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

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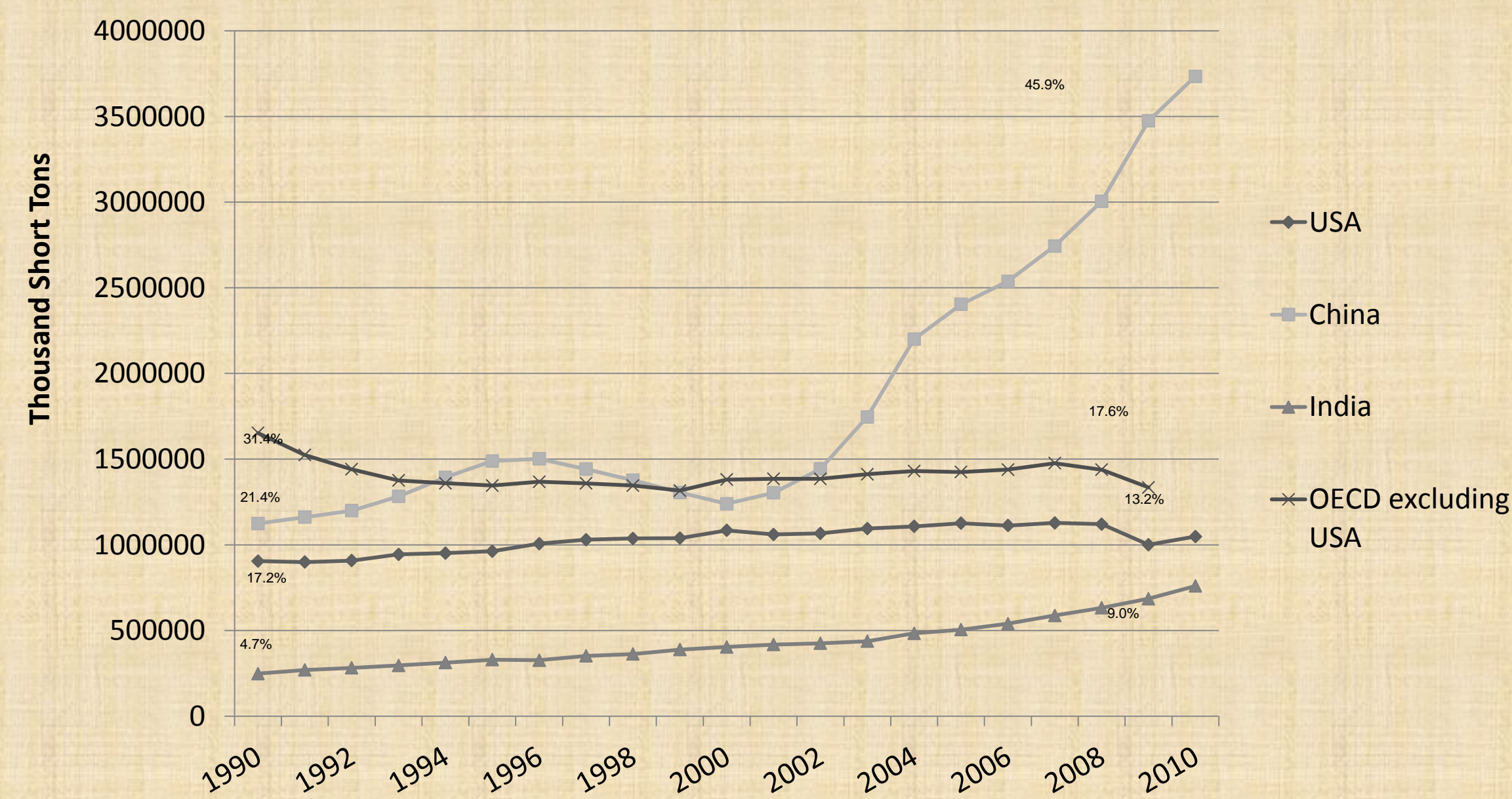
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Introduction

- 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

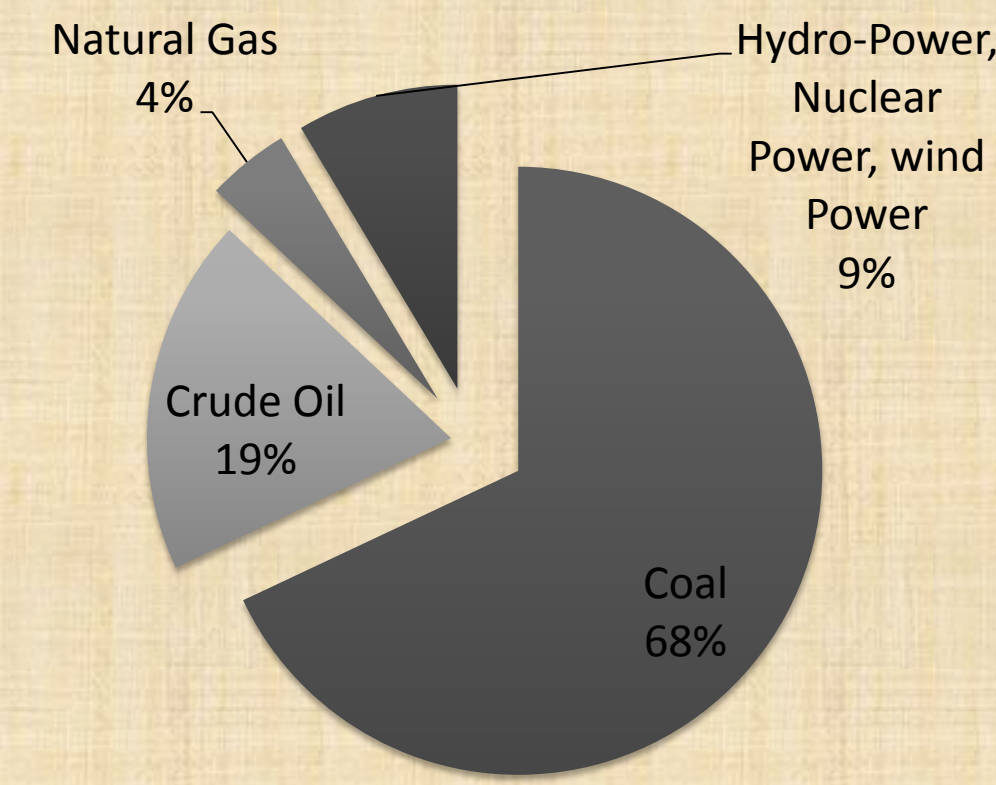
Figure 1. Historical Coal Consumption



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:

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

Table 1. Granger Causality Tests

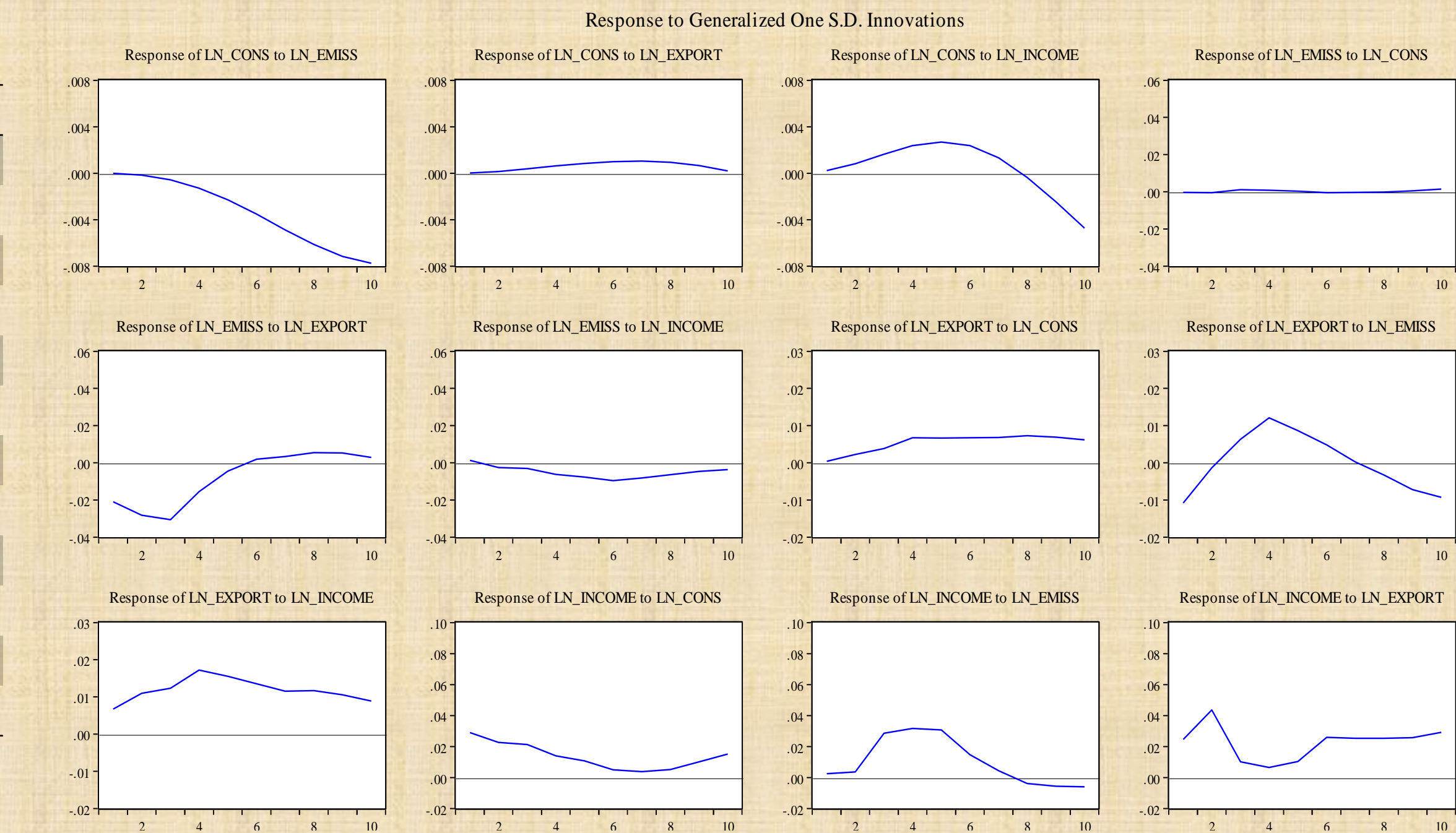
Hypothesis:	F-Statistic	Prob.
LN_EXPORT does not Granger Cause LN_CONS	2.3831	0.0898*
LN_CONS does not Granger Cause LN_EXPORT	1.9036	0.1511
LN_EXPORT does not Granger Cause LN_EMISSIONS	3.1473	0.0400**
LN_EMISSIONS does not Granger Cause LN_EXPORT	2.2986	0.0986*
LN_EXPORT does not Granger Cause LN_INCOME	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

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