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Revisiting the Effect of Exchange Rate Fluctuations on the Trade Balance: Evidence from Sri Lanka

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Outline

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- Overview of Sri Lanka's Trade
- Literature Review
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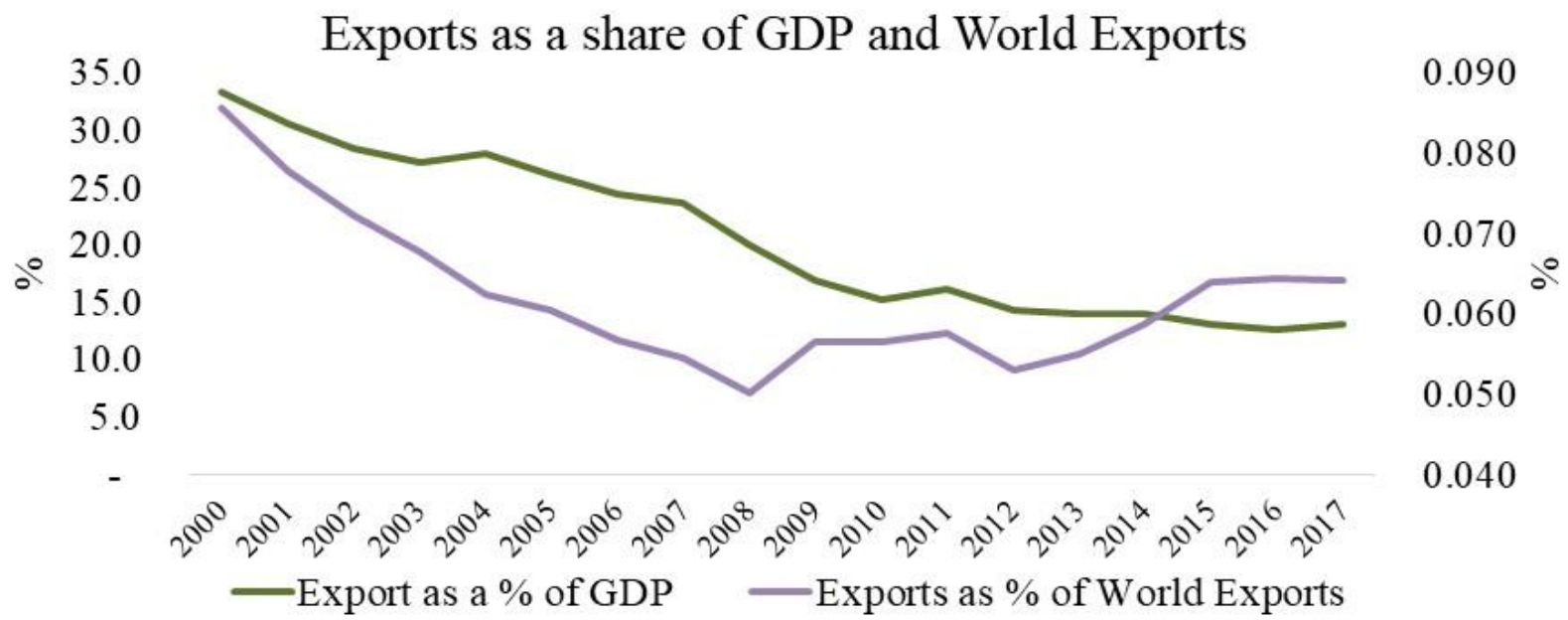
- Results
- Conclusion

The views and opinions expressed in this paper are those of the authors and do not necessarily reflect the official position of the Central Bank of Sri Lanka

Introduction

- Theory suggests that the link between exchange rate fluctuations and the trade balance has important economic implications
- However, despite popular belief that depreciation can improve the trade balance, empirical work tends to suggest mixed results
- This paper aims at revisiting the relationship between exchange rate fluctuations and the trade balance for Sri Lanka using new methods

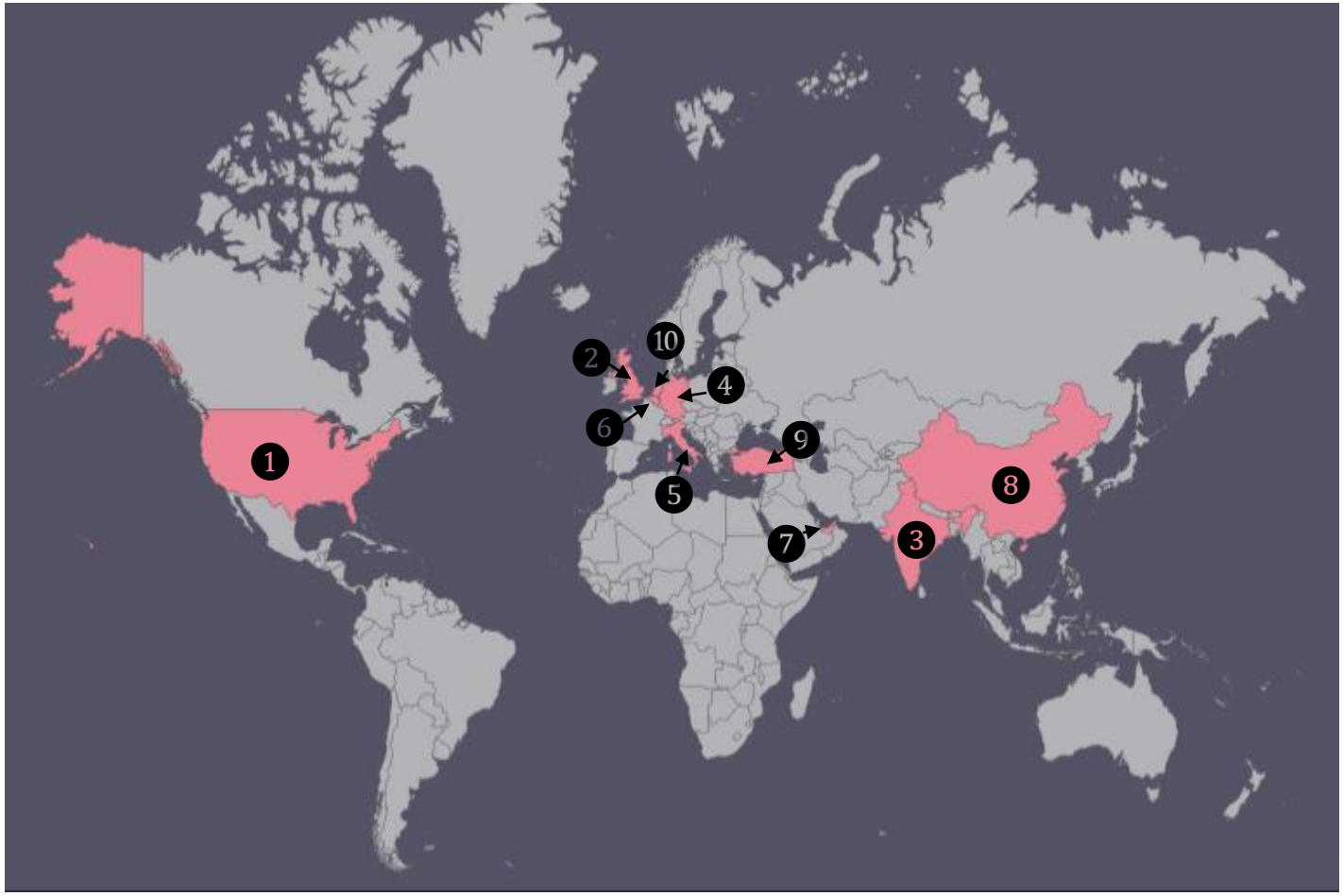
Overview of Sri Lanka's Trade



Overview of Sri Lanka's Trade

Top 10 Export Destinations of Sri Lanka in 2017

1. USA
2. UK
3. India
4. Germany
5. Italy
6. Belgium
7. UAE
8. China
9. Turkey
10. Netherlands

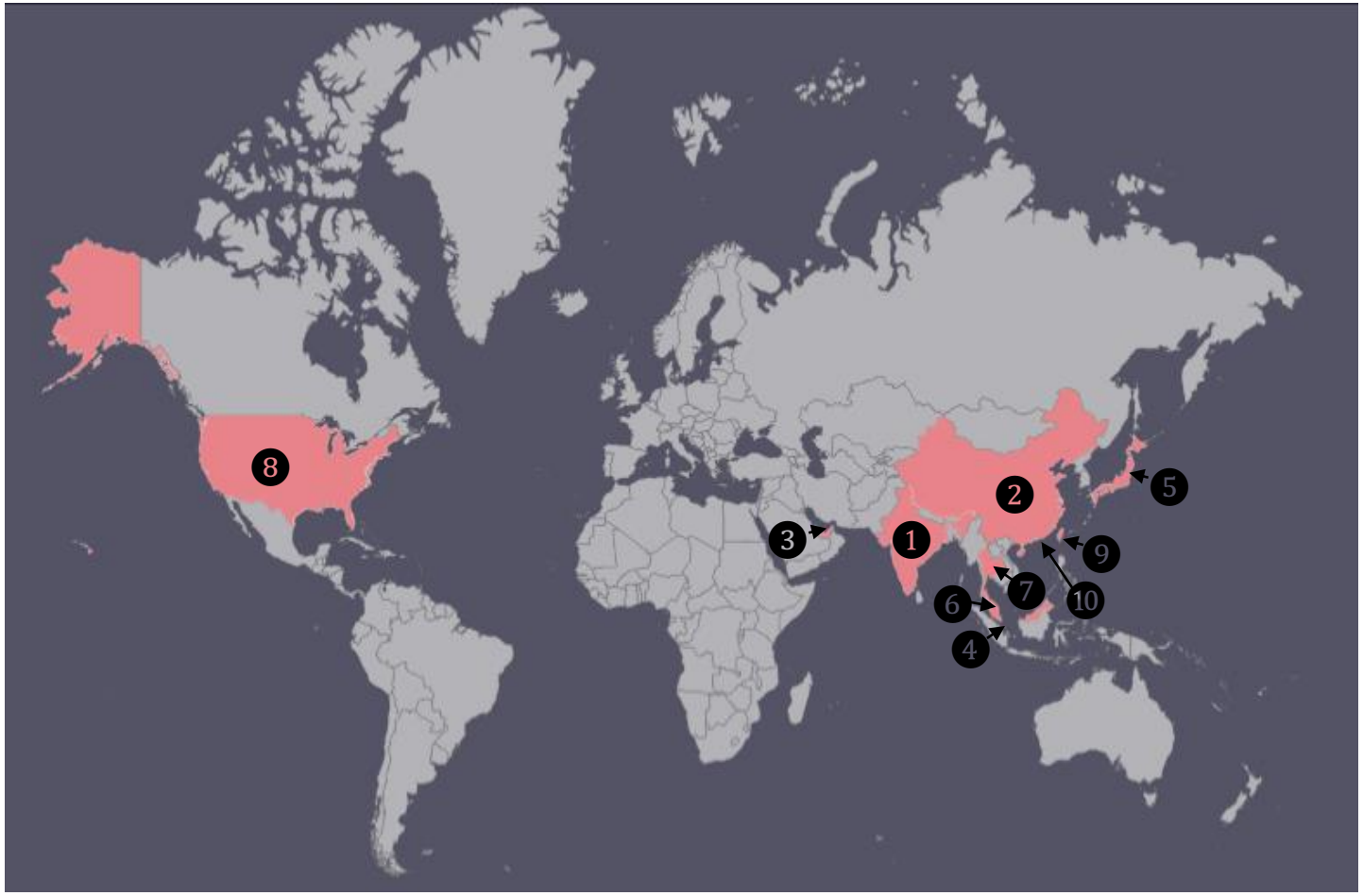


Source: Trade Map

Overview of Sri Lanka's Trade

Top 10 Import Origins of Sri Lanka in 2017

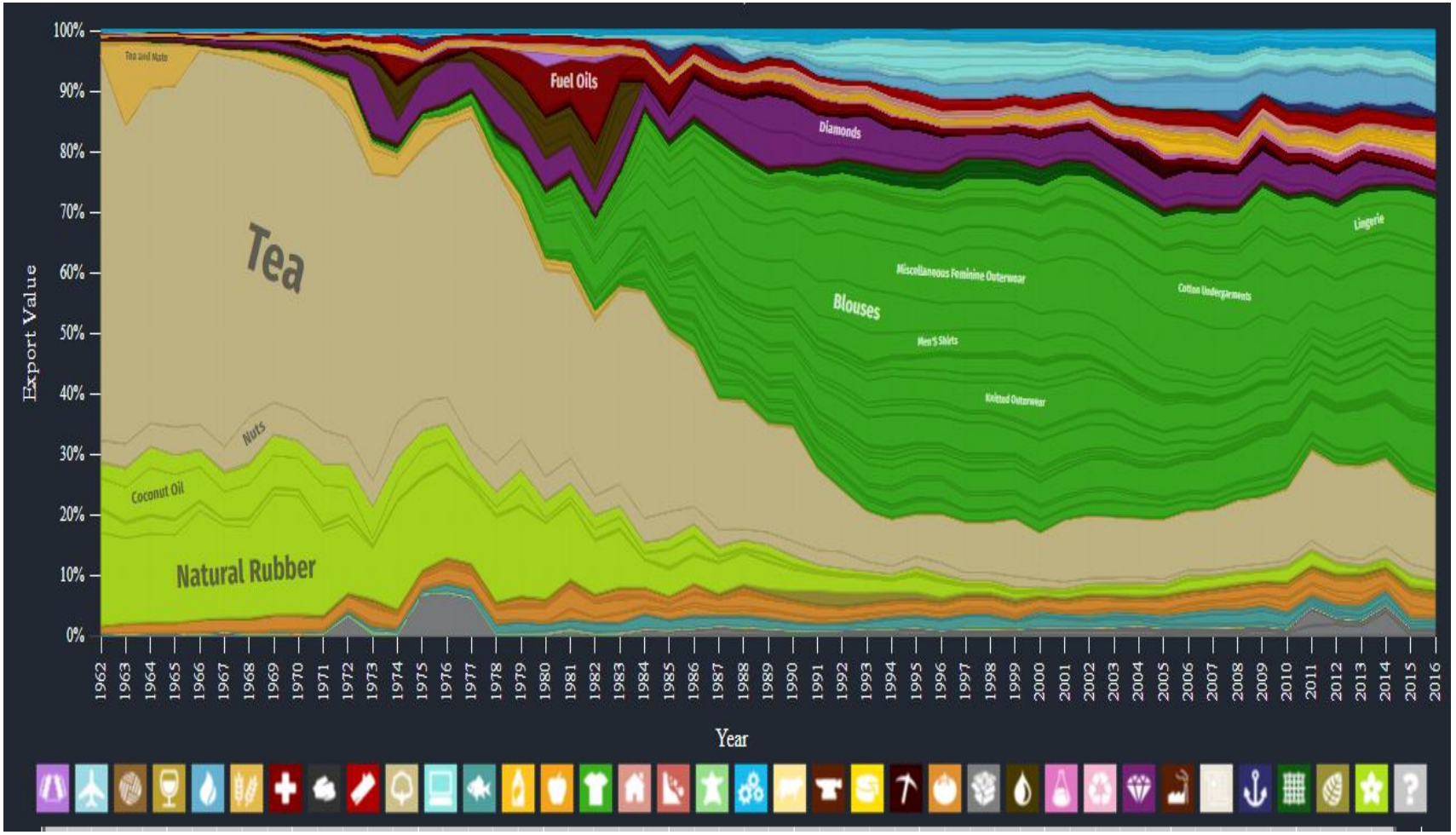
1. India
2. China
3. UAE
4. Singapore
5. Japan
6. Malaysia
7. Thailand
8. USA
9. Taiwan
10. Hong Kong



Source: Trade Map

Overview of Sri Lanka's Trade

Composition of Sri Lanka's exports remained almost the same from the late 1990s….



Source: Trade Map

Literature Review – Global Context

Researcher/s	Variables Used	Methodology	Findings
Waliullah et. al (2010) Pakistan	RER, GDP, M3 (1970 – 2005)	ARDL method	Stable long-run relationship between the TB and EX Rate
Chowdhury et.al. (2014) Bangladesh	Nominal exchange rate, Per capita GDP for domestic and USA, Foreign Reserve asset (1973 – 2011)	ADF Unit Root Tests, Co-integration and Engle-Granger test	Devaluation improves trade balance in the long run
Duasa (2007) Malaysia	GDP, M3 (1974 – 2003)	ARDL co-integration approach	No relationship between EX & TB

Literature Review – Few Sri Lankan Studies

Researcher/s	Variables Used	Methodology	Findings
Wignaraja (1998)	RER, Real wages, Real gross manufacturing output (1974 -1991)	Cointegration Test and the ECM	Weak relationship between export and REER
Perera (2009)	RER, GDP of Sri Lanka, GDP of 6 partner countries (1996:Q1 to 2008:Q2)	ARDL model	No any specific pattern in TB in response to depreciation of RER
Vijayakumar (2014)	RER, RGDP of Sri Lanka, RGDP of the USA (1977 -2010)	Unit root test, Cointegration Test and Granger causality test	Positive relationship between REER and TB both in the short run and the long run

Methodology

Linear Model

$$LnTB_{j,t} = \propto_0 + \propto_1 LnY_t^{SL} + \propto_2 LnY_{j,t} + \propto_3 LnREX_t + D1 + \varepsilon_t$$

$$\Delta LnTB_{j,t} = \beta_0 + \sum_{t=1}^{n1} \beta 1, i\, \Delta\, LnTB_{j,t-i} + \sum_{t=0}^{n2} \beta 2, i\, \Delta\, LnY_{t-i}^{SL} + \sum_{t=0}^{n3} \beta 3, i\, \Delta\, LnY_{j,t-i} + \sum_{t=0}^{n4} \beta 4, i\, \Delta \quad LnREX_{t-1}$$
$$+ \gamma_0 LnTB_{j,t-1} + \gamma_1 LnY_{t-1}^{SL} + \gamma_2 LnY_{j,t-1} + \gamma_3\, LnREX_{t-1} + D_1 + \epsilon_1$$

Where,

TB_j - Trade balance defined as the ratio of Sri Lanka's imports from country *j* to its exports to country *j*

Y^{SL} - Sri Lanka's real income in index form

Y_{jt} - Real income of trading partner j

REX_j - Real bi-lateral exchange rate between Sri Lanka and its trading partner j

D1 - Dummy variable to capture the global financial crisis

Methodology

Non-Linear Model

$$\Delta LnTB_{j,t} = \beta_0 + \sum_{t=1}^{n1} \beta 1, i\, \Delta\, LnTB_{j,t-i} + \sum_{t=0}^{n2} \beta 2, i\, \Delta\, LnY_{t-i}^{SL} + \sum_{t=0}^{n3} \beta 3, i\, \Delta\, LnY_{j,t-i} + \sum_{t=0}^{n4} \beta 4, i\, \Delta\, POS_{t-i} + \sum_{t=0}^{n5} \beta 5, i\, \Delta\, NEG_{t-i} + \gamma_0 LnTB_{j,t-1} + \gamma_1 LnY_{t-1}^{SL} + \gamma_2 LnY_{j,t-1} + \gamma_3\, POS_{t-1} + \gamma_4\, NEG_{t-1} + D_1 + \epsilon_1$$

where,

POS_t - exchange rate depreciation

NEG_t - exchange rate appreciation

This Equation is named as Non-linear Auto Regressive Model, which allows to capture the asymmetric effect of exchange rate fluctuations on the trade balance, as it has been mentioned in Shin et al. (2014)

Data

- The data sample covers fourteen trading partner countries of Sri Lanka for the period 2007 Q1 to 2017 Q4

Sri Lanka's Trade with Major Trading Partners in 2017

	Value in USD million			Share (%)		
Country	Exports	Imports	Total Trade	Exports	Imports	Total Trade
India	691	4,527	5,219	6.1	21.6	16.1
China	247	3,955	4,203	2.2	18.9	13.0
United States of America	2,909	492	3,401	25.6	2.3	10.5
Singapore	189	1,352	1,541	1.7	6.4	4.8
United Kingdom	1,036	268	1,304	9.1	1.3	4.0
Japan	209	1,038	1,248	1.8	4.9	3.9
Germany	540	400	941	4.8	1.9	2.9
Italy	524	305	829	4.6	1.5	2.6
Malaysia	54	638	692	0.5	3.0	2.1
Hong Kong	170	422	592	1.5	2.0	1.8
Thailand	56	518	574	0.5	2.5	1.8
Belgium	347	79	425	3.1	0.4	1.3
Turkey	233	85	318	2.1	0.4	1.0
Netherlands	221	78	298	1.9	0.4	0.9
World	11,360	20,980	32,340	100.0	100.0	100.0

Source: Central Bank of Sri Lanka

Data

Variable	Definition	Expected sign
LNREX	Bi-lateral real exchange rate	+
LNY ^{SL}	Sri Lanka's economic activity is represented by real GDP which is converted in to an index (2007 Q1 = 100)	+/-
LNY$_j$	Economic activity of country j represented either by Industrial Production Index or index derived from real GDP	+/-
D1	Dummy variable to capture the global financial crisis	-

$REX = NEX * P_i / P_{SL}$

where P_i - CPI in county *i*

P_{SL} - CPI in Sri Lanka

NEX - bilateral nominal exchange rate (period average)

Data Sources: International Financial Statistics, Central Bank of Sri Lanka, Bloomberg

Results of Linear Specification

- Significant short-run effects of exchange-rate movements on the trade balance
  - India
  - Hong Kong
- Long run effect – Malaysia Only

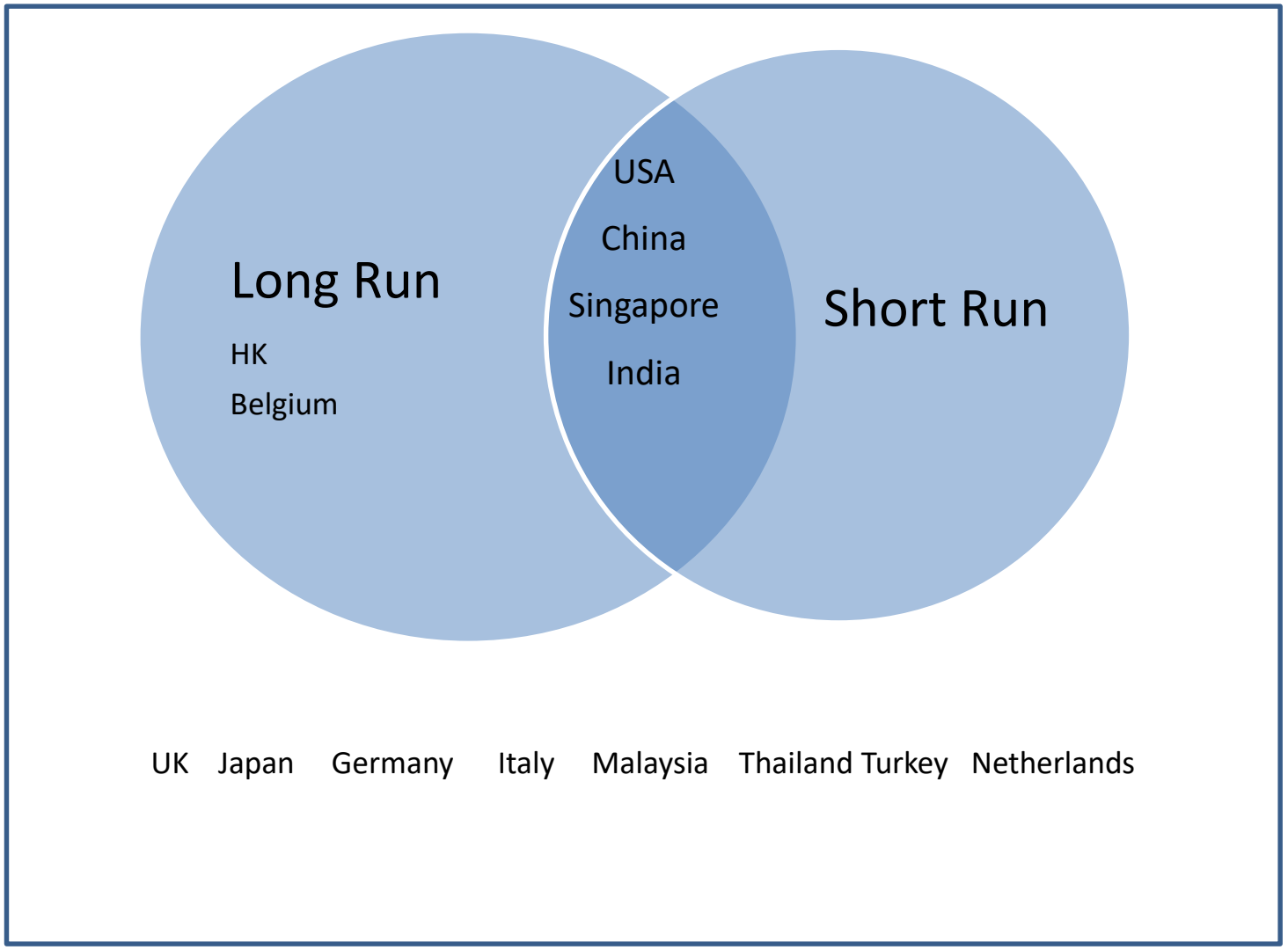
Results of Non-Linear Specification

	India	China	USA	Singapore	UK	Japan	Germany	Italy	Malaysia	Hong Kong	Thailand	Belgium	Turkey	Netherland
REX_pos	2.79**	0.84	6.47**	-5.12*	0.47	0.006	0.80	-0.21	-1.98	3.86*	1.75	2.71	1.37	-0.05
	[2.70]	[0.86]	[2.04]	[-1.89]	[0.64]	[0.01]	[0.83]	[-0.26]	[-1.30]	[1.76]	[0.89]	[0.92]	[0.53]	[-0.02]
REX_neg	0.01	-4.19***	0.68	-2.20	-0.49	0.37	0.32	0.26	-0.36	-3.92***	-0.34	-1.85**	0.82	-0.0004
	[0.03]	[-3.99]	[0.69]	[-1.02]	[-1.07]	[0.89]	[0.63]	[0.50]	[-0.33]	[-2.95]	[-0.30]	[-2.24]	[0.66]	[-0.0003]
LnY^{sl}	-1.16	-1.64	-2.03**	0.16	-1.36*	0.18	-0.75	-0.18	-1.31	-1.92	-3.50**	-1.22	-1.75	0.42
	[-1.48]	[-1.07]	[-2.16]	[0.07]	[-1.78]	[0.25]	[-1.34]	[-0.23]	[-1.22]	[-0.49]	[-2.70]	[-0.63]	[-1.04]	[0.20]
LnY_j	-1.82**	-0.23	-8.98*	3.02	-1.06	0.12	0.88	-1.08	0.67	-2.53	-0.30	-3.94**	1.04	0.48
	[-2.21]	[-0.27]	[-1.95]	[1.64]	[-0.45]	[0.18]	[1.44]	[-1.53]	[0.32]	[-0.43]	[-0.42]	[-2.52]	[0.50]	[0.25]
DREX_pos	2.79**	1.92	10.52***	-4.00	2.14	1.09	0.43	-0.11	-3.96	3.47	-2.82	-4.10	-1.44	2.52
	[2.70]	[0.92]	[3.13]	[-0.7]	[1.32]	[1.18]	[0.27]	[-0.08]	[-0.89]	[0.75]	[-1.36]	[-1.06]	[-0.39]	[0.78]
DREX_neg	1.09	7.47***	-10.10**	13.72*	-0.02	1.39	-1.02	-0.29	2.55	-2.53	0.29	4.72	3.73	0.92
	[0.99]	[-3.88]	[-2.07]	[2.00]	[-0.02]	[1.19]	[-1.00]	[-0.36]	[1.30]	[-0.52]	[0.07]	[1.20]	[1.06]	[0.43]
$DLnY^{sl}$	-0.72*	-1.19	-2.03**	-0.90	-1.28**	-0.49	-0.65	-0.54	-0.89	-4.08*	-2.36***	-0.68	-1.73	0.31
	[-1.73]	[-1.04]	[-2.16]	[-0.06]	[-2.14]	[-1.54]	[-1.32]	[-0.95]	[-1.21]	[-1.85]	[-2.78]	[-0.64]	[-1.44]	[0.20]
$DLnY_j$	0.05	-0.75	0.97	0.68	0.46	-0.06	-0.002	-1.07**	-0.66	3.16	2.51*	-1.99	1.01	0.21
	[0.04]	[-0.72]	[0.11]	[0.26]	[0.32]	[-0.12]	[-0.001]	[-2.74]	[-0.42]	[1.04]	[1.87]	[-0.84]	[0.80]	[0.16]
FC	0.07	-0.008	-0.71***	-0.02	0.38	-0.14	-0.13	-0.06	-0.44	0.89	0.02	-0.98***	-0.57	-0.04
	[0.64]	[-0.04]	[-3.61]	[-0.52]	[1.04]	[-0.96]	[-0.82]	[-0.35]	[-1.11]	[2.91]	[0.11]	[4.52]	[-1.23]	[-0.25]
Constant	11.98*	5.44	53.9*	-17.04	12.29	-1.36	-0.07	6.33	1.98	17.68	16.57*	23.42*	4.61	3.76
	[2.18]	[1.34]	[2.37]	[-1.60]	[0.98]	[-0.34]	[-0.02]	[1.04]	[0.30]	[1.31]	[2.17]	[2.04]	[0.93]	[-0.58]
EC term	-0.86***	-0.98***	-1.26***	-0.86***	-0.91***	-0.12	-0.75***	-0.72***	0.78***	-1.03***	-0.95***	-0.76***	-0.64***	-0.73***
	[-4.92]	[-9.88]	[-6.94]	[-5.08]	[-6.00]	[-0.97]	[-4.46]	[-3.96]	[-6.39]	[-4.47]	[-6.46]	[-4.66]	[-3.90]	[-5.41]
No. of Observations	42													
R-squared	0.5817	0.6197	0.7099	0.5141	0.5644	0.3313	0.4533	0.5324	0.4742	0.6788	0.5809	0.5315	0.505	0.3906
Diagnostic Tests														
Serial correlation LM test (1)	1.08(0.582)	1.09(0.580)	2.79(0.248)	12.13(0.002)	0.04(0.98)	3.86(0.145)	0.43(0.808)	5.58(0.061)	1.46(0.483)	3.30(0.192)	0.79(0.675)	3.12(0.201)	2.22(0.330)	3.66(0.161)
Standard errors have been corrected for presence of heteroskedasticity														

Notes: ***,**,* indicate significance at 1%, 5%, and 10%, respectively. t statistics are in [ ] parenthesis.

Critical values for diagnostic tests are taken from Chi-square distribution table and p values are in ( ).

Results of Non-Linear Specification



Results of Non-Linear Specification

- **India** is one of the major trading partners of Sri Lanka, and accounts for 16 per cent of total trade.

- Linear specification :The bilateral real exchange rate has significant impact on the trade balance in the short-run

- Nonlinear specification:
  - Depreciation of the real exchange rate has a significantly positive impact on the India-Sri Lanka trade balance both in the short-run and in the long-run
  - Real appreciation has no impact
  - Confirms the asymmetric effect of Rupee fluctuations

Results of Non-Linear Specification

- **China** is the second largest trading partner of Sri Lanka

- Linear specification: The bilateral real exchange rate has no significant short-run or long-run impacts on the trade balance

- Nonlinear specification:
  - Real exchange rate appreciations have significant negative impact on the China - Sri Lanka trade balance both in the short-run and long-run
  - Depreciation has no impact
  - Confirms the asymmetric effect of currency fluctuations

Results of Non-Linear Specification

- **USA** is the third largest trading partner of Sri Lanka accounting for 10.5% of the total trade

- Linear specification :The bilateral RER has no significant short -run or long-run impacts on the TB

- Nonlinear specification:
  - In the short- run: RER depreciation strengthens the trade balance whereas real appreciation weakens the same
  - In the long-run: real depreciation would provide significantly positive impact on the TB, while appreciation would cause no significant impact
  - Confirms the asymmetric effect of currency fluctuations both in the short run and in the long run

Results of Non-Linear Specification

- **Singapore** – **Contrasting Results**

  Singapore is the 4th Largest import origin, which contributes 6.4% of total imports of Sri Lanka

- Linear specification :The bilateral RER has no significant short-run or long-run impact on the TB

- Nonlinear specification:
  - Short Run: RER appreciation strengthen the TB
  - Long Run: RER depreciation worsen the TB

Results of Non-Linear Specification

- **Hong Kong**
  - Nonlinear specification:
    - RER appreciation would deteriorate the Hong Kong - Sri Lanka TB in the long run
    - RER depreciation would improve the TB
    - Results also revealed that exchange rate changes have asymmetric effects on the TB
- **Belgium**
  - Nonlinear specification:
    - RER appreciation would deteriorate the TB

Results of Non-Linear Specification

Additional Findings:

Own Income:

USA, UK and Thailand (Significant negative impact)

Trading partners income:
USA, Japan and Italy (Significant negative relationship)

Conclusion

- **The impact of currency fluctuation on trade balance, in the context of Sri Lanka, is more prevalent in this study than has been found by previous studies which used linear specifications**

- **Results also confirm asymmetry between the effect of currency appreciation and depreciation on the trade balance**

- **However, further research on this issue at Industry level may be necessary to come with policy recommendations**

Thank You