of the paper is to understand and evaluate the impact of COVID 19 on own account workers during the lockdown period in the month of April to June, 2020 in order to answer the following questions;

1. Has there been an economic impact on the households of own account workers during the lockdown period? If so, what is the nature of this impact?

2. Has there been an impact on the care work of the households during the lockdown period?
3. What has happened to perceptions on the economy of the household?

## **Methodology**

This paper looks into analyzing a survey conducted by the Centre for Poverty Analysis during the COVID 19 lockdown period in the first quarter of 2020. The methodology consists of two parts; quantitative analysis of the survey and analysis of the existing literature. Due to word restrictions, the analysis of the existing literature is not included in the paper. Limitation of this study described below.

The survey does not consist of a representative sample due to data collection limitations during the COVID 19 lockdown period. Therefore, the surveyed population is highly skewed towards the populations who have access to internet connections as the data collection method was online.

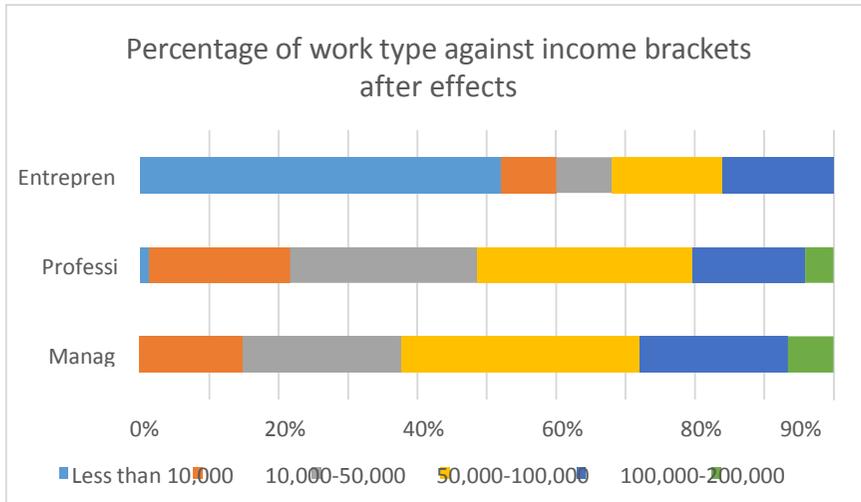
## **Results and Discussion**

The survey looked into seven types of working categories such as managerial, professional, teaching, assistant, entrepreneurial and other (workers who does not fall under any of the above six categories). Due to lesser number of responses in certain work types, we have only analyzed three main work types; managerial, professional and entrepreneurial sectors for comparative purposes.

This analysis particularly looks into three distinct areas as previously mentioned, which are the economic impact, changes in care work during COVID 19 and perceptions of certain aspects related to the household economy among the own account workers during the lockdown.

First, we explained the economic impact of COVID-19. There are four characteristics which can be used to identify the economic impact on the own account workers from the survey. They are job assurance, income reduction, income brackets and financial management. According to the survey, 80% of the own account workers (entrepreneurs) have indicated that they are expecting an income reduction while 50% of them are unsure about their jobs. These percentages are drastically high when compared with other work types

where these percentages lie in-between 20-30% and 40% respectively. According to these statistics, it is possible to infer that own account workers are more worried about job insecurity compared to other work types.



Looking at the income brackets, more than 50% of the own account workers fall under the lowest income bracket; “less than 10,000”. Only 32% of the sample of own account workers have reported that their monthly income is between 100,000 – 500,000. Since majority of the own account workers indicate that they belong to the lowest income bracket, we can conclude that the own account workers are the most vulnerable of the work types as opposed to other work types who are unable to absorb external shocks such as the COVID 19 lockdown.

The survey also has included a section on financial management during the COVID lockdown period which ranks the choice of accessing finance during the COVID period. While almost all the work types have utilized cash in hand as their primary option, own account workers have opted for pawning and non-interest borrowings as their second and the third option. However, professions like managerial, professional and teaching have opted for pawning and non-interest borrowings as their third and fourth options and cash in bank as the second option. This further establishes the previous argument that was made; that own account workers are worse off financially during the COVID 19 period. This finding is significant as the Sri Lankan literature has not covered the impact of COVID 19 on any of impacts on the work types.

Second, we will explain the impact of COVID-19 on work hours of different types of work.

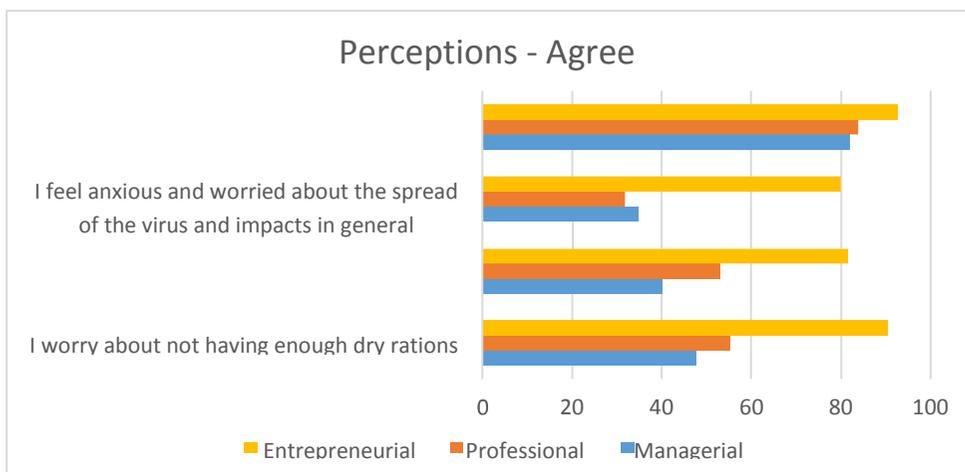
Table 1: Hours of Care Workers

Work Hours	Work Types		
	Managerial	Professional	Entrepreneurs
Change of Work Hours	77.35849	76.31579	58.82353
	13.20755	15.78947	17.64706
	9.433962	7.894737	23.52941
Change of HH Work Hours	3.773585	2.631579	9.090909
	29.24528	28.94737	18.18182
	66.98113	68.42105	72.72727
Change of Care Work Hours	0.943396	1.754386	2.941176
	55.66038	63.15789	50
	43.39623	35.08772	47.05882

Note: Figures are in percentages of the surveyed sample population.

Change indicates marginal number of people who were engaged in paid and unpaid work during and before the curfew period. On average, change of work hours had reduced and change of household work and change of care work hours in absolute numbers. However, 73% of the own account workers have indicated that they had allocated more time in household work in comparison to other work types (which averages around 60%) surveyed across. There is no major discrepancy in care work among work types.

Finally, we explain the perceptions of COVID-19. The result is given below:



While the statistics indicate that household work is burdened heavily on own account workers, looking into the perceptions according to the work type indicates

that the own account workers worry more about their family's finances, dry rations, and about the spread of the virus more than the other work types.

## Conclusion

It is evident that the own account workers are the worse off during the first wave of the COVID 19 which reflects the social security network in the country. The own account workers were affected on three tiers; their economy, household activities and their livelihood which had indirect influence on their mental health (perceptions mentioned above). Furthermore, in spite of the activated COVID 19 relief package by the government, certain case studies along with the quantitative analysis proved that there were many left out specially in terms own account workers in the country. Given that entrepreneurs and own account workers could be the backbone of an economy, the government should mainly focus on the most desperate income earners of the economy by implementing representative and vulnerable groups in the economy.

## References

- COVID-19 Outbreak Impact on Sri Lanka and Recommendations. (2020). [online] Available at: <https://www.pwc.com/lk/en/assets/COVID-19-Impact-on-Sri-Lanka-PwC.pdf>. [Accessed 22 Sep. 2020].
- COVID-Survey; Centre for poverty analysis (2020) data base. Centre for Poverty Analysis, Jawatta , Colombo.
- Wimalweera, A. (2020). COVID - 19 and beyond: The impact on the labour market of Sri Lanka. Survey Report of the e-survey, Department of Labour: Sri Lanka [online] Available at: [http://www.labourdept.gov.lk/images/PDF\\_upload/notices/survey%20report%202020.pdf](http://www.labourdept.gov.lk/images/PDF_upload/notices/survey%20report%202020.pdf)
- World Economic Forum, 2020. *Discovering the real impact of COVID 19 on entrepreneurship*. [Online] Available at: <https://www.weforum.org/agenda/2020/06/how-covid-19-willchange-entrepreneurial-business/> [Accessed 25 August 2020]

## **Violent Protests and Transitional Regimes: Empirical Evidence from Arab Spring**

**Tariq Basir<sup>1</sup> and Soumya Datta<sup>2</sup>**

<sup>1</sup> *PhD researcher in economics, South Asian University, India*

<sup>2</sup> *Faculty of Economics, South Asian University, India*

**Keywords:** *Intermediate regimes; Arab spring; Violent protests; MENA*

### **Introduction**

In December 2010, a wave of protests and uprisings, popularly referred as 'Arab Spring', spread throughout the MENA counties. It first started in Tunisia after Mohamed Bouazizi, an unemployed 26-year-old Tunisian citizen, protested government corruption by setting fire to himself on December 17 2010. Soon the protests and uprisings spread to other countries of the region like Egypt Libya, Syria, Bahrain and Yemen. In Tunisia and Egypt the protests resulted in the toppling of earlier authoritarian regimes and establishment of new democratic governments. In other cases like Libya and Syria, the uprisings led to civil wars and huge casualties and destructions. However, Bahrain and Yemen experienced waves of protests as well, but in both cases the protests were dismissed peacefully by political settlement. Apart from the above cases of Arab spring, no serious uprising or revolution happened in other countries of the region. Hence, the first question that comes to mind is what are the factors which caused public uprisings and revolutions in some countries but not in others?

However, It is not so obvious from the socio-economic conditions of the MENA region whether it was socio-economic distresses which caused Arab Spring events or a desire for more political rights and civil liberties. It is to be noted that in the 2000s, many developing countries in MENA region did well in terms of poverty statistics and human development indicators. The region had notable achievements in terms of Millennium Development Goals related to poverty, access to infrastructure services, sanitation, internet connectivity, reducing hunger, child and maternal mortality, and increasing school enrollment (Iqbal and Kindrebeogo, 2015). This apparently opposing relationship between socio-economic conditions in the decade prior to Arab

spring and the onset of Arab spring protests, calls for a deeper and more careful empirical study between the political structure and type of regimes common to the MENA region and onset of the protests. One cause for the onset of uprisings and instability in developing countries is the so called ‘intermediate/transitional regimes’ thesis which postulates that regimes with intermediate levels of political rights and democratization are more prone to destabilization, than consolidated dictatorships or democracies (Gates, et al., 2000; Goldstone et al., 2010; Korotayev, et al., 2018).

## Objectives

The purpose of this study is to empirically investigate the relationship between the so called intermediate/transitional regimes and violent protests during Arab spring event.

## Methodology

The data of 14 MENA countries over the period 2006-2017 were used in this study. Dependent variable data of Arab spring protests was extracted from ‘Global Dataset on Events, Location, and Tone’ (GDELT) data base. ‘Political Rights’ variable used as intermediate regimes which were collected from ‘Freedom House’ data base. Socio-economic variables employed as other explanatory variables were extracted from the World Bank data base. We also used other political variables from Polity IV and other data bases. Following some of the existing studies, we construct the regression model below to estimate the parameters:

$$\begin{aligned}
 Dem_v = & \beta_0 + \beta_1 DemV_{Eggsyr} + \beta_2 PR1 + \beta_3 PR1_{sqr} + \beta_4 \log GDPpc + \beta_5 GDPpcg + \\
 & \beta_6 CPI + \beta_7 HDI_{EduHealth} + \beta_8 Domgovhealthexp + \beta_9 Foodprodu + \\
 & \beta_{10} FoodImport + \beta_{11} Mobile + \beta_{12} Oil_{Rents} + \beta_{13} Unemp_{total} + \\
 & \beta_{14} Unemp_{youth} + \beta_{15} CL1 + \beta_{16} PTS_S + \beta_{17} xrcomp + \beta_{18} xropen + \\
 & \beta_{19} exconst
 \end{aligned}$$

We run a Fixed Effects model to investigate the socio-economic and political determinants of the Arab Spring violent uprisings. We run a number of tests for choosing the final appropriate model and the results suggest that a Fixed Effects model with robust standard errors is the appropriate model to use for our dataset. In order to choose between Random Effects and the pooled OLS model, we run a Breusch-Pagan Lagrange multiplier (LM) test. Our results

show that the pooled-OLS is a more appropriate model to use than the RE model. Next, in order to choose between pooled-OLS and fixed effects models, we test the null hypothesis that the country dummies are jointly statistically different from zero. Our results reject this Null hypothesis with very high statistical significance, which implies a FE model is the appropriate model to use compared to pooled-OLS model. We also run a test for choosing between FE and RE models. However, before that, we also test for the existence of heteroskedasticity in the data, from which we are able to reject the Null hypothesis of ‘no heteroskedasticity’ in the data. The presence of heteroskedasticity implies that the normal standard errors will be biased and we cannot use a standard Hausman test. Hence, instead, we use the Mundlak (1978) test for choosing between FE and RE, where the standard errors are robust to heteroskedasticity. Our Mundlak (1978) test results show that we are able to reject the Null hypothesis of ‘no correlation between the time-invariant unobservables and the regressors’, and, hence, the FE model is the appropriate model to use.

## **Results and Discussion**

Table1: Results of Fixed Effects Model

Variables	Dem_Voil		Variables	Dem_Voil	
DemV_EgpSyr	0.0779*	(0.037)	Mobile	-0.00344	(0.014)
PR1	-3.688**	(1.545)	Oil_Rents	-0.113*	(0.056)
PR1_sq	0.776**	(0.318)	Unemp_total	-0.165	(0.555)
logGDPpc	-2.135	(3.730)	Unemp_Youth	0.247	(0.175)
logGDPpcg	-0.169	(0.128)	CL1	-1.210	(1.456)
CPI	0.0147	(0.039)	PTS_S	-0.0914	(0.258)
HDI_EduHealth	10.67	(16.34)	xrcomp	-4.490	(5.845)
Domgovhealthexp	-0.330	(0.524)	xropen	-0.310	(1.920)
Foodprodu	-0.0201	(0.017)	exconst	-1.150	(0.671)
Foodimports	0.151	(0.161)	Constant	24.79	(31.94)
	Observations	=	110		
	R-squared	=	0.677		
	# of Countries	=	14		
	Year FE	=	YES		

Note: Robust standard errors are given in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Due to space constraints, we skip reporting the tables and figures of intermediate tests in this paper. So we directly report the results from the Fixed Effects model in the table below:

As is evident from the fixed effects model in Table 1, we have controlled for a set of socio-economic and political variables, along with our Political Rights variable (PR1) to capture the notion of intermediate regimes. As the intermediate regime hypothesis postulates that instability and revolutions are more frequent in societies in which democracy and political rights level is in intermediate levels, one would expect a nonlinear relationship between political rights and number of protests. To capture this nonlinearity we have added the quadratic term for political rights variable, as well. As results in Table 1 show, both PR1 and PR1\_sqr variables are statistically significant and the sign for PR1 is negative while it is positive for PR1\_sqr. This implies that the relationship between ‘political rights’ and protests is nonlinear and U-shaped. This means that in very strict dictatorships (i.e. left-hand side of the U-shape), any small increase in the level of political rights reduces people's inclinations to protest; while on the right-hand side of the U-shape, any small and marginal increase in political rights increases citizens' inclinations for protest and regime change. The logic behind this result would be that, in very strict authoritarian regimes any increase in political rights (up to a threshold) would reduce people's grievances associated with the lack of freedoms, and would make them protest less. But when political rights increase beyond a threshold, people would have higher preferences for real democratic regimes, and also would have more opportunities to organize themselves for protests and change of regime. This explains the logic behind why, beyond a threshold, increases in political rights and freedoms leads to more protests (right-hand side of the U-shape).

It seems that this result does not reflect the ‘inverted U-shape’ relationship in intermediate/transitional regime hypothesis. Furthermore, there are other papers in the literature which also find results that do not completely reflect the inverted U-shape of intermediate regimes. Daniel Stockemer (2010) finds that the occurrence of minor intrastate wars and major civil wars does not differ between hybrid (intermediate) regimes and autocracies, and only democracies have a significantly lower probability of experiencing intrastate fighting and warfare. Similarly, Slinko et al (2017) suggest that the inverted

U-shaped relationship between regime types and sociopolitical destabilization is typically characterized by an asymmetry, with consolidated authoritarian regimes being generally less stable than consolidated democracies. However, it should be noted that, as there are no real functioning democratic regimes in the MENA region (our dataset), in our study the right hand side region of the U-shape graph could be considered as the region coinciding with the intermediate regimes in the MENA region, which represents the relatively less authoritarian regimes. Therefore, it would be plausible to suggest that the U-shape relationship in our study, in a sense, would reflect the intermediate/transitional regimes hypothesis as well: as we do not have real democratic regimes in our dataset to capture the declining right-hand side of the 'inverted U-shape', the increasing right-hand side of our U-shape relationship would reflect the increasing part of the 'inverted U-shape' in the original intermediate regimes thesis. However, we should mention that further research is needed in this area. Further research can look at this in more detail.

Furthermore, we also find support for the positive spatial spillover effects from Egypt and Syria, the two countries that experienced the highest number of protests. This confirms the positive spatial spill-overs from these two high experiencers of Arab spring to other neighboring countries. Our regression results also show a negative and significant coefficient for Oil-rents (% of GDP) variable, which implies that countries with higher oil rents experienced lesser protests. The reason for this could be that these regimes had more rents and resource to provide higher distributions or services to their citizens, or might have had more resources to buy-off the protesters. This finding further might support the 'authoritarian bargain' hypothesis in MENA region, in which an authoritarian regime buys-off political legitimacy against better economic services and distributions to its citizens.

However, we do not find any empirical support for other socio-demographic factors like level of GDP per capita, GDP growth, CPI, HDI, youth unemployment, or developments in cellphone use and social media communications. Similarly, our results do not support other political variables such as civil liberties (CL1), or other democratic measure from Polity IV index such as 'constraints on chief executives recruitment'

(exconst), or chief executives recruitment openness/competitiveness (exopen/excomp).

We should, however, point out that the results from this exercise are limited to only a specific set of events in MENA region. We might require a wider set of econometric studies to investigate the extent to which these results can be generalized to other countries or other regions. In addition, we should also note that certain structural factors, such as external influences, which were not part of this study might have played a role in determining the protests. Similarly, the dynamic interaction between the regime and the protesters might have also influenced the evolution of the extent and mode of protests. In this sense, this study should be looked upon as a preliminary empirical investigation into certain important determinants of protests in MENA countries during Arab Spring. We feel that in this limited sense, this study contributes to the literature.

## References

- Goldstone, J. A., Bates, R. H., Epstein, D. L., Gurr, T. R., Lustik, M. B., Marshall, M. G., Ulfelder, J. and Woodward, M. (2010). A global model for forecasting political instability. *American Journal of Political Science*, 54(1), 190-208.
- Korotayev, A. V., Issaev, L. M., Malkov, S. Y. and Shishkina, A. R. (2014). The Arab spring: a quantitative analysis. *Arab Studies Quarterly*, 36(2), 149-169.
- Korotayev, A., Bilyuga, S. and Shishkina, A. (2018). GDP per capita and protest activity: a quantitative reanalysis. *Cross Cultural Research*, 52(4), 406-440.
- Slinko, E., Bilyuga, S., Zinkina, J. and Korotayev, A. (2017). Regime type and political destabilization in cross-national perspective: a re-analysis. *Cross-Cultural Research*, 51(1), 26-50.
- Stockemer, D. (2010). Regime type and civil war: A re-evaluation of the inverted U-relationship. *Global Change, Peace & Security*, 22(3), 261-274.

## **Impact of Regional Infrastructure Facilities on Provincial GDP in Sri Lanka**

**R. C. Jayatissa and T. L. Navaratne**

*Department of Business Economics, Faculty of Management Studies and Commerce, University of Sri Jayewardenepura, Sri Lanka*

**Keywords:** *Electricity; Infrastructure; Provincial GDP; Transportation; Water*

### **Introduction**

Infrastructure facilities in a country play a significant role in citizens' daily activities as well as in the overall economy. Transport, petroleum, electricity, port activities, telecommunication, water and sanitation come under economic infrastructure whereas health and education fall under social infrastructure (Amarathunge et al., 2007). An efficient and developed system of economic and social infrastructure across the country is essential for creating opportunities for economic growth, poverty alleviation and employment generation.

As identified by Amarathunge et al. (2007), the physical infrastructure system is the backbone of any nation and a sturdy infrastructure network can increase productivity, reduce the cost of production, increase trade and reduce poverty. On the other hand, Uduporuwa (2007) highlights that lack of infrastructure facilities can create major disasters or can augment the negative effects of disasters. Hence the absence of adequate infrastructure facilities is one of the major barriers for national as well as regional development (Sri Ranjith and Thilanka, 2019).

Regional disparity - uneven and unbalanced distribution of economic development in infrastructure facilities experienced by different districts or provinces is a commonly discussed issue. In the Sri Lankan context, scholars highlight that over the last decade the disparity in provincial Gross Domestic Product (GDP) contribution is relatively high (Sri Ranjith and Thilanka, 2019). Further, infrastructure was identified as responsible for determining the regional GDP contribution (Uduporuwa, 2007). With this backdrop the research problem of this study is as follows: differences in infrastructure

facilities across the provinces have direct and indirect impacts on the regional GDP, which thus create regional disparities. Henceforth, the study examines how differences in key infrastructure facilities may create disparities across regional economies.

### **Objectives**

The main objective of the study is to identify the impact of three key infrastructure sectors namely, transport, energy (electricity) and water on the aggregate level of GDP in Sri Lanka and provincial GDP contribution separately. The sub objective of the study is to identify whether the infrastructure facilities (water and electricity) specifically used for the industrial sector in Sri Lanka have any impact on the industrial sector's contribution to provincial GDP.

### **Methodology**

The study uses secondary data and a panel data set was formed based on annual data with regards to the nine provinces in Sri Lanka from the year 2008 to 2018. Variables are selected based upon existing studies and those variables are in relation to the three infrastructure facilities: water, electricity and transportation (Rohima et al., 2017). The measurement of specific variables used are as follows: Provincial GDP Contribution at current prices (Rs. Millions); Water - Number of total consumers which includes domestic, government and industrial consumers; Electricity - Number of total consumers which includes domestic, religious, industrial, commercial consumers and street lightning; Road - Number of total road kilometres covering all types of roads from type A to D and highways; Government Recurrent Expenditure (Rs. Millions) and Mid-Year Population.

The combined aggregate effect of infrastructure on GDP is explored via a Random Effect Multiple Regression Analysis and the model is specified below:

$$GDP_{it} = \beta_0 + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \beta_3 X_{3,it} + \beta_4 X_{4,it} + \beta_5 X_{5,it} + u_{it} \quad (1)$$

Where,  $\beta_0$  is the intercept,  $X_1$  is water,  $X_2$  is electricity,  $X_3$  is transportation,  $X_4$  is mid-year population,  $X_5$  is government recurrent expenditure and  $u$  is the error term. And provincial effect of infrastructure on provincial GDP is

represented by  $i$  ( $i = 1, 2, \dots, 9$ ). Impact of number of industrial consumers on industrial sector GDP contribution is only carried out in the provinces where it shows a significant impact on either water or electricity facilities on provincial GDP.

Based on the Hausman test, Random effect model is used to estimate the equation (1).

### **Results and Discussion**

The Random Effect Model results show that all the infrastructure facilities; water, electricity and transportation as well as the control variables; government recurrent expenditure and mid-year population have a significant impact on the GDP contribution in Sri Lanka (See Table 1). There is a positive relationship between GDP contribution and number of consumers of water, road kilometrages, government recurrent expenditure and mid-year population. Further, a negative relationship can be seen between GDP contribution and number of consumers of electricity.

Table 1: Results of Random Effects Multiple Regression Analysis

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
$C$	-945345.8	154755.4	-6.108645	0.0000
$X_1$	2.2	0.429454	5.190523	0.0000
$X_2$	-1.3	0.259107	-5.023101	0.0000
$X_3$	279.6	67.57900	4.137884	0.0002
$X_4$	612.1	99.19470	6.171470	0.0000
$X_5$	2.5	6.264151	0.411830	0.6827

After exploring the combined effect of infrastructure on national GDP the analysis was carried out to assess how provincial infrastructure affects the provincial GDP. Those results lead to the realization that, though as a country overall infrastructure plays a significant role, across the provinces some infrastructure facilities play a greater role than others.

Water has a significant positive relationship with GDP contribution in the Central, Nothern, Uva and Sabaragamuwa provinces. For electricity, Southern and North Central provinces show a positive relationship while Sabaragamuwa province shows a negative relationship with GDP contribution. In North Western province there is a positive relationship

between transportation and GDP contribution while North Central and Sabaragamuwa provinces have a negative relationship.

When considering the analysis done on industrial consumers and industrial contribution to GDP, the number of industrial water consumers in almost all the provinces indicates a significant impact on the provincial industrial contribution of GDP. Northern and Sabaragamuwa provinces show a significant positive relationship whereas Central and Uva provinces show a negative relationship between the number of industrial water consumers and the industrial portion of the provincial GDP.

As argued by D´emurger, (2001), not only the availability and the quantity of infrastructure but the quality should also be considered. Furthermore, equity should be practiced rather than equality when allocating funding and resources for the infrastructure development. Studies emphasize that the existing strategy for infrastructure development in Sri Lanka has not successfully contributed to reduce the regional disparities in terms of infrastructure (Uduporuwa, 2007).

### **Conclusion**

It can be concluded that even though infrastructure plays a significant impact on the GDP of Sri Lanka, the same infrastructure facilities would impact differently for different provinces. Moreover, industrial proportion of the GDP is also significantly impacted by the number of industrial consumers of water and electricity in different regions. This is important in improving the industrial sector GDP contribution. This study directs the policymakers to practice equity when developing regional infrastructure rather than focusing on equality.

## **References**

- Amarathunge, D., Palliyaguru, R. & Peter, R. (2007). Improving infrastructure to reduce future vulnerabilities to natural disasters. *CIB World Building Congress 2007*.
- D'émurger, S., (2001). Infrastructure development and economic growth: An explanation for regional disparities in China. *Journal of Comparative Economics*. 29, 95-117.
- Rohima, S., Yulina, S., Bashir , A. and Hafiz, N. (2017). Public infrastructure availability on development disparity. *Business and Economic Research*. 7(2), 375-391.
- Sri Ranjith, J. G. and Thilanka , H. R. A. C. (2019). The determinants of regional development disparities in Sri Lanka : An empirical investigation into the regional development policy and issues. *Sri Lanka Journal of Business Economics*. 8(1).
- Udupuwa, R. (2007). Regional dimensions of development of Sri Lanka. *Sabaragamuwa University Journal*. 7(1), 22-36.

## **Impact of Economic Growth on Income inequality: A Case Study of Sri Lanka**

**K.A.N.I. Kariyapperuma**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Keywords:** *Income inequality; Economic growth; Sri Lanka*

### **Introduction**

Economic growth and distribution of income can be recognized as two important issues, which are concerned with economic development. Although the poverty rate of Sri Lanka is a single digit value, the GINI coefficient value reflects relatively high income inequality. At the same time, even though Sri Lanka belongs to the middle income category<sup>2</sup>, the overall economic growth rate is unstable and not sustained. In addition, regional and provincial poverty levels depict disparities of income distribution at a micro scale. Therefore it is important to understand the growth-income inequality nexus.

Income inequality in economics is the significant disparity in the distribution of income between individuals, groups, populations, social classes, or countries. This territory is staked out by founding scholars. The seminal work of Kuznets (1955) is both important and controversial. He asserted that inequality was a consequence – though only temporary – of economic growth. In this respect, inequality was seen as increasing in the early stage of the economic development process before decreasing with further development. The existing empirical studies found a positive (e.g., Rubin and Segal 2015; Wahiba and Weriemmi 2014; Lundberg and Squire 2003), a negative (e.g., Majumdar and Partridge 2009; Nissim 2007) and mixed (e.g., Huang et al. 2015; Chambers 2010) relationship between economic growth and income inequality.

So in most cases, the nature of the relationship between income inequality and growth is dubious at best. Especially for developing countries, rising per

---

<sup>2</sup> Sri Lanka had been elevated to the status of an upper middle-income country in July 2019 and again down rated as lower middle income country in July 2020.

capita income induces more inequality, which retards growth in this range. By contrast, in developed countries, rising per capita income tends to reduce inequality, which lowers growth in this range (Barro, 1990). Moreover, the relationship may differ depending on the region or the size of an economy. Fallah and Partridge (2007) show that the impact of inequality on economic growth is opposite in rural and urban settings.

In considering the Sri Lankan literature an uncertain relationship is observed due to the policy changes in the country (Rathnayaka, 2014). Also, Sri Lanka has been experiencing different phases of income inequality; 1963-1973 low income inequality with welfarism policies, 1973-1987 high income inequality and 1987-1997 low income inequality (Karunaratne, 2000). Related studies on other Asian countries prove that economic growth impacts on income inequality significantly and positively. Further, Kakwani (1988) highlights that economic development and income inequalities are positively related in Sri Lanka, with the turning point of the Kuznets inverted U shape hard to find, or occurring at the last stage of development. In sum, studies highlight that there is no consensus on the sign and strength of the relationship.

### **Objective**

The main objective of this study is to examine the impact of economic growth on income inequality in Sri Lanka.

### **Methodology**

This study is based on time-series data of Sri Lanka over the period 1980-2019 to analyse the impact of economic growth on income inequality. The data was obtained from the World Development Indicators of the World Bank database. Variables of this study were selected based on some of the existing studies (e.g., Shahbaz 2010) and the model is expressed as follows:

$$LGINI_t = \beta_0 + \beta_1 LGDPC_t + \beta_2 LFDI + \beta_3 UMP_t + u_t \quad (1)$$

Where, LGINI: log of GINI coefficient, LGDPC: log of Gross Domestic Product per capita, LFDI: log of foreign direct investment, UMP: unemployment rate,  $\varepsilon$ : error term and the subscript t indicates time period.

Augmented Dickey Fuller (ADF) and Philips Perron (PP) unit root tests were used to check the stationarity of variables. AIC criterion was used to select the optimum number of lags that can be included in the model. Autoregressive Distributed Lag (ARDL) model - which was developed by Pesaran et al. (2001) – was employed to examine equation (1). ARDL Bounds Testing approach was used to find the existence of cointegration and long run equilibrium relationship between variables. ARDL version of Error Correction Model (ECM) was estimated to study the short run relationship between variables and long run adjustment of the model.

Diagnostic tests of Jarque-Bera, Lagrangian Multiplier (LM) and Breusch-Pagan-Godfrey test were conducted to check whether the residual was distributed normally, no serial correlation between two error terms and residual has constant variance respectively. Further, Ramsey RESET test was used to check whether the model is specified correctly. Cumulative Sum (CUSUM) test and Cumulative Sum Squares (CUSUMSQ) test was employed to check the stability of the model.

### Results and Discussion

ADF and PP unit root tests identified that all variables are integrated in I(1) except unemployment which is integrated in I(0) (see Table 1 in Appendix). AIC criteria selected ARDL (1, 2, 0, 0) model among the top 20 models. The results of ARDL Bounds test (see Table 2 in Appendix) confirm the existence of cointegration between the variables since the F statistic is greater than I(1) bound value. The table below shows long run relationship between the variables that were estimated from the ARDL model.

Table 3: Results of Long- run Relationships

Constant	LGDPC	LFDI	UMP	R <sup>2</sup>
2.223932***	0.110969**	-0.028958**	0.050689*	
(0.0000)	(0.0413)	(0.0442)	(0.0594)	0.911329

Note: Probability values are given in parenthesis. \*, \*\* and \*\*\* indicate variables are significant at 10%, 5% and 1% level of significance respectively.

Above results imply that GDPC and unemployment rate are positively and significantly correlated with GINI while FDI is negatively correlated with GINI in the long run. That is, a 1 per cent increase in per capita growth rate

induces income inequality by 0.11% in the long-run, *ceteris paribus*. Also, 1 per cent rise in FDI tends to decrease income inequality by 0.029 per cent whereas, a 1% increase in unemployment rate tends to rises income inequality by 0.05 per cent in the long run. Some of the existing empirical literatures on the developing and middle income countries are similar to these findings (e.g., Barro 1990). It may occur with the acceleration of economic growth through more investments, as the real return is not equally distributed and the higher income group gain more benefits. Corruption, structural features, high low-skilled labour proportion and low employment opportunities worsen this in the long run.

The results of ECM (see Table 4) depict that GDPC affect income inequality negatively at lagged 1 and positively at lagged 2 in the short-run. FDI has a positive and significant impact on income inequality in the short run. The speed of adjustment coefficient is negative and significant which implies that the disequilibrium of income inequality that arises from exogenous shocks moves towards steady state line at a speed of 70.64% in each year one period after the shocks. The short run impact is aligned with some studies (e.g., Majumdar, 2009) and the negative impact in the short run may occur due to welfare programs and high immigration of low skilled labour.

Table 4: Results of Error Correction Representation of ARDL Model

Panel A: Results of Short run (Dependent Variable: LGINI)			
Lag Order	0	1	2
$\Delta$ LGINI		0.592* (0.0730)	
$\Delta$ LGDP	0.206 (-0.4101)	-0.651** (0.0162)	0.503** (0.0344)
$\Delta$ FDI	0.016* (0.0970)		
$\Delta$ UMP	-0.002 (0.1068)		
Panel B: Results of Long run Adjustment			
ECT (-1) = -0.7064 (0.0489)***			

Note: Probability values are given in parentheses. \*, \*\*, and \*\*\* show variables are significant at 1%, 5% and 10% level of significance respectively.

All the diagnostic tests proved that there are no diagnostic errors in the model and the results are robust (see Table 5 in Appendix).

## Conclusion

This paper examines the impact of economic growth on income inequality in Sri Lanka both in the long run and in the short run. This study found that an increase in the economic growth tends to decrease income inequality in the short run but increase inequality in the long run. There is a negative relationship between FDI and income inequality in the long run while a positive relationship exists between these two variables in the short run. Unemployment affects income inequality positively and significantly in the long run while it does not have a significant impact in the short run. In taking policy decisions, one has to be conscious of these mixed results. Absence of corruption, transparency and proper management of welfare policies, reduce the dependency mentality of economically poor people, improve human capital, rule of law and long sighted economic policies over political biasness would be crucial to mitigate the income inequality conditions in Sri Lanka, although these are not directly revealed in this study. Therefore, it is planned to explore these factors in a further study.

## References

- Anand, S. and Kanbur, S.R. (1993). The Kuznets process and the inequality-development relationship. *Journal of development economics*, 40, 25-52.
- Barro, R.J. (1999). *Inequality, growth, and investment*. National Bureau of Economic Research. Working paper, No. W7038
- Fallah, B.N. and Partridge, M. (2007). The elusive inequality-economic growth relationship: are there differences between cities and the countryside?. *The Annals of Regional Science*, 41(2), 375-400.
- Hettige Don, Karunaratne. (2000). An Analysis of Long-term Income Inequality Trends in Sri Lanka. *Sri Lanka Economic Journal*. 1, 87-114.
- Huang, C.J. (2012). Corruption, economic growth, and income inequality: evidence from ten countries in Asia. *International Journal of Economics and Management Engineering*, 6(6), 1141-1145.
- Kakwani, N. (1988). Income inequality, welfare and poverty in a developing economy with applications to Sri Lanka. *Social Choice and Welfare*, 5(2-3), 199-222.

## Appendix

Table 1: Results of Unit Root Test

Variable	ADF test		PP test	
	Level	1 <sup>st</sup> Difference	Level	1 <sup>st</sup> Difference
LGDP	0.9116	0.0062***	0.9115	0.0062***
LGINI	0.6348	0.0000***	0.1487	0.0000***
LFDI	0.2376	0.0003***	0.2368	0.0000***
UMP	0.0364**	0.0022***	0.0405**	0.0019***

Note: \*, \*\* and \*\*\* indicate rejection of null hypothesis at 10%, 5% and 1% respectively.

Table 2: Results of Bounds Test

Test Statistic	Value	Significance.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.026663	10%	2.37	3.2
K	3	5%	2.79	3.67
		1%	3.15	4.08

Table 5: Diagnostic Tests

Diagnostic Test	Test Applied	P- Value
Serial correlation	BG Serial Correlation LM Test	0.6612
Functional Form	Ramsey's reset test	0.7267
Normality	Test of skewness and Kurtosis	0.6287
Heteroscedasticity	Breusch-Pagan-Godfrey	0.7270

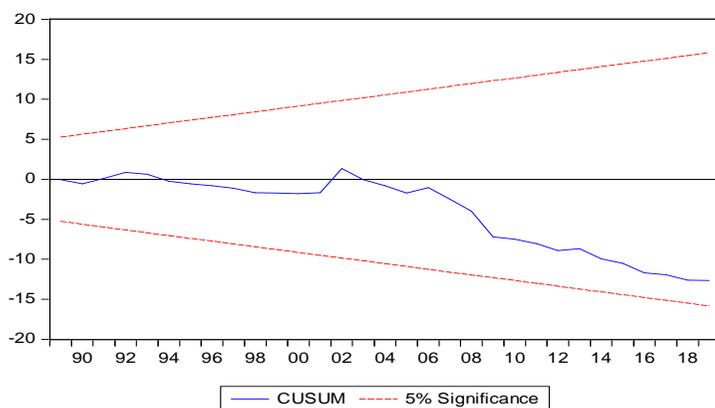


Figure 1: Results of CUSUM Test

## **The Relationship between Sustainability Reporting and Financial Performance of Listed Companies in Sri Lanka**

**W.A.P.L. Sandali<sup>1\*</sup>, W.K.N.C. Gunathilake<sup>2</sup>, M.G.C.D. Deshapriya<sup>3</sup>,  
M.A.C. Nirman<sup>4</sup>, A.A. Lokeshwara<sup>5</sup> and R.S. Weerarathna<sup>6</sup>**

*SLIIT Business School, Malabe, Sri Lanka*

**Keywords:** *Sustainability reporting (SR); Financial performance (FP); Global reporting initiative (GRI); Return on assets (ROA); Return on equity (ROE)*

### **Introduction**

In the modern business world, Sustainability Reporting (SR) is an essential but challenging subject which is considered to be important on a global scale (James, 2015). The concept of SR comprises of disclosure in three dimensions i.e. economic, environmental, and social. Therefore, SR can be referred to as a voluntary endeavor which involves publishing accounts that reflect economic, environment, and social performance of an organization (Isenmann & Kim, 2006). SR is the main platform of communicating the sustainability practices and corresponding impacts of a company to its stakeholders. Many developed countries disclose their sustainability practices (Dissanayake, Tilt and Xydias-Lobo, 2016).

On the contrary, there is a deficiency in sustainability reporting in developing countries. This is of special concern, since the majority of the world's population is predominately from developing countries and they are facing their own social and environmental problems on their own (United Nations, 2013). Even in Sri Lanka, SR has received relatively poor consideration compared to other developing countries, due to SR not being a mandatory reporting requirement in Sri Lanka (Peiris and Anise, 2019). Most companies adopt GRI framework in the reporting structure. This helps companies to move from either social or environmental based perspectives on sustainability to a progressively integrated view. Furthermore, adopting the GRI framework promotes clarity, accuracy, usefulness and comparability in sustainability reporting (Dissanayake, Tilt and Xydias-Lobo, 2016).

## **Objectives**

The main objective of this study is to explore the relationship between sustainability reporting and financial performance of listed companies in Sri Lanka.

## **Methodology**

The current study embraces a quantitative approach which uses secondary data to measure the relationship between sustainability reporting and firm-level financial performance. For this analysis, the study uses all two hundred and eighty-five (285) companies in the Colombo Stock Exchange (CSE), representing twenty different sectors for the study. As per the primary perusal, it was noted that, only eighty-seven (87) companies were following the GRI framework for SR in their annual reports which represent the total population of this study. Out of these, fifty-five (55) listed companies were selected through purposive sampling, based on researchers' criteria that annual reports should be prepared in compliance with the GRI framework and consecutively for the period 2015/16 to 2018/19.

Independent variable of this study is sustainability reporting, which consists of economic, social and environmental disclosures. The data related to these variables were gathered through content analysis based on G4 and GRI standards. Data was collected from the published annual reports of the companies in the sample for the period concerned and was then measured by deploying the SR index. To measure the dependent variable (i.e., financial performance) the study adapted the ratios of Return on Assets (ROA) and Return on Equity (ROE). The current study has used panel data for the process of analyzing the stated objective. Descriptive statistics and Pearson's correlation were computed to analyze the relationship between the SR and FP and the tests were conducted using STATA statistical package.

## **Sustainability Reporting Index**

SR Index is a measurement technique used to verify whether SR has been done in accordance with GRI framework. This measurement comprises of four (4) economic, twelve (12) environmental and thirty (30) social standards respectively, according to the G4 guideline. Whereas six (6) economic, eight (8) environmental and nineteen (19) social standards were recognized

according to the GRI standards (GRI, 2015). Each sub-variable was computed based on the standards adhered to by companies after measuring the total compliance of each component, which was then converted to a 100% scale using equation (1) (De Silva, 2019). This study used SR index as a composite variable to analyze sustainability reporting through the combination of economic, social and environmental disclosure.

$$SR\ Score = \frac{Amount\ of\ Compliance}{Number\ of\ Standards\ Considered} \times 100\% \quad (1)$$

### **Return on Assets (ROA)**

ROA is an indicator of efficiency of the firm relative to the total assets employed, which is given by equation (2):

$$ROA = \frac{Net\ Income}{Average\ Total\ Assets} \quad (2)$$

### **Return on Equity (ROE)**

ROE is a profitability measure that calculates the amount of profits earned as a percentage of the shareholders' equity, which is shown by equation (3):

$$ROE = \frac{Net\ Income}{Average\ Shareholders'\ Equity} \quad (3)$$

## **Results and Discussion**

The descriptive analysis demonstrates the objective and it derived basic characteristics of the present study data set as variability and distribution. The descriptive statistics of SR Index (independent) and dependent variables in the study, allows the researcher to describe data in terms of mean, standard deviation, minimum and maximum values and it provides basic summary of variables. In assessing the companies, researchers have found fifty-five companies (55) who report on sustainability according to the researchers' criteria for the period 2015/2016 –2018/2019 (four-year period).

Table 1 (in Appendix) shows that ROE has recorded a mean of 0.13 and standard deviation of 0.15 with a minimum of -0.44 and maximum of 0.93. The mean of ROA is 0.05, while the standard deviation is 0.07, with a minimum of -0.11 and a maximum of 0.39. Overall sustainability disclosures were indicated through SR Index which has a mean of 0.56 and standard

deviation of 0.20. In addition, social disclosure, an independent variable, has an average value of 0.53 and standard deviation of 0.20. Furthermore, other independent variables, environmental and economic disclosures, have 0.59 and 0.62 average values respectively. Economic disclosure shows the highest mean value of 0.62 among the variables and a standard deviation of 0.29 with a minimum of 0.17 and maximum of 1.

Further, the mean of the economic disclosure variable showed the highest indicated response in the data, while the ROA disclosure variable reported lowest response compared with other variables. According to the analysis, average values of dependent variables are 0.05 to 0.15. The independent variables' average values are maintained above 0.5. Due to the dispersion of data, economic disclosure is highly spread-out over a wide range and the ROA amount of variation is the lowest value.

**Correlation analysis** was carried out to measure the relationship between a company's FP and sustainability disclosures. Further, correlation indicates the strength of the linear relationship (positive or negative) of variables. Pearson correlation was calculated between the main variables (dependent and independent variable) and results reported in Table 2 (see Appendix).

The reported results show that economic (-0.00071) and social disclosure (-0.1343) is negatively correlated with ROA which indicates that there is a weak negative relationship at 5% level of significance and only environmental disclosure is positively correlated with ROA at a 5% level of significance which are tabulated in the table, depicting a weak positive relationship (0.0774) while being insignificantly correlated. This condition indicates that most of the companies provide sustainability reports as a form of environment disclosure to stakeholders to improve return on assets in the company by increasing recording environment disclosure. However, it indicates a negative relationship, by decreasing recording the economic and social disclosure to improve return on assets in the company.

The correlation coefficients between economic, environmental and social disclosures with ROE are respectively -0.0525, -0.1184 and -0.0286. Furthermore, correlation between SR index and ROA is -0.0604 while the correlation between SR and ROE is -0.0630. According to the outcomes of correlation matrix, by decreasing reporting sustainability disclosure will

enhance the Return on Equity in the company. It was also revealed that SR and ROE has no statistically significant correlation.

## **Conclusion**

The present study explores the relationship between SR and FP of the listed companies in Sri Lanka. SR index was used to measure the SR in accordance with GRI framework while ROA and ROE were used to measure financial performance for the period 2015/16 to 2018/19.

The study concludes that ROA has no statistically significant correlation with independent variables of SR except for the social disclosure variable, which showed a weak negative correlation with ROA in public listed companies. Furthermore, it was noted that all three variables in sustainability reporting revealed a negative correlation with ROE. It also identified SR of many publicly listed companies being negatively correlated with the ROE compared to ROA. As future research the study recommends that this phenomenon be further observed by increasing sample size and deploying other SR frameworks.

## **References**

- Dissanayake, D., Tilt, C. and Xydias-Lobo, M. (2016). Sustainability reporting by publicly listed companies in Sri Lanka. *Journal of Cleaner Production*, 129, 169-182.
- Isenmann, R.A. and Kim, K. (2006). *Interactive Sustainability Reporting. Eco-Efficiency in Industry and Science*, Vol. 21 ed. Springer, Editors: Stefan Schaltegger, Martin Bennett, Roger Burrit.
- James, M. (2015). The benefits of sustainability and integrated reporting: An investigation of accounting majors' perceptions. *Journal of Legal, Ethical and Regulatory Issues*, 18(1), 1
- Peiris, N. and Anise, R. (2019). Corporate Sustainability Reporting: An Empirical Study on Social & Environmental Reporting among Sri Lankan Public Listed Companies in the Hotel and Travel Industry. *Colombo Journal of Advanced Research*, 1(1), 35.

## Appendix

Table 1: Results of Descriptive Statistics

Variable	Obs	Mean	Std.dev	Min	Max
ROE	220	.1291818	.1511577	-.44	.93
ROA	220	.0530909	.0717205	-.11	.39
SR Index	220	.5614545	.2014959	.15	1
Social	220	.5362727	.2087836	.11	1
Environmental	220	.5965909	.268263	0	1
Economic	220	.6166818	.2872693	.17	1

Table 2: Correlation between SR and FP

	Eco	Env	Soc	SR_index	ROA	ROE
Eco	1.0000					
Env	0.3618*	1.0000				
	0.0000					
Soc	0.6024*	0.5567*	1.0000			
	0.0000	0.0000				
SR_index	0.6955*	0.7621*	0.9460*	1.0000		
	0.0000	0.0000	0.0000			
ROA	-0.0071	0.0774	-0.1343*	-0.0604	1.0000	
	0.9163	0.2533	0.0467	0.3725		
ROE	-0.0525	-0.1184	-0.0286	-0.0630	0.6794*	1.0000
	0.4381	0.0797	0.6734	0.3520	0.0000	

Note: \* represents significant at 5% level of significance.

## **The Twin Deficits Hypothesis in Sri Lanka: An Econometric Analysis**

**A.J. F. Shifaniya and T. Rajeswaran**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Keywords:** *Budget deficit; Current account deficit; ARDL Model*

### **Introduction**

The Twin Deficits Hypothesis (TDH) states that a government budget deficit (BD) leads to current account deficit (CAD) in an open economy (Salvatore, 2006). High BD, by leading to higher interest rates would in turn attract capital inflows and thereby cause an appreciation of the exchange rate. This will make exports more expensive and imports cheaper, thereby worsening the trade deficit, which is the major component in the CAD. In the economics literature, two prime approaches are used to explore the relationship between the CAD and BD of a country: the Keynesian proposition and the Ricardian Equivalence Hypothesis (REH). Based on the Mundell-Fleming framework, the Keynesian view asserts that BD has a statistically significant impact on CAD; there exists a unidirectional causality that runs from BD to CAD. By contrast, the REH posits that a cause and effect relationship does not exist between the two deficits. But, these are not the only possible outcomes between the two deficits. A bi-directional causality between the two deficits could also exist.

For a long period of time, Sri Lanka has experienced persistently high BD as well as CAD. The COVID-19 is likely to further exacerbate the highly vulnerable fiscal and external financial situation of Sri Lankan economy. The anti-COVID-19 measures have lowered economic activities and would further reduce fiscal revenues. The recently announced import restrictions will also reduce the import tax revenues. On the other hand, government expenditure will increase due to additional expenditure incurred on anti-COVID-19 efforts including cash payouts to the affected people. The Export Development Board has estimated that the export of goods and services will drop by \$ 7 billion in 2020. The CAD of Sri Lanka's balance of payments is likely to increase from \$ 3 billion to \$ 6 billion - \$ 7 billion ([www.ft.lk](http://www.ft.lk)). These twin

deficits cause macroeconomic imbalances and indebtedness. Hence, this study attempts to examine the relationship between CAD and BD. The findings of the study are expected to guide policymakers to formulate fiscal and monetary policies to avert further BD and CAD.

Saleh et al. (2005) and Sivarajasingham and Balamurali (2011) examined TDH for Sri Lanka only by focusing on the relationship between current account balance (CAB) and BD. Therefore, this study attempts to examine the TDH of Sri Lanka including important variables such as interest rate and exchange rate, which directly influence the twin deficits process.

### **Objectives**

The main objective of this study is to examine the relationship between CAD and BD of Sri Lanka. Also, this study aims to examine the validity of the TDH for Sri Lanka.

### **Methodology**

This study uses the time series data of Sri Lanka over the period 1960-2019 to achieve the above objective. Based on the twin deficit hypothesis, the econometric model of this study is expressed as follows:

$$CAD_t = \beta_0 + \beta_1 BD_t + \beta_2 ER_t + \beta_3 IR_t + u_t \quad (1)$$

Where, CAD: current account deficit, BD: budget deficit, ER: exchange rate IR: interest rate, u is the error term and the subscript t indicates time. Data for all variables are extracted from Central Bank of Sri Lanka annual reports.

Augmented Dickey- Fuller (ADF) and Ng- Perron unit root test were adopted to test the stationary property of series. AIC was used to select the optimum number of lag of each variable. ARDL Bounds test approach was employed to investigate the existence of cointegration and long run relationship among the variables. The Error Correction version of ARDL model was employed to test the long run adjustment and short run dynamics of CAD. Granger Causality test was employed to check the causality relationship between the variables.

## Results and Discussion

The ADF and Ng- Perron tests confirmed that all the variables were stationary at their first difference. Akaike Information Criteria (AIC) suggested the use of ARDL (1, 0, 1, 0) model for this analysis. The results of Bounds test for the selected model is given below:

Table 1: Results of Bounds Test for ARDL (1, 0, 1,0) Model

Panel A: F- Bounds Test (95% level of confidence)				
F- Statistics	Lower Bound	Upper Bound		
12.48	2.79	3.67		
Panel B: Long run Coefficient Estimates				
Constant	BD	ER	IR	R <sup>2</sup>
7.4970 (0.0006)	1.4845*** (0.0000)	-0.0575*** (0.0002)	-0.3095** (0.0138)	0.8042

Note: P- value is given in parentheses. \*, \*\* and \*\*\* indicate variables are statistically significant at 10%, 5% and 1% level of significance respectively.

Results of Panel A in Table 1 reveal that there exist cointegrating relationship between the variables since we reject the null hypothesis of no cointegration as the F- Statistic is higher than the upper bound critical value (at 5% level of significance). Since the cointegrating relationship between the variables is confirmed through the Bounds test there should be long run correlation among the variables. Panel B in Table 1 shows that BD has a significant and positive impact on CAD. If BD is increased by 1% of GDP, CAD will be increased by 1.4845% of GDP in the long run, ceteris paribus. Government borrowing to finance the BD leads to higher IR, which in turn would attract capital inflows, thereby causing appreciation of the ER. This will make exports to become expensive and imports cheaper and thereby worsen the CAD. Further, ER and IR have a significant and negative impact on CAD in the long run. These results suggest that depreciation of ER and an increase in IR would improve the CAD. Some of the existing empirical literature on the developing countries also found similar findings (e.g., Epaphra, 2017).

Coefficients of ECT (-1) carry a negative sign, which is highly significant, indicating that there should be an adjustment towards steady state line at the speed of 96.7% in each period one period after the exogenous shocks.

Table 2: Results of Error Correction Version of ARDL (1, 0, 1, 0) Model

Short run coefficient estimates and error correction representation					
Lag order	$\Delta$ CAD	$\Delta$ BD	$\Delta$ ER	$\Delta$ IR	ECT (-1)
0		0.8828*** (0.0000)	0.2270** (0.0159)	-0.2964** (0.0118)	-0.9671** (0.0000)
1	0.4165*** (0.0034)		-0.2164*** (0.0322)		

$R^2 = 0.6919$

Note: P- value is given in parentheses. \*, \*\* and \*\*\* indicate variables are statistically significant at 10%, 5% and 1% level of significance respectively.

The previous year CAD and current value of BD have positive and significant impacts on CAD. The current value of ER has a positive and significant impact on CAD whereas previous year ER (at lag 1) has a negative and significant impact on CAD. This is consistent with the J- Curve phenomenon, which states that devaluation of the currency will not improve CAB in the immediate period but will significantly impact on the CAB, while making CAB improvement in subsequent periods. Further, IR has a negative and significant impact on CAD in the short run.

The results of the diagnostic tests show that the model is correctly specified and the parameters are correctly estimated by satisfying all the assumption related to the residual (see Table 3 in appendix).

The results of the Granger causality test (see Table 4) identified weak unidirectional causality between BD and CAD that runs from BD to CAD.

Table 4: Results of Granger Causality Test

Null hypothesis	Obs	F- statistics	Prob.
D_BD does not granger cause D_CAD	57	2.4541	0.0588*
D_CAD does not granger cause D_BD	57	1.6235	0.2070

Note: \*, \*\* and \*\*\* indicate that variables are statistically significant at 10%, 5% and 1% level of significance respectively.

## Conclusion

The empirical results of this study show that, there is a positive and significant relationship between CAD and BD in Sri Lanka both in the long run and in the short run. At the same time, there is a unidirectional causation

that runs from BD to CAD. Therefore, this study concluded that the TDH is confirmed in Sri Lanka. Further, the results of this study support the Keynesian view and REH is not valid for Sri Lanka during the study period. So this conclusion emphasizes that, in order to reduce the CAD in Sri Lanka BD could be used as a policy instrument especially in this COVID- 19 pandemic situation.

## References

- Epaphra, M. (2017). The twin deficit hypothesis: An empirical analysis for Tanzania'. *The Romanian Economic Journal*. 20(65), 1-34.
- Saleh, A.S., Nair, M. and Agalewatte, T. (2005). The twin deficit problem in Sri Lanka: An econometric analysis. *South Asia Economic Journal*. 6(2), 221-239.
- Salvatore, D. (2006). Twin deficits in the G-7 countries and global structural imbalances. *Journal of Policy Modeling*. 28(6), 701-712.
- Sivarajasingham, S. and Balamurali, N. (2011). An empirical analysis of the twin deficits evidence from Sri Lanka'. *Journal of Management*. 7(1), 74-92.

## Appendix

Table 3: Results of Diagnostic Test

Diagnostic	Test applied	P- Value	Conclusion
Serial correlation	(B-G serial correlation LM test)	0.5021	No serial correlation
Normality	(Jarque- Bera)	0.3108	Error is normal
Heteroskedasticity	(White test)	0.1334	No heteroskedasticity
Omitted variable	(Ramseys' RESET test)	0.1650	No omitted variables

## **An Empirical Analysis of the Impact of Fiscal Policy on Stock and Bond Markets in Sri Lanka**

**D.M.S.M. Dissanayaka**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Keywords:** *Fiscal policy; Stock market; Bond market; Sri Lanka*

### **Introduction**

The world's financial market transactions have increased with a busy and modern life style. In particular, the stock market and the bond market play a key role in establishing a correlation between financial market transactions. Therefore, more and more investors have shown their interest in stock and bond market activities. When focusing on the behaviour of the above markets, deep understanding of the volatility or fluctuations of the markets is important. These markets response to changes in key macro variables, such as inflation, interest rate, monetary policy, money supply and Foreign Direct Investment, etc. Yet, there is no clear understanding of which factors cause the stock and bond markets to actually fluctuate. Some studies give priority to monetary rather than fiscal policy. Some early studies identified fiscal policy as a neglected factor (Sprinkel, 1964), and subsequent studies show that fiscal policy also has a significant impact on stock market volatility (Lapodis, 2009).

In particular, using a theoretical framework, Tobin has explained how monetary policy as well as fiscal policy influence stock market volatility. He states that the growth of money supply and budget deficits create impacts on the stock market (Tobin, 1960). Some empirical evidence shows that the bond market clashes with public sector debt. Government expenditure shocks are expected to be positive for stock and bond yields (Tavares and Valkanow, 2001). They found that fiscal policy generates some impacts on the volatility of both stock and bond markets. Many previous studies have identified that monetary policy has a direct relationship, and fiscal policy an indirect relationship with capital markets. Given this background, it is clear that only a few studies have focused on investigating the impact of fiscal

policy on the stock market and the bond market; thus opening up an avenue to further examine the possible impacts of fiscal policy on capital market behavior.

## Objectives

The objective of this study is to empirically investigate the effects of fiscal policy on the stock and bond markets in Sri Lanka.

## Methodology

The present study employs two models to test for a causal relationship between fiscal policy variables and stock (1987-2018) and bond markets variables (1997-2018), sourced from the Central Bank of Sri Lanka annual report and World Development Indicators of the World Bank database. Stock market index (ST) and bond market yields (BN) are used as the dependent variables in the respective models. The independent variables are: government expenditure (ex), government revenue (tx) and budget deficit (bg) are used as the fiscal policy variables. Three types of data have been used to represent fiscal policy variables. They are, normal fiscal policy values (% of GDP), growth rate data values (c) and the one year lagged values of fiscal policy variables.

The following regression models were estimated to identify the impact of fiscal policy on the stock and bond markets. The model was regressed on two occasions to avoid multicollinearity between government expenditure, government revenue and budget deficit.

$$ST_t = \beta_0 + \beta_1 tx_t + \beta_2 ex_t + \beta_3 ctx_t + \beta_4 cex_t + \beta_5 tx_{t-1} + \beta_6 ex_{t-1} + u_t \quad (1)$$

$$ST_t = \alpha_0 + \alpha_1 bg_t + \alpha_2 cbg_t + \alpha_3 bg_{t-1} + v_t \quad (2)$$

$$BN_t = \beta_0 + \beta_1 tx_t + \beta_2 ex_t + \beta_3 ctx_t + \beta_4 cex_t + \beta_5 tx_{t-1} + \beta_6 ex_{t-1} + u_t \quad (3)$$

$$BN_t = \alpha_0 + \alpha_1 bg_t + \alpha_2 cbg_t + \alpha_3 bg_{t-1} + v_t \quad (4)$$

Further, the pair wise Granger causality test was used to identify the direction of the causal relationship between the variables. ADF unit root test was employed prior to the Granger causality test.

## Results and Discussion

The results of model 1 (see Table 1 below) show that the coefficient of the previous year's government expenditure is statistically significant at 5% level, which indicates a negative correlation with the stock market index; whereas the coefficient of the previous year's government revenue has a positive and significant impact on the stock market. The  $R^2$  value 0.611 reveals that 61% of the variability of the stock market index is described by the explanatory variables of model 1.

Table 1: Results of Model 1 (Dependent Variable: Stock Market Index)

Variables	Coefficients	Std Error	t-stat	p-value
tx <sub>t</sub>	0.052449	0.058196	0.901242	0.3772
ex <sub>t</sub>	-0.033215	0.052388	-0.63402	0.5326
ctx <sub>t</sub>	0.407706	0.685163	0.595049	0.5579
ceX <sub>t</sub>	-1.159547	1.075356	-1.07829	0.2926
tx <sub>t-1</sub>	1.804252	0.508161	3.550556	0.0018***
ex <sub>t-1</sub>	-1.874982	0.845609	-2.21731	0.0372**
_con	-0.00520	0.058543	-0.01185	0.9907
Number of obs.	= 30		R-squared	= 0.61112
F- Statistics	= 15.04		Prob > F	= 0.0009

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

Table 2 below shows that the coefficient of current and last year budget deficit growth rate has a negative and significant impact on the stock market index. The  $R^2$  value of the model is 0.63, so that 63% of total variability of the stock market is explained by the independent variables of the model.

Table 2: OLS Results of Model 2 (Dependent Variable Stock Market)

Variables	Coefficients	Std Error	t-stat	p-value
bg <sub>t</sub>	0.003241	0.043411	0.074655	0.9411
cbg <sub>t</sub>	-0.600712	0.270629	-2.21969	0.0357**
cbg <sub>t-1</sub>	-0.966925	0.179421	-5.38913	0.0000***
con	0.138021	0.347244	0.397475	0.6944
Number of obs.	= 30		R-squared	= 0.634563
F- Statistics	= 14.47		Prob > F	= 0.0000

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

Even though none of the fiscal policy variables have significant impact on the bond market index, government expenditure and budget deficit affect the bond market positively while government revenue has a negative impact on the bond market index<sup>3</sup>.

Results of Granger causality tests (see Table 3) demonstrate that there is a unidirectional causality relationship between government revenue and the stock market index (at 10% level of significance); budget deficit and stock market index (at 5% level of significance) and budget deficit and bond market index (at 10% level of significance).

The Granger causality test results of Fiscal policy variables indicate that they are not correlated with the Bond market. But only the budget deficit is correlated.

Table 3: Results of Granger Causality Test<sup>4</sup>

Dependent Variables: Stock Market		
Hypothesis	F-Statistic	P-Value
tx – ST	2.93887	0.0722***
bg - ST	7.87318	0.0023*
Dependent Variables: Bond Market		
bg- BN	2.74034	0.0990***

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

## Conclusions

This study identified that only lagged values of fiscal policy instruments are directly correlated with the stock market whereas fiscal policy variables are not correlated significantly with the bond market. In particular, it implies that there is a tendency of the bond market to be determined by factors other than fiscal factors. The 30 year war that ended in 2009 and internal political crises have affected the bond market more than fiscal factors. Granger causality test found a unidirectional causality relationship flowing from tax revenue to stock market, budget deficit to stock market and budget deficit to bond market. When income taxes go up, investors move away from the stock

<sup>3</sup> Due to page limit, results of these two models are not shown but available up on request.

<sup>4</sup> Only the results of significant variables are presented here due to page limit.

market whereas when income tax rates reduced, investors invest more on the stock market. Therefore, the fiscal policy variables should be appropriately used in formulating stock market and bond market policies.

## **References**

- Blanchard, O.J. (1981). Output, the stock market, and interest rates. *The American Economic Review*, 71(1), 132-143.
- Brunie, C. H., Hamburger, M. J. and Kochin, L.A. (1972). Money and stock prices: The channels of influence. *The journal of Finance*, 27(2), 231-249.
- Tavares, J., and Valkanov, R. I. (2001). The neglected effect of fiscal policy on stock and bond returns. In *EFA 2003 Annual Conference Paper* (No. 201).
- Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit, and Banking*. 1(1), 15-29.

## **The Dynamic and Causal Relationship between Tourism and Economic Growth in Sri Lanka**

**K. Kumudhini**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Key words:** *Granger causality; Tourism income; VEC model; Economic growth*

### **Introduction**

The tourism industry has grown to be one of the largest industries and fastest growing economic sectors in the world. Tourism is considered as a most powerful tool and an economic activity to trigger economic growth in developing countries. Over the years tourism has contributed towards the generation of remittances and creating of job opportunities by using local resources. Tourism accounts for 10.4% of global GDP and 313 million jobs globally or 9.9% of total employment in 2018 (World Bank Report, 2019). Acknowledging these facts, countries in general are heavily focused on tourism as an option for their sustainable development.

As a developing country, Sri Lanka has given high priority to the tourism sector as a result; this sector is growing rapidly as a key sector in the economy. Sri Lanka has been a popular place of attraction for foreign travelers because of its uniqueness, strategic location, natural environment, cultural diversity, wildlife sanctuaries, sandy white beaches, underwater life that surrounds the island and warm climate making visitors comfortable and attracted to it. In 2018, Lanka received over 2.3 million international visits, generating revenue of approximately US \$ 4.3 billion from tourism. In 2019, contribution of travel and tourism to GDP for Sri Lanka was 12.6 %. It increased from 6 % in 2000 to 12.6 % in 2019 growing at an average annual rate of 4.28 (Sri Lanka Tourism Development Authority, 2019). In 2017, travel and tourism generated 404,000 direct jobs, equal to 5.1% of national employment (Central Bank of Sri Lanka, 2019). This has grown by 3.7% in 2018 to 419,500 jobs – 5.3% of total employment.

Several empirical studies have explored the relationship between tourism and economic growth in emerging economies (King and Gamage, 1994). Wickremasinghe (2006) examines the causal relationship between tourism and economic growth using an error correction model and variance decomposition analysis. But though tourism is considered as one of the major contributing sectors to economic growth in Sri Lanka, the relationship has not been established empirically using econometric analysis. Also, the causal relationship between tourism and economic growth has not been explored statistically for the period 1971-2019 in the Sri Lankan context. Therefore this research is an attempt to fill this gap.

### **Objective**

The objective of this study is to investigate the causal relationship between tourism and economic growth in Sri Lanka for the period 1971-2019.

### **Methodology**

This study uses yearly data on Real Gross Domestic Product (RGDP) which measures the overall economic performance of the country, and Tourism Revenue (TR) as a measure of tourism sector expansion. The data of RGDP was extracted from the Central Bank of Sri Lanka annual report (for various years) and TR was collected from Tourism statistics published by Ministry of Tourism, Government of Sri Lanka over the period from 1971 to 2019. Both variables of this study have been transformed to their natural logarithms. The following equation shows the basic relationship between the dependent and independent variables as in the study of Godbey et al. (1994).

$$\ln RGDP_t = \beta_0 + \beta_1 \ln TR_t + u_t \quad (1)$$

In the 1<sup>st</sup> step of the estimation technique, the stationarity of the variables have been tested by Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) unit root tests. In the second step, AIC and SC criteria were adopted to choose the optimum number of lags that can be included in the model. In the next step, Johansen's co-integration test has been performed to assess whether a cointegrating relationship holds between the tourism sector development and economic growth. Finally, the Granger causality test has

been applied in the vector error correction framework to find the direction of causal relationship between the variables.

### Results and Discussion

The table below presents the results of unit root tests. Both approaches confirmed that both variables are integrated in the same order, i.e. I(1), which suggests using the Johansen cointegration method to identify the existence of a cointegrating relationship.

Table 1: Result of Unit Root Tests

Variables	ADF test		PP test	
	Level	1 st difference	level	1 <sup>st</sup> difference
lnRGDP	0.7854	0.0000***	0.7191	0.0000***
lnTR	0.6673	0.0008***	0.2575	0.0000***

Note: \*, \*\* and \*\*\* represent variables stationary at 10%, 5% and 1% level of significance respectively.

The table below shows the results of the Johansen rank test. Both Trace test and Maximum Eigen value test identified one cointegrating relationship between the variables since the null hypothesis was rejected at rank 0 but it failed to reject the null hypothesis at rank at most 1 as the test statistic was less than the 5% critical value. This indicates the existence of long-run correlation between the variables.

Table 2: Results of Johansen’s Cointegration Test (Trace Test)

Null hypothesis	Eigen Value	Trace statistics	Critical value at 5%	Max Eigen statistics	Critical value at 5%
None*	0.1887	13.187	12.32090	23.326	21.131
At most1	0.0689	3.355	4.129906	9.014	14.264

The following normalized cointegrating coefficients show that Tourism Revenue affects Real GDP positively and significantly in the long run which is consistent with theory and some of the empirical studies.

$$\widehat{\ln RGDP}_t = 0.762 + 3.388 \ln TR_t$$

std. error = (0.234) (0.49065)

Table 3 below shows the short run relationship between the variables and long run adjustment of the real GDP.

Table 3: Results of VECM (Dependent variable: DLNRGDP)

Variables	Coefficients	T-stats
D(LNRGDP(-1))	-0.21949	-1.6062
D(LNITR(-1))	-0.03468	-0.0254
constant	0.06077	0.3988
ECT(-1)	-0.30437**	-2.5917

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

Tourism revenue does not have a significant impact on real GDP in the short run. Sometimes, it takes some periods to affect the GDP even though we receive more income from the tourism sector due to long term investment. This could be the reason that it does not have significant impact on real GDP. Negative and significant coefficient of speed of adjustment implies that real GDP moves towards steady state line at the speed of 30 % in each year one period after the exogenous shocks.

Granger Causality test is used to test the causality between the variable. Table 4 below shows the results of VECM based Granger Causality test (Block Exogeneity Wald Test results). The results show weak evidence of existence of unidirectional causality that running from Tourism Revenue to RGDP at 10% significance levels.

Table 4: Results of Pairwise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
D_LNITR does not Granger Cause D_LNRGDP	47	4.9289	0.0851
D_LNRGDP does not Granger Cause D_LNITR		3.9649	0.1377

## Conclusion

The present study investigates the relationship between tourism revenue and economic growth using annual data for the period 1971-2019. The empirical analysis suggests that all variables used in this study are integrated in order one. On this basis, the Johansen cointegration test identified one cointegrating relationship among the variables. This study found a positive and significant relationship between tourism and real GDP in the long run but tourism revenue does not have significant impact on real GDP in the

short run. Also this study identified weak unidirectional causality between tourism and economic growth that runs from tourism revenues to economic growth. It means that if tourist activities increase, the GDP growth rate improves via increase in Tourism Revenue. It provides a rationale for the government to provide tourism related facilities in the country. In general, the study appears to support a tourism led-growth (TLG) hypothesis for Sri Lanka. The results of this study suggest that promoting tourism via developing a long-term tourism strategic plan will contribute to economic growth in Sri Lanka. The finding validates the necessity of government intervention for promoting international tourism demand by providing mandatory facilities and other motivation to enhance tourist arrivals.

## References

- Jayathilake, P.B. (2013). Tourism and economic growth in Sri Lanka: Evidence from cointegration and causality analysis. *International Journal of Business, Economics and Law*, 2(2), 22-27.
- Mishra, P. K., Rout, H. B. and Mohapatra, S. S. (2011). Causality between tourism and economic growth: Empirical evidence from India. *European Journal of Social Sciences*, 18(4), 518-527
- Wickremasinghe, G.B. and Ihalanayake, R. (2007). Causal relationship between tourism and economic growth in Sri Lanka: some empirical evidence. *CAUTHE 2007: Tourism-Past Achievements, Future Challenges*, 742.

## **Impact of Macroeconomic Variables on Stock Market Performance in Sri Lanka**

**W. M. T. Jayamali**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Keywords:** *ASPI; Macro economic variables; Stock market; Sri Lanka*

### **Introduction**

The stock market in any country leads to economic growth and development of that nation since it mobilizes the domestic resources in the country and leads them to productive investments. After the liberalization in 1977, the financial market in Sri Lanka was developed to a greater extent. The Colombo Stock Exchange (CSE) is a major part of the financial market in Sri Lanka. It has 290 companies representing 20 businesses sectors as at 30 June 2019, with a market capitalization of Rs. 2523.38 Bn. CSE has two main price indices, All Share Price Index (ASPI) and Standard and Poor's Index (S & P SL 20). These index values are calculated on an ongoing basis during the trading session. ASPI measures the movement of share prices of all listed companies. ASPI recorded a decreasing trend in Sri Lanka from 1997 to 2000 while it shows an increasing pattern from 2000 to 2005. However, fluctuations can be seen in the ASPI from 2010 to 2020 (Source: <https://www.cse.lk/pages/market-capitalization/market-capitalization.html>).

The performance of the stock market in any country depends on various macro-economic factors. Menike (2006) found a negative relationship between Treasury bill rate and stock market prices. Badullahewage and Jayawardenepura (2018) found that exchange rate and Gross Domestic Product have a positive relationship with ASPI. Addy et al. (2014) identified the relationship between macro-economic variable in Ghana stock exchange which revealed that there is a long run relationship between some of the macro economic variables and the stock market. Caroline et al. (2011) studied the relationship between stock market, expected inflation rate, unexpected inflation rate, exchange rate, interest rate and GDP in the case of

Malaysia, US and China. They suggest that these variables have a significant impact on stock market performance in the long run.

Several studies have been carried out to examine the relationship between macro-economic variables and stock market performance. But, there are no in-depth studies that investigate the association between macro-economic variables and stock market performance in the context of Sri Lanka. Thus, this study attempts to bridge this gap by examining the connection between macro-economic variables and stock market performance in order to draw economic policy implications and to have a proper understanding of the stock market in Sri Lanka and its subsequent status.

### **Objectives**

The objective of the study is to examine the impact of macroeconomic variables on the stock market performance in Sri Lanka.

### **Methodology**

The All Share Price Index (ASPI) was used as a proxy variable for stock market performance which is the dependent variable of this study. Inflation rate (INF), Exchange Rate (ER), Interest Rate (IR), Gross Domestic Product (GDP), Foreign Direct Investment (FDI) and Broad Money Supply (M2) are employed as macroeconomic (independent) variables. This study uses time series data from the World Bank database and Central Bank of Sri Lanka over the period 1997 – 2019. All variables except INF and IR are transformed to natural logarithm form. Following a study conducted by Paudel (2009), the functional model of this study is given below:

$$LASPI_t = \alpha_0 + \alpha_1 INF_t + \alpha_2 IR_t + \alpha_3 LER_t + \alpha_4 LFDI_t + \alpha_5 LGDP_t + \alpha_6 LM2 + \mu_t \quad (1)$$

Where  $\alpha_0, \dots, \alpha_6$  are coefficients of determinant variables;  $\mu_t$  is error term and subscript t is time period

The All Share Price Index (ASPI) is the broad market index of the CSE, and is designed to measure the movements of the overall market price. The index is calculated in real-time as a market capitalization weighted index, which constitutes all voting and non-voting ordinary shares listed on the CSE.

The study adopted Augmented Dickey Fuller (ADF) unit root test method to check the order of integration of variables and Akaike Information Criterion (AIC) was employed to determine the optimal lag length of each series. Since the series are stationary with mixed orders of I(0) and I(1), Autoregressive Distributed Lag (ARDL) Bounds test procedure which was developed by Pesaran et al. (2001) is adopted to investigate the effects of macroeconomic determinants on ASPI and to investigate the existence of cointegration among the variables. Error Correction representation of ARDL mechanism is adopted to determine the short run dynamic relationship between the variables and long run adjustment of the model. These tests were conducted through E- views 10 statistical software.

### Results and Discussion

The ADF test confirmed that, IR is stationary at level while the other variables are stationary at their 1<sup>st</sup> difference implying that variables are of mixed order. Akaike Information Criteria (AIC) suggested the use of ARDL (1, 2, 0, 2, 2, 2, 2) model for this analysis. The below table shows the results of ARDL Bounds test.

Table 1: Results of F- Bound Test

F-Bound test	95% Level of Confidence		90% Level of Confidence	
F- Statistics	I(0) Bound	I(1) Bound	I(0) Bound	I(1) Bound
7.374303	2.27	3.28	2.88	3.99

Above results reveal that there exists cointegration among the variables since we reject the null hypothesis of no cointegration as the calculated F-statistic (7.3743) is greater than the I(1) critical value at 5% level of significance (3.28). Since we confirmed the cointegrating relationship between the variables through the Bound test, there should be a long run association among the variables. The result is given below:

Table 2: Long run Results of ARDL (1, 2, 0, 2, 2, 2, 2) Model

Constant	INF	IR	LER	LFDI	LGDP	LM2	R <sup>2</sup>
0.235	0.160**	-0.088***	4.688**	0.129	4.314***	-2.795**	0.998
(0.016)	(0.026)	(0.009)	(0.014)	(0.155)	(0.005)	(0.015)	

Note: probability values are given in parentheses. \*, \*\*, and \*\*\* show variables are significant at 10%, 5% and 1% level respectively.

The value of R-squared illustrates that approximately 99 percent of the variation in ASPI in Sri Lanka is explained by the explanatory variables included in this study. As expected by theory and some of the existing empirical literature (e.g., Balagobei, 2017) Inflation, Exchange Rate and Gross Domestic Product affect ASPI significantly and positively whereas Interest rate and Money Supply have a negative effect on ASPI in the long run. However, FDI Does not have statistically significant impact on ASPI in the long run.

The table below represents the results of short run dynamics and long run adjustment.

Table 3: Results of Error Correction version of ARDL (1, 2, 0, 2, 2, 2, 2) Model

Panel A: Results of Short run							
Lag Order	$\Delta$ LASPI	$\Delta$ INF	$\Delta$ IR	$\Delta$ LER	$\Delta$ LFDI	$\Delta$ LGDP	$\Delta$ LM2
0		-0.078* (0.054)	-0.176** (0.033)	2.308* (0.064)	0.143 (0.123)	0.845 (0.197)	5.448* (0.062)
1	2.899** (0.037)	-0.139** (0.036)	0.163* (0.052)	-4.15** (0.099)		-0.811 (0.277)	11.12** (0.040)
2		-0.038** (0.039)	0.171** (0.027)	-9.51** (0.048)		-8.47** (0.031)	-13.87** (0.044)
Panel B: Long run Adjustment Coefficient							
ETC(-1)	-0.649* (0.071)						

Note: probability values are given in parentheses. \*, \*\*, and \*\*\* show variables are significant at 10%, 5% and 1% level respectively.

Accordingly, as expected, coefficient of error correction term [ETC (-1)] is negative weakly significant, which indicates that there should be an adjustment towards steady state line at the speed of 64.91 % in each year one period after the exogenous shocks. The current and past year (lagged 1 and 2) inflation, current year interest rate past year exchange rate (lagged 1 and 2), past year GDP (lagged 1 and 2) and past year money supply (lagged 2) have significant and negative impact on ASPI in the short run whereas last year ASPI, past year interest rate, current year exchange rate, current and last year money supply have positive and significant impact on ASPI in the short run.

## **Conclusion**

The results of this study have shown the existence of a long run and short run relationship between macro-economic variables and All Share Price Index (ASPI). Gross Domestic Product has a significant and positive impact on ASPI in the long run while current value of GDP does not affect ASPI in the short run. In contrast, past value of GDP affect ASPI negatively in the short run. Further, there is a negative relationship between M2 and ASPI in the long run and a positive correlation between these two variables in the short run. These findings are consistent with Balagobei (2017) and Rathnayaka and Seneviratna (2017); they concluded that the Colombo Stock Exchange (CSE) is highly sensitive to macroeconomic variables such as real gross domestic product and broad money supply. Next, interest rate has a negative effect on ASPI in both long run and short run while past value of interest rate affects ASPI positively in the short run. This finding is consistent with Menike (2006) and Balagobei (2017) and they confirmed that there is a negative relationship between interest rate and stock market returns. Moreover, there is a positive and significant relationship between inflation and ASPI in the long run while a negative relationship exists between these two variables in the short run. Exchange rate affects the ASPI positively and significantly both in the short run and in the long run while past value of exchange rate affects it negatively in the short run.

Therefore, this study suggests that the government should consider about stock prices and other macro-economic variables when implementing government policies such as privatization, foreign exchange control and monetary policy. Also the findings of the study may be useful to the public and the economy especially stock market investors to focus on macroeconomic variables for making effective decisions to enhance their stock market returns.

## References

- Addy, F.M., Sampson, V. and Yakubu, A. S. (2014). Relationship between stock market performance and macroeconomic variables in Ghana, *Issues in Business management and Economics*. 2(3), 46-53.
- Badullahewage, S.U. and Jayewardeneperura, C. (2018). The effects of macroeconomic factors on the performance of stock market in Sri Lanka. *International Journal of Innovation and Economic Development*, 3(6), 33-41.
- Balagobei, S. (2017). Macroeconomic variables and stock market returns in Sri Lanka. *Asian Journal of Finance and Accounting*, 9(2), 206-218.
- Caroline, G., Rosle, M., Vivin, V.C. and Victoria, C. (2011). The relationship between inflation and stock market: evidence from Malaysia, United States and China. *International journal of Economics and Management Science*. 1(2), 1-16.
- Menike, L.M.C.S. (2006). The effect of macroeconomic variables on stock prices in emerging Sri Lankan stock market. *Sabaragamuwa University Journal*, 6(1), 50-67.
- Rathnayaka, R.M.K.T. and Seneviratna, D.M.K.N. (2018). Impact of macroeconomic variables on stock market returns: a case study of Colombo Stock Exchange, Sri Lanka. *Kelaniya Journal of Management*, 6.

## **Economic Implications of Unpaid Domestic and Care Work of Women**

**Irshad Sreenthaj**

*Department of Economics, University of Jaffna, Sri Lanka*

**Keywords:** *Care work; Gender inequality; Time use survey; Sri Lanka; Unpaid domestic work*

### **Introduction**

There is a bilateral relationship between economic growth and gender in/equality. That is, rising economic growth could potentially reduce gender inequality in terms of access to formal employment, gaps in pay, etc. Similarly, shrinking gender inequality (in terms of access to formal employment, gaps in pay, etc.) could potentially boost economic growth as well (Cuberes and Teignier, 2014). The services sector has hugely contributed to the rise in the labour force participation of women due to structural changes in the economy. Economic models estimate that the rise in service sector accounted for 44% of the increase in the hours worked by women and 11% decrease in the hours worked by men (Ngai and Petrongolo, 2013). Galor and Weil (1996) demonstrate that generally women have comparative advantage in the mental labour (brain) output whereas men have comparative advantage in the physical labour (brawn) output and therefore the rise in capital intensity of production as a result of economic growth raises the relative wage of women. Moreover, the higher wages of women and the consequent lower population growth result in greater capital per worker and higher output growth. Although gaps in gender inequality (in the labour market, political representation, and intra-household bargaining power) is faster in the developing countries compared to the developed countries in the past, it is still very high especially in the Middle East, North Africa, and South Asia including in Sri Lanka (Klasen and Lamanna, 2009).

The gender differences in the labour market are reflected not only in terms of access to jobs but also in terms of differences in productivity and earnings (World Bank 2012). Women who play multiple roles within households and society endure an opportunity cost for working outside the home for a wage. Thus, potential earnings and productivity are also critical factors that could affect labour force participation of women. Therefore, instead of jobs per se,

the nature and effects of jobs available to women are what would determine labour force participation by women. Gender differences in the use of time and access to inputs influence productivity and earnings of women entrepreneurs, farmers, or workers alike (World Bank, 2012).

Similarly, education per se is not going to lift women out of inequality and dis-empowerment. For example, although women are the majority who enter the public universities in Sri Lanka, the bulk of them study arts, commerce, and humanities subjects that have very low employability (and low pay) in the labour market, especially in the private sector. In spite of sustained economic growth and significant improvements in access to education of women in the Middle East and North Africa and South Asia, the labour force participation rates of women in these sub-regions have been very low (26% and 35% respectively). In contrast, East Asia (65%) and Sub Saharan Africa (61%) have the highest among developing countries (World Bank, 2012).

However, in certain circumstances and senses armed conflict could transform the gender dynamics in favor of women in traditional conservative societies like Somalia. The informal sector jobs that are dominated by women world over, the unpaid household care work of women, and care economy are the key attention of economists and policymakers at this time of COVID-19 pandemic (Alon, Doepke, Olmstead-Rumsey, and Tertilt, 2020). Although this research study was conducted prior to the pandemic and the resultant lockdown and curfew, its relevance is all the more during this time of public health emergency, viz. COVID-19 pandemic, and its aftermath.

According to recent estimation, world's women aged 15 and above are devoting 12.5 billion hours per day for care work without any remuneration and many more hours for underpaid care work (Coffey et al., 2020). In all the countries of the world, the annual unpaid care work of women aged 15 and over is estimated to be at least 10.8 trillion dollars, which is three times the size of the global technology industries (Coffey et al., 2020). The traditional measures of the economy do not account for the unpaid household and care work of women. However, unpaid household work is closely related to well-being.

## **Objectives**

The primary objective of this study is to estimate the real value of the unpaid domestic care work undertaken by women in a family. The sub-objective of this research is to examine the gender division of work within households, and to highlight the caring role of women therein.

## **Methodology**

The data of this study were collected through a questionnaire from 50 respondents through simple random sampling. The data were processed using the Statistical Program for Social Sciences (SPSS) and Microsoft Excel. The following variables were used in this study:

- Labor force participation rate: the number of people engaged in the activity divided by total sample (engaged or not).
- Mean hours spent by men and women in housework and care work activities
- The mean actor time spent in a given activity of the classification by the sample engaged (or involved) in the activity.

Although, the opportunity cost method, the replacement cost method, and input/output cost method can be used to measure the value of unpaid work, this study used replacement cost method, which measures the value of unpaid work by calculating the monetary cost of purchasing this service instead. The reported activities were coded according to the International Classification of Activities for Time Use Statistics (ICATUS 2016). The Activity Categories 3 to 5 in the foregoing are unpaid household work, caregiving services and unpaid assistance to other households. However, this study considered the first two categories only; that is, the unpaid household work and the caregiving service.

## **Results and Discussion**

The results of this research study reveal that female heads of families spend more time on unpaid care duties at home than male heads of families. The survey results also reveal that, by imputing a monetary value for the time spent on household care work, productivity and income of households and the country could be enhanced.

Figure 1 (see annex) shows the participation rates for men and women in housework and care work. Accordingly, 56.8 percent of men and 87.2 percent women reported that they were involved in household activities. Participation rates were lower for care of persons. But the largest gender disparity was recorded in household activities. Also the participation rate of women was about 17 percent greater than that of men in care work.

Figure 2 (see annex) shows the mean hours spent by men and women in housework and care work activities. The largest gender gap was seen in housework where women spent 4.9 hours more than the time spent by men on these activities (7.7 hours spent by women per day compared to 2.8 hours spent by men per day) which implies that women spent 175% more time than men in household work. Women spent 3.3 hours per day on care activities, while their male counterparts spent just 1.8 hours, indicating that women spent 83% more time on caregiving work than men.

Figure 3 (see annex) shows that women spent on average 9.7 hours per day for all unpaid work while men spent 2.7 hours; the largest gender gap was seen in unpaid domestic work (house work) where women spent 5.1 hours more than the time spent by men on these activities (6.7 hours spent by women per day compared to 1.6 hours spent by men per day).

In terms of the replacement cost method, the money value of women mean population time is 843 rupees per day while the money value of men mean population time is 107 rupees per day, and the money value of women mean actor time is 928 rupees per day while the money value of men mean actor time is 399 rupees per day.

## **Conclusion**

Findings of this study imply that if the gap between men and women in terms of the time spent on unpaid household chores and care work could be reduced, it would increase the labour force participation of women and thereby stimulate economic growth. It is timely and imperative that both individuals and the government should be concerned about the time spent/used on unpaid care work within households and remedial action should be taken by all stakeholders.

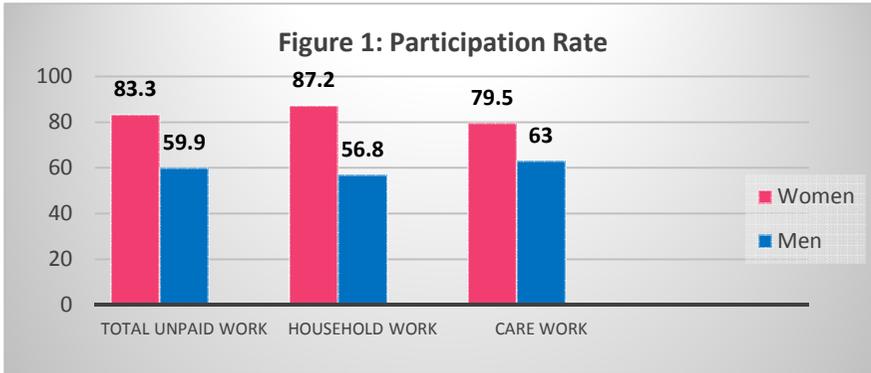
Based on the results of this research study, the following recommendations are postulated:

- A nationwide time use survey should be continually conducted on women's unpaid care work within households.
- Necessary technological innovations and introductions as well as infrastructural facilities should be made available in order to ease the burden of household chores of women.
- The government and private social welfare services should be tapped for child and elderly care work within households.
- The government should ensure that female informal sector workers are entitled to increased maternity leave provisions.
- Effective measures should be undertaken to promote equal sharing of the burden of household care work between men and women of each family.
- Increase the awareness and education among men about the imperative of gender equality for economic growth and prosperity.

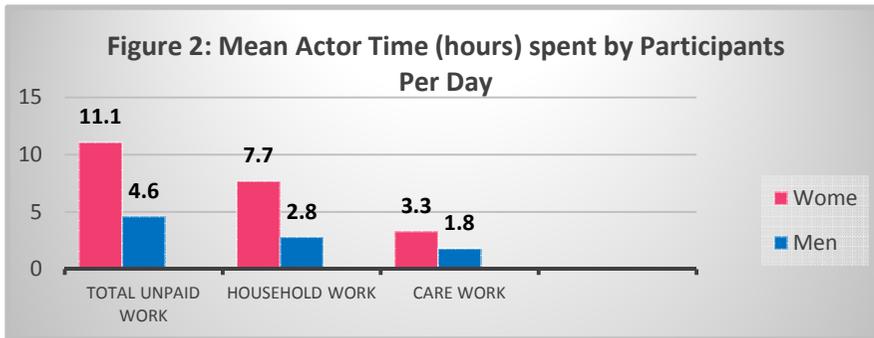
## **References**

- Alon, T., Doepke, M., Olmstead-Rumsey, J. and Tertilt, M. (2020), *The Impact of COVID-19 on Gender equality*. March, unpublished manuscript.
- Coffey, C., Revollo, P. E., Harvey, R., Lawson, M., Butt, A. P., Piaget, K., Sarosi, D. and Thekkudan, J. (2020), *Time to Care: Unpaid and underpaid care work and the global inequality crisis*, Oxfam Briefing Paper, January, Oxford: Oxfam International.
- David, C. and Teignier, M. (2014). Gender inequality and economic growth: A critical review. *Journal of International Development*, 26, 260-276.
- Galor, O. and Weil, D. N. (1996). The gender gap, fertility, and growth. *American Economic Review*, 85 (3), 374-387.
- Klasen, S. and Lamanna, F. (2009). The impact of gender inequality in education and employment on economic growth: New evidence for a panel of countries. *Feminist Economics*, 15 (3), 91-132.

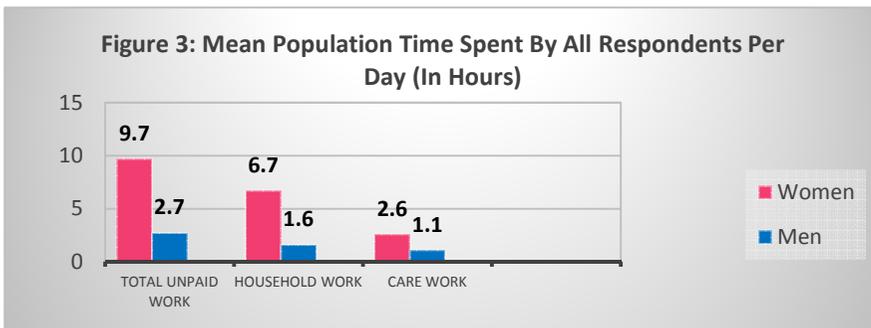
**Appendix:**



$$\text{Participation rate in activity} = \frac{\text{Participants in the Activity in Specified Group}}{\text{Total Population In specified Group}} \times 100$$



$$\text{Mean actor time} = \frac{\text{Total Hours spent by respondents in Specified Activity}}{\text{Total Participations in the ActivityGroup}}$$



$$\text{Mean population time} = \frac{\text{Total Hours spent by respondents in specified Group on the Specified Activity}}{\text{Total Population in Specified Groups}}$$

## **A Political Economic Analysis of the Sri Lanka-Singapore Free Trade Agreement**

**A.S.G.S. Bandara and K.D.M.S.B. Wijerathna**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Keywords:** *Free trade agreement; Export; Import; Political economy*

### **Introduction**

Today, the future of globalization has become the world's most powerful ideology over the past few decades. At a time, when the Western world is stuck in a transitional period of deciding whether to move away from neo-liberalism with globalization or move forward with it, Sri Lanka's current foreign trade policy helps to make some decisions regarding the economic conditions. Sri Lanka enters into international trade agreements with other countries in accordance with the General Agreement on Tariffs and Trade (GATT) and the General Agreement on Trade and Services (GATS) agreements enacted within the WTO mechanism.

Currently, bilateral and multilateral trade agreements have been signed with the objective of enhancing Foreign Direct Investment (FDI) in Sri Lanka, linking global products and values, promoting trade between countries and enhancing economic cooperation. They are the South Asian Free Trade Agreement (SAFTA), the Indo Sri Lanka Free Trade Agreement (ISFTA), the Sri Lanka-Pakistan Free Trade Agreement (SPFTA), the Multilateral Sectorial Free Trade Agreement for Technical and Economic Cooperation in the Bay of Bengal (BIMSTEC) and the Sri Lanka-Singapore Free Trade Agreement (SLSFTA). Free Trade Agreements (FTAs) have already been signed by Sri Lanka. Various parties have expressed varying views on the Sri Lanka-Singapore Free Trade Agreement.

This agreement is set to take Sri Lanka to a critical juncture in the economy of South Asia. It is the first free trade agreement signed by Sri Lanka in ten years, and is the first comprehensive free trade agreement signed by Sri Lanka, including trade in goods and services. It is also Sri Lanka's first free trade

agreement with a Southeast Asian country. The agreement is primarily for service investment, sanitation and biometric operations, removal of technical barriers to trade, trade assistance and dispute resolution, provision of customs relations and trade facilities, economic and technical cooperation, government planning, e-commerce and intellectual property rights.

Singapore is Sri Lanka's 8th largest trading partner, according to the 2018 Central Bank report. In terms of commodity trade, Singapore is not a highly important export market for Sri Lanka. At present Sri Lanka exports to Singapore only parts for electrical and electronics manufacturing, machinery, minerals, apparel, food and beverages and tobacco. The agreement opens up more opportunities for Sri Lanka to export men's T-shirts and women's clothing, jersey, rubber tires, special men's wear, pepper, light utensils, electric ovens, vulcanized rubber products, gemstones and semi-precious stones. Singapore is currently the 7th largest investor in Sri Lanka. More than 119 Singaporean companies currently operating in Sri Lanka have invested about US \$ 658 million in Sri Lanka from 2005 to the third quarter of 2017 (Central Bank of Sri Lanka, 2018).

Singapore has invested in IT, real estate, manufacturing, construction, renewable energy and pharmaceuticals. Although the primary objectives of the Sri Lanka-Singapore Free Trade Agreement are to attract foreign direct investment to Sri Lanka's manufacturing and services sectors, and to engage with global product and value chains, many have expressed a number of critical views on the matter. Some of those critical views are the impact on local industrialists, the risk of losing government tax revenue, and whether foreigners can come to work in the country. In this context, it is a timely necessity to analyze what its objectives really are under a political-economic approach.

## **Objectives**

The primary objective of this study is to investigate whether the Free Trade Agreement between Sri Lanka and Singapore will bring specific benefits to Sri Lanka. The secondary objective is to examine the arguments raised by people protesting against the Sri Lanka-Singapore Free Trade Agreement and to gain a political-economic approach.

## Methodology

This study uses annual data from the Department of Commerce Sri Lanka on Import and Export Trade between Sri Lanka and Singapore between 2001 and 2019 as secondary data to identify whether Sri Lanka would experience specific benefits through the Sri Lanka-Singapore Free Trade Agreement. The export intensity index, import intensity index and trade balance index have been used to analyze the specific benefits to Sri Lanka through this agreement. The Export Intensity Index studies the export orientation and export trade relations between the two countries as follows:

$$XIJ = \frac{Xij}{Xj} / \frac{Mj}{Mw-M} \quad (1)$$

The Import Intensity Index studies the import-trade direction and import-trade relationship between the two countries as follows:

$$MIJ = \frac{Mij}{Mi} / \frac{Xj}{Xw-X} \quad (2)$$

The Trade Balance Index studies the trade direction and trade relationship between two countries as follows:

$$TBIj = \frac{Xij-Mij}{Xij+Mi} \quad (3)$$

Microsoft Excel software was used to calculate and analyze the above index. To examine the arguments of people who have a positive and critical view on the Sri Lanka-Singapore Free through the Trade Ministry of Development Strategies and International Trade is applied. Data were collected via in-depth questionnaire-based interviews from the officials of the Department of Commerce Sri Lanka and members of the National Front of Professionals. The transparency of the Lanka-Singapore Free Trade Agreement has been studied using detailed statistical methods.

## Results and Discussion

Figures 1, 2 and 3 below show the values of the Export, Import Intensity and Trade Balance Index respectively calculated for trade between Sri Lanka and Singapore from 2001 to 2018. It identifies variations in these indicators under three main phases: 2001-2004, 2005-2014 and 2015-2018.

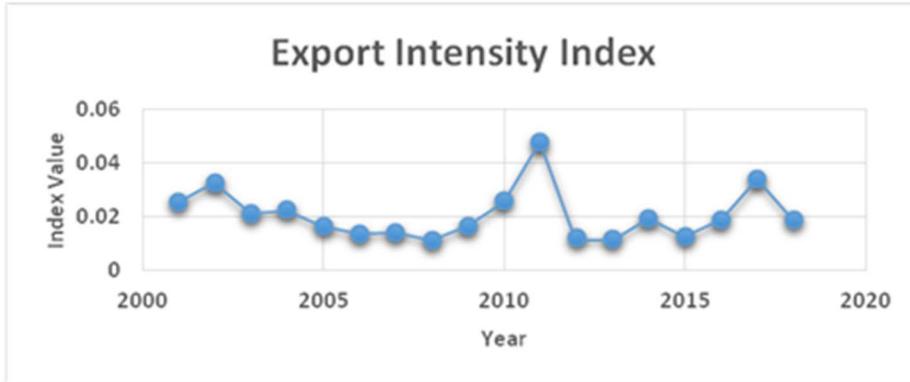


Figure 1: Values of the Export Intensity Index

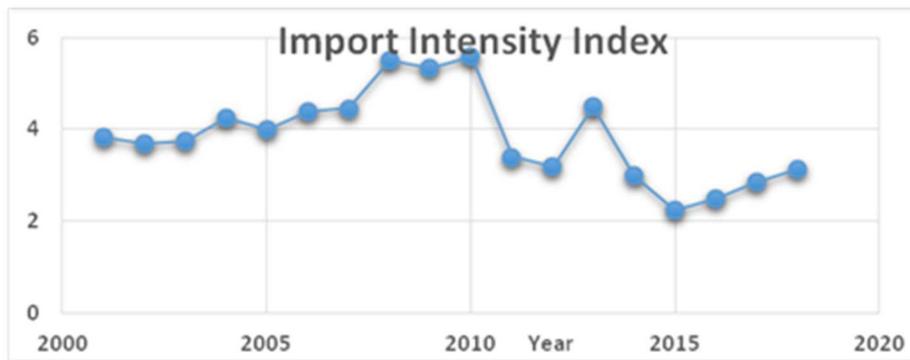


Figure 2: Values of the Import Intensity Index



Figure 3: Values of the Trade Balance Index

During the first phase, an increase in the Export Intensity Index was detected in 2002. Sri Lanka's exports to Singapore have not been as lucrative as Sri Lanka had hoped, and the value of the import intensity index has remained stable. Considering the second period, the value of the Export Intensity Index declined during 2005-2008, to a low of 0.113 in 2008. During the period 2005-2010, the value of the Import Intensity Index increased steadily, reaching its highest level in 2010 (5.58). This may have been due to the war situation in Sri Lanka during that period. The value of the Export Intensity Index rose sharply during the period 2008-2011, reaching a high of 0.047 in 2011. But since 2011, the value of the Export Intensity Index has fallen again until 2014. Although the import intensity index declined to 2.22 in 2015, its value has continued to rise since then. The trade balance depreciated from 2001-2004, hitting a low of -0.90 in 2008, and has improved after. This is due to the end of the war and the implementation of export promotion programs. But after 2011, the trade balance index fell to 2014. It is also possible to detect fluctuations in the values of the trade balance index during the period 2015-2018.

The major weakness in the drafting of the Sri Lanka-Singapore Free Trade Agreement is the lack of consultation with the various stakeholders involved. But the government denies the allegation. In addition, Sri Lanka does not have a national trade policy except for a document called the New National Trade Policy. The basic arrangements of this agreement have put Sri Lanka at a disadvantage. It can also be seen that Sri Lanka is losing a lot of tax revenue through this and Singapore has gained a huge advantage from the trade in goods. According to the agreement, falling prices of imported goods could lead to a severe crisis in the local manufacturing industry and the risk of losing the local job market.

## **Conclusion**

Sri Lanka is subject to import and export activities between Sri Lanka and Singapore due to a value of less than 1 in the Export Intensity Index and more than 1 in the Import Intensity Index for trade between Sri Lanka and Singapore during the period between and 2001-2019. In addition, Sri Lanka is a net importer as the value of the trade balance index is less than one. Through this Free Trade Agreement, not only the citizens of Singapore but

also the citizens who have obtained permanent citizenship of Singapore will have the opportunity to come to Sri Lanka and engage in various occupations. The quality of the Sri Lankan labor market will improve due to the expertise of the people arriving from Singapore. Also there is a risk that waste such as garbage, which is harmful to the environment, could enter Sri Lanka through this trade agreement. The response from Sri Lankan scholars and trade unions to the Sri Lanka-Singapore Free Trade Agreement has been poor. The trade agreement should be reactivated after a feasibility report on the Sri Lanka-Singapore Free Trade Agreement is prepared and studied. Necessary policies should be formulated to promote small and medium scale industries in Sri Lanka. As there is no stable national trade policy in Sri Lanka, an effective national trade policy that is beneficial to the country should be created.

## References

- Brockman, J. D. (2018). An Australian perspective on the Australia-EU Free Trade Agreement. University of Adelaide Press. [Online]
- Hundlani, D. and Wignaraja, G. (2018). Sri Lanka-Singapore Free Trade Agreement a new dawn. Lakshman Kadiragaman Institute. [Online]
- International Trade Statistics Report of Sri Lanka (2018). Annual Report, Department of Commerce: Colombo.
- Liu, X. (2008). The political economy of Free Trade Agreements: An empirical investigation, *Journal of Economic Integration*. 237-271.
- Maggi, G. and Clare, A.R. (2007). A political-economy theory of trade agreements, *American Economic Association*, 94(4), 1374-1406.
- Pang, E.S., (2007).The case of the United States—Singapore Free Trade Agreement, *ISEAS - Yusof Ishak Institute*, 29(1), 1-32.
- Young, R.A., (1989). Political scientists, economists and the Canada-US Free Trade Agreement, University of Toronto Press on behalf of Canadian Public Policy, 15(1), 49-56.

## **The Deepening Crisis of Global Capitalism in the Age of COVID-19: Why Marx was Right?**

**Kalpa Rajapaksha**

*Doctoral Student, Department of Economics, The New School for Social  
Research, New York, USA*

**Keywords:** *Covid-19; Capitalism; Falling rate of profit; Marxism; Working  
class*

### **Introduction**

Any crisis provides an opportunity to learn. But what is the class nature of the learning process? The current global crisis triggered by the COVID-19 pandemic is not different at all from that political historicity. However, the recent global political experience bears sufficient evidence that the global capitalist class and mainstream economics are not ready to learn – they tend to repeat the history, as Marx said, *first as a tragedy then as a farce*. While the global capitalist class converts history into opportunism and its ultimate survival method – profitability, mainstream neoclassical economics keeps itself occupied with producing ‘more rigorous’ mathematico-deductive models and theories to justify the same historical process. The present debate of mainstream economics on the crisis dedicates its role to fulfill two main objectives, which as this study will demonstrate are equally false. Firstly, it attempts to highlight that the present crisis and its deepening nature were caused by the global pandemic. In other words, the argument goes, prior to the pandemic global capitalism was vibrant and healthy. Secondly, it attempts to highlight that the recovery methods that are identical to the 2008 crisis, consisting of austerity measures, financialization, tax-cuts to the top 1% and dispossession etc. should be instrumented in order to attain recovery from the current crisis. This study was conducted in order to challenge these views and to present a Marxist alternative.

### **Objectives**

The direct objectives of this study are, firstly, to demonstrate the unparalleled importance of Marxian theory, not only to understand the protracted crisis (long-waves) of capitalism since 1950s but also to demonstrate that the so-called ‘recovery’ of the world economy and domestic

economies in the aftermath of the 2008 crisis and deepening crisis of global capitalism in the reality of COVID-19 are significantly different from the narration presented by mainstream economics. Secondly, to historically reposition the Marxian categories with theoretical and empirical evidence as confronting the mainstream views on everlasting capitalist growth, recovery and exploitation (material and ideological) etc. The indirect objective of the study, is to encourage young intellectuals in Sri Lanka to embrace this approach as a larger research framework in order to nourish Marxism in the 21<sup>st</sup> century with more theoretical and empirical work.

### **Methodology**

The theoretical framework of the study consisted of the Marxian categories, mainly, constant capital (c), variable capital (v), rate of profit (ROP/ r), rate of surplus value (ROSV/ s) and organic composition of capital (OCC) at the global level, which are economic categories developed by Marx through his work “A Contribution to the Critique of Political Economy and Capital Vol. I, II and III”. The empirical evidence and calculations are extracted from secondary sources, and are primarily based on the work by Michael Roberts (2020), Anwar Shaikh (2016) and Carchedi and Roberts (2018).

### **Results and the Discussion**

The pioneering work on long waves, laws of motion and trends of capitalism by Nikolai Kondratiev, Ernest Mandel, Anwar Shaikh, Esteban Ezequel Maito and Michael Roberts confirm the importance of using Marx’s model for the world economy, in Marx’s words capital in general. The law of the tendency of the rate of profit to fall, as Marx discussed in the third volume of Capital, as all the above authors argued, can be considered as one of the most important laws of motion in Marxian categories. Specially, Roberts’ recent work (2020), revisited the significance of the falling rate of profit in the world economy – global capital in general – as highlighting the dialectical significance of this analysis in order to capture the long movement and unavoidable consequences of capital in the age of a global pandemic. The narration of mainstream economics, which articulated the present pandemic as the culprit of the recent economic crisis as undermining the long trends (falling rate of profit) of global capitalist order, is misleading. The pandemic has triggered and opened up the next level of the global crisis; however it did

not cause it. Thus, the so-called methods of recovery in debate are absolutely subjected to the misinterpretation of the health of global capitalism in general and whose recovery such a process will sustain in the coming years. The quick nature of the recovery is laid upon the path of pain, dispossession and exploitation of the global working class.

Roberts' work, with respect to both G7 and G20 economies (figure 1 and 2), shows us that the rate of profit (ROP %) of major capitalist economies since 1960s is in a long-term decline except the period that is remarked by neoliberal recovery between 1983 and 1998. Even though neoliberal recovery lifted up the ROP it was nowhere close to the ROP in the golden age of capitalism (1950-1965). Roberts calls this period the relatively weak neoliberal recovery (Roberts, 2020).

Then, as we witnessed, the inherent nature of neoliberal recovery (profits without producing – financialization) had paved the way to the period of long depression. We can identify the same trend in both figures but with G7 ROP is recording a lower ROP% and G20 ROP recording a higher ROP% throughout the period of long depression.

Thus, as both Roberts and Shaikh argued in their work, there is sufficient empirical evidence to prove and justify Marx's law of profitability (Shaikh, 2016 and Roberts, 2020). The modern phase of the capitalist mode of production exhibits that this value-fundamentalism has not been changed but intensified and universalized. In other words, even today possibilities of cost cutting are a result of replacing labour power with more machinery and intensification of work. The Organic Composition of Capital (OCC) as an indicator could clearly demonstrate the trends of this inherent conflict between constant capital (C) and variable capital or labour power (V).

Roberts's calculations of G20 ROP% against OCC proves the validity of Marx's theoretical take on the labour theory of value with respect to the articulation and accumulation of capitalist profit in the global scale. As opposing trends of ROP and OCC to each other demonstrate that there are, firstly, rising organic composition of capital at the global scale as a direct result of a rise in constant capital against labour, secondly, until the mid-1980s the rate of OCC was maintained under the falling ROP and then

neoliberal recovery offered sufficient amount of reasoning to unleash an increasing rate of OCC against ROP% globally. Thirdly, as Roberts concluded, the long-term decline in profitability (1950-2017) is matched by a long term rise in the OCC as Marx predicted (Roberts, 2020).

The above calculations, Rate of profit, Organic composition of capital and Rate of Surplus value, by Roberts do fit well into the theoretical framework of Marx. If OCC rises more than the ROSV, the ROP will fall – and vice versa (Marx, 1867 and Roberts, 2020). During 1997-2017, OCC was 3.4, well above ROSV -6.8 thus ROP recorded a value of -9.9. Throughout the long period of analysis, 1950-2017, OCC was 12.6, which is well above -8.4 of ROSV and resulted in -18.7% of overall global capitalist rate of profit.

The question we should wisely raise at this point of history is, what kind of consequences will be fall on the global trends of higher OCC, where the working class is put under pressure (in numerous ways) as ROP is further falling down universally following the same historical patterns. In other words, how would both so-called economic recovery and recovery from the pandemic be carried out under the historical contradictions of capital in the coming years? The pressure that both global corporate profit and the US rate of profit were undergoing way before the global pandemic is well depicted by figures 4 and 5.

The so-called recovery from the 2008 financial crisis is false. As many have pointed out, the peak of the recovery is well below the pre-Great Recession's peak while the rate of global corporate profit hit a negative trend in December 2018 and further plummeted due to the economic consequences of the global pandemic. As Roberts pointed out the pandemic slump has driven global corporate profits down by around 25% in the first half of 2020 – a bigger fall than in the Global Recession (Roberts, 2020).

Similarly, the US ROP% at both historic and current cost measures indicates that it never recovered from the Global recession even though the capitalist class was supplemented by stimulus packages, austerity measures and tax cuts under different political regimes. Will the recent plummeting of ROP and deepening crisis of neoliberal state of the US be supplemented by any

historically-different methods of recovery or by the same? Furthermore, whose voice will be heard?

## **Conclusions**

The current global pandemic had pushed global corporate profit of the G7 and G20 economies, including, US, UK, Germany, Japan and China to further downfall. However, as mainstream economists argue, the pandemic was not the cause of the current crisis but, in many ways, it triggered the unrecovered long recession of the global financial crisis of 2007-2008. The unparalleled importance of economic categories by Marx and his long view, especially articulated under the law of the tendency of the rate of profit to fall, can be validated both theoretically and empirically. Roberts' analysis demonstrates that the long-term decline in profitability (1950-2017) is matched by a long term rise in the organic composition of capital, where constant capital occupies the largest and increasing production share while the global working class is pushed into further immiseration; as an inherent need of capitalist global competition, as Marx well-predicted. Any crisis is a historically significant moment to learn and struggle against the bondage of dominance. The 2008 financial crisis helped to revive the global left and Marxism to some extent. However, the real political possibilities were subsumed under the liquidity of global finance, dispossession, austerity and militarism – in other words, further intensification of neoliberalism. This study attempts to demonstrate that the same process could be repeated as a prescription of recovery to the current crisis which was triggered by the pandemic. The global south and the global working class will have to be vigilant about the intensification of neoliberal recovery methods that are yet to come and organize against the capitalist atrocities.

## **References**

- Carchedi, Guglielmo and Roberts, Michael. (2018). *World in crisis: A global analysis of Marx's Law of Profitability*. Chicago: Haymarket Books
- Marx, K. (1976). *Capital volume I*. London: Penguin Publishers
- Marx, K. (1978). *Capital volume II*. London. Penguin Publishers
- Marx, K. (1991). *Capital volume III*. London: Penguin Publishers

Roberts, M . (2020). More on a world rate of profit. Available at: <https://thenextrecession.wordpress.com/2020/09/20/more-on-a-world-rate-of-profit/>(Accessed 5<sup>th</sup> October 2020)

Shaikh, Anwar. (2016). Capitalism: competition, conflict and crisis. New York: Oxford University Press.

### Appendix

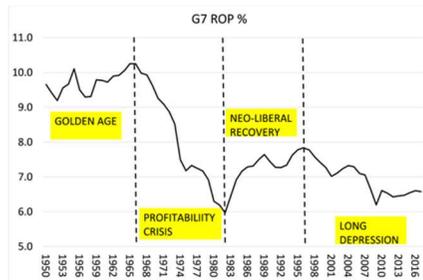


Figure 1

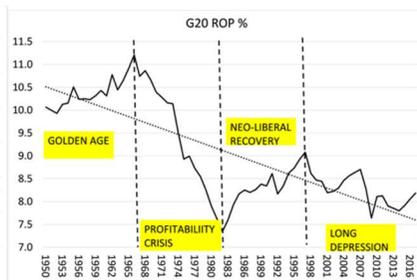


Figure 2

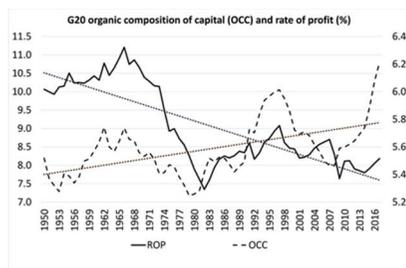


Figure 3



Figure 4

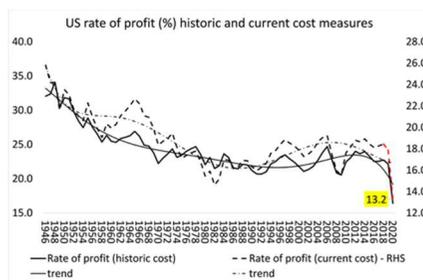


Figure 5

	ROP	OCC	ROS	ROSV
1950-17	-18.7	12.6	-8.4	
1950-66	11.3	4.0	15.7	
1966-82	-34.5	-5.6	-38.1	
1982-97	23.6	11.0	37.2	
1997-17	-9.9	3.4	-6.8	

Table 1

Source: All the above figures and tables were calculated by Michael Roberts using Penn World Tables.

## **The Impact of the Organizational Mission Drift on its Employee Effort**

**D.I.J. Samaranayake<sup>1</sup> and S. Banuri<sup>2</sup>**

*<sup>1</sup>Department of Management Studies, Faculty of Management, University of Peradeniya, Sri Lanka*

*<sup>2</sup>School of Economics, University of East Anglia, United Kingdom*

**Keywords:** *Employee's effort; Mission match; Mission drift; Motivation; Pro-sociality*

### **Introduction**

The mission statement of an organization highlights the uniqueness and difference from the other organizations in society. It appears as a way to clarify the role of an organization and equally as a method to attract employees (Chu and Luke, 2012). Although, one of the inherent challenges of operating as an organization in modern business is the maintenance of its original mission. Rapid changes in the external environment encourage organizations to drift from their original mission to a broader scope of activities. Mission drift can be identified as a noticeable movement of organizational main objectives and goals towards a new direction (Ebrahim et al., 2014; Mader and Sabro, 2019).

According to Minkoff and Powell (2006), this movement represents a deviation of an organization's resources and activities in two modes. They are the administrative and programmatic drifts. Such movements are noticeable in organizations such as social enterprises, non-profit organizations, healthcare, and educational bodies. For instance, the social enterprises such as microfinance institutions experienced mission drifts (Jaquette, 2013; Armendariz and Szafarz, 2009). Also, the literature encourages to observe whether such mission drifts cause less engagement and less effort by its key stakeholders. This can occur due to mismatches in the pro-sociality, meaningfulness, and the expectations of the mission they are engaged in (Carpenter and Gong, 2016; Smith, 2016; Banuri and Keefer, 2016). Therefore, the study designs to observe the impact of the mission drift of an organization on its employee's effort. For that, the study introduces a model to observe such impact through an experiment using the modified version of "dictator game" and "real effort tasks".

## **Objectives**

This study aims to introduce an extension to the model developed by Carpenter and Gong (2016) in order to accommodate the effect of mission drifts on effort and to perform an experiment to test the following hypotheses.

**Hypothesis 1:** Mission matched subjects exert more effort than mission mismatched subjects.

**Hypothesis 2:** Mission drifted subjects exert less effort than mission matched subjects.

**Hypothesis 3:** Mission drifted subjects exert more effort than mission mismatched subjects.

The initial hypothesis (H1) distinguishes the behaviour and performance of the mission matched and mismatched subjects. Then the following hypotheses (H2 and H3) consider the impact of mission drift on employee's effort compared to the effort made by mission matched and mismatched subjects. Therefore, these three hypotheses were used as the benchmark in recognizing treatments and the structure of the experiment. The experiment consisted of three experimental sessions considering mission matched (baseline), mismatched (treatment 2), and drifted (treatment 3) situations.

## **Methodology**

This study follows the theoretical model developed by Carpenter & Gong (2016) to examine the effect of mission matching and incentives on employee's productivity. They used the standard principal-agent model, where the employer offers a wage contract and the employee decides the degree of effort to exercise. Accordingly, this study introduces an extension to the model as to examine the impact of mission drift on the employee's effort. Then an online experiment using a pool of undergraduates coordinated by the Laboratory for Economics and Decision Research (LEDR) of the University of East Anglia, the UK. It consists of three experimental sessions accompanied by 23 participants each.

As it demonstrated in the figure 1, the experiment focuses three sessions, a baseline and two treatments including a modified version of “dictator game<sup>5</sup>” and “real effort task<sup>6</sup>”. All treatments include two modified dictator games and two rounds of real effort task. Then the two rounds of real effort task split each for a mission matched condition at the baseline and for mission mismatched condition at the second treatment. Finally, the two rounds of real effort task split each for a mission matched condition and a mission mismatched condition for the third treatment.

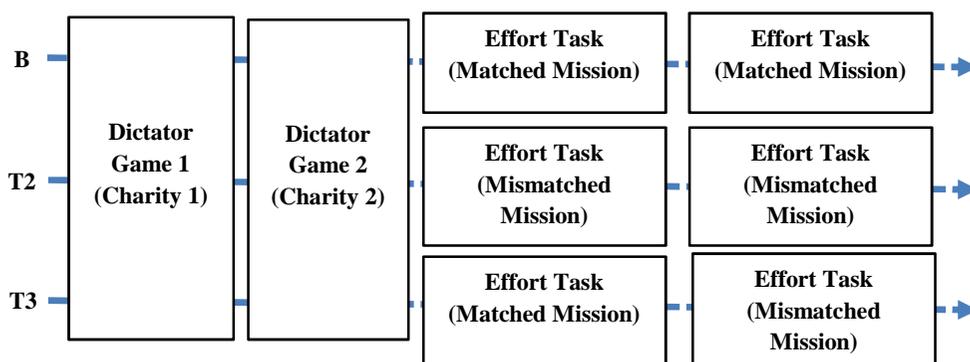


Figure 1: Structure of the Experimental Sessions

Further the flowchart of an experimental session (annexure 1) shows that, all three sessions include an exit survey to collect key demographic information and feedback from the subjects. The data obtained from the experimental sessions were utilized to test the three hypotheses via descriptive reviews and OLS regressions. The following regressions are developed separately for the three treatments of the experiment.

<sup>5</sup>Provide a modified version of the standard dictator game by matching subjects with a pro-social organization to assure the two players in the game (Banuri & Keefer, 2016). The modified version of the dictator provides an opportunity to obtain a direct measure of pro-social motivation. The subjects will be given an endowment with sole authority to split it between themselves and a pro-social organization.

<sup>6</sup>This study is supposed to use one of the recent and convenient real effort tasks applicable in an online setup. Therefore, this study is able to use one of the most recent methods which also convenient to implement and requires a low level of skills and ability from participants having good control for the experimenter. It is the task of “Counting Zeroes of Matrices”. This method was first used by Abeler et al. (2011) and participants are allowed to count the number of zeroes appear in a sequence of matrixes that appeared within a limited time on a computer interface.

*Baseline* (Treatment 1)

$$TFG_{B_i} = \alpha + \beta MOTIV_{1_i} + \delta MOTIV_{2_i} + \rho EFF_{B_1_i} + \theta EFF_{B_2_i} + \gamma CONT_i + \varepsilon_i \quad (1)$$

The dependent component of the OLS regression represents the Total Funds Generated (*TFG*) by the respondent at the experimental session by adding both donations to the charity organizations, amount of Experimental Currency Units (ECU) raised at the effort task for measuring the ability of the respondents, and effort made at both effort tasks for fundraising. Then  $\beta MOTIV_{1_i}$ ,  $\delta MOTIV_{2_i}$  are for the measures from the dictator games from the charity 1 and charity 2 for the baseline.  $\rho EFF_{B_1_i}$  represents the records from the initial effort task for fundraising and  $\theta EFF_{B_2_i}$  for the data obtained from the second session of the effort task with the mission match condition. The demographic characteristics ( $CONT_i$ ) will be collected through the debriefing questionnaire provides to the subjects at the end of the experiment. Similarly, the regressions for treatment 2 and 3 also can be developed as follows for mission mismatched and drifted conditions.

*Baseline* (Treatments 2 and 3)

$$TFG_{T2_i} = \alpha + \beta MOTIV_{1_i} + \delta MOTIV_{2_i} + \rho EFF_{T2_1_i} + \theta EFF_{T2_2_i} + \gamma CONT_i + \varepsilon_i \quad (2)$$

$$TFG_{T3_i} = \alpha + \beta MOTIV_{1_i} + \delta MOTIV_{2_i} + \rho EFF_{T3_1_i} + \theta EFF_{T3_2_i} + \gamma CONT_i + \varepsilon_i \quad (3)$$

**Results and Discussion***Theoretical Extension*

This study introduced an extension to the model developed by Carpenter & Gong (2016) based on the effect of mission drifts considered that the mission motivation [ $\theta$ ] is a dynamic parameter and depends on the magnitudes of the employee's personal mission and the mission of the organization. The extension introduced three new parameters in order to derive the impact of mission drift. " $\alpha$ " represent the mission preference of the organization and the " $\beta$ " for the mission preference of the employee. The magnitude of the mission drift is represented by " $\eta$ " and it generates an impact on the static parameter [ $(\theta = 1)/\gamma > 0$ ]. Therefore, difference in the magnitudes of  $\alpha$  and  $\beta$  tend to decrease the value of " $\theta$ " as [ $(\theta < 1)/\gamma > 0$ ] and it appears to be a dynamic parameter  $\{\theta = 1 - [\eta(\alpha - \beta)]\}$ . Therefore, the standard utility

function<sup>7</sup> described in Carpenter & Gong (2016) requires an extension as  $U(e) = [w+pe] + \{\theta = 1 - [\eta(\alpha - \beta)]\} M(e, \gamma) - C(e)$  with the consideration on the impact of mission drift on effort. Therefore, the new model predicts that the employee's mission utility  $[\theta M(e, \gamma)]$  decreases when the degree of mission match  $[\theta]$  decreases as a result of the variations in the magnitude of mission drift  $[\{\theta = 1 - [\eta(\alpha - \beta)]\} M(e, \gamma)]$ .

### **Empirical Outcomes: Descriptive Analysis**

The analysis of the three effort tasks shows that the efforts made at the baseline are slightly higher than the other two treatments. The group of respondents at the baseline are the less prosocial group but exerted higher effort due to the matched mission. Further, the ability and efforts on fundraising are very similar in the mission matched condition compared to the other two treatments. It is visible that the magnitude of effort at treatment 2 is slightly below treatment 3 with a drifted mission. Also, a comparison of total efforts in each fundraising task (annexure 2) demonstrates a significant difference between the effort levels across three treatments. The baseline shows an increasing trend in the total effort made. In contrast, treatment 2 with the mission mismatch demonstrated a significant decline in the total effort made at the effort tasks. The treatment 3 represented a significant improvement of the total effort made at the beginning of the task but declined later due to the mission drift.

### **Experimental Outcomes: Regression Analysis**

The regressions are arranged to test three hypotheses following baseline and two treatments of the experiment. The comparison on the statistical outputs from the OLS models (annexure 3) indicates that all three models are statistically significant to describe the impact of causal variables on TFG. The estimated coefficients of both the donations to charity organizations and effort tasks demonstrated significant impacts on the funds accumulated for the charity organizations. The models on the baseline and treatment 2 predict that the donations to both charities made a positive significant impact on the TFG. A mission drift demonstrated only a positive significant impact from the donations made to KSF on the TFG. Also, the positive and significant

---

<sup>7</sup> Standard utility function considered the mission motivation  $[\theta]$  as a static parameter.

coefficients of the effort tasks related to the fundraising demonstrate a high impact in accumulating funds to the charity organizations. The respondents are appeared to be less efficient in terms of the effort once the mission mismatched compared to the mission matched respondents.

## **Conclusion**

This study introduced an attempt to extend the model developed by Carpenter and Gong (2016) considering the impact of organizational mission drift on effort. The outcomes of the model extension support to recommend the inclusion of the parameters which describe the magnitude of the mission drift when observing the impact of the organization's mission on its employee's effort. Then a comparison of data obtained from three treatments of the online experiment provided evidence to support the predictions made at the theoretical extension. The respondents who experienced a mission drift tend to exert effort in between the effort levels of mission matched and mismatched individuals. Further, the study found that the respondents with a similar degree of pro-sociality demonstrate clear improvement in the effort made on duties in both mission match and drift compared to a mission mismatch. This supports Smith (2016) as mission matched individuals show more effort and were mediated by the meaningfulness of work. However, a respondent with a high degree of pro-sociality demonstrates a high explicit impact on the effort on their duties even in a drifted mission compared to a less pro-social individual in a matched mission.

**References**

Banuri, S. and Keefer, P. (2016). Pro-social motivation, effort and the call to public service. *European Economic Review*, 83, 139-164.

Carpenter, J. and Gong, E. (2016). Motivating agents: How much does the mission matter? *Journal of Labor Economics*, 34(1), 211-236.

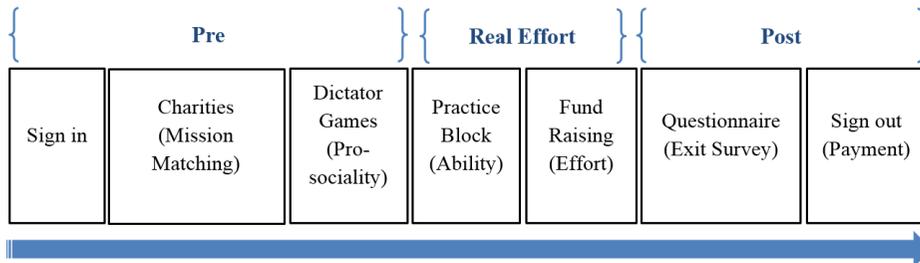
Chu, V. and Luke, B. (2012). Mission drift or strategic shift? Group formation strategies within MEPS. *Journal of International Development*, 24, 1042-1045.

Jaquette, O. (2013). Why do colleges become universities? Mission drift

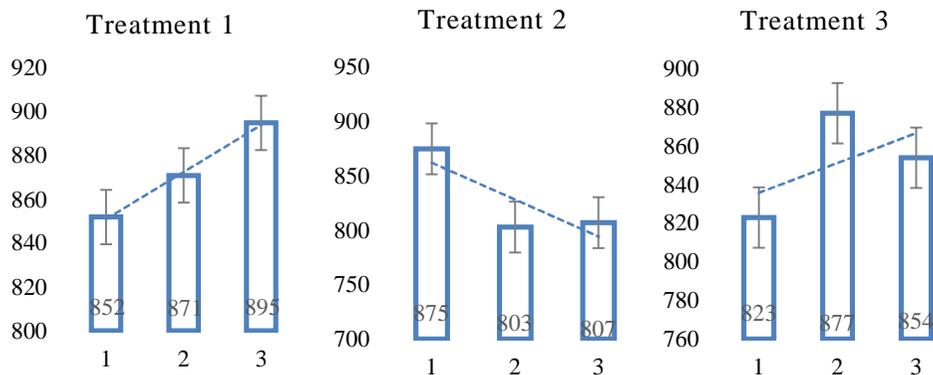
Smith, J. (2016). The motivational effects of mission matching: A lab-experimental test of a moderated mediation model. *Public Administration Review*, 76(4), 626-637.

**Appendices**

**Annexure 1: Flowchart of an experimental session**



**Annexure 2: Comparison of total efforts across the treatments**



**Annexure 3: Regression Outputs**

<i>Test for the Model Fitness</i>	<i>Fitness Index (Treatment 1)</i>	<i>Fitness Index (Treatment 2)</i>	<i>Fitness Index (Treatment 3)</i>
<i>F-Statistic</i>	341.84***	96.14***	36.68***
<i>R-Squared</i>	0.9923	0.9730	0.9322
<i>Adjusted R-Squared</i>	0.9894	0.9629	0.9068

---

**Dependent Variable:** total funds generated at the experiment

<b>Subject</b>	<b>Treatment 1</b>	<b>Treatment 2</b>	<b>Treatment 3</b>
<i>Donations to the MCS</i>	0.9087*** (0.1632)	1.4767*** (0.3267)	0.5879 (0.3439)
<i>Donations to the KSF</i>	0.7382*** (0.1718)	1.0675*** (0.2815)	0.8140** (0.3575)
<i>Effort Task 2 (fundraising)</i>	1.0440*** (0.1011)	0.6577*** (0.1286)	0.7765*** (0.2029)
<i>Effort Task 3 (fundraising)</i>	0.5540*** (0.1045)	0.3722*** (0.1140)	0.7535*** (0.2281)
<i>Age</i>	0.0116 (0.0718)	-0.2663 (0.3723)	-0.0270 (0.1505)
<i>Gender (male=1)</i>	-0.9352 (0.9377)	1.0047 (0.4779)	0.8790 (1.9210)
<i>Constant</i>	-3.0972 (0.9377)	20.5148** (8.6660)	1.0480 (6.9748)

Note: Standard errors are in parentheses, and \*, \*\* and \*\*\* represent variables are statistically significant at 10%, 5% and 1% level of significance respectively.

## **Japanese Technical Intern Training Program: A Way to Develop Human Capital in South East Asia**

**Peemmaphat Buarapha and Saliya De Silva**

*Faculty of Economics, Saga University, Japan*

**Keywords:** *Technical intern training program; Human capital; South East Asia*

### **Introduction**

It is well known that the Asian Newly Industrialized Economies (NIEs) achieved their remarkably fast economic growth through export-oriented policies that led to Foreign Direct Investment (FDI) and acquisition of foreign technology since the 1960s. The other South East Asian countries (hereafter SEACs) also replicated these policies following the Asian NIEs. Japan, due to increasing labor costs, relocated its labor-intensive manufacturing to the Asian NIEs in the early 1960s. During that time Japan was in the second stage of industrial restructuring to catch up with the Western economies. However, after the Yen appreciation in 1985, Japanese export started to decline and lost its competitive situation against the Asian NIEs in consumer electronics. Thus, Japan relocated its manufacturing firms again to low cost SEAC countries, such as Thailand and Indonesia.

Even though, these SEACs used similar strategies in developing their own economies as the Asian NIEs like South Korea since the 1960s, they still have not been able to escape from the “Middle Income Trap” (MIT) passing the required amount of GNI per capita (i.e. pass \$12,535 GNI p.c. in 2020). One reason why SEACs are still in the MIT lies in their lack of human capital (HC). The foreign firms use various strategies such as retaining tacit knowledge, separating the production process in different countries, in order to keep the secrets by themselves. Like what happened in Asian NIEs, the duty of absorbing foreign knowledge and technology lies upon the host country’s workforce. Therefore, Human Capital Development (HCD) is imperative to increase the absorptive capacity of the host country. One of the ways used by SEACs in recent times for HCD in their home countries is

through Japan's Technical Intern Training Program (TITP). A question arises whether TITP is an effective way of HCD in labor sending SEACs.

## **Objectives**

This research aims to analyze how successful TITP has been addressing the HCD issue of SEACs enabling them to overcome the MIT.

## **Methodology**

This paper is based on desk research conducted by analyzing qualitative and quantitative secondary data collected from prior literature and relevant databases. The protocols of systematic reviews were used to carry out the literature review. The analysis was carried out to achieve the research objective as follows. Firstly, the data on HCD strategy through TITP and number of trainees from SEACs' were analyzed to give a clear idea of the current situation. Then the prior literature concerning the opportunities and challenges of TITP was systematically reviewed.

The definition of HCD, according to Lawrence and Ismail (2009), is the knowledge, skills, and expertise one accumulates through education and training. Ratnayake and De Silva (2018) argue that HCD should not only focus on the improvement of knowledge and skills but also on developing attitudes such as social values and work ethics. During the latter half of the 20<sup>th</sup> century, SEACs had a more positive policy towards FDI, mostly from Japanese-affiliated firms. These countries wished to develop their HC from backward linkage with foreign firms but failed. This is because, as Booth (1999) suggested, educational progress in the fast-growing SEACs had been much slower than in NIEs such as Taiwan and Korea, which made it hard to absorb the knowledge and technology from Japan. Many emerging Asian countries also use the strategy of exporting their labor force to technologically advanced countries to develop their HC. Japan's Technical Intern Training Program (TITP), which gained increasing interest from SEACs in the past three decades for their labor exports, is an alternative way to develop HC apart from FDI.

## Results and Discussion

The TITP was established in 1993 with the purpose of accepting young workers from various countries, who then obtain industrial and vocational skills in Japan, thereby, contributing to the improvement of their occupational live after their return to home countries. TITP has gone through several changes since its establishment. The most notable one was in 1997 when it extended the period of training from a maximum of 2 years to 3 years. In 2009, the Immigration Control and Refugee Recognition Act was Revised, then in July 2010 the “Technical Intern Training” (i) and (ii) residence statuses were added. With the revised law, the labor standard and minimum wage law was applied to the Technical Intern Trainees (TITs). This also distinguishes “TIT” who get on-the-job training from the “Trainee” status which are limited to off-the-job training. In 2017, a TITP was changed again and “Technical Intern Training (iii)” was also added, which extended the training period from 3 to 5 years.

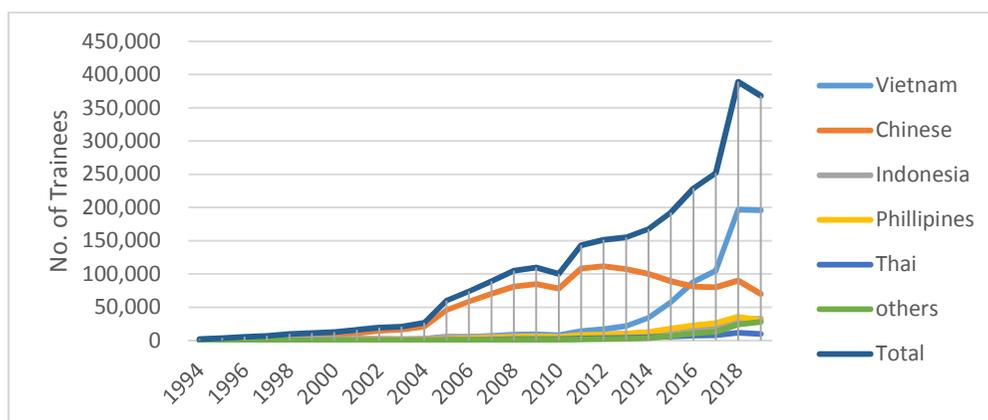


Figure 1: Number of TITs by countries

Source: Year 1994-2010: Ratnayake Piyadasa and Saliya De Silva (2018); Year 2011-2016: Ministry of Health, Labor and Welfare of Japan; Year 2017-2019: Organization of Technical Intern Training. <https://www.otit.go.jp/research/>.

According to Ratnayake and De Silva (2018), the number of TITs in 1994, was 2,138 people (Figure 1). The number kept rising and reached 10,550 in 1997, the year in which the training period was extended from two years to three years. According to the Japanese Ministry of Health and Welfare, in 2011 the new status of trainees was accepted, and the number rose to

143,308 people, with 108,252 trainees coming from China and 13,789 trainees from Vietnam. According to the Organization for Technical Intern Training, in 2019, the number of TITs increased to 389,321, or about 255.51% since 2011. Surprisingly, in 2019 most of the TITs came from Vietnam accounting for 196,001 people or 53.5% of all the TITs, followed by China 69,795 people, Indonesia 32,528 people, Philippines 30,326 people, Myanmar, 13,739 people and Thailand 9,587 people. The sharp increase of TITs from SEA countries shows that they have a great interest in developing the human capital of their work force through the TITP.

Many studies prove that TITP benefits both the trainees themselves and their home countries. The workers can earn better income in Japan and after going back to their home country, develop technical knowledge and management skills, improve their attitudes, learn the Japanese language, and get better job opportunities after the program. For the SEACs not only they can resolve the immediate issues related to jobs creating and increasing foreign currencies, but can also improve the labor quality and labor productivity and human capital, which are regarded as long-term development objectives (Nguyen *et al.*, 2018; Ratnayake and De Silva, 2018).

Many researchers also claim that TITP contribute to solve Japan's labor shortage problem. Employers in Japan use the TITP to recruit foreign labor to fill low- and semi-skilled jobs. Most TITs work in industrial cities which are home to large scale companies. These large companies rely mainly on Japanese labor force, forcing micro, small and medium enterprises in these prefectures to turn to TITs (Verité, 2018). However, research on TITs also found many concerns on human rights. For instance, in 2016, US Department of State reported that 2,977 out of 3,918 workplaces were found with violations of working hours, safety standards, payment of overtime wages, and other regulations. The Verité organization (2018) found in a sample of Chinese TITs, that they faced many problems such as financial penalties, withholding of assets/wages, being threatened to end their contract from employer and even physical violence. The main cause of this problem was the high pre-departure fees collected from the trainees (Ishizuka, 2013).

The human rights and desertion problems cannot be overlooked. However, what this research would like to focus more on is the problem of the trainee

not being able to develop their skills and transfer technology, since it is the fundamental goal of the TITP. There are many reasons which leads to this problem. Firstly, Ratnayake and De Silva (2018) stated that TITs were generally given simple routine, mostly menial '3K' works (Kitanai - dirty, Kitsui - difficult and Kiken – dangerous), which makes the TITs unable to develop advanced skills. Secondly, Nguyen et al. (2013) claimed that many TITs fail to see the long-term benefits of grasping skills and knowledge to reach the professional level and focus only on making money. The lack of Japanese language skills is also an impediment. Moreover, the returnees claimed that they failed to use the knowledge they had learned in Japan after they returned to their home countries, due to the unavailability of similar jobs in corresponding fields (Nguyen *et al.*, 2018; Ratnayake and De Silva, 2018). To make technology and skill transfer to TITs successful, proper human capital development practices need to be applied to the TITP.

Many researchers tried to identify the factors which lead to the success of TIT's human capital development. Nguyen et al. (2018) tried to identify factors, which determine the success of the TITP by conducting surveys on 120 graduated TITs and 207 TITs who were in the pre-training period before going to Japan. The factors include 1) Self-awareness orientation and Japanese teaching, 2) Japanese language, 3) technical trainee plan, 4) preparation for Japanese language proficiency and national technical tests, and 5) working conditions. Unfortunately, they found that the five variables have only 25% influence on the success of the TITP. The factors related to working conditions were found not significant on the TITs' human capital development. Major factors that influence the success of TITP include preparation for the Japanese language proficiency test and other national technical tests.

To find whether TITP helps the sending countries' economies or not, we must see whether there is application of knowledge and skills learnt from Japanese firm into local industries and TITs become entrepreneurs in their home countries. Regarding this topic Saputra, Setiawan and Yandri (2008) studied about Indonesian TITs in Japanese SMEs and their potential to develop micro-small business in Indonesia by interviewing the trainees. They found that the important factors which influences the capability in developing a technology based business creation are saving accumulation

and business interest; reason to become an entrepreneur; industry where they are working at; division where they are working at; jobs characteristics; understanding level of productivity and quality of products; what kind of machine is being operated; and understanding level of machine operating system. About 70% of the Indonesian trainees working in Japanese SMEs acquire the necessary human capital in developing their business starts up. About 25-40% save enough money for their business creation.

## **Conclusions**

TITP helps the developing countries by creating jobs, developing workers' skill, providing better life after the program and finally to help overcome the MIT. The program also solves Japanese labor shortage problem. However, much research also highlights problems occurring in the program. To solve the problem concerning workers' HCD, the factors, which influence success of TITP need to be thoroughly investigated. Not only technical skills which are important, but language skills, entrepreneurship skills, and social values and work ethics are also essential. Due to the COVID-19 pandemic, many reports show a lot of foreigners losing their jobs in Japan. On the other hand, Japan is also facing lack of foreign labors due to the pandemic. According to Japan Today article on June 6, 2020, the number of people who had been expected to enter Japan this year as TITs fell far short of the expected 400,000 people. Lastly, with the International Olympic Committee's decisions to hold the Olympics in 2021 in Tokyo, with or without the pandemic, we assume that the demand for TITs would not be declined. Thus, the prospective youth from the developing SEACs should prepare themselves to take this opportunity at it most to develop their knowledge, skills, and attitudes through participating in the TITP in in Japan.

## References

- Arokiasamy, L. and Ismail, M. (2009). Human capital development and its impact on firm performance: Evidence from developmental economics', *Journal of International Social Research*, 2, 265–272.
- Booth, A. (1999). Initial conditions and miraculous growth: Why is South East Asia different from Taiwan and South Korea ? *World Development*, 27(2), 301–321.
- Ishizuka, F. (2013). *International labor migration in Vietnam and the impact of Receiving Countries' Policies*. 414. Chiba, Japan
- Nguyen, D. B. L. *et al.* (2018). Factors influencing the success of the Vietnamese technical trainees: an empirical study of the technical trainee training program By Japan International Technical Cooperation Organization (JITCO), *International Journal of Multidisciplinary Thought*, 7(2), 221–234.
- Ratnayake, P. and De Silva, S. (2018) *Human Capital Development in Asia with Japanese Technical Intern Training Programme – Opportunities and Challenges*. Saga University Economic Society.
- Saputra, W., Setiawan, B. and Yandri, E., 2008. *Indonesian Trainees In Japanese Smes, Capital Accumulation And Micro-Small Business Development In Indonesia: A Preliminary Study*. Munich Personal RePEc Archive Paper No.11491. University Library of Munich, Germany.

## **Cost Pricing of Private versus Government Biochemistry Laboratory Tests in Sri Lanka**

**K. H. I. S. Hettiarachchi<sup>1</sup>, S. S. K. B. M. Dorabawila<sup>1</sup>  
and D. Dissanayake<sup>2</sup>**

*<sup>1</sup>Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

*<sup>2</sup>Department of Pathology, University of Peradeniya, Sri Lanka*

**Keywords:** *Cost pricing; Biochemistry laboratory test; Total cost; Unit cost*

### **Introduction**

Previous studies have shown that laboratory services play a major role in the health care and that laboratory services account for about 10% of the total expenditure on the health care (Mouseli et. al., 2017). Presently, total health care expenditure is continually increasing around the world as well as Sri Lanka. From the ever increasing total expenditure about 10% of it will always be for laboratory services. In this context, it is a timely need to determine the true cost of government and private laboratory tests in Sri Lanka. Therefore, this study will primarily study the cost pricing of private versus government biochemistry laboratory tests in Sri Lanka.

According to the 2018, Annual Report of the Central Bank of Sri Lanka, the total expenditure on government health services is 13.7% of the total government consumption expenditure and the private sector expenditure on health services is 2.5% of the total private consumption expenditure. Furthermore, the National Health Report (2013) states that the 2013 total health expenditure of Sri Lanka was Rs.260 billion, which is 3.24% as a percentage of Gross Domestic Production and per capita health expenditure was Rs.12,636. According to the Sri Lanka Health Account, National Health Expenditure Report 1990-2016, the total health expenditure in 2016 was Rs. 398 billion and the per capita health expenditure was Rs.18,880 (Institute for health policy, 2018). This data reveals that over time health expenditure on healthcare in Sri Lanka has been steadily increasing.

As noted earlier, many foreign studies have identified that laboratory services play a major role in a health care and about 10% of the total health care expenditure is spent on laboratory services. Furthermore, 70% or more of medical decisions are based on the result of laboratory tests (Mouseli et. al., 2017). As a result, there is a trend of increasing demand for laboratory services in future. Especially, when a pandemic like Covid-19 necessitates continuous laboratory testing which are highly expensive. In the United State alone, over 7 billion laboratory tests are performed annually (Jackson, 2015).

When the price of a product is determined by balancing the demand and supply of the product, one of the ways that a producer sets the price by determining the price based on the cost of production. Therefore, it is important to identify the cost of laboratory tests. Barker and Huang (1983) identify the importance of the true cost of a laboratory service as “A better knowledge of the actual costs is required for the promotion of more rational utilization and better appreciation of health laboratory services by medical and public health workers”.

The above statement shows the importance by determining the true cost of laboratory tests. The cost of production of a good or service is calculated by adding the cost of inputs required to produce the goods or services. But from an economic point of view, costs should include opportunity costs such as time cost of patients, in addition to direct and indirect costs for inputs. Therefore, there is a timely need to determine the true cost of government and private laboratory tests in Sri Lanka.

## **Objectives**

The main objective of the study is to calculate the cost pricing of private versus government biochemistry laboratory tests in Sri Lanka.

## **Methodology**

The sample selected for this study were all Biochemistry laboratory tests<sup>8</sup> conducted in a government laboratory and a private laboratory during the six month period from January 1<sup>st</sup> to June 30<sup>th</sup>, 2019. The Peradeniya Teaching

---

<sup>8</sup> The biochemical profile is a series of blood tests used to evaluate the functional capacity of several critical organs and systems, such as the liver and kidneys.

Hospital laboratory was selected as the government laboratory and a private laboratory located in Kurunegala district was selected as the private laboratory based on convenient sampling method. 40 patients from each laboratory were randomly selected for the study sample to calculate patients time cost. Primary data was collected using an ethical committee approved questionnaire using face to face interview and telephone interview methods. Secondary data was collected from selected laboratory financial reports of the respective accounting departments, annual reports of the Central Bank of Sri Lanka, national health reports, articles and magazines.

Data analysis was performed under two stages. In the first stage, the total cost and per unit cost were calculated based on the Biochemistry laboratory tests related to the both laboratories. The total cost is defined as:

$$TC = LC + CGC + TMC + UC + TRC + BOC \quad (1)$$

Where, TC: total cost, LC: labor cost, CGC: consumable goods cost, TMC: time cost, UC: utility cost, TRC: transport cost, and BOC: building opportunity cost. Average cost (AC) or per unit cost (PUC) is give by:

$$PUC = \frac{TC}{\# \text{ of Laboratory Tests}} \quad (2)$$

In the second stage, a statistical hypothesis test is performed to examine the difference between cost pricing of government laboratory and private laboratory tests. The Wilcoxon Signed Rank test was used for this analysis and it was done by using SPSS software. The following hypotheses were tested.

$H_0$ : There is no difference between cost pricing of both laboratories

$H_1$ : There is a difference between cost pricing of both laboratories

## Results and discussion

According to the sample information, the number of biochemistry laboratory tests performed in the selected two laboratories over a period of six month is as follows:

Table 1: Number of Biochemistry Laboratory Tests Performed in Both Laboratories

Labo ratory	Month						TLT (6 Month)	ALT Per month	TLT Per Year
	January	February	March	April	May	June			
Govt.	49515	60925	67500	67704	69341	71269	386254	64376	772508
Private	9549	8859	9725	8192	10125	10123	56573	9429	113146

**Note:** TLT denotes the Total Laboratory Tests, ALT represent Average Laboratory Tests

As shown in table 1 above, the number of laboratory tests performed in private laboratory is about six times the number of laboratory tests performed in government hospital laboratory in each month.

Table 2: Per unit cost of Biochemistry Laboratory Tests in Two Laboratories in Terms of Cost Components

Cost Type	Cost Per Biochemistry Laboratory Test		Difference
	Government (Rs.)	Private (Rs.)	
LC	18.73	262.01	-243.28
CGC	42.49	217.03	-174.54
TMC	142.8	151.7	-8.9
UC	0.72	21.92	-21.2
TRC	0.20	20.19	-20.19
BOC	2.42	42.11	-42.11
AC Per Test	207.40	714.98	-507.58

Separate total cost of biochemistry laboratory tests for government and private laboratories are Rs. 160,218,159.00 and Rs. 80,897,127.00 per year. Average cost per test of biochemistry laboratory tests in government laboratory is around Rs. 207.40 and per unit cost of private laboratory is around Rs. 714.98. All average cost types for biochemistry laboratory tests in private laboratory are higher than government laboratory. It is about Three times compared to the Government hospital laboratory.

According to Wilcoxon Signed Rank Test results (see Table 3), at 5% level of significance, there exists enough evidence to conclude that there is a difference between the government and private cost.

Table 3: Results of the Wilcoxon Signed Rank Test

Difference	Description	Rank	Mean Rank	Sum of Rank	Tail Test	Probability
Private-Govt	Negative Rank	6 <sup>a</sup>	3.50	21.00	Two Tail	0.031
					One Tail	0.016
	Positive Rank	0 <sup>b</sup>	0.00	0.00		
	Ties	0 <sup>c</sup>				
	Total	6				

Note: 'a' private < government; 'b' private > government; 'c' private = government

## Conclusion

Based on the Wilcoxon Signed Rank Test results, this study can conclude that, there is a difference between costs pricing of the two laboratories. One of the major Government Teaching Hospital in the country incurs an annual total cost of Rs. 160,218,159.00 on biochemistry laboratory tests only compared to a total cost value of Rs. 80,897,127.00 at a leading private sector laboratory. And also, separate average cost per biochemistry laboratory tests for government and private laboratories are Rs. 207.40 and Rs. 714.98. Although the total cost value is in the government hospital high, the average cost per test in the private laboratory is three times higher than the government laboratory. This notable difference between the annual total cost is due to high patient turnover rates in the government hospital than the private sector in the country. Therefore, can conclude that, the cost of non-medical factors has exacerbated the unit cost of providing laboratory services in the private sector compared to the public sector. Enormous number of laboratory tests in the government hospitals decrease per unit cost of a test.

## **References**

- Broughton, P.M.G. and Hogan, T.C. (1981). A new approach to the costing of clinical laboratory tests. *Annals of Clinical Biochemistry*, 18(6), 330-342.
- Leijten, J.F., Van Der Geer, F., Scholten, M.N. and Goldschmidt, H.M. (1984). The costing of tests in a laboratory for clinical chemistry and haematology. *Annals of Clinical Biochemistry*, 21(2), 109-115.
- Mouseli, A., Barouni, M., Amiresmaili, M., Samiee, S.M. and Vali, L. (2017). Cost-price estimation of clinical laboratory services based on activity-based costing: A case study from a developing country. *Electronic Physician*, 9(4), 4077.
- Rajabi, A. and Dabiri, A. (2012). Applying activity based costing (ABC) method to calculate cost price in hospital and remedy services. *Iranian Journal of Public Health*, 41(4), p.100.
- Tantanate, C. and Charuruks, N., (2017). Cost Analysis in Clinical Laboratory in Thailand. *Dalam: Siriraj Med Journal*, 59.

**A Study of Emergency Learning-Teaching Methods (ELTM)  
Implemented by the Stakeholders of Kandy Educational Zone (KEZ)  
during COVID-19 Pandemic**

**R. Gangahagedara<sup>1</sup>, Muditha Karunarathna<sup>2</sup>  
and Wasantha Athukorala<sup>3</sup>**

<sup>1</sup> *PGIHS University of Peradiniya, Sri Lanka*

<sup>2,3</sup> *Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

***Keywords:*** *COVID-19; ELTM; Stakeholders; Education; Kandy*

### **Introduction**

The COVID-19 pandemic is recognized as the world's largest education crisis ever experienced in the recent past. According to UNESCO, during the first wave of the COVID-19 pandemic, over 190 countries had implemented nationwide closures, affecting more than 90% of the world's student population (Abdulmir and Hafidh, 2020). Interruption in continuous education leads to many repercussions that are beyond mere losses in learning, including increased drop-out rates, loss of nutrition, and reductions in future earnings – the effects of which are disproportionately experienced by the more vulnerable (Liguori and Winkler, 2020).

In response to the first wave of COVID-19 pandemic on 12<sup>th</sup> March 2020, all educational institutions including schools and universities were closed down island-wide in Sri Lanka with an overnight switch to the emergency education mode via distance teaching and learning process. Following the national guidelines, Kandy Educational Zone (KEZ) closed down all schools and other educational centers and turned overnight to emergency learning teaching methods as a measure to respond to the COVID-19 pandemic. KEZ comprises two Divisional Secretariat divisions, namely Gangawatakorala and Pathahewaheta. Gangawatakorala division consists of 60 schools with a student population of 67,661 (excluding private and international schools). At KEZ, the emergency learning-teaching methods mainly occurred via online channels, with teachers sending large volumes of material as PDF documents to students via WhatsApp and Viber. Few schools initiated standard online education processes using MS-Teams, Google Classroom

and Zoom etc. In addition, some teachers conducted Teaching-Learning process through traditional distance Teaching-Learning methods according to the guidelines of the health authorities.

Traditional classroom settings at the school, despite many disparities, attempted to bring all the students into a common equitable platform irrespective of their different cultural or socio-economic backgrounds by ensuring the co-values of free Education. According to a survey conducted in 2018 by DCS, only 52% of Sri Lankan households with school-aged children owned a smartphone or computer (laptops 52%, desktop 10%, tabs 3%) which are essential for online learning. Only 40% had an internet connection, primarily via mobile phones (mobile phones and dongles 37%, Fibre/ ADSL/ Wireless 4%). This survey report projected the reality of the availability of computer-related appliances at the household-level in Sri Lanka. Accordingly, only less than half of the households in Sri Lanka have the possibility of engaging in online distance education. (This paper consists of the preliminary findings; as such the full report is yet to be finalized).

## **Objective**

This paper attempts to explore the constraints faced by stakeholders in the Kandy Educational Zone while implementing Emergency Learning - Teaching Methods (ELTM) during COVID-19 pandemic lockdown. Special attention is given to socio-economic disparities within the framework of ELTM.

## **Methodology**

The study uses descriptive statistics method for analyzing data. Primary data for the analysis was collected covering students, teachers and parents in KEZ. A list of all the government schools was taken from the Provincial Education Department. We received a list of 55 schools and of them 19 schools were selected at random. In order to select the sample from each school, approximately 10 to 25 sample of each category is taken. We only consider secondary level education in this study. Therefore, Type 3 Schools are excluded from the selection process due to the unavailability of secondary education. Accordingly, the final sample size was 797 and the survey was carried out covering all selected schools between August and

September, 2020. A survey questionnaire was distributed among the participants (teachers, parents and students) at the schools. Only 16 schools responded positively. Approximately 797 survey questionnaires were distributed among the participants and 351 completed questionnaires were returned which includes teachers (116), parents (102) and students (133). When we analyze the data, various descriptive data analytical techniques were used. In addition to that, Probit regression model was used to identify the factors that determine the ELTM.

## **Results and Discussion**

This study focused on the household average monthly income, expenditure, educational level, distance travelled to the school or workplace, ICT literacy, availability of internet and computer appliances at the household level of teachers, students and parents. Table 1 displays the demographic data collected from the survey. It shows a similar picture in the teacher's category across school types, but at the parents level it shows a gap between 1AB and 1C groups of schools in overall income and education. The students category displayed a gap concerning the distance travelled to the schools in daily routine with average 1AB students travelling 37 Km per day while type 2 students travel only 2.5 Km per day.

Table 2 shows the data of Likert scale question asked about the usage of ICT in the teaching-learning process at the school. A response placed at 'Never' shows a low value in parent's income and education level (1AB only up to A/L and in type 2 up to primary level) whereas the response 'All the times' shows comparatively high value. Table 3 shows the data of the ICT literacy among teachers at the three types of schools. Accordingly the 1AB group has the highest percentage of ICT literacy and Type 2 group has the lowest percentage of ICT literacy whereas the 1C group shows the highest percentage of advanced literacy-rate.

Table 4, 5 and 6 shows the data on the availability of ICT appliances at the domestic level, Laptop or desktop computer at home is common in the 1AB schools group and smartphone at homes is common among the type 2 schools. Table 7 shows the data on the usage of social media among the teachers, students and parents. It shows comparatively lower percentage among the type 2 category. Tables 8 and 9 shows the data of the

commencement of online Teaching and engagement of online Teaching during the COVID-19 pandemic lockdown period, displaying comparatively less progress in the Type 2 group compared to 1AB group but it shows progress among parents and students engagement in 1C and 1AB groups of schools. Finally, Table 10 shows the attitudinal response to the usage of ICT in the teaching-learning process. The Technology Acceptance Model (TAM), developed by Davis (1989) was used to explain the determinants of computer acceptance and user behavior across a broad range of computing technologies and populations.

According to the above ICT acceptance model, over 80% of the responses of teachers, students and parents attitudinally accepted the usefulness of ICT in the Teaching-Learning process. Besides, Table 9 shows over 60% of engagement in online education, even though 1AB schools type shows greater response of behavioral intention to ICT usage compared to Type 2. This projects a positive technology acceptance according to the Davis TAM Model, among the teachers, parents and students. Most of the variables in the Probit regression model is not significant. Therefore, these results are not included into the analysis.

## **Conclusion**

This study concludes that there are visible disparities among privilege and non-privileged school in the urban settings of KEZ. In this case, 1AB categories of schools are identified as privileged and type 2 categories of schools are identified as non-privileged schools. The teachers, principals and all administrators are appointed to the respective schools and regulated by the KEZ. According to the survey results, a positive gap is noticeable among the privileged and non-privileged schools of KEZ when implementing ELTM.

According to the Davis et al. (1989) technology acceptance model, a positive technology acceptance is evident among the stakeholders of the KEZ but a gap of different variables is also visible among privileged and non-privileged schools categories which could be due to many reasons especially the affordability of appliances and the cost.

There are no positive disparities among teachers' income or qualification level at these schools. An examination of the net income level of the parents

of these schools indicates that there is a positive gap among 1AB and type 2 category schools. It also reveals that the students coming from under privileged settings are polarized to the type 2 category of schools of the KEZ. This could be the possible reason for the gap created when implementing ELTM among privileged and non-privileged schools settings at KEZ.

**References**

Abdulmir, A. S. and Hafidh, R. R. (2020). The possible immunological pathways for the variable immunopathogenesis of COVID -19 infections among healthy adults, elderly and children. *Electronic Journal of General Medicine*, 17(4).

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly*, 13(3), 319–340.

Department of Census and Statistic of Sri Lanka. (2018). Household Income and Expenditure Survey 2016, DCS, Colombo

Liguori, E. and Winkler C. (2020). From offline to online: challenges and opportunities for entrepreneurship education following the COVID-19 pandemic. Sage, Los Angele.

**Appendices**

Table 1: General Information about the Respondents

	Teachers			Parents			Students		
	1AB	1C	T 2	1AB	1C	T 2	1AB	1C	T2
Age	45.5	45.4	50.2	46.5	46.5	47.5	16.7	15.4	15.1
Female (%)	88.4	86.8	96.0	53.8	57.1	41.6	62.0	86.9	40.7
Income *	48701	49943	43975	52122	42563	14115	N/A	N/A	N/A
Income **	218909	132904	101728	89399	67481	36600	N/A	N/A	N/A
N	115			83			112		

Note: Average educational qualification of teachers is in between A/L and graduate level. \* represents the average income level (Rs.) of respondents while \*\* represents the average income of the family.

Table 2: Usage of ICT Facility for Teaching -Learning process at the School of KEZ

	Teachers (%)			Parents (%)		
Never (%)	19.61			9.21		
Rarely (%)	29.41			13.16		
Sometimes(%)	32.35			52.63		
Often(%)	15.69			19.74		
All the times (%)	2.94			5.26		
Total Responses	102			76		
Family income	Below 50000	51,000-100,000	Above 100,000	Below 50000	51,000-100,000	Above 100,000
Never	66.67	40.91	13.33	5.88	15.00	0.00
Rarely	0.00	13.64	33.33	11.76	10.00	0.00
Sometimes	33.33	31.82	23.33	52.94	55.00	55.56
Often	0.00	9.09	23.33	23.53	20.00	22.22
All the times	0.00	4.55	6.67	5.88	0.00	22.22
Total Responses	3	22	30	17	20	9
	Teachers (%)			Parents (%)		
Education	Below Graduates	Graduates	Above Graduates	Below AL	AL	Graduates
Never	8.11	31.58	22.22	31.43	8.00	11.11
Rarely	35.14	23.68	16.67	5.71	20.00	16.67
Sometimes	35.14	34.21	33.33	45.71	48.00	44.44
Often	16.22	10.53	22.22	14.29	16.00	22.22
All the times	5.41	0.00	5.56	2.86	8.00	5.56
Total responses	37	38	18	35	25	18

Table 3: ICT knowledge of teachers (%)

	1AB	1C	TYPE 2
Introductory level courses	43.48	40.48	47.37
Elementary level courses	18.84	19.05	26.32
Advance level courses	2.90	14.29	5.26
Special training for the usage of IT tools interactive boards laptops.	14.49	14.29	10.53
ICT for pedological purposes	20.29	11.90	10.53

Table 4: Desktop/Laptop Computer Availability at Home (%)				Table 5: WIFI /INTERNET Availability at Home (%)			
	1AB	1C	TYPE 2		1AB	1C	TYPE 2
Parents	82.86	14.29	2.86	Parents	66.67	21.21	12.12
Students	85.07	11.94	2.99	Students	77.19	12.28	10.53
Teachers	53.42	28.77	17.81	Teachers	50.70	33.80	15.49
Table 6: Smart Phone Availability at Home (%)				Table 7: Usage of social media (%)			
	1AB	1C	TYPE 2		1AB	1C	TYPE 2
Parents	59.21	22.37	18.42	Parents	68.33	25.00	6.67
Students	75.51	16.33	8.16	Students	76.60	14.89	8.51
Teachers	47.66	32.71	19.63	Teachers	52.13	32.98	14.89
Table 8: Commencement of online programme (%)				Table 9: Engagement of the Participants in Online Teaching (%)			
	1AB	1C	TYPE 2		1AB	1C	TYPE 2
Parents	60.76	17.72	21.52	Parents	63.77	20.29	15.94
Students	65.29	17.36	17.36	Students	64.96	17.09	17.95
Teachers	52.53	33.33	14.14	Teachers	58.62	27.59	13.79

Table 10 Technology Acceptance (TAM) (%)					
‘According to my knowledge ICT is helpful to Teaching to learning process’				‘According to my knowledge ICT is not helpful to Teaching to learning process’	
Response	Students	Parents	Teachers	Students	Teachers
Strongly Agree	23.77	26.51	25.23	1.80	6.59
Agree	59.84	63.86	63.96	9.91	19.78
Uncertain	12.30	6.02	6.31	21.62	4.40
Disagree	3.28	1.20	3.60	49.55	47.25
Strongly Disagree	0.82	2.41	0.90	17.12	21.98
Total responses	122	83.	111	111	91

## **Effects of Non-Tariff Measures on Fruit Exports from Afghanistan: A Gravity Analysis**

**Sahibzada, S\* and Weerahewa, J<sup>1</sup>**

*\*Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka*

*<sup>1</sup> Department of Agricultural Economics and Business Management, Faculty of Agriculture, University of Peradeniya, Sri Lanka*

**Keywords:** *Afghanistan; Export; Fruit; Gravity model; Non-tariff measures*

### **Introduction**

Agriculture sector plays an important portion in the Afghan economy. Agricultural exports contributed to 78.24% of the total exports and 21.3% of the Gross Domestic Product (GDP) in Afghanistan in 2018. Fruits are the major exportable products among agriculture products in Afghanistan and fruit sector has been identified as one of the economic drivers in the country. Grapes, nuts, figs, and dry fruits contribute to 87% of the total earning of fruit export in the year 2018 and they contributed 57.8% of agriculture exports in 2018. The values of exports of fresh fruits have increased more than eightfold over past decade. The USA was the leading global importer of the fruits followed by Germany, Netherlands, and France, while Afghan fruits were mainly exported to India followed by Pakistan, China, Turkey, and United Arab Emirates in 2018.

Even though a reduction in average applied tariff rates for agriculture products exported from Afghanistan has been noted, the Non-Tariff Measures (NTMs)<sup>9</sup> facing Afghanistan have been increasing over time. UNESCAP (2015) indicated that Afghan agricultural exports have been struggling to meet Sanitary and Phyto-Sanitary (SPS) standards abroad and suffered delays at the border owing to inefficient or inadequate inspection regimes and facilities. Empirical evidence of previous studies with respect to the effects of NTMs however are mixed. More recently, Timini and Conesa

---

<sup>9</sup> The NTMs are defined as policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices, or both. However, NTMs are important for health and environmental protection, such as sanitary and phyto-sanitary measures and technical barriers to trade.

(2019) showed positive effect of NTMs on Chinese exports while Sandaruwan et al (2020) showed negative effects of NTMs on seafood exports from Sri Lanka. An evaluation of effects of NTMs on export of fruits from Afghanistan hence is timely.

## Objectives

The objective of this study is to determine the effect of NTMs on the export of fruits from Afghanistan.

## Methodology

The gravity equation explains that the gravitational force between two countries is proportional to the product of the masses of the two countries and inversely proportional to the distance between them. The gravity model proposed by the Tinbergen (1962) was initially presented as an intuitive way of understanding international bilateral trade and over time it was extended to accommodate various other factors. The version of gravity equation used in this study is given below:

$$\ln EXP_{ijt}^p = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln DIST_{ij} + \beta_4 COML_{ij} + \beta_5 COMB_{ij} + \beta_6 SAARC_{ij} + \beta_7 \ln(NTMTOT_{ijt}) + \epsilon_{it} \quad (1)$$

Where,  $EXP_{ijt}^p$  is the export flow of the product  $p$  from  $i$  (Afghanistan) to partner country  $j$  at time  $t$ .  $GDP_{it}$  and  $GDP_{jt}$  are the Gross Domestic Product at time  $t$  of Afghanistan and the  $j^{th}$  importing country respectively.  $GDP$  of exporting and importing countries is expected to be positively correlated with the dependent variable. The distance between Afghanistan and the  $j^{th}$  trade partner is given by  $DIST_{ij}$ , which is hypothesized to be negatively correlated with the fruit exports from Afghanistan.  $COML_{ij}$  is for partners sharing a common language,  $COMB_{ij}$  is for partners sharing a common border, is for partners in the South Asian Associate for Regional Cooperation (SAARC) and  $NTMTOT_{ijt}$  refers to the NTMs. The latter three are dummy variables in the gravity equation and positive effects of such on the export of fruits from Afghanistan are expected. In the first set of specifications total number of non-tariff measures, imposed by  $j^{th}$  country on exports at time  $t$  was included and in the second set, it was treated as a dummy variable.

Bilateral exports of fruits in HS code category 08 that include fresh and processed fruits were used as the dependent variables in alternative specifications. The data set comprised of exports of 52 products from Afghanistan into 40 export destinations in 2008 and 2018. The total number of observations was 581. Export data were extracted from the United Nations Commodity Trade Statistics Database (UN Comtrade). The data on GDP were gathered from the World Bank. The data regarding the geographical distance between the capital cities of trading countries, common language, and common border were extracted from the Institute for Research on the International Economy (CEPII). The data on NTMs were extracted from the Trade Analysis and Information System (TRAINS) database of the United Nations Conference on Trade and Development (UNCTAD) where the NTMs are classified into 16 chapters. This classification comprises technical measures, such as Technical Barriers to Trade (TBT), Sanitary and Phyto-Sanitary (SPS) measures, and Pre-Shipment Inspection (PSI) measures. The non- technical measures consisted of Quantity Control (QC), Price Control (PC), and Other (OTH) measures. Only import-related NTMs are considered in the estimation of the above model.

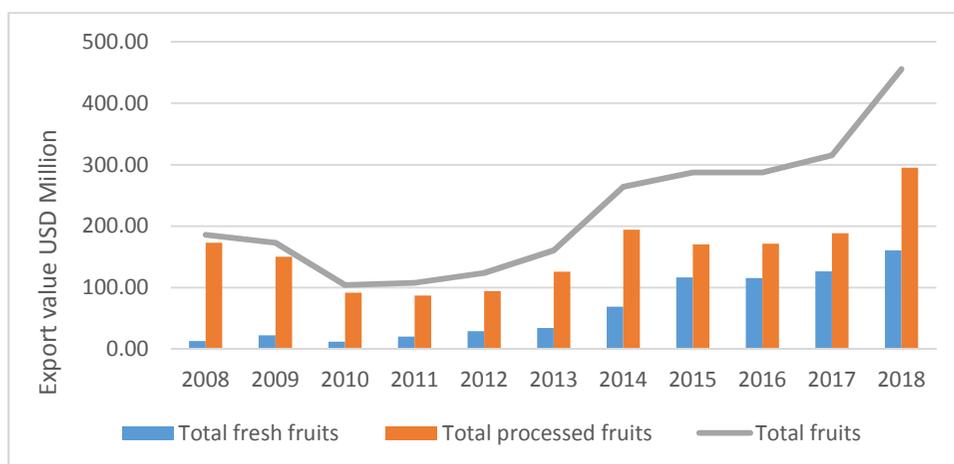


Figure 1: Value of Fruits Exports from Afghanistan during 2008-2018.

Above Figure depict that a rapid growth of the exports of fruits from Afghanistan can be observed after 2010. The values exports of processed fruits have consistently been higher than that of fresh fruits though fresh fruits exports have increased more than eightfold during 2008 – 2018.

An examination of NTMs shows an increase in the number of NTMs imposed by each export destination. The most commonly recorded NTMs against Afghan fruits are Technical Barriers to Trade (TBT) followed by the SPS measures. TBTs represent 37% and SPSs represent 22% of the total NTMs respectively in 2018. More NTMs have been imposed on processed fruits compared to those of fresh fruits. The descriptive statistics of the variables used in the gravity estimation presented in table 1.

Table 1: Descriptive Statistics of the Variables used in the Estimation

Variables	Units	Mean	Std. Error	Minimum	Maximum
Export value	USD Million	1.36	0.26	0	104.09
Exporter's GDP	USD Billion	66.02	0.32	54.71	71.27
Importer's GDP	USD Billion	20,767	1,734	7.38	194,688
Distance	KM	3,859	143.95	374.65	13,762
Common language	Dummy	0.05	0.01	0	1
Common border	Dummy	0.23	0.02	0	1
Member of SAARC	Dummy	0.24	0.02	0	1
Total NTMs	Number	331.3	39.13	0	5,001
TBT	Number	272.54	58.24	0	3,954
SPS	Number	158.02	28.42	0	1,466
PSI	Number	8.15	1.17	0	69
PC	Number	10.53	1.24	0	69
QC	Number	30.56	4.80	0	284
OTH	Number	3.16	0.72	0	57

Note: TBT- Technical Barriers to Trade, SPS- Sanitary and Phyto-Sanitary, PSI- Pre-Shipment Inspection, PC- Price Control, QC- Quantity Control and OTH- Other

## Results and Discussion

Alternative estimation techniques namely Ordinary Least Square (OLS) regression, Poisson pseudo maximum likelihood (PPML) and Poisson model with Fixed effect (PFE) were employed to ascertain the effect of dependent variable on export value of fruits. The results of the estimation are presented in table 2. A log-log formulations have been used and zero export values were replaced with very small values.

Table 2: Results of the Gravity Model

Variables	Units	Log of total NTMs			NTMs as Dummy		
		OLS	PFE	PPML	OLS	PFE	PPML
Ln-Exporter GDP	US\$ Billion	0.72 (2.03)	0.72 (1.5)	0.33 (1.2)	1.2 (2.1)	1.24 (1.7)	0.53 (1.2)
Ln-Importer GDP	US\$ Billion	0.09 (0.05)	0.085 (0.06)	0.14*** (0.05)	0.115 (0.06)	0.115 (0.07)	0.177*** (0.04)
Ln-Distance	Km	-0.44*** (0.21)	-0.44 (0.33)	-0.66*** (0.19)	-0.34 (0.19)	-0.34 (0.24)	-0.52*** (0.22)
NTMs	Number/ dummy	0.28*** (0.09)	0.28** (0.13)	0.25*** (0.06)	0.63** (0.32)	0.64 (0.57)	0.76** (0.38)
Common Language	Dummy	0.29 (0.08)	0.29 (0.32)	0.083 (0.45)	0.3 (0.78)	0.31 (0.37)	0.22 (0.45)
Common Border	Dummy	0.007** (1.1)	0.007*** (0.36)	0.43 (0.47)	-0.13 (1.12)	-0.14 (0.42)	0.094 (0.53)
SAARC	Dummy	3.48*** (0.91)	3.49*** (0.61)	1.44*** (0.42)	3.83*** (0.98)	3.84*** (0.54)	1.77*** (0.45)

Note: Robust standard errors are in parentheses. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1% levels, respectively.

The results show that the GDP of the exporter has a positive and significant effect on bilateral export of fruit exports of Afghanistan. The coefficient of geographical distance was negative and statistically significant indicating that Afghanistan has been exporting more to neighboring countries. The coefficient of common border was positive and statistically significant. Since most of fresh fruits do not have a long shelf life, export to the neighbors can guarantee a safe reach to the partner county. The coefficient of SAARC is highly significant and positive. Common language do not have a significant effect on bilateral trade of fruits. The coefficients of NTMs (log and dummy) on fruits exports were positive, small and statistically significant in all models reported in Table 2 except for one. Similar results were obtained when sub-samples were estimated, i.e., the effects of NTMs on exports of fresh fruits, exports of processed fruits, exports of fruits in 2008, and exports of fruits in 2018 were also positive and small and in most cases statistically significant.

## Conclusions

This study was conducted to determine the effect of NTMs on the export of fruits from Afghanistan during 2008-2018 using a gravity analysis. It was revealed that technical barriers to trade and sanitary and phyto-sanitary were the major NTMs faced by the exports of fruit products from Afghanistan. Processed fruits, which constitute a relatively higher portion in the Afghan fruit export basket, faced higher NTMs compared to fresh fruits. The results reveal a small, positive and statistically significant effect of NTMs on the exports of fruits from Afghanistan suggesting that Afghanistan was successful in penetrating to exports markets that are regulated through NTMs. Further studies that estimate different specifications of the gravity model to examine the effect of each NTMs component on export flows are suggested.

## References

- Sandaruwan, K.P.G.L., Weerasooriya, S.A. and Weerahewa, J. (2020). Effects of non-tariff measures on seafood exports from Sri Lanka: A gravity approach. *Tropical Agricultural Research*, 31(3), 11-24.
- Timini, J., and Conesa, M. (2019). Chinese exports and non-tariff measures: Testing for heterogeneous effects at the product level. *Journal of Economic Integration*, 34(2), 327-345.
- Tinbergen, J. (1962). *Shaping the world economy: Suggestions for an international economic policy*. New York: The Twentieth Century Fund.
- United Nation, Economic and Social Commissions for Asia and the Pacific. (2015). *Reforms, P. P. Strengthening Trade and Economic Ties between Afghanistan and Central Asia*.
- UNCTAD (2015). *International classification of non-tariff measures*. United Nations Conference on Trade and Development. Geneva, Switzerland.

## **Cost Benefit Analysis of Solar Power Electricity Consumption in Katugasthota Municipal Area**

**M. M. D. V. Bandara and Muditha Karunarathna**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

**Keywords:** *Solar power electricity; Cost benefit analysis; Net present value; Internal rate of return*

### **Introduction**

Solar powered systems are becoming more prevalent in many countries and it is one of the most important renewable energy sources that has been gaining increased attention in recent years (Khaligh, 2010). Solar energy is used worldwide and is increasingly popular for generating electricity or heating and desalinating water. Most countries have decided to aid consumers choosing to invest in solar in the hopes of supporting the “green” or sustainability movement. Solar energy is clean and free of emissions, which is beneficial for the environment, as it does not produce pollutants or by-products harmful to nature (Robert et al., 2010).

Sri Lanka should secure its energy future by focusing on the development and adoption of indigenous, renewable sources of energy to meet this growing demand and reduce the economic burden of imports. Accordingly, this study investigates the effectiveness of solar power electricity investment through a cost-benefit analysis and the calculation of two measurements of net present values (NPV) and internal rate of return (IRR) using data gathered from 100 households in the Katugasthota municipal area.

### **Objective**

The main objective of this study is to investigate the effectiveness of solar power electricity investment through a cost-benefit analysis.

### **Methodology**

In order to investigate the effectiveness of solar power electricity investment through a cost-benefit analysis we first obtained the electricity bill from

households before using solar power electricity. There are 11600 households in Katugasthota Municipal area and only 816 households are using solar panel to generate electricity for their consumption. Among them only 312 households are fully consuming solar power electricity. For this study we selected only 100 households among these 312 households which are only using solar power electricity.

Benefit and cost components were quantified from the economic perspectives. An economic sensitivity analysis was then followed with two measurements of net present values (NPV) and internal rate of return (IRR). The NPV was determined using the annual cash flows of the solar panels. The discount rates were determined by the most current rates in Sri Lanka. The average annual inflation rate was determined using the CPI index and estimates of what it will be for the next 20 years. The NPV was calculated taking into consideration inflation and the discount rates. The analysis was done for a certain time period that was based on the anticipated lifespan of the solar panels. Solar panels have at least a 20 year warranty. For the total cost it included instalment cost, operation cost and repair cost for 20 years. The NPV and IRR were calculated using the cumulative annual cash flows. If the NPV is positive, it is regarded as being a good investment. Another way to prove that the investment is a positive choice is if the IRR is at least greater than the discount rate. Lastly, the cost benefit analysis is done by adjusting costs and benefits. If benefits outweigh the costs, it is a worthwhile investment.

## **Results and Discussion**

To begin the analysis, the monthly bills of the 100 households were totalled for getting the total cost of the sample. The monthly amounts were summed to determine the amount spent on electricity for one year as being Rs 5,857,296.00 (Table 1). The households' electricity bills not only included the amount of money spent on the energy, but also the amount of electricity used in kilowatt-hours (kWh). Each month was recorded to come up with a total yearly electricity usage of 199,032 kWh (Table 1).

Table 1: Electricity Consumption and Cost before using Solar Power

	Total kWh	Total cost (Rs)
Monthly	16,586	488,108
Annual	199,032	5,857,296

The average solar power system capacity is calculated using the sample data. According to the analysis, the average solar power system capacity was 0.98 kWh and the average production of solar power was 144.4 kWh per household per month. The results show that 1.0kWh system capacity is enough for one household and this implies that 100kWh solar power system capacity is needed for 100 households in the study area. The cost of 1kWh system capacity is Rs 250,000.00 and then the total cost for the 100kWh system capacity is approximately Rs 25,000,000.00 for the study area.

In order to perform the cost-benefit calculations, this study used financial information from the sample. The NPV and IRR were calculated using the cumulative cash flows for the 20 years. The inflation rate was determined using the electricity supply from the Ceylon Electricity Board Statistical Digest 2015. Referring to the Sri Lanka electricity price changes, household energy price inflation was 0.7%. This percentage value was used as the inflation rate in the analysis. Once the future avoided electricity costs are determined, taking into account the inflation rate, the annual cash flow is calculated for 20 years. The NPV of the annual cash flows is calculated each year by using 5%, 8% and 10% discount rates. Finally, the cumulative NPV is calculated.

Table 2: Calculated NPV and IRR at Three Discount Rates.

Discount Rate	NPV	IRR	Payback time period
5%	Rs. 55 097 919.62	23.921	5 years
8%	Rs. 35 868 094.38	22.341	6 years
10%	Rs. 27 583 793.80	21.978	6 years

Table 2 shows the calculated NPV and IRR values at 5%, 8% and 10% discount rates. Results show that highest net present value is Rs. 55 097 919.62 which is at 5% discount rate. This is followed by net present values of Rs. 35 868 094.38 and Rs. 27 583 793.80 at 8% and 10% discount rates respectively over a warranty period of 20 years. When the discount rate

increase from 5% to 8%, the NPV decreases by 65%; a further increase from 8% to 10%, causes the NPV to decrease again by 75%. The IRR values are 23.92%, 22.34% and 21.97% for these three discount rates respectively. IRR values are higher than all discount rates and they are above zero. If the discount rate increases, the IRR value decreases slightly. Accordingly, the highest NPV is at the 5% discount rate and the reason for that is, the low discount rate means that the NPV is affected more by the cash flows that occur further in the future.

Payback time period was calculated by using the cumulative net present value. When cumulative net present value began to get positive value that means the investment is beginning to generate positive cash flows and is no longer a burden to the households. At 5% discount rate the cumulative NPV began to show positive cash flows after 5 years. However, at the 8% and 10% discount rates the cumulative NPV began to show positive cash flows after 6 years. Accordingly, at 5% discount rate NPV value is higher and the payback time is less than other two discount rates.

The results of the cost-benefit analysis turned out to be positive over the time period of 20 years. The initial cost of installing the solar panels was only a small cost and eventually beneficial to the study area households. The NPV being a great deal larger than zero and the IRR being much larger than the discount rates indicate that the investment is financially favourable. Since the cost-benefit analysis proved financially favourable, installing solar panels would be a favourable investment for generating electricity in this area.

## **Conclusion**

The purpose of this study was to determine whether applying solar energy system to the Katugasthota area households was going to prove cost-beneficial or detrimental. NPV and IRR are major indicators of whether or not an investment is beneficial. The NPV was calculated using the annual cash flows which took into account avoided electricity costs, the system cost, and any incentives. Unfortunately, in Sri Lanka the only incentive was to freely install the solar power and no transportation cost for the buyers. The results show the positive values of NPV and the internal rate of returns are greater than the discount rates. After 6 years, it began to make positive cash flows at the 8% and 10% discount rates while at 5% discount rate it takes

only 5 years. That means there is no burden to households of investing solar panel after 6 or 5 years at different discount rates. This analysis will help investors and policy makers to have a clearer idea about investing in solar panels. As homeowners are the investors, they can make a decision on whether it is effective to generate electricity from solar panels. This study shows that generating electricity by using solar panels is beneficial.

## **References**

- ADB (2017). 100% electricity generation through renewable energy by 2050. Assessment of Sri Lanka's Power Sector, Published by ADB and UNDP
- Khaligh, A., and Omer C. Onar. (2010). Energy harvesting: Solar, Wind, and Ocean energy conversion systems. CRC Press.
- Prest, A. R. and R. Turvey. (1965). Cost-benefit analysis: A survey. *The Economic Journal*. 75(300): 683-735.
- Robert, F., M. Ghassemi, and A. Cota. (2010). Solar energy: Renewable energy and the environment, CRC Press.

## **The impact of COVID-19 on Tourism sector MSEs and its Resilience: A Case Study of Arugam Bay- Sri Lanka.<sup>10</sup>**

**J. Sujeeva**

*PhD student, University of Sri Jayewardenepura, Sri Lanka*

*Keywords: Covid-19; Tourism sector; MSEs, Resilience; Arugam Bay*

### **Introduction**

Micro and Small-scale enterprises (MSEs) play a significant role in promoting growth and development of tourism in Sri Lanka. As per the Department of Census and Statistics (DCS) Economic Census 2013/14, the MSEs<sup>11</sup> account for over 95 percent of the total enterprises in accommodation and food services sub-sector. Its contribution to employment and value added in the same sector is around 70 and 50 percent respectively. Moreover, tourism sector is the 3<sup>rd</sup> highest foreign exchange earner and accounts for about 4-5 percent of GDP. Undoubtedly, the MSEs operating in tourism value chain is a major in terms of value added, foreign exchange earnings and job creation. There is a good body of knowledge on the impact of COVID-19 on Sri Lanka at national and sub-sector level based on secondary data.<sup>12</sup> However, there is hardly any work at sub-sector level based on firm level data on MSEs and this study is an attempt to fill this literature gap in tourism sector MSEs.

Arugam Bay (AB) is well-known as one of world's best ten surf points in 2010 (Lonely Planet, 2009) located in the east coast of the Sri Lanka and is made up of several right-hand points for surfing that only work from May to November. It attracts guests from various parts of the world and provides livelihood for fishing communities characterized by high unemployment, underemployment, poverty and inequity. The impact of COVID-19 on

---

<sup>10</sup> The advice and guidance provided by Prof. Sunil Chandrasiri throughout the study is gratefully acknowledged. Helpful comments and suggestions by two anonymous referees are also thankfully acknowledged.

<sup>11</sup> Micro enterprises with less than 10 employees and Small-scale enterprises with 10-50 employees. Source: The Ministry of Industry and Commerce (MIC), National Policy Framework for Small Medium Enterprise (SME) Development (undated)

<sup>12</sup> For a review of existing body of work on COVID-19 see Chandrasiri et al. (2020) and references cited therein.

tourism and hospitality is unprecedented. It has led to devastating implications on tourism sector MSEs operating in economically backward areas such as AB. There is a debate on MSE's ability to face the challenges of COVID-19. Can they survive through the crisis or will they go out of business? What is the role of the government in helping MSEs during the post-COVID-19 economic recovery? The present study is designed to engage in this debate concentrating on two main research issues: (a) what is the immediate economic impact of COVID-19 on tourism sector MSEs? (b) what is the recovery capacity of MSEs in tourism during the post-lockdown period?

### **Objectives**

In view of the above two research problems, the main objectives of the study are two-fold: a) to assess the economic impact of COVID-19 on MSEs operating in the tourism sector and b) to examine MSEs' response to business recovery during the post-lockdown period.

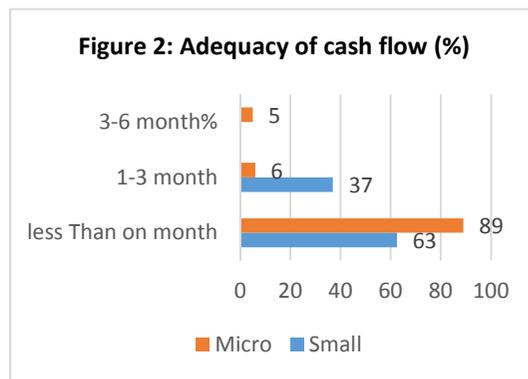
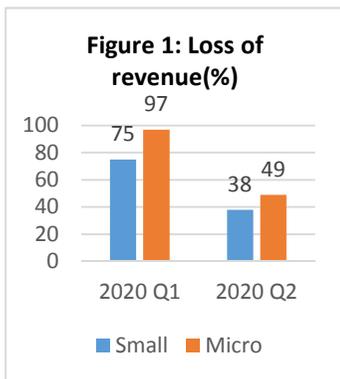
### **Methodology**

The MSEs in AB are represented by 278 enterprises with a heavy concentration of micro-level firms (83%). In terms of business sectors, it covers four main business segments: 1. Accommodation, 2. Food and beverages, 3. Entertainment and 4. Surfing. The analysis is based on a data set generated through a field survey carried out from 10th to 15th August 2020, using a sample of business establishments (n=45) representing MSEs in the tourism value chain. It is a stratified purposive sample with full coverage of the surf tourism sector (n=10) and partial coverage of the other three segments of the tourism value chain. This sampling procedure rendered in the selection of the most representative and suitable respondents for the survey during adversities. A Structured questionnaire was administered among sample firms using face to face interview technique with a special focus on employment, links with the value chain, and impact of the pandemic, coping strategies, and business owners' perceptions on institutional efficiency in the delivery of relief measures. The data were analyzed through descriptive statistics using SPSS. In addition, a review of secondary data was also carried out with a view to elicit information on COVID-19 impact on the national economy.

## Results and Discussion

The period May to November is the peak season for MSEs in Arugam Bay. Over 80 percent of tourism market in AB is dominated by foreign guests and in March and April, with the lockdown restrictions, 96% of foreign and 36% of local bookings were cancelled.<sup>13</sup> Booking cancellations by foreign guests among micro and small-scale enterprises were 71 and 86 percent respectively during the 1<sup>st</sup> quarter of 2020.

Similarly, in the 1<sup>st</sup> quarter the loss of business operations was 100% for about 95 and 75 percent of micro and small-scale enterprises respectively. In the 2<sup>nd</sup> quarter however, 100 percent business losses were reduced to 11 and 25 percent of micro and small-scale enterprises respectively in AB demonstrating MSEs' ability to bounce back with the relaxation of lockdown restrictions. The evidence on status of business operations<sup>14</sup> also revealed high economic vulnerability of MSEs in AB during the 1<sup>st</sup> quarter of 2020 and their ability to recommence business operations with necessary adjustments during post-lockdown period. For example, in the 1<sup>st</sup> quarter of 2020, 89 and 63 percent of micro and small business in AB were fully closed and in the 2<sup>nd</sup> quarter, 62 and 75 percent of micro and small business units were fully open.



Similarly, loss of revenue was 97 and 75 for micro and small-scale enterprises respectively in the 1<sup>st</sup> quarter of 2020 and 49 and 38 in the 2<sup>nd</sup> quarter of 2020 (Figure1). The net result of booking cancellations and loss of revenue is reflected in the cash flows of the MSEs in AB. In fact, majority of

<sup>13</sup> 100% cancellations

<sup>14</sup> This was measured in terms of 3 options: a) fully closed, b) open in limited way and c) fully open.

micro (89%) and small scale (63%) units reported that their cash balance was adequate for a period of less than one month (Figure 2). Another 6% of micro and 37% of small-scale units stated that cash flow was adequate for less than 3 months. Only 5% of micro enterprises estimated adequacy of cash flow for 3-6 months.

The total employment of the sample units before COVID 19 crisis was 494 representing both direct (61%) and indirect (39%) employment. The evidence on job losses was very high during the 1<sup>st</sup> quarter of 2020 and estimated values are in the region of 84 and 74 percent among micro and small business units respectively. However, in the 2<sup>ed</sup> quarter the situation has improved and estimated job losses were 63 and 46 percent among micro and small business units. The disruptions in business operations have also led to a significant loss in target investments of micro (57%) and small scale (63%) firms respectively.

MSEs are more likely to adopt an agile approach than medium and large-scale companies, which typically follow a resilience strategy. In this context, institutional and policy support system becomes an essential element in helping MSEs to recommence and reinvent business operations during the post-lockdown period. Survey evidence clearly point out the vital role expected from the institutional support system<sup>15</sup> during the recovery phase. (Table1).

Table 1: Key Interventions that Firms want Government to Implement (in %)

Area of intervention	ACC	F&B	EN	Surf	All
Institutional support	13	10	7	10	40
Monetary & Fiscal	5	2	1	3	11
Marketing & Promotion	7	3	3	7	20
Product Development	8	5	4	5	22
Tourism Sector Development	2	1	2	2	7
Total	35	21	17	27	100

Alarmingly, over half of survey respondents reported that they found it hard to access information and benefits from COVID-19 related assistance

<sup>15</sup> Sri Lanka Tourism Development Authority, Eastern Tourism Bureau, Arugam Bay Tourism Association, District Administration and institutions representing the line ministries at national level (e.g., Ministry of Labour).

packages, calling into question the efficiency and effectiveness of existing institutional support system. However, the success of firm level business strategies (e.g. reduced prices, discounts and preparation for COVID-19) is a green signal in the dark. As viewed by the respondents, these measures paved the path for them to rethink their justifiable coexistence, workforce skills-gap development and more focus on innovation in order to meet post-COVID-19 standards of tourism and travel industry. They are also in search of new and updated marketing strategies and avenues to make AB an enjoyable paradise for both local and foreign guests. The MSEs' ability to navigate through the COVID-19 crisis shows that there will be new opportunities for them to reinvent businesses based on their past experiences, but needed is institutional and efficient policy support.

### **Conclusion**

The key finding of the analysis is that MSEs have demonstrated their capacity to survive through a crisis and key stakeholder groups need to take a full advantage of this positive response.

It is apparent that more efficient and effective institutional and policy support system could help MSEs to steer through the challenges presented by the pandemic and turn these challenges into opportunities to reinvent their businesses. Thus, supporting MSEs should be the main focus of economic and social development strategies at national, provincial and district level. As the COVID-19 pandemic is a crisis with an unforeseeable ending, the government has to ensure efficient delivery of institutional and policy support systems to create a more resilient and sustainable MSEs particularly in high growth sectors such as tourism.

## **References**

- Chandrasiri, S., Gunatilaka, R., Wijsekera, S. Kumara, D.R., Gunasekera, A., and Premarathne. C. (2020). An Initial Assessment of the Impact of Covid-19 on Members of the Employers' Federation of Ceylon. Colombo: EFC.
- Gunawardana D.P (2020). The Impact of COVID 19 to SME Sector in Sri Lanka, UN DESA/DSDG.
- ILO (2019). The Power of Small: Unlocking the potential of SMEs, Geneva.
- Lonely Planet (2009). Lonely Planet's best in travel 2010: Top 10 Surfing Destinations in the World. Foots Cray, Vic, Lonely Planet.

## **Institutional Determinants of Domestic Investment: A GMM Panel Data Analysis**

**Mirwais Parsa and Soumya Datta**

*South Asian University, India*

**Keywords:** *Investment; Institutions; GMM; Factor analysis*

### **Introduction**

Investment is a significant component of the aggregate demand that plays a vital role in the growth of output, employment, and productivity in the long-run. Over recent decades, the cross country variations in investment have been remarkable. As noted in Lim (2014), between 1980 and 2010, the variability in the rate of gross fixed capital formation ranged between 1 to 90 percent of GDP worldwide, the greater part of which has come from the developing countries that also exhibit higher diversity in terms of their institutional structures.

The conventional belief is that the accumulation of investment funds, labor growth, and productivity rise explain the growth rate of economies. The role of a sound institutional environment as an essential pre-condition to providing a healthy climate for factor accumulation and productivity growth is mostly neglected in the neoclassical theories of economic growth. However, recently, a big strand of literature emerged that has broadly acknowledged the importance of institutions for technological progress and innovation, FDI, financial development and more extensively for economic growth. A dynamic analysis of the impact of institutional quality for factor accumulation is far less discussed in the literature that demands further investigations.

### **Objectives**

The objective of this paper is to test the impact of institutional quality on domestic investment using the three indices of institutions that we have constructed for the purpose of this study.

## Methodology

This study used panel dataset of 92 countries (47 high-income and 45 middle-income) for the period 1995-2017. The primary sources of the data are World Economic Outlook, IMF, World Development Indicators of the World Bank, and the Fraser institute's economic freedom database. Real GDP per capita, gross domestic saving, gross capital formation, domestic credit provided to the private sector, and interest rate data are derived from the World development indicators (WDI) database. We have used gross capital formation as a proxy domestic investment, and domestic credit provided to the financial sector is used as a proxy for the level of financial development. Average consumer price from World Economic Outlook (WEO) is used as a proxy for inflation, and for the construction of institutional indices, the data for the selected variables are derived from Fraser institute's database of the economic freedom of the world.

In this paper, we use the Arellano-Bover (1995) system GMM to estimate an augmented version of the MRW (1992) model (equation 1). The generalized method of moment (GMM) has grown in popularity among researchers due to its characteristic of correcting the problems of endogeneity, omitted variable bias, measurement error, and unobserved country heterogeneity in econometric studies (Bond et al., 2001). We have followed Roodman (2009) to choose the number of lags, and we have paid close attention to keeping the number of the instrument below the number of cross sections. As suggested by Arellano and Bover (1995), we have used the forward orthogonal deviation transformation method to remove the unobserved individual effect.

$$I_{it} = \alpha_0 + \alpha_1 Y_{it} + \alpha_2 I_{i,t-1} + \alpha_3 INS_{it} + \alpha_4 Z_{it} + \alpha_5 \delta C + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = \mu_i + \vartheta_{it} \sim i.i.d(0, \sigma_i^2)$$

Where,  $I_{it}$  and  $Y_{it}$  are investment and output respectively,  $I_{i,t-1}$  is the one period lag of investment – we have used the transformed initial value of  $I$  as an instrument for the predetermined variable.  $C$  is the user cost of capital proxied with the rate of interest,  $INS_{it}$  is the institutional quality variable,  $Z_{it}$  a set of controls, and  $\varepsilon_{it}$  is the error term consists of two-component, a country-specific component  $\mu_i$ , and an idiosyncratic component  $\vartheta_{it}$ . Controls here include variables such as domestic saving, inflation, and total credit to the private sector.

## Results and Discussion

Table 1 and Table 2 show the empirical results for the impact of institutional quality on investment for the middle-income and high-income countries, respectively. The dependent variable is domestic investment. The independent and control variables include our measures of institutional quality, output, cost of capital, gross domestic savings, inflation, and domestic credit provided to the private sector. All explanatory variables except inflation are with expected signs and statistically significant at the standard significance levels.

Table 1: Results of Investment Regression for Middle Income Countries

Variables	Two-step system GMM			One-step system GMM		
	gcf	gcf	gcf	gcf	gcf	gcf
gcf_1	0.547*** (0.021)	0.572*** (0.026)	0.527*** (0.026)	0.583*** (0.051)	0.590*** (0.051)	0.576*** (0.052)
ln_rgdppc	0.161*** (0.039)	0.097 (0.049)	0.074 (0.045)	0.175*** (0.036)	0.097* (0.049)	0.091* (0.037)
r	-0.094*** (0.017)	-0.103** (0.028)	-0.091*** (0.022)	-0.088*** (0.020)	-0.080*** (0.020)	-0.078*** (0.020)
gds	0.121*** (0.017)	0.144*** (0.019)	0.135*** (0.018)	0.114*** (0.015)	0.13*** (0.019)	0.125*** (0.016)
cpi	0.268*** (0.041)	0.307*** (0.040)	0.299*** (0.041)	0.265*** (0.052)	0.287*** (0.055)	0.272*** (0.053)
cre_to	1.677*** (0.090)	0.583*** (0.042)	1.762*** (0.089)	1.900*** (0.093)	0.884*** (0.072)	0.858*** (0.095)
lspr	0.176*** (0.028)			0.137*** (0.029)		
regu		0.198*** (0.051)			0.182*** (0.049)	
comp_inst			0.139*** (0.023)			0.111*** (0.021)
# of Obs.	505	505	505	505	505	505
# of Groups	39	39	39	39	39	39
No. of Inst	31	31	31	31	31	31
AR2 (p-value)	0.972	0.909	0.952	0.958	0.908	0.953
Hansen (p-value)	0.227	0.155	0.197			

Note: Standard errors in parentheses. \*, \*\* and \*\*\* represent variables are stationary at 10%, 5% and 1% level of significance respectively.

The coefficients of the institutional proxies show that institutional quality has a large and significant impact on domestic investment. In the case of the middle-income countries, one percentage point increase in institutional quality measured by the quality of the legal system and property rights, and the quality of regulations increases the domestic investment as a percentage of GDP by 17.6 percent and 19.8 percent, respectively. However, for high-income countries, although the effect of institutions on investment is significant, the magnitude of the impact is much lower. One percentage point of increase in the quality of legal system-property rights and regulatory quality in an average high-income countries leads to a 4.7% and 7% increase in domestic investment as a percentage of GDP, respectively.

Table 2: Results of Investment Regression for High Income Countries

Variables	Two-step system GMM			One-step system GMM		
	gcf	gcf	gcf	gcf	gcf	gcf
gcf_1	0.694*** (0.025)	0.725*** (0.028)	0.698*** (0.031)	0.708*** (0.048)	0.718*** (0.047)	0.714*** (0.047)
ln_rgdppc	0.142*** (0.026)	0.109*** (0.020)	0.137*** (0.020)	0.160*** (0.039)	0.109* (0.044)	0.148** (0.045)
r	-0.304*** (0.026)	-0.308*** (0.026)	-0.303*** (0.026)	-0.274*** (0.057)	-0.283*** (0.058)	-0.280*** (0.057)
gds	0.039** (0.010)	0.037** (0.010)	0.037** (0.011)	0.033* (0.013)	0.031* (0.012)	0.032* (0.013)
cpi	0.594*** (0.041)	0.587*** (0.038)	0.600*** (0.042)	0.569*** (0.101)	0.575*** (0.103)	0.577*** (0.102)
cre_to	0.082*** (0.005)	0.079*** (0.006)	0.081*** (0.006)	0.077*** (0.014)	0.080*** (0.014)	0.077*** (0.014)
lspr	0.045** (0.045)			0.029* (0.018)		
regu		0.070*** (0.017)			0.082* (0.037)	
comp_inst			0.027* (0.011)			0.020 (0.014)
#. of Obs.	526	526	526	526	526	526
# of Groups	41	41	41	41	41	41
# of Inst.	31	31	31	31	31	31
AR2 (p-value)	0.865	0.883	0.861	0.802	0.824	0.782
Hansen (p-value)	0.100	0.080	0.181			

Note: Standard errors in parentheses. \*, \*\* and \*\*\* represent variables are stationary at 10%, 5% and 1% level of significance respectively.

## Conclusion

In this paper, we have looked at the impact of institutions on investment using a panel dataset of 92 countries for the period 1995 to 2017. The analysis suggests that the quality of institutions play a vital role in domestic investment in both high-income and middle-income countries. However, we have found a stronger effect of institutions for investment in the case of middle-income countries. Between the two measures of institutions, the index of the quality of regulation is found with relatively higher importance for domestic investment generation. These findings show that the regulatory efficiency, well-defined and enforceable property rights, and the quality judicial system strongly stimulate investment and drive capital resources towards the most productive employments.

## References

- Arellano, M., and Bover, O. (1995). Another look at the instrumental variable estimation of error components models. *Journal of econometrics*, 68(1), 29-51.
- Bond, S. R., Hoeffler, A., and Temple, J.R. (2001). GMM estimation of empirical growth models, Economics Papers 2001-W21. *Economics Group, Nuffield College, University of Oxford*.
- Lim, J. J. (2014). Institutional and structural determinants of investment worldwide. *Journal of Macroeconomics*, 41,160–177.
- Mankiw, N.G., Romer, D., and Weil, D.N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, 107(2), 407-437.
- Roodman, D. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics and statistics*, 71(1), 135-158.

## **Road Traffic Congestion Induced CO<sub>2</sub> Emission: Evidence from Kandy City in Sri Lanka**

**Muditha Karunarathna**

*Department of Economics and Statistics, University of Peradeniya,  
Sri Lanka*

### **Abstract**

Transportation plays a significant role in carbon dioxide (CO<sub>2</sub>) emissions. This paper examines traffic congestion and its impact on CO<sub>2</sub> emissions in Kandy city. Data were collected between November and December 2018 using road monitoring surveys which includes vehicle counting and time recording. The results show that cost of extra fuel consumption due to traffic congestion is Rs. 12.94 million during 12 hour day time which account Rs. 4.72 billion per year. The total CO<sub>2</sub> emission weight is estimated 263.48 tons per day which is 96,170 tons per year. Approximately 55 % of the total emission is contributed by the bus, lorry and truck while combined effects of car, cabs, jeep and wagon is more than 27%. The study also identifies the contributing of CO<sub>2</sub> emission by diesel, petrol and hybrid vehicle separately in the study area. The results of the study provide the direct evidence on the magnitudes of the unnecessary fuel loss and magnitude of the CO<sub>2</sub> emission due to road traffic congestion in Kandy city in Sri Lanka.

**Keywords:** *Traffic congestion; Loss of fuel; CO<sub>2</sub> emission; Kandy city*

### **Introduction**

Road traffic congestion is a situation in which demand for road space exceeds supply. It occurs when the road capacity does not meet traffic demand at an adequate speed, traffic controls are not effectively used, or there is an incident on the road due to an accident or disabled vehicle. Congestion can occur during any time of the day and along any type of roadway while it has an impact on both the speed of travel as well as on the *reliability* of travel conditions. Road traffic congestion in urban areas is often the outcome of successful urban economic development (Chakrabarty and Gupta, 2015). However, congestion prevents us from moving freely while

generating direct additional cost elements such as travel time delay, travel time unreliability, excess fuel consumption, CO<sub>2</sub> emissions.

With the rapid urbanization, it is evident that commercial and socio-economic activities tend to centralize only in major cities in a country (Vliege et al. 2000; Ali et al. 2014). This has led to increase the number of commuters daily travelling to the cities (Harriet et al. 2013). As a result, while the economy is contributed by way of increasing production and real income of household, the accumulation of vehicle population creates a huge burden to the society which is not understood properly by the urban planning authorities in most developing countries. Road traffic congestion directly increase a loss of resources including extra time and fuel (Hartgen and Fields, 2009; Harriet et al. 2013). Moreover, it creates huge external costs in terms of excess fuel consumption and contributing to higher emission level which directly has some impacts on society in the forms of increasing health issues and global warming.

Total vehicle population in Sri Lanka has dramatically increased with a compound annual growth rate of 10 % between 2012 and 2016 (Karunaratna et al. 2018). The growth of vehicles per 1000 people from 2008 to 2015 was raised 171 to 305 (Department of Motor Traffic, 2016). This growing trend in vehicle population provides important implications on Sri Lankan society, economy and environment. A larger portion of vehicles in Sri Lanka are driven in major cities and much of the issues related to the transport sector in Sri Lanka are associated with urban environment. The traffic congestion on streets in major cities in the country is getting worse each day as people shift from unorganized, outdated and overcrowded public transport modes and started to use their private vehicles. Low travel speed due to the traffic congestion results in high CO<sub>2</sub> emissions to the environment, loss of productivity and production, deteriorating the health capital and increasing the other costs components such as adaptation (for example living closer place to the city). All these have resulted in a massive environmental, financial, health and man-hour loss, waste of fuel, wear and tear of vehicles (Jayasooriya and Bandara, 2017).

Given this background this research attempts to estimate cost of excess fuel consumption and amount of extra carbon emission due to road traffic congestion in Kandy city in Sri Lanka using survey data collected in 2018. Methodology used by Kakouei et al. (2012), Ali et al. (2014) is used to calculate extra CO<sub>2</sub> emission of traffic congestion. The results of this study will help understand the magnitudes of the unnecessary fuel loss due to vehicle congestion in Sri Lanka.

### **Literature Review**

A number of studies have already been undertaken to investigate the various aspects of urban traffic congestion and its impact on individual, businesses and the economy as a whole (Arnott et al. 1993; Shefer, 1994; Lindsey and Verhoef, 2000; Weisbrod et al. 2003; Small et al. 2005; Brownstone and Small, 2005; Parry et al. 2007; Barth and Boriboonsomsin, 2008; Palma and Lindsey, 2009; Harsman and Quigley, 2010; Duranton and Turner, 2011; Song and Miller, 2012; Gallego et al., 2013; Cerruti, 2013; Gibson and Carnovale, 2015). In general, all these studies have repeatedly identified road traffic congestion as one of the major factor for emissions in the world. These studies mainly described the undesirable effects of traffic to their environments, like air degradation due to vehicle emission and traffic noise pollution along with the congestion.

Arnott et al. (1993) analyzed the impact of road traffic congestion on urban society and its economic implication using a detailed analysis of the structural model. Vliege et al. (2000) and Shefer (1994) identifies the gap between private and social cost of vehicle travel and resulting negative externalities such as air pollution, noise pollution and productivity loss. According to Faiz et al. (1996) and Chen et al. (2007) the emission levels depend heavily on traffic-flow characteristics, such as average flow speed, the frequency and intensity of vehicle acceleration and deceleration, the number of stops, and vehicle operating mode. De Vlieger et al. (2000) studies the environmental effects of driving behaviour and congestion by considering passenger cars. According to this study an intense traffic congestion can increase fuel consumption by 20 – 45.

Barth and Boriboonsomsin (2008) found that traffic congestion induced transportation plays a significant role in carbon dioxide (CO<sub>2</sub>) emissions. Eliasson (2008) evaluated environmental effects of the pilot test of congestion charging in Stockholm and found that possible emissions reduction by changing the scenario was reduced 2 to 3%. Hartgen and Fields (2009) examines the impact of congestion on accessibility to key employment centers and destinations within an urban region while Shukla and Alam (2010) study the relationship of traffic and emissions in a dynamic urban traffic condition in Delhi. They found high emissions level during accelerations. Maparu and Pandit (2010) found the delay in minutes on the different corridors of Kolkata to range from 20 minutes to about 60 minutes indicating a considerable congestion on the roads of Kolkata.

Anas and Lindsey (2011) discuss the major negative externalities of transportation such the costs of greenhouse gas emissions, air pollutants, noise pollution and accidental costs of congestion. Wolff (2011) studied the impacts of low-emission zones (LEZs) areas on air pollution and the spatial substitution effects in green versus dirty vehicles. Danielis et al. (2011) and Cerruti (2013) analyze the impact of a vehicle pollution charge on nitrogen oxides concentration in Milan. Carrillo and Malik (2013) estimated the impact of driving restrictions on vehicle flows and carbon monoxide emission. Viard and Fu (2014) evaluate the environmental benefit and economic cost of Beijing's driving restrictions. According to this study air pollution falls 19 % during every-other-day and 7 % during one-day-per-week restrictions. Bento et al. (2014) discusses the welfare effects of urban traffic congestion while Song et al. (2015) developed the delay correction model (DCM) to predict emissions from buses traversing intersections based on traffic variables. Rodríguez et al. (2016) studies the influence of driving patterns on vehicle emissions using data from Latin American cities.

The review of previous literature shows that research in this area are numerous and number of researchers have used different techniques and methodologies to measure CO<sub>2</sub> emission of road traffic congestion. However, it is clear that most of these studies have tended to simply analyze CO<sub>2</sub> emission using secondary data in more sophisticated cities in developed countries. Therefore, these studies have only provided limited information to

make appropriate policies on road traffic congestion in developing countries. This study will partly attempt to fill this void in the literature by estimating the CO<sub>2</sub> emission of road traffic congestion in Kandy city using survey data in Sri Lanka.

**Methodology**

The method used to estimate cost of excess fuel consumption and CO<sub>2</sub> emission is primarily based on the methodology developed by Kakouei et al. (2012) and Ali et al. (2014). For estimating the cost of excess fuel consumption of the traffic congestion, we first separated all the vehicles into four groups namely diesel (d), petrol (p), hybrid (h) and electric. We found 14 vehicle categories for diesel vehicles, 7 vehicle categories for petrol vehicles, 5 vehicle categories for hybrid vehicles and 2 categories for electric vehicles<sup>16</sup>. Then within diesel vehicles, different type of vehicles (mainly based on engine capacity) is identified. Accordingly we have identified 19 vehicle types for diesel vehicles while the number is the same for petrol and hybrid vehicles. Then total number of vehicles entering to the city in each three hours time slots under each vehicle type is recorded. After sorting out the vehicle type, we first estimated the fuel expenditure for each vehicle type for travelling one kilometre in each road corridor under the free flow. The following Equation 1 is used for this purpose.

$$FEFF_i = TFC_i \times D.....(1)$$

Where, FEFF<sub>i</sub> is the fuel expenditure (Rs.) that is needed to travel a specific distance on a road corridor for a particular vehicle category (i) under free flow. TFC<sub>i</sub> is the total fuel cost (Rs./per Km) of the ith vehicle category and D is the total travel distance(number of Km) in a specific corridor.

$$TFC_i = \sum_t^m (FC_t \times NOV_t).....(2)$$

Where FC<sub>t</sub> is the fuel expenditure<sup>17</sup> (Rs/per Km) of the t vehicle type in a specific vehicle category and NOV<sub>t</sub> is the total number of vehicles entering

---

<sup>16</sup> Electric vehicles were dropped from the analysis as they did not use petrol or diesel.

<sup>17</sup> Fuel expenditure is estimated for each vehicle type. For this purpose we first estimated number of liters (quantity) required to travel one Km distance using the standard

to the city in a specific time period in t vehicle type. We next estimated the fuel expenditure to travel the same distance under congested situation. Total fuel expenditure due to the traffic congestion (FETC<sub>i</sub>) of i<sup>th</sup> vehicle category in a specific transport mode can be estimated using following Equation 3.

$$FETC_i = \left( \frac{FEFF_i}{TFF} \right) \times ATT_i \dots\dots\dots(3)$$

Where FEFF<sub>i</sub> is the time (in minutes) that is needed to travel a specific distance on a road corridor for a particular vehicle category (i) under free flow, TFF is the average number of minutes taken to travel the same distance of a road corridor under free flow and ATT<sub>i</sub> is the total number of minutes taken to travel the same distance of a road corridor under traffic congestion by i<sup>th</sup> vehicle category. Accordingly, total extra fuel cost (EFC) of i<sup>th</sup> vehicle category of a specific transport mode due to traffic congestion can be estimated by using Equation 4.

$$EFC_i = FETC_i - FEFF_i \dots\dots\dots(4)$$

Using estimates taken from Equation 4 extra fuel consumption quantity due to traffic congestion can be estimated as follows.

$$EFQ_i = \frac{EFC_i}{FP_j} \dots\dots\dots(5)$$

Where EFQ<sub>i</sub> is the extra fuel consumption quantity (liters) of the i<sup>th</sup> vehicle category and FP<sub>j</sub> is the fuel price per liter (Rs.) of j fuel type (diesel or petrol). The estimation of the extra fuel consumption quantity is done for the each vehicle category in each time slots of a given day for the different fuel types as well as corridors separately. Finally total is taken for the three corridors.

This study estimates the total fuel expenditure due to delay related to the deviation from actual time taken from free flow. Then these cost components are converted into liters of different fuel type. In order to estimate total CO<sub>2</sub> emission, CO<sub>2</sub> Emissions Footprint Calculator used by Kakouei et al. (2012) is used. Accordingly, burning a litre of diesel produces around 2.64 kgs of

---

(recommended) fuel consumption rate. Then the quantity is multiplied by average (survey period) fuel price to identify the fuel consumption expenditure per Km for each vehicle type.

carbon dioxide, whereas petrol has lower carbon content and produces about 2.392 kgs<sup>18</sup>. Accordingly, CO<sub>2</sub> emission by *i*th vehicle category (CO<sub>2i</sub> - metric tons) is estimated by multiplying extra fuels quantity consumed (by each vehicle category) from emission per liter burning of petrol or diesel and dividing by 1000,000. This is given in Equation 6.

$$CO_{2i} = \frac{FQ_i \times Emission(per\ /\ liter)_i}{1000 \times 1000} \dots\dots\dots (6)$$

This study will use primary data along with secondary data. Primary data were obtained from two surveys. First survey was the road monitoring survey while second survey was the time monitoring survey. Data collected from the vehicle monitoring survey covering three road corridors of the Kandy city in November and December 2018 is mainly used to identify the number of vehicles entering the city each day. Also, a time monitoring survey carried out during the same month is used to estimate the delay time (different between the actual time taken and regulated time) for each vehicle categories.

## Results and Discussion

The details of those three main corridors are given in Table 1. Table 2 summarizes details about the number of vehicles entering to the city from three main corridors. According to the Table 2, total number of vehicles entering from 3 main corridors between 6.00am and 6.00pm is 52,987 per day and approximately 45 % of the vehicles enter the city from corridor 1 while 29 % and 26 % enter from corridor 2 and 3 respectively. Further out of different vehicle categories cars (23 %), three wheel (20 %) and motorcycles (29%) show relatively higher percentages. The presence of significant amount of motorcycles, three wheel and cars is mainly due to inconvenient public transport system prevailing in Kandy.

---

<sup>18</sup> In general 1 liter of diesel weighs 835 g and it consists for 86,2% of carbon, or 720 g of carbon per liter. In order to combust this carbon to CO<sub>2</sub>, 1920 g of oxygen is needed. The sum is then 720 + 1920 = 2640 g of CO<sub>2</sub>/liter diesel. Further, 1 liter of petrol weighs 750 g. Petrol consists for 87% of carbon, or 652 g of carbon per liter of petrol. In order to combust this carbon to CO<sub>2</sub>, 1740 g of oxygen is needed. The sum is then 652 + 1740 = 2392 g of CO<sub>2</sub>/liter of petrol.

Table 1: Details of the Corridor

Name	Details
Corridor 1 (C1)	Peradeniya Town and Kandy Clock Tower / Hospital 6.5 Km- Free flow 13 minutes
Corridor 2 (C2)	Katugasthota Town and Kandy Market Station 5.4 Km- Free flow 14 minutes
Corridor 3 (C3)	Thennekumbura Bridge and Kandy Market Station 6.0 Km- Free flow 16 minutes

Note: Corridor 1 is a part A1 and AB42 while Corridor 2 is a part of B70 and A9. Corridor 3 includes a part of A26.

It is evident that during 6am and 9am 32 % of total vehicles enter the city and further between 12 noon and 3pm approximately 28 % of vehicles are entering to the city. Accordingly, these two time slots can be considered as the peak-hours in the city area.

Table 2: Number of Vehicles Entering from Three Main Corridors

Category	Corridor 1 (%)	Corridor 2 (%)	Corridor 3 (%)	Total
Bus	50.46	26.44	23.11	3,484 (6.58)
Lorry	44.14	33.44	22.43	1,953 (3.69)
Truck	38.26	37.83	23.91	230 (0.43)
Bowser	39.68	14.29	46.03	126 (0.24)
Car	48.85	26.57	24.57	12,265 (23.15)
Cabs	52.01	33.17	14.81	621 (1.17)
Jeep	41.78	29.57	28.66	1,982 (3.74)
Wagon	52.38	28.51	19.11	1,638 (3.09)
Van	37.10	35.26	27.64	4,356 (8.22)
Ambulance	44.07	30.51	25.42	59 (0.11)
Three wheel	50.48	25.43	24.09	10,543 (19.90)
Motorcycle	38.62	32.42	28.96	15,625 (29.49)
Others	41.90	37.14	20.95	105 (0.20)
Total	23,801 (44.92)	15,537 (29.32)	13,649 (25.76)	52987

Note: Under the brackets of last column gives the percentage of each vehicle category out of total number of vehicles. Brackets of the last row reports the % of vehicles coming from each corridor.

Large numbers of schools, hospitals, government offices are located along the road sides of these three main corridors. Due to this fact a significant number of office vans are also seen frequently during peak hours which carry school children and office workers from the residence to relevant schools or workstations. Total number of vans entering to the city is around 4,356 which account approximately 8 % of the total vehicle flow with 12 hours in a given day.

The average time to travel one kilometer distance can mainly depend on the vehicle type as well as the time of the day. Under free flow average time taken to travel one Km along Corridors 1, 2 and 3 are 2, 2.6 and 2.7 minutes respectively. Table 3 reports the average number of minutes taken to travel one Km distance during a particular day between 6.00am and 6.00pm along these three corridors. It was clearly observed from the table the bike (except ambulance) has lesser delay while bus as well as trucks has largest delay with respect to the reference speed which in mainly due to their size.

Table 3: Average time taken to Drive along the Corridors (minutes/ per Km)

Vehicle Category	Corridor 1	Corridor 2	Corridor 3
Bus	9.69	10.42	8.00
Lorry, Truck Bowser	9.31	10.60	7.13
Car, Cabs, Jeep, Wagon	8.00	8.69	6.58
Van	8.46	8.29	6.54
Three Wheel	5.35	4.35	3.83
Motorcycles	3.58	4.54	3.42
Ambulance	2.88	2.73	2.54
Others	9.15	9.35	7.96

Note: Ambulances are exceptional as they are not expected to follow the rules applied to drive on the road.

As the next step of the analysis we estimated the total costs of extra fuel consumption due to traffic congestion per day. For this purpose, we divided all the vehicles into diesel, petrol and hybrid. Under each fuel type different types of vehicles based on average fuel consumption and engine capacity were identified. This information helps to identify the total fuel cost of a particular vehicle type that is required to run a specific distance of a road corridor. Then the required fuel cost is estimated under free flow and actual

time taken. The difference between those two gives us the fuel cost due to traffic congestion. The estimated fuel cost under different time slots as well as different vehicle categories are given in Table 4.

Table 4: Estimated Value of the Extra Fuel Consumption

Vehicle Category	Diesel Vehicle	Petrol Vehicle	Hybrid Vehicle	Total
				2,538,722
Bus	2,538,722			(39.19)
Lorry, Truck				686,511
Bowser	686,511			(10.59)
Car, Cabs,				2,066,806
Jeep, Wagon	477,363	1,230,903	358,539	(31.90)
				65,3876
Van	464,876	182,899	6,100	(10.09)
				1,778
Ambulance	1,778			(0.03)
				315,337
Three Wheels		315,337		(4.86)
				170,667
Motorcycles		170,667		(2.63)
				43,909
Others	43,909			(0.67)
	4,213,161	1,899,807	364,640	
Total	(65.04)	(29.33)	(5.63)	6,477,609

Note: Under the brackets of last column gives the percentage of expenditure out of total expenditure for extra fuel consumption. Brackets of the last row reports the % distribution of extra fuel expenditure among different fuel type.

The information given in Table 4 represents the difference in cost taken to travel a given section of roadway during free flow and real time. It is evident that the estimated cost of extra fuel consumption is Rs.6.47 million per day which will be Rs. 194.10 million per month and Rs. 2.36 billion per year for one direction travel delay (only entering to the city). The analysis also finds that approximately 65 % of the total excess fuel costs is coming from diesel vehicles while others contribution is approximately 35 %. Also combined effects of bus, lorry, truck and bowsers are more than 50 % of the diesel

vehicles. The total combined costs of car, cabs, jeep and wagon which are mostly privately used vehicles appear as 32 % of the total costs.

Table 5: Total Extra Fuel Consumption (litters)

Vehicle Category	Diesel Vehicle	Petrol Vehicle	Hybrid Vehicle	Total
Bus	21,484			21,484 (42.06)
Lorry, Truck				
Bowser	5,809			5,809 (11.37)
Car, Cabs,				
Jeep, Wagon	4,039	8,385	2442	14,867 (29.11)
Van	3,934	1,245	41	5,221 (10.22)
Ambulance	15			15 (0.03)
Three Wheels		2,148		2,148 (4.21)
Motorcycles		1,162		1,162 (2.28)
Others	371			371 (0.73)
	35,654	12,942	2,484	
Total	(69.80)	(25.34)	(4.86)	51,080

Note: Average diesel price per liter was Rs. 118.16 and average petrol price per liter was Rs. 146.79 in 2018.

As the next step of the analysis extra fuel consumption is estimated and these estimates are given in Table 5. Average fuel consumption quantity of classified modes and their proportions are also shown in same Tables. Total extra fuel consumption by all vehicles are 51,080 liters in a given day. Accordingly, the estimated extra fuel consumption quantities due to the existing traffic congestion are 35,654 liters of diesel and 14,426 liters of petrol. Contribution of 3,484 buses for the total fuel consumption is 42 % while the combined effects of 16,506 car, cabs, jeep and wagon is 29.11 %. Increasing fuel consumption on the road mean emissions increase and air quality will only get worse. Therefore, as the final step of the analysis we estimated the extra CO<sub>2</sub> emission due to road traffic congestion. These estimates are given in Table 6.

Table 6: Total Extra CO<sub>2</sub> Emission due to Road Traffic Congestion (MT)

Vehicle Category	Diesel	Petrol	Hybrid	Total
Bus	57.15	0	0	57.15 (43.38)
Lorry, Truck				
Bowser	15.45	0	0	15.45 (11.73)
Car, Cabs, Jeep,				
Wagon	10.75	20.06	5.84	36.65 (27.72)
Van	10.46	2.98	0.10	13.54 (10.28)
Ambulance	0.04	0	0	0.04 (0.03)
Three Wheels	0.00	5.14	0	5.14 (3.90)
Motorcycles	0.00	2.78	0	2.78 (2.11)
Others	0.99	0	0	0.99 (0.75)
	94.84	30.96	5.94	
Total	(71.99)	(23.50)	(4.51)	131.74

Note: These CO<sub>2</sub> emission estimates are only for the delay of the vehicle that are entering to the city.

Given the standard emission rates, the CO<sub>2</sub> emission caused by excess fuel consumption due to congestion is estimated. The total CO<sub>2</sub> emission weight is estimated 131.74 tons per day which is 48,085 tons per year for the 3 main corridors when considering the vehicles that are entering to the city during 12 hours a day. Approximately 43 % of the total emission is contributed by the bus while combined effects of car, cabs, jeep and wagon is more than 36 %. As shown in Table 6, about 93 % of all CO<sub>2</sub> emissions in Kandy are produced by 9 vehicle categories which includes bus, lorry, truck, bowser, car, cabs, jeep, vega and van while the three wheel and motorcycles has lower CO<sub>2</sub> emission than other vehicles. Furthermore, it is found that the structural characteristics of the city such as number of crossing roads, the number of vehicles parked along the roadsides, crossing rail tracks, closer location of schools, hospitals, temples, availability of number of small temporary shops (small hut-type shops) along the roadsides, narrow crossing bridge and availability of main junctions have resulted in increasing traffic congestion significantly in the study area.

## **Conclusions and Policy Recommendations**

The main purpose of this research is to estimate cost of extra fuel consumption and extra CO<sub>2</sub> emissions of road traffic congestion using survey data in Kandy city in Sri Lanka. Data collected from several surveys covering in November and December 2018 is used to estimate cost of extra fuel consumption and CO<sub>2</sub> emission due to traffic congestion in the study area. Results show that approximately 53,000 vehicles are entering to the Kandy city area during 12 hours (day time) of a day from three main corridors. This can be approximately doubled when considering total number of vehicles that are entering to the city as well as exiting from the city. Accordingly the estimated extra fuel consumption quantities due to the existing traffic congestion are 35,654 liters of diesel and 15,426<sup>liters</sup> of petrol for 12 hours duration per day. The value of extra fuel consumption due to existing traffic congestion in the city area is Rs. 194.10 million per month. If we convert extra fuel consumption into CO<sub>2</sub> emission the total CO<sub>2</sub> emission is estimated 3,952 tons per month in the city area. Approximately 72 % of the total emission is contributed by the diesel vehicles. The contribution of bus, lorry, truck and bowser to the total CO<sub>2</sub> emission is approximately 73 % while combined effects of car, cabs, jeep and wagon is more than 37 %. These figures can be approximately double if entering as well as exiting vehicles are taken into account in the study area.

This research finding will contribute to pay immediate attention for this issue (which is hidden) while achieving environmental improvement in the urban areas in Sri Lanka. In the long term for reducing CO<sub>2</sub> emissions from the transportation sector, policy makers should pay their attention to introduce more efficient vehicles and the use of alternative fuels. In terms of alternative fuels, many carbon-neutral options are available today. In general, results of this study will provide an opportunity to make necessary policies that provide incentives to protect urban environment that generate regional as well as global benefits in the future.

## Acknowledgment

The author is grateful to Ceiline Nuges, Mani Nepal, Jeffery Vincent, Subhrendu Pattanayak and other resource persons, including SANDEE associates, for encouragement at various stages of this study. The author also acknowledges SANDEE secretariat for logistic and financial support.

## References

- Ali, M. S., Adnan, M., Noman, S. M., and Baqueri, S. F. A. (2014). Estimation of traffic congestion cost-A case study of a major arterial in Karachi. *Procedia Engineering*, 77, 37-44.
- Anas, A., and Lindsey, R. (2011). Reducing Urban Road Transportation Externalities: Road Pricing in Theory and in Practice. *Review of Environmental Economics and Policy*, 5(1), 66–88.
- Anderson, M. L. (2013). Subways, Strikes, and Slowdowns: the Impacts of Public Transit on Traffic Congestion. *American Economic Review, American Economic Association*, 104(9), 2763-2796.
- Arnott, R., Palma, A. De, and Lindsey, R. (1993). A structural model of peak-period congestion: A traffic bottleneck with elastic demand. *The American Economic Review*, 83(1), 161–179.
- Barth, M., and Boriboonsomsin, K. (2008). Real-world carbon dioxide impacts of traffic congestion. *Transportation Research Record*, No. 2058.
- Bento, A., Kaffine, D., Roth, K., and Zaragoza-Watkins, M. (2014). The effects of regulation in the presence of multiple unpriced externalities: Evidence from the transportation sector. *American Economic Journal: Economic Policy*, 6(3), 1–29.
- Brownstone, D., and Small, K. A. (2005). Valuing time and reliability: assessing the evidence from road pricing demonstrations. *Transportation Research Part A: Policy and Practice*, 39(4), 279–293.
- Carrillo, P. E. and Malik, A. S. (2013). Driving restrictions that work? *Canadian Journal of Economics*. 49(4), 1536-1568.
- Cerruti, D. (2013). No free polluting anymore: The impact of a vehicle pollution charge on air quality. Paper prepared for presentation at the Agricultural & Applied Economics Association. Washington, DC.

- Chakrabartty, A. and Gupta, S. (2015). Estimation of congestion cost in the city of Kolkata—A case study, *Current Urban Studies*, 3, 95-104
- De Vlieger, I., De Keukeleere, D. and Kretzschmar, J. (2000). Environmental effects of driving behaviour and congestion related to passenger cars. *Atmospheric Environment*, 34(27), 4649-4655.
- Duranton, G. and Turner, A. M. (2011). The fundamental law of road congestion: Evidence from US cities. *The American Economic Review*, 101(6), 2616-2652.
- Eliasson, J. (2008). Lessons from the Stockholm congestion charging trial. *Transport Policy*, 15(6), 395–404.
- Faiz, A., Weaver, C. and Walsh, M. (1996). Air pollution from motor vehicles: Standards and technologies for controlling emissions, International Bank for Reconstruction and Development/World Bank: Washington D.
- Gallego, F., Montero, J.P., and Salas, C. (2013). The effect of transport policies on car use: Evidence from Latin American cities. *Journal of Public Economics*, 107, 47–62.
- Gibson, M., and M. Carnovale. (2015). The effects of road pricing on driver behavior and air pollution. *Journal of Urban Economics*, 89: 62–73.
- Goodwin, P. (2004). The economic costs of road traffic congestion, A Discussion Paper published by the Rail Freight Group, ESRC Transport Studies Unit University College London.
- Graham, D. J. (2006). Investigating the link between productivity and agglomeration for UK industries. Report prepared for the UK Department for Transport.
- Harriet, T., Poku, K. and Emmanuel, A. K. (2013). An assessment of traffic congestion and its effect on productivity in urban Ghana. *International Journal of Business and Social Science*, 4(3), 225-234.
- Harsman, B., and Quigley, J. M. (2010). Political and public acceptability of congestion pricing: ideology and self-interest. *Journal of Policy Analysis and Management*, 29(4), 854–874.
- Hartgen, D. T. and Fields, G. (2009). Gridlock and Growth: The Effect of Traffic Congestion on Regional Economic Performance. Washington DC: Reason Foundation.

- Jayasooriya, S. A. C. S. and Bandara, Y. M. M. S. (2017). Measuring the economic costs of traffic congestion. Paper presented at the 2017 Moratuwa Engineering Research Conference (MERCon).
- Johnston, R. A. and Ceerla, R. (1996). The effects of new high-occupancy vehicle lanes on travel and emissions. *Transportation Research Part A: Policy and Practice*, 30(1): 35-50.
- Karunaratna, M. (2019). Loss of Manpower due to Road Traffic Congestion in Sri Lanka: A Study in Kandy City. *Applied Economics & Business*, 3(1):55 – 69.
- Lindsey, C. R., and Verhoef, E. T. (2000). Traffic congestion and congestion pricing, Discussion Papers No. 00–101/3: Tinbergen Institute.
- Maparu, T. S. and Pandit, D. (2010). A methodology for selection of bus rapid transit corridors: A case study of Kolkata, *India Journal*, 7, 21-36.
- Rouwendal, J. and Verhoef, E. T. (2006). Basic economic principles of road pricing: From theory to applications. *Transport Policy*, 13, 106–114.
- Sankaran, J. K. and L. Wood. (2007). The relative impact of consignee behavior and road traffic congestion on distribution costs. *Transportation Research Part B*, 41, 1033-1049.
- Shukla, A. and Alam, M. (2010). Assessment of real world on-road vehicle emissions under dynamic urban traffic conditions in Delhi. *International Journal of Urban Sciences*, 14 (2), 207-220.
- Smith, B. L., Lewis, D. C. and Hammod, R. (2003). Design of archival traffic databases: Quantitative investigation into application of advanced data modeling concepts. *Transportation Research Record*, 1836, 126-131.
- Song, Y. and Miller, H. J. (2012). Exploring traffic OW databases using space-time plots and data cubes. *Transportation*, 39, 215-234.
- Xu, L., Yue, Y., and Li, Q. (2013). Identifying urban traffic congestion pattern from historical floating car data. *Social and Behavioral Sciences* 96, 2084 – 2095.