

Does Sequencing Matter?

Regulation and Privatization in Telecommunications Reforms

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Abstract

The question of the most effective order of reforming state-owned enterprises has been hotly debated over the years. In the early 1990s many western advisers encouraged Eastern European countries and the former Soviet Union to privatize firms quickly under the assumption that market institutions would develop once firms were privately owned. The thinking since then has emphasized the importance of establishing an institutional framework conducive to promoting competition *before* privatizing firms. To date, there has been little empirical work clarifying the debate.

Wallsten attempts to address this gap by examining the effects of the sequence of reform in telecommunications, particularly the effects of establishing a regulatory

authority prior to privatizing incumbent telecommunications firms.

Consistent with current thinking, Wallsten finds that countries that established separate regulatory authorities prior to privatization saw increased telecommunications investment, fixed telephone penetration, and cellular penetration compared with countries that did not. Moreover, he finds that investors are willing to pay more for telecommunications firms in countries that established a regulatory authority before privatization. This increased willingness to pay is consistent with the hypothesis that investors require a risk premium to invest where regulatory rules remain unclear.

This paper—a product of Macroeconomics and Growth, Development Research Group—is part of a larger effort in the group to understand network industry reforms. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Paulina Sintim-Aboagye, room MC3-422, telephone 202-473-7644, fax 202-522-1155, email address psintimaboagye@worldbank.org. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at swallsten@worldbank.org. April 2002. (21 pages)

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Regulation and Privatization in Telecommunications Reforms

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Introduction

Countries around the world have been furiously privatizing state-owned firms over the last two decades. This wave of privatizations has been massive: revenues from privatizations were estimated at close to \$1 trillion through 1999 (Megginson and Netter 2001). Privatization typically has several objectives, including increasing service provision, quality, and efficiency of the firms; stemming the flow of public subsidies, which represent scarce public resources badly needed in other areas; and generating revenues for state coffers. Privatizing state-owned firms has proven to be complicated. One important issue is how privatization fits into a reform process, and what the sequence of reforms should be. In the early 1990s many influential advisers recommended fast privatization in Eastern Europe and the former Soviet Union as the only realistic method of reforming state-owned enterprises. To the extent that there was much debate on sequences of reforms it focused mainly on corporate governance and macroeconomic conditions, but rarely on microeconomic industrial structure or institutional issues. In particular, those early debates almost completely ignored issues of competition and regulation. By the end of the 1990s reformers recognized that ignoring the institutional and competitive framework was a mistake, and conventional wisdom held that a regulatory framework should be in place prior to privatization.

Absent from any of this debate, however, has been much empirical evidence on how the sequence of reforms might matter. This absence is understandable—consistent data on reforms are scarce, and time had to pass before enough data was available to allow for empirical work. In this paper I try to address this gap by testing the effects of reform sequencing in telecommunications. In particular, I use panel data covering 200 countries from 1985-1999 to test whether the sequence of regulatory reforms and privatization matters. Consistent with current thinking, and contrary to early advice on privatization, establishing a regulatory authority *before* privatizing the telecom firm is correlated with improved telecommunications investment and telephone penetration. In addition, in a sample of 33 countries where the data were available, investors were willing to pay substantially more for firms in countries where regulatory reform took place prior to privatization—consistent with the hypothesis that privatization in the absence of regulatory reform requires paying investors a risk premium to compensate for future regulatory uncertainty.

Background

In the early 1990s Eastern Europe and the former Soviet Union faced the daunting task of moving their economies from almost complete state ownership and command-and-control to market-based systems. Such radical reforms had not been attempted before, and there was much debate as to the proper way of proceeding. The prevailing view at the time was for quick privatization of large, state owned firms—that privatization was “urgent and must take place long before firms are restructured” (Blanchard, et al. 1991).

Two general arguments supported the argument for fast restructuring. First, advisers believed that “rapid privatization is needed to combat the inevitable social, political, and economic problems associated with the lack of corporate governance” (Lipton and Sachs 1990). The concern at the time was that the same factors and incentives that led the state to be inefficient—and often corrupt—managers of state-owned firms would prevent them from properly restructuring firms. The way to bring about real and lasting reforms was to leave restructuring to private owners, which meant removing the state from the economy as much as possible as quickly as possible and quickly dealing with the question of property rights (Roland 1994). Second, governments were hard-pressed for revenue, and privatizing firms was a realistic way to raise funds.

Though quick privatization was the prevailing view, it was certainly not the only one. Some suggested that perhaps privatization was moving forward too rapidly. Roland (1994) believed that privatization should be more gradual to deal with political problems and potential backlash. Others were concerned that perhaps not enough attention was being paid to the rule of law and other institutional issues that were certain to be problems in countries with industries dominated by large, state-owned firms (Summers 1994). Finally, Newberry (1991) noted that privatizing monopolies could be problematic, and that perhaps emphasis should be placed on breaking monopolies before privatization. Still, to the extent that sequencing of reforms was a concern, it had more to do with macroeconomic concerns rather than market structure or institutions necessary for markets to function. In general, there was a strong belief that privatization was the key to reform, with little thought given to the institutional framework necessary to allow markets to function.

In particular, the difficult task of building institutions charged with facilitating competition was given short shrift. Large monopoly firms were often privatized with no regulatory authorities present that could help facilitate competition. In some ways this decision was understandable. There was concern, for example, that regulatory agencies would simply become the new mechanism through which the state could interfere with and direct the market.¹ In addition, Western industrialized countries were beginning to realize the costs of regulation and were rapidly deregulating industries where there appeared to be little economic reason for regulation (Winston 1993). In that context it would have seemed somewhat hypocritical to advocate new regulatory authorities in transition and developing countries while dismantling them in industrialized countries.

Despite these concerns, owners of monopoly firms, far from being interested in promoting a market economy, naturally have a stronger preference for maintaining their monopoly profits. Newbery (1991) noted that reform advisers believed that large firms would face international competition, and that, presumably, international competition meant that it was not necessary to foster domestic competition. To the extent that advisers worried about this issue, the question then became sequencing of trade liberalization, again ignoring the question of building the institutional framework for functioning competitive domestic markets.

These decisions had serious consequences as privatization in many countries failed to foster competitive markets, instead creating large private monopolies. This approach to privatization was also common across sectors and countries. Many countries privatized their telecommunications firms, for example, without paying close attention to building a regulatory authority. Countries often privatized first and then turned their attention to building regulatory capacity later. In this paper I use the worldwide experience in telecommunications reforms to explore this issue.

Telecommunications

¹ This fear is still a real one. A proposal in Russia would establish a single agency to coordinate tariffs in energy, railways, transport terminals, atomic energy, water and air transport, gas and communications—a proposal that sounds remarkably like centralized planning and optimization Larina, Ekaterina. 2001. "Ministries Scrap Over Single Tariff Authority: Government Seeks Better Regulation of Natural Monopolies." *The Russia Journal*, Vol. 4 No. 31 ed..

The debate on reform sequencing has, to my knowledge, been completely devoid of any econometric or empirical work. This gap is largely the result of a lack of data. A very large amount of data, however, exists for telecommunications—a prime sector for reforms and privatization. Telecommunications has undergone dramatic shifts around the world since the mid-1980s. In 1980 nearly every country in the world save those in North America had a state owned monopoly telecommunications provider and no separate regulatory authority outside of the ministry tasked with overseeing and running the sector. By 1999 90 countries around the world had at least partially privatized their telecommunications firms, and 95 had built separate regulatory authorities (International Telecommunications Union 1999).

Substantial evidence reveals that privatization can lead to performance improvements. Megginson, et al. (1994) compare pre- and post-privatization financial and operating performance of 61 companies (in 32 industries, including telecommunications) from 18 countries. They find increased sales, profits, investments, and employment following privatization. Early case studies and empirical work compared average performance indicators across firms or countries before and after reforms took effect. Not surprisingly, given the region's relatively early start in reforms, most of that evidence was from Latin America. In general, these studies found positive effects of reforms (e.g., Kikeri, et al. 1992; Wellenius 1992).

Though privatization has yielded significant benefits, allowing entry and competition into the sector appears to bring far greater benefits. A monopoly provider, whether state-owned or private, faces fewer incentives to improve service and lower prices than do firms operating in a competitive environment. As Ambrose, et al (1990) note, "simply moving a monopoly from the public to the private sphere will not result in competitive behavior." More recent empirical work has been able to work with panel data as enough time has elapsed to make econometric analysis more useful. Across the board this research finds that competition drives the biggest improvements in the sector (Li and Xu 2001; McNary 2001; Petrazzini 1996b; Ros 1999; Wallsten 2001a).

The most elusive research so far, though, has been on the effects of regulatory reform. The research that exists suggests that regulatory issues were typically given short shrift compared to privatization. Wellenius, et al (1992), among the first to address regulatory reforms pointed out in their case studies that while many countries privatized their telecom firms quickly, they built up regulatory capacity much more slowly. Galal and Nauriyal (1995) compared the

performance of the telecom sector in several countries before and after regulatory reforms. They attempt to explore how well countries were able to balance regulatory objectives: commitment, information asymmetry, and pricing issues. They found that the country in their sample (Chile) that resolved all three issues achieved the greatest improvement, while the country (the Philippines) that did not experienced the worst performance. Countries that resolved some issues experienced mixed success. Finally, in a recent empirical paper using a sample of 30 African and Latin American countries I found that privatization alone was uncorrelated with improvements in the sector, while privatization combined with building regulatory capacity was (Wallsten 2001a).

The existing research suggests that regulatory reforms are important, though our empirical knowledge on the issue is quite limited. One question about which we know very little is whether the order of reforms matters. Two main hypotheses suggest that sequencing could matter, both of which are empirically testable. The first hypothesis is that having in place a regulatory authority prior to privatization will facilitate improvements in the sector following privatization. An incumbent telecom monopolist faces both the incentive and the means to prevent competition. Telecommunications, once thought to be a natural monopoly, clearly no longer is (Crandall and Waverman 1995; Noll 1987; 2000). Wireless technology, in particular, has made competition feasible. And, as discussed above, a growing body of literature has demonstrated that where competition has developed (almost always from new wireless entrants), it brings about dramatic improvements in countries' telecommunications networks sector (Li and Xu 2001; Petrazzini 1996a; Ros 1999; Wallsten 2001a). While competition is *technically* possible, new entrants must surmount large obstacles to gain a foothold. In particular, network externalities in telecommunications mean that the network is more valuable the more people are connected to it. New entrants, therefore, are more likely to succeed when they can interconnect with the incumbent telecommunications firm in order to reach its customers.

The incumbent telecommunications firm has no incentive to allow such interconnection and every incentive to prevent competition in order to maintain its monopoly profits. This desire will only increase with a privatized incumbent. Putting the regulatory framework in place *before* privatizing the firm may help foster competition or ensure that the incumbent monopolist's investment obligations are clear when the firm is privatized. This hypothesis would suggest that

building regulatory capacity prior to privatization should yield greater improvements and investment in the telecommunications network.

The second hypothesis is that failing to put in place the regulatory framework prior to privatization will reduce the value of the firm to investors (Stiglitz 1999). Investors bidding on the firm being privatized will require a risk premium to compensate them for future changes in the regulatory rules of the game. If the regulatory structure is in place at the time of privatization investors face less uncertainty and, therefore, are willing, on average, to pay more for the firm.

Though there have been no empirical tests of these hypotheses, a detailed case study of the telecommunications privatization in Argentina seemed to bear them out (Hill and Abdala 1996). The authors found that while privatization proceeded rapidly in 1990, little attention was paid to the regulatory framework. Though a regulatory framework was drawn up the same year, little was done at first to implement it. Many of the rules were rewritten and the management changed within a year. This uncertainty seemed to hurt the privatization process, causing investors to demand very large risk premiums.

Building on the debate, theory, and case studies, this paper will test empirically whether sequencing of regulatory reform and privatization affects both sector performance and the price investors are willing to pay for the privatized firm. The sections below detail the data I use, empirical methods, and results.

Data

I use data from two primary sources to test the effects of sequencing. First, the International Telecommunications Union (ITU) compiles telecommunications data for every country around the world. I use sector data on the number of telephone mainlines, telecom investment, and cellular subscribers. The ITU also conducts regulatory surveys every year, and the 1999 survey lists which countries have a separate regulatory authority and the year it was established. Finally, data on whether and when the country's incumbent telecom firm was privatized also comes from another ITU survey. This combination of data allows me to determine whether the firm was privatized, whether there is a regulatory authority, and which came first. I complement these data with information on population and GDP, which are crucial controls since the most important determinant of telecommunications development is per capita

income (Roller and Waverman 2001). I thus have complete data for 197 countries from 1985 through 1999, yielding a panel dataset with 2,533 observations. Though it is not practical to list all the countries in a table, Table 1 provides the year a regulator was established and telecom firm privatized where for each country where at least one of those events happened.

Second, the World Bank-Stanford University Infrastructure Privatization Database allows me to test the effects of sequencing decisions on the price investors pay for the firm. This database is an ongoing effort to collect systematic, comparable data across countries and time on firms and countries undertaking telecommunications reforms. From this database I can extract data on firms in 33 countries, including the price paid, share purchased, and other factors that can influence investors' valuation of the firms, such as whether the firm received an exclusivity period (that is, a guaranteed monopoly for a period of time). I supplement this information with data from the ITU and from the U.S. Federal Communications Commission (FCC). Table 2 lists summary information on the firms included in the data. Some countries privatized more than one firm, reflecting a decision to break the incumbent up geographically (as in Argentina and Brazil) or function (domestic and international firms in El Salvador and Brazil). I explain the variables in more detail when describing the empirical method below.

Empirical Method and Results

As discussed, this paper tests two hypotheses regarding sequencing of reforms: that building a separate regulator before privatization will (1) aid sector development, and (2) increase the price investors are willing to pay for the privatized firm. I explore each hypothesis separately below.

Regulatory reforms and sector investment and performance

As mentioned above, the first task is to test whether the sequence of reforms affect sector performance. I estimate several versions of equation (1) to explore this question.

$$(1) \quad \ln(\text{sector performance}) = \beta_0 + \beta_1(\text{regulator prior to privatization}) + \beta_2(\text{private}) + \beta_3(\text{regulator}) + \beta_4(\text{regulator} * \text{private}) + \beta_5(\text{independent}) + \beta_6(\text{independent} * \text{private}) + \beta_7 * \ln(\text{population}) + \beta_8 * \ln(\text{gdp per capita}) + \alpha_i + \gamma_t + \varepsilon$$

Finding a good measure of sector performance is not easy, and no country-level indicator can hope to perfectly capture the state of the industry. Still, the ITU provides country-level indicators that provide a decent snapshot of the state of the sector. In particular, I estimate each version of the equation four times with using four dependent variables to proxy for sector performance and investment. I first use the *number of telephone mainlines* in the country-year, consistent with most empirical work in the area. And although I control for population, I next estimate the equation using the number of mainlines per capita. Third, I use *telecom investment*, and finally, the *number of mobile cellular subscribers*. Each of these indicators is problematic. First, while the number of mainlines is the most widely reported indicator around the world, mainline service is becoming increasingly less representative of the sector. In particular, competition typically comes from entrants into wireless telephony, meaning that telephone penetration can increase through cellular phone and not be reflected in the number of mainlines.

Because the number of mainlines is increasingly less representative of telephone density, I also use reported telecom investment. The problem with this indicator, however, is that it typically only reflects investments by the incumbent firms. Still, if reforms affect the incumbent's investment and if the incumbent's investment is important to the sector, then this variable is a reasonable indicator of the effect of reforms on the sector. Finally, I also explore what happens to the number of mobile cellular subscribers. Again, this variable typically excludes entrants, who often hold the bulk of new mobile subscribers, meaning that the variable is incomplete. Nonetheless, if the incumbent's investment is affected by reforms, it may invest in mobile services instead of landlines. It is thus important to explore the various ways the incumbent might invest after privatization.

The remaining variables are defined as follows:

- *Regulator before privatization* is a dummy variable that equals one if the country established a separate regulatory authority before privatizing the incumbent telecom firm. The variable equals zero for countries with no regulator and for countries with a regulator that was established the year of privatization or later. It equals one beginning the year the regulator was established.

- *Private* is a dummy variable that equals one if the firm is private. Note that this variable does not capture degrees of privatization—even a partly-private firm is considered privately owned.
- *Regulator* is a dummy variable that equals one if there exists a separate regulatory authority in the country-year.
- *Regulator*Private* is an interaction variable that indicates whether there is a separate regulator AND a private telecom firm.
- *Independent* is a dummy variable that equals one if the regulator claims to be independent from political power. Advisers typically recommend that a regulator must not be influenced by short-term political pressures if it is to be effective. Because this is such a common claim, the ITU regulatory survey asks regulators whether “the Regulatory Authority [is] independent from political power.” It is not entirely clear what answers to this question might mean. First, it is self-reported; that is, the regulators themselves answer the question. Whether a regulator is, in fact, insulated from short-term political pressures may differ from whether the regulator, when asked, says he is insulated. Second, almost no government agency is *completely* insulated from political power. The variable, therefore, best indicates whether the regulator wants the ITU to believe that it is independent from political power. Despite the numerous problems with this variable, it is worth including in the estimation since conventional reform advice so strongly emphasizes the importance of regulatory independence and, problematic though it may be, is the best systematic information we have at the moment.
- *Independent*Private* is an interaction term that indicates whether the incumbent is private AND there is a regulator that claims to be independent from political power.

Finally, in addition to those variables, the regression controls for population, per capita GDP, and year and country-fixed effects.

The strategy is to estimate the equation three times for each dependent variable, including additional exogenous variables each time to test the robustness of the variable of interest (*regulator before privatization*). This approach yields twelve regressions, allowing us to see whether there is any robustness or pattern across the results, which are presented in Table 3.

I find privatization by itself negatively and significantly correlated with the number of mainlines, negatively but not significantly correlated with mainlines per capita, but positively

and significantly correlated with investment and the number of cellular subscribers. A separate regulator is negatively, though rarely significantly, correlated with the number of mainlines, mainlines per capita, and investment. It is positively and significantly correlated with the number of cellular subscribers, however. Consistent with earlier work, the regressions reveal that privatization combined with a separate regulator is positively correlated with the number of mainlines and mainlines per capita, though not significantly correlated with this measure of investment or cellular subscribers.

The coefficient on the *independent* variable is, surprisingly, negatively and significantly correlated with the number of mainlines and mainlines per capita. It is not significantly correlated with investment, though the sign of the coefficient is positive. And with one exception it is also not significantly correlated with the number of cellular subscribers, though the sign is negative. The exception occurs when including both *independent regulator* and *independent*private* in the equation. In that case, the coefficient on *independent* is (weakly) significantly positively correlated with the number of cellular subscribers, and negatively and significantly correlated with interaction term.

The question at hand, though, is the effect of sequencing, so we are most interested in the effects of a separate regulator being established prior to privatizing the firm. Unlike the coefficients on other variables, which differ somewhat by specification, the results in this case are remarkably robust. Establishing a regulator prior to privatizing is significantly and positively correlated with the number of mainlines, mainlines per capita, investment, and mobile subscribers. The one exception is that the coefficient is not significant when the dependent variable is the number of mainlines and the variables measuring independence are also included. Though it is dangerous to leap from correlation to causality, overall the results strongly support hypothesis one: establishing a regulatory authority before privatizing the firm enhances investment and sector performance.

Regulatory reforms and the privatized firm's value to investors

The second hypothesis to test regarding sequencing is the effect of the order of reforms on the price investors are willing to pay for the privatized firm. The hypothesis is that investors will require a risk premium in countries privatizing without having first established regulatory

institutions to compensate for the uncertain nature of the rules of the game in the industry. I test this hypothesis by estimating equation (2) below using data from the World Bank Stanford University Infrastructure Reform database discussed above.² The data I compile to estimate the regression is a combination of firm and country-level data, where data on the privatization of the firm is combined with the firm's respective country-level data.

$$(2) \ln(\text{implied firm value}) = \beta_0 + \beta_1 * (\text{regulator prior to privatization}) + \beta_2 * (\text{exclusivity}) + \beta_3 * \ln(\text{number mainlines}) + \beta_4 * \ln(\text{population}) + \beta_5 * \ln(\text{gdp per capita}) + \beta_6 * \ln(\text{international settlement payments}) + \varepsilon$$

I derive the dependent variable, *implied firm value*, from the price paid by the winning bidder and the share of the firm the bidder bought. *Regulator prior to privatization* is, as above, whether there was a regulatory authority in place prior to privatization. *Exclusivity* is a dummy variable indicating whether the firm was given any period of guaranteed monopoly status after privatization. The *number of mainlines* is as defined above, and here proxies for the assets purchased by the investor. Population and *per capita gdp* control for the potential market—size and wealth of the country.

International settlement payments are the net payments the country's telephone company receives from United States-based carriers for international call from the U.S. that terminate in that country. These payments result from bilaterally negotiated "accounting rates" between each country-pair in the world for international message telephone service. Only the U.S., the U.K., and New Zealand make the rates and net payments public. The FCC posts on its website current accounting rates, net payments to each country, and historical data. These payments may be an important component of an investor's willingness to pay since the payments can be quite large. Between 1985 and 1998 developing countries received nearly \$35 billion in net settlement payments from U.S. carriers (Wallsten 2001b). Mexico alone, for example, received more than \$550 million in 1990, the year it was privatized—an amount large enough to be one of the factors potentially explaining investors' willingness to pay nearly \$1.8 billion for 20.4 percent of the company.

Table 4 presents the results of this regression. Having a guaranteed monopoly is valuable to investors, substantially increasing the selling price of the firm. Population, per capita income,

² It is important to note that this regression includes data ONLY on firms that were privatized, meaning that the regression tells us nothing about the effects of privatization, per se.

number of mainlines, and international settlement payments are also positively and significantly correlated with the implied firm value, as expected. The coefficient on the variable of interest, regulator prior to privatization, is also positive and significant, consistent with the hypothesis. In other words, investors appear to be willing to pay more for a firm privatized in an environment with less institutional uncertainty.

Though the results are statistically significant and large in magnitude, the results should be interpreted with care. The sample is small and nonrandom, meaning that it may not be possible to extrapolate out of sample. Nonetheless, the results strongly support the notion that investors will demand a risk premium to invest in an uncertain institutional environment.

In the section below I discuss all of these results in more detail, considering what they mean overall and other interpretations that might be consistent with the results.

Discussion

Though it is not the focus of the paper, the generally negative coefficient on the variable indicating that the regulator claims to be independent of political power is surprising given the emphasis advisers place on the importance of such independence. This result must be considered carefully, as the variable itself is highly problematic. First, the variable is simply whether the regulator himself claims to be independent. The self-reported nature of the variable makes the validity of the answer questionable. Second, almost no government agency is *truly* independent, so it is difficult to know what to make of a regulator claiming to be independent. Finally, there is a difference between being independent from short-term political pressures and completely independent from political pressure, and the variable provides no distinction between those two types of independence. The robust nature of this negative result across specifications, however, suggests that the correlation may be more than a spurious one. At least two hypotheses are consistent with the result, though of course there is no way to rule out a spurious correlation here.

First, it is possible that too much independence from political influence is harmful. For example, if consumers' preferences are at all expressed through the political system (and certainly in many countries they are not), then divorcing politics from regulation could, in principle, make it easier for the already-organized privatized firm to capture the regulator. That

is, under this scenario the regulated private firm has close contact with the regulator, carefully controlling the flow of information. Consumers, meanwhile, have much less access since their interests would come to the regulator through the political system. In this case the firm could easily capture the regulator, with little recourse by the government.

Second, it is possible that the variable has little to do with actual political independence. Instead, it could be much more closely related to the regulators' belief of what they think the surveyor (or those reading the results) want to hear. In particular, the World Bank and other international organizations emphasize the importance of independent regulatory authorities. Some regulators, therefore, may feel that they should answer "yes" to the question of whether they are independent, regardless of whether, in fact, they are. Those same countries who claim to have "independent" regulators because that's what they believe is expected of them may be the same countries who reform state-owned enterprises only because reform is required to receive international aid. Those countries are unlikely to be committed to true reforms, leading to the trappings of reforms on paper, but not to improvements on the ground.

The results on the sequencing issue are also robust and are consistent with the hypotheses being tested. Having a regulator in place prior to privatizing the telecom firm is correlated with improvements in telephone penetration and investment by the incumbent, and with an increased investor valuation of the firm when it is privatized. Unfortunately, it is not immediately clear that these results easily translate into policy recommendations. In particular, there may be endogeneity issues to consider.

It is possible, for example, that countries that privatized quickly had especially poorly-performing telecom firms that they wanted to be rid of. Countries whose firms were not in such bad shape may have felt they could take more time in the reform process, carefully building regulatory agencies that could help oversee the privatization process. In this case, firms that perform worse would be sold more quickly than firms that perform better, making it more likely that bad firms would be sold before the complicated task of building a regulator was complete. It is also possible that countries with more solid political institutions, in general, were more easily able to build credible regulatory agencies in addition to having other institutions that made reforms more likely to succeed. As Levy and Spiller (1996) note, the "credibility and effectiveness of a regulatory framework, and so its ability to encourage private investment and support efficiency in the production and use of services, vary with a country's political and social

institutions.” The analysis in this paper deals with some of these issues by including country and year fixed effects. Country fixed effects control for a country-specific issues such as the propensity to reform and institutional quality, while year fixed-effects control for general trends of changes in telecom service. Nonetheless, while the results are consistent with theoretical predictions, it is important to be aware of these issues when considering these results.

Conclusion

The debate over the best sequence of stages in a reform process is a long one. Early in the process many advisers, especially those involved in privatizations in Eastern Europe and the former Soviet Union advocated fast privatization, with the belief that market institutions would be built once private ownership was established. More recent thinking recognizes the importance of institutions and the importance of setting the rules of the game if markets are going to function. These issues may be especially important in infrastructure utilities, where the incumbent can be a significant bottleneck to competition. In telecommunications, for example, it is especially difficult for an entrant to succeed if the incumbent does not allow interconnection. Without a regulator, or some unbiased entity overseeing the incumbent’s behavior, the privatized firm has no incentive to allow competition, which we know to be the most effective agent of change.

To date there has been no empirical work on whether the sequence of reforms matters. This paper is an attempt to fill that gap using data on the telecommunications sector. I find that establishing a regulatory authority *before* privatizing the telecom firm is correlated with increased telephone penetration, telecom investment, and mobile cellular subscriptions. This result is consistent with the hypothesis that it is important to first build the institutional and regulatory framework and then privatize, as opposed to simply creating a private monopoly. I also find that establishing a regulator prior to privatizing the firm substantially increases the price investors are willing to pay for the firm, consistent with the hypothesis that investors require a risk premium to invest in a market with uncertain rules.

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Table 1
Countries that Privatized and/or Established a Separate Regulator

Country	year privatized	year regulator established	Country	year privatized	year regulator established
Albania	n/a	1998	Kenya	n/a	1999
Angola	n/a	1999	Kiribati	1983	n/a
Argentina	1990	1990	Kyrgyzstan	n/a	1997
Armenia	1998	n/a	Latvia	1994	1992
Australia	1997	1992	Lithuania	1998	n/a
Austria	1998	1997	Luxembourg	n/a	1997
Bahrain	1981	1996	Madagascar	1995	1997
Barbados	always	n/a	Malawi	n/a	1998
Belgium	1996	1993	Malaysia	1990	1998
Belize	1996	1988	Maldives	1988	n/a
Bhutan	n/a	1998	Mali	n/a	2000
Bolivia	1995	1995	Malta	1998	1997
Botswana	n/a	1996	Mauritania	n/a	1999
Brazil	1998	1997	Mauritius	n/a	1988
Bulgaria	n/a	1998	Mexico	1990	1996
Burkina Faso	n/a	1999	Mongolia	1995	1995
Burundi	n/a	1997	Morocco	n/a	1998
Cameroon	n/a	1998	Mozambique	n/a	1992
Canada	always	1976	Namibia	n/a	1992
Cape Verde	1995	1992	Nepal	n/a	1998
Central African Republi	1990	1996	Netherlands	1994	1997
Chile	1988	n/a	New Zealand	1990	n/a
Colombia	n/a	1994	Nicaragua	n/a	1995
Costa Rica	n/a	1996	Nigeria	n/a	1992
Croatia	1999	2000	Norway	n/a	1987
Cuba	1994	n/a	Pakistan	1996	1996
Czech Republic	1994	1993	Panama	1997	1996
Denmark	1991	1991	Papua New Guinea	n/a	1997
Ecuador	n/a	1995	Paraguay	n/a	1995
Egypt	n/a	1998	Peru	1994	1993
El Salvador	1997	1996	Philippines	always	1979
Equatorial Guinea	1987	n/a	Poland	1998	n/a
Eritrea	n/a	1998	Portugal	1995	1989
Estonia	1993	1998	Qatar	1998	n/a
Ethiopia	n/a	1996	Romania	1998	n/a
Finland	1998	1988	Russia	1997	n/a
France	1997	1997	Senegal	1997	n/a
Gabon	n/a	2000	Serbia	1997	n/a
Georgia	1994	n/a	Seychelles	1954	n/a
Germany	1996	1998	Singapore	1993	1992
Ghana	1997	1997	Slovakia	2000	1993
Greece	1996	1995	Slovenia	1996	n/a
Grenada	1989	n/a	Solomon Islands	1990	n/a
Guatemala	1998	1996	South Africa	1997	1997
Guinea	1996	1995	South Korea	1993	n/a
Guinea-Bissau	1990	n/a	Spain	1992	n/a
Guyana	1991	1992	Sri Lanka	1997	1991
Haiti	n/a	1969	Sudan	1994	1996
Honduras	n/a	1995	Sweden	2000	1992
Hungary	1993	1990	Switzerland	1998	1992
Iceland	n/a	1997	Tanzania	n/a	1994
India	n/a	1997	Togo	n/a	1999
Indonesia	1995	n/a	Trinidad and Tobago	1989	n/a
Ireland	1996	1997	Turkey	n/a	2000
Israel	1990	n/a	Uganda	2000	1997
Italy	1998	1998	United Arab Emirates	1976	n/a
Ivory Coast	1997	1995	United Kingdom	1984	1984
Jamaica	1989	1995	United States	always	1934
Japan	1985	n/a	Vanuatu	1990	n/a
Jordan	2000	1995	Venezuela	1991	1991
Kazakhstan	1994	n/a	Zambia	n/a	1994

"n/a" = firm not privatized or regulator not established

Source: ITU-BDT Telecommunications Regulatory Database, 1999

Table 2
Privatization Summary Statistics

Country	Firm name	transaction year	price paid (\$ millions)	share sold	num mainlines	implied value (\$ millions)	implied value per line
Argentina	TASA (south)	1990	2834	60	1,695,504	4,723	2,786
Argentina	Telecom Argentina (north)	1990	2408	60	1,401,969	4,013	2,863
Barbados	Cable & Wireless BARTEL	1991	3	11	77,977	27	350
Bolivia	ENTEL	1995	610	50	246,881	1,220	4,942
Brazil	Embratel	1998	2370	19.26	17,932,814	12,305	686
Brazil	Telesp	1998	5160	19.26	6,377,677	26,791	4,201
Brazil	Telecentro-Sul	1998	1850	19.26	3,757,261	9,605	2,556
Brazil	Telenorte-Leste	1998	3070	19.26	7,797,876	15,940	2,044
Chile	CTC	1988	99.5	30	591,565	332	561
Cote d'Ivoire	Cote d'Ivoire Telecom	1997	210	51	143,800	412	2,863
Czech Republic	SPT Telecom	1995	1450	27	2,444,156	5,370	2,197
El Salvador	Compania de Telecomunicaciones (CTE)	1998	275	51	396,402	539	1,360
El Salvador	Internacional de Telecomunicaciones (INTEL)	1998	41	51	396,402	80	203
Ghana	Ghana Telecom	1996	38	30	77,886	127	1,626
Guatemala	Telecomunicaciones de Guatemala (TELGUA)	1998	700	95	517,000	737	1,425
Guinea	SOTELGUI	1995	45	60	10,900	75	6,881
Guyana	Guyana Telephone and Telegraph Ltd. (GT&T)	1991	16.5	80	16,000	21	1,289
Hungary	MATAV (Magyar Tavkozlesi Vallalat)	1993	875	30.29	1,466,946	2,889	1,969
Jamaica	Jamaica Telephone Company (JTC)	1987	155.8	79	81,700	197	2,414
Mexico	TelMex	1990	1757.6	20.4	5,354,500	8,616	1,609
Mongolia	Mongolia Telecoms	1995	4.5	40	77,745	11	145
Peru	Telefonica del Peru	1994	2002	35	772,390	5,720	7,406
Poland	Telekomunikacja Polska S.A. (TP)	2000	4300	35	.	12,286	.
South Africa	Telkom, SA	1997	1260	30	4,650,000	4,200	903
Tanzania	Tanzania Telecommunications Company Limited (TTC)	2000	120	35	163,000	343	2,103
Trinidad & Tobago	Trinidad & Tobago Telephone Company	1989	85	49	165,000	173	1,051
Uganda	Uganda Telecom Ltd. (UTL)	2000	33.5	51	57,239	66	1,148
Venezuela	CANTV	1991	1885	51	1,598,947	3,696	2,312
Senegal	SONATEL	1997	106.6	33	95,100	323	3,397
Jordan	Jordan Telecommunication Corporation	2000	508	40	565,000	1,270	2,248
Panama	INTEL / Cable & Wireless Panama	1997	652	49	366,000	1,331	3,636
Romania	RomTelecom	1998	675	35	3,600,000	1,929	536

Source: World Bank Stanford Infrastructure Privatization Database and ITU

Table 3
Telecommunications Reforms and Investment

Dependent Variable	ln(number mainlines)			ln(mainlines per capita)			ln(telecom investment)			ln(cellular subscribers)		
Regulator before privatization?	0.101	0.120	0.097	0.106	0.122	0.102	0.319	0.343	0.344	0.739	0.815	0.612
	(2.32)*	(2.70)**	(2.16)*	(2.86)**	(3.22)**	(2.68)**	(1.97)*	(2.12)*	(2.10)*	(1.67)+	(1.79)+	(1.33)
Private?	-0.050	-0.052	-0.047	-0.009	-0.012	-0.008	0.222	0.204	0.204	0.658	0.642	0.686
	(2.01)*	(2.05)*	(1.86)+	(0.40)	(0.55)	(0.35)	(2.20)*	(2.04)*	(2.03)*	(2.52)*	(2.43)*	(2.59)**
Regulator?	-0.108	-0.048	-0.083	-0.100	-0.067	-0.097	-0.281	-0.467	-0.466	0.831	0.602	0.310
	(2.35)*	(0.90)	(1.55)	(2.56)*	(1.49)	(2.13)*	(1.66)+	(2.42)*	(2.36)*	(1.77)+	(1.11)	(0.56)
Regulator * Private	0.081	0.065	0.165	0.111	0.095	0.181	-0.034	0.040	0.038	-0.385	-0.236	0.596
	(1.95)+	(1.54)	(3.27)**	(3.12)**	(2.63)**	(4.20)**	(0.22)	(0.26)	(0.20)	(0.90)	(0.54)	(1.15)
Regulator independent of political power?		-0.138	-0.039		-0.072	0.013		0.138	0.137		-0.020	0.810
		(4.13)**	(0.90)		(2.53)*	(0.34)		(1.08)	(0.83)		(0.06)	(1.82)+
Independent * Private			-0.207			-0.177			0.003			-1.728
			(3.62)**			(3.63)**			(0.02)			(2.94)**
ln(population)	0.517	0.515	0.519	-0.445	-0.432	-0.428	1.110	0.740	0.740	-0.079	-0.134	-0.108
	(7.79)**	(7.69)**	(7.76)**	(7.89)**	(7.56)**	(7.52)**	(2.73)**	(1.81)+	(1.81)+	(0.12)	(0.19)	(0.16)
ln(gdp per capita)	0.030	0.029	0.030	0.051	0.049	0.049	0.506	0.505	0.505	0.637	0.618	0.618
	(2.59)**	(2.55)*	(2.57)*	(5.22)**	(4.99)**	(5.02)**	(10.11)**	(10.13)**	(10.12)**	(5.44)**	(5.22)**	(5.23)**
Constant	9.277	8.330	8.269	8.106	7.959	7.907	-3.730	2.074	2.075	-2.233	7.712	7.294
	(8.83)**	(8.00)**	(7.96)**	(9.24)**	(8.99)**	(8.95)**	(0.58)	(0.32)	(0.32)	(0.21)	(0.71)	(0.67)
Observations	2533	2419	2419	2543	2428	2428	1915	1842	1842	2486	2371	2371
Number of Countries	197	189	189	197	189	189	184	176	176	196	188	188
R-squared	0.72	0.72	0.72	0.53	0.54	0.54	0.28	0.27	0.27	0.66	0.66	0.66

Absolute value of t statistics in parentheses

Country and year fixed effects included

+ significant at 10%; * significant at 5%; ** significant at 1%

Table 4
Regulator Prior to Privatization & Price Paid

dependent variable	ln(implied value)
Regulator in place prior to privatization?	0.698 (2.50)*
Any exclusivity	1.352 (3.73)**
ln(population)	0.603 (4.00)**
ln(gdp per capita)	0.621 (2.85)**
ln(number mainlines)	0.346 (2.06)*
ln(international settlement payments)	0.222 (1.86)+
Constant	-17.405 (7.65)**
Observations	33
R-squared	0.91

Absolute value of t statistics in parentheses

+ significant at 10%; * significant at 5%; ** significant at 1%

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