



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

# An Empirical Analysis of the Role of China's Exports on CO2 Emissions

Nyakundi M. Michieka

Graduate Research Assistant, Natural Resource Economics Department,  
West Virginia University,  
Morgantown, WV 26505-6108  
Email: nyakundi.michieka@mail.wvu.edu  
Tel: 304-293-5403

Jerald Fletcher

Professor of Energy, Environmental and Natural Resource Economics,  
West Virginia University,  
Morgantown, WV 26505-6108  
Email: jerry.fletcher@mail.wvu.edu  
Tel: 304-293-5499

Wesley Burnett

Assistant Professor of Energy, Environmental and Natural Resource Economics,  
West Virginia University,  
Morgantown, WV 26505-6108  
Email: wesley.burnett@mail.wvu.edu  
Tel: 304-293-5639

***Poster prepared for presentation at the Agricultural & Applied Economics  
Association's 2012 AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012***

*Copyright 2012 by Nyakundi M. Michieka, Jerald Fletcher and Wesley Burnett. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.*

# An Empirical Analysis of the Role of China's Exports on CO2 Emissions

Nyakundi Michieka, Jerald Fletcher and Wesley Burnett

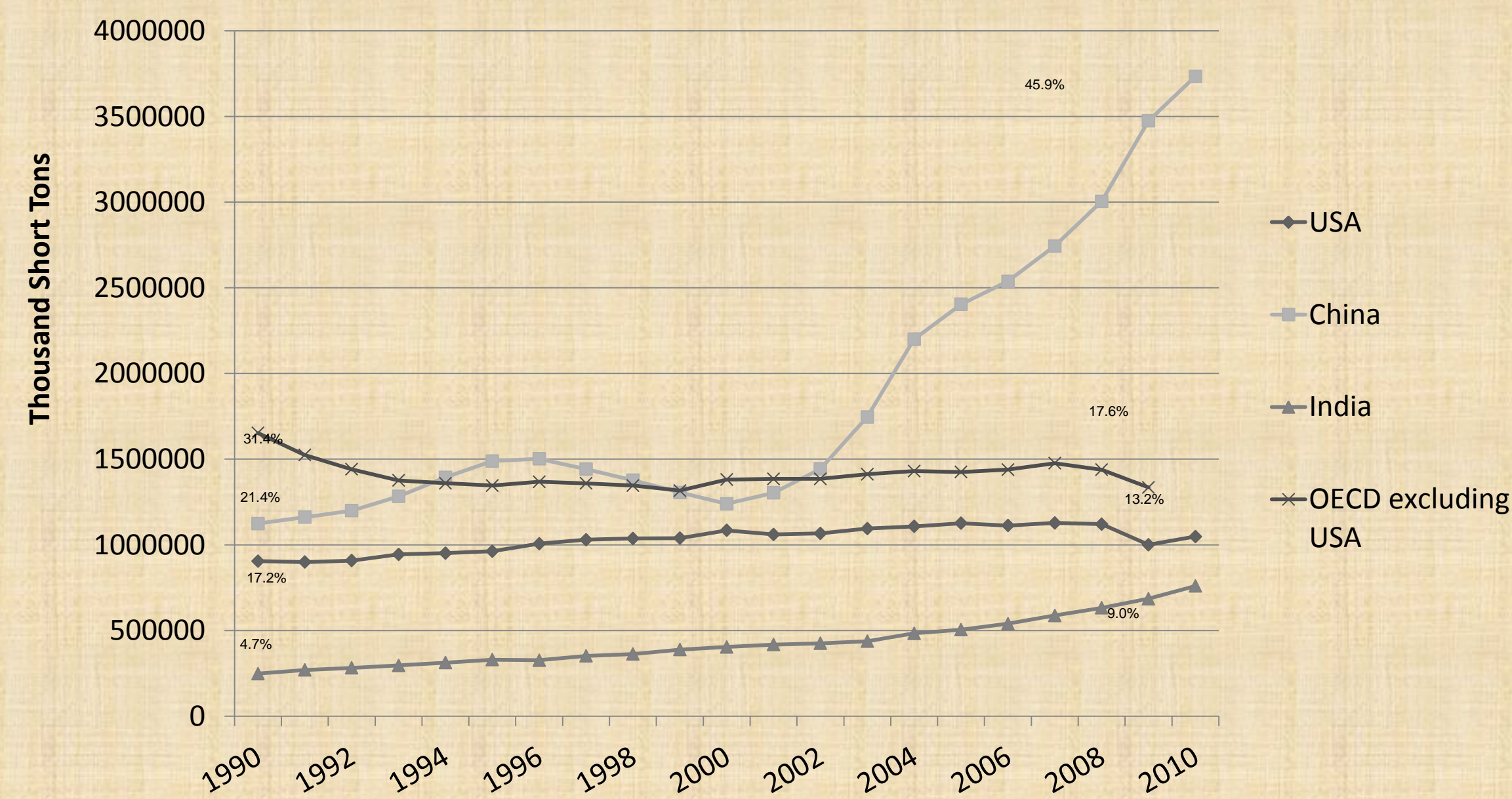
Department of Natural Resource Economics, West Virginia University, Morgantown WV, 26506



## Introduction

- China is the largest Energy consumer and the world's top CO2 emitter
- Presently, China emits 21.3 percent of global CO2 emissions
- Growth in coal – fired electricity generation has been cited as one of the reasons for this surge

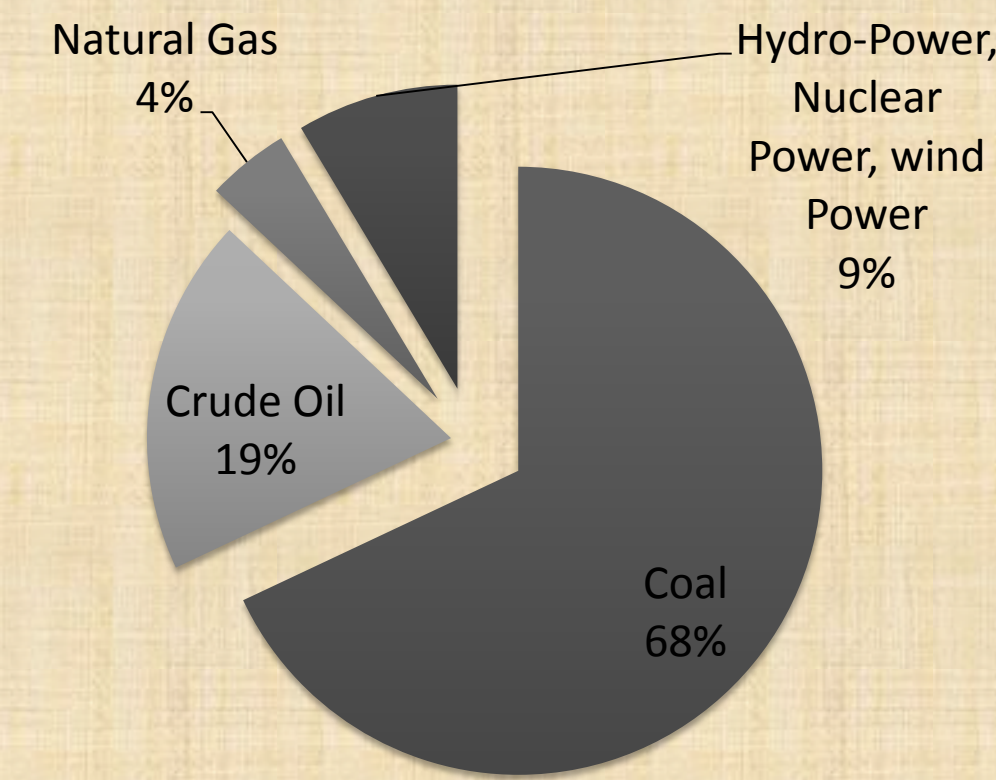
Figure 1. Historical Coal Consumption



## Motivation

- According to new research, about 33% of all Chinese carbon emissions are the results of producing goods for export
- This problem is likely to persist owing to the rising popularity of China's exports
- Pollution havens will attract industries from areas with more stringent rules

Figure 2. China's Consumption of Energy (2010)



## Objectives

- Investigate the relationship between exports, coal consumption, income and CO2 emissions
- Attempt to correct for coal consumption data

## Methodological Approach

- To analyze this relationship we specified a VAR model as follows:

$$\begin{bmatrix} EXPORTS_t \\ EMISS_t \\ CONS_t \\ INCOME_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} EXPORTS_{t-1} \\ EMISS_{t-1} \\ CONS_{t-1} \\ INCOME_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} EXPORTS_{t-2} \\ EMISS_{t-2} \\ CONS_{t-2} \\ INCOME_{t-2} \end{bmatrix} + \dots + A_i \begin{bmatrix} EXPORTS_{t-i} \\ EMISS_{t-i} \\ CONS_{t-i} \\ INCOME_{t-i} \end{bmatrix} + \begin{bmatrix} \epsilon_{EXPORTS} \\ \epsilon_{EMISS} \\ \epsilon_{CONS} \\ \epsilon_{INCOME} \end{bmatrix}$$

Table 1. Granger Causality Tests

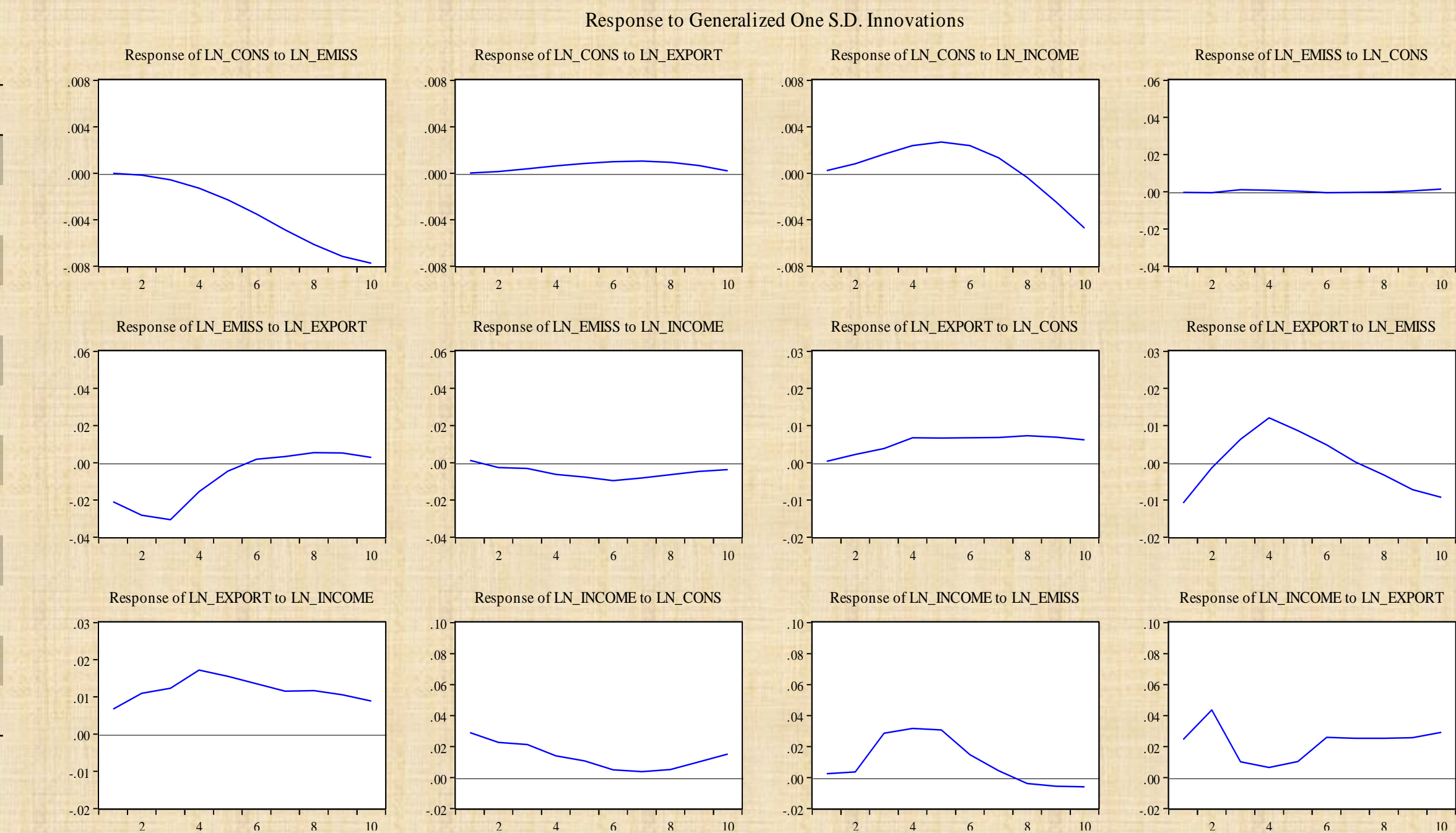
Hypothesis:	F-Statistic	Prob.
LN_EXPORT does not Granger Cause LN_CONS	2.3831	0.0898*
LN_CONS does not Granger Cause LN_EXPORT	1.9036	0.1511
LN_EXPORT does not Granger Cause LN_EMISSIONS	3.1473	0.0400**
LN_EMISSIONS does not Granger Cause LN_EXPORT	2.2986	0.0986*
LN_EXPORT does not Granger Cause LN_INCOME	2.3441	0.0936*
LN_INCOME does not Granger Cause LN_EXPORT	0.5981	0.6214
LN_EMISSIONS does not Granger Cause LN_CONS	0.8166	0.4952
LN_CONS does not Granger Cause LN_EMISS	2.5802	0.0727*
LN_INCOME does not Granger Cause LN_CONS	4.3563	0.0119***
LN_CONS does not Granger Cause LN_INCOME	0.6426	0.5938
LN_INCOME does not Granger Cause LN_EMISSIONS	1.2149	0.3219
LN_EMISSIONS does not Granger Cause LN_INCOME	1.0245	0.3962

Figure 3. Variance Decomposition Analysis

Variance Decomposition of LN_CONS:					
Period	S.E.	LN_CONS	LN_EXPORT	LN_EMISS	LN_INCOME
1	0.000511	100	0	0	0
5	0.007855	92.70707	5.344069	1.398673	0.550192
10	0.019797	53.36225	7.766309	9.437798	29.43364
Variance Decomposition of LN_EXPORT:					
Period	S.E.	LN_CONS	LN_EXPORT	LN_EMISS	LN_INCOME
1	0.019677	4.922843	94.73549	0	0.341672
5	0.03985	2.919406	34.03641	7.49851	55.54568
10	0.047905	5.45398	25.44814	11.18288	57.915
Variance Decomposition of LN_EMISS:					
Period	S.E.	LN_CONS	LN_EXPORT	LN_EMISS	LN_INCOME
1	0.042797	2.869818	18.40518	66.29852	12.42648
5	0.093723	1.752594	13.99362	71.74069	12.51309
10	0.163376	2.183012	9.58627	45.27713	42.95358
Variance Decomposition of LN_INCOME:					
Period	S.E.	LN_CONS	LN_EXPORT	LN_EMISS	LN_INCOME
1	0.086355	11.12244	0	0	88.87756
5	0.196482	2.855105	2.96612	4.229296	89.94948
10	0.247411	2.126706	2.562368	3.408093	91.90283

Cholesky Ordering: LN\_CONS LN\_INCOME LN\_EXPORT LN\_EMISS

Figure 4. Generalized Impulse Response Functions



## Summary of Key Findings

- Bi-directional causality running from exports to emissions
- Granger causality running from exports to coal consumption
- Income will determine the future variability in CO2 emissions
- The government should employ renewable energy strategies to reduce CO2 emissions

### Acknowledgements

This material is based upon work supported by the Department of Energy under Award Number DE-FC26-06NT42804. **Disclaimer:** "This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof."

### Further Information

Please contact nyakundi.michieka@mail.wvu.edu for more information. The views expressed are those of the authors, all errors are our own. Results are preliminary, do not cite without permission.