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Privatizing Monopolies in Developing Countries: The Real Effects of Exclusivity Periods in Telecommunications

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Executive Summary

When reforming their network utility industries, many developing countries give the newly-privatized incumbent exclusive rights to serve a particular market. These "exclusivity periods" are especially common in telecommunications. Research to date has explored the effects of privatization, competition, and to a lesser extent, regulation. We know very little, however, about the effects of the details of privatization transactions themselves and, in particular, how exclusivity periods matter. I use an original, new dataset to explore the costs and benefits of this approach to privatization. I find that exclusivity periods are associated with significant increases in the firm's sale price. The increased revenues to the government come with a cost, however. Exclusivity periods are correlated with a significant decrease in the incumbent's investment in the telecommunications network, payphones, mobile telephone penetration, and international calling.

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1. Introduction

Countries around the world—and especially developing and transition countries—undertook massive privatization campaigns over the last two decades of the 20th Century. By the year 2000 worldwide privatization revenues had topped $1 trillion. A relatively large body of research on privatization suggests that, overall, it has led to large improvements in the privatized firms' efficiency and performance (see, e.g., Megginson and Netter 2001, Shirley and Walsh 2000 for comprehensive overviews of this literature). Most of this research has focused on the outcomes of privatization by comparing performance before and after the privatization, across countries with different market structures, or both (panel data).

Existing studies, however, have largely ignored how the details of the privatization transaction itself matter. When markets are contestable and competitive entry is fairly easy the details of how the firm is privatized may not have many implications for the market as a whole. The biggest privatizations, however, both in terms of magnitude and complexity have been in network utilities, such as telecommunications, electricity, and water. In industries like these where the monopoly incumbent has a great deal of market power, the rules of the privatization can largely determine the resulting market structure, and thus outcomes. That is, the investor is not simply buying a firm's assets, but also the right to operate in a particular way in a particular market. The details of the privatization often implicitly define the market that the investors are bidding to serve. One of the most common features of privatizations in these industries that helps define the market is a multi-year exclusivity period. Under such an agreement the government allows the newly-privatized firm to operate as a monopoly for some number of years. Such arrangements are generally defended as necessary to attract investors and investment, even if they delay competition.

Largely because data are scarce, to date no empirical studies have attempted to systematically estimate the effects of these exclusivity periods. The gap in our knowledge is unfortunate given both the magnitude of the transactions and the fact that that the rules of the

privatization can potentially have large impacts on how the market develops and thus on the success of the reforms.

In this paper I use an original, new dataset to explore the real effects of exclusivity periods in telecommunications privatizations. The Infrastructure Privatization Database is jointly sponsored by The World Bank and Stanford University to analyze the impact of regulatory institutions and privatization policies on utility performance. I complement this database with information from the International Telecommunications Union (ITU) and World Bank Development Indicators. Using this combination of firm- and country-level cross-section and panel data, I estimate the effect of exclusivity periods on firms' sale prices and also on the development of the telecommunications sector. The analysis reveals that exclusivity periods significantly increase the sale price of the firm, but substantially decrease investment in the telecommunications network.

2. Background

The recent trend towards competition in telecommunications is best described as a return to competition, rather than as an entirely new phenomenon. Telecom markets around the world in the nineteenth century were highly competitive (Petrazzini 1996, Wallsten 2003). Nonetheless, telecom soon came to be viewed as a natural monopoly—that it could be provided at the lowest cost by one firm. Most developing countries nationalized their telecom providers in the 1960s, with disastrous consequences for service. Saunders, et al (1983) note that by 1981 Africa and Latin America averaged only 0.8 and 5.5 telephones per hundred people, respectively, compared to 83.7 in the United States.

In the 1980s, the nationalization trend began to reverse itself. Though the specifics differ by country and region, in large part three common factors drove reforms around the world. First, the exceptionally poor performance of state-owned telecom firms generated pressure for reforms. Long waiting periods for telephone connections and the unreliability of those connections generated popular demand, while inefficient operations often requiring large state subsidies encouraged governments to divest firms that were draining national treasuries. Second, international lending organizations began pressuring countries to divest. Wellenius (1992) notes that in the 1960s the World Bank funded primarily infrastructure investments, in the 1970s organization and management reforms, but by the 1980s focused on sectoral reforms, including

privatization. Using panel data on 167 countries from 1980 through 1998, Li, Qiang, and Xu (2001) find empirical evidence that telecom reforms were brought about both in response to poor sector performance and foreign aid, including the presence of World Bank telecommunications loans. Finally, there was a general worldwide trend towards divestiture, started largely by Britain's Thatcher government in 1979, which coined the term "privatization" (Megginson and Netter 2001).

The pace of telecommunications reforms accelerated dramatically in the 1990s. By the end of 1999 the International Telecommunications Union reported that more than half of Asian and Latin American countries and one-third of African countries had privatized their telecommunications providers, and another eight African countries had immediate privatization plans (International Telecommunications Union 1999).[1]

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) in 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 (Fink, et al. 2002, Li and Xu 2001, Petrazzini 1996, Ros 1999, Wallsten 2001a).

Most competition has come in the form of mobile telephony. Because the fixed line network was in horrific condition in many countries, and the fixed costs of building out a

[1] The ITU also noted that no Arab states had privatized their telecommunications providers.

wireless network relatively low, new entrants were able to build wireless networks and attract large numbers of customers relatively quickly. Indeed, it is not much of a stretch to claim that the true mobile revolution occurred in developing countries—not by providing wireless internet or data services, but simply by providing a viable competitor to the fixed line incumbent. In many cases, the incumbent had already lost a substantial degree of market power by the time it realized that mobile telephones were true competitors.

Conflicting objectives

Despite the obvious and proven benefits of competition, the reform process has often not been friendly to its introduction. At the end of the 20th century, only somewhat more than half of all countries allowed competition in mobile services, and less than 30 percent allow competition in basic services (International Telecommunications Union 1999). The reason for this hostility is a combination of the need to balance conflicting objectives, political constraints, and biased advice.

It is an understatement to say that telecom reforms are complicated. State-owned enterprises confront inconsistent objectives and competing constituencies (The World Bank 1995), and the privatization process itself is not insulated from those problems. Wellenius (1997) notes that

> The primary purpose of reform is to get consumers more, better, new, and less costly services. Pressures from interest groups—incumbents who want ongoing protection, new entrants seeking special deals, treasury officials expecting to use sales revenues to reduce budget deficits, financial advisers earning success fees tied to transaction prices—can steer reform off track. In particular, sales strategies that drive up prices paid for existing companies or new licenses can hold down growth, reduce the funding available to invest in those companies, or result in high tariffs.

One important conflict arises between the government's desires to maximize revenues to the treasury from the privatization and to improve telecom service.[2] The problem is that especially in the case of the telecom sector, where most nations have a monopoly provider, the easiest—and certainly the most common—method of increasing the firm's value to private investors is to give the incumbent firm monopoly rights. Unfortunately, as discussed above, precluding competition is likely to retard improvements in the telecom sector.

[2] Though Megginson (2001) notes that there is progress towards both goals. Privatizations (across the globe for all privatized industries, not just telecommunications) have raised over $1 trillion through 1999, while substantial evidence suggests that privatized firms exhibit improved operating and financial performance.

The government may face substantial pressure to maximize revenues. The first metric by which the success of the sale is likely to be judged is the sale price. Privatizations tend to be controversial, and the government may be wary of being accused of "giving away the crown jewels." This wariness and a need to build support for privatization may create an incentive to generate a high sales price, even at the expense of delaying future improvements in the network. These pressures may have been especially intense during the first privatizations, when there was little evidence that privatizations could be successful or that failing state-owned firms could attract private investors.

Sometimes governments may face outside pressure to maximize the sales price. Consultants advising countries on how to structure privatization deals face their own incentives, which may be towards maximizing revenue rather than subsequent investment in the network. Senegal, for example, enlisted the help of a French bank, Crédit Commercial de France (CCF), to aid its privatization of Sonatel. For its services CCF was paid a fixed fee plus a percentage of Sonatel's sale price (Azam, et al. 2002). Such an arrangement clearly provided CCF with an incentive to encourage the government to maximize the sales price and to put less weight on how the sector was likely to improve after the transaction.[3]

While maximizing sales price is typically the primary reason for granting exclusivity periods, some advance other rationale. First, some privatization advisers believe that the incumbent must be given an exclusivity period in order to stimulate investment. One consultant writes that

> The effectiveness of restrictions on competition during the exclusivity period assures the economic viability of that period. The privatized company relies upon an exclusivity period during which the competitive boundaries are strong enough to control competitive entry so that the operator may direct and concentrate its capital and human and technical resources on expanding and modernizing the network. Successful infrastructure expansion and modernization to ensure broad coverage of service mutually benefits the operator and the customer base. (Barbour 1997)

This argument is unlikely to be correct. While such advice is certain to boost the treasury's revenues and the transaction advisor's fee, restricting competition is probably not likely to stimulate investment. As Noll (2000) notes, firms operating in a competitive environment and monopolists both face the same cost of capital, and neither will invest unless

[3] Indeed, Sonatel was given a seven-year exclusivity arrangement when it was privatized. It should be noted that it is unclear whether CCF influenced this decision.

the expected revenues make the investment worthwhile. The monopolist's market power makes it less, not more, likely to undertake a given investment, since monopoly profits are typically obtained by providing lower quantities of the good or service at higher prices. A firm with a guaranteed monopoly is also likely to invest less since it does not have to worry about more efficient competitors stealing market share. Even the threat of entry—which is typically the situation when reforms are introduced—can be enough to induce the incumbent to invest.[4]

Second, while decidedly an increasingly less-accepted view, some still believe that local telecom service is a natural monopoly, providing ammunition for those who wish to give exclusive concessions. But this belief contradicts our current understanding of telecommunications. The notion that telecom was a natural monopoly began to appear less tenable as early as 1959, when the U.S. Federal Communications Commission decided to allow large firms to use microwave transmission to bypass the telephone network (Crandall and Waverman 1995). Continuous improvements in technology make it increasingly unlikely that telecom is a natural monopoly (Noll 2000, Spiller and Cardilli 1997). Advances in wireless technology alone allow competing firms to roll out telecommunications services with relatively low sunk costs—an attractive option in many developing countries.

Ultimately, the real effect of these exclusivity periods is an empirical question. To my knowledge, only one paper has taken an empirical look at the effect of exclusivity periods. D'Souza and Megginson (1999) find exclusivity periods correlated with capital expenditures in a cross-sectional sample of ten firms. While the paper is the first to begin to explore transaction details, the analysis does not control for important factors such as national income or population. Such controls are especially important given that their small sample includes both very wealthy and very poor countries.[5] In addition, Wellenius (1997) noted that Chile, which did not grant an exclusivity period, saw faster network growth than Argentina, Mexico, or Venezuela, which did

[4] Incumbents typically are typically reluctant to give up their monopoly rents. Interconnection issues are almost always the most contentious issue in both industrialized and developing countries. Nobody will contract with a competing firm if it cannot to connect to the existing network. The incumbent has no incentive on its own to allow interconnection or to set interconnection prices at their true cost, leading to a great deal of debate as to how to enforce interconnection rules and set prices.

[5] For example a study of 79 firms (in several industries) in 21 developing countries found significant productivity improvements after privatization Narjess Boubraki and Jean-Claude Cosset, "The Financial and Operating Peformance of Newly Privatized Firms: Evidence from Developing Countries," *Journal of Finance* 53, no. 3 (1998).. But they also note that privatization appears most successful in wealthier countries. This observation highlights the need for controlling for important factors such as income. While it may be the case that privatization is most successful in wealthier countries, it may also be the case that firms in general in wealthier countries

grant exclusivity periods to newly-privatized firms. While this observation adds support to the hypothesis that exclusivity periods come with costs, it also does not control for other factors that may affect network growth and contains only one observation that did not grant an exclusivity period.

In this paper I attempt to quantify econometrically the effects of exclusivity periods by measuring their effects of the firms' sale prices and on sector performance in countries that privatized their telecom providers. In essence, this paper is a cost-benefit analysis in that it attempts to quantify the tradeoff between sale price and network performance. In the following sections I discuss the data, methods, and results.

3. Data

Much of the data I use is part of the Infrastructure Privatization Database, sponsored jointly by The World Bank and Stanford University. This ambitious project aims to fill the large empirical holes in our understanding of telecommunications reforms in developing countries. In particular, the project is compiling and quantifying detailed regulatory, firm, and transaction information from many sources. Regulatory data is derived from reform legislation and documents published by regulatory agencies. Firm-level financial and operating performance information comes from the firms' annual reports and prospectuses. Details on the privatization transaction come from annual reports, investor prospectuses, and detailed case studies of privatizations. Although this database is still a work-in-progress, enough information has been collected to begin to allow some new analyses. In addition to information from this database, I add country-level data from the International Telecommunications Union and macroeconomic data from the World Bank Development Indicators.

This paper explores the effects of exclusivity periods on firm sales price and sector performance. Though this dataset has more complete information on reforms than any other, consistent data remain spotty. I have consistent information on the privatization transaction for 32 telecom firms in 28 countries. Those data are cross-sectional. I have panel data on exclusivity and performance indicators for 29 countries. These samples are small and nonrandom, with selection based largely on the existence of data. In addition, because we are interested in the effects of the details of the transaction itself, I include only firms that were

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experienced improved productivity during the few years studied.

privatized. The analysis, therefore, does not tell us anything about the effects of privatization, per se, since there is no shortage of research on that issue, but instead allows us to compare firms that were privatized under different conditions. Table 1 lists the firms, the year they were privatized, the length of the exclusivity period, share sold, price, and the number of mainlines.

The first firm in this group to be privatized was the Jamaican Telephone Company, in 1987, while the most recent privatizations—in El Salvador and Brazil—took place in 1998. The table shows a great deal of variation in transaction details. First, exclusivity periods range from 25 years for local, fixed service granted to the Jamaica Telephone Company to none in Chile, Bolivia, El Salvador, Guatemala, and Brazil. The share of the firm sold to private investors differs a great deal, as well. The Brazilian government sold its entire stake in its telecom firms, while the Mexican government initially sold only 20.4 percent. Pakistan stands out by simply selling shares of Pakistan Telephone and Telegraph to the public (twelve percent of the company) and not offering concessions to private firms. Brazil and Argentina are noteworthy in having split their telecom firms into several separate companies before selling them. Argentina created two firms—one to operate in the north (Telecom), and another to operate in the south (Telefonica). They share ownership of the long distance provider. Brazil split its telecommunications provider geographically into three companies plus an international long distance provider.

I derive the value of the firm from the share of the firm sold and the price investors paid for that share. Because privatizations occur over the course of more than a decade, deflating those values is important for any cross-sectional comparison. Choosing the proper deflator is never an easy task, and it becomes more difficult in this cross-country sample. I chose to use the United States capital expenditures deflator since purchasing a telecom firm is essentially a capital investment. As it turns out, the choice of deflator affects only the magnitude of the empirical results but not the conclusions.[6]

4. Empirical Tests

The analysis contains two primary components. First, to explore the effects of exclusivity on the sale price of the firm I estimate a cross-sectional specification in which an observation is a firm in the year it was privatized. Second, to explore the effects of exclusivity

on the telecom sector, I use country-level panel data to test the effects of exclusivity on investment. Below I describe the test and results for each component in turn.

Exclusivity and firm sales price

Equation (1) details the general specification I use to test the effects of exclusivity on sales price.

(1) $ln(implied\ firm\ value_i) = \beta_0 + \beta_1*(exclusivity_i) + \beta_2*ln(population_i) + \beta_3*ln(gdp\ per\ capita_i) + \beta_4*ln(number\ mainlines_i) + \beta_5*ln(international\ settlement\ payments_i) + \varepsilon_i$

I estimate several different versions of this equation, using different variable definitions to test the robustness of the results. I first describe the general form and the reasons for including these particular exogenous variables, and then describe the specific variations of the equation.

Implied firm value is the market value of the firm derived from the share of the firm sold and the price paid for that share. *Exclusivity* indicates the exclusivity period granted to the firm. Because a monopoly is likely to be more profitable than a firm operating in a competitive environment, we would expect the coefficient on *exclusivity* to be positive. *Population* and *gdp per capita* control for the size and potential profitability of the market. The larger the population and per capita income, the more an investor may be willing to pay for the telecom firm. The *number of mainlines* proxies for the actual plant and equipment the investor is purchasing.

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

[6] As it turns out, the empirical results are robust to any deflator choice, including no deflator.

factors potentially explaining investors' willingness to pay nearly $1.8 billion for 20.4 percent of the company.

Though these independent variables are straightforward enough, no single specification is inherently superior to others since there are many types of exclusivity and many ways one might determine the value of the investment. I therefore use four different definitions of "exclusivity" and two different dependent variables, for a total of eight regressions. I first define exclusivity as a dummy variable that equals one if the firm was granted any exclusivity period at all in any services (fixed local, domestic long distance, or international long distance). The advantage of this dummy variable is that, while crude, it allows the largest sample size, since we have no more detailed exclusivity data for some firms.

Second, I define exclusivity as a dummy variable that equals one if the firm received any exclusivity in international telecom services. International exclusivity may be especially valuable to the investor. While mobile firms can undermine exclusivity in local, fixed telephony, international exclusivity is harder to undermine since the owner of the international gateway can essentially completely control international telecommunications from the country.

Those dummy variables, however, provide no information on the effects of the length of the exclusivity period. To explore this question I define exclusivity as the log of the number of years of exclusivity.[7] Thus, the third definition is the log of the number of years of local fixed exclusivity, and the fourth definition is the log of the number of years of international exclusivity.

Finally, for each definition of exclusivity I estimate the equation twice using slightly different versions of the dependent variable. I first define the dependent variable as the implied value of the telecom firm. The implied value is the price paid by the investor divided by the share of the firm the investor purchased. I then normalize the variable by dividing it by the number of mainlines to derive a value per line paid by the investor. In this case I exclude the number of mainlines as an exogenous variable.

Table 2 shows the results of estimating equation (1). Higher population increases the sales price of the telecom firm and value per line, which was expected given that a larger population means a larger potential market. Per capita income is positively correlated with the firm value, though it is only weakly statistically significant, at best. The number of mainlines is,

[7] Since some countries granted no exclusivity, the actual definition is ln(exclusivity + 1).

surprisingly, negatively correlated with the implied value of the firm. The insignificant results on per capita income and the negative coefficient on number of mainlines is likely due to the collinearity between those two variables. It is well-known that the most important determinant of telephone penetration is per capita income, so including both variables in the equation makes it difficult to separately identify them. The coefficient on international settlement payments is positive and significant in the per-line regressions, and positive but not statistically significant in the total value regressions.

The coefficients of interest, those on the exclusivity variables, are uniformly positive and, with one exception, statistically significant. In other words, the estimation reveals that investors were willing to pay substantially more for firms with monopoly concessions. Granting any exclusivity is associated with more than *doubling* the price investors pay for the firm, *ceteris peribus*. A monopoly in international long distance services appear to be even more valuable than a local monopoly. It is clear why an exclusivity period is so appealing to governments looking to raise revenue and to transaction advisors, whose compensation may depend on the sale price.

Each additional year of exclusivity appears to be valuable, as well. A one percent increase in the length of the local exclusivity period and international exclusivity period are associated with a 0.35 percent and 0.52 percent increase, respectively in the price per line an investor is willing to pay. The coefficient on the log of the number of years of fixed local exclusivity is not statistically significantly correlated with total implied firm value, though the log of the number of years of international exclusivity is significantly correlated with an increase in firm value.

Exclusivity and telecom investment

The second part of the analysis explores the effect of exclusivity on growth of the telecom network in the country. This analysis differs from that described above in that the dataset becomes a country-level panel in which the first year a country appears is the year its telecom provider was privatized. Again, as I noted above, this method of sample selection means that the analysis does not tell us anything about privatization, *per se*, only the difference between countries that privatized with and without granting exclusivity periods.

To explore the effect of exclusivity periods on growth of the network, I estimate several versions of equation (2).

(2) $$ln(telecom\ investment_{it}) = \beta_0 + \beta_1*(exclusivity_{it}) + \beta_2*ln(population_{it}) + \beta_3*ln(gdp\ per\ capita_{it}) + \alpha_t + \gamma_i + \varepsilon_{it}$$

I estimate the equation several times using different definitions of, and proxies for, investment, which I describe in more detail below. And, as in the analysis above, I use several definitions of exclusivity, also described below. Independent variables include population and per capita GDP, for reasons described above. Finally, the panel nature of the data lets me control for country and year fixed effects.

When only one firm in a country provided all telecommunications, country-level analyses of this sort were relatively straightforward. Country-level data from the International Telecommunications Union provided a fairly good snapshot of telecommunications development. Reforms have complicated such analyses. ITU data typically includes only the incumbent, and thus becomes less representative of the sector as a whole as the sector becomes more competitive. In some ways the focus on the incumbent is beneficial to my analysis, and in some ways it is costly. To the extent that I am interested in the effects of exclusivity on the incumbent, the data are appropriate. But the new focus on wireless in developing countries means that the number of mainlines—traditionally the best measure of telephone penetration—may no longer be a useful measure if new investment and competition is in other areas.

Despite its problems, there is no good alternative to the ITU data. I thus use several variables to measure investment. I first use the number of mainlines as the dependent variable, consistent with most past work on telecom reforms. As demonstrated below, however, when using this variable almost nothing in the regression is identified when controlling for fixed effects—not surprising since so much post-reform investment has focused on mobile services. I therefore also estimate the equation using as the dependent variable the incumbent's reported telecom investment, the number of payphones, the number of mobile subscribers, and the number of international outgoing minutes.

The data on telecom investment by the incumbent may be the most useful indicator for testing the effects of exclusivity periods. The variable typically measures only the incumbent's investment. This limitation is problematic when looking at total investment in the country, but in

this case it is actually beneficial: the incumbent was privatized and I wish to measure the effects of exclusivity on its investment.

Other variables proxy for the incumbent's investment and may prove useful. Payphones, for example, are an important method of bringing telecommunications to poorer people in developing countries. Competitive pressures may induce firms to increase investment in payphones; on the other hand, firms may be given exclusive telecom rights if they make a commitment to invest in the payphone network. Competition, meanwhile, almost always comes from mobile telephone companies, and it is thus worth exploring the effects of exclusivity on the number of mobile subscribers. The measure of mobile subscribers from the ITU typically excludes subscribers to new entrants—such data is enormously difficult to acquire—and thus this variable is another measure of the incumbent's investment.

Finally, as discussed above, many countries give the privatized firm exclusive use of the international gateway. To explore the effects of this type of exclusivity I also use as a dependent variable the number of international outgoing minutes. It is actually quite difficult to measure influences on international telecom traffic. International settlement rates, as discussed above, differ between each country-pair and affect international calling prices, but are not publicly-available. In addition, the advent of "call-turnaround"—services that reverse the billing direction of a call so the consumer can pay the cheaper rate between the two countries—makes it difficult to know how much traffic actually originates in a country. The number of international outgoing minutes is likely to be a quite noisy variable.

Introducing the *exclusivity* variable into the equation is complicated, and each approach has its own problems. I use several definitions of *exclusivity* to determine how robust any conclusions are to the specification. First I use a definition similar to that discussed above—simply the log of the length of the exclusivity period.[8] This definition is acceptable for international exclusivity, since competition is nearly impossible without access to the international gateway. The definition is problematic for fixed local service, however.

The main problem is that legal exclusivity in fixed local provision does not necessarily mean that the firm actually is the monopoly provider. In particular, the viability of mobile telephony as a strong competitor to fixed lines came as something of a shock to many governments and incumbent telephone firms. Thus, many firms were given exclusivity periods

[8] Actually, I define the variable as ln(number of years of exclusivity + 1) to deal with the zero problem.

in fixed, local provision, but not in mobile telephony. Because mobile firms proved to be worthy competitors, exclusivity in fixed line often proved meaningless. To deal with this issue I define a variable called "true exclusivity" which takes the value of one if the firm had an exclusivity period in fixed, local telephony AND faced no competition in mobile telephony.

Table 3 shows the results of estimating this equation for local exclusivity. The first two columns show the results using the number of mainlines as the dependent variable without controlling for fixed effects. Both *true exclusivity* and the log of the number of years of exclusivity are significantly negatively correlated with mainline growth. However, none of the variables in the equation are identified when fixed effects are included. This result should not come as a surprise. Investing in the fixed line network in countries with poor existing service is rarely the focus after reforms. Instead, mobile networks that can reach a much larger number of customers can be built for a fraction of the sunk costs, and this tends to be the focus in developing countries.

The next set of columns, therefore, uses the incumbent's investment as the dependent variable. The results on this variable are dramatic and robust. Even controlling for country and year fixed effects, the coefficient on GDP per capita is positive and significant—wealthier countries see greater investment, *ceteris peribus*. The coefficients on the exclusivity variables are large, and statistically significant, negative numbers. *True exclusivity* is negative and significant, as is the log of the number of years of exclusivity. An exclusivity period is negatively correlated with investment by the privatized telecom firm.

The remaining regressions yield qualitatively similar results. Exclusivity is negatively correlated with growth in the number of mobile subscribers, which is not surprising since competition typically comes from mobile providers. Exclusivity is also negatively correlated with growth in the number of payphones, which is disturbing since many firms with exclusivity rights pledge to build out the payphone network in exchange for monopoly rights. Finally, international telecom traffic (as measured by international outgoing calls) is negatively correlated with exclusive provision of international services.

In sum, these panel regressions highlight the cost of exclusivity periods. Incumbents with guaranteed monopolies appear to invest far less than incumbents that were privatized and had to face competition. Total investment by these firms was lower than firms that faced competition, as was mobile penetration, payphone growth, and international calling.

Together, the results of the two components confirm empirically what standard economic theory holds should be true. A monopoly is more valuable to its owners than is a firm operating in a competitive environment. Governments can significantly increase the sale proceeds of the telecom firm by guaranteeing its monopoly status. However, this increased revenue to the treasury comes with a real cost. Granting a monopoly concession seriously reduces investment by the privatized firm relative to firms that face competition. Residents and businesses in the country not only lose out on the benefits of services provided by new entrants, but also suffer from reduced investment by the monopoly provider.

5. Discussion

Empirical studies of telecom reform often suffer from endogeneity problems. Telecom reforms can cause changes in and result from the condition of the national telecom infrastructure, for example. To some degree, this paper faces the same issue—granting an exclusivity period may be endogenous to network penetration. In other words, countries that give exclusivity periods may do so because they have an especially poor telecom infrastructure and believe that monopoly concessions are needed to attract investors. If this were true, we would find exclusivity periods negatively correlated with network expansion because poor networks cause exclusivity periods, not vice versa. But if countries with poor networks were more likely to grant exclusivity periods, we would also expect to find a negative correlation between exclusivity periods and sales price when, in fact, the correlation is positive.

While endogeneity may not be a problem of the same magnitude as in other empirical telecom studies, this paper is not without problems. In particular, the dataset is still far from ideal. First, its small, nonrandom, sample makes it difficult to generalize the results. Second, it does not address the greatly varied regulatory environments across countries, which can significantly impact both the privatization transactions and network performance. Finally, it does not adequately capture the many important details of the privatization transactions. The solution to these problems is, of course, to gather more data. This data-collection process is time-consuming and expensive, since it involves acquiring annual reports, prospectuses, and legislative and regulatory documents from a host of sources in each country. Nonetheless, the provocative results in this paper only scratch the surface of what these data can tell us about a

host of topics. The Infrastructure Privatization Database, when complete, promises to yield valuable new insights on a host of privatization topics crucial to developing countries.

The Database will also ultimately help us answer many other questions about the privatization process. What are the long-term effects of foreign ownership restrictions? What are the effects of employee-ownership or of voucher privatization schemes? How do regulatory institutions affect the development of the telecom sector? These are especially important questions as countries continue to privatize telecom and other sectors and work on building nascent regulatory agencies.

6. Conclusions

- Telecommunications reforms around the world—and in developing countries in particular—have brought telecom service to literally millions of people, and improved service to many others. Research to date has largely demonstrated that competition and privatization under the right institutional environment can lead to substantial performance improvements. The empirical literature, however, has almost completely ignored the details of the privatization process. These details can make an enormous difference. In particular, governments tend to give the newly privatized firm a monopoly concession on telecom service. While some contend that an exclusivity period is necessary to encourage investment, the only reasonable explanation is to increase the government's revenues from the sale.
- The government may face intense pressure to maximize the sale price. But turning a public monopoly into a private monopoly may not necessarily generate the improvements reformers envision. Guaranteeing the newly-privatized firm a monopoly can increase the government's windfall from the sale, but may limit the improvements that reforms could bring. The point of this paper is to quantify the implications of that choice. I find evidence that exclusivity periods can double the firm's sale price, but at the cost of substantially reducing investment.

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Table 1
Privatization Summary Statistics

Country	Firm name	transaction year	price paid ($ millions)	share sold	exclusivity		num mainlines	implied value ($ millions)	implied value per line
					local	international			
Argentina	TASA (south)	1990	2834	60	10	10	1,695,504	4,723	2,786
Argentina	Telecom Argentina (north)	1990	2408	60	10	10	1,401,969	4,013	2,863
Barbados	Cable & Wireless BARTEL	1991	3	11	.	0	77,977	27	350
Bolivia	ENTEL	1995	610	50	0	6	246,881	1,220	4,942
Brazil	Embratel	1998	2370	19.26	0	0	17,932,814	12,305	686
Brazil	Telesp	1998	5160	19.26	0	0	6,377,677	26,791	4,201
Brazil	Telecentro-Sul	1998	1850	19.26	0	0	3,757,261	9,605	2,556
Brazil	Telenorte-Leste	1998	3070	19.26	0	0	7,797,876	15,940	2,044
Chile	CTC	1988	99.5	30	0	0	591,565	332	561
Cote d'Ivoire	Cote d'Ivoire Telecom	1997	210	51	7	7	143,800	412	2,863
Czech Republic	SPT Telecom	1995	1450	27	0	5	2,444,156	5,370	2,197
El Salvador	Compania de Telecomunicaciones (CTE)	1998	275	51	0	0	396,402	539	1,360
El Salvador	Internacional de Telecomunicaciones (INTEL)	1998	41	51	0	0	396,402	80	203
Ghana	Ghana Telecom	1996	38	30	6	6	77,886	127	1,626
Guatemala	Telecomunicaciones de Guatemala (TELGUA)	1998	700	95	0	0	517,000	737	1,425
Guinea	SOTELGUI	1995	45	60	10	10	10,900	75	6,881
Guyana	Guyana Telephone and Telegraph Ltd. (GT&T)	1991	16.5	80	20	20	16,000	21	1,289
Hungary	MATAV (Magyar Tavkozlesi Vallalat)	1993	875	30.29	8	8	1,466,946	2,889	1,969
Jamaica	Jamaica Telephone Company (JTC)	1987	155.8	79	25	25	81,700	197	2,414
Mexico	TelMex	1990	1757.6	20.4	0	6	5,354,500	8,616	1,609
Mongolia	Mongolia Telecoms	1995	4.5	40	3	0	77,745	11	145
Peru	Telefonica del Peru	1994	2002	35	4	4	772,390	5,720	7,406
Poland	Telekomunikacja Polska S.A. (TP)	2000	4300	35	0	3	.	12,286	.
South Africa	Telkom, SA	1997	1260	30	5	5	4,650,000	4,200	903
Tanzania	Tanzania Telecommunications Company Limited (TTC	2000	120	35	4	4	163,000	343	2,103
Trinidad & Tobago	Trinidad & Tobago Telephone Company	1989	85	49	20	20	165,000	173	1,051
Uganda	Uganda Telecom Ltd. (UTL)	2000	33.5	51	5	5	57,239	66	1,148
Venezuela	CANTV	1991	1885	51	9	9	1,598,947	3,696	2,312
Senegal	SONATEL	1997	106.6	33	7	7	95,100	323	3,397
Jordan	Jordan Telecommunication Corporation	2000	508	40	5	5	565,000	1,270	2,248
Panama	INTEL / Cable & Wireless Panama	1997	652	49	5	5	366,000	1,331	3,636
Romania	RomTelecom	1998	675	35	5	5	3,600,000	1,929	536

Table 2
Exclusivity and Firm Sales Price

	ln(implied firm value)				ln(implied value per line)			
Any exclusivity	**1.05**				**1.162**			
	(2.86)**				**(3.15)****			
Any international exclusivity		**1.178**				**1.247**		
		(4.41)**				**(4.60)****		
ln(years of local exclusivity)			**0.254**				**0.355**	
			(1.40)				**(2.24)***	
ln(years of international exclusivity)				**0.48**				**0.517**
				(3.78)**				**(4.18)****
ln(population)	0.558	0.477	0.452	0.468	0.327	0.271	0.288	0.305
	(3.15)**	(3.04)**	(2.26)*	(2.80)*	(3.34)**	(3.08)**	(2.09)*	(3.27)**
ln(gdp per capita)	0.522	0.5	0.498	0.367	0.173	0.184	0.159	0.11
	(1.95)+	(2.08)*	(1.43)	(1.42)	(1.17)	(1.37)	(0.91)	(0.8)
ln(international settlement payments per line)					0.283	0.226	0.221	0.176
					(2.33)*	(2.18)*	(1.73)+	(1.62)
ln(international settlement payments)	0.196	0.155	0.146	0.121				
	(1.5)	(1.4)	(1.02)	(1.03)				
ln(number of mainlines)	-0.558	-0.475	-0.477	-0.38				
	(2.62)*	(2.53)*	(1.83)+	(1.85)+				
Constant	-16.133	-15.081	-14.002	-14.517	-14.863	-13.84	-13.526	-13.565
	(6.29)**	(7.25)**	(5.10)**	(6.61)**	(5.96)**	(7.00)**	(4.96)**	(6.60)**
Observations	32	30	29	30	32	30	29	30
R-squared	0.41	0.58	0.3	0.53	0.36	0.54	0.27	0.5

Absolute value of t statistics in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 3
Exclusivity and Investment

	ln(number of mainlines)					ln(investment)			ln(mobile subscribers)			ln(number payphones)			ln(international outgoing minutes)
	no fixed effects		country fixed effects	country & year fixed effects		country and year fixed effects included			country and year fixed effects included			country and year fixed effects included			country and year fixed effects included
True exclusivity	**-0.238**		**-0.092**	**0.002**		**-1.121**		**-1.142**		**-0.41**	**-0.389**	**-0.282**		**-0.249**	
	(1.63)		**(1.30)**	**(0.04)**		**(5.36)****		**(5.24)****		**(2.08)***	**(2.38)***	**(2.75)****		**(2.36)***	
ln(years exclusivity + 1)		**-0.176**			**-0.019**		**-0.248**	**-0.224**	**-0.273**		**-0.244**		**-0.113**	**-0.122**	
		(2.98)**			**(0.35)**		**(1.90)+**	**(1.94)+**	**(3.43)****		**(3.06)****		**(2.42)***	**(2.74)****	
ln(years international exclusivity + 1)															**-0.095**
															(1.80)+
ln(gdp per capita)	1.009	1.03	1.076	0.166	0.098	2.091	2.207	2.138	0.031	0.833	0.163	-0.982	-0.322	-0.899	1.576
	(19.80)**	(18.16)**	(4.61)**	-0.81	(0.46)	(2.99)**	(2.78)**	(2.93)**	-0.04	-0.93	-0.22	(2.43)*	-0.78	(2.16)*	(5.76)**
ln(population)	0.814	0.719	5.602	1.081	0.053	1.926	1.289	1.469	0.317	4.262	1.455	4.823	6.567	4.907	4.945
	(21.79)**	(14.90)**	(10.85)**	(1.68)+	(0.07)	-0.87	-0.47	-0.57	-0.15	-1.63	-0.62	(3.67)**	(4.60)**	(3.31)**	(6.26)**
Constant	-7.159	-5.603	-84.926	-6.23	11.131	-27.787	-19.515	-21.674	3.148	-67.449	-16.367	-60.979	-95.98	-64.299	-74.45
	(9.93)**	(6.25)**	(11.42)**	(0.60)	(0.93)	-0.77	-0.43	-0.51	-0.09	-1.53	-0.41	(2.82)**	(4.06)**	(2.58)*	(5.66)**
Observations	178	163	178	178	163	128	117	114	160	169	156	154	144	141	170
Number of countries			27	27	25	22	20	20	27	29	27	28	26	26	28
R-squared	0.89	0.88	0.7	0.84	0.85	0.53	0.43	0.56	0.91	0.87	0.91	0.67	0.7	0.69	0.83

Absolute value of t statistics in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

True exclusivity = exclusivity period in effect & no mobile or fixed competitors