UNIVERSITY OF CAMBRIDGE
Electricity Policy Research Group

HUMAN RESOURCE CONSTRAINTS FOR ELECTRICITY REGULATION IN DEVELOPING COUNTRIES: HAS ANYTHING CHANGED?

EPRG Working Paper EPRG 0910

Cambridge Working Paper in Economics CWPE 0914

Michael G.Pollitt and Jon Stern

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Keywords electricity regulation, human resource constraints, developing countries

JEL Classification L30; N40; O15

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Publication March 2009
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In a paper written in 2002 with Preetum Domah, we provided strong evidence that there were significant human resource constraints which limited the scale and, hence, the scope and potential effectiveness of electricity/energy regulatory agencies in developing countries. That paper (DPS), although only circulated in working paper versions, has been quite widely referred to in policy discussions and also quite widely cited .

The key findings of the paper were:

(i) There were large fixed costs in electricity regulation which were particularly important for developing countries;

(ii) These fixed costs were particularly serious as regards professional staff; and

(iii) The form and explanatory variables of the estimated human resource cost function for developing countries was quite different from that found for developed countries.

The discussion in this new paper reveals that the fixed costs of regulation remain as significant as our original DPS paper suggested.

In addition, the human resource requirements for specialist professional staff seem still to be a binding constraint for some low income and/or small countries.

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However, the most significant - and worrying - finding of this current paper is how little new information on regulatory staff numbers there is since 2002. It is surprising (and disappointing) that no multilateral or regional regulatory grouping collects such data.

What little new data has emerged (e.g. for India and Latin America) tends to confirm the findings for 2001-02. Little seems to have changed: the Indian State Regulators still have tiny numbers of staff, the Caribbean and some of the smaller, poorer Latin American countries still have very low numbers of regulatory staff, while the middle income Latin American regulators seem, at least as far as these data inform us, not to have any human resource problems. For Africa, for the countries covered typical electricity staff numbers are in the 30-60 range. Of the three regulators in both the DPS sample for whom we have been able to collect recent data, two have grown by over 50% since 2002.

We strongly believe that more attention should be paid to human resource issue and how it can best be addressed. We urgently need panel data and this requires systematically collecting data on regulatory staff numbers on a regular (e.g. annual) basis. We see this as an obvious – and important task for regional regulatory groupings (such AFUR, OLADE and IERN).

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Publication March 2009
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HUMAN RESOURCE CONSTRAINTS FOR ELECTRICITY REGULATION IN DEVELOPING COUNTRIES: HAS ANYTHING CHANGED?[1]

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March 2009

Abstract

We provide strong evidence that there are significant human resource constraints which limit the scale and, hence, the scope and potential effectiveness of electricity/energy regulatory agencies in developing countries. We summarise the key findings in our earlier Domah, Pollitt and Stern paper (2002). We then consider what new evidence there is on regulatory staffing levels since 2001/2002 and on the implications of high fixed costs for developing countries' electricity and regulatory policies. Our conclusion is that little has changed over the intervening period.

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[1] The authors wish to acknowledge the contribution of Preetum Domah to their original joint paper and of Alexandra Maratou for her research assistance with this paper.

1. Introduction

In a paper written in 2002 with Preetum Domah, we provided strong evidence that there were significant human resource constraints which limited the scale and, hence, the scope and potential effectiveness of electricity/energy regulatory agencies in developing countries. That paper, although only circulated in working paper versions, has been quite widely referred to in policy discussions and also quite widely cited[2].

The key findings of the paper were:

(i) There were large fixed costs in electricity regulation which were particularly important for developing countries;

(ii) These fixed costs were particularly serious as regards professional staff; and

(iii) The form and explanatory variables of the estimated human resource cost function for developing countries was quite different from that found for developed countries.

There were caveats about these findings, which were drawn from postal and e-mail survey responses from regulators in 60 countries during 2001 and 2002. In particular, it was unclear whether countries' responses to staff numbers were always consistent. In spite of all of the checks that we could do, we had limited very quality control over the responses and little external information against which to check them. In a few cases, based on what else we knew about the countries, the numbers of regulatory staff looked just far too high to be credible[3]. In addition, we suspected that many of the staff classified as 'professional' in developing countries would not have been so classified in developed countries (e.g. book-keeping staff). In that case, our data might have over-estimated the numbers of professional staff in for developing countries.

In general, it is likely that the survey provided a relatively optimistic view of regulatory developments and staff numbers. This is likely because the overall response rate was 34% and that, given the nature of the survey, country regulators/Ministries would have been more likely to respond if they had in place regulatory arrangements (including staff numbers) of which they were proud and more likely to be non-respondents if they felt that their regulatory arrangements were deficient. Hence, our sample may provide an upward bias to the quality of regulatory arrangements and staff numbers in the total population of countries and, in particular, in developing countries. Unfortunately, the data does not exist which would allow us to test for the existence of and potential magnitude of this probable bias.

In the 2002 working paper, we took a simple income definition to distinguish between developed and developing countries (whether countries in 2001 had GDP per head above or below $4,300 in

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2 "Modelling the Costs of Electricity Regulation: Evidence of Human Resource Constraints in Developing Countries", Cambridge CMI Working Paper No 11 and London Business School Regulation Initiative Working Paper No 49.

3 For instance, Poland recorded 285 electricity/energy regulatory staff, of whom 232 were deemed as 'professional'. Given our knowledge of Polish energy regulation that only made sense if it included local authority staff involved in regulation of district heating.

constant 2000 $ US). That led to the inclusion in the list of developed countries of, among others, Argentina, Brazil, the Czech Republic and Trinidad & Tobago. However, from an institutional development perspective, it was not at all clear that this was ideal and we discussed taking an alternative country assignment between developed and developing countries.

In recent years, there has been continued discussion of the importance of the role of regulation in electricity supply and investment growth in developing countries[4]. The role of human resource constraints has also been much discussed so that, there have been a variety of proposals for back-up solutions, particularly for low income and/or small developing countries
.
A non-exclusive list of these includes:

- contracting out much of the detail of regulation to consultants or co-operative expert exchanges with other regulators
- greatly increased use of contracts relative to regulatory processes, sometimes with binding arbitration either in-country or externally
- non-discretionary regulation
- much greater reliance on expatriate regulatory experts or expert panels[5].

It seems clear that effective regulation is, in practice, important for electricity supply industry performance in developing and transition at all levels: generation, transmission and distribution. Both case studies and econometric research have shown significant impacts on investment, labour productivity, cost recovery and distribution losses[6]. However, there is also no question that many developing countries still struggle to provide effective electricity/energy regulation. There are many reasons why that is so, including political and legal reasons. However, human resource constraints – particularly the relative scarcity of sufficient experienced professional people in many developing countries – clearly still play a major role.

In what follows, in Section 2, we summarise and visualise the key findings in the earlier Domah, Pollitt and Stern paper in the light of our current understanding. In section 3, we consider what new evidence there is on regulatory staffing levels since our 2001/2 and on the implications of high fixed costs for developing countries' electricity and regulatory policies. Section 4 provides some concluding comments.

2. Domah, Pollitt and Stern (DPS) Revisited

Although we found significant evidence of high fixed costs, it was – somewhat surprisingly - not the case that in 2001 developed countries had smaller numbers of regulatory staff. The median number of staff (51) was identical between developed and developing countries, although there was more difference in the mean number of total staff per regulatory agency - 131 in developed countries as against 72 in the developing countries. This, however was primarily due to the

[4] See, for instance, Cubbin and Stern (2006), Pollitt (2008), Andres, Guasch & Azumendi (2008), Estache and Rossi (2008) and others for electricity regulatory impacts and many papers on the impact of regulation on telecoms performance.

[5] For discussion of these and other options, including their relative advantages and disadvantages, see Chapter 4 of Brown, Stern and Tenenbaum (2006) and the papers cited there.

[6] See, for instance, Mota (2004) who compares Brazilian with US electricity experience.

inclusion in the sample of a few very large US PUCs (Public Utility Commissions) - e.g. California with 946 staff – though these covered up to 6 regulated sectors.

For professional staff, taking the data at face value, developing countries actually had a *higher* median number – 37 as against 32, although the mean was markedly higher for developed countries, 81 as opposed to 48. Whether, though, these numbers classify like-with-like is a difficult issue. It is hard to believe that the 95 staff classified as 'professional' for Cambodia are comparable in educational and other skills to the 90 recorded for Spain. Nevertheless, the resource burden for even moderately skilled white-collar staff requiring secondary education can still be difficult for low income countries and may well impose significant opportunity costs.

It was not the case that developing countries had lower absolute numbers of staff or of professional staff - in 2001. A major reason for that was that there were some very small developed country electricity/energy regulators in the sample e.g. Netherlands 25 with staff in total. However, by 2005, their staff numbers had grown to 70. Nevertheless, *absolute* staff numbers was not the main issue. The key point was that developing countries have a very much lower level of electrification. Hence, the number of regulatory staff *per number of connections* (or customers) is <u>much</u> higher in developing countries due to the much lower number of connections per million population than in developing countries.

In Africa, several countries have electrification rates of 10% or lower (e.g. Malawi and Uganda) and others both in Africa and among the poorer Asian economies have electrification rates of 10-20% (e.g. Cambodia and Zambia)[7]. For such countries, any regulatory agency - however low-geared to the actual number of customers and companies - will inevitably look highly staffed relative to its developed country counterpart. It is this that gives rise to the observed fixed costs and leads policy-makers to explore alternatives (such as contracting out regulation or regulatory swaps) that either reduce the regulatory burden; or at the limit, schemes like expert panels or regulation by contract alone that may offer the possibility of eliminating the need for a separate autonomous regulatory agency.

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[7] See Human Development Report 2007-08.

TEXT BOX

REGULATORY FIXED COSTS AND TELECOM REGULATION

Regulatory staff numbers for telecom regulators are also difficult to find – they are not recorded on the ITU website. However, Buckle (1999) reported some data for the late 1990s.

Buckle's data just recorded total staff numbers. However, his findings showed quite large regulators – Jordan with 65 staff, Malaysia with 85 staff, Peru with 125 and Chile with 130. The only small(ish) developing country telecom regulators in his 13 country sample were Colombia with 20 staff plus 20 consultants (in 1996) and Jamaica with 27 staff. Chile and Peru had responsibility for spectrum management and regulation as well as telecom regulation – but so did Jamaica and Colombia.

However, the fixed costs of telecom regulation are rather lower than for electricity regulation (or water regulation) since mobile coverage and penetration rates are so much higher in even low income developing countries than are electricity coverage and connection rates. In 2007, it is reported in a recent Frontier Economics report that, in Sub-Saharan Africa, mobile coverage was around 60% and penetration rates were 37%, which means that usage rates will be around 50%. By March 2008, India's tele-density was 26%, with 86% of the connections from mobile.

Given the explosion in developing country mobile penetration rates since 2000, the much lower fixed costs of telecom regulation may not have been so different from electricity 10-15 years ago but their importance is certainly much lower now. Note also that, even if mobile regulation may not require much in the way of detailed work, telecom regulators will have responsibility for fixed networks and regulatory implications of IT and broadband as well as (in many cases) radio spectrum and/or broadcasting issues (viz Botswana and Jamaica).

Even normalising by population, developed and developing countries electricity regulators on average had very similar median (and mean) numbers both of total staff and professional staff. But, we estimated an average cost curve of regulation by plotting the number of staff per million customers per regulated sector[8] against number of customers. The average cost curve of regulation thus involves taking the total number of reported staff for the regulatory agency as a whole and dividing it by the multiple of the number of customers (in millions) and the number of regulated sectors[9]. As shown in Figures 1 and 2 below, the slope of the resulting line is downwards for both total and professional staff. This indicates significant economies of scale and a high fixed cost element of regulation.

[8] To cover multi-sector regulators. Note that in each of the Figures that follow we drop Cambodia and India (CERC) as extreme outliers. We have also corrected some mistakes in the original dataset, notably on some of the population and customer number figures.

[9] For example the Jamaica regulatory agency has 28 total staff, 0.427m customers and 3 regulated sectors. This gives a Y axis value for Figure 1 (Total staff) of 28/(0.427*3)=19.6.

Figure 1: Average Regulatory Staff Cost (based on Total Staff)

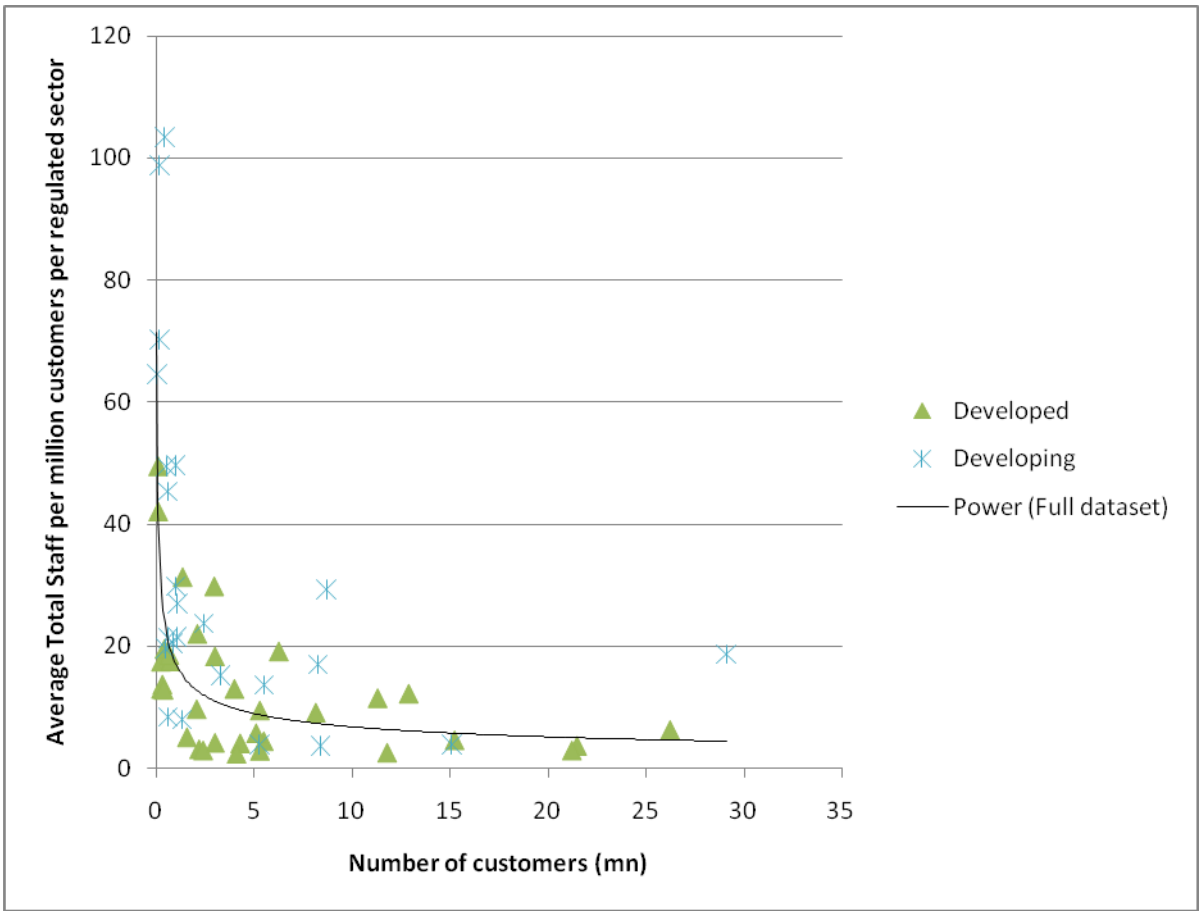
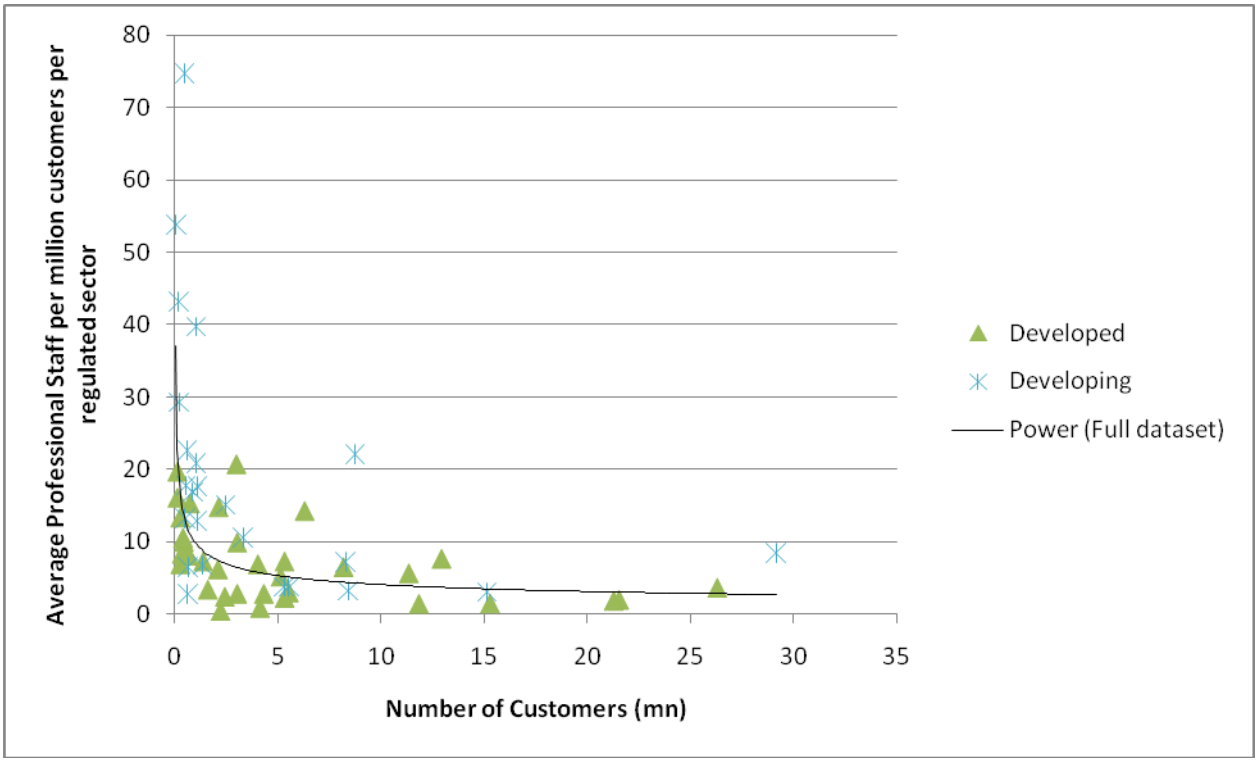


Figure 2: Average Regulatory Staff Cost (based on Professional Staff)



The key point to note is that the developing countries were concentrated on the relatively steeper (left side) of the curve – and that many more of the developing country electricity/energy regulators had staff numbers *above* the fitted (power function) line to the whole sample[10]. Conversely, the developed countries' regulatory staff numbers were spread out along the whole length of the curve and more were below than above the fitted line.

Even more telling in terms of the human resource burden on human resource poor developing countries was when we plotted the ratio of staff numbers per sector divided by the number of people in the country (in millions) who had completed post-secondary education (on the Y-axis) against customer numbers (on the X-axis). Thus the Y axis takes the number of staff in the whole regulatory agency divided by the number of sectors regulated and divides this number by the number (in millions) of people who had completed post-secondary education.[11] Again, we plotted this relationship both for total staff and for professional staff to provide a measure of the size of the regulatory agency relative to the pool of qualified staff.

The results of this exercise are plotted in Figures 3 and 4. They again show:

(i) a downward sloping curve – implying high fixed resource burden cost;

[10] Note that the developed country observed on the top left of Figure 1 is Barbados.

[11] For example the Jamaica regulatory agency has 28 total staff and 3 regulated sectors, while the 7.8% of the Jamaican population of 2.598m has completed post-secondary education. This gives a Y axis value for Figure 3 (Total staff) of (28/3)/(2.598*0.078)=46.1. Strictly the percentage completing post-secondary Education (7.8% for Jamaica) is relative to the relevant starting cohort but our calculation is a reasonable estimate of the relative human resource burden across countries from readily accessible data.

(ii) developing countries concentrated on the left hand side of the figure and with many above the fitted line; and

(iii) developed countries spread along the curve with more below or very close to rather than clearly above the fitted line.

Figure 3: Average Human Resource Burden (based on Total Staff)

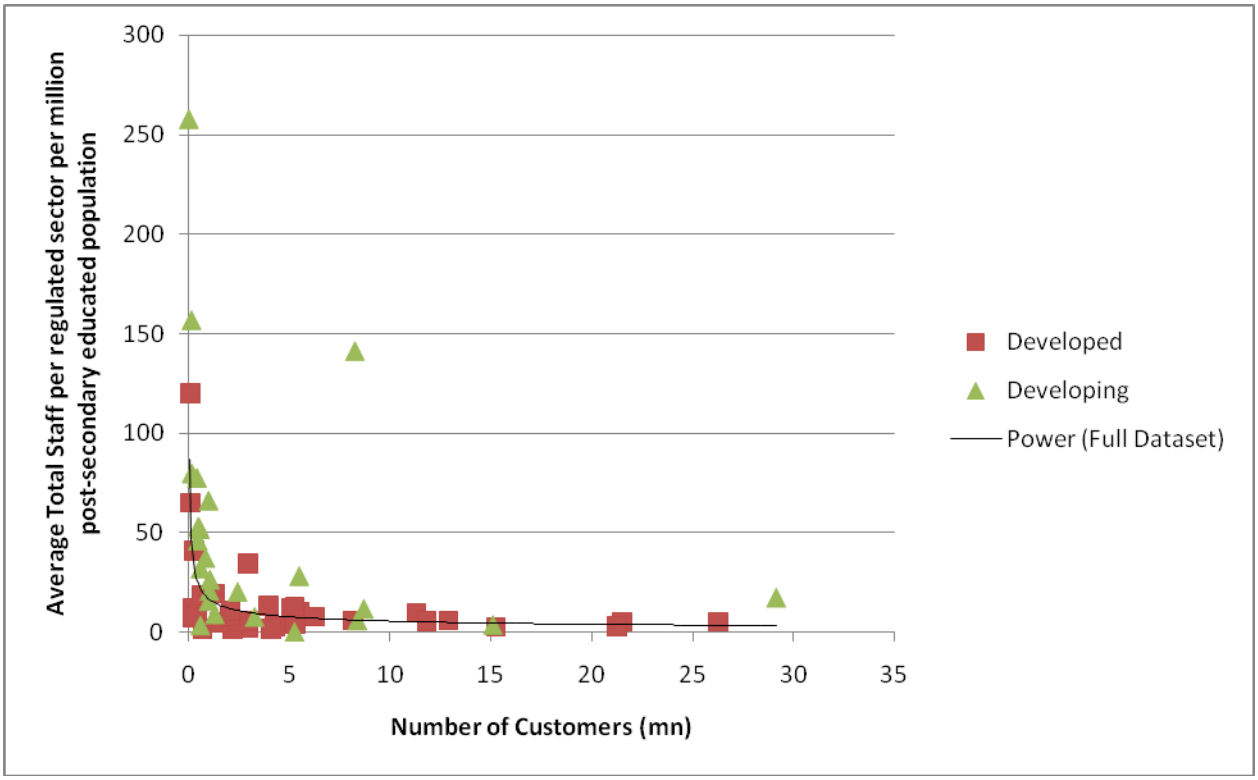
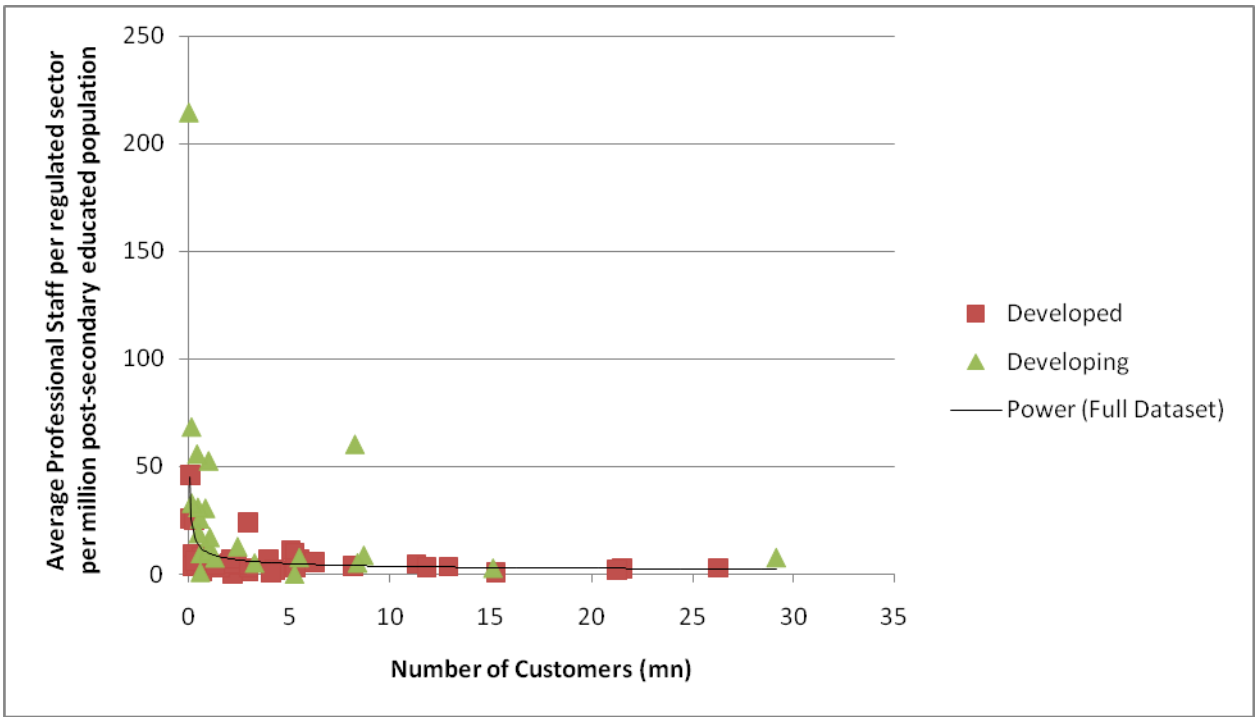


Figure 4: Average Human Resource Burden (based on Professional Staff)



As (anecdotal) supporting evidence, one of us was working in an advisory team to a small, well-governed African country about 10 years ago. Our task was to recommend to its telecom regulatory agency as to how best it could carry out the functions that it had been assigned in the regulatory law under which it operated. We were given a free hand – except that we were told at the outset of the assignment that any recommendation to hire 25 or so accountants (or similar professionals) would be impossible even to consider seriously since there was no way that this agency would be allowed to hire half the accountants in the country. Of course, there would have been an immense opportunity cost of assigning significant numbers of scarce professionals to this agency rather than to the country's companies, Ministries and other agencies and any such recommendation would have been virtually impossible to justify. Hence, the question became how to prioritise regulatory requirements and how best to use the fall-back options discussed in the previous section. This exercise brought out the fixed costs of regulation very starkly and in clear practical terms.

The other main empirical results reported in DPS were of regressions for the numbers of total and of professional staff[12]. The two most important points arising from this were:

(i) The best fitting equation for developed countries was quite different from that for developing countries; and

(ii) Age of regulatory agency dummies showed significant effects on staff numbers, total and professional, for developing countries, but <u>not</u> for developed countries.

For developing country total staff, the dominant effect was of significantly more staff for energy regulators in existence for 10 years or more. For professional staff, there were significantly more in post after 2 years and again after 5 and, even more, after 10 years.

In terms of differences between developed and developing countries, the most obvious were:

- Staff numbers in developed countries were much more strongly related to customer numbers than in developing countries;
- Having more regulated companies in the sector was strongly associated with more staff in developed countries but no significant relationship was found for developing countries;
- Neither equation showed any systematic relationship between real GDP per head and regulatory staff numbers;

[12] The data used in our original regressions did not incorporate the latest adjustments made when compiling Figures 1-4 for this paper. However, the original regression work done included extensive sensitivity testing e.g. estimating equations with and without the large US regulators and other outliers and the resulting estimates changed very little. Hence, we are confident that the conclusions of the original quantitative results would not be altered by the (minor) data adjustments reflected in the Figures. We also conducted further sensitivity analysis (with the help of Alexandra Maratou) on the original dataset testing a nested full sample model classifying all middle income and transition countries as developing rather than developed countries (reflecting an institutional quality measure of development rather than our original income based measure). The results of this analysis also supported the conclusions of the work reported in the original paper.

- For professional staff, licence fee funding was *positively* related to professional staff numbers in developed countries but it was *negatively* related in developing countries[13]; and
- In developing countries, but not developed countries, civil service pay scales for regulatory agencies were associated with lower numbers of professional staff. (It is unclear whether this is a demand effect arising from shortage of funds or a supply side effect from relative earnings in public and private sectors.)

We also used our equations to predict the number of staff required for median values of the variables. These indicated that, using median values of the variables, a typical developing country regulatory agency in 2001-2 needed around 30-35 staff in total compared to a developed country, which needed an estimated 53 staff. For professional staff, the numbers were around 15-20 in developing countries and around 35 in developed countries. This was in spite of the median developed country having three times the number of electricity customers and three rather than two sectors to regulate. Finally, predictions for Guatemala, Sri Lanka and Zambia (none of which were in the main sample) suggested that these relatively small countries would need total staff numbers of around 50-60 and 25-45 professional staff.

These results clearly demonstrate the nature of the high fixed resource cost of electricity regulation for small and low income developing countries.

3. More Recent Information on Regulatory Staff Numbers in Developing Countries

The Domah survey data is now over 6 years old and there have been major developments in utility (and electricity/energy) sector reform and regulation. So, given the concerns about human resource costs of regulation, what has happened to regulatory staff numbers in developing countries since 2001/2? The answer is that, in general, we don't know.

There are some snippets of information that we report below, but it does not seem to be data that anyone regularly or systematically collects. In particular, it does not seem to be reported on IERN (the International Energy Regulation Network), nor on regional websites like AFUR (the African regulators) nor OLADE (the Latin American energy website).

IERN reproduces country Factsheets, which typically give total staff numbers (but not professional staff numbers) country-by-country. However, these are not assembled into any single table. More importantly, the majority of Latin American, Asian and African developing countries do not have IERN Factsheet data. For Africa, only 3 out of 26 countries have an IERN Factsheet. For some countries, staff numbers may be available from individual regulatory agency websites, but for most it is not recorded.

Individual researchers may collect some relevant data for their research purposes by approaching individual regulators (as Preetum Domah did) but it does not seem to be systematically collected by any international agency. This is true for telecoms as well as energy as there seems to be no such data on the ITU website.

[13] Whether regulators were autonomous or not had no impact on staff numbers in either developed or developing countries.

In consequence, there are no data sets of staffing with comparable definitions and some of the data reported to the researchers is often of variable quality. Also survey response rates can often be low – the response rate in the Domah survey was 34% after major prompting. Most importantly, it seems impossible to collect *time-series* data on staffing for a significant number of developing countries.

This last is important in that most of the regulators for whom we had staff numbers in 2001/2002, particularly in developing countries, were very young, e.g. 3-5 years old. We know for EU countries that many have grown substantially. If the same is true for developing countries, we may well have *under-estimated* the fixed costs of regulation for them. Insofar as the data exist that allows us to test this, we will examine this below.

We return in our concluding comments to the implications of these issues for policy as well as research but we continue below by summarizing two recent studies.

3.1 India: Staffing in State Electricity Regulators

In 2003, the Prayas Group[14] published a major, and, in general, very critical study of State Electricity regulatory commissions (ERCs). Staffing was one of the areas where they were particularly critical.

The key 2003 Prayas findings in this area were that ERCs had grossly inadequate staffing resources and that this contributed greatly to the disappointing performance of the agencies. The most important findings were:

- On average, ERCs had approval for 8-10 professional and technical staff. Only Andhra Pradesh approval for more than 20 while West Bengal and Maharashtra had approval for only 2 professional and technical posts. Requests for additional professional and technical staff are delayed for months or years.

- The average number of authorized administrative posts was around 20-30 but many of these posts were left unfilled for various reasons (State Government unwillingness to allow them to be filled, low pay, etc.)

- 8 out of 12 reporting ERCs had no permanent professional and technical staff. Andhra Pradesh had 8 permanent professional and technical staff and Orissa had 12; none of the others had more than 3.

- Many of the professional and technical staff were on loan from the incumbent utility[15].

The Prayas Report is particularly valuable in focusing on *professional* staff numbers. This approach has been replicated as one part of a recent study by TERI which attempts to evaluate the performance of Indian State ERCs. The results of this study for professional staff levels in 9 Indian states in 2006 are reproduced below. The dominant feature to note is how little progress has been made since the earlier survey.

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[14] Prayas Energy Group (2003).

[15] See Stern and Cubbin (2005) and Prayas Energy Group (2003).

Table 1 - Professional Staff Levels in 9 Indian State Electricity Agencies 2006

State	Number of Professional Staff
Andhra Pradesh	19
Assam	6 *
Delhi	16
Jharkand	2 **
Kerala	4
Madhya Pradesh	22
Maharashtra	20
Uttarakhand	9
West Bengal	7

* 2 of the 6 are consultants

** Both are consultants

Source: Garg et al., 2007, p. 53.

Of these States, only Jharkand (8 million) and Delhi (14 million) have population sizes of under 25 million. Andhra Pradesh, Madhya Pradesh and Maharashtra all had populations of over 50 million people and, even with relatively low connection rates, they (plus West Bengal and Kerala) have over 5 million (officially registered) consumers[16].

It is hardly surprising, with such small numbers of professional staff, both in absolute and relative terms, that Indian electricity regulation has found it so difficult to make much progress. These difficulties remain and lead TERI to conclude their report with a long list of major recommendations for improvement.

In summary, at least as yet, Indian State Governments seem to be unable and/or unwilling to pay the necessary fixed costs of having a regulatory agency. Nor, with the possible exception of Delhi, have they adopted any of the solutions that might reduce the need for an effective and reasonably well-staffed regulatory entity.

3.2 Latin America and the Caribbean

A recent paper by Andres et al. (2007) provides the results of a survey of regulators in Latin America and the Caribbean. The survey was carried out by the relevant World Bank group to assess the quality of governance of Latin American electricity regulatory agencies. The paper reports results for 21 national regulators, although survey responses were received from a larger number of countries. The date of the survey is not clearly stated but seems to be around 2006-07.

The survey collected a great deal of information on country regulators. The survey document, reproduced as Appendix 2 of the paper, seems to derive primarily from the standard recommended postal survey set out as Annex C of Brown et al. (2006). However, for the purposes of this paper, the main interest is in the reported staff numbers for 21 national regulators

[16] See Garg et al. (2007), p.62.

in 19 countries set out in Appendix 1 of Andres et al (2007)[17]. Unfortunately, the data gives numbers only of total staff so that it is not possible to identify professional staff numbers where the main human resource problems exist.

The results for the staff numbers are summarized in Table 2 below.

Table 2 - Total Staff Numbers in 21 National Latin American and Caribbean Electricity Regulators 2006

Staff Numbers	Under 25	26-50	51-100	101-250	Over 250
	3 Countries	3 Countries	3 Countries	10 Countries	2 Countries
	Honduras, Trinidad & Tobago, Uruguay	Barbados, Chile(a), Jamaica	Bolivia, Colombia(a) and Guatemala	Argentina, Chile (b), Costa Rica, Dominican Republic, Ecuador, El Salvador, Mexico, Nicaragua, Panama and Peru.	Brazil and Colombia(b)

Source: Andres et al. (2007) Appendix 1, p 41.

The key conclusions from this table are that the problems of regulatory staff numbers seem only to be significant for some of the Caribbean Islands and for Honduras. All of those are very small countries and, in addition, Honduras is one of the lowest in terms of income per head.

For the non-island, middle income countries in this region, staff numbers do not appear to be a constraint. Some of the regulators are very large, particularly as in many of these countries, electricity markets operate with few companies and constrained generation and supply competition. ANEEL in Brazil with 765 staff is much the largest – approaching California PUC levels and twice as large as the UK - and this excludes non-Federal electricity regulators. Some of these state regulators are sizable agencies. For instance, the Domah 2001/2 survey reported Sao Paulo as having 60 staff, although this will include non-energy regulatory staff as in a US PUC. Argentina also has significant numbers of regulatory staff beyond the "more than 100" in the national-level regulatory agency.

Of course, the major potential resource constraint is of professional staff. It is quite possible for regulators to be very large but find it hard to recruit or retain sufficient numbers of professional staff. This certainly seems to be a problem for some of the smaller island regulators and may be for some others.

[17] Chile and Colombia each have two regulatory agencies, a smaller one which has no autonomy from the Ministry and a larger one that does. It is the latter - the (b) agencies in the table above - which seem to carry out the majority of the functions that would be the responsibility of an EU or North American independent electricity/energy regulatory agency. Barbados, Costa Rica, El Salvador and Jamaica include telecom regulation and several include water and sewerage and any regulated transport industries.

Inspection of the DPS data suggests that the proportion of professional staff in total staff was around two-thirds in the Latin American and Caribbean countries in 2001/02[18]. The DPS sample includes the majority of countries included in Table 3. On this basis, professional staff numbers are unlikely to be a problem outside the Caribbean Islands and Honduras - provided that this covers sufficient numbers of critical high-level professionals[19].

3.3 Africa

Information on staff numbers for African electricity/energy regulators is difficult to find. In Table 3 below, we show what we have been able to assemble from country websites. However, we can only find information for 10 countries, of which only 8 are Sub-Saharan African countries. The countries for which we have found data on staff numbers are, on the whole, the higher income and/or higher institutional quality countries

Table 3

Staff Numbers for African Electricity Regulators

Country	**No Total Staff**	**No Professional Staff**	**Electrification Rate (%)**
Algeria**	39*	31*	98
Egypt	49	N/A	98
Ethiopia	60+	N/A	15
Namibia	15-18	N/A	34
Niger***	22	14	N/A
Senegal	30	N/A	33
South Africa****	About 115	N/A	70
Tanzania*****	42	N/A	11
Uganda	18	13	9
Zambia	55	N/A	19

* Includes 12 Board Members and Directors
** Electricity and gas regulatory agency
*** Multi-sector Regulatory agency
**** Regulates gas and oil pipelines as well as electricity
***** Regulatory agency covers water as well as electricity

N/A – Not available

[18] Domah, Pollitt & Stern, Appendix 2.

[19] A high proportion of professional staff in ANEEL in Brazil are engineers. This seems to be common in the energy regulators of other Latin American countries – and we suspect more widely. We are grateful to Ashley Brown for information in this.

Sources: *National Regulatory Agency Websites for staff numbers and UNDP Human Development Report 2007/08 for electrification rates.*
Latest available data, typically 2005-07. Dates sometimes unclear.

Of the ten countries, only two (Namibia and Uganda) had electricity regulators with fewer than 20 staff. For the remaining eight, with the exception of South Africa, total staff numbers were in the 30 - 60 range.

Of the ten countries in this table, only three (Ethiopia, Namibia and Uganda) were in the DPS 2001-02 sample. The Namibian electricity regulatory agency is effectively the same size as 2001-02 but both the Ugandan regulatory agency and the Ethiopian regulatory agency have significantly increased in size. The Ugandan regulatory agency has increased its staff numbers from12 to 18 with an increase in the number of professional staff from 5 to 13, while the Ethiopian regulatory agency has grown from 26 staff to over 60.

If we assume that 2/3 of total staff are professionals, the table above implies that there are around 20 – 40 professional staff per regulatory agency. This represents a sizeable fixed cost for the country, especially where the regulatory agency is just for electricity, which is the case for all but Niger and Tanzania. This is most obvious for Ethiopia and Zambia both of which have over 50 total regulatory staff but have electrification rates of 15% and 19% respectively. In addition, whereas in other parts of the world the regulatory agency would also have responsibility for natural gas, that does not seem to be the case for any of the ten countries in our table. This further increases the fixed costs of regulation.

It might be expected that the human resource problems of finding sufficient qualified staff for SSA regulatory agencies might lead to their making greater use of outsourcing. However, Tremolet et al. (2004) showed, firstly, that African regulators were *less* likely to outsource regulatory functions than most other regions – and much less than OECD regulators; and, secondly, that outsourcing of regulatory tasks was less likely for electricity than for telecom or multi-sectoral regulators. Why this is so, is unclear, although Tremolet et al. shows that the costs of external consultants coupled with low regulatory budgets seem to be important impediments. There also seem to be concerns about effectively managing and using external consultants.

4. Concluding Comments

The discussion above shows that the fixed costs of regulation remains as significant as our original DPS paper suggested. In addition, the human resource requirements for specialist professional staff seem still to be a binding constraint for some low income and/or small countries.

However, the most significant - and worrying - finding of this paper is how little new information on regulatory staff numbers there is since 2002. It is surprising (and disappointing) that neither the ITU nor the IERN or any other multilateral agency collects such data and nor do the regional regulatory groupings such as OLADE or AFUR.

What little new data has emerged (e.g. for India and Latin America) tends to confirm the findings for 2001-02. Little seems to have changed: the Indian State Regulators still have tiny numbers

of staff, the Caribbean and some of the smaller, poorer Latin American countries still have very low numbers of regulatory staff, while the middle income Latin American regulators seem, at least as far as these data inform us, not to have any human resource problems. For Africa, for the countries covered typical electricity staff numbers are in the 30-60 range. Of the three regulators in both the DPS sample for whom we have been able to collect recent data, two have grown by over 50% since 2002.

Case studies and World Bank and other reports have consistently shown that good regulatory governance and practice can help improve electricity and other utility performance in terms of efficiency, costs, prices, access rates etc – and that poor regulatory quality can be a serious impediment (see Besant-Jones, 2006, for a survey). They have also shown that the availability of sufficient regulatory staff can be crucial as to whether or not electricity and other regulatory agencies can, in practice, achieve their potential. This applies, in particular, to specialist regulatory experts such as accountants, economists and lawyers. The problems for Sub-Saharan African and some other countries in recruiting such staff has led to much discussion as to how to alleviate shortages by other means. (See Brown et al 2006, Chapter 4.)

However, the comments above *assume* that staff numbers and, in particular, professional staff numbers are genuinely important for the successful delivery of regulatory outputs, controlling for all other relevant factors. We – and the authors of many other pieces on regulatory effectiveness – strongly suspect that this is so, but we cannot properly *demonstrate* it.

Since 2002, our understanding of the impact of stronger as opposed to weaker regulatory governance has improved considerably. Building on earlier literature on telecoms, Cubbin and Stern (2006) have shown that regulatory governance (and age of regulatory agency) has significant impacts on generation investment. They did this with the DPS data set, using fixed-effects econometric models. That has become the standard technique to estimate the impact of regulatory arrangements (and privatization and competition) on electricity industry outcomes. More recently, Andres et al (2008) have shown similar impacts on Latin American and Caribbean distribution company performance, again with the use of panel data models with fixed-effects, as have Estache and Rossi (2008) using a sample of developing country distribution companies from around the world.

However, none of these studies was able to estimate the impact of staff (or professional staff numbers) on industry performance. This was the case even though both Cubbin and Stern and Andres et al. were using data sets which included data on staff numbers. The reason why they could not do so was that the data on staff numbers was only present in the data set for *one single year*. In consequence, for panel data modeling, the single year of data became just one part of the country/company specific fixed effect.

So, the modeling in this area shows that fixed effects consistently provide the best fitting models but, with the current data availability, this means that we cannot seriously estimate whether staff and professional staff numbers genuinely matter for regulatory performance. This is an extremely unsatisfactory state of affairs for anyone involved either in policy making or research in these areas and suggests that there would be a major improvement in our knowledge if one of the multilateral bodies – or some aspiring PhD students – could be persuaded to collect such data retrospectively. At the least, it seems reasonable for ITU, IERN and the regional regulatory groupings to collect it on a systematic basis moving forward.

When we started our work in this area in 2001, we hoped that we would be able to follow it up 5-10 years later and find not only new data but also to be able to report information which suggested that the recently established electricity/energy regulators had managed to expand their professional staff sufficiently to become *effective* regulatory agencies. We saw that as being very important both in attracting much-needed new investment and improving efficiency but also for developing more sophisticated market arrangements – and for meeting new challenges such as climate change. However, we find, firstly, that there is disappointingly little new information; and, secondly, that, insofar as we can judge, little seems to have changed in terms of human resource availability relative to 2001-02.

We strongly believe that more attention should be paid to this issue and how it can best be addressed. We urgently need panel data and this requires systematically collecting data on regulatory staff numbers on a regular (e.g. annual) basis. We see this as an obvious – and important task for AFUR, OLADE and IERN.

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