

Regulatory Governance and its Relationship to Infrastructure Industry Outcomes in Developing Economies

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Overview

- Previous literature on institutions and performance
- Governance concepts, criteria and measurement
- Outputs/outcomes definition
- Regression results

Institutions, Regulation and Commitment

- Institutions matter – well-designed and effective institutions result in good policies, including higher growth (See North, Easterley & Levine, etc)
- Growth spurts can be achieved for reasonable periods (eg 10 years or so) but *sustained* growth requires *sustained* good policies which seems only to be achieved in countries which sustain sound institutions (See Rodrik 2003)

Institutions, Regulation and Commitment II

- Governments cannot bind their successors so commitment is difficult to achieve where governments have incentives to renege
- This leads to well-known time inconsistency problems for
 - Monetary policy and inflation
 - Utilities and private investment
- In both cases, the standard answer is for the government to hand over the responsibility to an independent agency
 - an independent central bank or an independent regulatory agency

(See Levine, Stern and Trillas for a formal exposition)

The Impact of Independent Central Banks

Empirical investigation shows that

- 1) ICBs are consistently associated with lower average rates of inflation (but note potential simultaneity issue)
 - Evidence weaker for growth, investment and unemployment
 - 2) Effect is larger for ICBs with better governance
 - 3) Relevant governance measure in OECD countries is quality of legal framework
 - Can assume broadly comparable observance of legal framework
 - 4) Relevant governance measure in developing countries is practical performance eg turnover rate of ICB governors
 - This result holds particularly for countries with very high inflation rates
 - 5) Higher ICB transparency associated with fewer financial market surprises and better economic outcomes
 - Effect takes longer to build up in developing countries
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Regulatory Governance Criteria

There is consensus on this (eg Smith, 1997, Stern & Holder (1999)).

Key aspects are

- 1) Rule of law, sound commercial courts and contract enforcement (Levy & Spiller, 1994)
- 2) Adequacy on *formal* legal attributes of regulatory agency (Clarity of Roles and Objectives, Autonomy, Accountability)
- 3) Adequacy on *informal* attributes of regulatory agency – ie performance in practice, regulatory process (Participation, Transparency and Predictability)

For developing countries, also recognition to add need for sufficient resources in regulatory agency (Noll 2001)

Results from Surveys of Regulatory Governance

- Surveys/reports of regulatory governance for N America, EU and similar (eg OECD) do not show major concerns on regulatory governance or practice
- Very few systematic cross-country surveys of regulatory governance for developing and transition economies (DTEs) but many case studies
- Case studies and systematic studies for DTEs all reveal widespread (but not universal) problems in regulatory governance – especially in practice
- The systematic studies for DTEs (Stern & Holder, Prayas Report 2003) show that performance on *informal* aspects consistently worse than on *formal* aspects – cf ICBs.
 - Surveys based solely on formal legal aspects exaggerate regulatory governance quality
 - Econometric results for outcomes based on formal measures of regulatory governance likely to be biased (errors in variables problem)

Outputs of Effective Regulation I

For all countries

- Technical efficiency and quality of service
- Cost efficiency (operating costs and investment costs)

For N America, EU and similar – *typically*

- Lower capacity margins, reductions in investment costs
- Cost control plus greater efficiency with reasonable rate of return giving *lower* prices to final consumers
- Lower prices key political driver (UK, California, etc)

Unbundling with competition in generation and supply as important if not more important than regulation. Ensuring effective competition a key regulatory task.

Outputs of Effective Regulation II

For developing countries

- *Much higher* investment levels
- Rural electrification

In many developing countries (but not all), *higher* prices to final consumers - especially to household and peasant farmers needed so that

- Companies will invest on expectation of earning a reasonable rate of return :- encouraging private investment/finance
- Prices correspond to costs of supply for all main customer groups :- encouraging technical and allocative efficiency
- Competition *in* generation and supply markets very limited (with a few LAmerican exceptions). Some competition *for market* (IPPs, distribution etc concessions)

Outputs of Effective Regulation III

For World Bank and similar policy institutions, the single most important output for effective utility regulation (electricity and other utility service industries) in developing countries was higher investment - particularly private investment

Implication for econometric studies of outcomes:

Policy-related variables which good regulatory governance most expected to improve in developing countries

- (i) Capacity and investment (especially private)
 - (ii) Efficiency (eg technical efficiency, labour productivity, etc)
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The Impact of Telecom Regulators I

- There are a number of good papers which estimate the effects of regulation on:
 - Capacity: Mainlines per 100 inhabitants and
 - Efficiency: Mainlines per employee
- The latest (and best) of these is Gutierrez (JRE, May 03) who uses a regulatory index based on Stern and Holder.
 - See also Fink et al (2003), Wallsten, Ros, etc
- All these studies apply panel data techniques to various country samples – Gutierrez a sample of 25 Latin American + Carrib. countries, Fink et al to a sample of over 70 developing countries

The Impact of Telecom Regulators II

- The standard model estimated (eg Gutierrez) is

$$Y_{it} = X_{it}\beta + D_{it}\delta + \alpha_i + \varepsilon_{it}, \quad i = 1, \dots, N; \quad j = 1, \dots, T$$

where X is a vector of exogenous variables, D is a vector of dummy variables, α_i is a country specific fixed effect and ε_{it} is an error model.

- The X vector includes both regulatory variables and standard control variables
 - Gutierrez has a time-varying index of 7 regulatory variables derived from the Stern and Holder typology – but based on properties of laws and amendments without any data on process or practice
 - The other studies have a single non-time varying measure for the existence (or not) of a regulator
 - All the studies interact the regulatory variable(s) with variables for competition and privatisation

The Impact of Telecom Regulators III

- Gutierrez finds significant positive effects of his regulatory index on tele-density and efficiency. Other findings by Gutierrez:
 - Diminishing returns to regulatory quality
 - Smaller effects in low income LA countries
 - Fixed effects models dominate random effects
 - No evidence that endogeneity of regulation is important
 - Dynamic model with LDV outperforms static model and has larger estimated impact of regulatory index
- Fink et al , Wallsten find weaker effects of regulation eg as significant positive interaction effects rather than direct effects
 - Their regulatory measures are not strong
 - It is difficult using data just from analysis of the main telecoms law to separate the dating of changes in competition, privatisation and regulation
 - Implies problems in robustly estimating separate effects (Gutierrez goes some way to address this and finds larger, better determined regulatory effects)

The Impact of Electricity Regulators: Previous Econometric Studies

- Studies by Bergara et al (1998), Zhang et al (2002) and (part of) Pargal (2003)
 - The Pargal study for 9 Latin American countries is the best of these
 - It uses panel data to estimate fixed effects equations for private investment in generation 1980-98
 - Only very weak regulation effects are found and liberalisation dominates regulation
 - There seem to be acute problems in disentangling the effects of regulation from liberalisation
 - The Cubbin-Stern analysis builds on these drawing on the panel data modelling approach of Pargal and the telecoms investigators (especially Gutierrez and a regulatory index)
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Cubbin-Stern Econometric Analysis of Impact of Electricity Regulators I

- We examined effects of regulation on 28 developing countries 1980-2001
 - 15 Latin American countries, 4 African, 4 Asian and 5 Caribbean
 - Transition and developed countries excluded because they did not always have clear-cut unmet demand and capacity shortages
 - Main focus on determinants of *per capita generation capacity* (public and private)
 - Also explored determinants of
 - Private investment in generation in 9 LA countries
 - “Availability” proxy (Annual generation in GWh/Annual generation capacity in GW multiplied by no hours per year)
 - Efficiency (Annual T and D losses as % total annual generation)
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Cubbin-Stern Econometric Analysis of Impact of Electricity Regulators II

- Data from
 - US EIA: Generation capacity, generation, losses
 - World Bank Development Indicators: Control variables
 - Domah regulatory survey
 - Miscellaneous (Kaufmann Index)
 - The Calderon Servén data for 9 LA countries
- Equations were estimated by panel data regression methods eg as in equation on Slide 11
 - Primarily fixed effects models (random effects never superior)
 - We had an unbalanced panel, typically with 577 useable observations

Cubbin-Stern Econometric Analysis: Specification of Regulatory Variables

- Following Gutierrez, we had an index with 4 components of good governance
 - Regulatory agency established by a primary law
 - Regulator funded by licence fees or similar
 - Autonomous regulator
 - Regulatory staff not on Civil Service pay scales
- We used 2 versions of index- either total score OR hierarchic Guttman index
 - Specification of index made very little difference to results
- We also estimated effects of individual components of index
 - Separate equations for each of the 4 elements: Necessary because of collinearity between elements

Cubbin-Stern Econometric Analysis: *Ceteris paribus*

- GDP per capita: Key factor
- Industry share in value added Not significant
- Debt payments as share in GNI Not significant
- Climate, energy availability, country institutional history/capacity Reflected in fixed effect

Main Positive Findings on Impact of Regulation on Developing Country Electricity Industries I

- In static model, each unit increase in Reg Gov Index associated with 4.3% increase in per cap generation capacity (MW)
 - Max score of 4 on index => 17% more generation per cap
- Age of regulator crucial – takes time to build up regulatory capacity and establish reputation for credibility
 - Regulator under 1 year old has no apparent effect
 - 3 Yr old or more regulator associated with 35% more generation per cap
 - Impact of regulation on generation per cap estimated to peak at around 15 years
 - Including age effects eliminates significance of Reg Index per se

Main Positive Findings on Impact of Regulation on Developing Country Electricity Industries II

- Having an electricity law has largest (most statistically significant effect) of index components, even with Ministry regulator – associated with 18% higher generation per cap in long run
 - Licence funding associated with +14%
 - Autonomous regulator with +10%
 - Freedom from mandatory Civil Service pay scales with 18% –
- Difficult to find statistically significant effects of privatisation or competition but data far from ideal
 - Kaufmann Rule of Law Index * Index of Reg Gov sometimes significant but never large (eg +5%)

Main Positive Findings on Impact of Regulation on Developing Country Electricity Industries III

- Long run estimates from a dynamic model (including a lagged dependent variable) very similar to those from static model
 - Long run effect of Reg Index max score on generation per cap +24%
 - Long run effect of regulator aged 3 years or more +26%
- Econometric robustness tests (eg for spurious correlation) do not lead to model rejection or statistical insignificance of regulatory coefficient estimates
- Statistically significant coefficient (at 5% level) of Reg Index on utilisation of generation plant
 - Max score on index associated with +3% increase in utilisation rate

Main Negative Findings on Impact of Regulation on Developing Country Electricity Industries

- Privatisation, competition non-significant and frequently with negative sign on coefficient
- Form of regulation (price cap etc.) not significant
- No apparent effect on technical losses
 - Unfortunately no data on non-technical losses (“stolen” electricity)
- No apparent effect on private investment in 9 Latin American countries - the Calderon-Serven data set as used in Pargal (2003)

Conclusions

- Results on impact of regulatory governance on developing country generation capacity (ie investment) very encouraging
 - Consistent with economic theory (and common-sense), including literature on growth and institutions
 - Statistically robust
- Estimation needs to be refined and replicated on better data
 - Need for better data – especially on performance of regulators in practice
 - Data for privatisation and competition particularly difficult to obtain/construct
 - Tricky econometric issues over dynamics, potential endogeneity of regulatory institutions

Links to Supporting Papers

- Stern, J. and Cubbin J.S. (2003), “Regulatory Effectiveness: The Impact of Regulation and Regulatory Governance Arrangements on Electricity Outcomes – A Review Paper”

<http://facultyresearch.london.edu/docs/No56.pdf>

- Cubbin, J.S and Stern J., (2004), “Regulatory Effectiveness: The Impact of Good Regulatory Governance On Electricity Industry Capacity And Efficiency In Developing Countries”

<http://facultyresearch.london.edu/docs/paper57.pdf>