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Political Accountability and Regulatory Performance in Infrastructure Industries: An Empirical Analysis*

Farid Gasmi
Université de Toulouse I (GREMAQ, IDEI)
gasmi@cict.fr

Paul Noumba
The World Bank
pnoumbaum@worldbank.org

Laura Recuero Virto
Université de Toulouse I (GREMAQ)
recuerovirto@hotmail.com

Abstract

The aim of this paper is to empirically explore the relationship between the quality of political institutions and the performance of regulation, an issue that has recently occupied much of the policy debate on the effectiveness of infrastructure industry reforms. Taking the view that political accountability is a key factor that links political structures and regulatory processes, we investigate, for the case of telecommunications, its impact on the performance of regulation in two time-series-cross-sectional (TSCS) data sets on 29 developing countries and 23 developed countries covering the period 1985-1999. In addition to confirming some well documented results on the positive role of regulatory governance in infrastructure industries, this paper brings some empirical evidence on the impact of the quality of political institutions and their modes of functioning on regulatory performance. This first analysis of the data sets shows that the (positive) effect of political accountability on the performance of regulation is stronger in developing countries. An important policy implication of this finding is that future reforms in these countries should give due attention to the development of politically accountable systems.

1 Introduction

The last two decades have witnessed a worldwide wave of reforms that have significantly affected both the market structure and the institutions in the infrastructure industries including high-tech sectors such as telecommunications or electricity and more traditional domains such as water or postal services. In developed countries, the main objective of these reforms has been to improve the functioning of industries traditionally organized as what has become to be recognized as ill-performing public or private monopolies. The fundamental policy task has then been to redesign the legal and regulatory frameworks so as to generate "proper" economic incentives in those industries, namely, inventives for operators to enhance their offerings, in particular, in terms of cost efficiency, quality of service, and tariffs.

While the reforms conducted in developing countries have been grounded on similar principles, in practice they differed markedly in at least two respects. First, even though there was clearly room for improving the performance of infrastructure industries in developed countries, one should recognize that in these countries service was typically available whereas in developing countries it was sometimes merely non existent. This was for instance the case in the telecommunications industry when networks were not developed in large parts of the developing countries' rural areas.

Second, and most importantly, the task of institutional design was far more challenging in developing countries. Developed countries essentially needed to work on how to modernize an already existing institutional fabric and a complex system of functioning rules built over a long history of political and economic administration of market economies. It is safe to say that in most of the cases, although for different reasons, this crucial experience was just lacking in developing countries. Beyond the fact that these countries had to follow the industrialized world in the setting of new institutions to regulate the reformed industries, an uneasy task by itself given the scarcity of human capital, they could only expect to deal with a severe inadequacy of the old administrative functioning rules. This inadequacy would be certainly felt more at the global level of the functioning of political institutions than

at the local level of the governance of regulatory institutions.

More recently, policy makers in developing countries have pushed further the process of reforms of their infrastructure industries. After a period of implementation of policies of liberalization and privatization of some segments coupled with the creation of regulatory authorities, large efforts have been allocated to improve the efficiency of the working of these authorities. Degree of independence, capacity of human capital, and particularly quality of governance are the three policy items that have mobilized much of these efforts. On the research front, however, both theoretical work on the optimal design of regulatory institutions and empirical work on the measurement of regulatory institutions' performance suggest that these specific items should not be analyzed independently from more general factors related to the governance of the economy as a whole. The main purpose of this paper is to investigate the relative weight of these factors in regulatory performance by means of an econometric analysis of two data sets on the telecommunications industry in developing and developed countries.

The determinants of regulatory performance have been discussed both in the theoretical and empirical streams of the literature on infrastructure industries regulation. For our purpose, we distinguish two approaches. A first approach, which is conceptual in nature and inspired by political science, argues that when thinking about regulatory performance the relevant game is to be found upstream at the (higher) level of politics (Spiller and Tommasi, 2003). Another more empirical approach emphasizes the impact of regulatory governance on performance (Cubbin and Stern, 2005b). Our general view is that indeed the relationship between political structures and regulatory processes has to be given due attention when assessing regulatory performance. Hence, our study might be viewed as an attempt to merge both of these approaches in order to feed in some empirical elements to the debate on the relationship between political and regulatory institutions that so far has mainly taken place at a conceptual level.

Our empirical strategy consists in implementing a series of econometric tests with a special attention given to variables that capture political account-

ability, a concept that we consider as fundamental in the exercise of the link between political structures and regulatory processes. Hence, we regard the (political game) equilibrium level of political accountability as an important determinant of the regulatory process' performance. This leads us to set up, and illustrate with our data, a test having as the null hypothesis that, all things equal, more political accountability should enhance the performance of regulation. In addition to merely testing its significance, we attempt to give some empirical substance to the conjecture that political accountability has an even stronger effect in developing countries.[2]

The plan of the paper is as follows. The next section summarizes some of the main theoretical and empirical arguments recently put forward in the literature on the design of institutions and the evaluation of regulatory performance in infrastructure industries. This section is not meant to be exhaustive but rather to serve the purpose of arguing that there is a need to merge these two streams of the literature on regulatory institutions. Section 3 describes the basic econometric-theoretical ingredients that constitute the elements of the empirical methodology we use to analyze two data sets on 29 developing countries and 23 developed countries covering the period 1985-1999. In section 4, we discuss the results of a preliminary analysis of these data. Our objective there is to uncover some general properties of the data and attempt to establish a diagnostic of stationarity for the regulatory performance variables.

The actual empirical analysis of the relationship between political accountability and regulatory performance is taken up in Section 5 in two-steps. First, in subsection 5.1 we investigate the existence of causality relationships. This causation analysis provides us with a set of variables that could be credibly used as independent variables in regressions of regulatory performance on political accountability variables. The results of such regressions are discussed in subsection 5.2. Section 6 summarizes our empirical findings and discusses some policy implications. A detailed description of the data used, their sources, and some complementary material are given in the appendix.

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[2]From a normative analysis perspective, assuming that regulatory performance increases social welfare, such a finding would suggest that marginal social benefit of political accountability is higher in developing countries.

2 Design of institutions and regulatory performance: The need for an integrated approach

Recent contributions to the theory of the design of institutions and empirical work concerned with the measurement of their performance have brought to daylight the issue of the performance of regulation.[3] Two approaches have been followed to examine the determinants of regulatory performance and outcomes. A first approach is conceptual and analyzes the role of political structures and processes. A second approach, more empirical in nature, emphasizes the impact of the quality of regulatory governance. We briefly review the main arguments developed by these two approaches and point to the need to develop a unified analytical framework. This study is a first empirical effort exerted towards this direction.

The first approach analyzes the relationship between political structures and processes and the conduct of regulation by emphasizing the need to open the black box of the organization and functioning of governments (see Estache and Martimort, 1999 and North, 2000).[4] In their analysis of the link between politics and regulation in the US, McCubbins et al. (1987) argue that, by reducing the costs of monitoring and by sharpening sanctions, administrative procedures can give rise to an equilibrium in which compliance with the preferences of political agents is greater than it otherwise would be.[5] This relationship is explored by Levy and Spiller (1994) in the telecommunications sector through an analysis of case studies. In particular, they evaluate the potential for political agents to manipulate the regulatory process. They find

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[3]Laffont (2005) devotes two chapters of his book on regulation and economic development to the discussion of issues related to the design of proper institutions in developing countries.

[4]By putting the political game at the heart of the analysis, this approach fits in the New Institutional Economics paradigm founded on the precepts of transaction cost theory and positive political economy. This constitutes an important departure from the standard normative approach to public economics.

[5]Bottom-up "fire-alarm" monitoring through external agents who are affected by regulatory agencies' policies is a good example of a method that can reduce the informational costs of following the activities of agencies (McCubbins and Schwartz, 1984).

that sector performance can be satisfactory under a wide range of regulatory procedures as long as arbitrary administrative moves can be restrained.

The link between the political and regulatory spheres is further analyzed in Spiller and Tommasi (2003) through the impact that the characteristics of political environments have on the ability of political agents to reach intertemporal cooperation. They argue that long term political cooperation is more likely to lead to stable and flexible regulatory policies, i.e, to effective regulation, when the agents with decision power have strong intertemporal relationships, policy and political moves are widely observable, good enforcement technologies are available, political exchanges take place in arenas where the previous features are satisfied, and the short-run payoffs from noncooperation are not so high. For example, these authors argue that more inefficient regulatory rules, i.e, a rigid regulatory context, may in fact provide higher incentives for investment whereas granting discretion to the regulator may lead to arbitrary outcomes if institutional endowments are low.

Heller and McCubbins (1996) argue that incentives for investing in infrastructure industries are not credible within a given regulatory structure unless there is a political context that makes them sustainable. Regulatory predictability is a key feature for gaining credibility, and hence the importance role of political institutions in enhancing this predictability. The higher the quality of the political and institutional environment, the more difficult it is to change regulatory structures and procedures. In particular, the more veto political players with effective authority there are, the easier it is to block policy changes.

Let us now turn to an overview of the empirical approach that emphasizes the role of regulatory governance. The fundamental belief that motivates much of this line of research that essentially deals with infrastructure industries is that good regulatory governance is a prerequisite to a proper functioning of the positive relationship between regulatory incentives and regulatory performance. This belief is based on the conjecture that "..regulatory agencies with better governance should make fewer mistakes, have their mistakes identified and rectified better and more quickly, so that good

regulatory practice is more readily established and maintained." (Cubbin and Stern, 2000a)

The basic empirical implications of these "theoretical" hypotheses is that, thanks to the structuring and the practice of regulation it entails (e.g., as an independent regulator that makes transparent regulatory decisions), better regulatory governance increases capacity and enhances productive and allocative efficiency. In the case of telecommunications, which is the sector concerned by our study, these implications are typically tested in data collected on a set of developing countries observed during a given time period. Regulatory performance is measured by mainline penetration rates and mainlines per employee, and regulatory governance is captured in an index (see Gutierrez, 2003a) that aggregates a set of aspects related to the structuration and internal organization of regulation. The methodology applied to both telecommunications (Gutierrez, 2003b) and electricity (Cubbin and Stern, 2000a) yields a positive impact of regulatory governance on output.[6]

A typical contribution to this line of research starts from the global conceptual view that the "..institutional quality is the dominant determinant of variations in long-term growth performance."[7] However, in its implementation part often it only accounts for micro dimensions of institutional quality embodied in what is referred to as the quality of regulatory governance. Our view is that this approach should substantially gain in richness by drawing lessons from the literature on the design of institutions discussed in the beginning of this section. Our goal then is to take a step towards a unified approach that, when evaluating regulatory performance, in addition to specifying variables of regulatory governance, explicitly incorporates variables that link political and regulatory structures and processes. Hence, our study can be viewed as a first exploration of the relative merits of such an integrated empirical approach.

In our empirical analysis, the variables through which the interface between political and regulatory structures and processes is going to materialize

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[6]For a survey of empirical studies on regulatory performance and regulatory governance in developing countries, see Cubbin and Stern (2005b).

[7]See Cubbin and Stern (2005a) and the citations thereof.

are variables that are used to proxy the concept of political accountability. Broadly speaking, this concept may bedefined as "..a proactive process by which public officials inform about and justify their plans of action, their behavior and results and are sanctioned accordingly."[8] A key idea here is that limiting the use and sanctioning the abuse of political power should help disentangling regulatory processes from the opportunistic behavior of political agents.[9]

The elections mechanism should, in principle, ensure political accountability since citizens select representatives who hold bureaucrats and members of the judiciary system accountable for their behavior. However, this property of elections is hard to satisfy since the electoral process suffers from important information asymmetries between elected politicians and citizens and lack of politicians ex post accountability. Hence, "marketization" policies of some segments of infrastructure industries, including the privatization of government monopolies, liberalization, and the application of private management principles to state-owned entreprises, have proved to be reforms that improve political agents' accountability in a much more targeted way. When analyzing regulatory performance, beyond giving full consideration to such pro-accountability reforms as the above marketization policies, the independence of the regulator, and other factors related to the sector's regulatory governance, we believe that it is also important to give due attention to other pro-accountability factors that are related to the governance of the economy as a whole. Our empirical study is a modest effort motivated by such a belief.

3   Econometric methodology

Our empirical investigation of the impact of political accountability on regulatory performance relies on a series of regressions. In each of these regres-

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[8]See Ackerman (2005).

[9]As noted by Spiller and Tommasi (2003), opportunistic behavior of politicians can be expected in infrastructure industries because of the important economic stakes involved. Indeed, these industries are characterized by very large sunk costs, substantial economies of scale, and a wide domestic consumption.

sions, the dependent variable is a variable that measures regulatory performance and the independent variables that retain much of our attention are variables that are used to capture political accountability. In view of the framework discussed in the previous section that forms the conceptual foundations of this empirical study, these variables of political accountability are regrouped into variables of "local" accountability meant to reflect the quality of regulatory governance in the sector, and variables of "global" accountability meant to reflect the quality of political governance in the economy as a whole.

Regulatory performance is measured by the level of output (mainline penetration or cellular subscription), efficiency (mainlines per employee), or price (fixed residential, cellular). Local accountability is captured in variables reflecting the degree of political and financial independence of the regulator, the level of transparency of accounts and regulatory decisions, the clarity of the allocation of tasks among institutions, the nature of the legal environment, and the degree of social participation in regulatory decisions.[10] As to global accountability, it is captured in variables reflecting the quality of the institutional framework (government integrity, efficiency of bureaucracy, strength of courts and enforcement capacity, government's commitment capacity, and currency risk) and the quality of the political process (strength of checks and balances).[11] When estimating the relationship between political accountability and regulatory performance, we control for some other variables that are deemed important such as the degree of privatization of the incumbent and the level of competition. We also account for endogeneity when it is appropriate to do so.

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[10]Thus, unlike most analyses of the impact of the reforms in infrastructure sectors, this study accounts for a large set of regulatory governance dimensions. Exceptions are Gutierrez (2003b) and Holder and Stern (1999) who have constructed detailed indices of regulators' characteristics in Latin American countries for the telecom sector, and in Asian countries for the electricity sector, respectively. These dimensions have been emphasized in the literature (see, e.g., Estache and Martimort, 1999) as important for regulatory agencies to be sustainable.

[11]Both the empirical and theoretical literatures suggest that it is not so much the extent of democracy that is relevant to investors but rather the ability of the government to credibly commit to a policy regime. To capture the level of policy stability, we choose to use an index that indicates whether there is an "effective" number of checks and balances.

Given the type of our data which are time-series-cross-sectional (TSCS), we choose to apply the Differenced Generalized Method of Moments (DIF-GMM) to estimate the relationships of interest. Lagrange multiplier and Wald tests applied to the data support the presence of dynamics and fixed effects which suggested to us the use of this method developed by Arellano and Bond (1991) for analyzing panel data and applied by Beck and Katz (2004) to TSCS data.[12] A typical relationship is specified as a dynamic equation given by

$$\log(y_{it}) = \alpha_0 + \alpha_1 \log(y_{it-1}) + \mathrm{x}'_{it}\beta + \mu_i + \epsilon_{it} \qquad (1)$$

where $i = 1, 2, \ldots, N$, $t = 1, 2, \ldots, T$, y_{it} is a one-dimensional dependent variable representing regulatory performance, α_0 and α_1 are scalar parameters, x_{it} is a vector of regressors representing, among other things, political accountability, β is the associated vector of parameters, μ_i captures a country-specific fixed effect, and ϵ_{it} is a disturbance term.[13] The indices i and t refer to the country and the year respectively. For both data sets used in the analysis $T = 15$.[14] For the data set on developing countries, $N = 29$, and for that on developed countries, $N = 23$.[15] The following (standard) assumptions are made:

$$\mathrm{E}(\mu_i) = 0, \ \mathrm{E}(\epsilon_{it}) = 0, \ \mathrm{E}(\epsilon_{it}\mu_i) = 0, \ \mathrm{E}(y_{i1}\epsilon_{it}) = 0 \qquad (2)$$

In this setting, estimation can be potentially plagued by endogeneity coming from a correlation of two types: a correlation between the regressors and the fixed effect term, on the one hand, and a correlation between the regressors and the disturbance term, on the other hand. In our context, one might expect a possible correlation between the extent of reforms captured by some

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[12]We are well aware of the (not yet settled) debate on the statistical properties of various methods used to fix problems due to dynamics in TSCS data. However, we choose to use DIF-GMM because, as an instrumental variables (IV) estimation technique, this method privileges consistency.

[13]Taking logs allows to minimize heteroskedasticity and influential outliers problems.

[14]These data sets cover the period 1985-1999.

[15]The lists of countries are given in the appendix.

regressors and some country characteristics such as population density and wealth which are embodied in the fixed effect term. Moreover, the regressors used to capture the degree of privatization and competition are likely to be endogenous, in particular, in the early stages of the reforms. For example, licenses are typically granted conditional on the fulfillment of some performance targets based on penetration, quality, or some other dimensions of the industry, and are often associated with exclusivity periods.[16]

The endogeneity problem stemming from the correlation of the first type is taken care of by merely expressing equation (1) in first differences to obtain

$$\Delta \log(y_{it}) = \alpha_1 \Delta \log(y_{it-1}) + \Delta \mathrm{x}_{it}'\beta + \Delta \epsilon_{it} \qquad (3)$$

where Δ is the first difference operator. However, this transformation brings with it another endogeneity problem due to the contemporaneous correlation between $\log(y_{it-1})$ and the error term ϵ_{it-1}. But, note that this correlation is of the same nature as the correlation of the second type mentioned above.[17] The question therefore boils down to finding instruments which can be used in the estimation of equation (3).

We follow a standard approach in which lagged values of the potentially endogenous regressors are taken as possible instruments and then appropriate lag lengths are selected by investigating whether the disturbance term is serially uncorrelated or follows a moving average process of some order q, $MA(q)$. In the case of a serially uncorrelated disturbance term, we have $\mathrm{E}(\epsilon_{it}\epsilon_{is}) = 0$ for $t \neq s$, and the variables y and x lagged two and more periods are valid instruments.[18] If the disturbance term is a $MA(1)$, we have

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[16]Endogeneity might also be a concern when using variables to capture some aspects of the structuration of regulation (see Laffont, 2005 for a discussion of some important factors that influence the structuration of regulatory institutions). A good example is the variable that indicates whether or not there exists an independent regulator. Indeed, the decision to create, and the timing of the creation of an independent regulator can be influenced by pre-regulatory performance. For an empirical account of the endogeneity of regulatory policies, see Gasmi and Recuero Virto (2006), Gutierrez (2003), and Ros (1999, 2003), among others.

[17]In fact, this problem concerns any other predetermined variable.

[18]Indeed, it can be seen that for $T \geq 3$, $\mathrm{E}(\Delta \epsilon_{it} \log(y_{it-t'})) = 0$ and $\mathrm{E}(\mathrm{x}_{it-t'}\Delta \epsilon_{it}) =$

$\mathrm{E}(\epsilon_{it}\epsilon_{it-l}) \neq 0$ for $l \leq 1$ and $\mathrm{E}(\epsilon_{it}\epsilon_{it-l}) = 0$ for $l > 1$, and the variables y and x lagged three and more periods are valid instruments. More generally, if the disturbance term follows a $MA(q)$, the valid instruments are y and x lagged $(2+q)$ and more periods.[19]

Another technical issue that needs to be addressed is that of stationarity of the dependent variable. Indeed, lack of stationarity can have two consequences in our context. A first consequence is that any estimation method applied to such a dynamic system is likely to be inaccurate.[20] A second consequence has to do with the application of DIF-GMM. The available instruments for the equation in first differences are likely to be weak which would impoverish the finite-sample properties of the estimator.[21]

To address stationarity, we follow Blundell and Bond (1998) who find that when series are close to non stationarity, DIF-GMM underestimates the coefficients of an autoregressive process of order one ($AR(1)$). For each candidate dependent variable (the regulatory performance variables), we then estimate an $AR(1)$ with both DIF-GMM and System GMM (SYS-GMM) where the latter uses, in addition to the moment conditions used in DIF-GMM, instruments in first differences for the equation in levels ($\log(y_{it})$). The use of SYS-GMM requires the following additional assumptions:

$0, \; i = 1, 2, \ldots, N; \; t = 3, \ldots, T, \; t' = 2, \ldots, t-1.$

[19]In practice, we start by using as instruments for the equation in first differences the variables $\log(y)$ and x lagged two and more periods . If the disturbance term in first differences presents no second-order autocorrelation, we are facing a serially uncorrelated disturbance term in levels which therefore says that the instruments used are valid. If the disturbance term in first differences presents a second-order autocorrelation, this indicates that, in levels, this term follows a moving average process and that the dependent variables $\log(y)$ and x lagged two periods is endogenous and hence is not a valid instrument. We then repeat the procedure by using, as instruments for the equation in first differences, the variables $\log(y)$ and x lagged n times ($n \geq 3$) and more until we find no second-order autocorrelation in the disturbance term in first differences.

[20]For example, Beck and Katz (2004) show that with a non stationary dependent variable, the dispersion of the value of the coefficient in an autoregressive process of order one found with different asymptotically equivalent methods often exceeds its standard errors.

[21]To illustrate this point, assume that the dependent variable follows the $AR(1)$ process $\log(y_{it}) = \alpha \log(y_{it-1}) + \mu_i + \epsilon_{it}$ with $\alpha \to 1$, i.e., the dependent variable becomes increasingly non stationary. Then, the instrument $\log(y_{it-2})$ is not correlated with the regressor $\Delta \log(y_{it-1})$ in (3). Indeed, $\Delta \log(y_{it-1}) = (\alpha - 1) \log(y_{it-2}) + \mu_i + \epsilon_{it-1} \to \mu_i + \epsilon_{it-1}$.

$$\mathrm{E}(\Delta \log(y_{i2})\mu_i) = 0, \ \mathrm{E}(\Delta \mathrm{x}_{i2}\mu_i) = 0, \ i = 1, \ldots, N \tag{4}$$

As shown by Arellano and Bover (1995), since the SYS-GMM approach is immune to the weak instrument problem in the case of close to non stationarity, we use it as a benchmark.[22] It is then possible to use as instruments in the equation in levels, the endogenous variables $\{\Delta y, \Delta \mathrm{x}\}$ lagged one period when the disturbance is serially uncorrelated, and lagged $(q+1)$ periods when it follows a $MA(q)$.[23]

As indicated in the beginning of this section, our investigation of the role of political accountability relies on a set of regressions. While the estimation of the coefficients of these regressions allows us to assess the (quantitative) impact of the political accountability variables on the regulatory performance variables, asking first whether there exists a causal relationship between these variables will allow us to meaningfully interpret this impact. We therefore perform some causality tests by combining the DIF-GMM estimation technique with a Granger-causality testing procedure developed in Holtz-Eakin et al. (1988) for panel data. These tests are based on the estimation of the equation

$$\Delta \log(y_{it}) = \sum_{k=1}^{m} \alpha_k \Delta \log(y_{it-k}) + \sum_{k=1}^{m} \delta_k \Delta x_{it-k} + \Delta \mathrm{x}'_{it}\beta + \Delta \epsilon_{it} \tag{5}$$

which we use to see whether the variable used to capture political accountability, x, "Granger-causes" the variable used to measure regulatory performance, y. Following Holtz-Eakin et al. (1988), we initially set the lag length

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[22]The way we use SYS-GMM as a benchmark is as follows. When this method yields an $AR(1)$ coefficient greater than or equal to one, i.e., when the dependent variable is a pure non stationary stochastic process, we take first differences and check stationarity again. When SYS-GMM yields close to unit root (the dependent variable is close to being non stationary) and DIF-GMM yields a substantially smaller coefficient, then again, we work with first differences. Otherwise, i.e., when SYS-GMM doesn't yield close to unit root or yields close to unit root but DIF-GMM doesn't underestimate the $AR(1)$ coefficient, we directly work with levels as this doesn't weaken the statistical properties of the estimator.

[23]Indeed, it can be seen that $\mathrm{E}(\Delta \log(y_{it-1-q})(\mu_i + \epsilon_{it})) = 0$ and $\mathrm{E}(\Delta x_{it-1-q}(\mu_i + \epsilon_{it})) = 0, \ i = 1, 2, \ldots, N; \ t = 3 + q, \ldots, T$.

m equal to 3 and check whether this lag length is "acceptable" by means of a Wald test of the significance of α_3 and δ_3. If such a lag length is accepted, we test the joint significance of δ_1, δ_2, and δ_3 and conclude on whether x does not cause the variable y. If the lag length is not accepted, we repeat the procedure using the next smaller lag length. In the case where no lag length is accepted, we conclude that no causality running from x to y exists.[24]

4 Preliminary empirical analysis

The purpose of this section is twofold. First, we attempt to uncover some general properties of the raw data from an examination of their descriptive statistics.[25] Second, we discuss the outcome of our investigation of the stationarity of the regulatory performance variables. Tables A1-A6 given in the appendix exhibit the list of variables and their designation, standard summary statistics, correlation coefficients for some variables of interest, and compounded annual rates of increase for the data on developing and developed countries.

From Tables A2 and A5, we see that the correlations between variables of regulatory performance and political accountability are generally stronger for developing countries than for developed countries. This is particularly the case when regulatory performance is measured by mainline penetration (ml), cellular subscription (cel), and mainlines per employee (eff), and political accountability is captured by the strength of checks and balances ($checks$). The same is true when regulatory performance is measured by mainlines per employee and political accountability is captured by the regulatory governance index (reg), and when regulatory performance is measured by price of cellular (p_cel) and political accountability is captured by the quality of

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[24]Strictly speaking, these causality tests concern the transformed variables as shown in equation (5). The political accountability variable x will represent in turn the quality of the regulatory governance, of the institutional environment, and of the political process. See the appendix for a precise definition of the variables used to capture political accountability.

[25]This step should only be taken as a first diagnosis of the data that will, at best, suggest some of their aspects to be examined with some details.

the institutional environment (*institutional*). We also observe that, in both samples, the regulatory performance variables tend to correlate more with the variables which reflect the quality of the institutional environment than those that reflect the quality of the political process or the regulatory governance.

Tables A3 and A6 reveal that, when measured by mainline penetration, cellular subscription, or mainlines per employee, regulatory performance has, on average, increased twice as much in developing countries than in developed countries over the 1985-1999 period. This might be due to the fact that, in the early part of the period, unmet demand was more important in developing countries. When measured by the monthly subscription to the fixed service (which has increased in both types of countries) or the price of cellular (which has decreased in both types of countries) instead, regulatory performance seems to have improved more in developed countries. The significantly higher increase of the monthly subscription to the fixed telephone service in developing countries might be due to the fact that policies of tariff rebalancing have been relatively more intense in these countries. As the significantly lower decrease of price of cellular in developing countries, it might reflect a relatively less effective competition in this segment of the market as compared to developed countries. To conclude this brief check up of the data, we note the evolution of the quality of the institutional environment and the political process showing a higher improvement in developing countries. However, this might only reflect the fact that these countries were lagging behind on these two dimensions.

We now discuss the outcome of our investigation of the stationarity of the regulatory performance variables which will be the dependent variables of our regressions. Tables A7 and A8 given in the appendix show the results of the estimation of an $AR(1)$ with both the DIF-GMM and SYS-GMM methods applied to the variables in levels, and then with the DIF-GMM method applied to the variables in first differences in the cases where they are found to be non stationary in levels.[26] These tables give the DIF-GMM and

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[26]A time trend is included in all $AR(1)$ estimations to allow for stationarity around a trend.

SYS-GMM (one-step robust) estimates of the $AR(1)$ coefficient, the estimate of the time trend coefficient, Time, the first- and second-order autocorrelation coefficients of the residuals in first differences, $m1$ and $m2$, the value of the J statistic for testing the validity of instruments, the value of the Dif-Sargan statistic that allows us to test the validity of the additional SYS-GMM conditions, the value of the starting lag of the instruments, L, and the number of observations actually used.[27]

From these two tables, we see that in almost all the $AR(1)$ estimations, second-order autocorrelation of the residuals in first differences ($m2$) is rejected using as instruments the initial lag of two periods and more for the variables in levels and one period for the variable in first differences. This confirms then the validity of these instruments. The only exception is the mainline penetration series (in first differences) in the data set on developing countries. In this case, we find empirical evidence that the disturbance term in levels follows a $MA(2)$. The valid instruments then are the variables in levels lagged four periods and more for the equation in first differences, and the variables in differences lagged three periods and more for the equation in levels. In fact, the J test never rejects the validity of the instruments.[28] We also see that the Dif-Sargan test never rejects the additional moment conditions required to use SYS-GMM.

From Table A7, we see that the SYS-GMM $AR(1)$ coefficient is greater than or equal to one for the series mainline penetration (ml), cellular subscription (cel), and mainlines per employee (eff), and hence conclude that these series are non stationary. Stationary is achieved when taking their first differences as can be seen from the results of DIF-GMM applied to these first differences shown at the right of the table. We therefore use these first dif-

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[27]In all the tables presented in this paper, we indicate the significance at the 10%, 5%, and 1% confidence level by the superscript *, **, and *** respectively. Even if two-step GMM is known to be asymptotically more efficient than one-step GMM, we omit the two-step GMM estimates as we find that their asymptotic standard errors tend to be abnormally small even when we make the finite sample correction proposed by Windmeijer (2000). In fact, Arellano and Bond (1991) show by means of simulations that this apparent gain in precision might come at the cost of a downward finite-sample bias.

[28]Let us mention that Blundell and Bond (1999) interpret a rejection with such a J test as possibly due to measurement errors.

ferences in the remainder of the analysis of the data on developing countries. We further see from this table that the estimates of the $AR(1)$ coefficient obtained with DIF-GMM applied to the series monthly subscription to fixed and price of cellular are smaller than those obtained with SYS-GMM. We conclude that the instruments for the equation in first differences are weak and hence we also use these series in first differences.

Concerning the data on the developed countries, we see from Table A8 that the estimates of the $AR(1)$ coefficient obtained with DIF-GMM applied to the series mainlines per employee (eff), monthly subscription to fixed (p_res), and price of cellular (p_cel) are also smaller than those obtained when SYS-GMM is applied instead. We therefore conclude again that the instruments for the equation in first differences are weak and use these series in first differences as well.[29]

5 Analysis of the relationship between political accountability and regulatory performance

5.1 Causality results

In this subsection we address the issue of the existence of causal relationships between the variables of political accountability and regulatory performance. Tables A9-A14 given in the appendix show the DIF-GMM estimation results on which we build our testing procedure asking whether the variables of local accountability, namely, the regulatory governance index (reg) and global accountability, namely, the institutional environment index ($institutional$) and the index of checks and balances ($checks$), Granger-cause the variables of regulatory performance, namely, mainline penetration (ml), cellular subscription (cel), mainlines per employee (eff), monthly subscription to fixed

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[29]In fact, for the purpose of our empirical analysis that seeks to cross-examine the results found with the developing and developed countries data sets, we ultimately use the regulatory performance series in first differences.

(p_res), and price of cellular (p_cel).[30]

In addition to showing the estimated values of the parameters associated with the explanatory variables listed at the left and some items already described in section 4, namely, $m1$, $m2$, J, L, and Obs., Tables A9-A14 include two Wald statistics. A first Wald statistic, Lag length, allows us to test for the joint significance of the coefficients associated with the dependent and the explanatory variables with the highest lag length. A second Wald statistic, Causality, allows us to test the joint significance of the coefficients associated with the lagged political accountability variables when the Lag length test accepts the significance of the appropriate coefficients. The choice of valid instruments is made by using information contained in these tables and following the procedure discussed in section 3.[31]

From the results in Tables A9-A11 obtained with the data on developing countries, we see that in all estimations there exists a certain lag length which is accepted. Then, when proceeding to examine Granger-causality, Table A9 shows that regulatory governance causes regulatory performance except when using the cellular subscription or mainlines per employee variables to measure regulatory performance.[32] Table A10 shows that the institutional environment causes regulatory performance independently of which of the five variables is used to measure regulatory performance. Finally, we see from Table A11 that the political process causes regulatory performance except when the latter is measured by the variables mainlines per employee or price of cellular. Table 1 below summarizes these findings on the existence of causality relationships in the data on developing countries.

While some causality relationships are also found in the data on developed countries, the empirical evidence is somewhat weaker than in the case of

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[30]We also include in our estimations some additional control variables as needed and account for any possible endogeneity problem. The estimates shown in these tables are those of the parameters of equation (5).

[31]See also footnote (18). In all the estimations shown in these tables, the disturbance term in levels is serially uncorrelated, except for the cellular subscription series (see Table A9) where the disturbance term follows a $MA(2)$, and for the price of cellular series (see Tables A9 and A13) where it follows a $MA(1)$.

[32]See the Causality statistic which is not significant in those two cases.

Table 1
Causality relationships
(developing countries)

Variable	LOCAL ACCOUNTABILITY reg	GLOBAL ACCOUNTABILITY institutional	checks
ml	Yes	Yes	Yes
cel	No	Yes	Yes
eff	No	Yes	No
p_res	Yes	Yes	Yes
p_cel	Yes	Yes	No

the data on developing countries. Indeed, from the results shown in Tables A12-A14, we see that there are some estimations where no lag length and hence no Granger-causality relationship is accepted. More specifically, when testing whether regulatory governance causes regulatory performance and the latter is measured by mainline penetration or price of cellular, no lag length is accepted (see Table A12). Hence, we conclude that regulatory governance does not cause regulatory performance in either of these two cases. In the same vein, these data on developing countries do not show causality relationships between the institutional environment and regulatory performance when the latter is measured by mainlines per employee or price of cellular (see Table A13) and between the political process and regulatory performance when the latter is measured by price of cellular (see Table A14).

In instances where a certain lag length is accepted, we proceed to examine Granger-causality. From Table A12, we see that regulatory governance causes regulatory performance when the latter is measured by cellular subscription or monthly subscription to fixed. From Table A13, we see that the institutional environment causes regulatory performance when the latter is measured by mainline penetration, cellular subscription, or monthly subscription to fixed service. Finally, we see from Table A14, that the data on developing countries show that the political process causes regulatory performance only when the latter is measured by cellular subscription. Figure 2 below summarizes our discussion of the existence of causality relationships in the data on developed countries.

From Tables 1 and 2, it is fair to say that, overall, the results presented

Table 2
Causality relationships
(developed countries)

Variable	LOCAL ACCOUNTABILITY *reg*	GLOBAL ACCOUNTABILITY *institutional*	*checks*
ml	No	Yes	No
cel	Yes	Yes	Yes
eff	No	No	No
p_res	Yes	Yes	No
p_cel	No	No	No

in Tables A9-A14 support the proposition that, in developing as well as in developed countries, there exists a causal relationship between political accountability and regulatory performance. This is particularly true when we examine political accountability through the quality of the institutional environment. Another interesting feature of the results is that global accountability variables seem to be in a stronger causal relationship with regulatory performance than local accountability variables, and this is even more so in developing countries. Even though the empirical evidence of such relationships is admittedly stronger in the data on developing countries, we feel that the importance of the issue from a policy point of view warrants a careful analysis of the quantitative aspects of these relationships, a task which is taken up next.

5.2 Regression estimation results

The preliminary analysis of the data performed so far sets the ground for a scrutiny of the relationship between political accountability and regulatory performance in the data on both the developing and developed countries. Let us briefly recall the different steps and outcomes of this analysis. We have started with a quick inspection of simple correlation coefficients between the variables used as proxies for these two concepts (see section 4). This light-handed checkup of the data has led us to conclude that there are reasons to believe that such a relationship exists indeed and is generally stronger in developing countries. The next step then has been to search in the data for evidence of a causal relationship running from political accountability to

regulatory performance. We have tackled this task by means of Granger-causality tests. These tests have also shown that such a causal relationship exists, although we have found a stronger empirical support for this relationship in the developing countries data (see subsection 5.1).

In addition to bringing empirical evidence on the causal relationship between political accountability and regulatory performance, the Granger-causality tests provided us with some further information on the dynamic structure of this relationship. The end-product of this testing procedure is a list of potential variables to be included as regressors when estimating the quantitative impact of political accountability on regulatory performance. In order to minimize the risk of estimation inaccuracy, a serious threat in the context of dynamic data analysis which is ours, we made sure that, if needed, the variables used to measure regulatory performance, the dependent variables, were transformed so as to make them stationary (see section 4).

Tables 3 and 4 below report DIF-GMM estimations of regressions drawing some of their main political accountability regressors from the set of variables that have "passed" the causality test performed in the previous section.[33] The content of these two tables is similar to that of Tables A9-A14 already discussed in the previous subsection. Two additional items are appended however. First, we indicate, next to the entry "Endogenous reforms," whether the variables privatization ($priva$), competition in fixed ($comp\_fix$), competition in cellular ($comp\_cel$), and regulatory governance index (reg) have been included in the regressions as endogenous regressors or merely as exogenous.[34] Second, we provide the value of a Wald statistic for testing the joint significance of time-specific effects captured in Time dummies.[35]

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[33]These variables are selected on the basis of the results detailed in Tables A9-A14 and summarized in Tables 1 and 2 given in the appendix and the previous subsection respectively. For notational simplicity, in Tables 3 and 4 we take the transformations log and Δ as implicit.

[34]We have already alluded to this endogeneity problem in section 3 (see also footnote 15). The decision to include these variables as endogenous, and hence to instrument them, was made on the basis of goodness-of-fit.

[35]Testing for the presence of time-specific effects seems particularly relevant in our context since some important events have occurred during the period under study. These events include, among others, the 1995 "Tequila" crisis, the 1997 South-asian crisis, the 1998-1999 financial breakdown, and some events related to technological progress such as the introduction of digital systems.

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From Table 3 concerning the developing countries data, we see that, for any of the five variables used to measure regulatory performance, namely, mainline penetration (ml), cellular subscription (cel), mainline per employee (eff), monthly subscription to fixed (p_res), and price of cellular (p_cel), there is at least one variable used to represent political accountability which significantly impacts it. Except when regulatory performance is measured by the monthly subscription to fixed, the sign of this impact is as can be expected, i.e., the higher the political accountability, the better the regulatory performance as reflected in higher output (increase in mainline penetration and cellular subscription), higher efficiency (increase in mainlines per employee), and lower prices (decrease in price of cellular). The apparently counterintuitive case where we find that higher political accountability (less risk of expropriation for operators and stronger checks and balances) leads to a higher monthly subscription to fixed service might in fact only reflect the extent of tariff rebalancing that typically takes place in developing countries during the early stages of the reforms. When we distinguish local accountability (regulatory governance) from global accountability, it is interesting to note that the latter is more often found to have a significant impact on regulatory performance. Nevertheless, in the cases when it is found to be significant, the effect of regulatory governance on regulatory performance has the expected sign, namely, a better regulatory governance leads to a higher output and a lower price.

The least we can say about the results obtained with the developed countries data set is that Table 4 which presents them does not convey the same messages. A general comment that should be made at the outset is that these results are poor compared with those obtained when the developing countries data set is used. Indeed, as can be seen from Table 4, some reasonable regressions could only be found when using either mainline penetration (ml), cellular subscription (cel), or monthly subscription to fixed (p_res) to measure regulatory performance. As to the impact of political accountability on regulatory performance, the only sensible results that could be recovered from the data on developed countries is a positive effect of regulatory governance (reg) on cellular subscription (cel) and a decrease in the monthly subscription to the fixed service (p_res) with a lowering of the currency risk

to operators (*currency*).[36] We finally note that, for developing countries where typically the divisions of powers is well balanced, the quality of the political process as reflected in the strength of checks and balances (*checks*) turns out not to be significant in explaining regulatory performance.[37]

We note that the dummies used to capture time-specific effects were always significant at the 10% or lower significance level which suggests that attention should be given to important political and economic events in a country when examining the performance of regulation. We also observe that the reforms variables were used as endogenous regressors in all the regressions except when regulatory performance was measured by cellular subscription in the data set on developing countries and by the monthly subscription to fixed in the data set on developed countries. This is consistent with the idea that reforms are increasingly performance-based.

To summarize, the findings suggest there are reasons to believe that local political accountability (regulatory governance) is generally an important determinant of regulatory performance in both developing and developed countries. The story is not so clear when it comes to global accountability. In the data set on developing countries, we found that the quality of the political process and the institutional environment have a favorable on regulatory performance in terms of output, price and efficiency. In contrast, with the data set on developed countries the quality of the political process has been found not to have a significant impact on regulatory performance and the institutional environment showed even a negative impact on regulatory performance as measured by output. Tables 5 and 6 below summarize our discussion of the results on the impact of political accountability on regulatory performance.

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[36] Two additional effects were found significant, but with unexpected signs, namely, a lower risk of expropriation to operators was found to decrease mainline penetration and cellular subscription.

[37] Note that this result is consistent with the implications of the simple correlation coefficients (see Table A5).

Table 3
DIF-GMM parameter estimates
(developing countries)

y_{it}	ml_{it}	cel_{it}	eff_{it}
y_{it-1}	0.247**	0.322**	-0.139**
reg_{it-1}	0.003**		
$corruption_{it-1}$		0.086***	0.017
$bureau_{it-1}$		-0.023	0.012
law_{it-1}		0.003	0.017*
$expropri_{it-1}$		0.031	0.013
$currency_{it-1}$		-0.002	-0.003
$corruption_{it-3}$	-0.011		
$bureau_{it-3}$	0.003		
law_{it-3}	0.006		
$expropri_{it-3}$	0.020		
$currency_{it-3}$	-0.004		
$checks_{it-1}$		0.024***	
$checks_{it-2}$	0.003*		
$checks_{it-3}$	-0.001		
$priva_{it}$	0.066**	0.133	0.187***
$comp\_fix_{it}$	-0.004	0.018	-0.119**
$comp\_cel_{it}$	0.022**	0.146**	0.051*
$m1$	-3.15***	-2.61***	-3.31***
$m2$	1.55	0.33	-1.46
J	3.87	13.81	10.57
Time dummies	3.03***	8.20***	1.83*
Endogenous reforms	Yes	No	Yes
L	5	2	3
Obs.	295	318	316

y_{it}	p_res_{it}	p_cel_{it}
y_{it-1}	-0.294***	-0.215***
reg_{it-1}	-0.010*	
reg_{it-2}		-0.007*
$corruption_{it-1}$	0.001	-0.005
$bureau_{it-1}$	-0.024	-0.002
law_{it-1}	0.035	0.001
$expropri_{it-1}$	0.056*	-0.043
$currency_{it-1}$	-0.016	-0.025*
$checks_{it-1}$	0.017*	
$priva_{it}$	0.185	0.869***
$comp\_fix_{it}$	-0.147*	0.001
$comp\_cel_{it}$	0.047	0.046
$m1$	-2.74***	-1.78***
$m2$	-1.62	-0.80
J	15.51	4.56
Time dummies	15.21***	2.01*
Endogenous reforms	Yes	Yes
L	2	2
Obs.	152	162

Note: The starting lag for the instruments is L and $(L-1)$ for the equation in first differences and levels respectively.

Table 4
DIF-GMM parameter estimates
(developed countries)

y_{it}	ml_{it}	cel_{it}	p_res_{it}
y_{it-1}	0.063	0.424***	-0.078
reg_{it-2}		0.012***	0.002
$corruption_{it-1}$		0.036	-0.004
$bureau_{it-1}$		0.069	0.067
law_{it-1}		0.049	0.038
$expropri_{it-1}$		-0.069**	0.143
$currency_{it-1}$		0.012	-0.025**
$corruption_{it-2}$	0.006		
$bureau_{it-2}$	-0.009		
law_{it-2}	-0.005		
$expropri_{it-2}$	-0.007*		
$currency_{it-2}$	-0.001		
$checks_{it-1}$		0.019	
$priva_{it}$	-0.014*	0.033	-0.017
$comp\_fix_{it}$	0.014*	-0.043	-0.016
$comp\_cel_{it}$	-0.004	0.000	-0.044
$m1$	-2.72***	-3.45***	-3.33***
$m2$	0.22	-2.11**	-0.96
J	2.52	2.52	4.18
Time dummies	4.06***	5.00***	43.94***
Endogenous reforms	Yes	Yes	No
L	2	2	2
Obs.	276	253	182

Note: The starting lag for the instruments is L and $(L-1)$ for the equation in first differences and levels respectively.

Table 5
Impact of political accountability on regulatory performance
(developing countries)

Variables	LOCAL ACCOUNTABILITY reg	GLOBAL ACCOUNTABILITY $institutional$	$checks$
ml	+	NS	+
cel	NA	+	+
eff	NA	+	NA
p_res	−	+	+
p_cel	−	−	NA

Note: NA ans NS stand for not applicable and not significant respectively.

Table 6
Impact of political accountability on regulatory performance
(developed countries)

Variable	LOCAL ACCOUNTABILITY reg	GLOBAL ACCOUNTABILITY $institutional$	$checks$
ml	NA	−	NA
cel	+	−	NS
eff	NA	NA	NA
p_res	NS	−	NA
p_cel	NA	NA	NA

Note: NA and NS stand for not applicable and not significant respectively.

6 Conclusion

The quality of political institutions has long been emphasized in both the academic and the institutional spheres as being a crucial determinant of economic performance. This paper is a first attempt to draw lessons from the recent conceptual literature concerned with the role of the economy-wide governance in the shaping of regulatory outcomes and feed them into the more empirical approach that directly examines the impact of sector-wide governance on regulatory performance. Our "integrated" empirical approach rests on the idea that political accountability is a key factor in the interface between political and regulatory structures. This approach is illustrated for the case of telecommunications in developing and developed countries by analyzing the impact of political accountability variables on regulatory performance variables in two time-series-cross-sectional data sets.

In this paper we have used two sets of variables to capture political accountability, local accountability variables and global accountability variables. Local accountability variables include most of the features related to "regulatory governance," namely, unbundling of regulation from policy making, autonomy and independence of the regulator, accountability of the regulator, clarity in the allocation of mandates and attributes among government institutions, legal aspects, transparency of regulatory practices, and participation in the regulatory process. These variables were synthesized in a regulatory governance index. Global accountability variables include variables concerning corruption, bureaucracy, law and order, expropriation,

currency risk, and checks and balances. We have estimated the impact of these political accountability variables on regulatory performance when the latter is measured by mainline penetration, cellular subscription, mainlines per employee, monthly subscription to the fixed, or price of cellular. Our empirical analysis of the two samples has shown a relatively weak effect of political accountability on the performance of regulation in developed countries and a clear cutting effect in the case of developing countries where we found that the higher the political accountability, the better the regulatory performance. What implications can one derive from such a finding?

During the last two decades, many developing countries have created regulatory agencies mostly relying on advice provided by international financial institutions (IFIs) and international lawyers to implement these regulatory models. New regulatory institutions were however not tailored or customized enough to fit the local cultural, political and social endowments. Our paper once again stresses this very important requirement for success in developing new institutions. Furthermore, the paper goes beyond most current analyses in the area by extending the focus of the analysis to what we have referred to as issues of "global accountability" which reflect the quality of political institutions.

Recent contributions have deepened the understanding of regulatory effectiveness along two dimensions. The first dimension is regulatory governance, a concept which is a bit broader than what our definition in this paper encompasses. The second is regulatory substance, a concept which is meant to capture the way regulation is actually performed. Brown et al (2006) have proposed a comprehensive evaluation process of the effectiveness of regulatory institutions. If implemented, this process will highlight not only the structural weaknesses but also the deficiencies stemming from the surrounding environment of regulation, in particular, the political environment.

It is thus important to devise policy mitigation instruments that incorporate both of these dimensions. Unfortunately, common practices during the last decade or so have shown that donors' interventions are centered on structural issues. The analysis conducted in this paper clearly advocates for

the definition of a set of instruments of effective intervention with the objective of achieving political accountability improvements in the practice of regulation. Indeed, building regulatory institutions in developing countries should be part of a broader strategy of "good governance" and not only be considered, as it has been in the past years, as a sectoral matter.

International donors, including the World Bank, the Department for International Development, and others have been strong and effective advocates for good governance since many years, but a sound policy for supporting the development of politically accountable systems in developing countries has yet to be designed. The general wisdom is that in order to promote good governance one has to support the development of demand and supply institutions for governance. Supply side institutions involve structural mechanisms for establishing a set of institutions with the goal of promoting accountability, whereas demand side institutions are those that advocate for good governance. Assuming that good governance is promoted, political accountability improves and so does the performance of regulation.[38]

A further aspect that needs to be highlighted is that established regulatory agencies need long term support so that they can significantly improve regulatory practice. As opposed to the short term approach relied upon during the past years, IFIs should define long term programs to support regulatory institutions newly established so the latter can build the human capital as well as develop the technical tools and instruments required by an efficient practice of regulation.

In designing reforms in the 1990s, the World Bank has usually included capacity building components in its loans to provide such support to regulators. However, although the intention was encouraging, this approach had suffered from two caveats. First, the approach was a short term one in that these programs assumed that newly established regulatory agencies will become self sustaining in five years whereas their host environments did not really support the development of such institutions. Consequently, as soon as the World Bank loan is signed or closed, most regulators did not benefit

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[38]A country such as Chile demonstrates to some extent such a cycle.

from the support of their governments, were side-lined at best, or captured. Second, the approach was lacking appropriate mitigation instruments to deal with the political environment. The issue is how do we make regulation politically acceptable or supported. Little was done to understand the political game while establishing regulatory agencies. As a result, donors did not have a clear understanding of the political requirements to make regulation acceptable in a given country. Instead, the debate centered on ring fencing regulatory agencies from political interference forgetting that regulation, in institutional terms, is no more than a delegation of power from elected officials to bureaucrats.

With this in mind, technical assistance programs typically involved training programs (skills building, hands on) to build up the human capital base, on the one hand, and helping the board or management of regulatory agencies to establish and comply with approved procedures and regulations, on the other hand. In effect, international development partners could also rely on a stick and carrot approach to catalyze necessary changes at the political level. Doing this would imply working only with those countries which are committed to improving political accountability.

To sum up, future reforms should not only devote attention to improving regulatory governance (structural requirements, regulatory substance), but should pay much more attention to understanding the political context within which regulatory institutions will be performing in. In developed countries, as our quantitative results have shown, political accountability is already well established and practiced through an effective use by the electorate of its votes as a sanction tool. The focus therefore in those countries is on regulatory governance. In developing countries, political accountability is at an early stage of development and hence this calls for additional means and resources from development partners to promote good governance which will in turn enhance the quality of regulation.

Appendix

- **Data on developing countries**

  A first data set contains observations on the following list of 29 developing countries during the period 1985-1999:

  India, Sri Lanka, Malaysia, Pakistan, Thailand, Côte d'Ivoire, Ghana, Kenya, Malawi, Tanzania, Uganda, South Africa, Jordan, Morocco, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Honduras, Jamaica, Panama, Peru, El Salvador, and Venezuela.

  Information have been collected on variables regrouped in five categories: Regulatory performance, local accountability, global accountability, and other variables. The designation of these variables, their sources, and their precise definition are given below.

Regulatory performance

Variable	Source(s)
OUTPUT	
• Mainline penetration	ITU
• Cellular subscription	ITU
EFFICIENCY	
• Mainlines per employee	ITU
PRICE	
• Monthly subscription to fixed	ITU
• Price of cellular	ITU

Local accountability

Variable	Source(s)
STRUCTURATION OF REGULATION	
• Separation of the regulator	-Bortolotti et al. (2001), Fink et al. (2002), Gutierrez (2003a), Ros (2003). -ITU World Telecommunications Regulatory database. -Clark et al. (2004).
AUTONOMY/INDEPENDENCE	
• Regulator's budget	-Clark et al. (2004).
• Can members of the regulatory commission be fired by the executive?	-Idem
• Can the minister/president veto the regulator's decisions?	-Idem
• Has the minister/president written policy guidelines during the past year?	-Idem
ACCOUNTABILITY	
• Is accounting separation mandatory?	-Idem
• Can the operator appeal if it disagrees with regulator's decisions?	-Idem
• Can other parties appeal?	-Idem
CLARITY OF ALLOCATION OF TASKS	
• Who is in charge of resolving (interconnection) disputes?	-Idem
• Who controls pricing?	-Idem
• Who controls the procedure of licence granting?	-Idem
• Who decides on the number of licenses to be granted?	-Idem
• Who controls the procedure of spectrum allocation?	-Idem
LEGAL ASPECTS	
• What type of approval is required for private firms in order to operate?	-Idem
PARTICIPATION/TRANSPARENCY	
• Are regulatory meetings open to the public?	-Idem
• Are explanations of regulatory decisions published?	-Idem
REGULATORY GOVERNANCE	
• Regulatory governance index	-Index computed from values of the previous local accountability variables.

Global accountability

Variable	Source(s)
INSTITUTIONALIZATION	
• Corruption	-IRIS dataset by Steve Knack and Philip Keefer for the IRIS Center at the University of Maryland (1982-1997). -International Country Risk Guide (ICRG) risk ratings (1997-1999).
• Bureaucracy	-Idem.
• Law and order	-Idem.
• Expropriation	-IRIS dataset by Steve Knack and Philip Keefer for the IRIS Center at the University of Maryland (1982-1997).
• Currency risk	-Exchange Rate Stability, International Country Risk Guide (ICRG) risk ratings (1985-1999).
• Institutional environment index	-Index computed from values of the previous institutionalization variables.
QUALITY OF THE POLITICAL PROCESS	
• Checks and balances	-DPI2000 Database of Political Institutions 1975-2000, Philip Keefer (Development Research Group), The World Bank (2002).

<div align="center">Other variables</div>

Variable	Source(s)
• Privatization	-Various authors (Ros, 1999, 2003, Bortolotti et al., 2001, McNary, 2001, Li and Xu, 2004, Fink et al., 2002). -ITU World Telecommunications Regulatory database. -Operators and regulators websites. -Clark et al. (2004). -Private Partcipation in Infrastructure (PPI) Project World Bank database. -IPANeT Privatization Transactions database (World Bank).
• Competition in fixed	-Various authors (Ros, 1999, 2003, Bortolotti et al., 2001, McNary, 2001, Li and Xu, 2004, Fink et al., 2002). -ITU World Telecommunications Regulatory database. -Operators and regulatory authorities websites. -Clark et al. (2004). -http://www.gsmworld.com.
• Competition in cellular	-Idem

<div align="center">Regulatory performance</div>

- Output

  . Mainline penetration: Number of telephone lines per 100 inhabitants that connect the subscribers' terminal equipment to the Public Switched Telephone Network (PSTN).

  . Cellular subscription: Number of users of portable telephones subscribing to a mobile telephone service with access to the PSTN.

- Efficiency

  . Mainlines per employee: Number of mainlines per employee in the fixed service activity.

- Price

  . Monthly subscription to fixed: Recurring fixed charge (in 2000 US dollars) paid by residential subscribers to the PSTN. This

charge covers only the rental of the line, not that of the terminal.

. Price of cellular: Price (in 2000 US dollars) paid for a 3-minute call during peak hours from a cellular telephone. For reasons of inter-country comparability, this price corresponds to that of a call placed with a pre-paid card.

Local accountability

- Structuration of regulation

  . Separation of the regulator: Dichotomous variable which takes on the value 1 if the regulatory agency is separated from and not directly controlled by a ministry or a utility, and 0 otherwise.

- Autonomy/Independence

  . Regulator's budget: Trichotomous variable which takes on the value 1 if the regulatory agency is financed from licence fees or donors contributions, 0 if it is financed from the general budget of the government, and 0.5 if it is financed from both types of sources.

  . Can members of the regulatory commission be fired by the executive?: Dichotomous variable with value 1 if the answer to the question is "no," and 0 if the answer is "yes."

  . Can the minister/president veto the regulator's decisions?: Dichotomous variable which takes on the value 1 if the answer to the question is "no," and 0 if the answer is "yes."

  . Has the minister/president written policy guidelines during the past year?: Dichotomous variable with value 1 if the answer to the question is "no," and 0 if the answer is "yes."

- Accountability

  . Is accounting separation mandatory?: Dichotomous variable which takes on the value 1 if the answer to the question is "yes," and 0 if the answer is "no."

. Can the operator appeal if it disagrees with regulator's decisions?: Dichotomous variable which takes on the value 1 if the answer to the question is "yes," and 0 if the answer is "no."

. Can other parties appeal?: Dichotomous variable with value 1 if the answer to the question is "yes," and 0 if the answer is "no."

- Clarity of allocation of tasks

. Who is in charge of resolving (interconnection) disputes?: Dichotomous variable with value 1 if the answer to the question is "the regulator," and 0 if the answer is "the ministry" or "nobody."

. Who controls pricing? (this variable concerns pricing of fixed (local), domestic long distance, international, ISP, and mobile services): Trichotomous variable which takes on the value 1 if the answer is "the regulator," 0 if the answer is "the ministry" or "nobody," and 0.5 if the answer is "both the regulator and the ministry."

. Who controls the procedure of license granting? (this concerns licenses for fixed (local), domestic long distance, international, ISP, and mobile services): Trichotomous variable with value 1 if the answer to the question is "the regulator," 0 if the answer is "the ministry," and 0.5 if the answer is "both the regulator and the ministry."

. Who decides on the number of licences to be granted?: Trichotomous variable with value 1 if the answer to the question is "the regulator," 0 if the answer is "the ministry" or "nobody," and 0.5 if the answer is "both the regulator and the ministry."

. Who controls the procedure of spectrum allocation?: Dichotomous variable which takes on the value 1 if the answer to the question is "the regulator," and 0 if the answer is "the ministry."

- Legal aspects

    . What type of approval is required for private firms in order
    to operate?: Trichotomous variable which takes on the value
    1 if the answer to the question is "a formal approval," 0 if the
    answer is "no approval at all," and 0.5 if the answer is "just
    a notification."

- Participation/Transparency

    . Are regulatory meetings open to the public?: Trichotomous
    variable with value 1 if the answer to the question is "yes, all
    of them," 0 if the answer is "not at all," and 0.5 if the answer
    is "yes, some of them."

    . Are explanations of regulatory decisions published?: Dichoto-
    mous variable which takes on the value 1 if the answer to the
    question is "yes," and 0 if the answer is "no."

- Regulatory governance

    . Regulator governance index: Variable which takes on the
    value 0 when the value of the variable separation of the reg-
    ulator is 0, i.e., when regulation is directly exercised by a
    ministry or a utility. When the variable separation of the reg-
    ulator takes on the value 1, i.e., when there exists a separated
    regulatory agency, this regulatory governance index takes on
    a value between 1 and 15 computed as the sum of the values
    taken by the local accountability variables described above
    which are 0, 0.5, or 1. Higher values of this index reflect
    better regulatory governance.

<center>Global accountability</center>

- Institutionalization

    . Corruption: Variable with values ranging from 0 to 10 and
    meant to reflect the degree of corruption of the political sys-
    tem. The higher the value of the variable, the less corrupt the
    political system. The particular concern here is with actual or

<center>36</center>

potential corruption in the form of excessive patronage, nepotism, job reservations, favors for favors, secret party funding, and close ties between politicians and business.

. Bureaucracy: Variable with values between 0 and 10 used to assess the quality of the bureaucracy. Higher points are attributed to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policies or interruption in government services.

. Law and order: Variable taking values between 0 and 10. The "Law" part of this variable is used to assess the strength and impartiality of the legal system (e.g., due to the existence of a strong judiciary system). The "Order" part gives an indication of the popular observance of the law (e.g., low crime rate or law not routinely ignored as with illegal strikes without effective sanctions). Higher values of this variable reflect a better judiciary system.

. Expropriation: Variable with values in the range 0-10 meant to assess the risk of expropriation of private investments in terms of outright confiscation or forced nationalization. Higher values of this variable reflect less risk of this type for operators.

. Currency risk: Variable taking values between 0 and 10 which captures the risk of operators stemming from exchange rate fluctuations. Again, higher values of this variable reflect a lower risk of this type.

. Institutional environment index: Variable whose value is found by summing the values taken by the five institutionalization variables described above. Hence, the values of this institutional environment index are in the range 0-50. Higher values of this index reflect a better overall institutional environment.

- Quality of the political process

. Checks and balances: Variable with values in the range 0-18 meant to give some indication on the division of powers.[39]

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[39]This variable "..counts the number of veto players in a political system, adjusting for

Higher values of this variable reflect more balanced division of powers and, accordingly, a better functioning of the political process.

Other variables

. Privatization: Variable giving the % of the incumbent's assets sold to private investors.

. Competition in fixed: Dichotomous variable which takes on the value 0 if the local segment (fixed) is a monopoly, and 1 if there are two or more operators in this segment.

. Competition in cellular: Variable which takes on the value 0 if no license for cellular (analogue and digital) has been issued, 1 if one licence has been issued, 2 if two licenses have been issued, and 3 if three or more licenses have been issued.

- **Data on developed countries**

  A second data set concerns the following list of 23 developed countries during the same period 1985-1999:

  Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States.

  Given the many similarities between this data set and the developing countries data set described at length above, below we give information only on items that are different in the developed countries data set.

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whether these veto players are independent of each other, as determined by the level of electoral competitiveness in the system, their respective party affiliations, and the electoral rules." (Henisz and Zelner, 2002). It assumes constant returns to additional voters.

Local accountability

Variable	Source(s)
STRUCTURATION OF REGULATION	
• Separation of the regulator	-Trends in Telecommunication Reform 1999: Convergence and Regulation. ITU. -ITU World Telecommunications Regulatory database.
AUTONOMY/INDEPENDENCE	
• Regulator's budget	-Telecommunications Regulations: Institutional Structures and Responsibilities. OCDE 2005.
• Overruling of the regulator's decisions	-Idem
CLARITY OF ALLOCATION OF TASKS	
• Who resolves (interconnection) disputes?	-Idem
• Who authorizes interconnection charges?	-Idem
• Who controls pricing?	-Idem
• Who controls quality of service?	-Idem
• Who is responsible of the issuing of licences?	-Idem
• Who is in charge of allocating the spectrum?	-Idem
REGULATORY GOVERNANCE	
• Regulatory governance index	-Index computed from values of the previous local accountability variables.

Other variables

Variable	Source(s)
• Privatization	-Various authors (Ros, 1999, McNary, 2001, Li and Xu, 2004). -Trends in Telecommunication Reform 1999: Convergence and Regulation. ITU.
• Competition in fixed	-Various authors (Ros, 1999, McNary, 2001, Li and Xu, 2004). -Trends in Telecommunication Reform 1999: Convergence and Regulation. ITU.
• Competition in cellular	-Idem

Local accountability

- Structuration of regulation

  . Separation of the regulator: Dichotomous variable which takes
    on the value 1 if there exists a separated regulatory agency not
    directly controlled by a ministry or a utility, and 0 otherwise.

- Autonomy/Independence

  . Regulator's budget: Trichotomous variable which takes on the
    value 1 if the regulatory agency is financed from licence fees
    or operators' contributions, 0 if it is financed from the general
    budget of the government, and 0.5 if it is financed from both
    types of sources.

  . Overruling of the regulator's decisions: Dichotomous variable
    which takes on the value 1 if there do not exist organizations
    other than the courts that can overrule the regulator's deci-
    sions, and 0 if such organizations exist.

- Clarity of allocation of tasks

  . Who resolves (interconnection) disputes?: Dichotomous vari-
    able with value 1 if the answer to the question is "the regu-
    lator," "the competition authority," or "the courts," and 0 if
    the answer is "the ministry."

  . Who authorizes interconnection charges? (this concerns in-
    terconnection with the networks of operators with significant
    market power): Dichotomous variable which takes on the
    value 1 if the answer to the question is "the regulator" or
    "the competition authority," and 0 if the answer is "the min-
    istry" or "nobody."

  . Who controls pricing?: Dichotomous variable with value 1 if
    the answer to the question is "the regulator" or "the compe-
    tition authority," and 0 if the answer is "the ministry."

  . Who controls quality of service?: Dichotomous variable with
    value 1 if the answer to the question is "the regulator" or "the
    competition authority," and 0 if the answer is "the ministry"
    or "nobody."

. Who is responsible of the issuing of licences? (this concerns licenses for fixed and mobile services): Trichotomous variable with value 1 if the answer to the question is "the regulator for both types of licenses," 0 if the answer is "the ministry for both types of licenses," and 0.5 if the answer is "the regulator for one license and the ministry for the other."

. Who is in charge of allocating the spectrum?: Trichotomous variable which takes on the value 1 if the answer to the question is "the regulator," 0 if the answer is "the ministry," and 0.5 if the answer is "both the regulator and the ministry."

- Regulatory governance

. Regulatory governance index: This variable takes on the value 0 when there is no separation between the regulator and the ministry or the utility. When such a separation exists, this variable takes on a value between 1 and 8 calculated as the sum of the values taken by the local accountability variables described above.

Other variables

. Privatization: Dichotomous variable which takes on the value 1 if the assets of the incumbent have been partly (or totally) sold to private investors, and 0 if the incumbent is State-owned.

. Competition in fixed: Dichotomous variable with value equal to 1 if there is more than one operator in the local segment (fixed), and equal to 0 if this segment is a monopoly.

. Competition in cellular: Dichotomous variable with value 1 if there is more than one operator in the cellular segment (analogue and digital), and 0 if this segment is a monopoly.

- **Descriptive statistics**

Table A1
Summary statistics
(developing countries)

Variable	Designation	Obs.	Mean	Std. Dev.	Min.	Max.
ml	Mainline penetration	435	5.27	4.96	0.11	22.36
cel	Cellular subscription	431	0.81	2.09	0	15.96
eff	Mainlines per employee	424	68.87	58.85	7.78	371.16
p_res	Monthly subscription to fixed	256	5.71	4.23	0	21.29
p_cel	Price of cellular	324	0.37	0.53	0	2.24
reg	Regulatory governance index	435	2.59	4.60	0	13.5
corruption	Corruption	435	5.07	1.43	1.66	10
bureau	Bureaucracy	420	4.84	1.86	1.66	10
law	Law and order	435	4.98	2.06	0	10
expropri	Expropriation	420	7.24	2.00	2	10
currency	Currency risk	435	5.88	1.98	1	10
institutional	Institutional environment index	435	27.60	7.10	8	41.16
checks	Checks and balances	423	3.12	2.06	1	18
priva	Privatization	435	0.16	0.32	0	1
comp_fix	Competition in fixed	435	0.09	0.29	0	1
comp_cel	Competition in cellular	435	1.05	1.10	0	3

Table A2
Correlation coefficients
(developing countries)

	ml	*cel*	*eff*	*p_res*	*p_cel*
institutional	0.41	0.65	0.42	0.23	0.60
checks	0.34	0.39	0.36	-0.01	0.30
reg	0.19	0.57	0.30	-0.06	0.61

Table A3
Compounded annual rates of increase
(developing countries)

Country	GLOBAL ACCOUNTABILITY		REGULATORY PERFORMANCE				
	institutional	*checks*	*ml*	*cel*†	*eff*	*p_res*††	*p_cel*†
India	2.57	10.40	14.18	118.61	13.76	-2.83	-
Sri Lanka	3.62	3.71	14.65	40.02	14.07	5.70	-2.23
Malaysia	-0.13	2.07	8.90	28.66	12.71	-7.86	-11.25
Pakistan	2.77	8.16	11.75	57.12	11.56	13.14	-5.53
Thailand	2.38	1.31	14.75	14.65	13.03	-8.03	-11.26
Côte d'Ivoire	0.15	5.07	7.14	105.48	10.62	-12.26	-
Ghana	5.42	8.17	7.68	78.50	13.40	-9.51	-
Kenya	0.20	8.16	3.89	74.52	1.42	6.25	-34.55
Malawi	0.47	10.40	2.92	171.59	-4.78	-15.62	19.35
Tanzania	3.05	8.16	4.80	89.82	8.63	-4.46	63.99
Uganda	5.85	-9.50	2.91	129.95	6.82	44.94	-
South Africa	0.13	5.07	4.55	72.68	10.54	-3.97	-9.59
Jordan	3.77	0	5.30	72.03	5.72	-2.08	-7.83
Morocco	3.73	0	11.84	85.92	7.44	10.86	-16.24
Argentina	4.18	6.76	5.82	74.78	14.10	6.49	1.04
Bolivia	10.49	12.18	6.18	169.71	2.76	-0.24	-17.66
Brazil	-0.36	-1.58	7.60	81.47	9.98	54.21	-11.90
Chile	3.43	10.40	11.61	81.66	8.31	-7.48	-
Colombia	1.23	1.60	7.62	60.50	5.67	-8.84	-4.66
Costa Rica	1.60	5.07	7.67	62.27	7.03	-0.18	-12.28
Dominican Rep.	3.52	12.18	11.60	64.18	8.29	76.53	-
Ecuador	0.13	0	8.37	78.41	9.66	19.69	8.53
Guatemala	5.60	5.07	9.18	139.78	13.17	-2.15	-13.03
Honduras	3.79	0	10.47	32.64	11.71	-7.73	-
Jamaica	4.20	0	13.22	137.08	12.17	19.81	0.40
Panama	2.29	2.07	5.50	89.33	4.84	-19.55	-
Peru	4.46	-4.83	8.57	143.06	17.42	27.36	6.58
El Salvador	6.49	2.07	10.82	71.02	15.60	45.10	-5.95
Venezuela	1.89	5.07	3.03	85.97	6.67	22.61	-12.49
Average	3.00	4.04	8.36	85.97	9.39	8.27	-3.64

†: Figures computed for the period 1995-1999.

††: Figures computed for the period 1993-1999.

Table A4
Summary statistics
(developed countries)

Variable	Designation	Obs.	Mean	Std. Dev.	Min.	Max.
ml	Mainline penetration	345	48.09	10.87	14.52	73.56
cel	Cellular subscription	344	8.92	13.51	0	63.37
eff	Mainlines per employee	345	168.59	57.53	43.48	358.76
p_res	Monthly subscription to fixed	252	13.87	4.70	5.60	26.27
p_cel	Price of cellular	192	1.37	0.86	0	4.95
reg	Regulatory governance index	345	2.62	3.11	0	8
$corruption$	Corruption	345	8.73	1.37	3.33	10
$bureau$	Bureaucracy	345	9.30	1.33	4.5	10
law	Law and order	345	9.42	1.11	5	10
$expropri$	Expropriation	345	9.73	0.66	4.6	10
$currency$	Currency risk	345	8.68	1.16	4	10
$institutional$	Institutional environment index	345	45.88	3.99	25.26	50
$checks$	Checks and balances	345	4.46	1.62	2	16
$priva$	Privatization	345	0.38	0.48	0	1
$comp\_fix$	Competition in fixed	345	0.23	0.42	0	1
$comp\_cel$	Competition in cellular	345	0.33	0.47	0	1

Table A5
Correlation coefficients
(developed countries)

	ml	cel	eff	p_res	p_cel
$institutional$	0.63	0.24	0.22	0.28	0.01
$checks$	0.07	0.04	0.01	0.12	0.24
reg	0.43	0.55	0.05	0.01	-0.07

Table A6
Compounded annual rates of increase
(developed countries)

Country	GLOBAL ACCOUNTABILITY		REGULATORY PERFORMANCE				
	institutional	*checks*	*ml*	*cel*†	*eff*	*p_res*††	*p_cel*†
Australia	0.30	1.60	1.98	28.04	3.98	-1.94	-4.86
Austria	0.31	0	2.10	82.20	2.34	-1.49	-24.03
Belgium	-0.50	-5.87	3.36	91.28	4.36	4.86	-11.73
Canada	0.29	0	2.16	26.64	4.30	5.11	-3.51
Denmark	0.29	0	2.31	33.17	1.50	-0.98	-12.39
Finland	0.29	-2.03	1.52	33.30	1.66	10.75	-16.69
France	-0.47	1.60	2.36	100.73	2.63	6.23	9.97
Germany	0.72	-1.58	2.48	50.22	4.37	-5.63	-4.72
Greece	3.48	0	3.78	93.65	6.91	2.67	-
Iceland	0.59	-2.03	3.25	52.23	5.02	3.31	-
Ireland	0.33	0	6.24	78.79	7.24	-1.92	7.37
Italy	0.86	0	3.02	66.69	5.50	10.78	-9.26
Japan	-0.55	0	1.94	48.11	6.63	-0.07	-25.33
Luxembourg	0.07	-1.58	4.03	64.84	3.31	10.25	-26.66
Netherlands	0.14	1.60	2.97	86.97	-0.19	2.08	-5.32
New Zealand	-0.02	0	1.35	38.32	12.18	-0.76	17.35
Norway	0.25	0	1.83	28.53	0.01	0.74	-16.49
Portugal	2.40	0	7.93	92.03	9.15	-0.81	-14.54
Spain	1.10	2.07	3.81	98.37	4.97	-4.30	5.77
Sweden	0.37	2.07	1.13	26.55	4.33	2.31	-5.07
Switzerland	-0.24	1.07	2.47	60.92	1.14	-1.43	-21.80
United King.	0.35	-2.03	3.07	46.92	4.53	2.67	-0.39
United States	-0.10	0	2.41	24.85	1.74	-1.70	-38.31
Average	0.44	-0.17	2.94	59.19	4.26	1.77	-9.55

†: Figures computed for the period 1995-1999.

††: Figures computed for the period 1993-1999.

- **Stationarity of regulatory performance series**

Stationarity tests of regulatory performance variables
(developing countries)

$log(ml_{it})$	DIF-GMM	SYS-GMM	$\Delta log(ml_{it})$	DIF-GMM
$log(ml_{it-1})$	0.785***	1.024***	$\Delta log(ml_{it-1})$	0.382***
Time	0.018***	0.003***	Time	0.001
$m1$	-2.22**	-2.62***	$m1$	-3.45***
$m2$	1.46	1.07	$m2$	2.10**
J	22.84	27.34	J	26.99
Dif-Sargan		4.5		
L	2	2	L	4
Obs.	377	406	Obs.	348
$log(cel_{it})$	DIF-GMM	SYS-GMM	$\Delta log(cel_{it})$	DIF-GMM
$log(cel_{it-1})$	0.965***	1.020***	$\Delta log(cel_{it-1})$	0.308*
Time	0.044***	0.045***	Time	0.024**
$m1$	-0.72	-0.82	$m1$	-2.45**
$m2$	0.31	0.22	$m2$	0.73
J	28.95	28.52	J	27.91
Dif-Sargan		-0.43		
L	2	2	L	2
Obs.	371	401	Obs.	342
$log(eff_{it})$	DIF-GMM	SYS-GMM	$\Delta log(eff_{it})$	DIF-GMM
$log(eff_{it-1})$	0.751***	1.015***	$\Delta log(eff_{it-1})$	0.023
Time	0.028***	0.005	Time	0.004
$m1$	-2.57**	-2.59**	$m1$	-3.26***
$m2$	-1.51	-1.48	$m2$	-1.16
J	27.90	27.40	J	26.55
Dif-Sargan		-0.50		
L	2	2	L	2
Obs.	359	391	Obs.	328
$log(p\_res_{it})$	DIF-GMM	SYS-GMM		
$log(p\_res_{it-1})$	0.680***	0.804***		
Time	-0.009	0.003		
$m1$	-2.39**	-2.47**		
$m2$	0.34	0.34		
J	26.30	25.20		
Dif-Sargan		-1.1		
L	2	2		
Obs.	190	220		
$log(p\_cel_{it})$	DIF-GMM	SYS-GMM		
$log(p\_cel_{it-1})$	0.566**	0.955***		
Time	-0.015	-0.001		
$m1$	-1.26	-1.97**		
$m2$	-0.10	-0.46		
J	19.03	19.03		
Dif-Sargan		0		
L	2	2		
Obs.	217	262		

Note: The starting lag for the instruments is L and $(L-1)$ for the equation in first differences and levels respectively.

Table A8

Stationarity tests of regulatory performance variables
(developed countries)

$log(ml_{it})$	DIF-GMM	SYS-GMM
$log(ml_{it-1})$	0.883***	0.931***
Time	0.002**	0.001
$m1$	-1.58	-1.62
$m2$	0.27	0.22
J	18.85	18.74
Dif-Sargan		-0.11
L	2	2
Obs.	299	322

$log(cel_{it})$	DIF-GMM	SYS-GMM
$log(cel_{it-1})$	0.924***	0.973***
Time	0.042***	0.037***
$m1$	0.48	0.38
$m2$	-2.24**	-2.28**
J	20.50	22.20
Dif-Sargan		1.7
L	2	2
Obs.	298	321

$log(eff_{it})$	DIF-GMM	SYS-GMM
$log(eff_{it-1})$	0.685***	0.906***
Time	0.012	0.001
$m1$	-1.76*	-1.39
$m2$	0.98	0.78
J	21.98	22.22
Dif-Sargan		0.24
L	2	2
Obs.	299	322

$log(p\_res_{it})$	DIF-GMM	SYS-GMM
$log(p\_res_{it-1})$	0.518***	0.842***
Time	0.004	-0.003
$m1$	-3.10***	-3.11***
$m2$	-1.13	-1.17
J	21.73	22.41
Dif-Sargan		0.68
L	2	2
Obs.	205	228

$log(p\_cel_{it})$	DIF-GMM	SYS-GMM
$log(p\_cel_{it-1})$	0.660***	0.807***
Time	-0.021***	-0.020***
$m1$	-2.15**	-2.30**
$m2$	-0.55	-0.68
J	18.40	19.27
Dif-Sargan		0.87
L	2	2
Obs.	123	152

Note: The starting lag for the instruments is L and $(L-1)$ for the equation in first differences and levels respectively.

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- **Causality relationships**

Table A9
Causality tests for local accountability variables
(developing countries)

y_{it}	$\Delta log(ml_{it})$	$\Delta log(cel_{it})$	$\Delta log(eff_{it})$
y_{it-1}	0.249***	0.278**	-0.164
y_{it-2}	0.039		-0.253***
y_{it-3}	-0.264***		
reg_{it-1}	0.002**	0.001	-0.001
reg_{it-2}	-0.001		-0.004
reg_{it-3}	0.001		
$corruption_{it}$	0.005	0.054**	0.009
$bureau_{it}$	-0.001	-0.008	0.016
law_{it}	-0.001	-0.001	0.001
$expropri_{it}$	0.003	0.010	0.002
$currency_{it}$	-0.004*	0.011	0.009
$checks_{it}$	0.004**	-0.016	0.009*
$priva_{it}$	0.075***	0.346*	0.205***
$comp\_fix_{it}$	-0.025**	-0.025	-0.101**
$comp\_cel_{it}$	0.004	0.139*	0.018
$m1$	-11.36***	-2.24**	-3.03***
$m2$	1.44	0.88	-0.43
J	227.75	14.06	14.44
L	2	4	2
Obs.	268	318	275
Lag length	7.02***	2.47**	7.97***
Causality	2.19*	0.14	0.47

y_{it}	$\Delta log(p\_res_{it})$	$\Delta log(p\_cel_{it})$
y_{it-1}	-0.303***	0.562***
y_{it-2}	-0.295**	-0.254***
y_{it-3}		
reg_{it-1}	-0.016**	0.003
reg_{it-2}	0.003	-0.018**
reg_{it-3}		
$corruption_{it}$	-0.001	0.035
$bureau_{it}$	0.036	-0.121**
law_{it}	0.024	0.002
$expropri_{it}$	0.059	-0.344**
$currency_{it}$	0.021	-0.002
$checks_{it}$	0.014**	0.011
$priva_{it}$	0.055	1.138***
$comp\_fix_{it}$	-0.169**	1.105
$comp\_cel_{it}$	-0.014	0.061*
$m1$	-2.05**	1.64
$m2$	-1.64	0.71
J	16.26	1.10
L	2	3
Obs.	123	124
Lag length	3.84**	13.90***
Causality	3.35*	4.15**

Note: The starting lag for the instruments is L and $(L-1)$ for the equation in first differences and levels respectively.

Table A10
Causality tests for institutionalization variables
(developing countries)

y_{it}	$\Delta log(ml_{it})$	$\Delta log(cel_{it})$	$\Delta log(eff_{it})$
y_{it-1}	0.257**	0.232*	-0.097
y_{it-2}	0.067		
y_{it-3}	-0.248***		
reg_{it}	0.001	0.001	-0.003
$institutional_{it-1}$	0.002	0.014**	0.005*
$institutional_{it-2}$	0.002		
$institutional_{it-3}$	-0.004**		
$checks_{it}$	0.004*	-0.004	0.010*
$priva_{it}$	0.074**	0.258***	0.172***
$comp\_fix_{it}$	-0.023	0.046	-0.114**
$comp\_cel_{it}$	0.06	0.037*	0.011
$m1$	-3.51***	-2.41**	-3.14***
$m2$	1.06	0.79	-1.69*
J	14.08	23.48	22.39
L	2	2	2
Obs.	278	330	316
Lag length	12.06***	4.51*	5.84***
Causality	5.71***	6.36**	3.25*

y_{it}	$\Delta log(p\_res_{it})$	$\Delta log(p\_cel_{it})$
y_{it-1}	-0.311***	-0.055**
y_{it-2}	-0.255**	
y_{it-3}		
reg_{it}	-0.009	0.005*
$institutional_{it-1}$	0.013	-0.021***
$institutional_{it-2}$	0.007	
$institutional_{it-3}$		
$checks_{it}$	0.019***	-0.001
$priva_{it}$	0.019	0.736***
$comp\_fix_{it}$	-0.181**	-0.016
$comp\_cel_{it}$	-0.009	0.003
$m1$	-2.11**	-1.89*
$m2$	-1.56	-0.33
J	18.75	8.08
L	2	2
Obs.	124	174
Lag length	6.07***	6.62***
Causality	4.29**	9.35***

Note: The starting lag for the instruments is L and $(L-1)$ for the equation in first differences and levels respectively.

y_{it}	$\Delta log(ml_{it})$	$\Delta log(cel_{it})$	$\Delta log(eff_{it})$
y_{it-1}	0.245**	0.342**	-0.212**
y_{it-2}	0.069		-0.273***
y_{it-3}	-0.215***		
reg_{it}	-0.001	0.007	-0.003
$corruption_{it}$	0.04**	0.056***	0.007
$bureau_{it}$	0.001	-0.012	0.018
law_{it}	-0.001	0.006	0.001
$expropri_{it}$	0.005	-0.013	-0.001
$currency_{it}$	-0.003*	0.012	0.009
$checks_{it-1}$	0.002	0.017**	0.007
$checks_{it-2}$	0.003*		0.009
$checks_{it-3}$	-0.004*		
$priva_{it}$	0.074**	0.160	0.199***
$comp\_fix_{it}$	-0.026	0.039	-0.092*
$comp\_cel_{it}$	0.010*	0.093**	0.019
$m1$	-3.39***	-2.44**	-2.87***
$m2$	1.69*	0.44	-0.50
J	8.58	18.08	10.12
L	2	2	2
Obs.	265	318	274
Lag length	9.85***	4.87**	7.89***
Causality	6.33***	5.42**	1.57

y_{it}	$\Delta log(p\_res_{it})$	$\Delta log(p\_cel_{it})$
y_{it-1}	-0.314***	-0.149***
y_{it-2}		
y_{it-3}		
reg_{it}	-0.013*	0.014
$corruption_{it}$	0.004	0.003
$bureau_{it}$	0.013	-0.046*
law_{it}	0.008	0.039
$expropri_{it}$	0.031	-0.166**
$currency_{it}$	0.012	-0.011
$checks_{it-1}$	0.016**	0.002
$checks_{it-2}$		
$checks_{it-3}$		
$priva_{it}$	0.007	0.859***
$comp\_fix_{it}$	-0.184**	0.030*
$comp\_cel_{it}$	0.014	-0.044
$m1$	-2.62***	-1.38
$m2$	-1.43	-0.15
J	17.27	6.11
L	2	2
Obs.	150	160
Lag length	6.40***	8.00***
Causality	5.31**	0.09

Note: The starting lag for the instruments is L and $(L-1)$ for the equation in first differences and levels respectively.

Table A12
Causality tests for local accountability variables
(developed countries)

y_{it}	$\Delta log(ml_{it})$	$\Delta log(cel_{it})$	$\Delta log(eff_{it})$
y_{it-1}	0.061	0.680***	-0.521***
y_{it-2}		-0.307***	-0.353**
y_{it-3}			-0.235***
reg_{it-1}	-0.001	0.002	-0.009
reg_{it-2}		0.012**	-0.001
reg_{it-3}			-0.009
$corruption_{it}$	0.006	-0.030	0.109**
$bureau_{it}$	-0.014***	0.003	-0.055
law_{it}	-0.005	-0.007	-0.039
$expropri_{it}$	0.002	-0.004	0.256
$currency_{it}$	-0.001	0.001	-0.016
$checks_{it}$	-0.002	0.020	0.063**
$priva_{it}$	-0.011	0.050	-0.050
$comp\_fix_{it}$	0.014**	-0.005	0.127
$comp\_cel_{it}$	-0.003	0.046	0.088
$m1$	-2.63***	-3.86***	-2.49**
$m2$	0.85	0.97	-0.33
J	12.51	4.54	5.28
L	2	2	2
Obs.	276	252	230
Lag length	0.32	8.38***	5.39**
Causality		9.17***	0.48

y_{it}	$\Delta log(p\_res_{it})$	$\Delta log(p\_cel_{it})$
y_{it-1}	-0.187**	-0.024
y_{it-2}	-0.2456***	
y_{it-3}		
reg_{it-1}	0.018	0.013*
reg_{it-2}	-0.020*	
reg_{it-3}		
$corruption_{it}$	-0.011	0.021
$bureau_{it}$	0.096	0.004
law_{it}	0.058	0.064
$expropri_{it}$	-0.191	-0.099
$currency_{it}$	0.038*	-0.013
$checks_{it}$	0.041*	0.002
$priva_{it}$	-0.164***	-0.066
$comp\_fix_{it}$	-0.121	-0.099
$comp\_cel_{it}$	0.041	-0.029
$m1$	-3.16***	-1.84*
$m2$	1.84*	-1.45
J	14.08	7.34
L	2	2
Obs.	159	99
Lag length	17.84***	1.61
Causality	2.92*	

Note: The starting lag for the instruments is L and $(L-1)$ for the equation in first differences and levels respectively.

Table A13
Causality tests for institutionalization variables
(developed countries)

y_{it}	$\Delta log(ml_{it})$	$\Delta log(cel_{it})$	$\Delta log(eff_{it})$
y_{it-1}	0.101	0.615***	-0.268*
y_{it-2}	0.032	-0.244***	
y_{it-3}		-0.034	
reg_{it}	0.001	0.015**	-0.008
$institutional_{it-1}$	0.001	-0.017*	0.006
$institutional_{it-2}$	-0.003**	0.012	
$institutional_{it-3}$		0.022	
$checks_{it}$	-0.001	0.011	0.045*
$priva_{it}$	-0.017*	0.051	-0.054
$comp\_fix_{it}$	0.007	-0.014	-0.001
$comp\_cel_{it}$	-0.007	0.033	0.013
$m1$	-2.53**	-3.93***	-2.01**
$m2$	0.73	-0.13	-0.81
J	16.61	9.68	17.22
L	2	2	2
Obs.	253	229	276
Lag length	3.52**	3.97*	2.08
Causality	3.57**	4.07**	

y_{it}	$\Delta log(p\_res_{it})$	$\Delta log(p\_cel_{it})$
y_{it-1}	-0.080	-0.091
y_{it-2}		
y_{it-3}		
reg_{it}	0.001	-0.003
$institutional_{it-1}$	-0.016**	0.001
$institutional_{it-2}$		
$institutional_{it-3}$		
$checks_{it}$	0.038	0.001
$priva_{it}$	-0.055	-0.073
$comp\_fix_{it}$	0.023	-0.079
$comp\_cel_{it}$	0.026	-0.060
$m1$	-3.46***	-1.94*
$m2$	-1.27	-1.68*
J	18.49	11.32
L	2	3
Obs.	182	99
Lag length	2.73*	0.42
Causality	4.91**	

Note: The starting lag for the instruments is L and $(L-1)$ for the equation in first differences and levels respectively.

Table A14
Causality tests for quality of the political process variables
(developed countries)

y_{it}	$\Delta log(ml_{it})$	$\Delta log(cel_{it})$	$\Delta log(eff_{it})$
y_{it-1}	-0.001	0.718***	-0.453**
y_{it-2}	0.203**	-0.280***	-0.301**
y_{it-3}			-0.229***
reg_{it}	0.002	0.013***	-0.013
$corruption_{it}$	0.007	-0.033	0.097*
$bureau_{it}$	-0.048***	0.057	-0.019
law_{it}	0.001	0.022	-0.017
$expropri_{it}$	0.025	0.096	0.122
$currency_{it}$	-0.003	0.007	-0.014
$checks_{it-1}$	-0.001	0.016**	0.058*
$checks_{it-2}$	0.001	-0.013	0.025
$checks_{it-3}$			-0.021
$priva_{it}$	-0.007	0.027	-0.044
$comp\_fix_{it}$	-0.003	-0.032	0.065
$comp\_cel_{it}$	-0.004	0.049	0.084
$m1$	-2.64***	-3.82***	-1.63
$m2$	0.73	0.22	-1.49
J	10.82	15.87	3.74
L	2	2	2
Obs.	253	252	230
Lag length	3.47**	1.74***	5.72**
Causality	0.24	3.57**	1.54

y_{it}	$\Delta log(p\_res_{it})$	$\Delta log(p\_cel_{it})$
y_{it-1}	-0.153	-0.019
y_{it-2}		
y_{it-3}		
reg_{it}	-0.001	-0.003
$corruption_{it}$	-0.030	0.017
$bureau_{it}$	0.099	0.012
law_{it}	0.066	0.060
$expropri_{it}$	-0.112*	-0.056
$currency_{it}$	0.034	0.005
$checks_{it-1}$	0.031	-0.012
$checks_{it-2}$		
$checks_{it-3}$		
$priva_{it}$	-0.135**	-0.056
$comp\_fix_{it}$	-0.063	-0.051
$comp\_cel_{it}$	-0.007	-0.006
$m1$	-3.68***	-1.85*
$m2$	-1.27	-1.43
J	13.22	4.38
L	2	2
Obs.	182	99
Lag length	4.14**	1.14
Causality	2.04	

Note: The starting lag for the instruments is L and $(L-1)$
for the equation in first differences and levels respectively.

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