

Place-Based versus Place-Neutral Policies for Promoting Regionally Balanced Economic Growth: A Sri Lankan Case using CGE based Simulations

by

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Introduction

- **Development thinking has evolved over time**
- **The role of space in economic growth/ development have become increasingly emphasized**
- **Regionally balanced economic growth is suggested to be a cure for the problems of**
 - 1. slow economic growth rate**
 - 2. regional economic disparities**
- **What kind of policies can create a balance growth?**

Place based? Place neutral? Or a mixture of each?
- **There is only very few empirical evidences**
- **Lack of appropriate and practical economic tool is another gap**

Introduction

The Objective

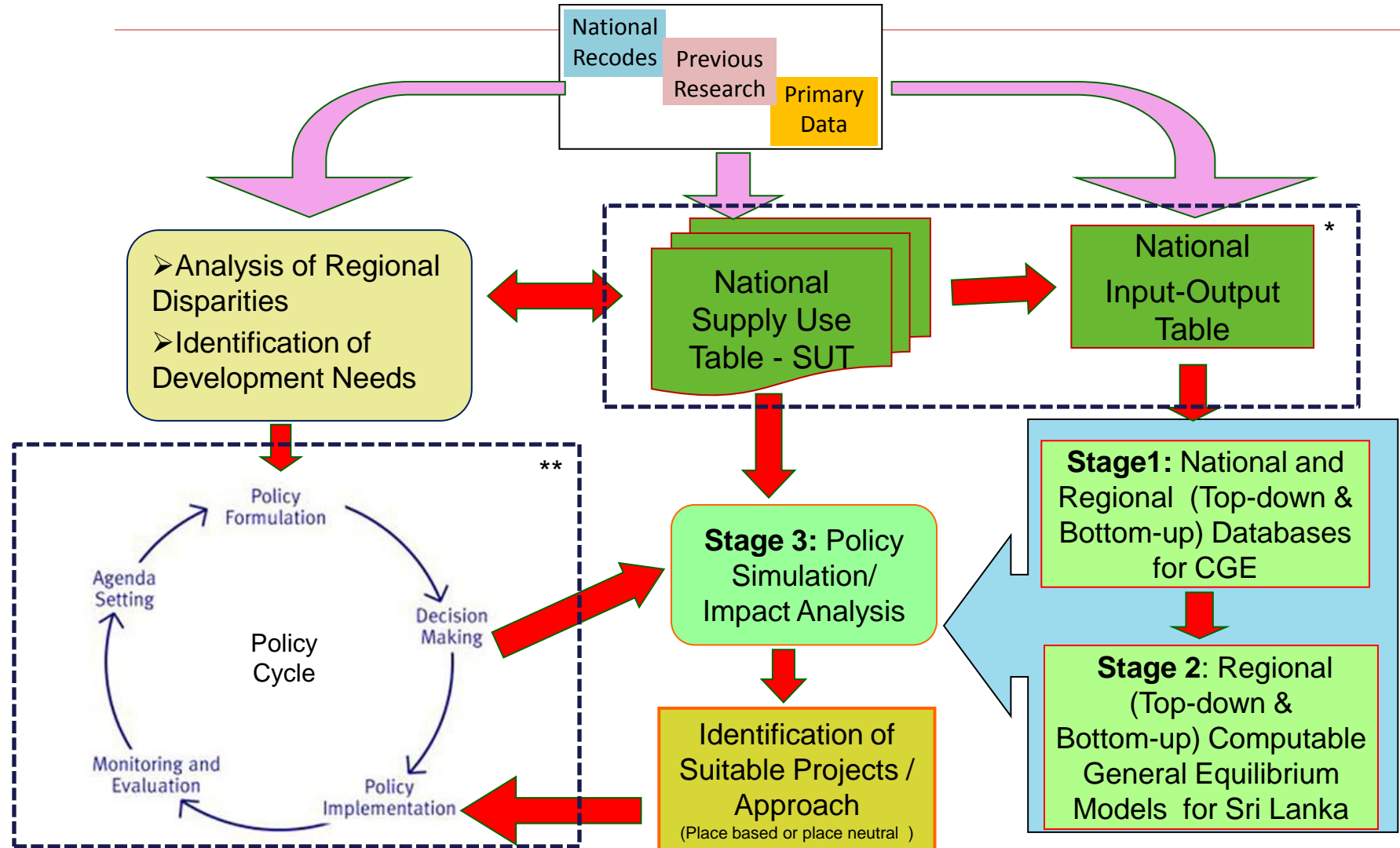
- **To analyze the relevance of place-based and place-neutral policies in achieving regionally balanced economic growth using a bottom-up regional CGE model developed for Sri Lanka**

Why Sri Lanka

- **Sri Lanka has considerable level of regional disparity at the moment**
- **The country has recently come out of a nearly three decades long civil conflict**
- **The country is currently motivated towards achieving a more regionally balanced economic growth pattern**

The Research

Framework



* Based on unpublished supply user and input output tables of department of statistics Sri Lanka

** Two development policies/ Projects given in current national development plan of Sri Lanka (NPD 2010) are selected for the analysis

Structure of a CGE model- national

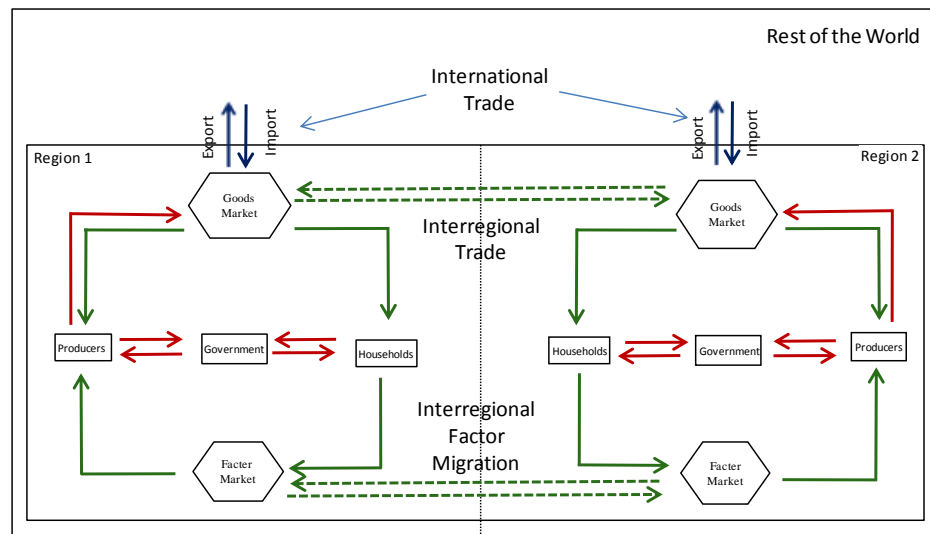
- **A CGE model is a system of simultaneous equations describing an economy**
- **Mostly based on neo classical economic theory and accounting principles in Input Output (IO) table**

Policy simulation with a CGE model

- **The base year situation is assumed as the initial equilibrium**
- **Economy is assumed to achieve a new equilibrium after a shock with the assumed optimization behavior of its all agents**

The Structure of SLBRCGE

- The model is based on the theoretical structure of Australian ORANI and TERM models
- Regions (Provinces) of the country are treated as independent sub-economies and all optimizations are taking place in regional level



SLBRCGE Model – Database

Index	Set Name	Description	Typical size
s	SRC	(dom,imp) Domestic or imported (ROW) sources	2
c	COM	Commodities	65
m	MAR	Margin commodities (Trade, Land/ Water/ Air Transport)	4
i	IND	Industries (Agric 15, industry 36, services 14)	65
d	DST	Regions of use (destination)	9
r	ORG	Regions of origin	9
p	PRD	Regions of margin production	9
f	FINDEM	Final demanders(HOU,INV,GOV,EXP)	4
u	USER	Users = IND + FINDEM	69

Methodology

SLBRCGE Model – Database

	Sector	Share in GDP
1	Trade and repair work	16.32%
2	Land transport	10.56%
3	Construction	8.24%
4	Financial intermediation	8.21%
5	Public administration and defence	7.43%
6	Real estate activities	3.57%
7	wearing apparel, except fur	3.19%
8	meat, fish, fruit, veg. Process	2.80%
9	Other Vegetables	2.66%
10	food and beverages nec	2.49%
11	electricity	2.48%
12	Education	2.14%
13	refined petroleum products	2.09%
14	Mining and quarrying	1.71%
15	Paddy	1.42%
16	Fish (Inland and Marine)	1.34%
17	Tea	1.27%
18	Other Services	1.24%
19	Livestrock and Dairy	1.12%
20	electric motors / equip n.e.c.	1.12%
21	Coconut	1.10%
22	Post and telecommunications	1.07%

	Sector	Share in GDP
23	Manufacturing n.e.c.	1.06%
24	other chemical products	1.02%
25	tobacco products	0.94%
26	Dairy products	0.92%
27	non-metallic mineral products n.e.c.	0.91%
28	Oth. Agric and hunting	0.88%
29	Tea Processing	0.78%
30	Supporting and auxiliary transport	0.78%
31	Rice milling	0.74%
32	Health and social work	0.71%
33	Water transport	0.70%
34	Air transport	0.68%
35	Insurance and pension funding	0.68%
36	Rubber	0.66%
37	Other cereals	0.58%
38	Hotels and restaurants	0.54%
39	Firewood	0.54%
40	basic chemicals	0.46%
41	knitted and crocheted fabrics	0.36%
42	rubber products	0.35%
43	Oth. Bever. and spice	0.35%
44	plastics products	0.26%

	Sector	Share in GDP
45	textiles	0.20%
46	water	0.15%
47	Logging	0.13%
48	Furniture	0.12%
49	Potatoes	0.11%
50	Other milling	0.10%
51	wood products	0.10%
52	paper products, printing and publishing	0.09%
53	Recycling of non-metal waste and scrap	0.08%
54	computers	0.08%
55	leather products and footwear	0.07%
56	other textiles	0.07%
57	Fruit	0.06%
58	structural and fabricated metal products	0.06%
59	Maize	0.04%
60	Basic metals	0.03%
61	transport equipments	0.03%
62	electronic components	0.01%
63	medical ,optical, photographic equi.	0.01%
64	special / domestic machinary nec	0.00%
65	general-purpose machinery	0.00%

Experiment

- **The key objective is to compare the economy-wide growth and disparity reduction impact of two selected policies of place-neutral and place-based nature**
- **The two policies (one ongoing and one suggested) related to paddy sector are selected for simulation**
 - 1. Ongoing national fertilizer subsidy scheme for all Sri Lankan small scale rice paddy farmers**
 - 2. Development of enhanced irrigation infrastructure in Northern Province of Sri Lanka aimed at enhancing productivity in the small scale rice paddy farms in this region**

Background

- **Paddy provide staple food of rice for Sri Lankans**
- **1.8 million farmer families, are engaged in paddy cultivation though out the country and the paddy sector is contributing to 1.6 % of the national GDP ([CBSL, 2014](#))**
- **Chemical fertilizer is a major input used in paddy farming and it contributes to higher yield; Sri Lankan govt. is providing subsidized fertilizer for its small scale paddy farmers for number of years**
- **Crop water requirement for paddy is very high; without supplementary irrigation farmers in dry regions cannot cultivate two seasons**

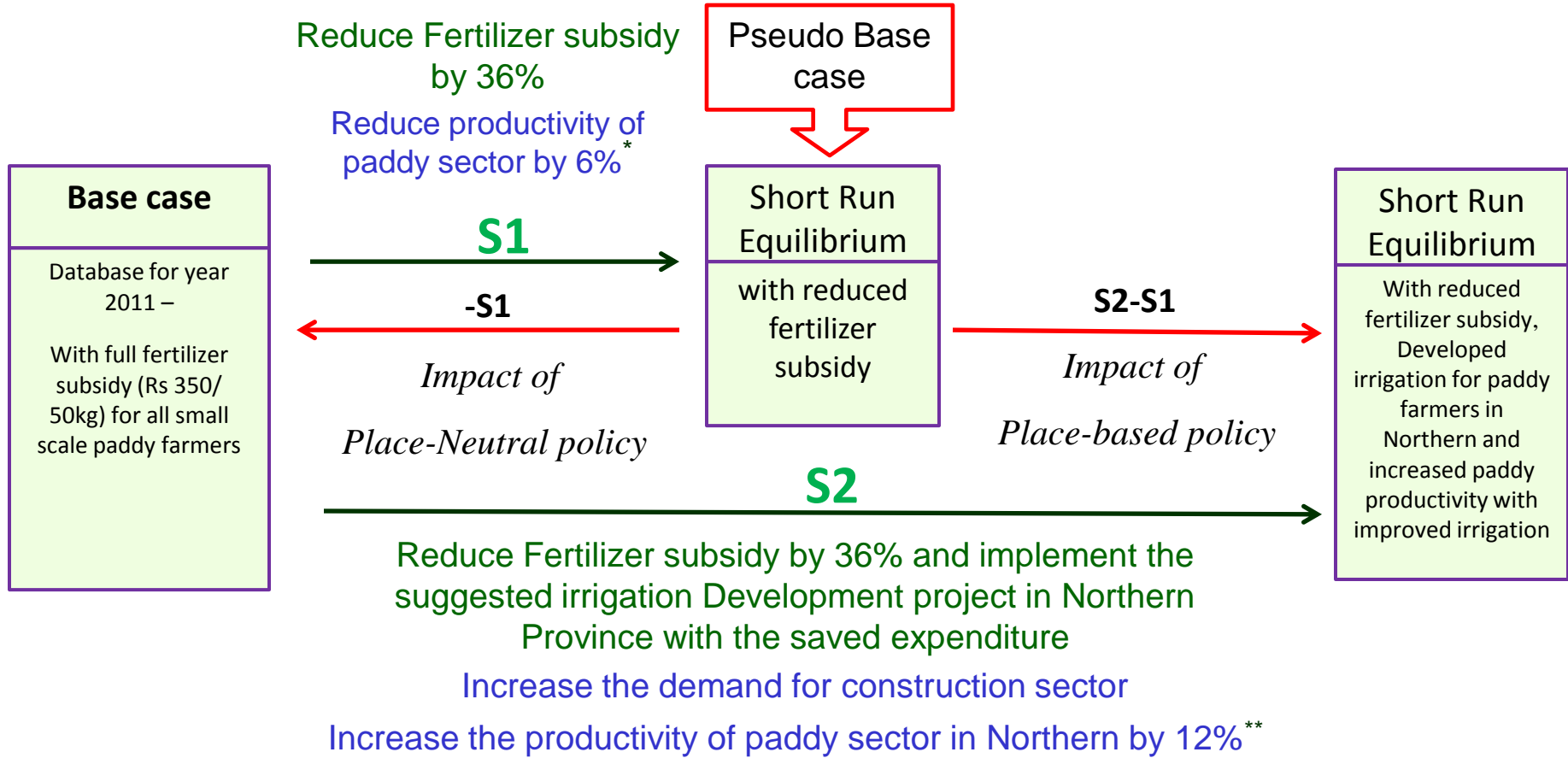
Experiment

- **The impact of developing irrigation infrastructure in Northern Province as a revenue neutral shock for the government by simultaneously cutting down the fertilizer subsidy is tested**
- **Cost of implementing the suggested irrigation projects is equivalent to 36% of current fertilizer subsidy**



Experiment

➤ Shocks used in the two stage simulation

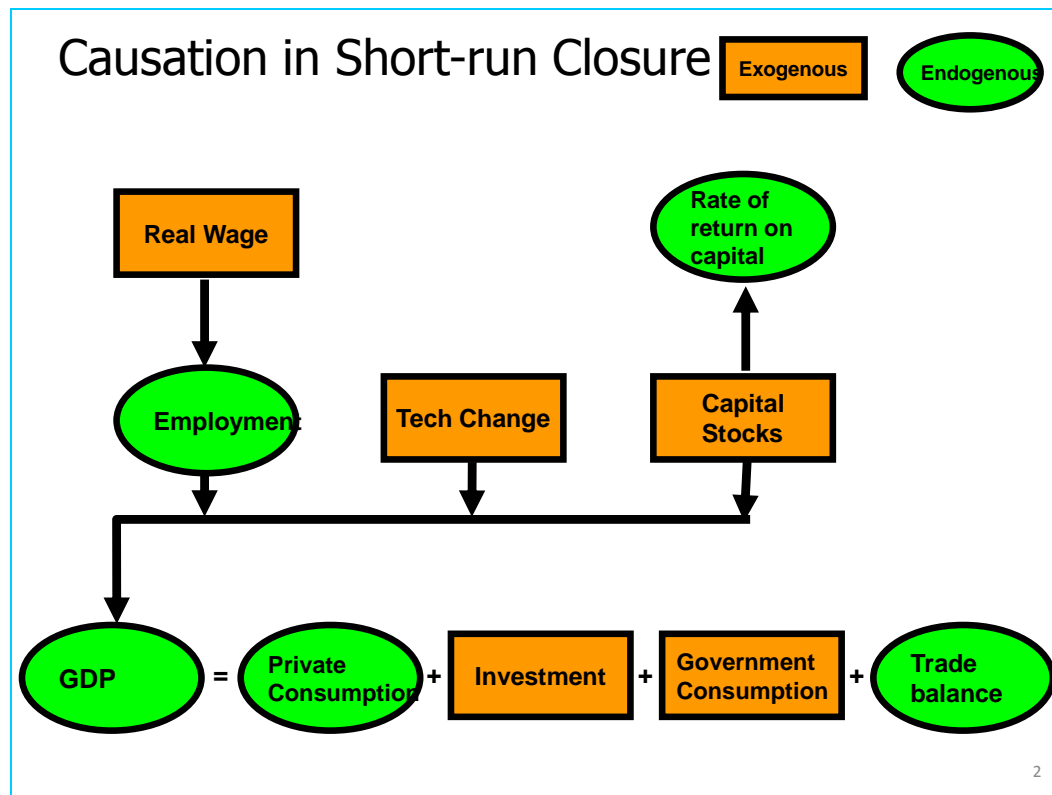


* Based on [Wijetunga et al., 2008](#)

** Based on [Hussain et al., 2007](#)

Closure

- A short-run closure is used



- At Macro level, Capital, Investments, Government expenditure, Real wages and Production technology are exogenous

Results

National Macro results

- The following table provide the national level macro impacts of our two simulation
- All the results are to be read as **Percent changes from base case**
- “-S1” and “S2-S1” indicate the impact of place based and place neutral policies

	S1	S2	-S1	s2-s1
Real GDP	-0.083	-0.023	0.083	0.060
Aggregate Employment	-0.124	-0.011	0.124	0.113
Real Household Income	-0.131	-0.024	0.131	0.107
Export Volume	-0.045	-0.337	0.045	-0.292
Import Volume Used	-0.057	0.082	0.057	0.139

Results



National Industry Output

	Sector	Share in GDP	Cumulative share	Percentage Change (from base case)		-S1	S2-S1
				S1	S2		
1	Trade and repair work	16.32%	16.32%	-0.06	-0.049	0.06	0.011
2	Land transport	10.56%	26.88%	-0.071	-0.022	0.071	0.049
3	Construction	8.24%	35.11%	-0.052	0.594	0.052	0.646
4	Financial intermediation	8.21%	43.33%	-0.065	-0.001	0.065	0.064
5	Public administration and Defense	7.43%	50.76%	0	0.003	0	0.003
6	Real estate activities	3.57%	54.33%	-0.131	-0.005	0.131	0.126
7	wearing apparel, except fur	3.19%	57.51%	0.009	-0.044	-0.009	-0.053
8	meat, fish, fruit, veg. Process	2.80%	60.31%	-0.035	-0.064	0.035	-0.029
9	Other Vegetables	2.66%	62.97%	-0.062	-0.014	0.062	0.048
10	food and beverages nec	2.49%	65.46%	-0.334	-0.304	0.334	0.03
11	Electricity	2.48%	67.93%	-0.086	-0.02	0.086	0.066
12	Education	2.14%	70.07%	-0.009	-0.003	0.009	0.006
13	refined petroleum products	2.09%	72.16%	-0.06	-0.045	0.06	0.015
14	Mining and quarrying	1.71%	73.88%	0.003	-0.036	-0.003	-0.039
15	Paddy	1.42%	75.29%	-1.372	-1.296	1.372	0.076
16	Fish (Inland and Marine)	1.34%	76.63%	-0.002	-0.053	0.002	-0.051
17	Tea	1.27%	77.90%	-0.136	-0.182	0.136	-0.046
18	Other Services	1.24%	79.15%	0.016	-0.053	-0.016	-0.069
19	Livestock and Dairy	1.12%	80.27%	-0.017	-0.082	0.017	-0.065
20	electric motors / equip n.e.c.	1.12%	81.39%	0.009	0.06	-0.009	0.051

Regional Macro results

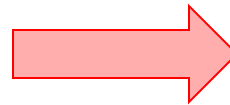
		Real GDP	Aggregate Employment	Real Investment	Export Volume	Import Volume
-S1	Western	0.026	0.051	-0.052	0.045	0.006
	Southern	0.092	0.131	0.001	-0.080	0.069
	Sabaragamuwa	0.093	0.144	0.021	-0.093	0.089
	Central	0.080	0.130	0.023	-0.130	0.071
	Uva	0.139	0.211	0.061	-0.185	0.130
	Eastern	0.155	0.188	0.037	0.227	0.094
	North Western	0.122	0.175	0.034	-0.085	0.104
	North Central	0.329	0.423	0.177	-0.437	0.304
	Northern	0.131	0.160	0.028	-0.159	0.086
S2-S1	Western	-0.024	-0.018	-0.211	-0.292	-0.053
	Southern	-0.004	-0.003	-0.159	-0.477	-0.007
	Sabaragamuwa	-0.001	0.001	-0.146	-0.472	0.003
	Central	0.018	0.036	-0.130	-0.620	0.025
	Uva	0.014	0.028	-0.121	-0.641	0.024
	Eastern	0.014	0.028	-0.107	-0.536	0.021
	North Western	0.009	0.019	-0.136	-0.628	0.019
	North Central	0.038	0.064	-0.044	-1.011	0.080
	Northern	1.624	2.533	3.125	-2.759	4.499

Results

Impact of selected policies on regional disparity

- Following Smith2004, regional disparity analysis indicator MD_w is used in analyzing regional disparity in base and post simulation situations.
- The indicator is further decomposed in understanding individual region's contribution to disparity

$$MD_w = \left(\sum_{i=1}^n (|Y_i - \bar{Y}|) \frac{P_i}{P} \right) / \bar{Y}$$

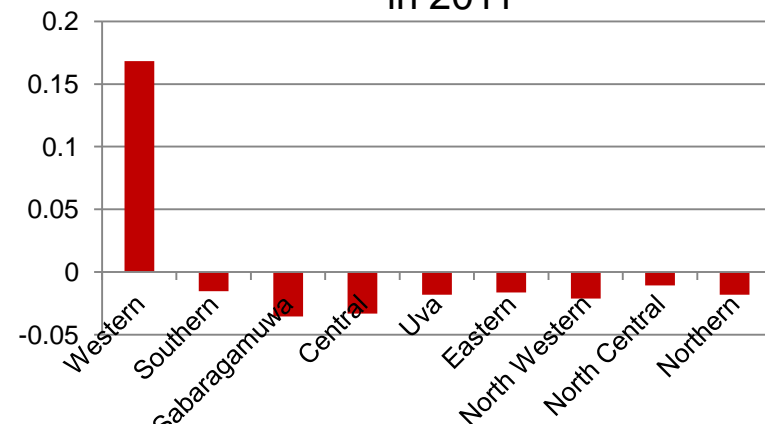


$$R_i = (Y_i - \bar{Y}) \frac{P_i}{P} / \bar{Y}$$

where Y_i is the per capita GDP of i^{th} province, \bar{Y} is per capita GDP of the country, P_i is population of i^{th} province, N is the number of provinces and P is population of the country

In our base year $MD_w = 0.336$

Regional Contribution to disparity (MD_w) in 2011



Impact of selected policies on regional disparity

- **Regional disparity reduction impact of place based policy is comparatively higher**

	MD_w	% Change
Base case	0.33653	
Short run equilibrium after S1 (after reducing Fertilizer Subsidy)	0.33705	0.155%
Short run equilibrium after S2 (With reduced subsidy and improved irrigation in Northern Province)	0.33630	-0.068%
- S1 (impact of place-neutral Fertilizer subsidy policy)	-0.00052	-0.155%
S2-S1 (impact of place based Northern irrigation development policy)	-0.00075	-0.223%

Results



Impact of selected policies on regional disparity

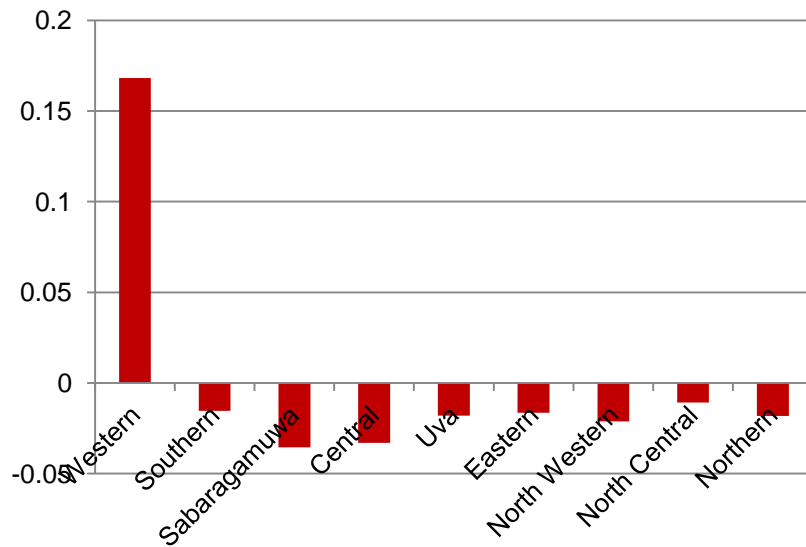
In summary,

	GDP Impact	Disparity Impact
- S1 (impact of place-neutral Fertilizer subsidy policy)	0.083 %	-0.155%
S2-S1 (impact of place based Northern irrigation development policy)	0.060 %	-0.223%

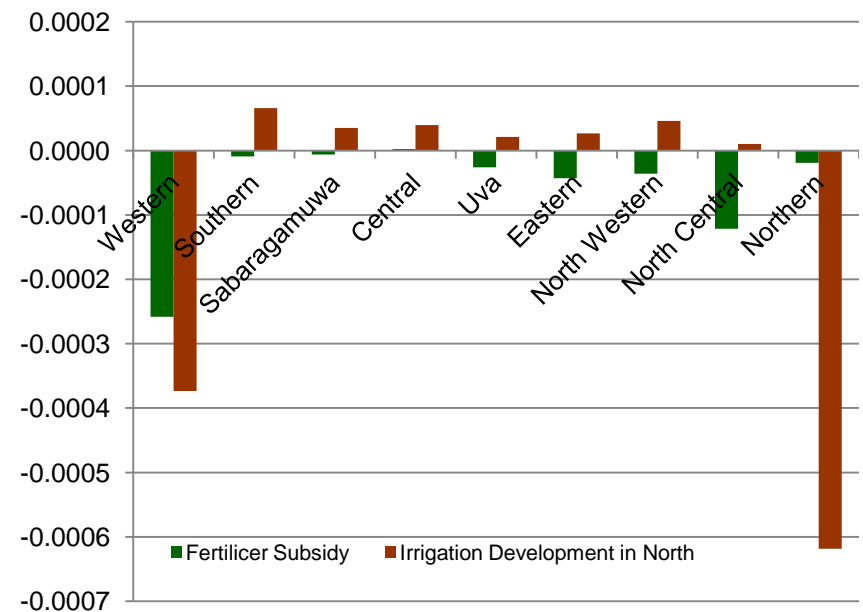
National and Regional Macro results

➤ Regional disparity impact of each policy is different

Regional contribution to mean deviation in base year



Changes in regional contribution to mean deviation



Limitations



Conclusions

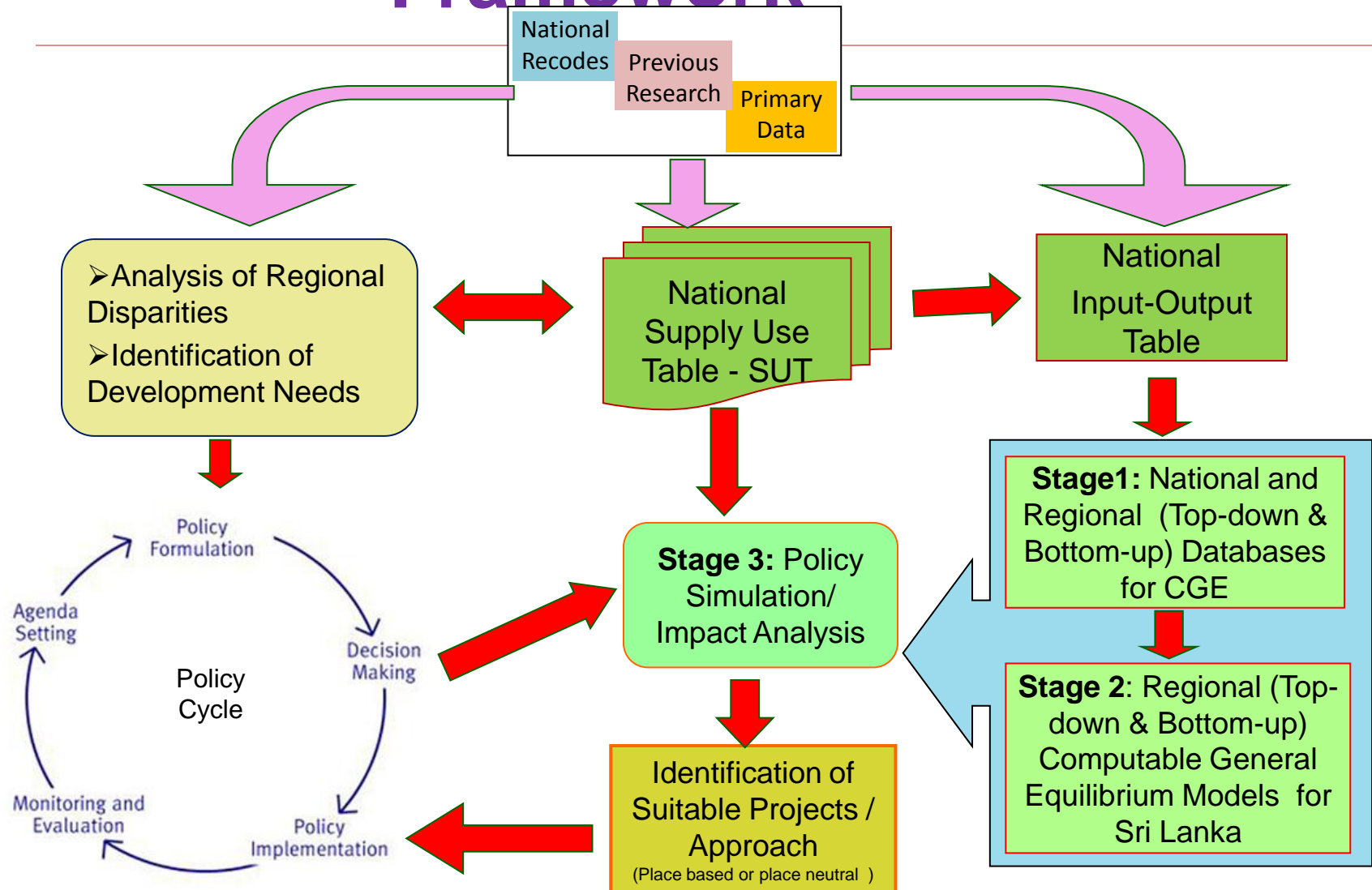
- **Our simulations highlight the usefulness of the model in analyzing the economy-wide effects of both Place-based and Place-neutral policy scenarios**
- **The simulation of the Sri Lankan fertilizer subsidy policy supports the argument that no policy can be purely Place-neutral in terms of impact**
- **The results from our Place-based policy of developing irrigation infrastructure in Northern Province show that even Place-based policies targeted to a single region can have impacts on other regions**

Conclusions

- **Simulations using our bottom-up model can assist in identifying the order of magnitude and spatial pattern of regional impact of policies**
- **This approach can be used in disaggregating the overall impact of policies by sector and by region**
- **Output from regional CGE model can effectively linked with convergence analysis in identifying the convergence impact of suggested policies**
- **Bottom up regional CGE modeling approach can usefully be employed in identifying relevant policies for regionally balanced economic growth**

The Research

Framework



Thank You

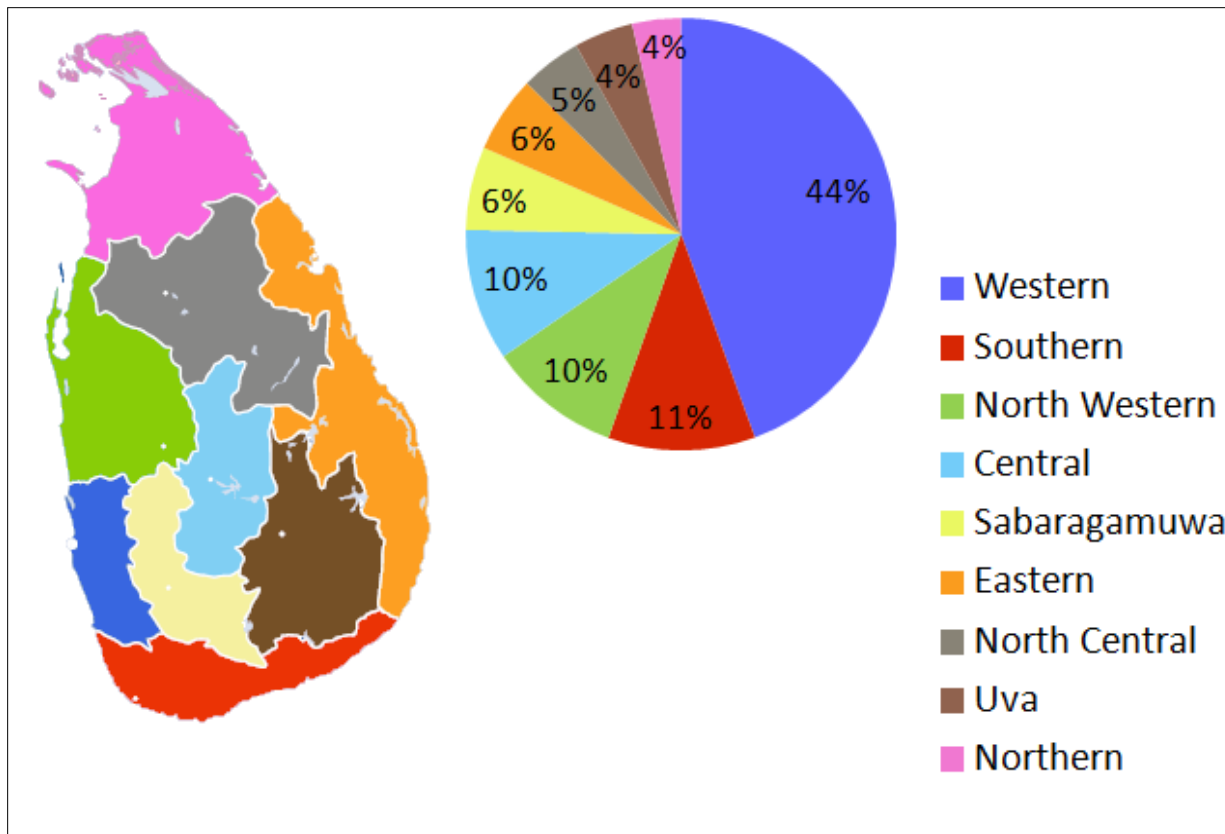
Acknowledgements

Constructive comments, suggestions, encouragement and all kinds of assistance received from supervisors Prof. Smith, A/Prof. Bandara and Dr. Naranpanawa as well as the comments, suggestions and insights into the modeling approach received from Prof. Horridge, Prof. Phillip Adams and other researchers from Center of Policy Studies are gratefully acknowledged. Support from various Sri Lankan institutes and officials in acquiring relevant data for this study is deeply appreciated.

For further details

<http://www.buseco.monash.edu.au/eco/research/conferences/monash-phd-conference-2014/wijerathna-griffith.pdf>

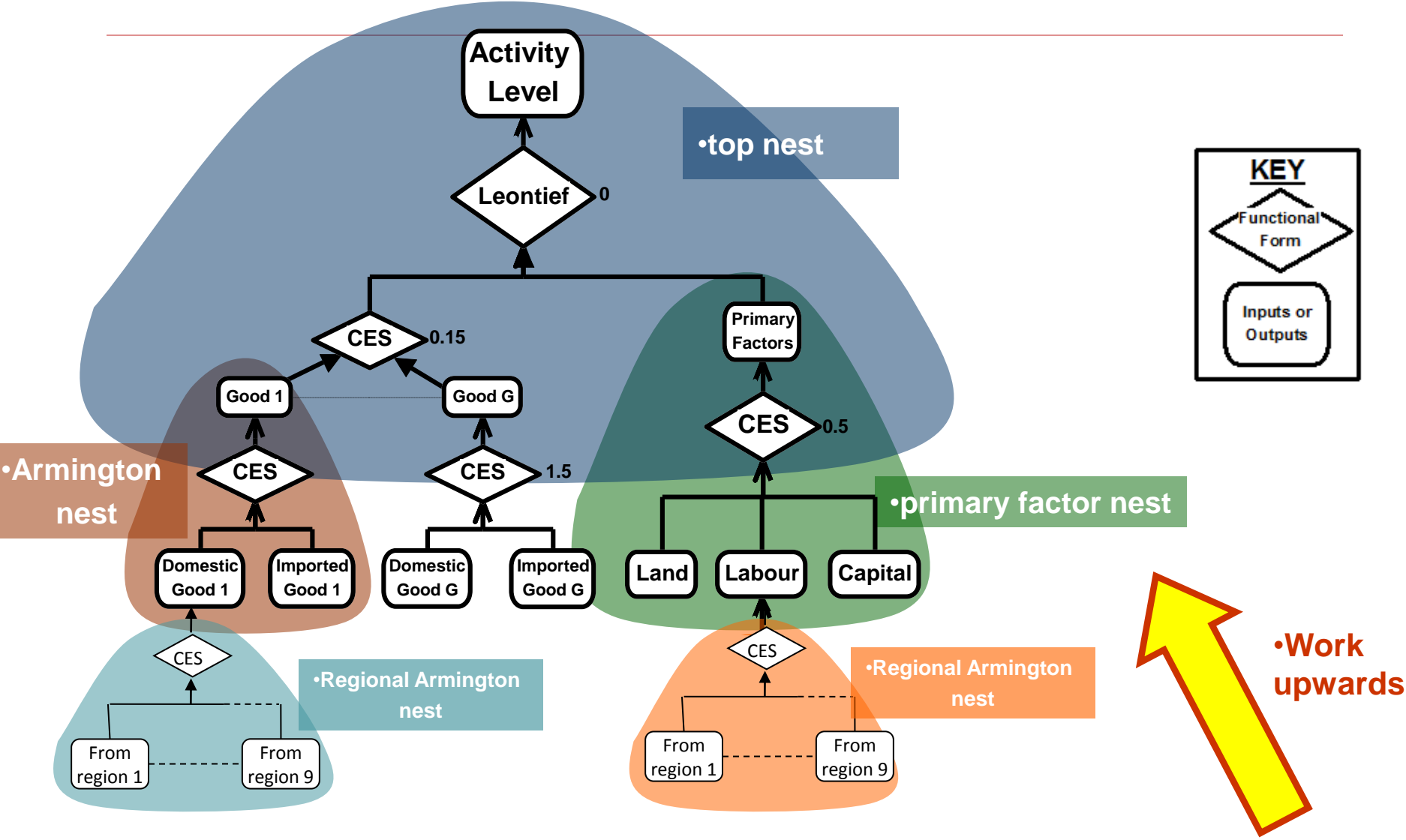
- **In 2011, 44% of national GDP is produced in Western Province**



Source: Authors Calculation based on Central Bank of Sri Lanka 2013

Methodology

The Nested Production Functions of SLBRCGE



Source: Adapted from Horridge et al 2005 and Horridge 2012