

Clean Development through Institutional Reform

*EMF 22: Climate Policy Scenarios
for Stabilization and in Transition*

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INTERNATIONAL

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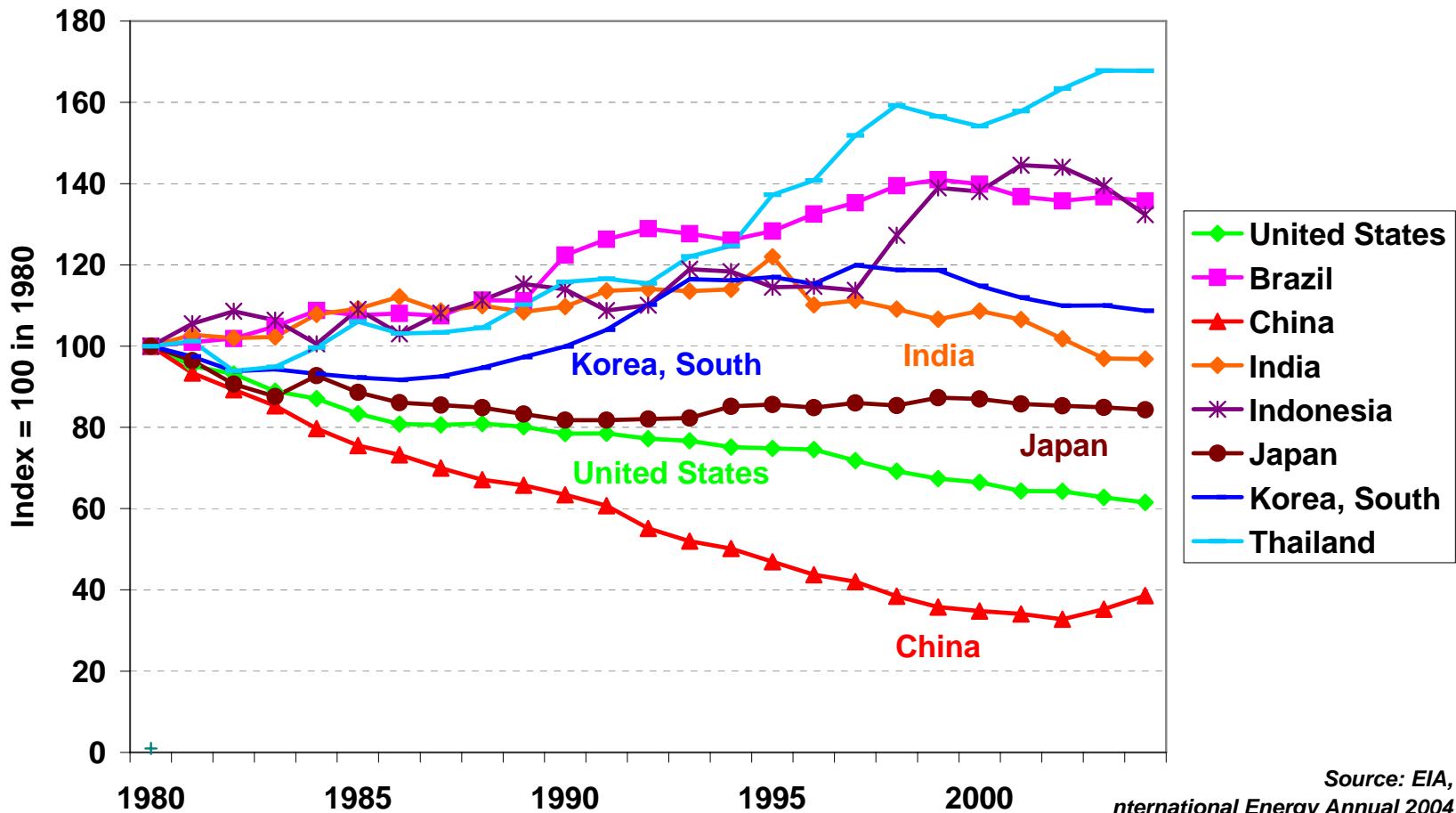
Washington, D.C.

Summary

- **Why do some countries have lower (higher) energy use per output than other countries?**
 - Comparisons of emissions and energy intensity suggest large opportunities for reducing emissions from developing countries
- **What can we say about determinants of energy intensity? Is there a relationship?**
 - There is a clear association between market failures and emissions intensity
 - These failures create obstacles to technology transfer and
 - Incentives for inefficient use of energy that explain some differences in emissions intensity
- **Has this been recognized within the modeling context? Does the cost of Integrated Assessment (IA) models reflect the true cost?**
 - IA models underestimate costs as these models assume that markets operate efficiently in all countries leading to equalization of marginal cost along the baseline
- **How can IA models incorporate these market failures? Is there a policy framework that can address market failures?**
 - In order to model the role of institutional reform new kinds of data and information need to be developed
 - How can Asia-Pacific Partnership (APP) be effectively used to improve energy intensity through institutional change
 - A proposal to bring about institutional reform
- **Role for EMF to improve analysis of governance issues**

Energy intensity index for some developing and developed countries

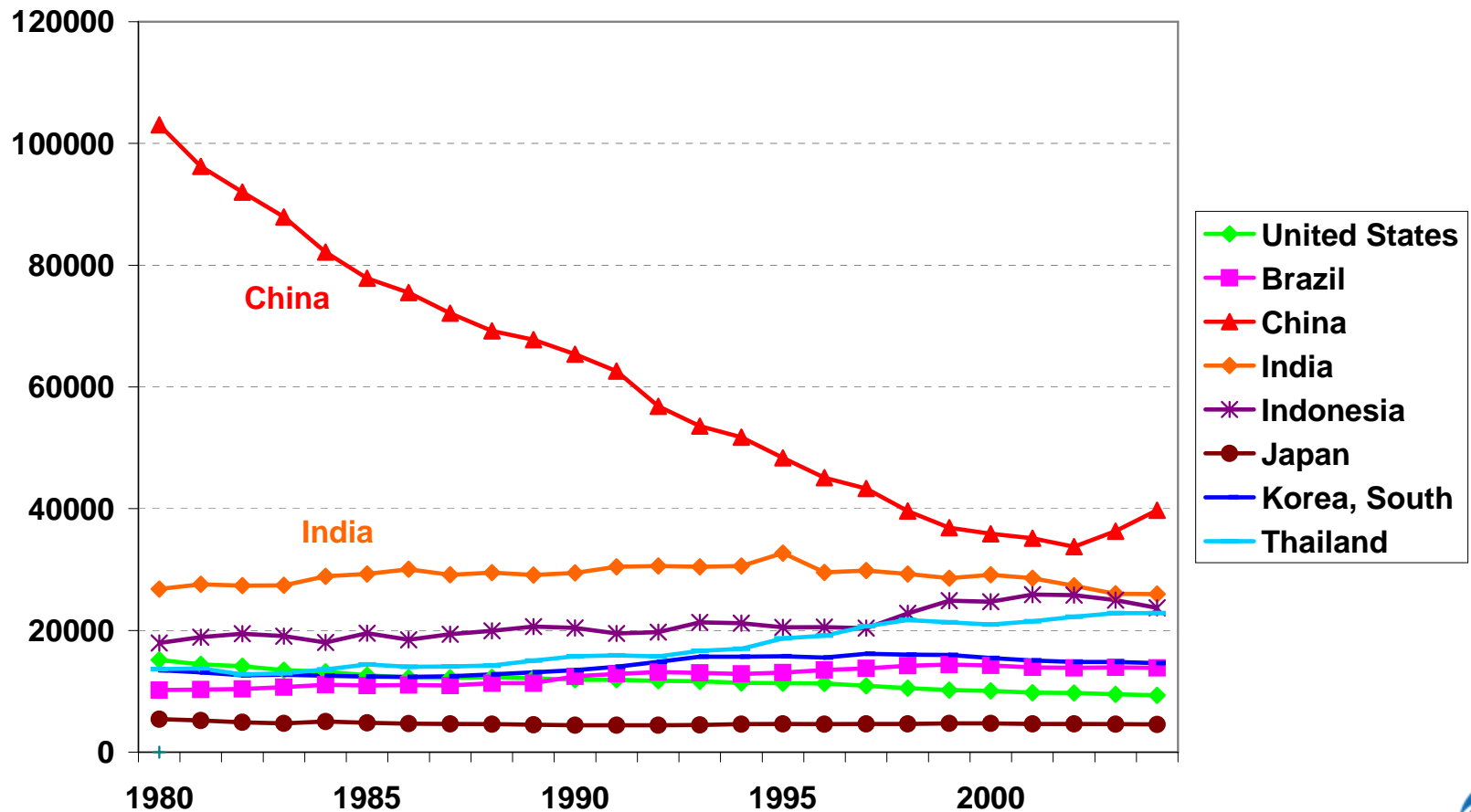
Energy Intensity Index
(All series indexed to 100 in 1980)



Source: EIA,
International Energy Annual 2004
Undated 2006

Energy use per GDP\$ for developing countries still higher than developed countries

Energy Intensity
(Btu per 2000 U.S. Dollars Using Market Exchange Rates)



Why do we see differences in technology across countries that yields different energy intensity?

Well analyzed approaches:

- **Bottom up answer**

- Market outcomes are inefficient if engineering calculations say so
- Mandatory caps or regulations will lead to cost-effective mitigation

- **Top down answer**

- Market determined outcomes include all mitigation that is cost-effective at zero carbon price
- Technology is chosen optimally given national resources and preferences
- Pricing emissions is necessary and sufficient to achieve efficient outcome

Alternative approach from the development literature

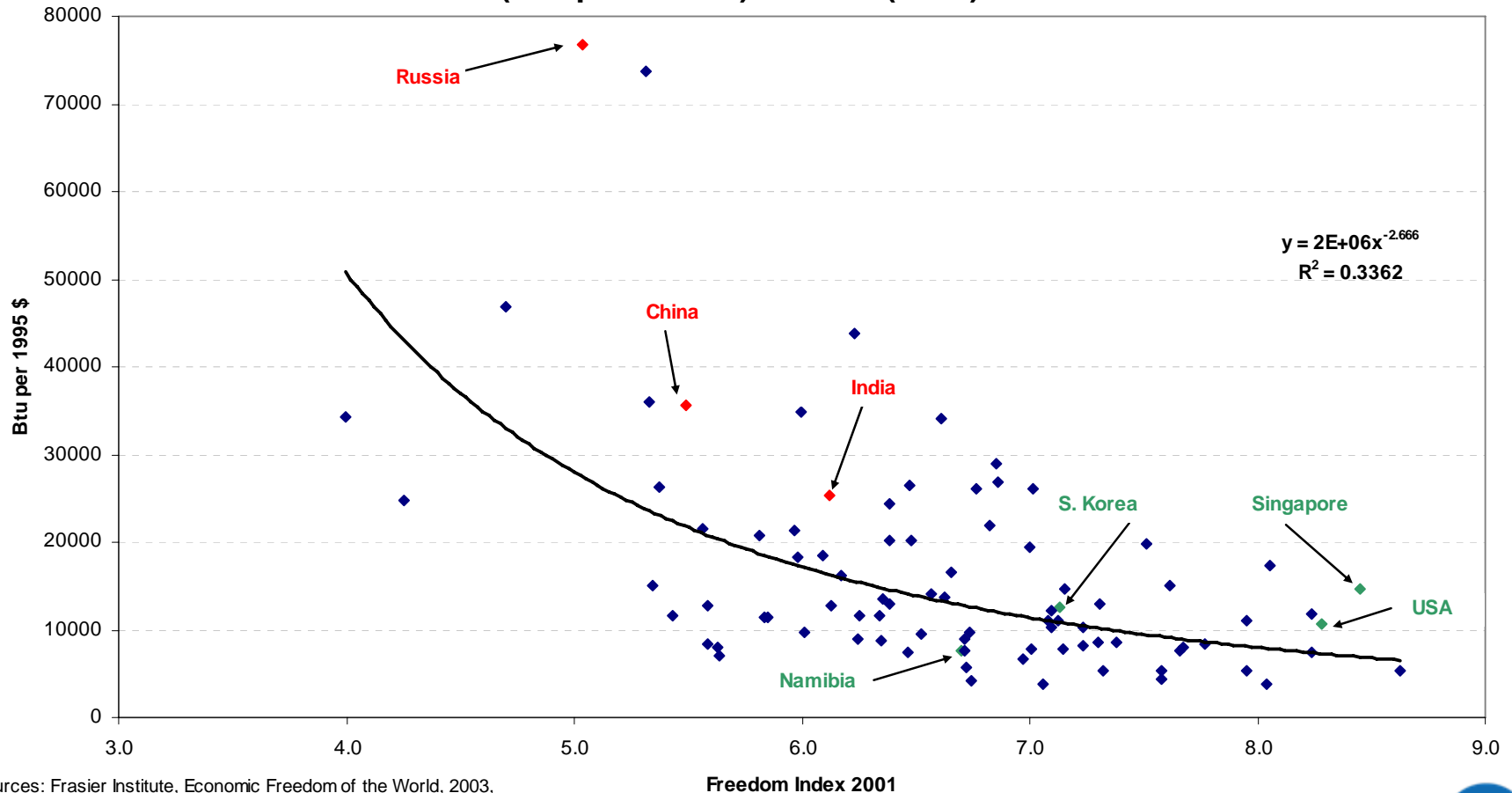
- **Institutional approach**

- Market outcome may be inefficient if institutional barriers exist
- Market outcome may be inefficient if institutions are inadequate
- Institutional reform is required to get markets to work
- We can conjecture under this approach that energy intensity is a function of market failures defined by subcomponents of economic freedom index
- We use score of economic freedom index to test this conjecture



Lack of Economic Freedom Explains Much of the Difference In Energy Intensity

Economic Freedom Compared to Energy per Dollar
(Btu per 1995 \$) of GDP (2001)



Sources: Frasier Institute, Economic Freedom of the World, 2003,
U.S. Energy Information Administration, International Energy Annual, 2002

Relationship of Subcomponents of Economic Freedom and Energy Intensity

Variable		Model-D1	Model-D4
Constant		105439 (8132)*	164021 (12625)*
Protection of intellectual property	iprop	-2640 (720)*	-4323.0 (1040)*
Access of citizens to foreign capital markets/foreign access to domestic capital	accap	-4194 (967)*	-4006 (1038)*
Time with government bureacracy	burea	-2520 (907)*	-2348 (947)*
Size of government	gsize	-3832 (732)*	-4184 (805)*
Services share of GDP	srvsh		-338 (157)**
Argriculture share of GDP	agrsh		-1490 (226)*
Dummy - low income	dlow		
Dummy - middle income	dmid		-17326.0 (4333)*
Dummy - high income	dhigh		-21275.0 (6340)*
Number of Observation		381	345
R-squared		0.27	0.38

Standard errors in parenthesis

* Significant at 1%, ** significant at 5%

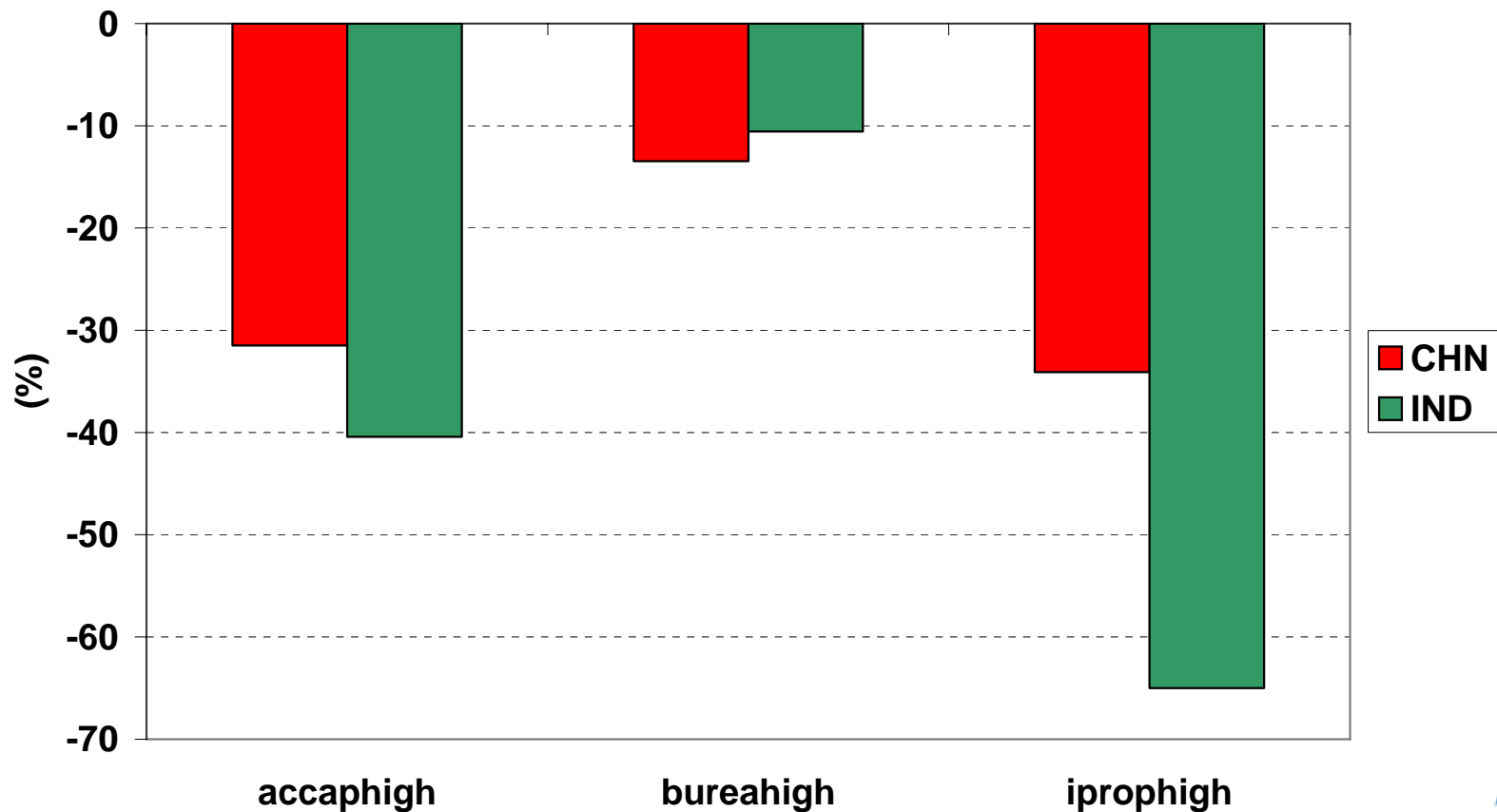
➤ **Not all economic freedom subcomponents are important for explaining variation in energy intensity. Institutional failures matter.**

Econometric analysis confirms a robust relationship between institutional failures and energy intensity

- **Quality of institutions yield statistically significant difference in energy intensity**
- **Overall economic freedom matters, because the process of growth itself leads to lowering energy intensity**
 - High income countries have lower carbon intensity than mid-income, and mid-income than low
- **Differences in energy intensity within each income level are explained by**
 - Protection of intellectual capital
 - Access of citizens to foreign capital markets
 - Foreign access to domestic capital
 - Time with government bureaucracy
 - Size of government
- **Improving governance results in lowering energy intensity for developing countries.**
- **China and India can improve energy intensity by as much as 40%-60% by improving intellectual rights alone.**
- **Room for improvement in energy intensity for developing countries with weak economic freedom by addressing market failures**

How much improvement can be realized with institutional reform at the level of high income countries?

Percentage Change in Energy Intensity if institutional barriers are improved



How are institutional aspects treated in integrated assessment models?

- **Market failures due to institutional deficiencies are generally omitted from modeling exercises**
 - **Assumption in IA models that marginal costs of abatement are equalized across countries requires the assumption that all markets are equally efficient**
 - **Clear institutional failings in major developing countries make that outcome unlikely to result from market-based policies**
 - **IA models underestimate the cost of emission reduction policies that do not address market failures**
 - **IA models neglect the potential for reducing emissions through institutional reform**
- **Institutional and governance issues are added cost**

Institutional barriers impose transaction cost

Why do we need to account for institutional barriers?

- **Institutional barriers results in transaction cost**
 - These cost are nontrivial in countries that have deep rooted market failures
 - Cost due to inefficient market along with the resource cost would give a true cost

Modeling challenges

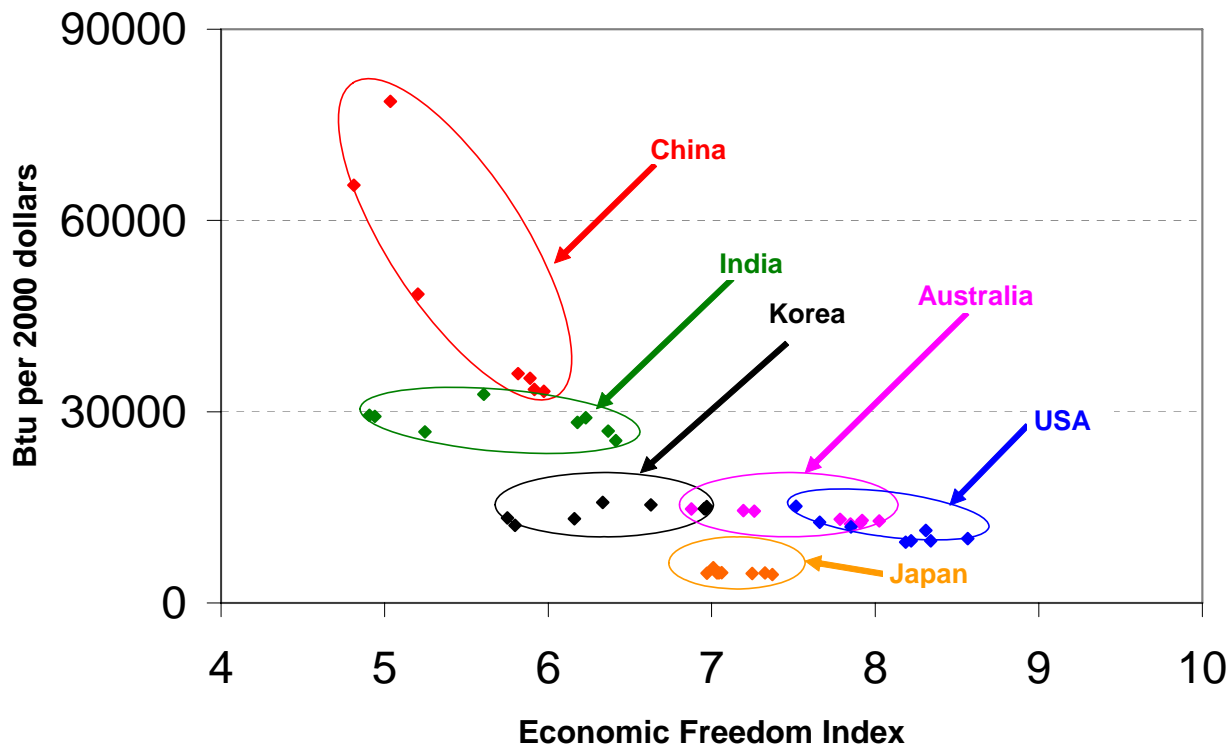
- **How to find a place in the model**
 - Can represent as inefficient use of resource
- **How to parameterize the model instrument**
 - It is difficult to pin down which market failures inhibit energy intensity improvements

Some key steps needed to move forward on institutional and governance issues?

- **Magnitude of “technology gap”**
 - Estimate potential by sector with real data on carbon intensity of new investment
 - Bottom up approach focus on technology and opportunity but does not identify policy levers, *but*
 - Realistic bottom up analysis comparing technologies currently in use to those that could be economic can help to define potential
- **Identification of governance issues relevant to carbon emissions**
 - Cross-sectional analysis establishes hypothesis that institutional failings with a plausible theoretical relationship to emissions intensity matter
 - Next step must be identification of specific institutional problems in specific economies with buy-in from the country involved
- **Policy levers that can bring about changes in institutions**
 - To prioritize reform, governments can start by measuring regulatory costs and identifying the biggest opportunities for improvement.
 - How can these be identified?
 - How can incentives¥willingness¥ability to reform institutions be changed?

Asia-Pacific Partnership a framework for China and India to attract technology transfer and efficient use of energy

Asia-Pacific Partnership Energy Intensity and Economic Freedom (1980-2003)



Countries whose emissions growth concerns us are precisely the countries lacking the institutional characteristics that lead to sustained economic growth

What avenues exist to develop enough information to assess the potential emission benefits of institutional reform and to design appropriate changes?

- **Asia-Pacific Partnership**

- Provides framework for involving business, experts and governments
- Potential for sponsoring studies and developing country-specific data
- Engagement of governments could lead to buy-in on the nature and importance of reform and identify ways that advanced countries could encourage reform

- **EMF**

- Opportunity to bring institutional economists and modelers together
- Could draw on studies done by World Bank and US AID
- Not suitable for generating new data on specific institutions in specific countries
- Bring research institutions from developing countries to better understand the linkage of institutional and governance reform and energy use.



Conclusions

- **Institutional development theory provides understanding of why energy use differs across countries**
- **Real opportunities exist for clean development in developing countries**
- **Addressing institutional reforms and market failures that inhibit technology transfer is a win-win approach for developing countries**
- **Institutional reform can produce emission reductions without additional measures and make market based policies feasible**
- **Empirical work especially IA modeling work should focus in accounting these market inefficiencies**
- **EMF can play a role in bringing institutionalists and modelers to get a better understanding of institutional issues and how to represent it within energy-economic models.**