

The Effects of “Institutions” on Investment and Policy Design in the Energy Sector in Developing Countries: Some implications for Integrated Assessment Models

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Today

1. International Investment: Patterns & Costs
2. Selection of National Policy Instruments
3. Selection of International Policy Instruments
4. Some Implications for Integrated Assessment



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1. Overseas Investment: Patterns & Costs

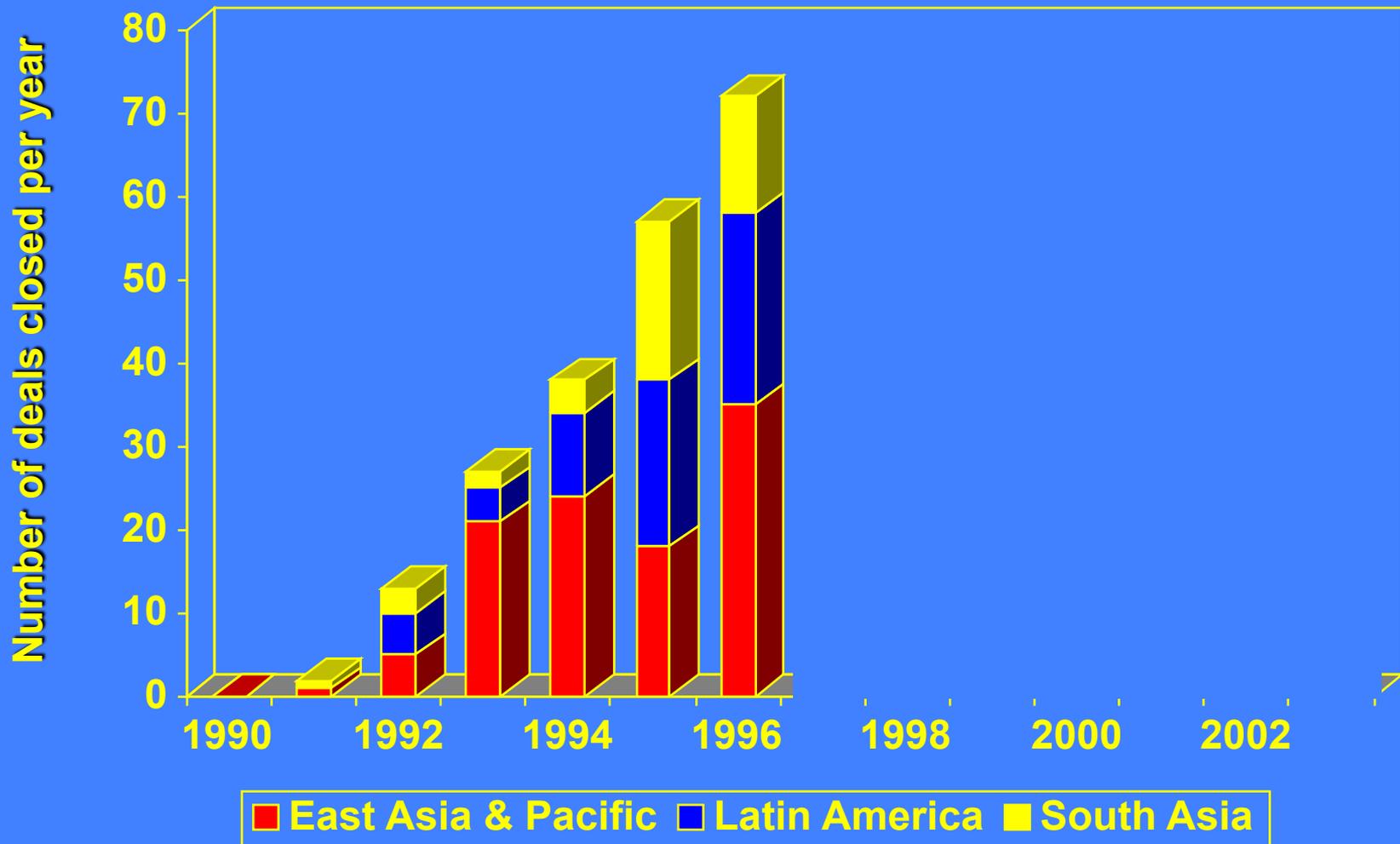
One (extreme) perspective: the experience of
Independent Power Producers (IPPs)

Key Sources: Woodhouse (2006) and Victor & Heller (2006)

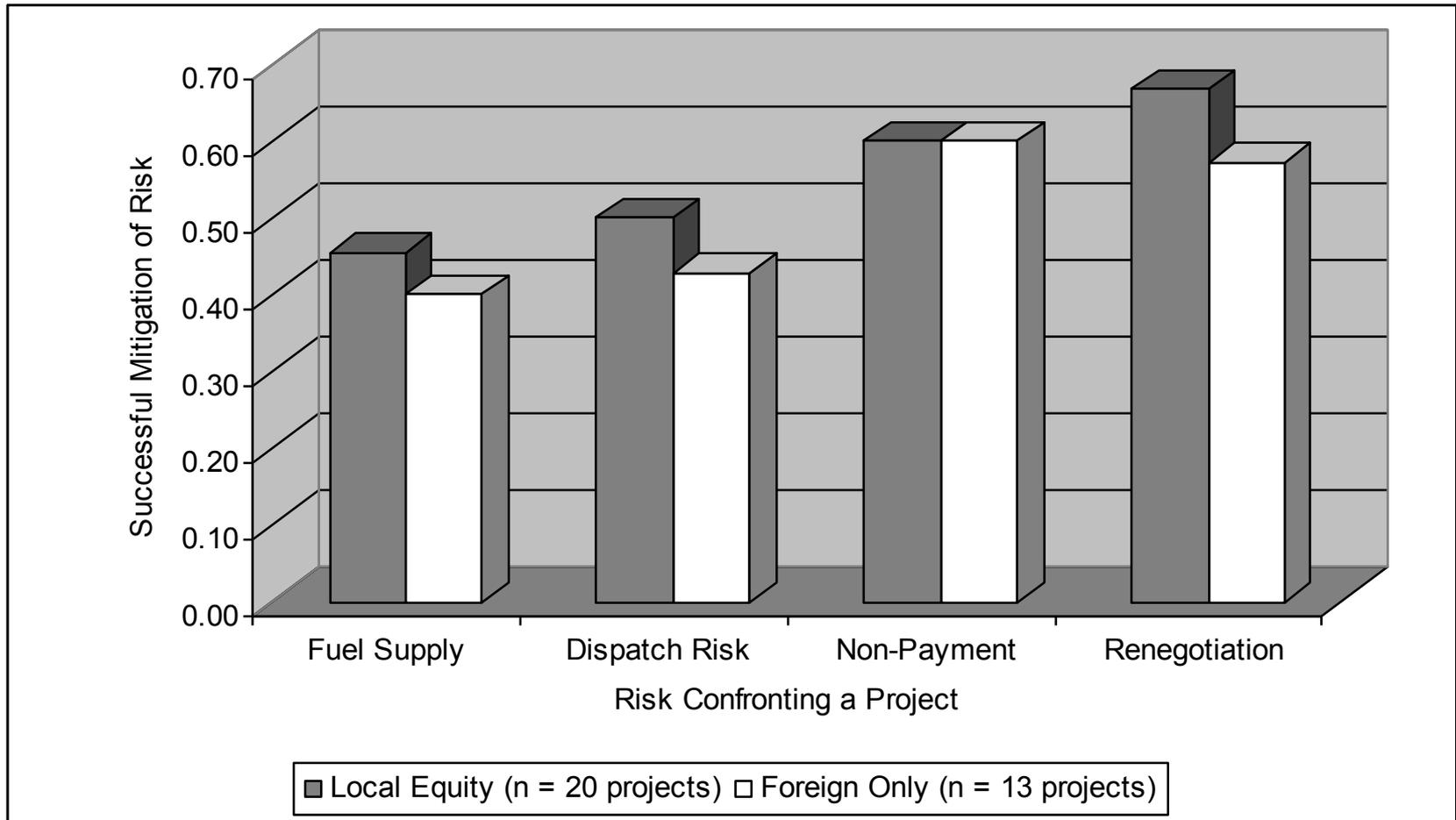


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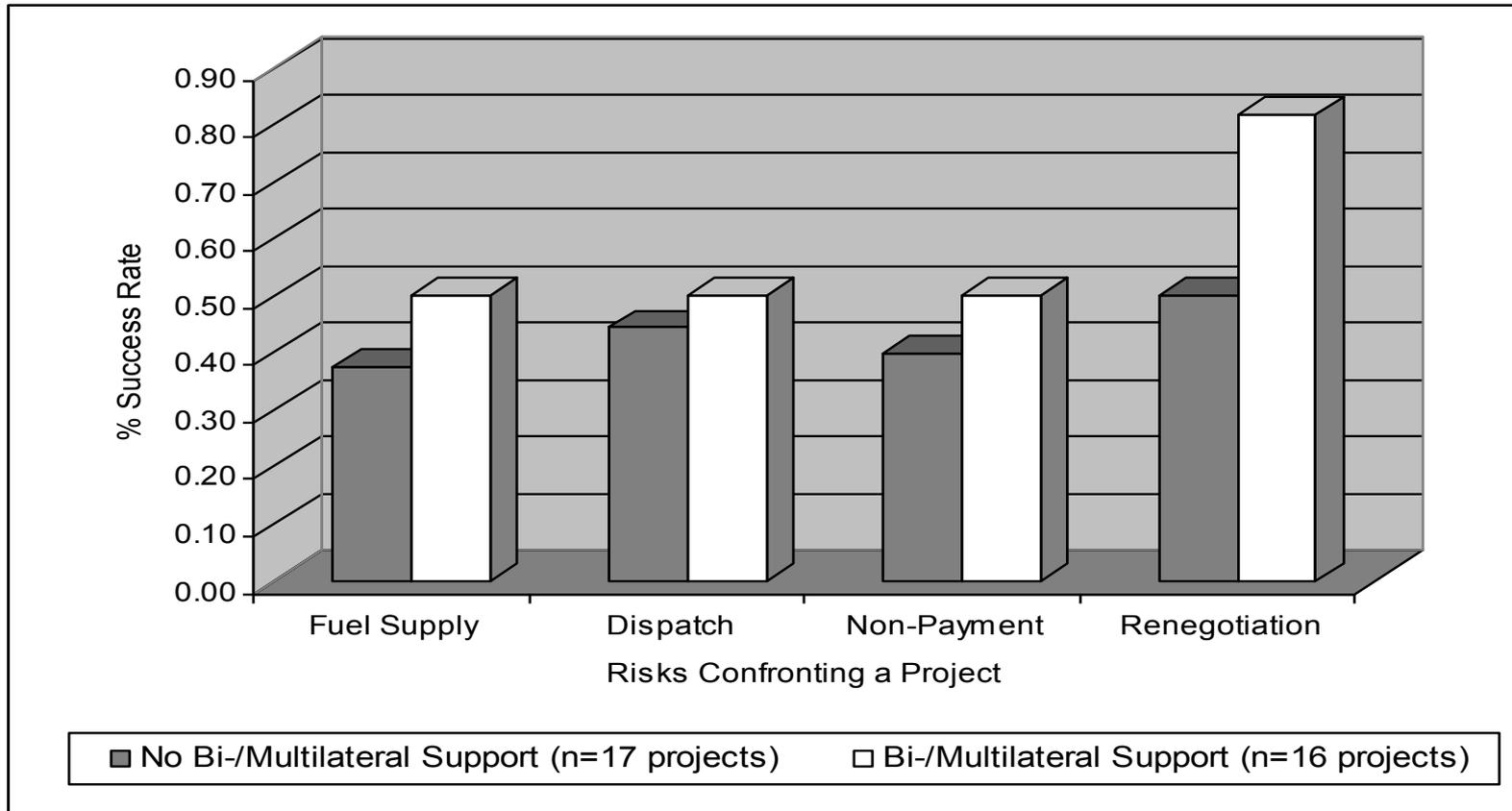
The IPP Market in the 1990s: hard currency SPVs anchored in PPAs



Risk Mitigation Effects of Local Partners



Risk Mitigation Effects of International Lenders



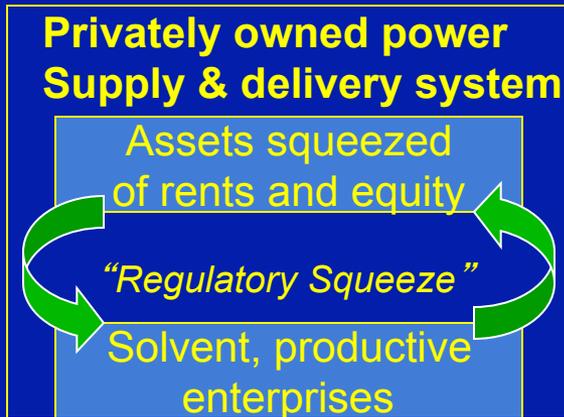
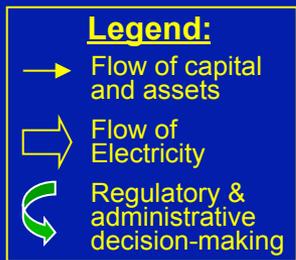
Full Sample of IPPs Studied

Project Name	Country	Fuel	MW	Cost US \$	\$/MW	COD	Foreign Sponsor	Local Sponsors
Termoeará	Brazil	Nat' l Gas	290MW	\$100	\$345	2001	MDU Resources	EBX Capital
Macaé	Brazil	Nat' l Gas	928MW	\$730	\$787	2001	El Paso Energy	--
Norte Fluminense	Brazil	Nat' l Gas	780MW	\$887	\$1137	2004	Electricite de France	--
Uruguiana	Brazil	Nat' l Gas	600MW	\$350	\$583	2000	AES Corp.	--
Caña Brava	Brazil	Hydro	450MW	\$426	\$947	2002	Tractebel Energia	--
Shajiao C	China	Coal	1980MW	\$1,870	\$944	1996	CEPA → Mirant	Guangdong gov' t
Meizhouwan	China	Coal	724MW	\$755	\$1043	2001	Intergen, El Paso, Lippo	--
Shandong Zhonghua	China	Coal	3000MW	\$2,200	\$733	2003	CLP, EDF	Shandong gov' t
Sidi Krir	Egypt	Nat' l Gas	685MW	\$418	\$610	2002	Intergen	--
Suez	Egypt	Nat' l Gas	683MW	\$340	\$498	2003	EDF	--
Port Said	Egypt	Nat' l Gas	683MW	\$338	\$495	2002	EDF	--
GVK Jegurupadu	India	Nat' l Gas	216MW	\$261	\$1208	1996	CMS	GVK
Lanco Kondapalli	India	Nat' l Gas	250MW	\$285	\$1140	2000	CDC Globeleq	Lanco
Essar Power	India	Naphtha/Gas	515MW	\$514	\$998	1995	--	Essar Steel
CLP Paguthan	India	Naphtha/Gas	655MW	\$734	\$1121	1998	Powergen → CLP	--
PPN	India	Naphtha/Gas	330MW	\$252	\$764	2001	El Paso, PSEG, Marubeni	Reddy Group
ST-CMS	India	Coal	250MW	\$320	\$1280	2002	CMS	ST Power
IberAfrica	Kenya	Diesel	44MW	\$65	\$1477	1997	Union Fenosa	KPLC Pension
Tsavo	Kenya	Diesel	75MW	\$85	\$1133	2001	Cinergy, CDC, Wartsila, IFC	IPS (Agha Khan)
Monterrey III	Mexico	Nat' l Gas	1190MW	\$610	\$513	2001	Iberdrola	--
Rio Bravo II	Mexico	Nat' l Gas	568MW	\$234	\$412	2002	EDF	--
Merida III	Mexico	Nat' l Gas	530MW	\$260	\$491	2000	AES, Nichimen	Grupo Hermes
Navotas I	Phil.	Diesel	210MW	\$40	\$190	1991	CEPA → Mirant	--
Pagbilao	Phil.	Coal	700MW	\$888	\$1269	1996	CEPA → Mirant	--
Quezon	Phil.	Coal	460MW	\$895	\$1946	2000	Intergen, Ogden	PMR Resources
Casecnan	Phil.	Hydro	140MW	\$495	\$3536	2001	CalEnergy, Peter Kiewit	LA Prairie, San Lorenzo
Cavite	Phil.	Diesel	63MW	\$22	\$349	1995	CMS → Covanta	--
ENS	Poland	Nat' l Gas	116MW	\$132	\$1138	2000	Enron (Prisma)	JAC International
Elcho	Poland	Coal	220MW	\$324	\$1473	2003	PSEG	EC Chorzow
Eastern Power	Thailand	Nat' l Gas	350MW	\$250	\$714	2003	Marubeni	GMS
Independent Power	Thailand	Nat' l Gas	700MW	\$369	\$527	2000	Unocal, Westinghouse	Thai Oil
Gebze, Adapazari, Izmir	Turkey	Nat' l Gas	3860MW	\$2000	\$518	2002	Intergen	Enka
Trakya Elektrik	Turkey	Nat' l Gas	478MW	\$600	\$1255	1999	Enron (Prisma)	Gama

Insert Your Name - World Forum on Energy

Regulation III - Washington, DC - October

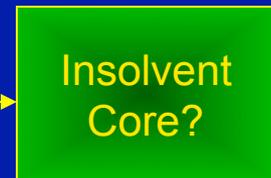
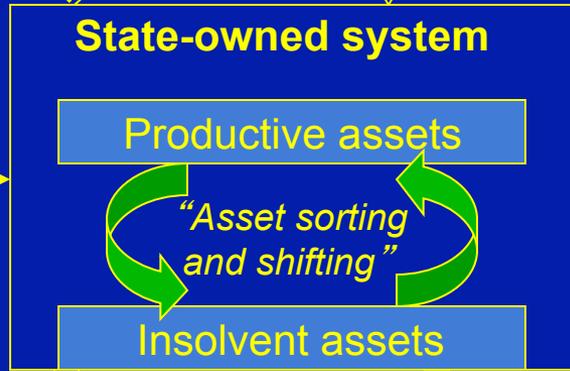
8-11, 2006



“Normal Private Firms”

“Dual Firms”

Privatization



“The State”

Pre-Reform



Unbundling and partial reforms



“Self-Generators”

Time (and increasing fragmentation)

2. Selection of National Policy Instruments

sources: Bosetti and Victor (2011) and Victor et al (2012) and Victor (2011)



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Two Views on National Policy

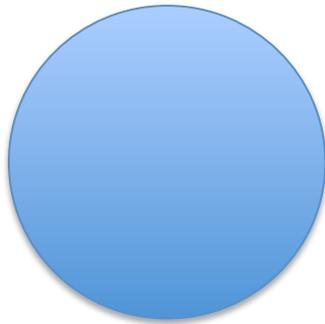
“Ideal Policy Design” (“optimal,” aka fantasy)

- Integrated across pollutants and sectors
- Integrated Policy Decision-Making
- Market-based
- Transparent
- Apply costs equally on all sectors and firms
- Credible and Long-Term

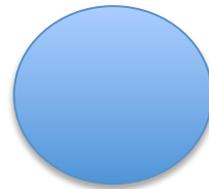
“Institutional Political Economy”

- Fragmented and Sector-specific
- Sequential decisions; veto players and agency issues
- Regulatory
- Opaque
- Focus costs on least well organized & new entrants
- Silent on Long-Term, especially fiscal cost

Costs of Second-Best Policies (aka life): The Problem of Short Time Horizons



Blind Response
(0-5 yr time
horizon)



Muddy foresight
(~8 year
anticipation)



Perfect foresight
(15+ year
anticipation)

Note: The effect of anticipation on regulatory costs for developing countries (% deadweight loss of economic output from developing countries in our “second best” scenario). Calculated from WITCH and reported in Bosetti and Victor (2011)

4. Selection of International Policy Instruments

sources: Raustiala and Victor (2004) and Keohane and Victor (2011)



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“Ideal” International Policy

**Integrated International
Treaty Framework**



National Policy

National Policy

National Policy



Firms

Firms

Firms

Firms

Firms

Firms

Fragmented Climate Change Legal Regime: Chaos or Opportunity?

UN Legal Regimes

(UNFCCC & Kyoto Protocol, formal funding mechanisms, nonbinding political agreements [e.g., Copenhagen Accord])

Expert Assessments

(IPCC; national assessments)

Montreal Protocol

(regulation of ozone-depleting gases that also affect climate warming)

Adaptation Initiatives

(e.g., programs by UN agencies and multilateral development banks [MDBs])

Bilateral Initiatives

(e.g., Norway-Indonesia; US-India; UK-China)

Clubs

(e.g., MEF, APP, G20, G8, G8+5)

Subnational Action

(e.g., California's emission trading system w/int'l offsets; subnational procurement rules)

Multilateral Development Assistance

(e.g., "mainstreaming" climate at MDBs; World Bank prototype carbon fund; clean energy & adaptation funds)

Geoengineering Governance

(e.g., ocean dumping rules for iron fertilization; possible regulation under Convention on Biological Diversity or new treaties)

Nuclear Technology

(e.g., nuclear suppliers' group provisions to accommodate US-India nuclear partnership)

Financial Market Rules

(e.g., regulation of cross-border emission trading)

Intellectual Property and Investment Rules

(e.g., clean energy provisions in bilateral investment treaties)

International Trade Regime

(e.g., possible GATT/WTO action to accommodate border tariff adjustments)

4. Some Implications for Integrated Assessment



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Some Implications for IA modeling

- **Don't Try to Absorb full bore NIE—nobody thinks that's tractable**
 - Instead, second-best ways for modeling second-best policies
 - And start with a review of the literature, if that hasn't been done.
- **Int'l diffusion of technologies sensitive to...**
 - Institutional factors that affect investor risk management
 - Especially if conduit for technology is cross-border investors
 - More than “just” IPR and unequal treatment
 - **Potential proxies (second best ways to simulate “dopey” policies):**
 - “Doing Business” indicators and national affiliate corporate bond spreads...
 - Country-specific risk hurdles, and “stickiness” (incumbent advantage)
- **National Policies highly unlikely to be optimal**
 - Big departures from “best” policy and investment because:
 - Credibility; unequal allocation of burdens (high on new entrants and on innovations); fundamental political economy pressures to deviate from “best” policy
 - **Potential proxies for studying “Nth best” policies**
 - POLITY, Veto Points, “Doing Business” indicators...
 - Country-specific cost adjustments, time horizons, and “stickiness” (incumbent advantage)
- **Thinking about other frontiers: firm type**
 - “private,” “state-owned” and “hybrid”
 - Useable data for proxies widely available
 - Big deal when modeling behavior in state-dominated systems with lots of “private” activity at the margins

All this suggests that climate policy will unfold at higher cost and slower speed than might be ideal...

...and those two trends are self-reinforcing and rewarding to local incumbents...

...aka the “unhappy families” problem.

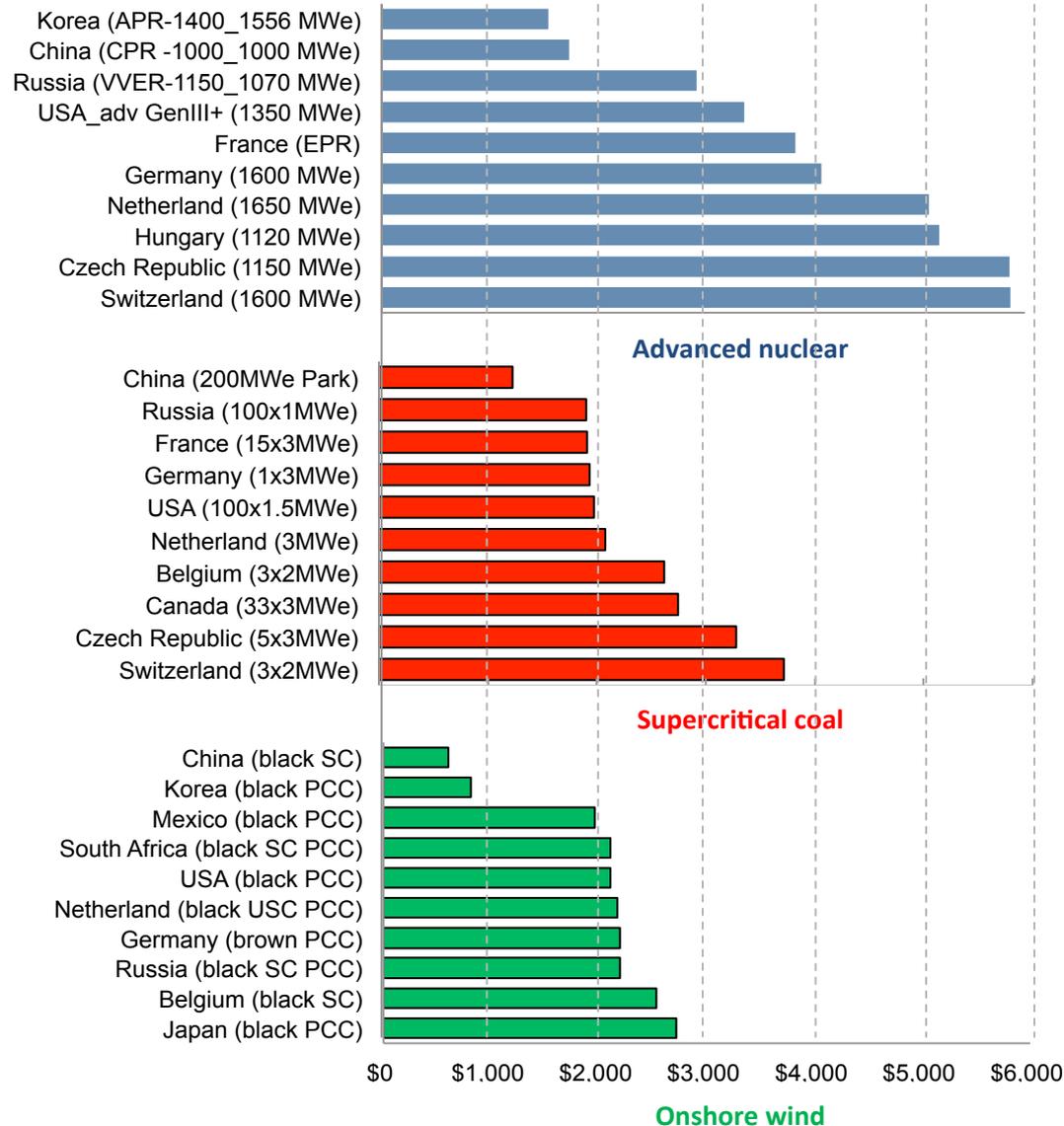
...but...

At least two areas where “adding institutions” could result in faster action

- Diffusion of social norms affecting attitudes and behavior
 - Often a tipping phenomenon, especially vis behavior
 - Slavery; FGC; new Facebook studies
 - Williamson’s “L1” with faster time constants
- Drivers of Technology Deployment Costs
 - Integration of fuel costs
 - Fragmentation of capital costs

Huge capital cost variations across countries

2010 Overnight Capex for Selected Power Generating Technologies in Major Countries (2010 USD/kWe)



Data source: IEA and OECD NEA (2010)

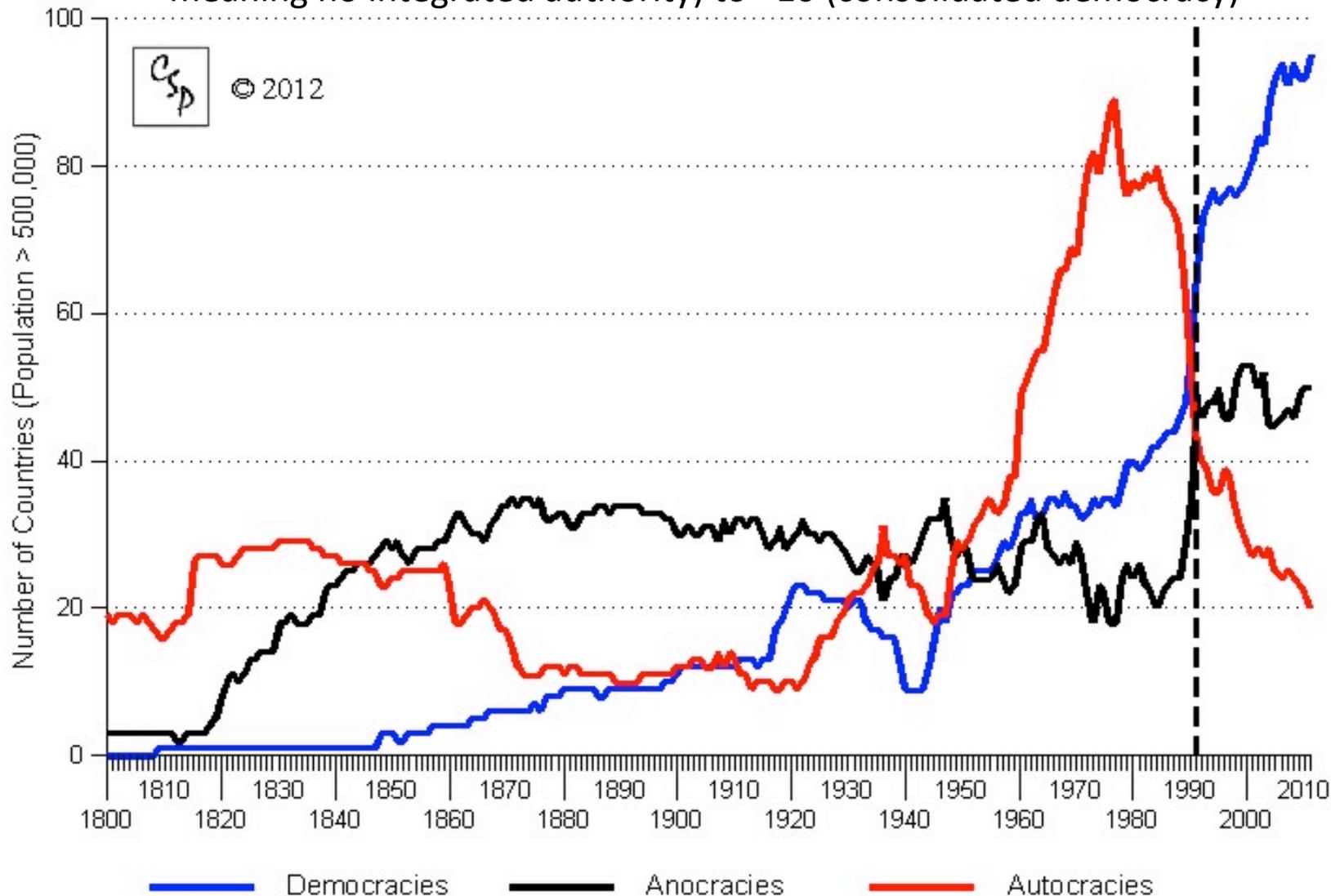
Thank You



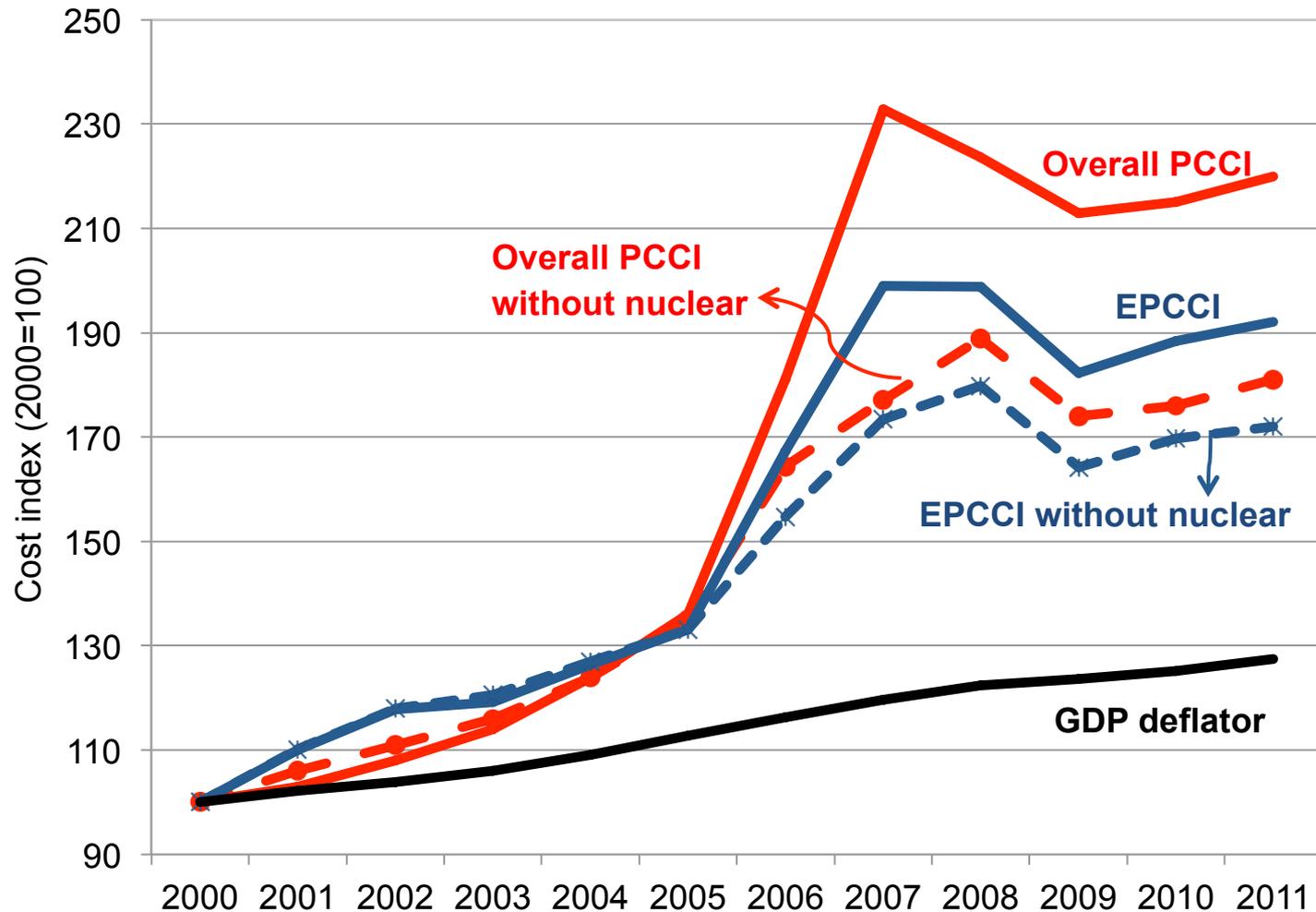
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Polity Scores

ranging from -10 (consolidated autocracy) through middle scores (“anocracy,” meaning no integrated authority) to +10 (consolidated democracy)

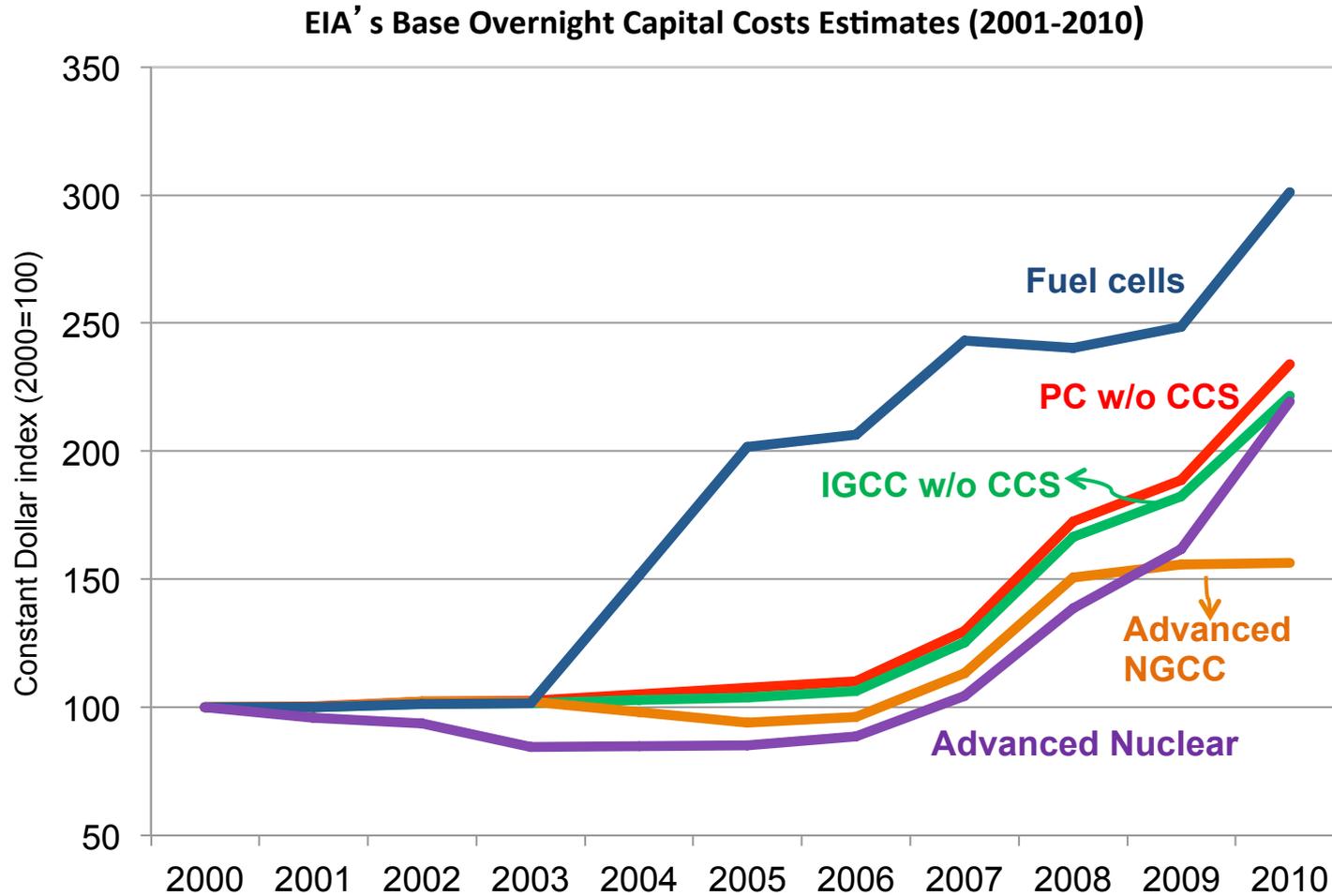


An overall upward trend in the past decade



Data source: IHS CERA (2011) and the U.S. Bureau of Economic Analysis (2012)

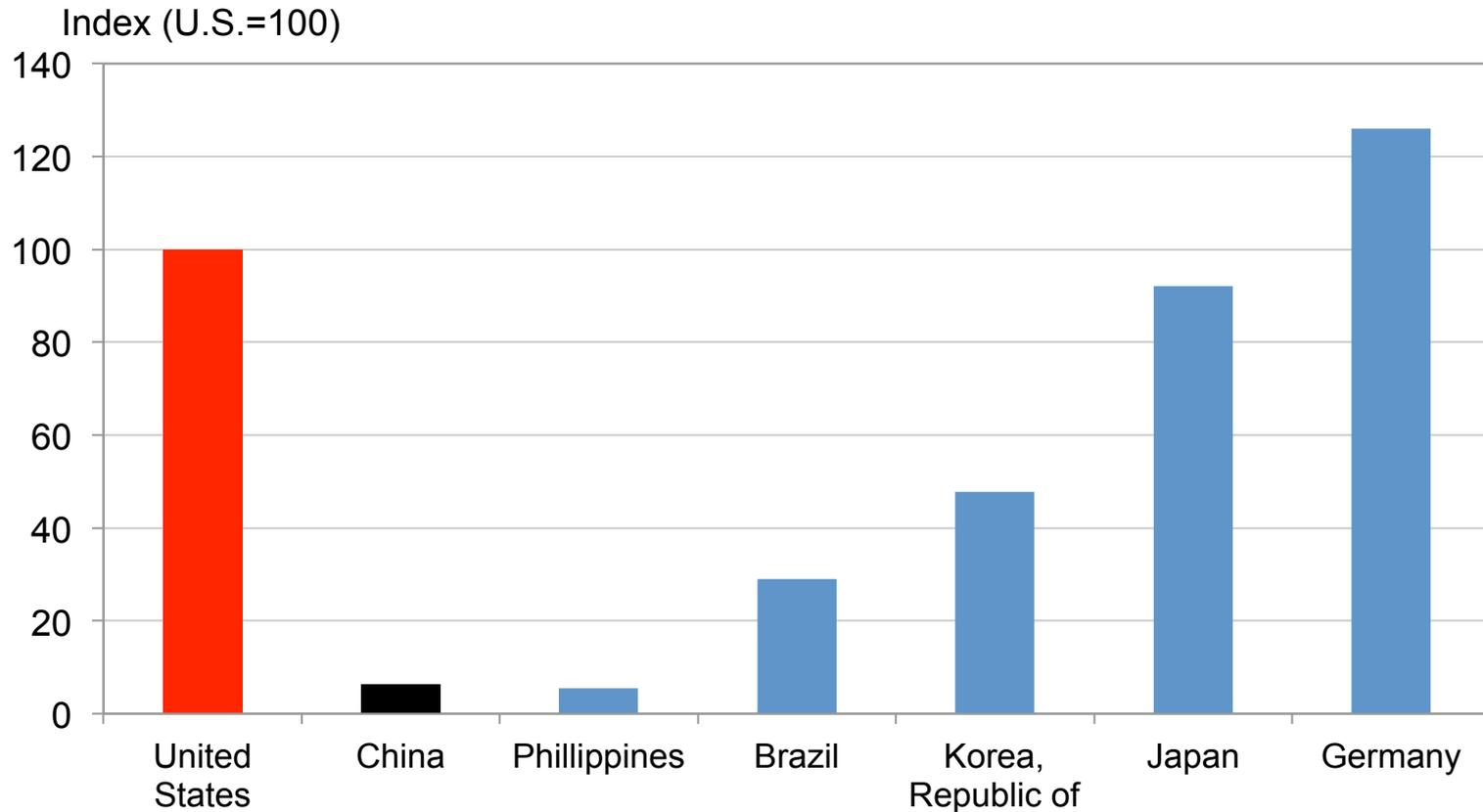
Projection challenge: EIA has been significantly raising their cost estimates over years



Data source: Assumptions to Annual Energy Outlook 2001 through 2011

Though shrinking rapidly, China's hourly labor cost advantage is still significant

Index of Hourly Compensation Cost in Manufacturing, Selected Countries, 2010

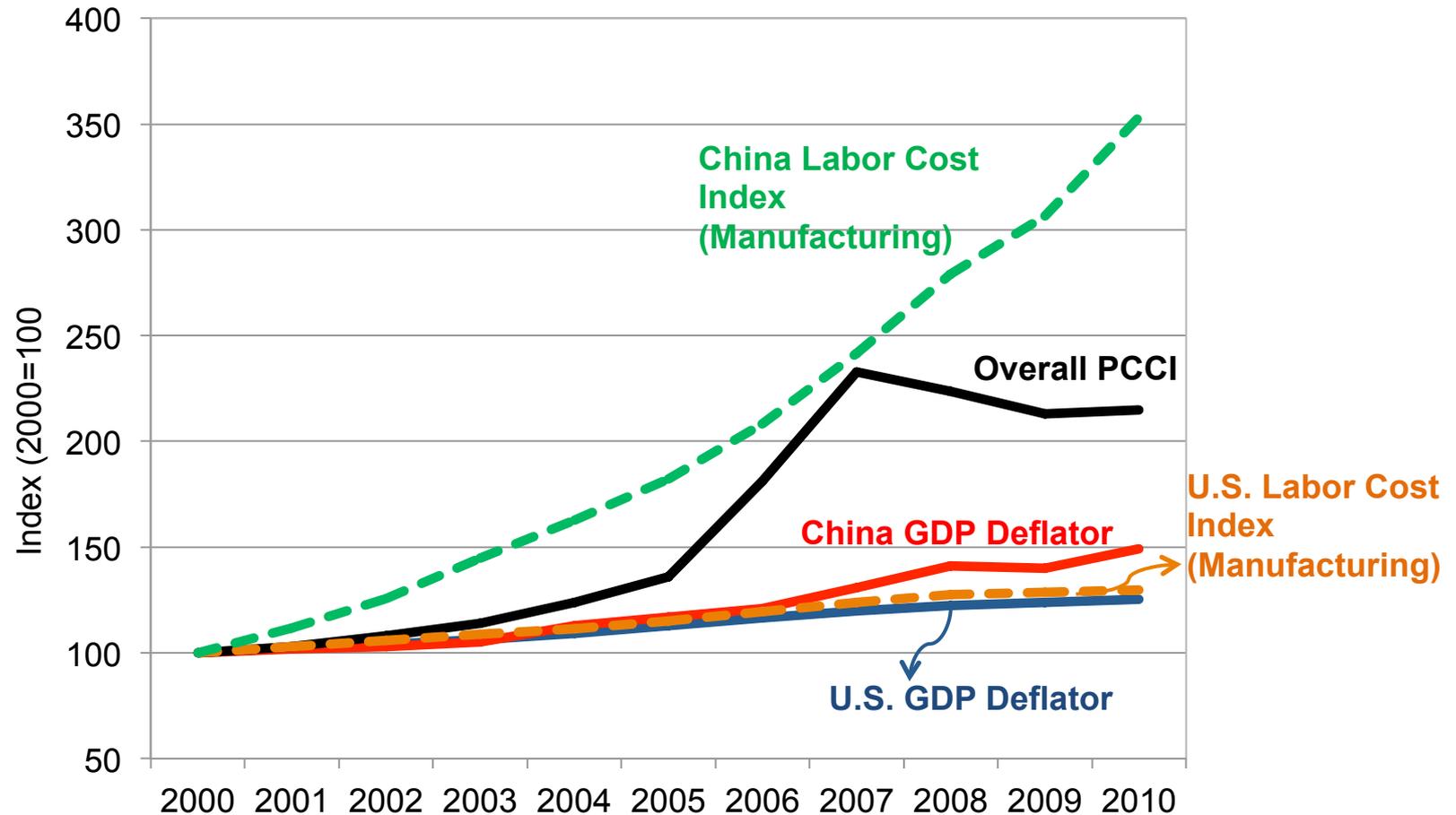


Note: Data are not strictly comparable. Direct comparisons should be made with caution.

Source: Data for China is from China Labor Statistics Yearbook 2011. Data for other countries are from U.S. Bureau of Labor Statistics (2011).

Labor cost is a significant component of capex, but its connection to overall capex will be more reflected by high-end skilled labor costs (e.g. EPC services)

Labor Cost and Power Plant Capital Cost Over Years



Data source: IHS CERA (2011), U.S. Bureau of Economic Analysis (2012), and China Labour Statistics Year Book (2011)