The Impact of U.S. Climate Legislation on Trade with China

CLIENT: ENERGY INFORMATION ADMINISTRATION; DEPARTMENT OF ENERGY

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Introduction

- Climate change is a growing concern for U.S. policymakers
  - American Clean Energy and Security Act (2009)
    - Waxman-Markey
  - Emissions Leakage

Goals

- To model impact of carbon tax on imports from China
  - Computable General Equilibrium (CGE) Modeling
  - Results: Impact on trade, emissions, and output
- To assess international policy implications
  - How China responds
    - Domestic Tax?
    - Files complaint with WTO?

Methods

- CGE Model
  - Simulates policy changes in a large number of inter-related markets
  - e.g. Heckscher-Ohlin
    - H-O: 2-regions; 2-goods; 2-factors
    - Our model: 4-regions; 5-goods; many factors
- Main focus
  - Policy change: imposition of carbon taxes
  - How do we calculate carbon taxes?

Cap and Trade and the Price of Carbon Dioxide

- Cap and trade adds a cost to CO_2, while the market mechanism directs remaining emissions
- In our model, the cap and trade price is the tax on CO_2 emissions
- CO_2 prices of $20/ton and $31.70/ton are used

Emission Coefficients: Ton CO_2 / Ton Output

EITE Sectors	U.S.	China
Steel	1.59	3.22
Aluminum	9.06	18.18
Cement	0.89	0.89
Pulp/Paper	0.70	0.80
Ammonia	2.27	4.58

Ad Valorem Tax (Emissions Price: $20/ton CO_2)

EITE Sectors	U.S. (%)	China (%)
Steel	4.55	16.99
Aluminum	8.41	16.88
Cement	23.62	57.52
Pulp/Paper	2.45	2.0
Ammonia	7.84	15.83

Ad Valorem Tax (Emissions Price: $31.70/ton CO_2)

EITE Sectors	U.S. (%)	China (%)
Steel	7.21	26.93
Aluminum	13.33	26.76
Cement	37.44	91.16
Pulp/Paper	3.89	3.17
Ammonia	12.43	25.09

Literature Review

- Background Literature
  - Top-Down
    - Focus: Macro-perspective, breakdown of regions into sectors
  - Bottom-Up
    - Focus: Micro-perspective, input/output coefficients
  - Static
  - Dynamic

- Our model is a top-down approach with static and dynamic simulations

Literature Review

- Top-Down: Dynamic
  - Bernstein, Paul M; Montgomery W. David and Thomas F. Rutherford (1999); EPA (2009); EIA (2009);Winchester, Niven; Paltsev, Sergey and John, Reilly (2010)
- Top-Down: Static
  - Al-Amin, Chamhuri Siwar and Abdul, Hamid (2009); Mattoo Aaditya, Subramanian Arvind; van der Mensbrugghe Dominique, and Jianwu, He (2009)
- Bottom-Up: Dynamic
  - Ping-Cheng Li; Chang-Huang, Huang and Shih-Hsun, Hsu (2001)
- Bottom-Up: Static
  - Fatai, Koli; Oxley, Les and F.G. Scrimgeour (2003); Fischer, Carolyn and Alan, K. Fox (2009); Laitner, A. John and Donald A. Hanson (2006); Lloyd, P.J. and X.G. Zhang (2006); Qiao-Mei, Liang; Ying, Fan, and Yi-Ming, Wei (2009); Zhang, Xiao-guang and George, Verikios (2006)

A Similar Study

- Example:
  - Mattoo et al (2009), World Bank Study

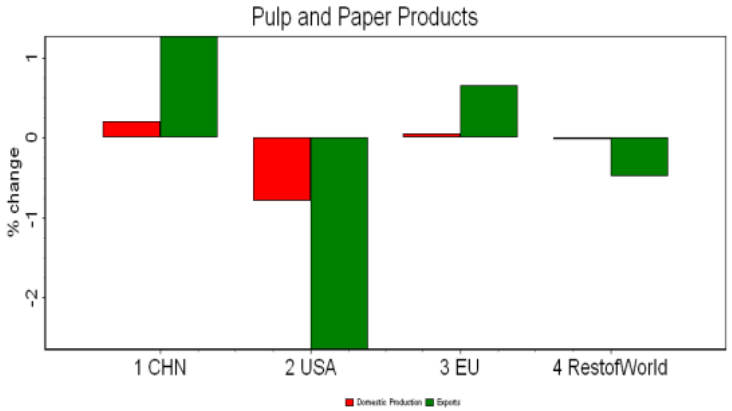
- Trade tax (collected at the border) has serious consequences for China, Brazil, and India
  - Exports decline
  - Real income decline

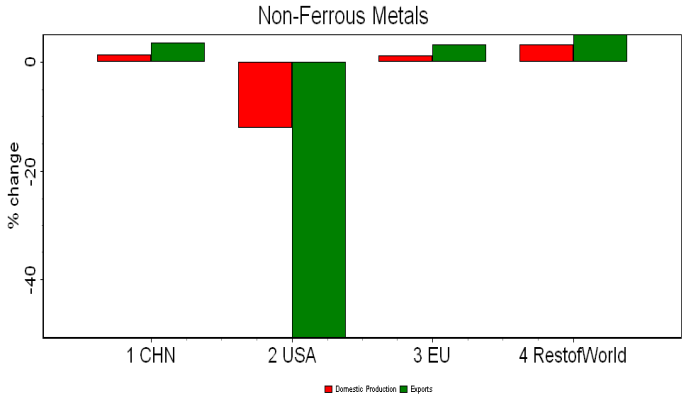
WTO implications

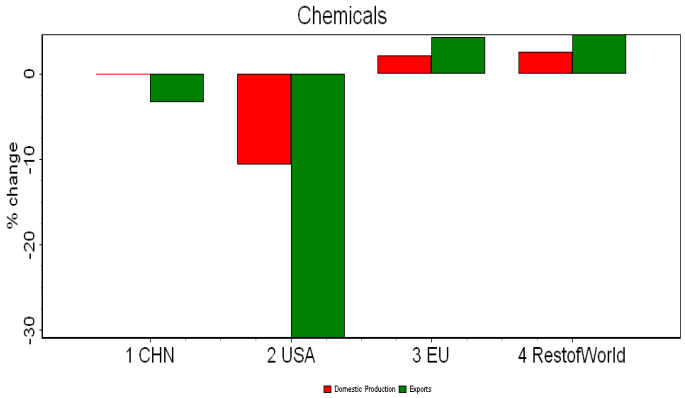
Our Results

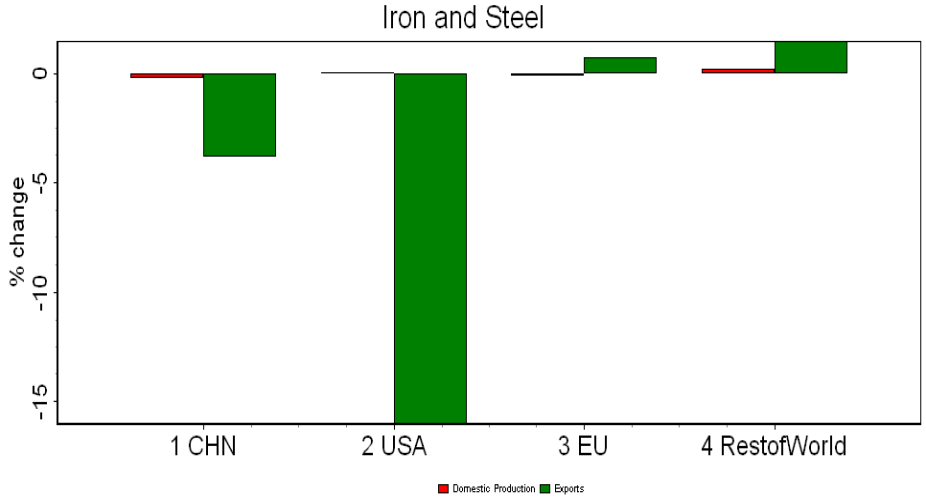
- Scenario 1 (using emission price of $20/ton)
  - Domestic Production Tax in the US
  - Import Taxes on goods from China, EU and ROW
- Scenario 2 (using emission price of $20/ton)
  - Domestic Production Tax in US, EU and ROW
  - Import Taxes in all regions on goods from China
- Dynamic Simulation of above scenarios ($31.70)
  - Simulation 1 & 2 over a ten year period

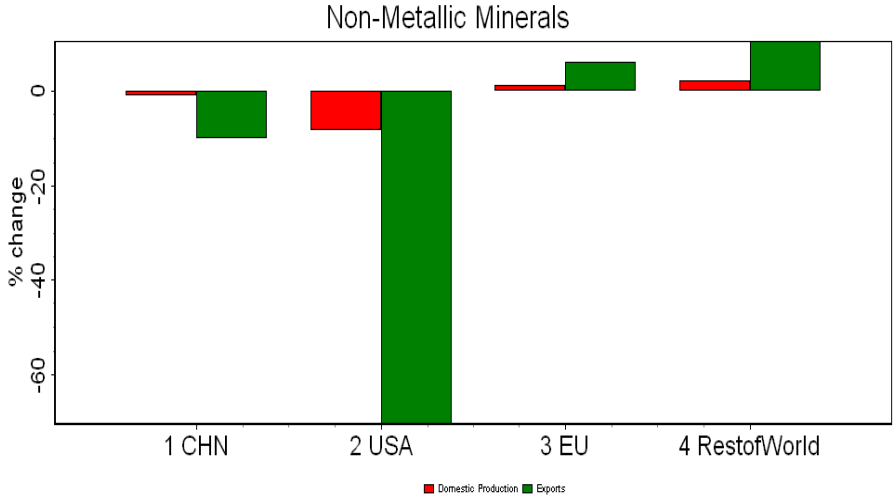
Scenario 1


Pulp and Paper Products
% change
1
0
-1
-2
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports

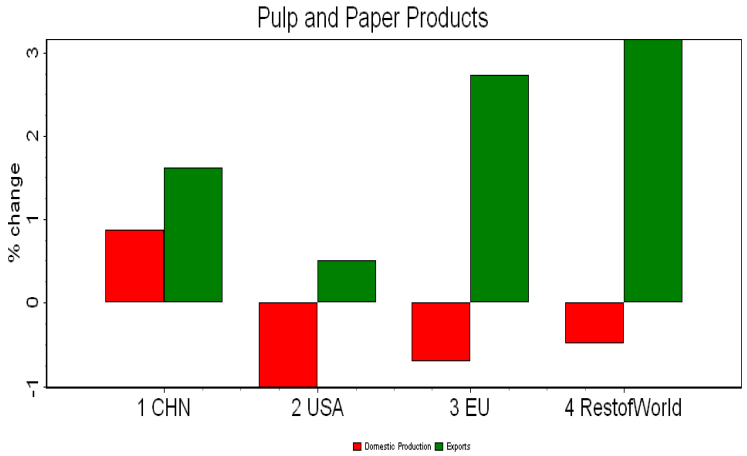

Non-Ferrous Metals
% change
0
-20
-40
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports

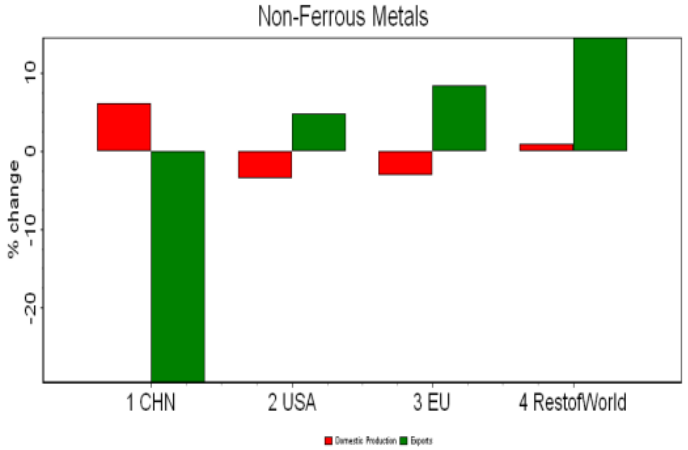

Chemicals
% change
0
-10
-20
-30
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports

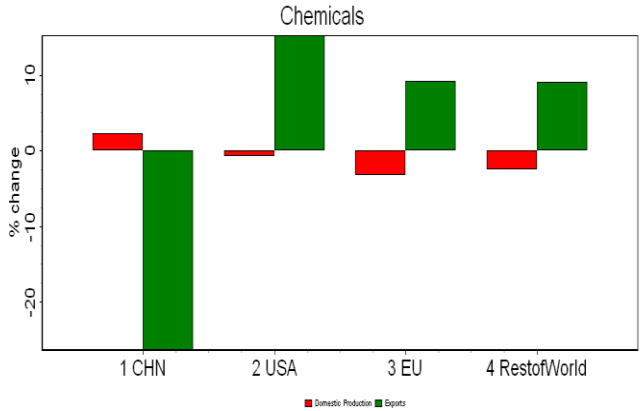

Iron and Steel
% change
0
-5
-10
-15
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports

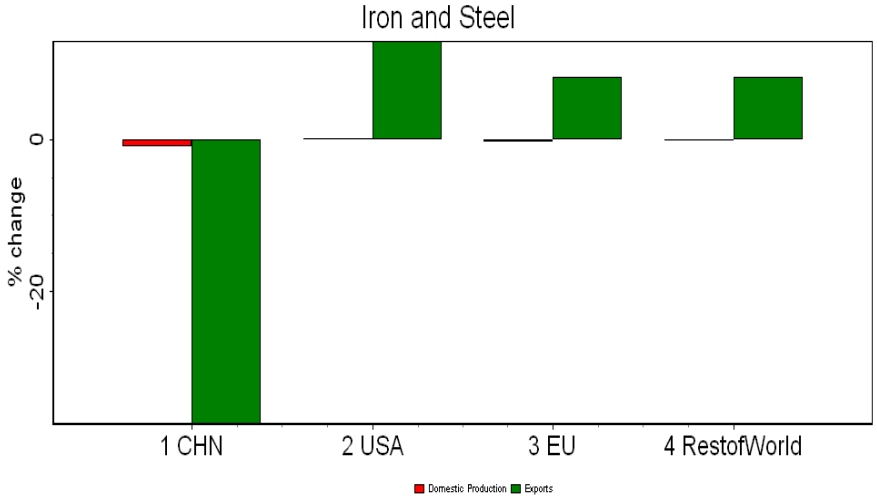

Non-Metallic Minerals
% change
0
-20
-40
-60
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports

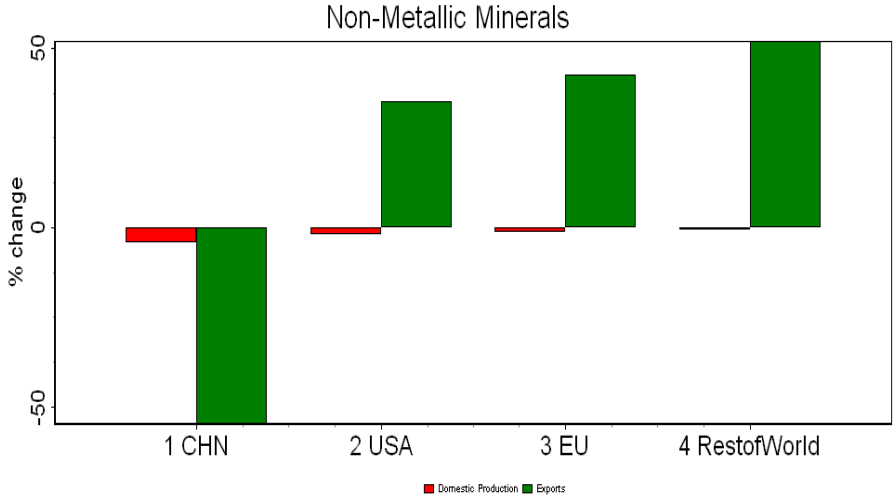
Scenario 2

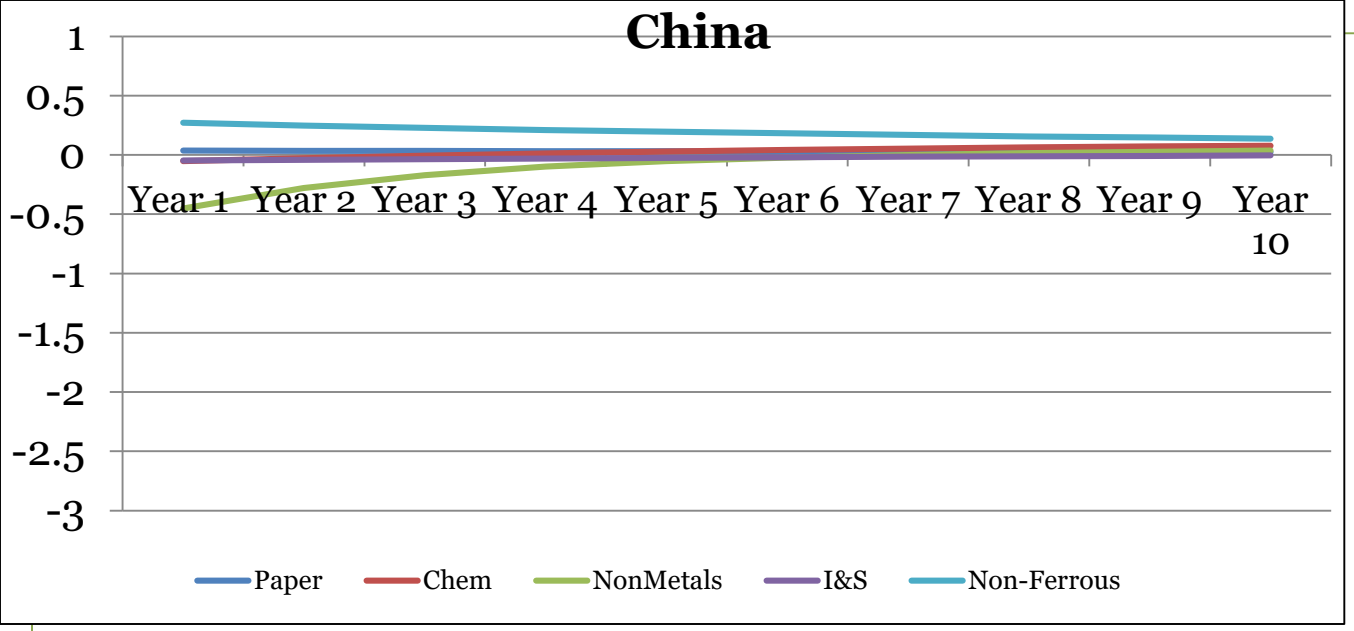

Pulp and Paper Products
% change
3
2
1
0
-1
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports


Non-Ferrous Metals
% change
10
0
-10
-20
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports


Chemicals
% change
10
0
-10
-20
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports


Iron and Steel
% change
0
-20
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports

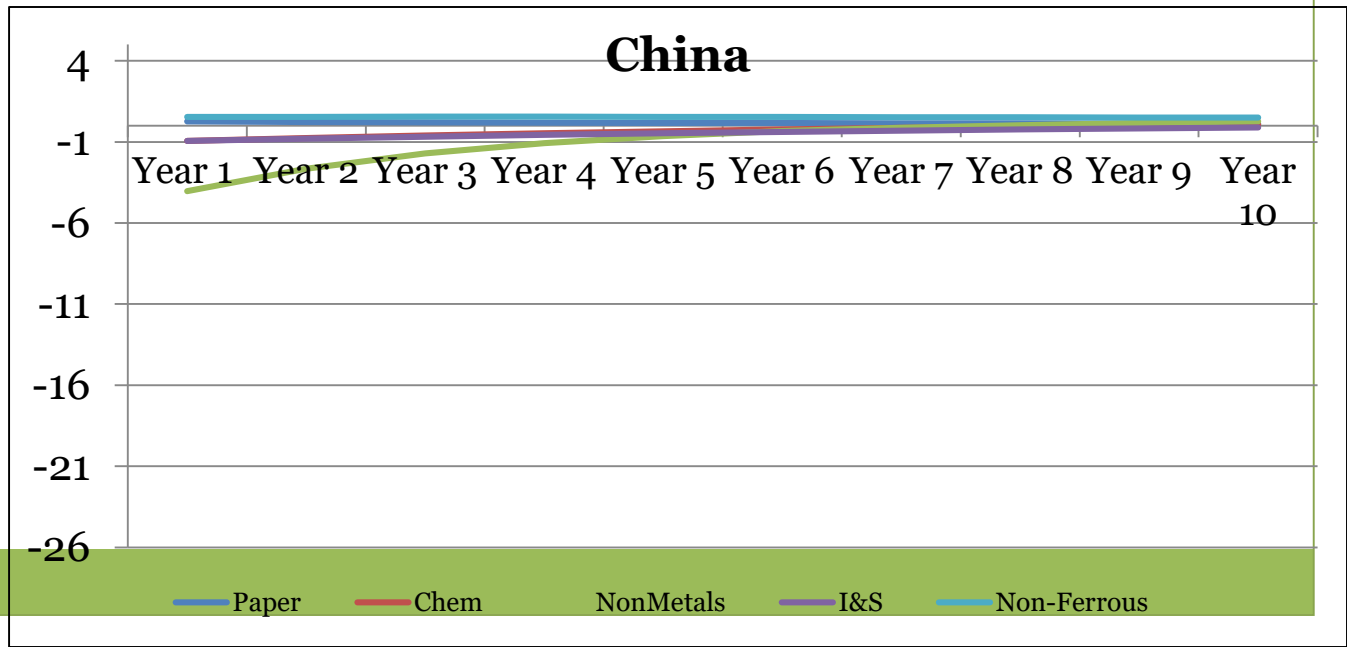

Non-Metallic Minerals
% change
50
0
-50
1 CHN
2 USA
3 EU
4 RestofWorld
Domestic Production
Exports

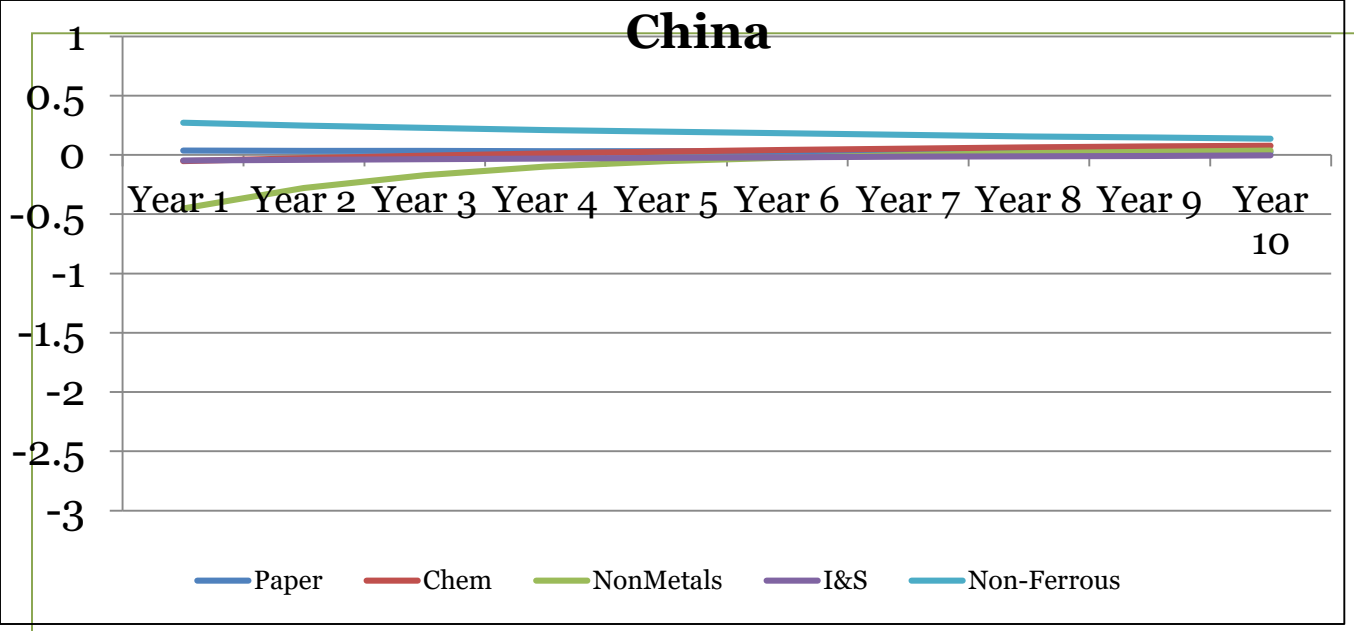


Percent Change in Domestic Production

Dynamic 1 – China Output & Emissions

Percent Change in Exports

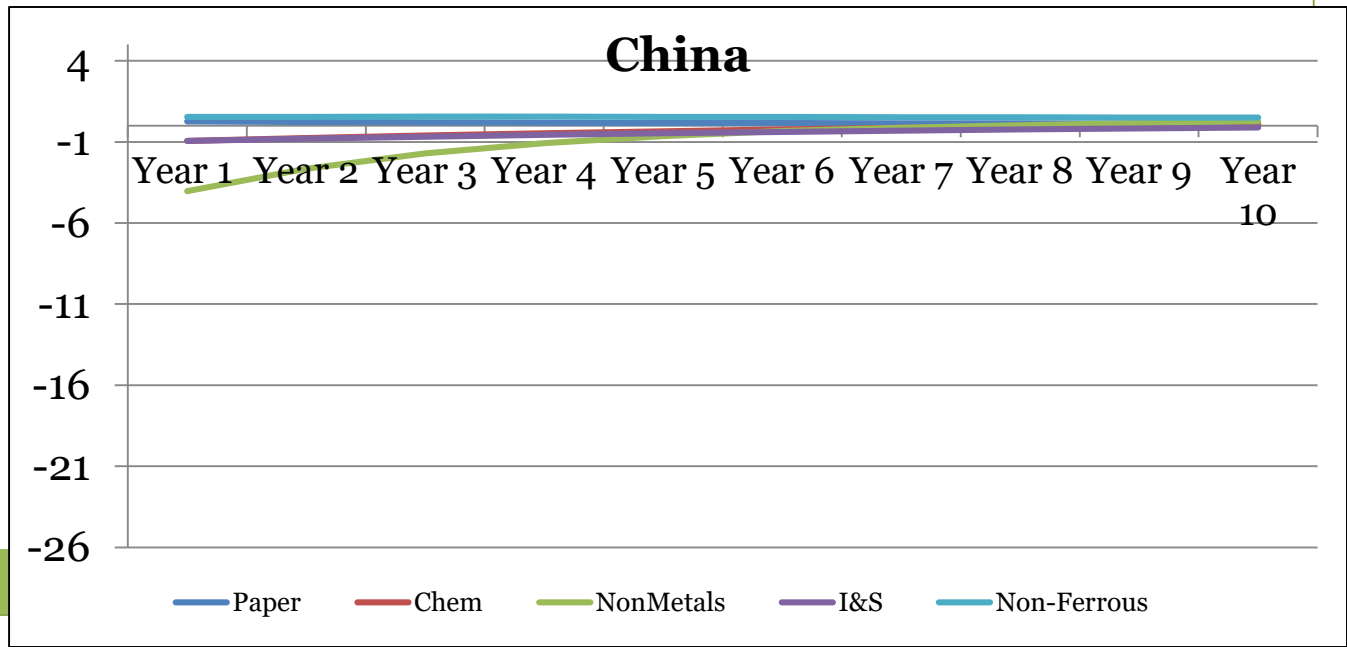


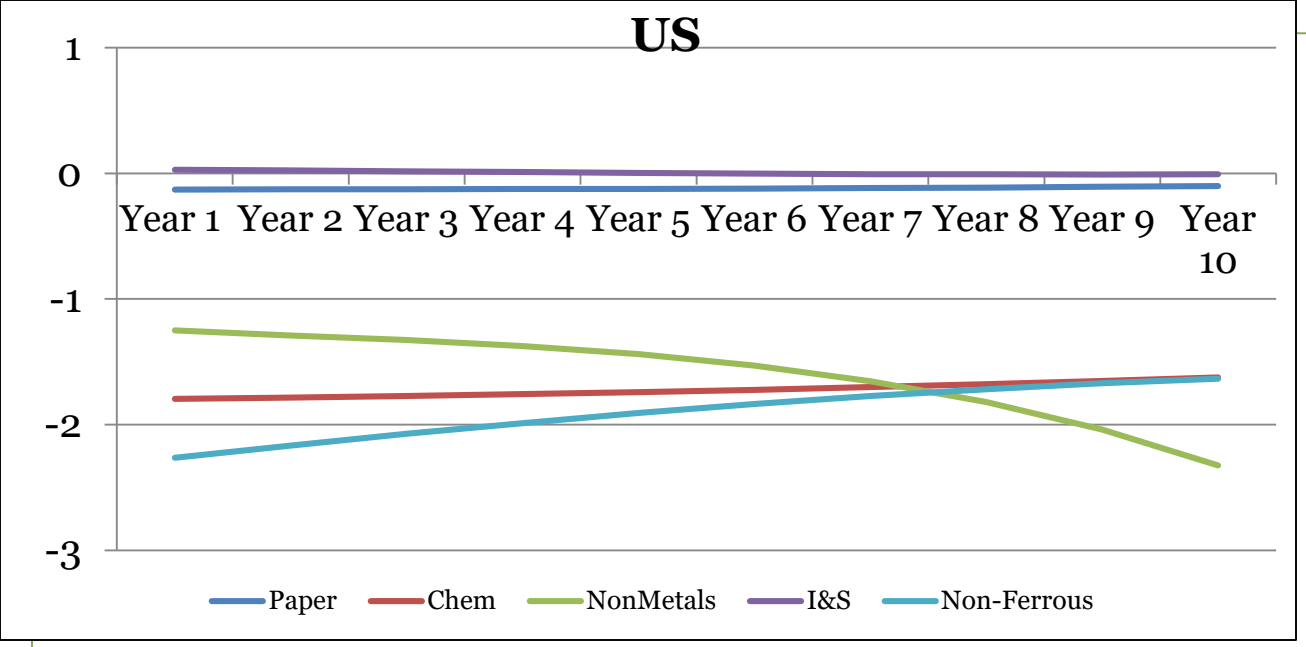


Percent Change in Domestic Production

Dynamic 1 – China Exports

Percent Change in Exports

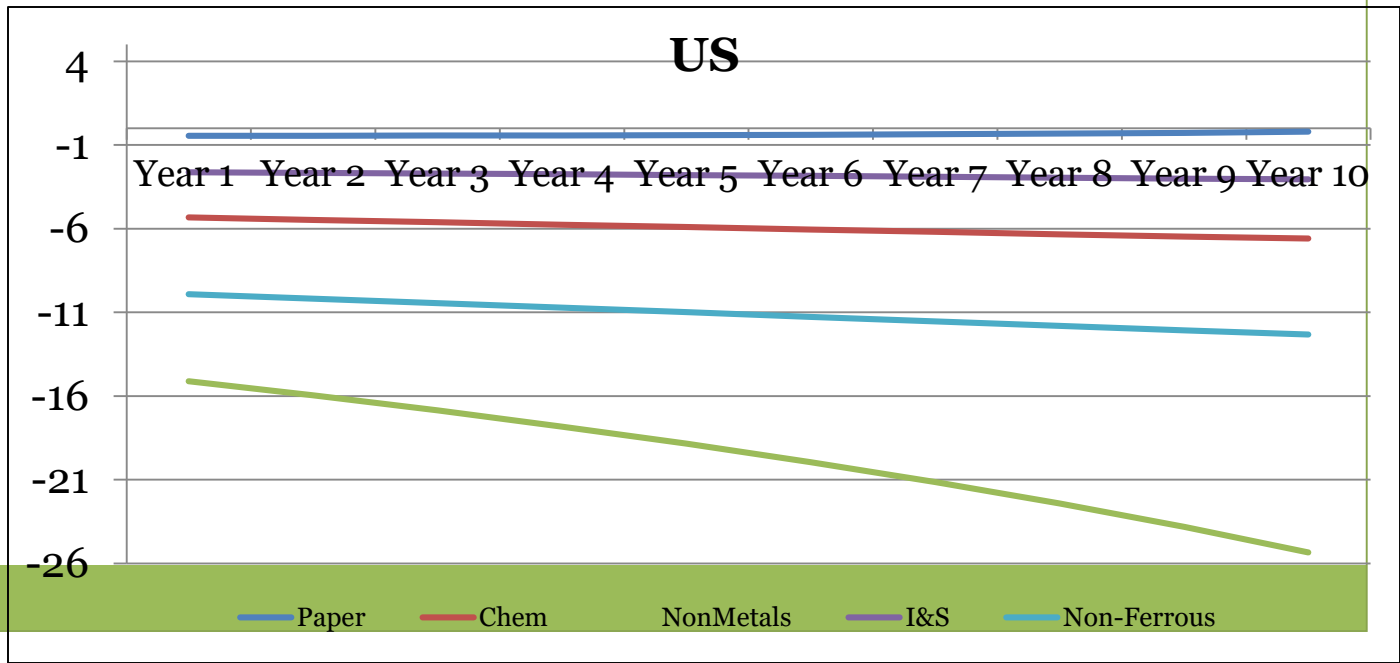


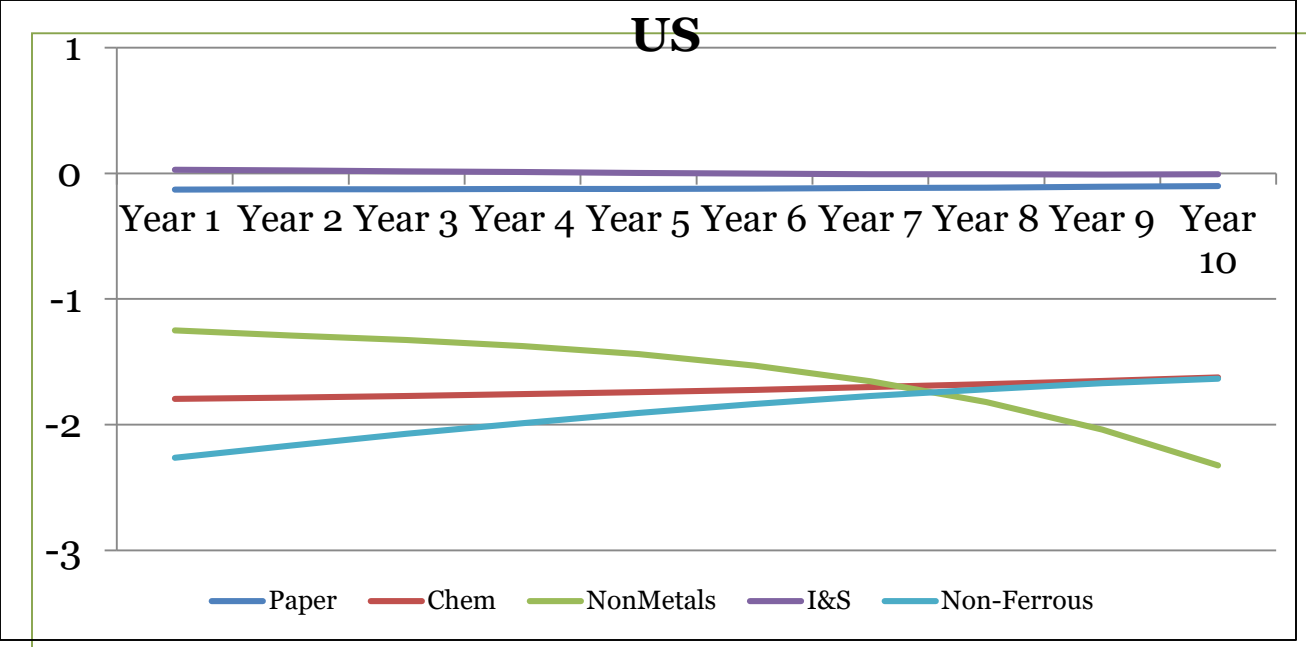


Percent Change in Domestic Production

Dynamic 1 – US Output and Emissions

Percent Change in Exports

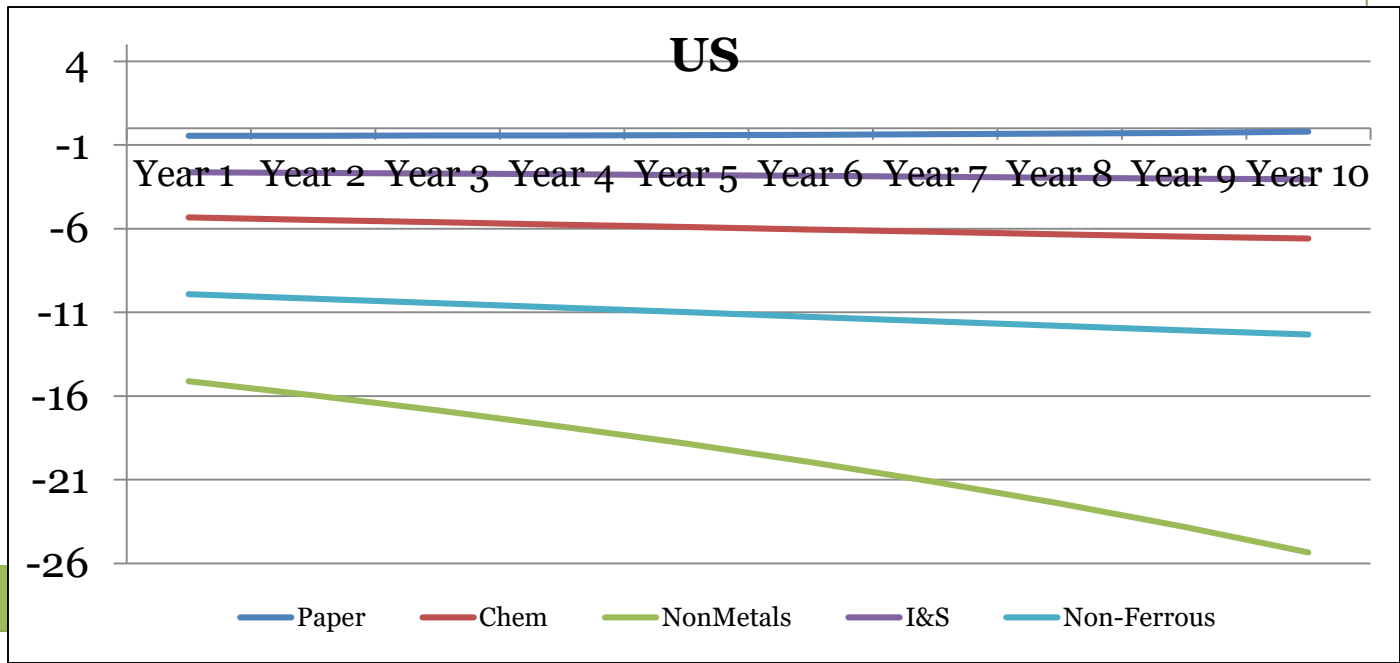


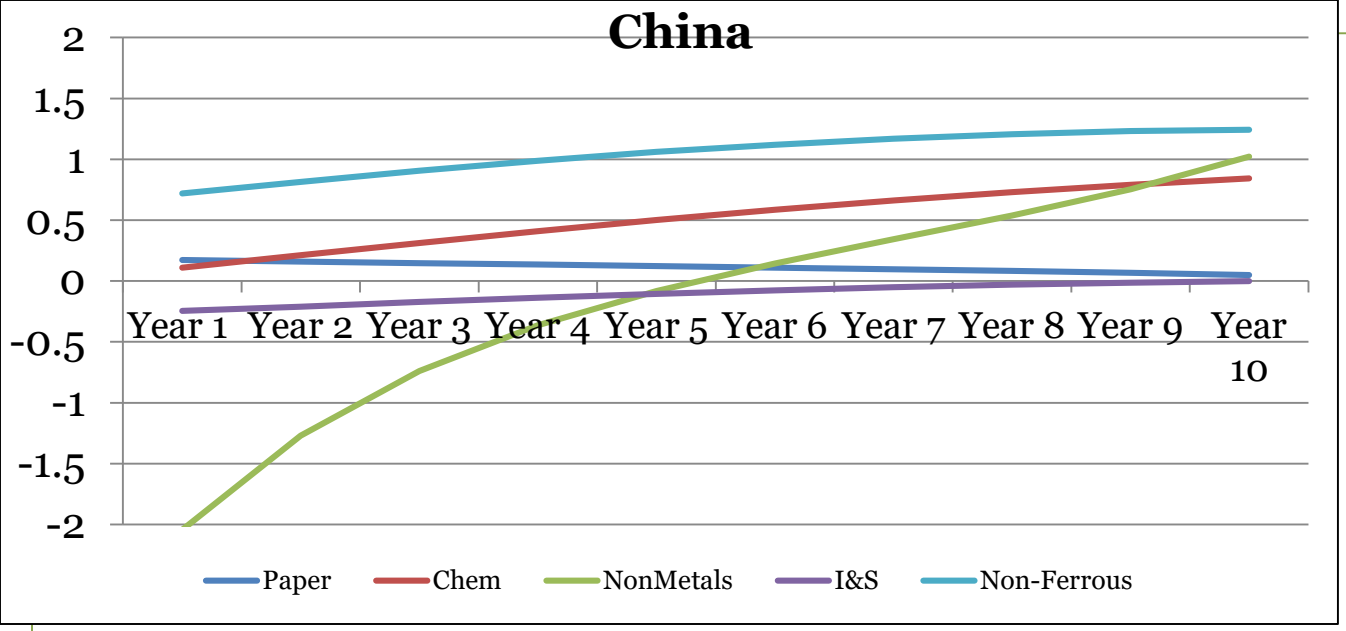


Percent Change in Domestic Production

Dynamic 1 – US Exports

Percent Change in Exports

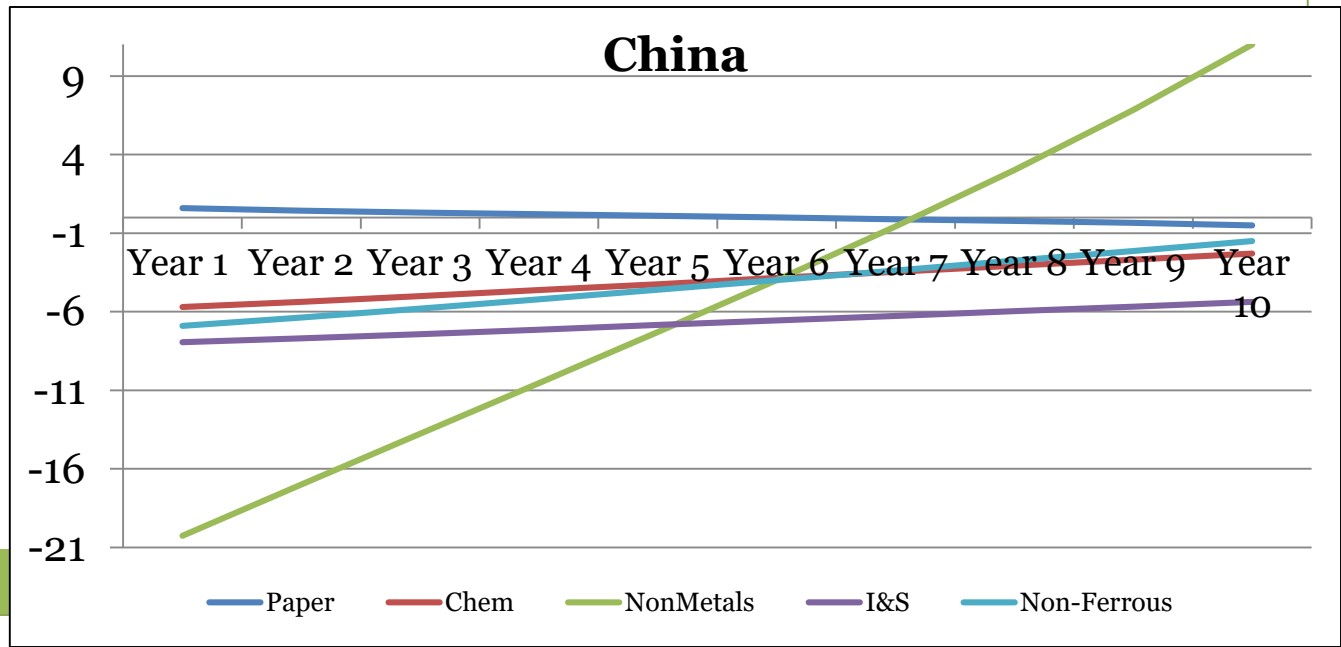


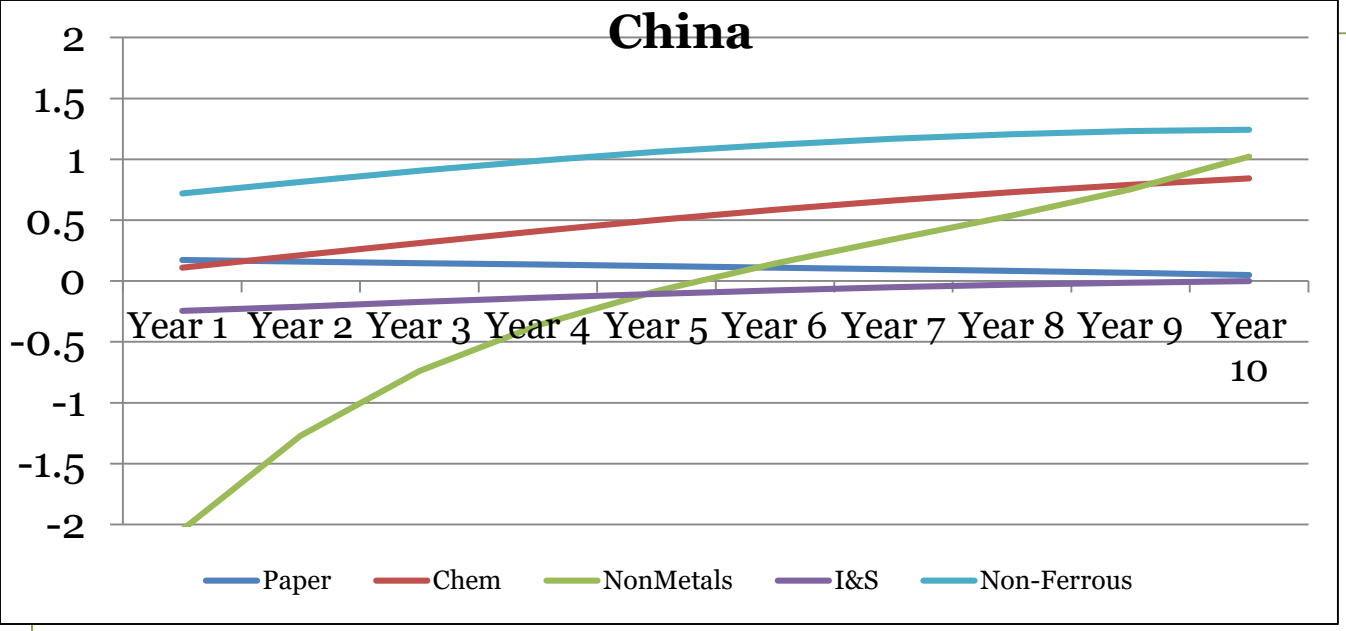


Percent Change in Domestic Production

Dynamic 2 – China Output & Emissions

Percent Change in Exports

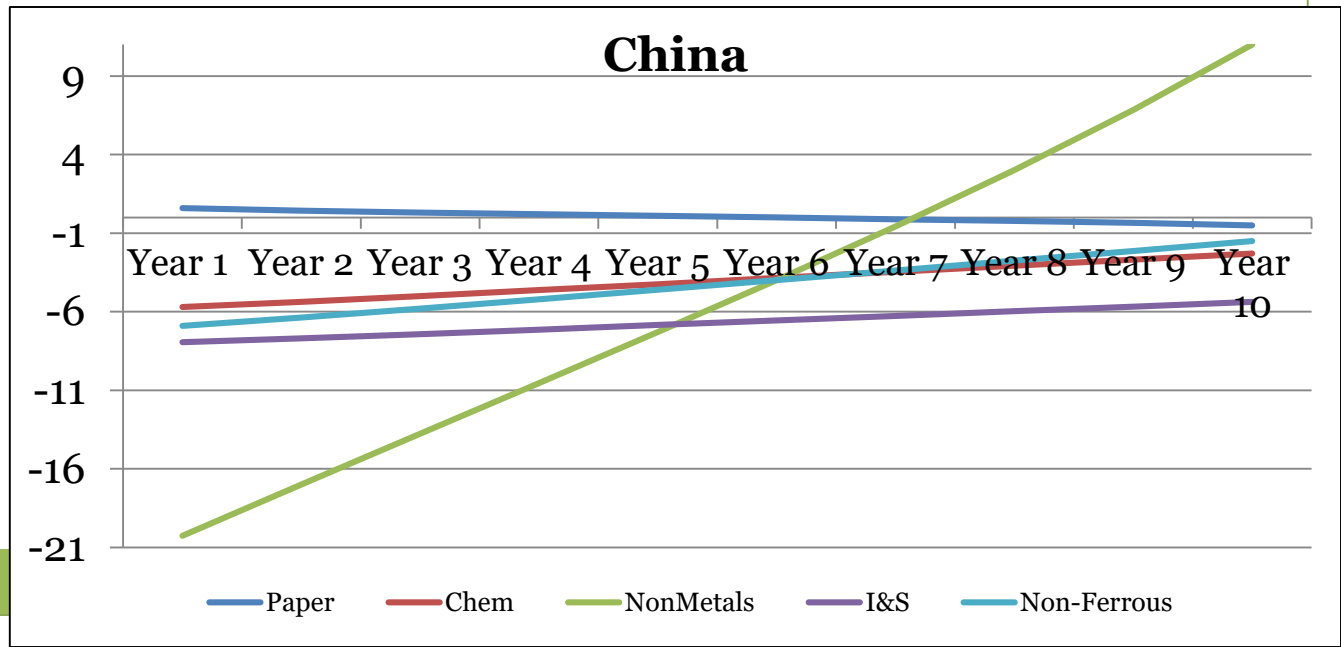


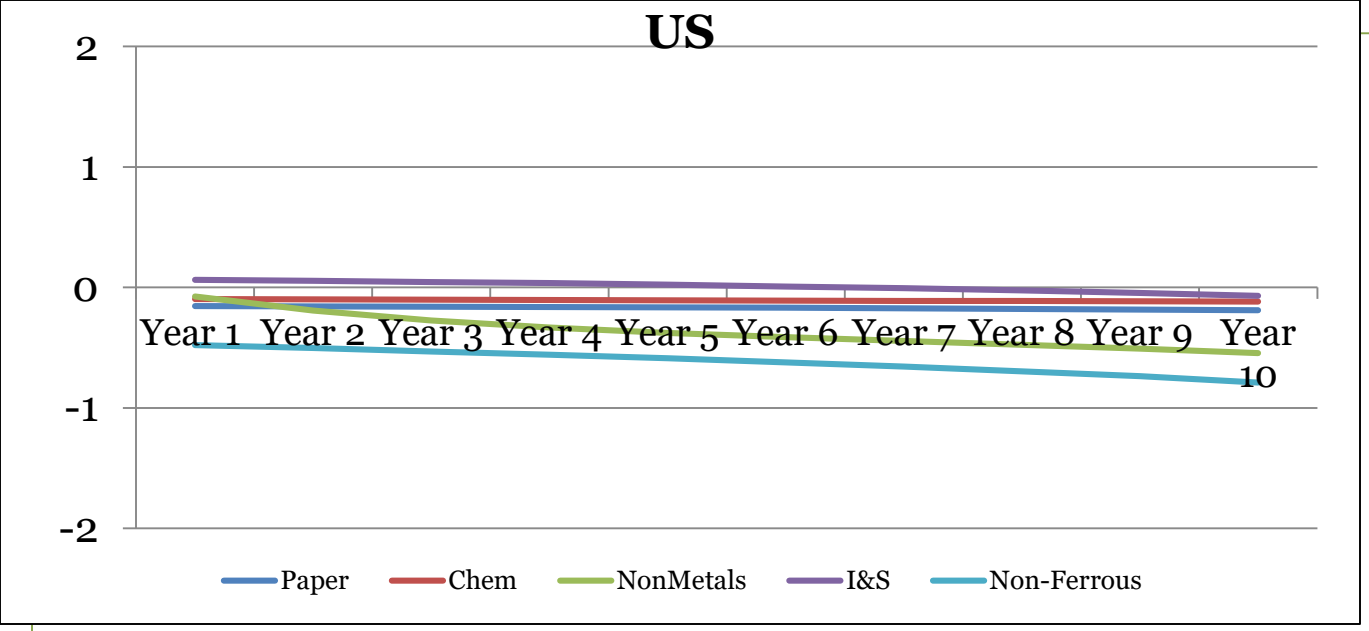


Percent Change in Domestic Production

Dynamic 2 – China Exports

Percent Change in Exports

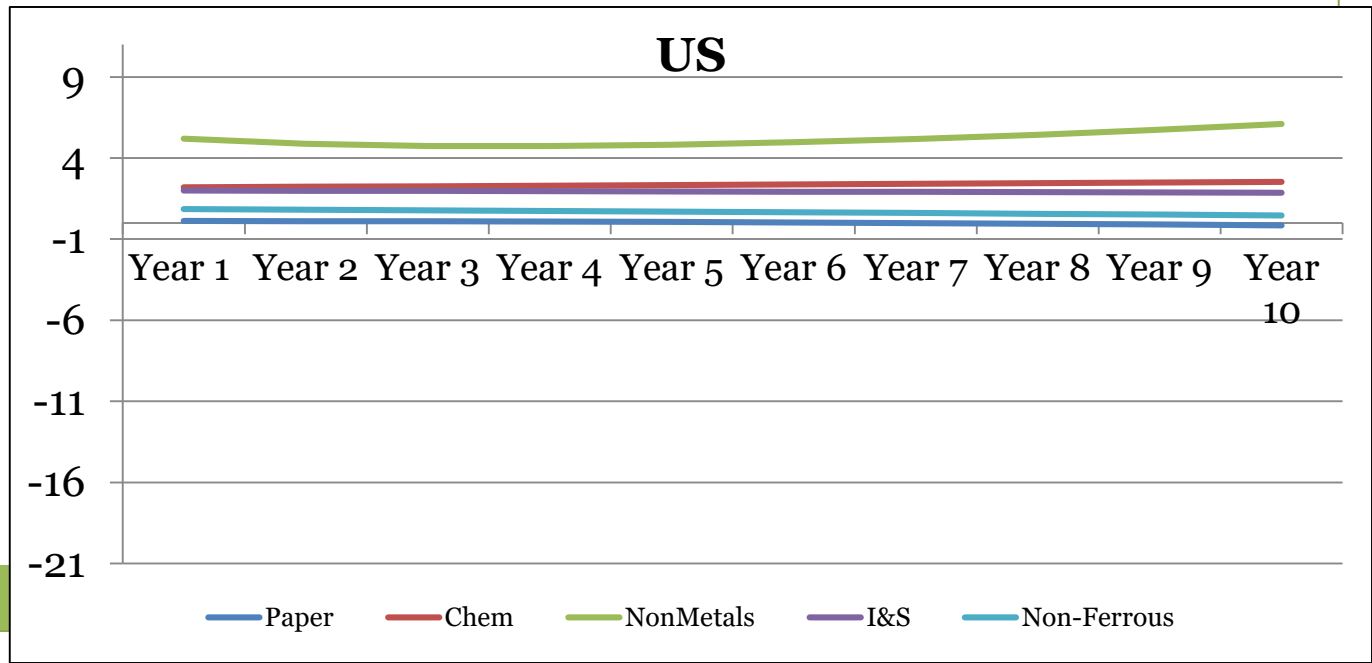


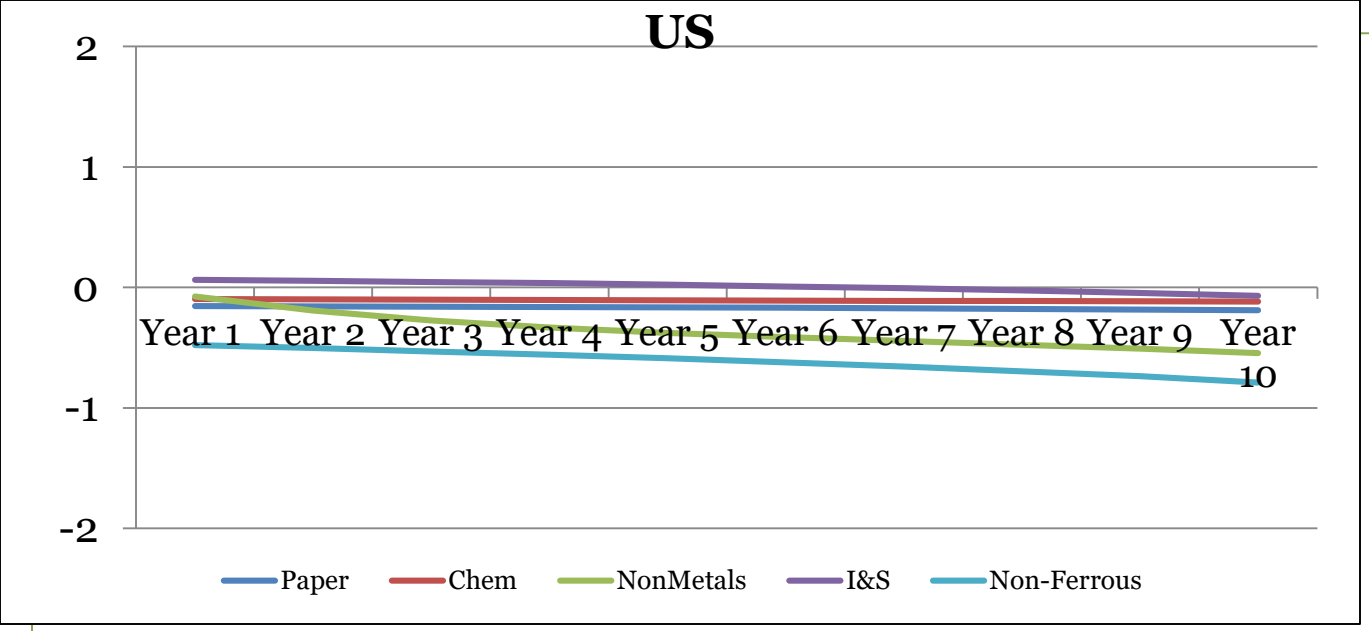


Percent Change in Domestic Production

Dynamic 2 – US Output & Emissions

Percent Change in Exports

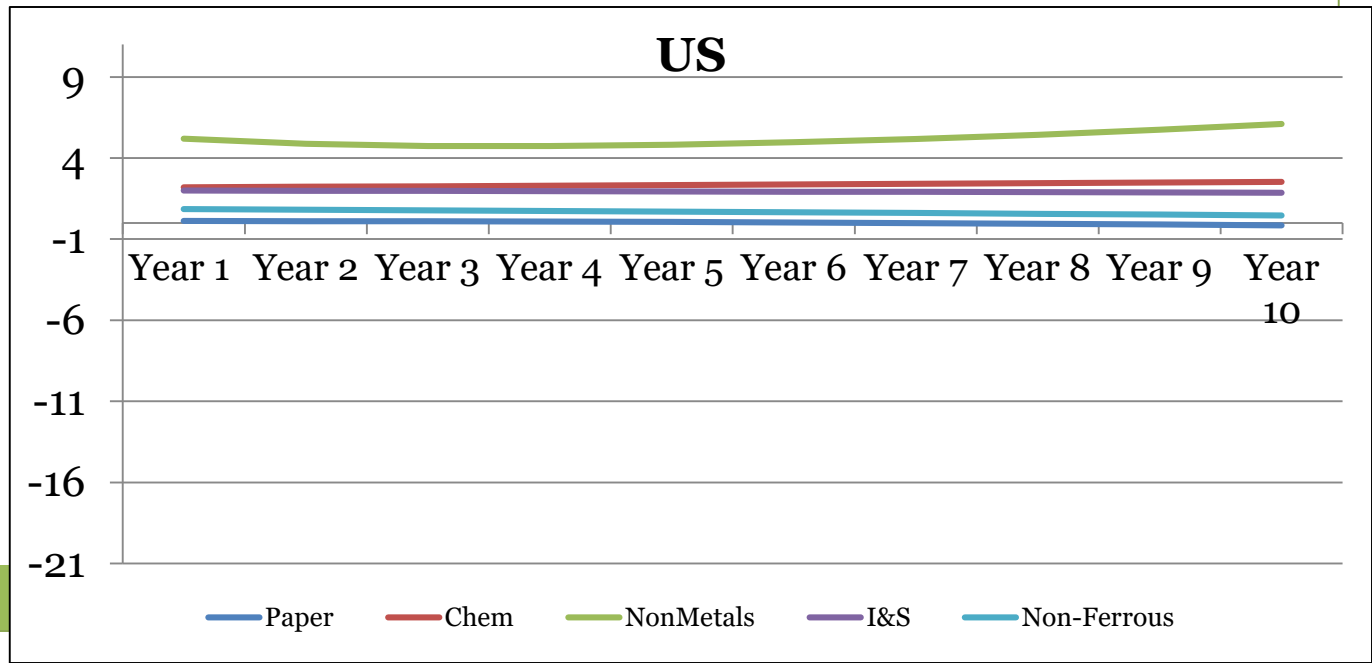


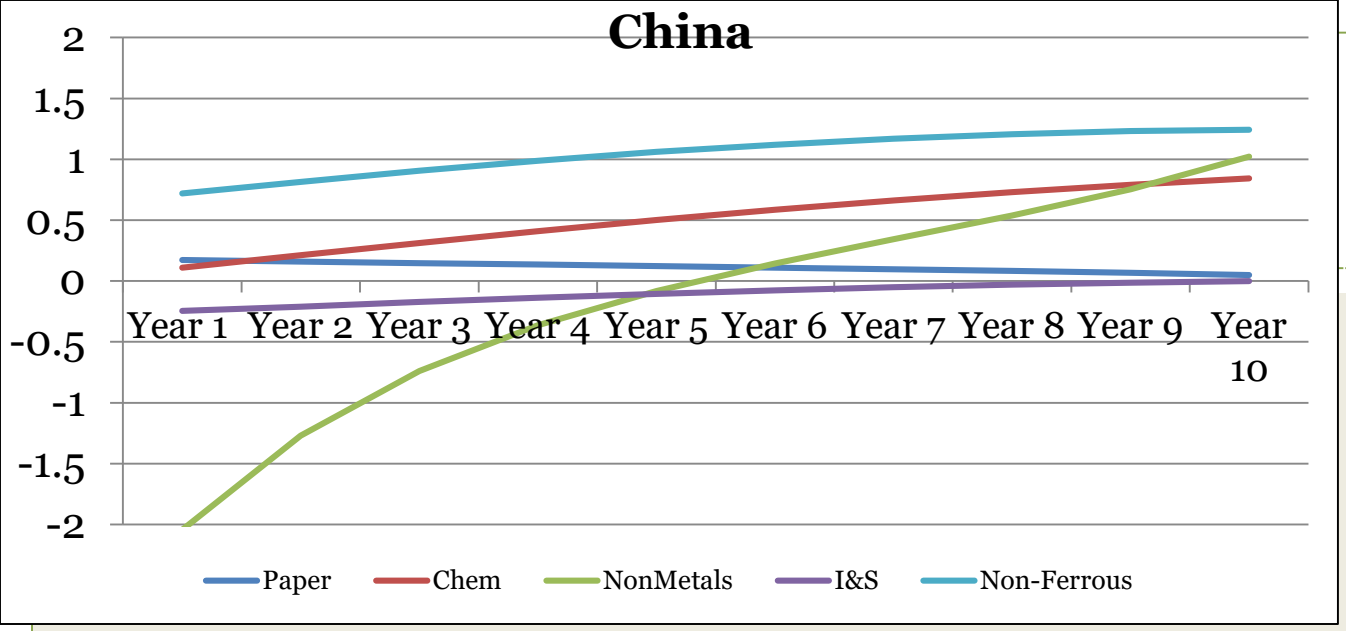


Percent Change in Domestic Production

Dynamic 2 – US Exports

Percent Change in Exports

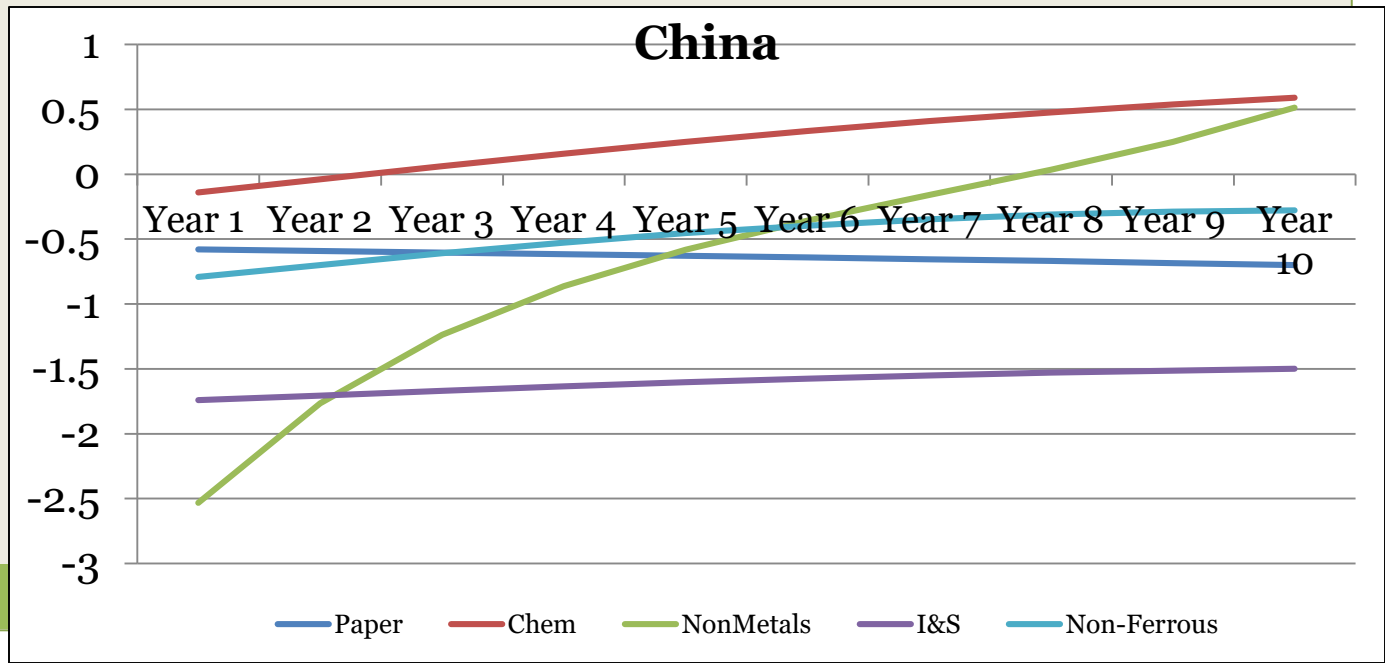




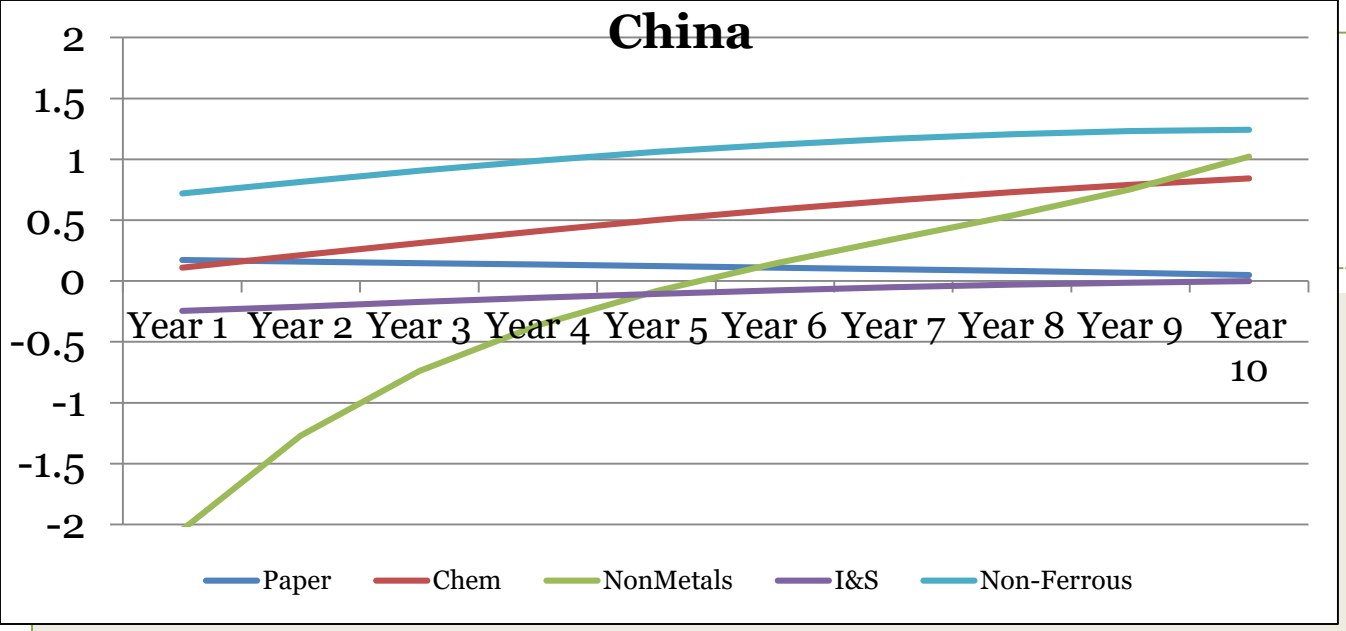
Percent Change in Domestic Emissions

Dynamic Simulation-2 Results

Percent Change in Domestic Emissions

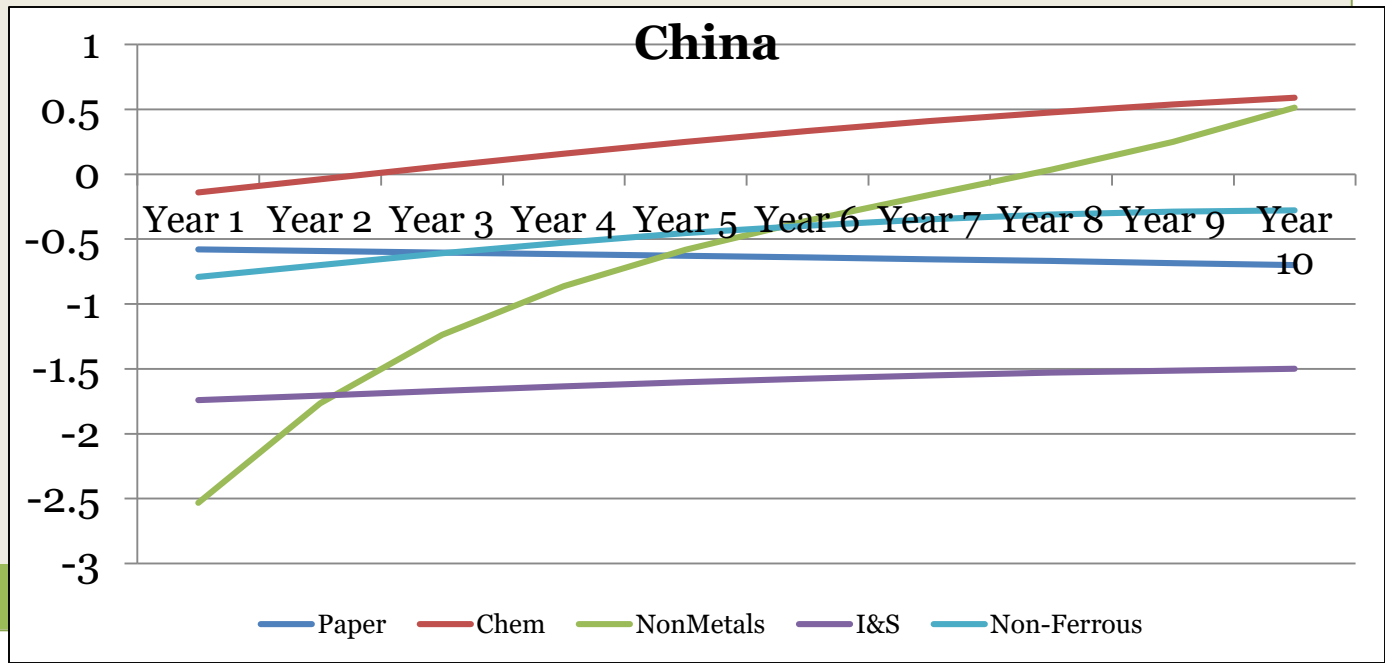


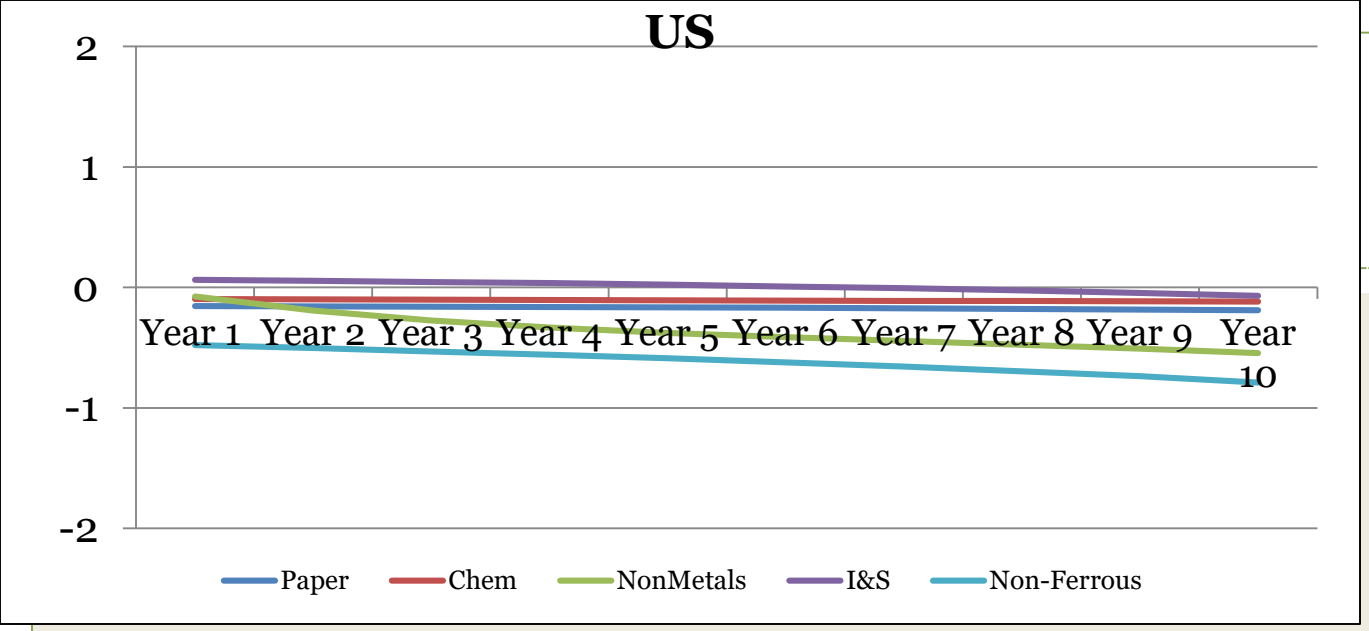
Dynamic Simulation-2 Results



Percent Change in Domestic Emissions

Percent Change in Domestic Emissions

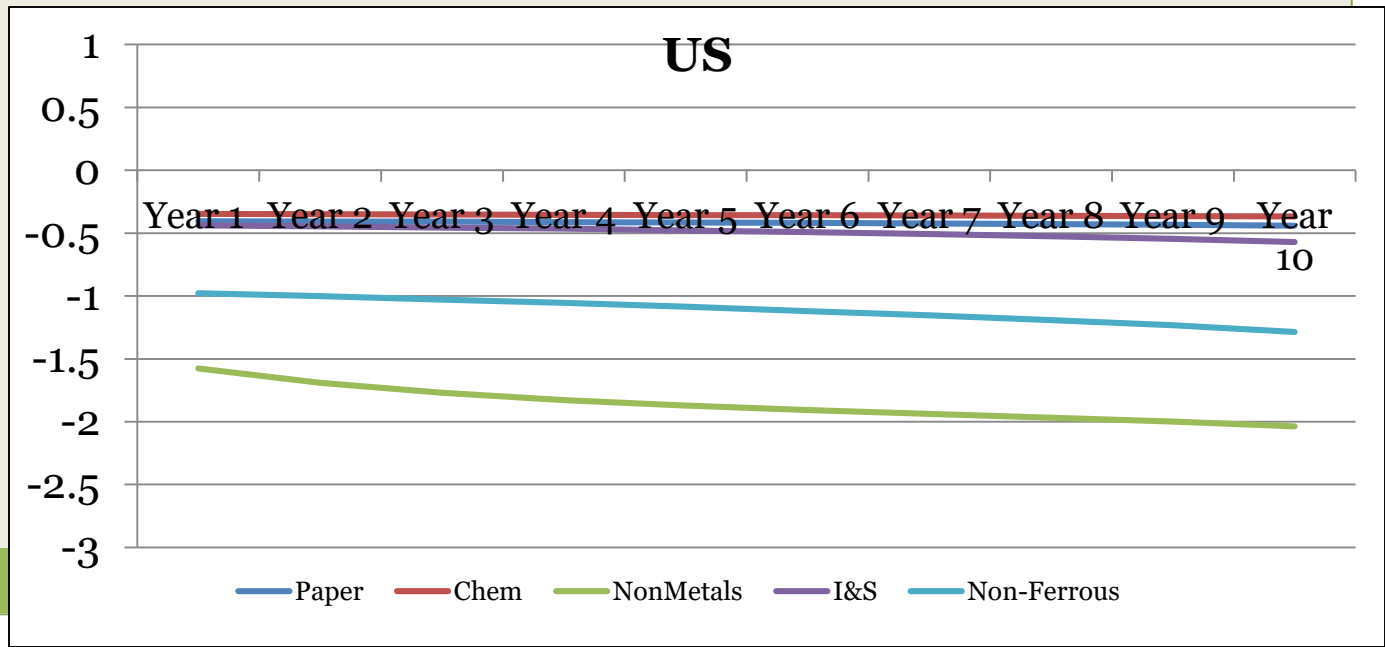


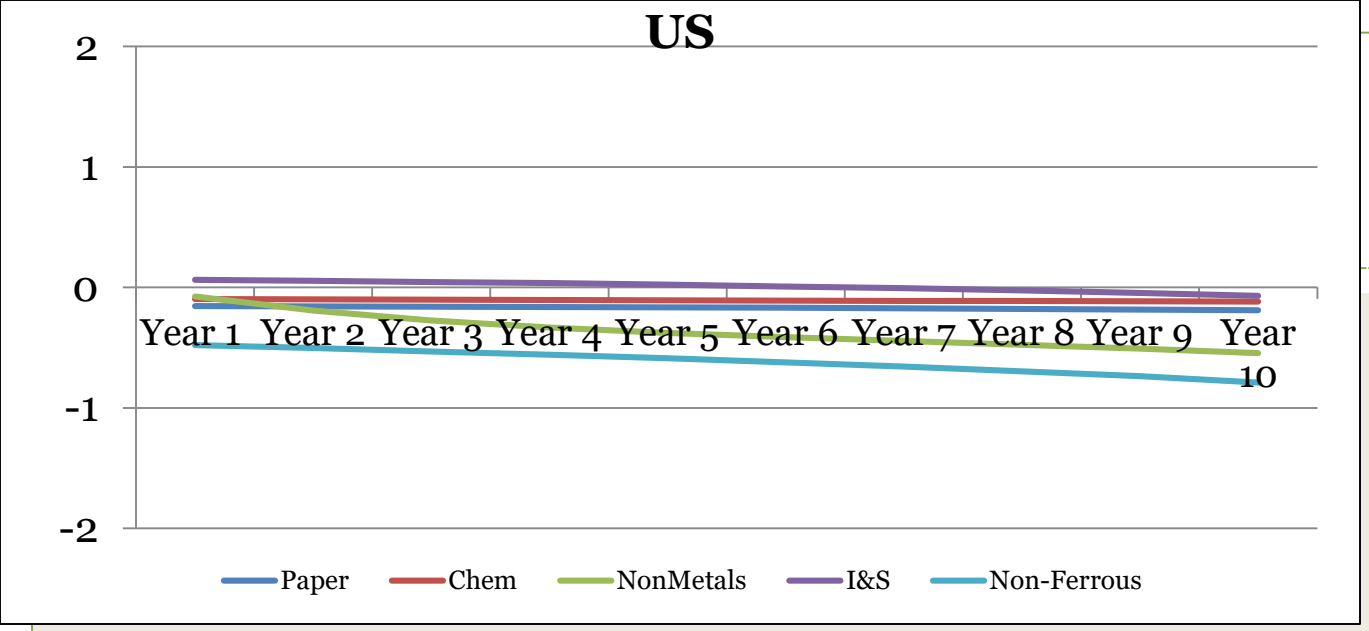


Percent Change in Domestic Emissions

Dynamic Simulation-2 Results

Percent Change in Domestic Emissions

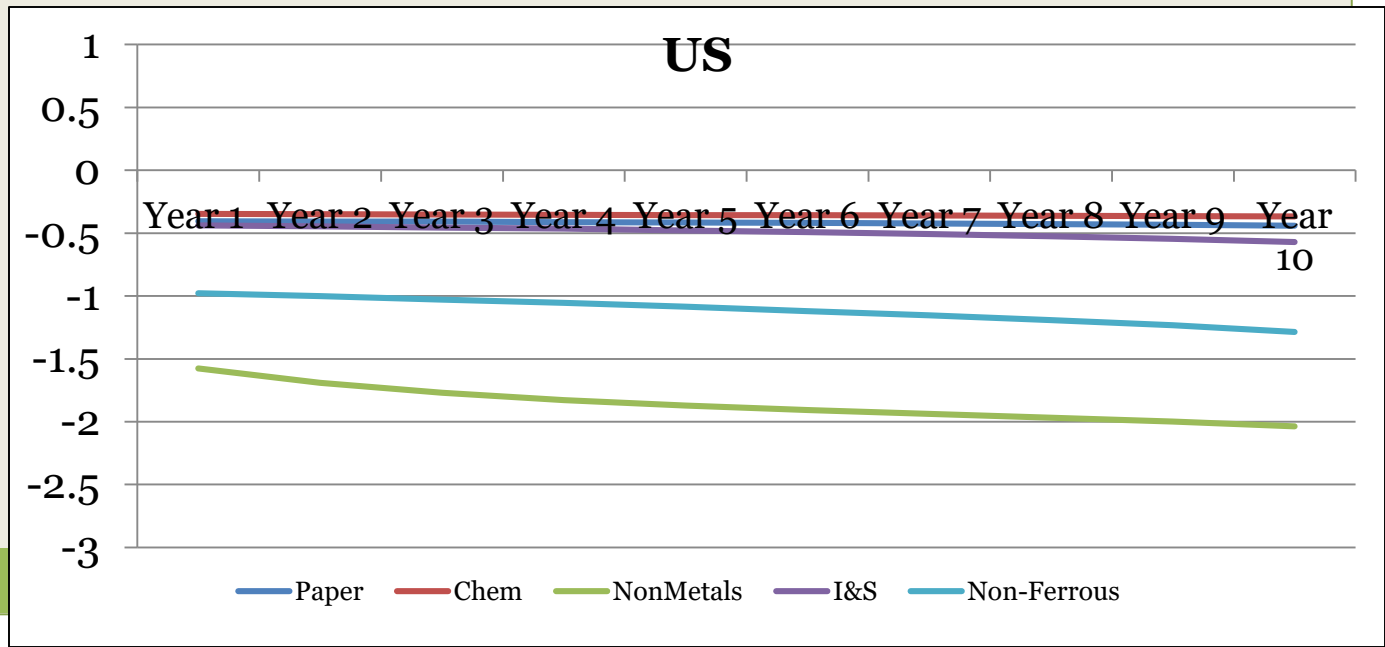




Percent Change in Domestic Emissions

Dynamic Simulation-2 Results

Percent Change in Domestic Emissions



Policy: China's Response – I

- Internalize the tax: China implements its own domestic carbon tax
  - America cannot impose trade tariff (No double taxation)
  - Tax revenue welcomed by government
  - Tax revenue can subsidize technology change in China
- Tax structure
  - Will be incorporated into energy tax category in first few years
  - Begin with $2 in 2012 and increase to $30 by 2030

Policy: China's Response – II

- China brings complaint to WTO
- WTO Case-by-Case System
  - Burden of proof falls on defendant government
    - Article I - MFN
    - Article III – National Treatment
  - Retaliatory measures allowed if legislation is not justified
    - Article XX – General Exceptions

Policy: China's Response – II

- Concerns
  - MFN violation
    - Waxman-Markey exceptions
  - National treatment violation
    - Controversy over determination of baselines
  - Article XX exception is a way around these two BUT must argue:
    - Protect human plant or animal life, or
    - Conserve exhaustible natural resources

Conclusions

- Waxman-Markey hurts output and exports of U.S.
- W-M will not prevent leakages unless China implements its own production tax
- W-M will not achieve its goals of reducing emissions worldwide
- Technological change is necessary to reduce emissions in the long run