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Global Macroeconomic Consequences of Pandemic Influenza

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and

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Structure of the paper

- Introduction
- Background on Influenza Pandemics
- Macroeconomic Costs of Disease
- A Global Economic Model
- Modeling the Pandemic shocks
- Results
  - Core scenarios
  - Sensitivity Analysis
- Summary and Conclusions

Overview

- H5N1 Avian influenza might be the source of the next human influenza pandemic

- What are the economic consequences globally?
  - ADB study (Asia focus)
  - CBO study (US focus)

- Enormous Uncertainty but can use historical experience adjusted for current conditions

Overview

- Explore 4 possible scenarios based on pandemics of the 20th century
  - Mild (1968 Hong Kong Flu)
  - Moderate (1957 Asian Flu)
  - Severe (lower estimates of 1918/19 Spanish Flu)
  - Ultra (higher estimates of 1918/19 Spanish Flu)

Approach

- Following the new literature from Lee and McKibbin (2003) on SARS
- Translate pandemic scenarios into a series of shocks and implement them in a global economic model
  - The Asia Pacific G-Cubed multi-country multi-sector model

Countries

- United States
- United Kingdom
- Canada
- New Zealand
- China
- Korea
- Singapore
- Malaysia
- Indonesia
- Oil Exporting Developing Countries
- Eastern Europe and the former Soviet Union
- Other Developing Countries

- Japan
- Europe
- Australia
- India
- Taiwan
- Hong Kong
- Thailand
- Philippines

Sectors

- Energy
- Mining
- Agriculture
- Durable Manufacturing
- Non-Durable Manufacturing
- Services

G-Cubed (Asia Pacific) Model

- Estimated dynamic intertemporal model with Keynesian short-run rigidities
  - Adjustment costs in capital accumulation
  - Financial capital mobile given risk premia
  - Wages adjust slowly given labour market rigidities
  - Financial markets for equity, bonds, money
  - Mix of intertemporal optimizing and rule of thumb decision rules
  - Imposition of intertemporal budget constraints

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Modeling a Pandemic

Creating the Shocks

- Major shocks:
  - Reduction in labour force (due to mortality and illness, includes carers)
  - Increase in business costs (differentiated by sector);
  - Shift in consumer demand (away from affected sectors);
  - Re-evaluation of country risks

Critical assumptions

- Start with US assumptions on epidemiological outcomes (study by Meltzer, Cox and Fukuda(1999))
  - Attack rate
  - Case mortality rate
- Scale for other countries based on a series of relative indicators

Critical assumptions

- Country specific
  - Geography indicator
    - Ease of entry, capacity to spread internally
      - Factors (air transport data, location in northern or southern hem, pop density, share of urban pop)
  - Health policy indicator
    - Resources available
      - Per capita health spending, antiviral doses available
  - Governance Quality indicator – govt effectiveness, regulatory quality, corruption control
  - Index of financial risk
  - Sectoral exposure in services

Epidemiological Assumptions: Attack Rate

- 1918/19 (USA) - 10% to 40%
- 1957/58 (USA) - 15% to 40%
- 1968/69 (Hong Kong) 10% to 30%

- Metzler US estimate 15% to 35%
- G-Cubed assumption 30%

Epidemiological Assumptions: Case Fatalities

- 1918/19 (USA) – 0.2% to 4%
- 1957/58 (USA) – 0.04% to 0.27%
- 1968/69 (Hong Kong) 0.01% to 0.07%

- Metzler US estimate 15% to 35%
- G-Cubed assumption
  - Mild 0.0233%
  - Moderate 0.2333%
  - Severe 1.1667%
  - Ultra 2.3333%

Figure 1: Geography Indicator

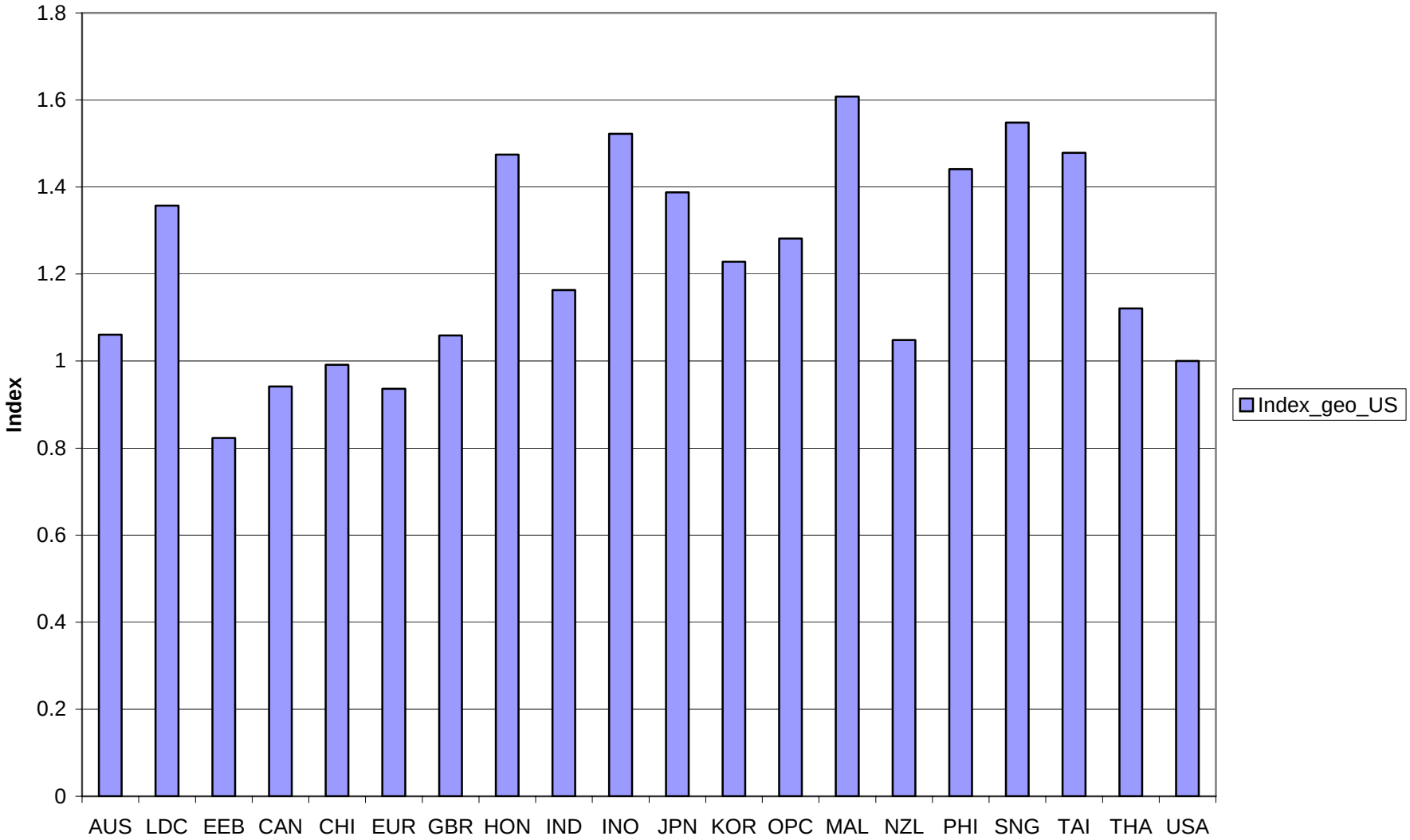


Figure 2: Health Policy Indicator

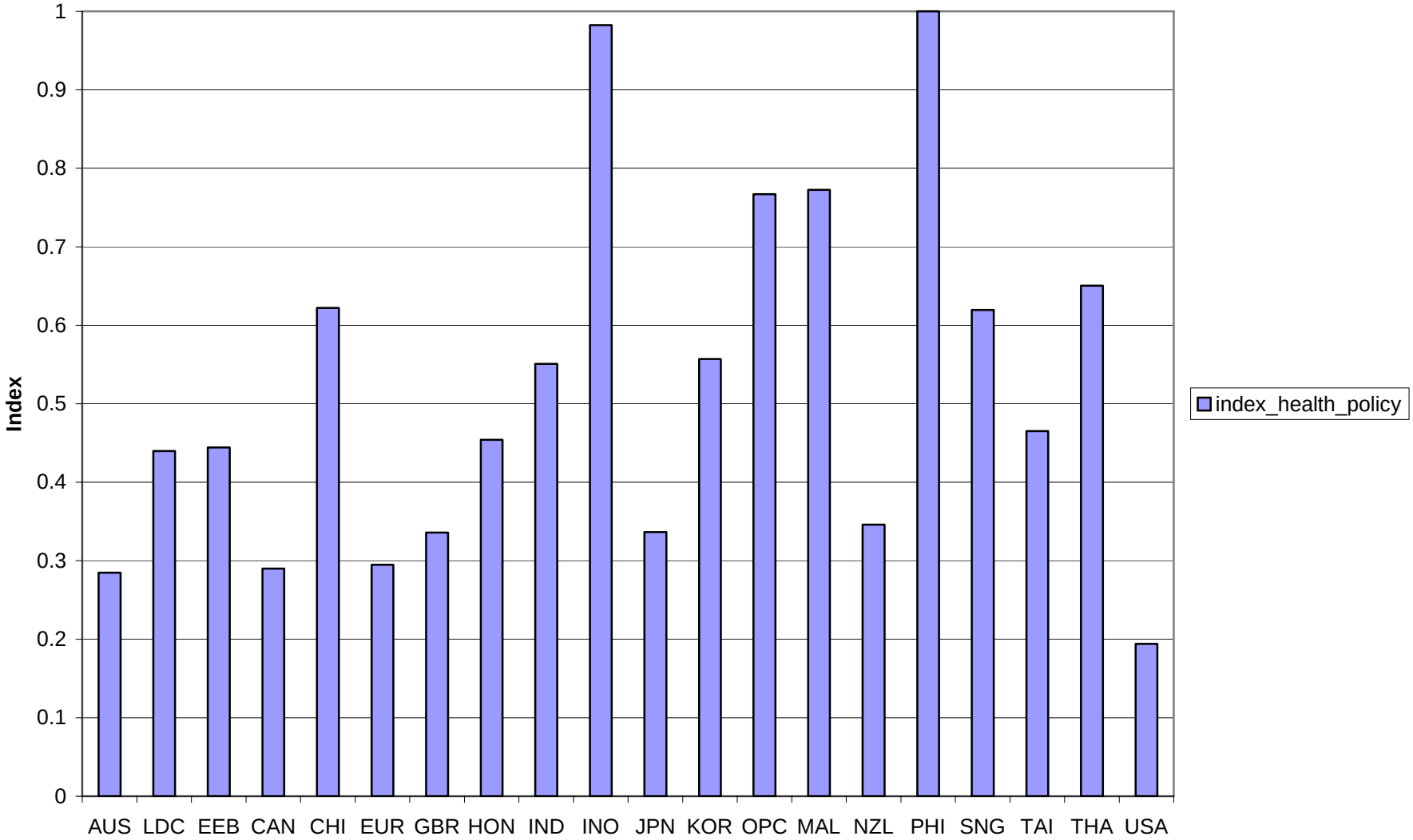


Figure 3: Mortality Rate Under each scenario

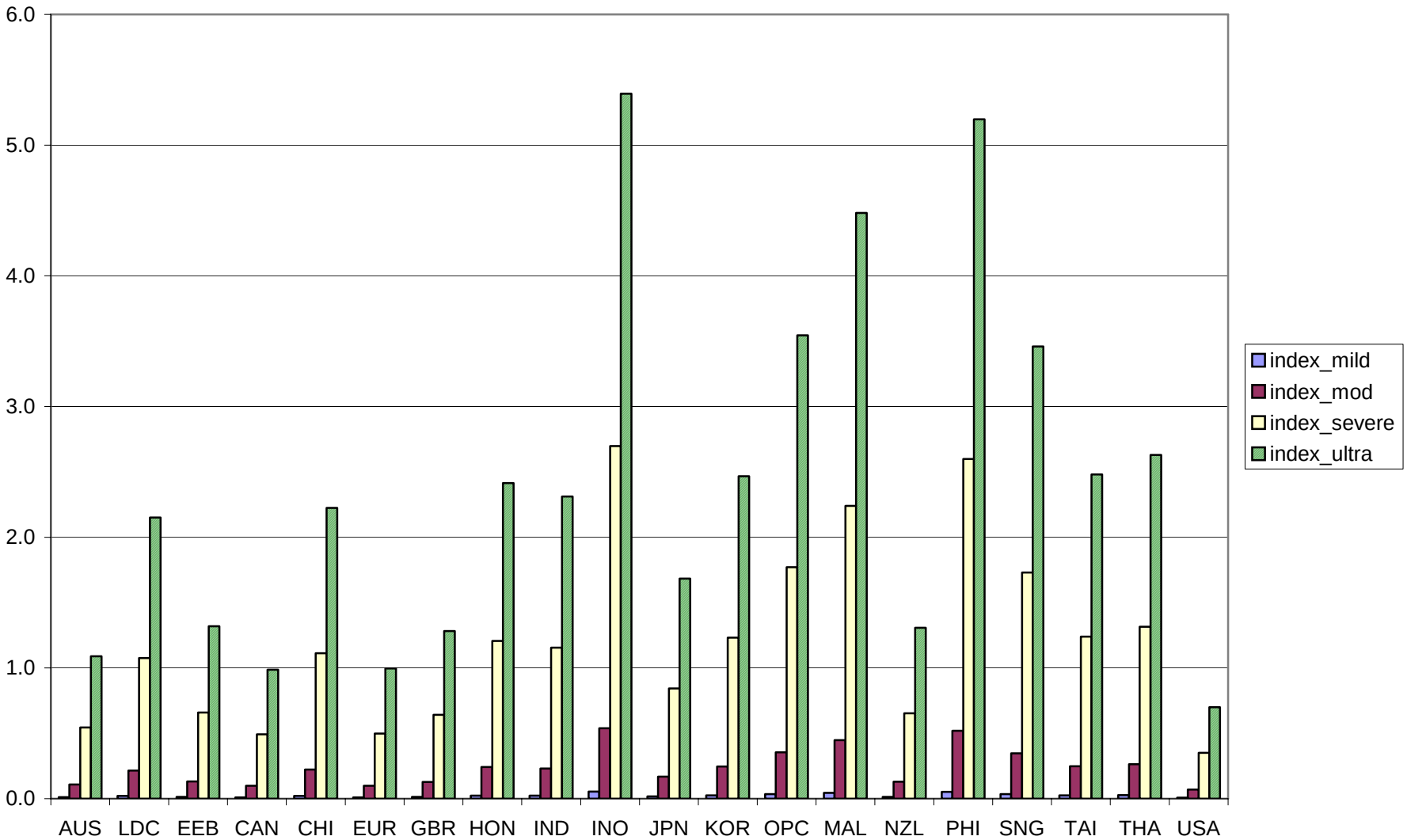


Figure 4: Additional labor force shock due to Absenteeism

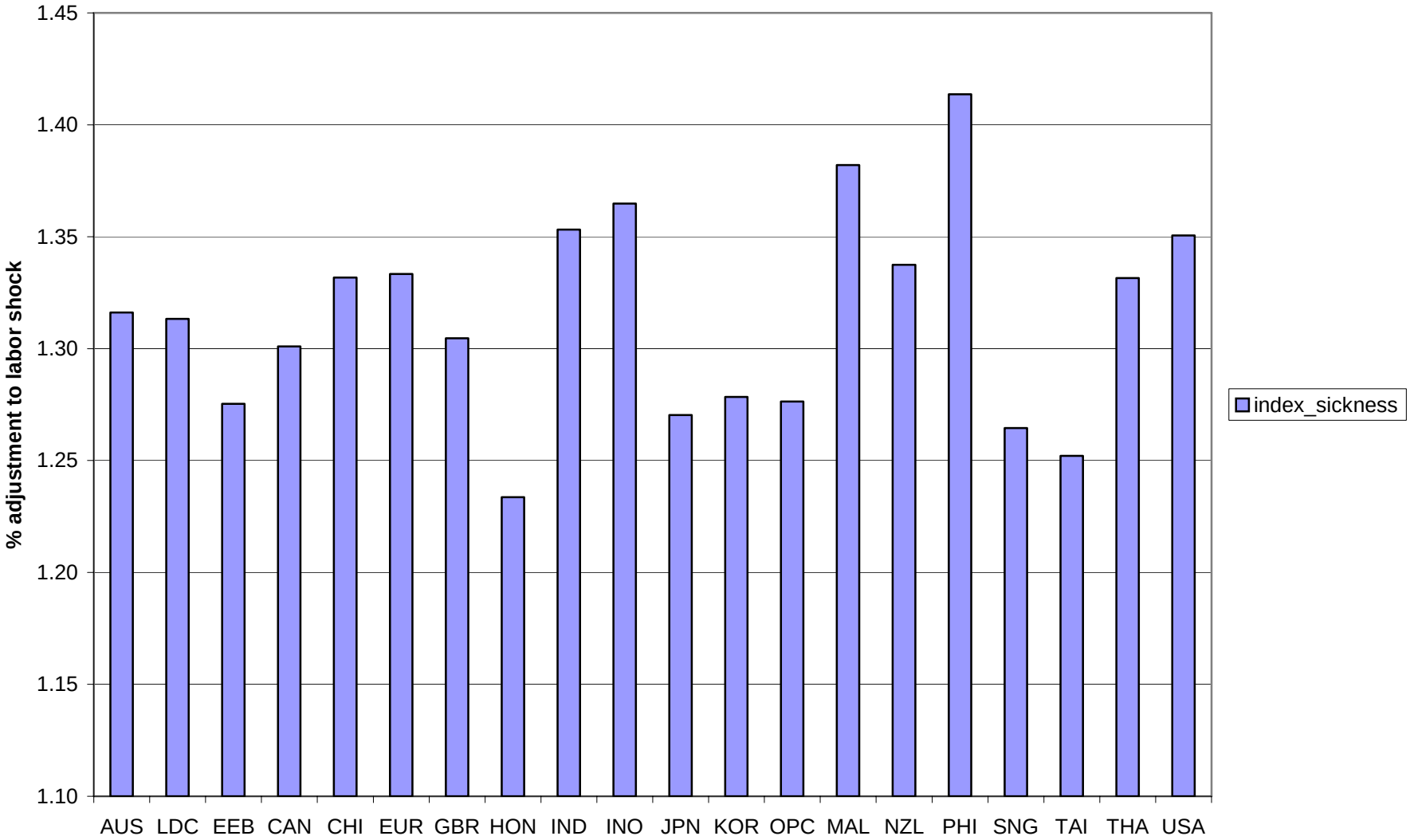


Figure 5: Service Sector Exposure in Production

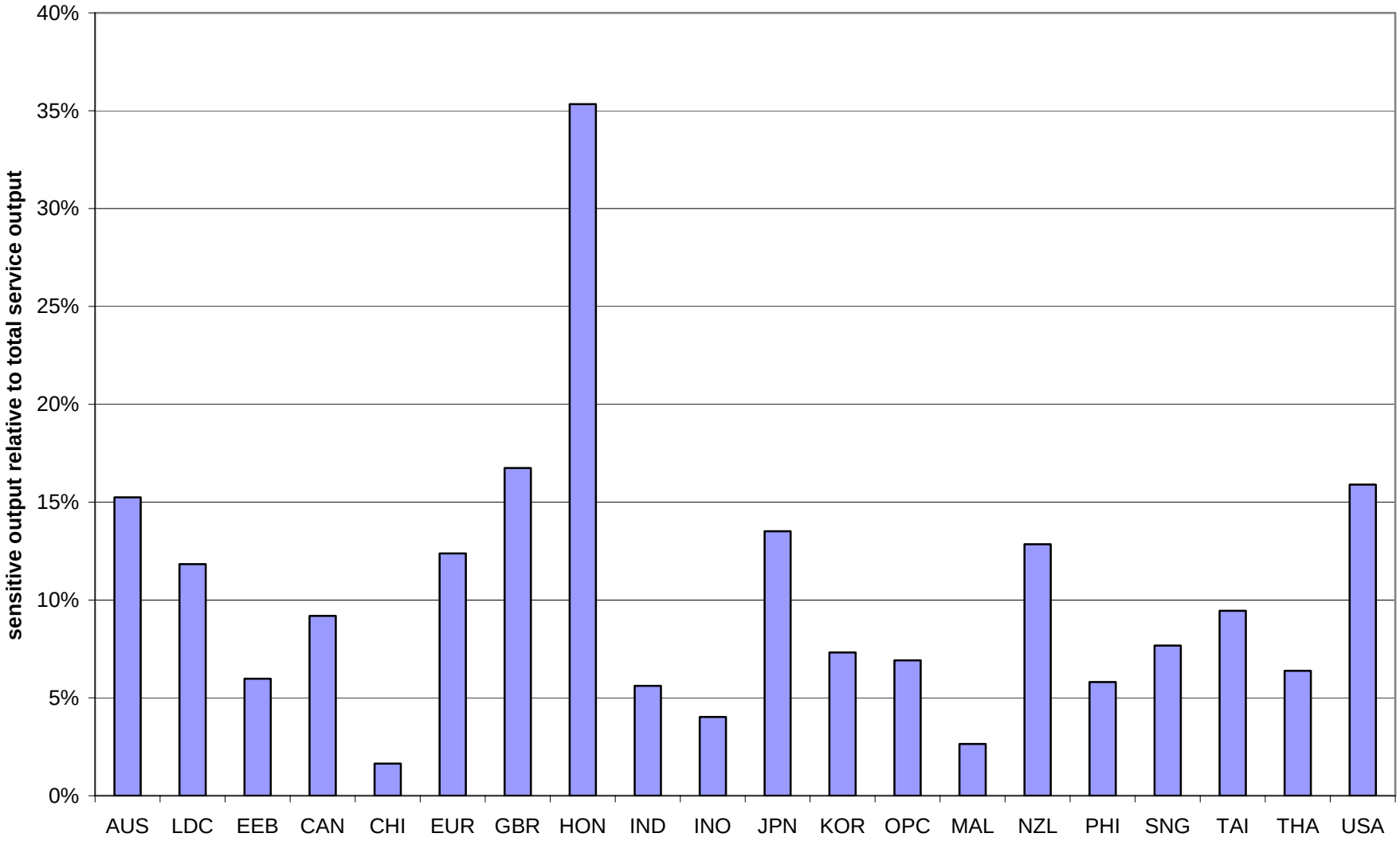


Figure 6: Governance Indicator

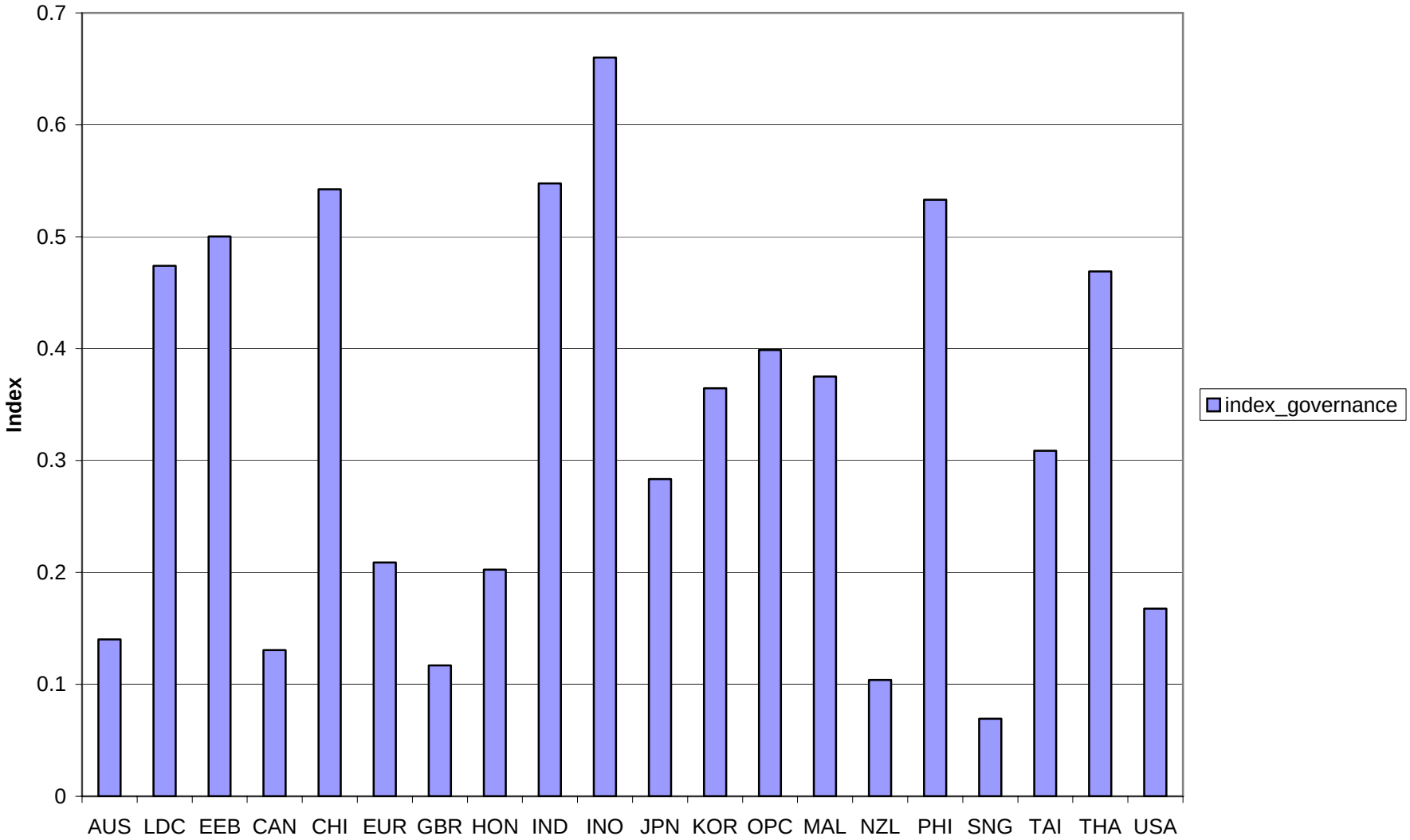


Figure 9: Cost shocks - Moderate Scenario

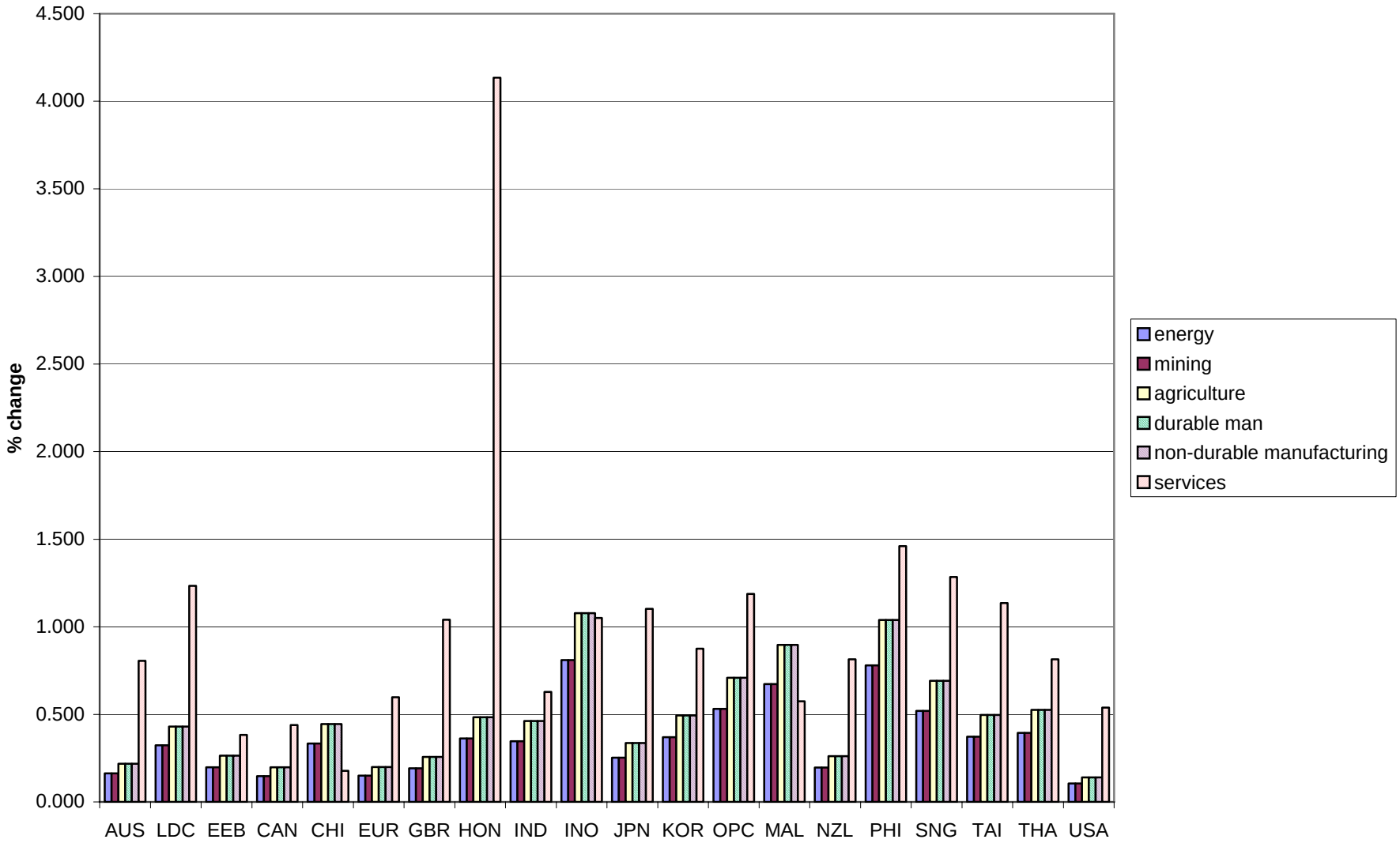
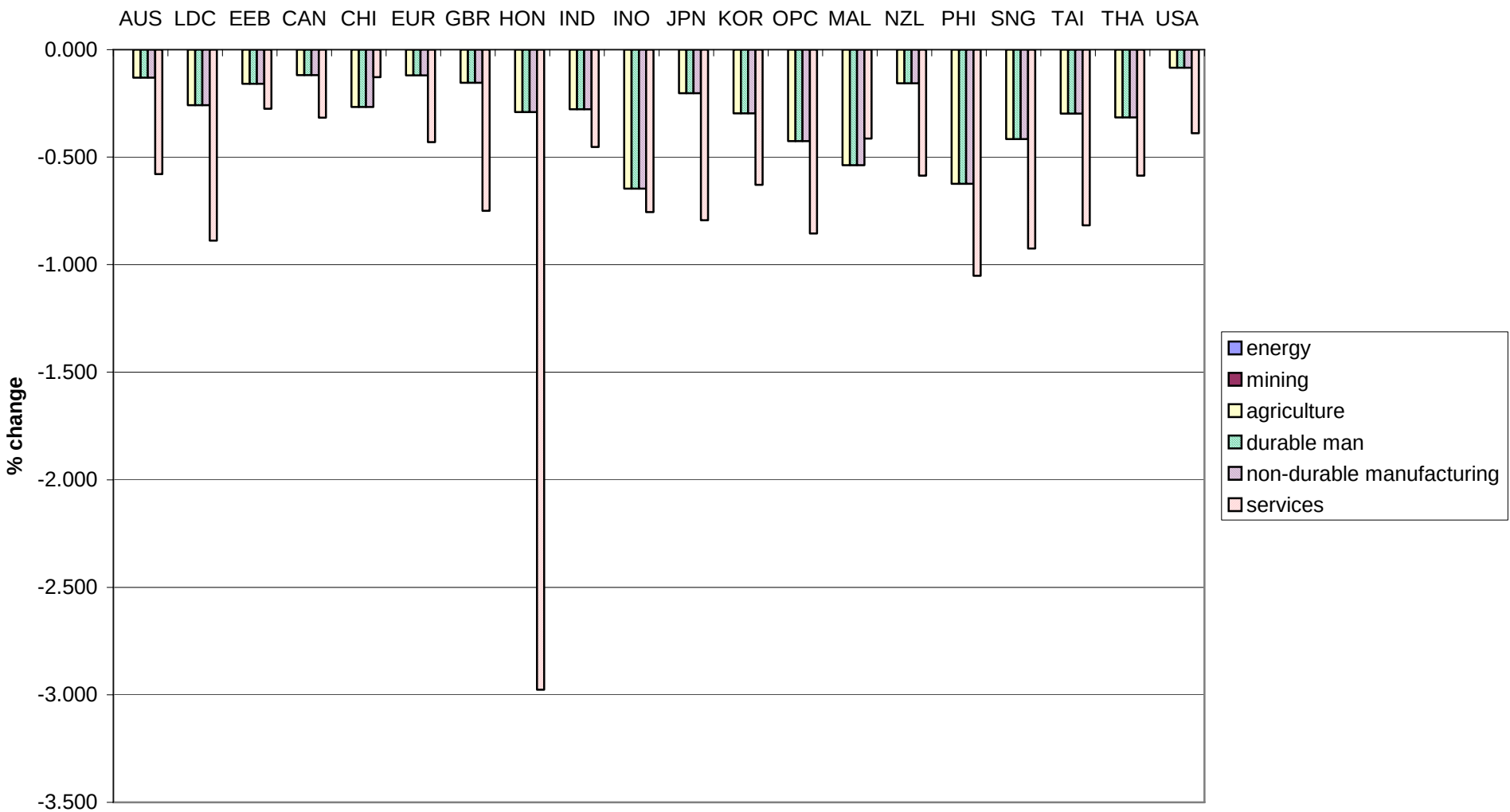


Figure 13: Demand shocks - Moderate Scenario



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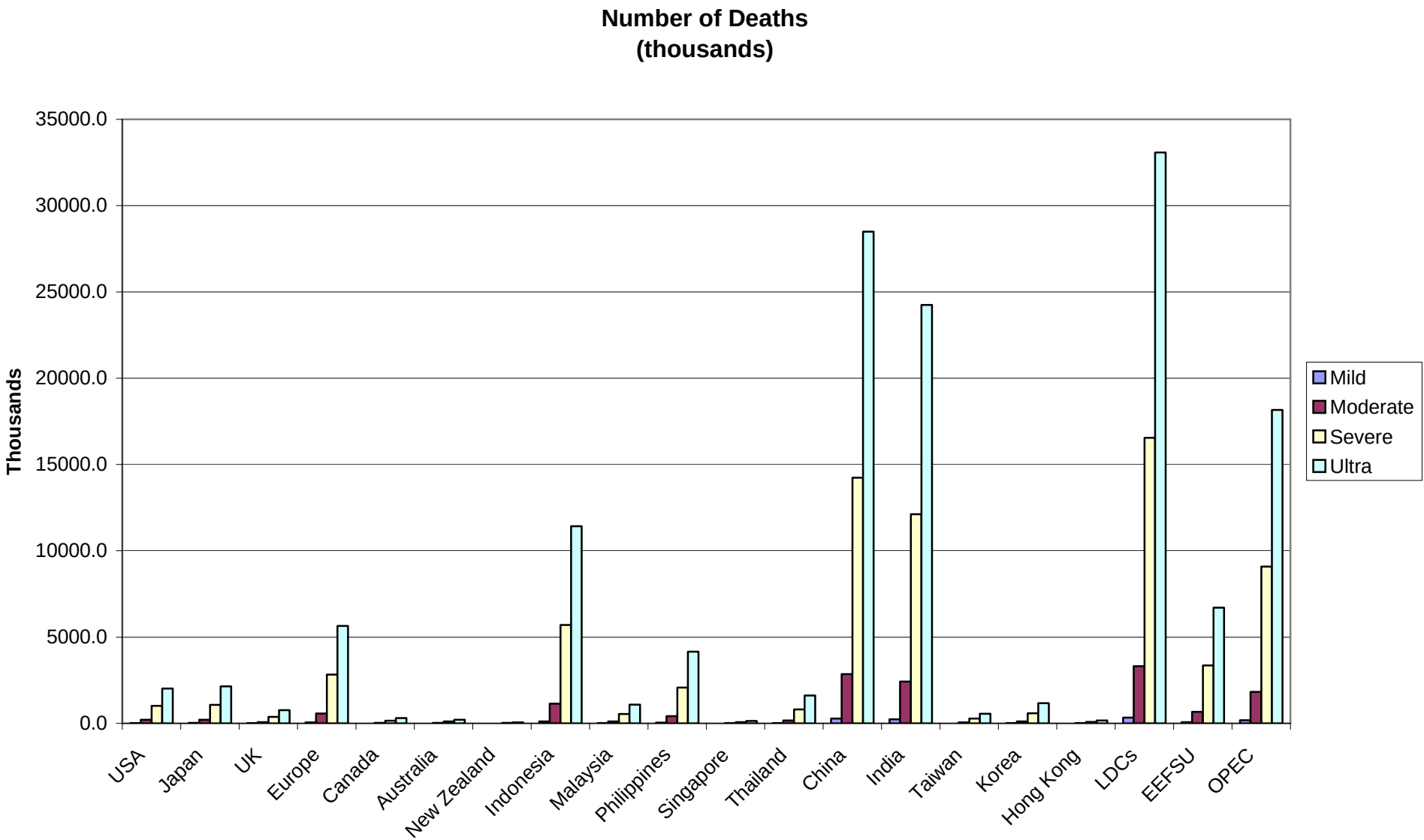
Results



Global Deaths in millions: Mild (1.4); Moderate (14); Severe (71); Ultra (142)

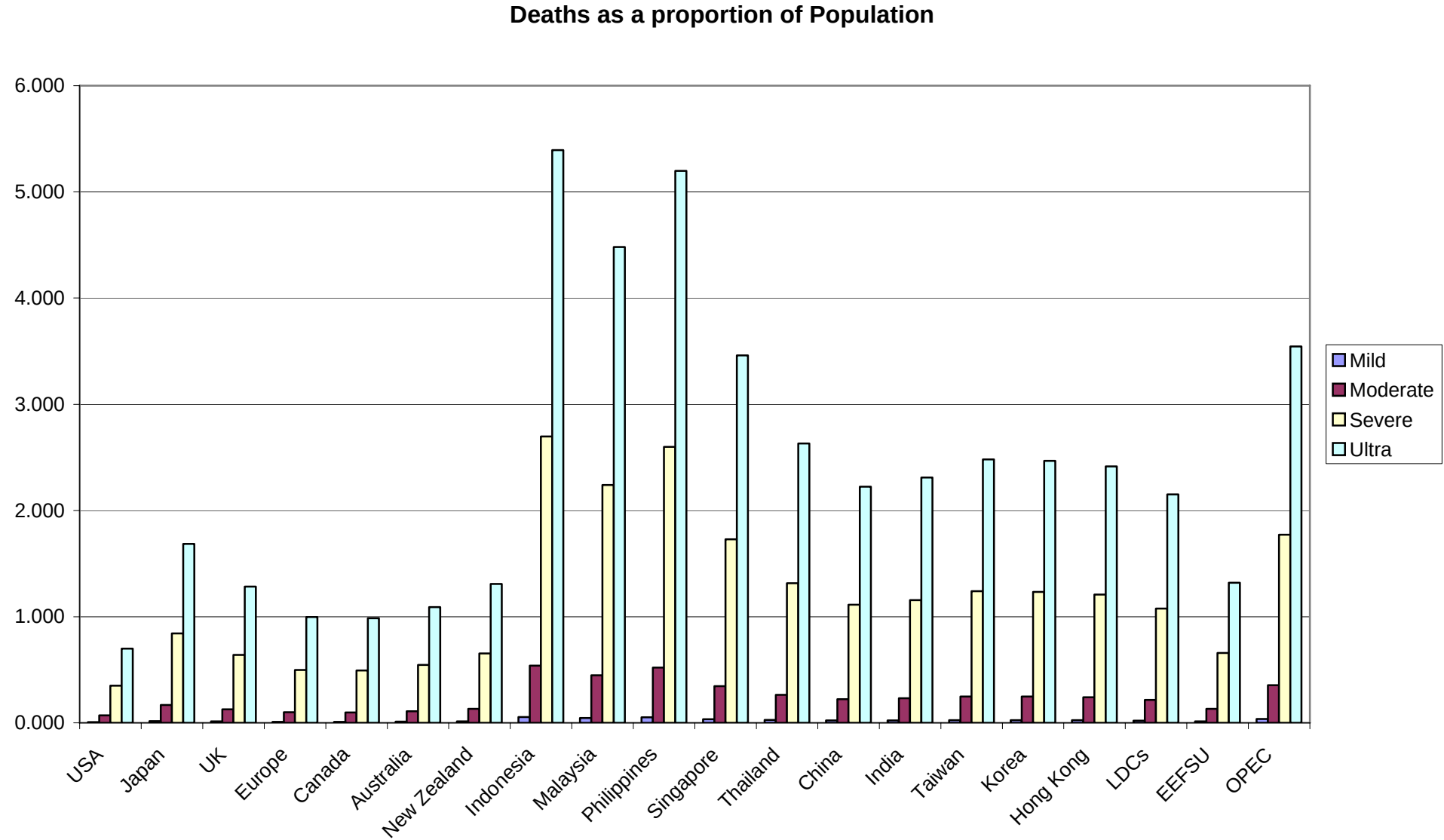
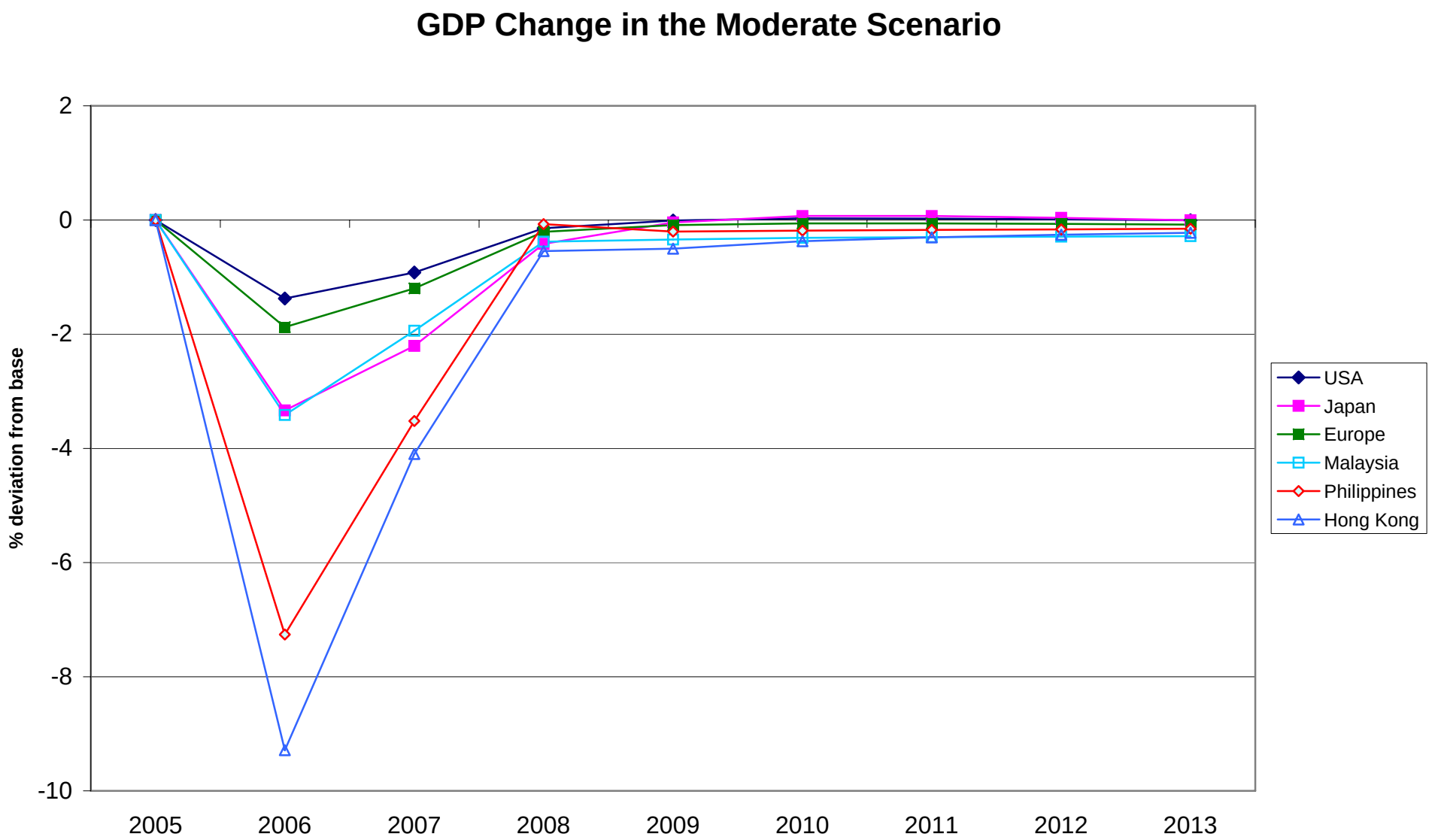

Deaths as a proportion of Population
6.000
5.000
4.000
3.000
2.000
1.000
0.000
USA
Japan
UK
Europe
Canada
Australia
New Zealand
Indonesia
Malaysia
Philippines
Singapore
Thailand
China
India
Taiwan
Korea
Hong Kong
LDCs
EEFSU
OPEC
Mild
Moderate
Severe
Ultra

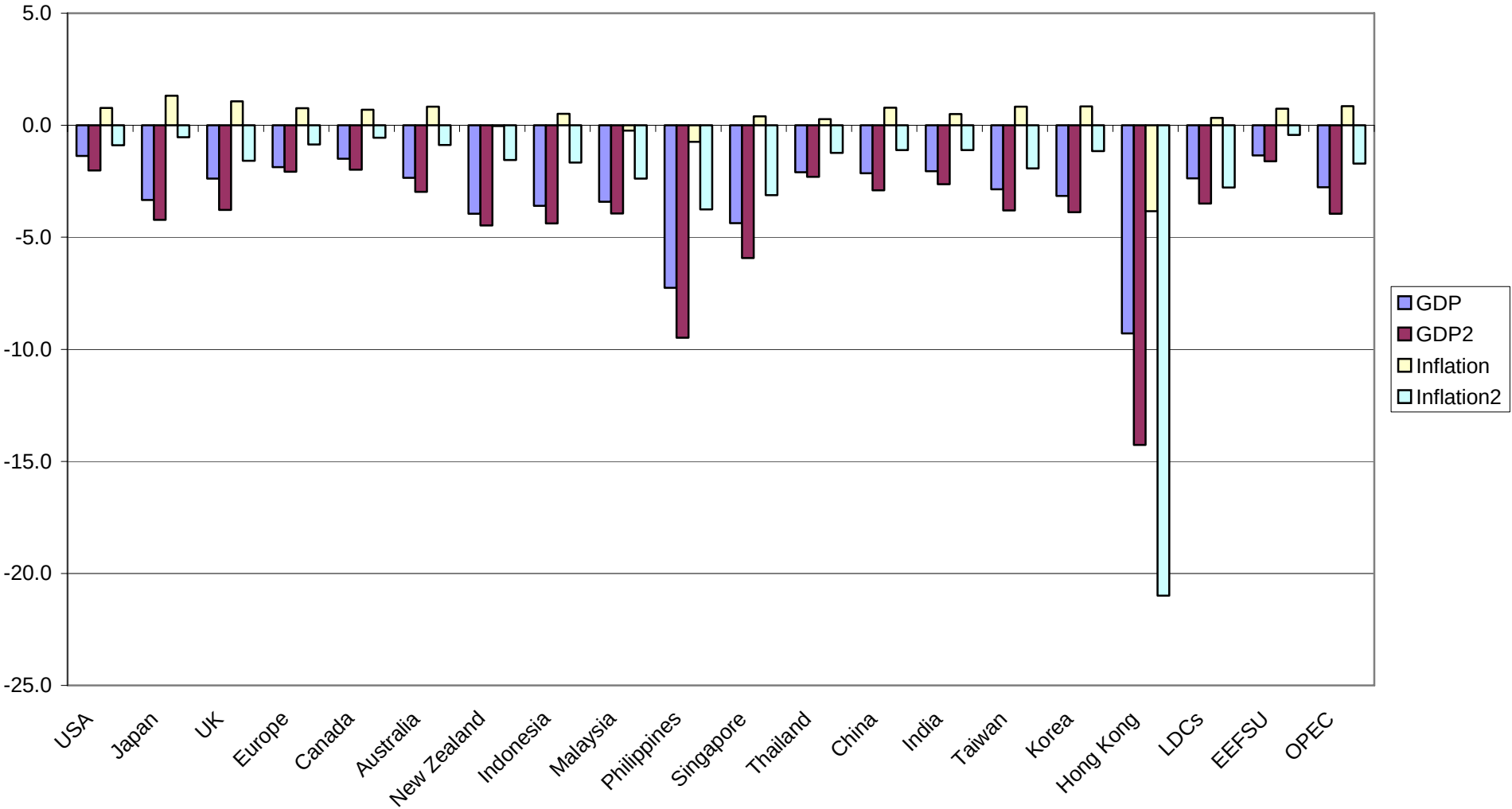
Table 7: 2006 percentage GDP loss by region

	Mild	Moderate	Severe	Ultra
USA	-0.6	-1.4	-3.0	-5.5
Japan	-1.0	-3.3	-8.3	-15.8
UK	-0.7	-2.4	-5.8	-11.1
Europe	-0.7	-1.9	-4.3	-8.0
Canada	-0.7	-1.5	-3.1	-5.7
Australia	-0.8	-2.4	-5.6	-10.6
New Zealand	-1.4	-4.0	-9.4	-17.7
Indonesia	-0.9	-3.6	-9.2	-18.0
Malaysia	-0.8	-3.4	-8.4	-16.3
Philippines	-1.5	-7.3	-19.3	-37.8
Singapore	-0.9	-4.4	-11.1	-21.7
Thailand	-0.4	-2.1	-5.3	-10.3
China	-0.7	-2.1	-4.8	-9.1
India	-0.6	-2.1	-4.9	-9.3
Taiwan	-0.8	-2.9	-7.1	-13.8
Korea	-0.8	-3.2	-7.8	-15.1
Hong Kong	-1.2	-9.3	-26.8	-53.5
LDCs	-0.6	-2.4	-6.3	-12.2
EEFSU	-0.6	-1.4	-2.9	-5.4
OPEC	-0.7	-2.8	-7.0	-13.6

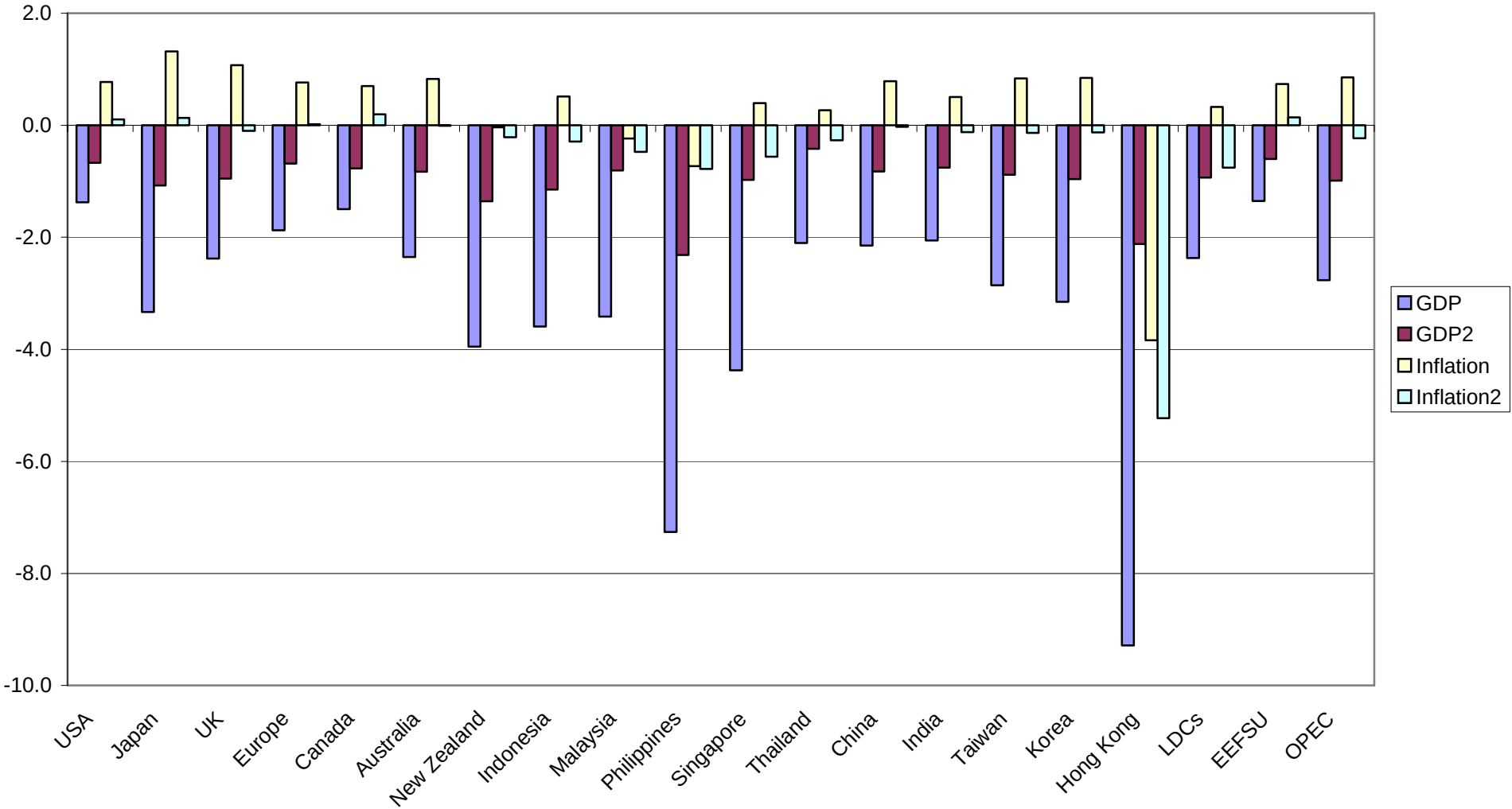
Source: APG-Cubed model version 63A


GDP Change in the Moderate Scenario
% deviation from base
2
0
-2
-4
-6
-8
-10
2005
2006
2007
2008
2009
2010
2011
2012
2013
USA
Japan
Europe
Malaysia
Philippines
Hong Kong

Sensitivity of GDP and Inflation to Demand assumptions



Sensitivity of GDP and Inflation to Cost assumptions



Summary

- Even a mild pandemic has significant costs (0.8% of global GDP or $330 billion)
- A repeat of the 1918/19 Spanish flu could cost up to $4.4 trillion
- The impacts are larger on developing countries because of larger shocks and the relocation of international capital flows to the relative safe havens of the US and Europe
- Equity markets fall and bond markets rally
- Inflation may rise or fall depending on the relative scale of cost increases versus demand switches

Summary

- Monetary responses matter
  - Countries which peg the exchange rate tend to suffer even more because of a tightening of policy to maintain the peg

Conclusion

- Predicting the impacts of pandemic influenza is difficult but the range of estimates found in this paper suggest that costs of any outbreak is potentially large and much larger than the resources currently being spent globally to tackle the likely sources of an outbreak

Background Papers

www.BROOKINGS.edu

www.SENSIBLEPOLICY.com