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THE ROLE OF INSTITUTIONAL DESIGN IN THE CONDUCT OF INFRASTRUCTURE INDUSTRY REFORMS – AN ILLUSTRATION THROUGH TELECOMMUNICATIONS IN DEVELOPING COUNTRIES[1]

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ABSTRACT: This paper is concerned with the role of political and economic institutions in the conduct of the infrastructure industries reform process in developing countries. Our point of departure is that the specific features of these countries' economies should be accounted for when considering policy design. We discuss the main results and policy lessons drawn from two studies of the telecommunications sector based on an econometric analysis of time-series-cross-sectional data on developed and developing countries. We synthesise the main empirical findings and policy implications pertaining to two issues. The first issue concerns the impact of the quality of institutions on the function of regulation. Our review points to the fact that political accountability of institutional systems is a key determinant of regulatory performance, in particular in developing countries. The second issue relates to the factors that shape the sectoral reforms themselves and the impact of these reforms on the development of the industry in developing countries. Our main conclusion is that countries' institutional risk and financial constraints are among the major factors that explain which reforms are actually implemented.
KEY WORDS: Political accountability, Reforms, Infrastructure industries and Developing countries

Introduction

For more than two decades a worldwide wave of reforms has been reshaping the landscape of infrastructure industries both in their market structure and in the institutions that govern them. In developed countries, these reforms mainly sought to improve industry performance by introducing competition in some selected segments and redesigning the legal and regulatory framework so as to enhance diversification and quality of service, efficiency, and pricing. Although based on the same fundamental principles, these reforms faced a significantly different context in developing countries. Indeed, these countries were typically characterised by not only poor infrastructures and weak economic conditions, but also, and more importantly, by severely inadequate administrative rules at both the sectoral and economy-wide levels inherited from the pre-reform era. An important methodological implication then is that both regulatory governance within the sector and more global factors related to the governance of the economy as a whole should be accounted for when evaluating the performance of regulation in a given infrastructure sector. A first objective of this paper is to discuss the relative weight of these sectoral and economy-wide factors in the determination of regulatory performance.

Two streams of literature stand at the forefront when considering the determinants of regulatory performance in infrastructure industries. A first empirical stream emphasises the impact of regulatory governance on performance (Cubbin and Stern, 2005). Another stream, this time conceptual, argues that when investigating regulatory performance in infrastructure sectors the relevant topic to consider takes place upstream at the (higher) level of politics. (Spiller and Tommasi, 2003). Our general view is that indeed the relationship between political

1 This paper was written while Laura Recuero Virto was at the Chair on Innovation and Regulation in the Digital Economy of Télécom ParisTech, École Polytechnique, and France Télécom. We thank the editor of this journal and an anonymous referee for useful comments on an earlier draft.

and regulatory structures and processes has to be given due attention when assessing regulatory performance. This leads us to suggest an approach that merges the above two streams of literature by assuming that political accountability is the fundamental factor through which the economic institutions of a country impact the performance of sectoral regulatory institutions. An econometric analysis of two data sets on the telecommunications industry, one on developing countries and another on developed countries, allows us to illustrate this link and to give some empirical substance to the presumption that political accountability enhances regulatory performance, more so in developing countries.

In addition to insufficient deployment of infrastructure and difficulties in the functioning of institutions, developing countries are often characterised by poor macroeconomic conditions. Both the structure of the reforms, in terms of their number, design and timing, and their impact on the performance of the infrastructure industry, are subject to these constraints. Therefore, the market reform conjuncture is not only conditioned by sectoral factors, but also by institutional and macroeconomic factors affecting the efficiency of institutional rules such as the corruption engrained in the political system, and the financial situation often constrained in developing countries by, among other things, high debt services and inefficient taxation. A second purpose of this paper is to explore both the impact of the sectoral reforms on the deployment of infrastructure and the conditions that lead to specific reforms and allow them to proliferate.

The impact of reforms on the deployment of infrastructure in developing countries has largely been addressed by an empirical stream of literature.[2] However, the determinants of these reforms have been mainly explored at the theoretical level.[3] There is room then for bringing the lessons from this theoretical literature to the empirical analysis of the role of reforms in the development of infrastructure in the developing countries. By means of an econometric analysis of a data set on the telecommunications industry in developing countries, we explore the impact of sectoral reforms on fixed-line deployment and discuss, in line with a series of theoretical hypotheses derived from the literature, the role of the level of infrastructure deployment, the institutional risk, and the cost of public funds in the decisions to introduce privatisation and competition and to create a separate regulator.

Cellular competition in the analogue and digital segments is separately analysed and indeed, empirical evidence on the timing of its introduction and on its market implications suggests such a separate analysis. An additional feature of the empirical analysis is that it emphasises the two-way causal relationship between sectoral reforms and infrastructure deployment. Indeed, reforms are likely to be endogenous to deployment, particularly in the early stages of privatisation and competition reforms.[4] Moreover, the creation of a separate regulator may also depend on conditions characterising the periods prior to the introduction of regulation.[5]

The plan of the paper is as follows. The next section describes the data sets and the econometric methodologies used in our analysis. In Section 3 we first present the empirical results on the role of political accountability in regulatory performance with two data sets on the telecommunications industry in developing countries and developed countries. We then discuss our empirical findings on the determinants of sectoral reforms and on the impact of

2 See Fink *et al* (2002) for an overview of this stream of literature.

3 See Auriol and Picard (2004), Warlters (2004), Laffont (2005), Emerson (2006), and Evans *et al* (2005).

4 For instance, licences are often granted conditional on the fulfilment of targets of penetration rates and quality and associated with exclusivity periods.

5 Gutierrez (2003), Ros (1999, 2003) already point out the potential endogeneity of telecommunications reforms.

these reforms on the deployment of infrastructure, with a data set on the telecommunications industry in developing countries. We conclude with a summary of our main findings and a discussion of some policy implications.

Data and econometric methodology

In this section, we give a brief account of the data and the econometric methodology used to analyse empirically the role of political and economic institutions in the development of the telecommunications sector in developing countries.

The first study concerning the impact of the quality of institutions on the performance of regulation, (Gasmi *et al*, 2006) is based on a set of regressions performed with two time-series-cross-sectional (TSCS) data samples, one containing information on 29 developing countries and another on 23 developed countries, and both covering the period that runs from 1985 to 1999, the last year for which data were available on all the variables considered in the study. Table 1 below exhibits the list of these variables and their designation.[6]

Table 1: List of variables and designation

Variable	Designation
Regulation performance	
ml	Mainline penetration
cel	Cellular subscription
eff	Mainlines per employee
p_res	Monthly subscription to fixed
p_cel	Price of cellular
Local accountability	
reg	Regulatory governance index
Global accountability	
corruption	Corruption
bureau	Bureaucracy
law	Law and order
expropri	Expropriation
currency	Currency risk
institutional	Institutional environment index
checks	Checks and balances
Other variables	
priva	Privatisation
comp_fix	Competition in fixed
comp_cel	Competition in cellular
rural	Rural population
density	Population density

(Gasmi *et al*, 2006)

6 For a thorough description of the data and their sources, the reader is referred to Gasmi *et al* (2006).

In each of the regressions, the dependent variable measures regulatory performance. More specifically, regulatory performance is measured by a variable of output (penetration rate of fixed-line telephone service or number of subscribers to cellular service), efficiency (number of fixed-lines per employee), or price (the monthly subscription to fixed telephone service for residential consumers or the price of a three-minute cellular call during peak hours).

As to the explanatory variables, they include variables describing the standard reform instruments, namely, privatisation (percentage of the incumbent fixed service operator's assets privatised) and competition (degree of competition in the fixed and cellular segments), and some variables conveying general information on demand (population density and percentage of population that is rural). For the purpose of this paper, however, we focus on the variables used to capture political accountability. These explanatory variables of interest are regrouped into "local political accountability" and "global political accountability" variables.

The "local" part of political accountability indicates the state of governance within the telecommunications sector and is captured in variables indicative of the political and financial independence of the regulator, the transparency of accounts and regulatory decisions, the clarity of the allocation of tasks among alternative regulatory institutions, the nature of the legal environment and the degree of social participation in regulatory decisions. As to the "global" part of political accountability, it refers to the state of governance in the economy as a whole. This is captured in variables reflecting the quality of the institutional framework, namely 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 inferred from the strength of checks and balances.

The second study seeking to investigate the determinants of sectoral reforms and their impact on telecommunications infrastructure deployment, (Gasmi and Recuero Virto, 2007) is based on a series of regressions performed with data collected on variables concerning 86 developing countries for the period 1985-1999.[7] Table 2 below gives the list of these variables and their designation.

7 In this study again, the timespan of the sample was constrained by data availability.

TABLE 2: LIST OF VARIABLES AND DESIGNATION

Variable	Designation
Telecommunications deployment	
ml	Fixed-line deployment
Telecommunications reforms	
ac	Cellular competition (analogue)
counter_ana	Counter (analogue)
dc	Cellular competition (digital)
counter_dig	Counter (digital)
lc	Fixed-line competition (local)
r	Separate regulator
p	Privatisation
Institutional environment and risk indices	
corruption	Corruption
institutional	Institutional index
democracy	Democracy index
risk	Risk index
Cost of public funds	
debt	Total debt service
tax	Net taxes on products
aid	Aid per capita
Other variables and instruments	
density	Population density
rural	Rural population
import	Imports
staff	Telecommunications staff
checks	Checks and balances
english	English legal origin
french	French legal origin
protestant80	Share of protestant (1980)
latitude	Latitude
school80	Average schooling years (1980)
ethno	Ethnolinguistic fractionalisation
africa	Africa
land	Crop and forest land
polcon	Political constraints
free_press	Free press
ethnic	Ethnic tensions
rule	Law and order

(Gasmi and Recuero Virto, 2007)

When running the regressions, a key point is to account for the endogeneity of some right-hand-side variables, in particular, of the variable capturing infrastructure deployment when explaining the sectoral reform variable and of the reform variable when explaining the

infrastructure deployment variable. The reform variable describes the reform instrument that has been implemented, namely, privatisation of the incumbent, introduction of competition in the fixed-service segment, introduction of competition in the analogue and digital cellular segments (number of granted licences), and creation of a separate regulator. The infrastructure deployment variable used is the penetration rate of fixed service. Among the other variables of the regressions, particular attention is given to those that measure the quality of the institutional framework (all the variables described above except currency risk) and the ease of government access to public funds. The latter is assessed through the marginal cost of public funds where parameters are set using variables of debt service, taxation, and international aid.[8] Finally, some additional variables are used to control the effect of human capital availability in the sector, state of democracy in the country, perceived country risk, and population density and distribution in the country.

In these two studies, we apply two different econometric estimation methods according to whether the dependent variable is continuous (regulatory performance/infrastructure deployment variables, privatisation variable) or discrete (variables of competition in the fixed, analogue cellular, and digital cellular segments, creation of a separate regulator). In the continuous case, we make use of the Differenced and System Generalised Method of Moments which is appropriate for dealing with dynamics and potential endogeneity of explanatory variables, two features of our TSCS data. (Arellano and Bond, 1991, and Arellano and Bover 1995). In order to avoid the weak instrument problem and more generally the risk of inaccurate results, before performing the regressions, dependent variables are stationarised when there is presence of unit roots in the series.

In the discrete case, we apply the Complementary Log Log estimator based on the grouped duration methodology (Beck *et al,* 1998). This methodology allows us to deal with temporal dependence and multiple events as in the case of our cellular competition variables, since several licences were typically granted during the period under study. Moreover, the problem of the potential endogeneity of the explanatory regressors is first addressed by an exogeneity test based on the Two Stage Conditional Maximum Likelihood Method and then, when needed, by an estimator, the Full Information Maximum Likelihood, that allows for the presence of endogenous regressors.

While the estimation of the coefficients of these (continuous/discrete) regressions allows us to assess the quantitative impact of the explanatory variables on the dependent variables, asking first whether there exists a causal relationship between some series of interest allows us to interpret this impact meaningfully. We test whether the variables that proxy political accountability "Granger-cause" those that proxy regulatory performance, and retain for our regressions only those series where causality is found. (Holtz-Eakin *et al*, 1988). Moreover, we test whether there is a two-way causal relationship between the variables used to proxy sectoral reforms and those used that proxy infrastructure deployment, and again retain only those where causality is found.

Empirical results and implications

causality

As mentioned in the previous section, before performing the econometric estimation of the relationship between political accountability and regulatory performance on the one hand, and

8 The cost of public funds has been shown in the literature to be an important determinant of telecommunications policy (Auriol and Picard, 2004, Gasmi *et al,* 1998, Warlters, 2004).

reforms and network deployment on the other, we first investigate the existence of causal relationships between the variables of interest.

For the data samples on 29 developing countries and 23 developed countries we set up a Granger-causality testing procedure asking whether political accountability causes regulatory performance. Table 3 below summarises the results of tests performed. These tests support the proposition that, in both developing and developed countries, there exists a causal relationship between political accountability and regulatory performance. This relationship is particularly apparent when the quality of the institutional environment is the variable used to measure political accountability. Another interesting feature of the results is that this causal relationship is stronger for the global accountability variables, that is, those that reflect the governance of the economy as a whole, than for the local accountability variables that reflect the governance in the sector. This result is even more emphatic in the data sample on developing countries.

For the data on 86 developing countries, we investigate the existence of a two-way Granger-causality between sectoral reforms (privatisation, competition, and creation of a regulator) and infrastructure (penetration rate). Table 4 below summarises the results of this investigation. Data shows evidence of both two-way and one-way causality relationships. We find that the creation of a separate regulator impacts fixed-line penetration but is also conditioned by it, a result also discussed by Ros (2003) and Gutierrez (2003). A similar two-way causality relationship is found between the variable that indicates the introduction of competition in the cellular digital segment and the one that measures fixed-line penetration. For the remaining reform instruments, we find one-way causal relationships. Privatisation of the fixed-line incumbent and introduction of competition in the analogue segment both cause fixed-line deployment. Finally, deployment of fixed-line service causes the introduction of competition in the fixed local segment.

Table 3: Causality relationships (developing countries, developed countries)

Variable	**Local accountability**	**Global accountability**	
	reg	*institutional*	*checks*
ml	(Yes, No)	(Yes, Yes)	(Yes, No)
cel	(No, Yes)	(Yes, Yes)	(Yes, Yes)
eff	(No, No)	(Yes, No)	(No, No)
p_res	(Yes, Yes)	(Yes, Yes)	(Yes, No)
p_cel	(Yes, No)	(Yes, No)	(Yes, No)

(Gasmi *et al* 2006)

Table 4: Causal relationships

	ac	*dc*	*lc*	*r*	*n*
reform → fixed-line deployment	Yes	Yes	No	Yes	Yes
fixed-line deployment → reform	No	Yes	Yes	Yes	No

(Gasmi and Recuero Virto, 2007)

Estimation

The estimation results provide strong evidence that in developing countries, the higher the political accountability the better the regulatory performance as reflected in higher output (increase in fixed-line penetration and cellular subscription), higher efficiency (increase in fixed lines per employee), or lower prices (decrease in price of cellular).[9] The results obtained from the data on the developed countries are much more poorer. In fact, we find that a higher level of political accountability translates into better regulatory performance only through higher output (increase in cellular subscription) and lower prices (decrease in price of fixed-line subscription).

Our findings also suggest there are reasons to believe that local political accountability is generally a relevant determinant of regulatory performance in both developing and developed countries. The higher the sectoral regulatory governance, the better the regulatory performance as reflected in the data from developing countries' set through higher output (increase in fixed-line penetration) and lower prices (decrease in price of fixed-line subscription and in price of cellular). In the developed countries data set, the higher the sectoral regulatory governance the better the regulatory performance as translated in higher output (increase in cellular subscription).

The story is less 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 effect on regulatory performance when the latter is measured by any of the variables measuring output, price, and efficiency. In fact, this effect is even stronger than for local political accountability. In contrast, with the data set on developed countries the quality of the political process has only been found to have a significant impact on regulatory performance when the latter is measured by output (increase in cellular subscription). Moreover, the quality of the institutional environment showed a positive effect on regulatory performance when the latter is measured by price (decrease in price of fixed-line subscription) but an ambiguous effect when regulatory performance is measured by output. Table 5 below summarises this discussion.

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

Variable	**Local accountability**	**Global accountability**	
	reg	*institutional*	*checks*
ml	(+, NA)	(NS, -)	(+, NA)
cel	(NA,+)	(+, NS)	(+, +)
eff	(NA, NA)	(+, NA)	(NA, NA)
p_res	(-, NS)	(+, -)	(+, NA)
p_cel	(-, NA)	(-, NA)	(NA, NA)

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

(Gasmi *et al* 2006)

9 The only result obtained that might at first seem counterintuitive is that higher political accountability (less risk of expropriation for operators and stronger checks and balances) leads to a higher price of fixed-line subscription. However, this might in fact only reflect the extent of tariff re-balancing that typically takes place in developing countries during the early stages of the reforms.

Tables 6 and 7 below summarise the estimated results of the relationship between reforms and network expansion. The regressions support the proposition that the current level of infrastructure deployment is a relevant determinant of sectoral reforms. More specifically, the higher the current fixed-line penetration, the more likely competition will previal in the cellular digital and the local fixed-line segments is to prevail and the less likely a separate regulator is to be created.[10] We can infer then that the government is more likely to introduce competition in the cellular digital and local fixed-line segments when the sector is performing relatively well (as indicated by relatively high penetration rates) since under these circumstances higher licence fees can be imposed. The creation of a separate regulator, however, seems to be a means to improve the performance of a weak sector.

TABLE 6: SUMMARY OF RESULTS: RELATIONSHIP BETWEEN REFORMS AND FIXED-LINE DEPLOYMENT.

	ac	*dc*	*lc*	*r*	*n*
reform → fixed-line deployment	-	+	NA	NS	+
fixed-line deployment → reform	NA	+	+	-	NA

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

(Gasmi and Recuero Virto, 2007)

We also find that institutional quality is an important determinant of reforms. On the one hand, the weaker the institutional environment, the less it is likely to find reforms such as cellular competition in the analogue segment and the creation of a separate regulator.[11] On the other hand, the weaker the institutional environment, the more likely it is to find privatisation of the fixed-line incumbent, cellular competition in the digital segment, and fixed-line competition in the local segment.[12] A possible interpretation of the results is that the higher the expected price of the licence and, in general, the greater the probability of attracting investors whose rents can be imposed, the more likely a government with a poor institutional profile will be to promote the reforms.[13]

10 These results are in line with Evans *et al* (2005) who suggest that regulatory independence becomes more necessary when returns on investment are expected to be high as is likely to be the case when fixed-line penetration is still low.

11 Taking the level of corruption as an indication of the level of the functioning of institution , this result is in line with the hypothesis of Emerson (2006) that corruption should have a negative impact on the decision to introduce competition.

12 The results support Laffont (2005) proposition that the probability of infrastructure privatisation should decrease in countries with low or extreme levels of corruption.

13 Note that while the privatisation of the fixed-line incumbent and the introduction of competition in the digital cellular and the fixed-line segments typically involve external investors, the first licence in the cellular analogue segment, which often remains the sole licence issued in this segment, is usually granted to the fixed-line incumbent.

Table 7: Summary of results: Determinants of reforms

	ac	*dc*	*lc*	*r*	*p*
Risk index					
Risk	NA	NA	NA	NA	+
Cost of public funds					
Total debt service	NS	+	NS	NA	+
Net taxes on products	+	NS	+	NA	-
Aid per capita	+	-	NS	NA	-
Aggregated	-	+	-	NA	+
Institutional environment indices					
Corruption	NS	NS	-	NS	NS
Institutional index	+	-	NS	+	-
Democracy index	NS	-	NS	NS	+
Institutional index (square)	NA	NA	NA	NA	+
Democracy index (square)	NA	NA	NA	NA	NS
Discount factor					
Checks and balances	NA	NA	NA	NS	NA
Returns on investment					
Fixed-line deployment	NA	+	+	-	NA

Note: NA and NS stand for "not applicable" and "not significant" respectively.
(Gasmi and Recuero, 2007)

Through the variable parameters used, namely debt, taxes and aid, the cost of public funds also appears to be a relevant determinant of sectoral reforms.[14] On the one hand, we find that the higher the cost of public funds, the more likely it is to see privatisation of the fixed-line incumbent and cellular competition in the digital segment. On the other hand, the higher the cost of public funds, the less likely it is to have cellular competition in the analogue segment and fixed-line competition. These results lead us to conclude that more "profitable" reforms are likely to be selected when the government is under tighter financial constraints.

Regarding the impact of sectoral reforms on the deployment of infrastructure, we find strong evidence in our data set on the positive impact of privatisation of the fixed-line incumbent on fixed-line penetration.[15] Also, our separate treatment of the analogue and digital segments allows us to shed some light on the effect of the introduction of competition in these two segments.[16] While we do find that cellular competition in the digital segment has a significant and positive impact on fixed-line penetration, cellular competition in the

14 For a given tax system, increases in debt force the government to increase its revenue requirement through increases in the tax level which in turn increases the cost of public funds. Changes in net taxes on products and aid per capita have a direct impact on the government funding requirements and are expected to be negatively correlated with the cost of public funds.

15 This result is in contrast with the literature which often reports an ambiguous impact of privatisation, and that is mainly due to the fact that some authors are aggregating countries at very different stages of development.

16 The usual strategy in empirical studies is to use an aggregate index of competition for the analogue and digital segments and the typical finding is a positive impact of competition on fixed-line penetration.

analogue segment is found to have a significant and negative impact on deployment. Therefore, fixed-line deployment and cellular competition in the digital segment can be viewed as complementary while fixed-line deployment and cellular competition in the analogue segment can be regarded as substitutes. This is consistent with the fact that analogue licences were granted before digital licences and that they have been typically granted to the incumbent. Hence, no strong competition can be expected between fixed and cellular analogue services.[17] Finally, the analysis of this 1985-1999 data did not show any significant impact of fixed-line competition pn the local segment and on the creation of a regulator on fixed-line penetration.[18]

Conclusion

The major point highlighted by this paper is the crucial role played by the institutional and macroeconomic foundations that characterise a country in the development of infrastructure industries. A no less major policy implication of this point is that the ongoing debate on the (re)structuring of infrastructure industries that has so far taken place mainly at a sectoral level should now be moving on to incorporating general factors of the economy as a whole. The significance of these factors calls for a particularly subtle attitude towards policy design in developing countries. On the one hand, this study has emphasised that what we consider as a fundamental link between sectoral and economy-wide institutions, namely, political accountability, has a positive direct impact on the performance of regulation. On the other hand, a country's institutional risk and financial constraints have a positive indirect impact on the deployment of infrastructure, through the sectoral reforms put in place by the government.

We find that political accountability, characterised through the quality of the institutional environment and the political process, is a relevant determinant of the performance of regulation. The higher the political accountability, the better the regulatory performance. A consequence of this result is that future reforms should not only devote attention to improving regulatory governance (structural requirements), but should also pay much attention to understanding the political context within which regulatory institutions will perform.

In developing countries, regulatory agencies have been strongly criticised since the late '90s as often failing to prevent crises, or even worse, as precipitating them.[19] Among the major criticisms has been their failure to retain private investment.[20] The discussion in this paper, however, suggests that the performance of regulation should not be attributed only to sectoral features in developing countries where political accountability is at an early stage of development. For these countries, additional means and resources from development partners should be directed towards promoting good global governance, which will in turn enhance regulatory performance.[21]

17 Capacity is also a constraint on analogue technology that limits the number of licences issued in contrast to digital in which multiple providers often exist.

18 Although analysis of more recent data is needed for confirmation, these results might reflect lack of effective competition and poor regulatory practices.

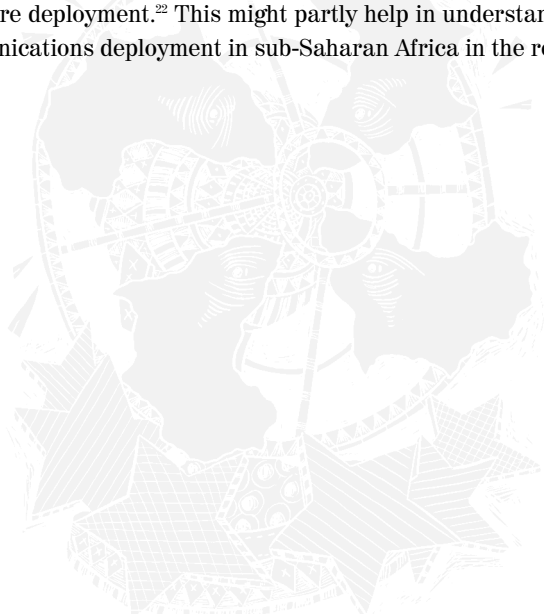
19 Some examples are the privatisation process in Ghana and Philippines and the competition process in Senegal.

20 According to the World Bank PPI database, investment rose from US$0.9 million in 1991 to US$44 million in 1997 and then decreased systematically (except in 2000) until its lowest level in 2004 at US$12 million.

21 In developed countries, as our results show, political accountability is already well established and practised through an effective use by the electorate of its votes as a sanctioning tool. The focus therefore in those countries is more on regulatory governance.

Next to factors of this global nature, namely, the institutional environment and the level of constraint of the government budget, infrastructure deployment has also been discussed as an important determinant of sectoral reforms in developing countries. In particular, in countries subject to higher institutional risk and to tighter financial constraints, governments are more likely to promote those reforms that attract a larger number of investors whose rents can be in turn extracted through the licence price, red tape, or else, such as the privatisation of the fixed-line incumbent and the introduction of cellular competition in the digital segment. For the same reasons, these governments are less likely to support those reforms that are likely to provide them with less cash, such as the introduction of competition in the analogue cellular segment and the creation of a regulator.

As it turns out, the more economically attractive reforms promoted by these governments are those that have a positive impact on infrastructure deployment. Overall, this leaves us with the result that might somehow seem paradoxical, that countries with poorer economic conditions and greater institutional risk are more likely to support those sectoral reforms that enhance infrastructure deployment.[22] This might partly help in understanding the impressive growth of telecommunications deployment in sub-Saharan Africa in the recent years. ❑



22 In Gasmi and Recuero Virto (2007) we find that both the privatisation of the fixed-line incumbent and the introduction of competition in the digital cellular segment have a positive impact on fixed-line deployment. These same reforms are also found to be important drivers of cellular subscription growth as well.

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