

Market liberalization and ownership status of incumbent telecom enterprises: global evidence from the telecom sector

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Abstract

Coupled with the early wave of privatization in the 80s of state-owned telecom enterprises, the reform trend in the telecom market has shifted toward the market liberalization since the 90s, resulting in extended multilateral negotiations on the introduction of competition into basic telecommunications. Building on the empirical model of Greene (1998), this study employs a recursive simultaneous bivariate probit model and examines how the ownership status of incumbent telecom operators affects the market liberalization in basic telecom services. The results show that the implementation of market liberalization programs is clustered where private ownership is more present while opportune stock market conditions and the government's capital constraints are positively associated with the privatization. This study provides the concerned governments with policy choices that can facilitate or retard the implementation of a market liberalization program in their respective countries.

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1. Introduction

Since the successful initial public offering of the British Telecom in 1984, a wave of privatization has challenged the long observed prevalence of state intervention or ownership in most countries' economies. The impact of privatization programs was most pronounced in telecommunications due to the inherent characteristics of the telecom sector. First, telecommunications have been considered an essential catalyst to a country's economic development and an industry of strategic interest in many countries. Second, as the provision of telecom services exhibits scale economies, the telecom sector, specifically the market for basic telecom services, has typically been a natural monopoly. Finally, the public good aspect of telecom services has often provided grounds for government intervention in the sector. Although the methods of the privatization of state-owned enterprises (SOEs) and the pace of the implementation of the privatization programs varied across countries, the transition of ownership from state to private sector in this key segment of the economy was one of the most prominent economic trends in the 1980's and 1990's.¹

Another noticeable market trend in the telecommunications sector since the 1990's has been the recognition of basic telecommunications as tradable services by the World Trade Organization (WTO). For instance, the "WTO Agreement on Basic Telecommunication Services" in 1996 was the first multilateral accord aimed at the liberalization of the market for the basic telecom services, not only promoting competition in the sector but also expanding the multilateral trade of telecom services. The trend of market liberalization² has remained strong with the launches of comprehensive negotiations on competition policy such as the General Agreement on Trade in Services (GATS) that came into effect in February 1998 (Lie 2002). By late 2003, a total of 97 countries introduced full or partial competition into basic telecom services.

To date, a vast amount of literature in telecommunications economics examined *ex post* impacts of telecom reform policies on telecom sector performances. For example, Ramamurti (1996), Boles de Boer and Evans (1996), Petrazzini and Clark (1996), Ros (1999), Ros and Banerjee (2000), Boylaud and Nicoletti (2000), Li and Xu (2002), Wallsten (2001, 2003), Fink, Mattoo and Rathindran (2002), Gutierrez (2003), Banerjee and Ros (2004), and Cox and Lee (2005) examined the effects on network expansion of the privatization of state-owned incumbent telecom enterprises and/or the introduction of competition into basic telecom services. The existing telecom literature, however, has made a little effort to inquire into the extent of interdependence or complementarity among the telecom reform policies. It is conceivable that the adoption of one telecom reform policy could be retarded or facilitated with or without the successful implementation of another telecom reform policy. For instance, the likelihood that a country liberalizes or introduces competition into its telecom sector may vary depending on the ownership status of its incumbent telecom service providers. In other words, a country's opportune implementation of one telecom policy may depend not only on the overall stage of its socioeconomic development and its telecom sector performance, but also on the presence of

¹ For a comprehensive review of the literature on privatization of state-owned enterprises, refer to Megginson and Netter (2001).

² Market liberalization usually refers to the transition of the telecom market from natural monopoly to an open competitive market.

another, possibly complementary, telecom reform policy. Apart from the existing literature, this study considers both the privatization and the market liberalization endogenous events and attempts to examine if market liberalization is retarded or facilitated by the ownership status of the incumbent telecom enterprises, especially in basic telecom services. For the purpose, this study builds a recursive simultaneous probit model of Burnett (1997) and Greene (1998).

The structure of this study is as follows. The next section discusses telecom reform policy and provides a basis for the economic model of the study. Section 3 introduces the recursive bivariate probit model and describes the explanatory variables and the data. The empirical results are discussed in Section 4 and policy implications are offered based on the main findings in Section 5.

2. Theoretical Framework

The privatization of the state-owned telecom enterprises (SOTEs) has been embraced for various reasons among different countries. One of the most common propositions in the literature suggests that governments may have the incentive to privatize their SOTEs in order to reduce fiscal or capital constraints facing the government, to apply the market discipline to the management of the incumbent SOTEs under soft budget constraints, and/or to enhance the opportunity to introduce competition into the telecom sector by equipping their incumbent SOTEs to prepare for competitive supply (see Megginson and Netter 2001).

Introducing competition into the telecom sector had long remained an issue of a country's structural economic policy until the launch of the Uruguay Round (1986 - 1994) and, even during the Uruguay Round, the participating governments made commitments on competition mostly in value-added telecom services only.³ It was during the extended WTO negotiations thereafter (1994 – 1997) that the member governments focused on the issue of liberalizing the market for basic telecom services where state ownership or state intervention was more present. Since then, its members have either implemented or scheduled open market access commitments in basic telecom services. Coupled with the privatization of the incumbent SOTEs, the market liberalization has been expected to promote competition and further free trade in the global telecom market.

Although the wave of privatization preceded the multilateral telecommunication's negotiations, actual implementations of privatization and competition policy in the telecom sector have not always occurred in the same chronological order. For example, both the privatization and the market liberalization were pursued at the same time in many Latin American and Caribbean countries. Some countries in the Asia-Pacific region induced private investments in the telecom sector without privatization and liberalization through non-traditional strategies such as the

³ Value-added telecommunication services are telecommunications for which suppliers “add value” to the customer's information by enhancing its form or content or by providing for its storage and retrieval. Examples are on-line data processing, on-line data base storage and retrieval, electronic data interchange, email and voice mail.

Build-Operate-Transfer (BOT) scheme.⁴ However, the most commonly observed pattern of implementations of the two key telecom reform policies has been the initiation of full or partial privatization of the state-owned incumbents followed by a phase-in of open competition into broader segments of the telecom market. As of 2003, 97 out of the 166 sample countries implemented full or partial access to the market for basic telecom services and 98 countries fully or partially privatized the incumbent telecom enterprises in local telephony.

While privatization and market liberalization are the two key contemporary telecom reform policies, the privatization of the SOTEs is a trend distinct from the market liberalization in that there have been no concerted international efforts to promote the privatization of the SOTEs. Furthermore, the privatization of the SOTEs was not a trend developed necessarily in conjunction with global market trends. On the other hand, unlike the privatization of the SOTEs, a full or partial implementation of market liberalization has often been scheduled at varying speeds over extended time periods among different countries. From the distinction in development processes of the two telecom reform trends arises an overarching question: what role does the privatization of the SOTEs play in the global trend of open market access and competition? The underlying reasoning behind the inquiry is that the presence of private ownership may be conducive to market liberalization. First, following the common propositions in telecommunications economics literature, fully or partially privatized incumbent telecom enterprises are expected to be equipped better to face competition or the trend of market liberalization as they are likely to get more market discipline. Second, with full or partial private ownership present in the basic telecom services, the transaction costs to new competitors of market entry may be reduced as the new entrants are less likely to face political arbitrariness or opportunistic behavior of government than when the government has high financial stakes in its state ownership in the telecom sector.

3. Empirical Method, Variables and Data

In this study, the adoption of privatization and/or liberalization programs is considered to be driven by slightly different motives. First, following the main propositions supported by the literature, the privatization of the state-owned telecom enterprises (SOTEs) is considered an endogenous event influenced by a country's stage of overall economic development, its telecom sector performance as well as the fiscal and capital constraints facing the government. Second, market liberalization or introduction of competition is also presumed to be an endogenous event affected by the country's overall economic development, the telecom sector performance, and the ownership status of the incumbent telecom enterprises.

Building on the theoretical framework in the previous section, a recursive simultaneous binary probit model is fitted following Burnett (1997) and Greene (1998) as follows:

$$\text{LIBERAL} = \Phi(\text{GDPPC}, \text{URBPOP}, \text{TRADEGDP}, \text{PARCOMP}, \text{PRIVATE}) \quad (1)$$

⁴ Under the BOT scheme, a company awarded a concession operates its investment for an exclusive time period before handing over its ownership to the state-owned incumbent telecom enterprises. This has been the case in China, Indonesia, Thailand and Vietnam.

$$\text{PRIVATE} = \Phi (\text{GDPPC}, \text{URBPOP}, \text{STOCKGDP}, \text{CGOVDEBT}) \quad (2)$$

where

$\Phi(\cdot)$ = the cumulative distribution function of the normal distribution,

LIBERAL = 1 if competition is introduced to at least one segment of the market for the basic telecom services and 0 otherwise,

PRIVATE = 1 if the incumbent telecom enterprises are fully or partially privatized and 0 otherwise,

GDPPC = gross domestic product (GDP) per capita in 2000 constant U.S. dollars,

URBPOP = the ratio of urban population to total population,

TRADEGDP = the sum of exports and imports of goods and services as a share of GDP

PARCOMP = the extent to which alternative preferences for policy can be pursued in the political arena, coded from 1 to 5,

STOCKGDP = the total value of all shares traded as a share of GDP,

CGOVDEBT = the gross amount of the central government's liabilities as a share of GDP.

Although the variable PRIVATE appears on the right-hand side of the first equation, its endogenous nature can be ignored in formulating the log-likelihood (Greene, 2003).⁵ Let $\Psi(\cdot)$, \mathbf{x}_1 , and \mathbf{x}_2 denote the cumulative distribution function of the bivariate normal distribution, all variables on the right hand side of the first equation except PRIVATE, and all variables on the right hand side of the second equation, respectively. Then the corresponding bivariate probabilities are yielded as follows:

$$\text{Pr} [\text{LIBERAL} = 1, \text{PRIVATE} = 1] = \Psi (\boldsymbol{\beta}'\mathbf{x}_1 + \gamma\text{Private}, \boldsymbol{\alpha}'\mathbf{x}_2, \rho) = \Psi (\boldsymbol{\beta}'\mathbf{x}_1 + \gamma, \boldsymbol{\alpha}'\mathbf{x}_2, \rho)$$

$$\text{Pr} [\text{LIBERAL} = 0, \text{PRIVATE} = 1] = \Psi (-\boldsymbol{\beta}'\mathbf{x}_1 - \gamma\text{Private}, \boldsymbol{\alpha}'\mathbf{x}_2, -\rho) = \Psi (-\boldsymbol{\beta}'\mathbf{x}_1 - \gamma, \boldsymbol{\alpha}'\mathbf{x}_2, -\rho)$$

$$\text{Pr} [\text{LIBERAL} = 1, \text{PRIVATE} = 0] = \Psi (\boldsymbol{\beta}'\mathbf{x}_1, \boldsymbol{\alpha}'\mathbf{x}_2, -\rho),$$

$$\text{Pr} [\text{LIBERAL} = 0, \text{PRIVATE} = 0] = \Psi (-\boldsymbol{\beta}'\mathbf{x}_1, -\boldsymbol{\alpha}'\mathbf{x}_2, \rho).$$

For the study, the 2003 cross-sectional data are collected for 166 countries from three different sources - the International Telecommunication Union (ITU), the World Development Indicators 2006 CD-ROM from the World Bank, and the Polity IV Project. The observations of privatization and market liberalization were collected from the 2003 regulatory information from the ITU while other economic and financial indicators were gathered from the World Development Indicators.

First, the observations of privatization are discrete as the ITU only reports the ownership status of a country's incumbent telecom enterprises as state-owned, partially privatized or fully privatized. In this study, the variable PRIVATE = 1 if a country's incumbent telecom enterprises are at least partially privatized. The ITU regulatory information on the status of competitive supply in the basic telecom services is also discrete. It only reports the level of competition as monopoly, partially competitive, or fully competitive across different segments of the telecom markets. This study utilizes only the observations of the market liberalization in the basic telecom services for the two reasons. First, the dominant role of state ownership is most

⁵ For a full discussion of a recursive simultaneous binary choice model, refer to Burnett (1997) and Greene (1998).

pronounced in the market for the basic telecom services. Second, the market for basic telecom services has typically remained in many countries the last segment to be opened up to competitive supply. The variable LIBERAL = 1, unless market for the basic telecom services is a monopoly.

To account for the privatization of the SOTEs, the variable GDPPC is controlled to examine the privatization incentives for the countries at different stages of overall economic development. The variable URBPOP is considered a proxy to measure the cost of the provision of basic telecom services. The logic behind this is that, the more concentrated a country's population is in urban areas, the lower is the incremental cost of adding a subscriber to the existing network. Other things being equal, private investments in the basic telecom services may be discouraged when the cost of network expansion is relatively high. The variable STOCKGDP is controlled as a measure of an opportune condition for sale of the incumbent state-owned telecom enterprises. The likelihood of privatization of the SOTEs is presumed to be positively correlated to the variable STOCKGDP. Finally the variable CGOVDEBT is controlled to examine the effect on privatization of the level of capital constraints the government faces. It is expected that the government under greater capital constraints is more likely to initiate the sales of its SOTEs.

It is also worth noting that GDP per capita of a country is highly correlated with the country's level of network penetration. A country's level of network penetration is commonly measured by teledensity - the number of main telephone lines per 100 inhabitants. For the sample countries, the correlation coefficient between GDP per capita and teledensity is estimated to be greater than 0.91. In addition, the causality may run in both ways between the privatization of the SOTEs and network penetration. Therefore any direct measure of network penetration has been excluded from the estimation equation.

As to the adoption of competition policy in the basic telecom services, the variables GDPPC and URBPOP are controlled for again to examine the effects on the incentives for market liberalization of the level of a country's overall economic development and of the costs of network penetration, respectively. The variable TRADEGDP is used as an indicator of openness of a country's economy, and a country with a relatively high ratio of trade to its GDP is expected to introduce competition into its telecom market sooner. The variable PARCOMP is used as a proxy for a country's institutional and political characteristics. It is not uncommon that opening a segment of the telecom sector involves the legislative process and is often subject to opportunistic behavior of the government or politicians especially when the government has a high financial stake in the telecom sector. The variable PARCOMP measures the extent to which alternative preferences for policy can be pursued in the political arena, and is coded from 1 (oppressed) to 5 (competitive). The observations were obtained from the Polity IV Project (Marshall and Jaggers 2007). It is inferred that the introduction of competition into the telecom markets is better facilitated in a country with few institutional barriers to political competition than in countries with a high degree of political repression. Finally, to fit a recursive simultaneous binary choice model, the binary endogenous variable PRIVATE is controlled for in the regression equation for market liberalization. Our presumption is that fully or partially privatized incumbent telecom enterprises in basic telecom services are better prepared to face

competitive supply, and thus the presence of private ownership is expected to be more conducive to liberalization of basic telecom services.

4. Empirical Results

Equations (1) and (2) are fitted by a recursive simultaneous bivariate probit model and the maximum likelihood estimates are computed for the sample of 166 countries. As of 2003, 97 of them allowed partial or full competition into the basic telecom services, 98 privatized partially or fully the incumbent state-owned telecom enterprises (SOTEs), and 66 adopted both privatization and liberalization programs (see Table 1). Table 2 reports the estimated parameters. Note that the estimate of ρ is -0.6883 with a standard error of 0.4077. It measures the correlation between the error terms in the two equations - the effect after the influence of the ownership status of the incumbent telecom enterprises is already accounted for (see Greene 2003). The Wald statistic suggests that the null hypothesis ($\rho = 0$) can not be rejected at the standard significance level of 5%.

The regression results are largely consistent with the propositions in our theoretical framework. First, in the market liberalization equation, the variable URBPOP is statistically significant and its sign is negative, implying that opening up the basic telecom services to competitive supply is less likely when a country's urban population is large relative to its total population. It could be inferred that governments have a greater incentive to liberalize the market for the basic telecom services when the cost of network expansion is relatively large. The variable PRIVATE is the most significant variable in either equation and its sign is positive as expected. The finding supports the previous presumption that the presence of private ownership is expected to facilitate liberalization as privatized incumbent telecom enterprises are better equipped to face competition.

In the privatization equation, all of the explanatory variables are statistically significant at least at the 10% significance level and their signs are all positive. The estimated coefficient of the variable GDPPC suggests that the privatization of the SOTEs is more likely in a relatively high-income country. However, the effect of the variable URBPOP on the privatization is no longer significant.

The estimated coefficients of the variables STOCKGDP and CGOVDEBT are quite consistent with the propositions in the literature: the government has a greater incentive to privatize the SOTEs when it is under greater fiscal constraints or when the stock market condition is attractive for the sale of the SOTEs.

Table 3 shows the estimated marginal effects of the explanatory variables. As some variables appear in both equations, their estimated marginal effects reported in Table 3 are the sum of a direct effect and an indirect effect. For instance, the variables GDPPC and URBPOP are both included in the privatization equation and, therefore, influence the probability that PRIVATE equals one. Since the variable PRIVATE also appears in the market liberalization equation, these effects are passed on to the probability of market liberalization.

While we obtain the marginal effect of a continuous variable by differentiating its conditional mean function, the marginal effect of the binary variable PRIVATE is computed as follows: $\Pr [\text{LIBERAL} = 1 \mid \text{PRIVATE} = 1, \mathbf{x}_1, \mathbf{x}_2] - \Pr [\text{LIBERAL} = 1 \mid \text{PRIVATE} = 0, \mathbf{x}_1, \mathbf{x}_2]$.⁶ As presumed, the presence of private ownership is estimated to be the most significant determinant of market liberalization in the market for basic telecom services.

5. Conclusions

In contrast to the conventional methodology of analyzing the *ex post* effects of telecom reform programs in the telecom sector, this study attempts to identify relevant economic and institutional factors that influence the introduction of competition into basic telecom services. As the basic telecom services are recognized as tradable services under the WTO system, formulating the market liberalization plan is a challenging task for the government. The empirical results clearly show that the implementation of market liberalization programs is clustered where private ownership is present among the incumbent telecom enterprises. Although this finding is not unexpected, this study provides the concerned governments with policy choices that can facilitate or retard the implementation or scheduling of market liberalization programs in their respective countries.

We recognize the limitations of this study. First, due to the lack of the information on the private share of the ownership of the incumbent telecom enterprises, their ownership status is treated as a binary variable. Second, the underlying causal effects would be examined better with chronological information on implementation of telecom reform policies.

⁶ For more rigorous derivation of marginal effects, see Greene (1998).

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Table I. Descriptive Statistics for 166 Sample Countries

Variable	Mean	Standard error	Min.	Max.
LIBERAL	0.5843	0.4943	0	1
PRIVATE	0.5903	0.4932	0	1
GDPPC	8870.859	9202.796	501.3241	35373.04
URBPOP	53.9704	23.5638	8.54	100
TRADEGDP	86.2040	38.3376	22.0688	205.8719
PARCOMP	3.4380	1.2838	1	5
STOCKGDP	21.2069	32.8117	0.0012	141.9688
CGOVDEBT	55.4775	33.2109	0.2098	145.0167

Cross Tabulation of LIBERAL and PRIVATE

	PRIVATE=0	PRIVATE=1	Total
LIBERAL=0	37 (28)	32 (38)	69 (66)
LIBERAL=1	31 (42)	66 (58)	97 (100)
Total	68 (70)	98 (96)	166 (166)

Note: Numbers in parenthesis indicate the count of fitted values.

Table II. Estimated Bivariate Probit Model

Variable	Coefficient	Standard Error
Equation (1): <i>LIBERAL</i>		
Constant	-0.2436	0.3296
GDPPC	0.4792E-04*	0.2824E-04
URBPOP	-0.1370E-01**	0.6020E-02
TRADEGDP	0.2031E-03	0.3041E-03
PARCOMP	-0.3596E-03	0.2268E-03
PRIVATE	1.3457**	0.5274
Equation (2): <i>PRIVATE</i>		
GDPPC	0.4876E-04**	0.2404E-04
URBPOP	0.5525E-02	0.5288E-02
STOCKGDP	0.4215E-03*	0.2249E-03
CGOVDEBT	0.4541E-03*	0.2618E-03
Rho (1, 2)	-0.7004*	0.3750

Note: ***, ** and * are the standard significance level of 1%, 5%, and 10%, respectively.

Table III. Marginal Effects on Market Liberalization

Variable	Coefficient	Standard Error
GDPPC	0.3187E-04***	0.1082E-04
URBPOP	-0.5333E-02**	0.2631E-02
TRADEGDP	0.9494E-04	0.1360E-03
PARCOMP	-0.1680E-03	0.1008E-03
PRIVATE	0.6289*	0.3671
STOCKGDP	0.8188E-04	0.7282E-04
CGOVDEBT	0.8822E-04	0.8285E-04

Note: The marginal effects are computed at the means of the explanatory variables.