WHEN IS PRIVATIZATION BETTER FACILITATED?:
GLOBAL EVIDENCE FROM THE TELECOM SECTOR

Sang Hyup Lee
Southeastern Louisiana University, U.S.A.

Shakil Quayes
Southeastern Louisiana University, U.S.A.

The paper attempts to identify the telecom-sector performance indicators, relevant economic variables, and institutional characteristics of a country that affect the process of privatization of state-owned telecom enterprises. Using standard duration analysis of a panel data, we demonstrate that the privatization incentives are not only shaped by a country's fiscal conditions but are also influenced by the degree of competitiveness of private sector participation in policy-making process. The empirical results also reveal the significant impact of efficiency in telecom service provision on its course to privatization.

Key words: telecommunications, privatization, state-owned telecom enterprises, hazard rate, Cox proportional hazards model

1. INTRODUCTION

The telecommunications sector, especially basic fixed-line services, has long been characterized by large-scale economies in production, product-specific assets with limited reversibility, and the public utility nature of its services. Such distinctive characteristics of the telecom sector often led to both the operation of state-owned telecom enterprises (SOTEs) in monopolistic market environments and the prevalence of government intervention in the sector. However rapid technological progress and changes in the nature of market conditions in the past two decades have initiated vast transformation in the telecom industry. Specifically, in the case where the incumbent telecom service provider has been owned and controlled by the government, one of the central policy issues in the sector has been privatization of incumbent state-owned telecom operators.

In the literature on privatization in the telecom sector, many empirical studies have investigated the impact of privatization of the state-owned telecom enterprises (SOTEs) on the telecom sector performance. For instance, Ros (1999), Ros and Banerjee (2000), and Wallsten (2001) tested the effects of privatization of the SOTEs on network penetration for various sample countries and found that privatization of the SOTEs has been positively associated with network expansion. However the existing telecom literature has made little efforts to investigate why the implementation of privatization programs has varied across different stages of economic development and different regions. Moreover, it has yet to be examined how the adoption of privatization of the SOTEs has been influenced by country-
specific economic conditions, telecom sector performance under state ownership, and institutional characteristics.

Departing from the conventional empirical analysis of the telecom literature that compares telecom sector performances before and after privatization, the main purpose of this study is two fold. First, it considers the privatization issue as an economic, rather than political, decision-making process in which privatization issue is shaped and developed by various economic incentives. Second, it attempts to answer how the issue of privatization of the SOTEs depends on telecom sector performance and the stage of overall economic development of countries. For instance, how does a country's level of network penetration affect the implementation of privatization of the SOTEs? Does the implementation of privatization depend on a country's fiscal constraints? How does privatization in telecom sector depend on the SOTEs' financial viability? And finally, do a country's institutional characteristics affect privatization?

The empirical results allow us to explain, how policymakers choose the circumstances under which the movement from state ownership to private ownership would ideally be facilitated. The rationale behind the study is that policymakers would be better prepared to prescribe strategies for successful privatization if they could identify the factors that facilitate privatization processes and the possible barriers that could retard the process. We utilize data from the World Development Indicators 2002 (World Bank) and the Telecommunications Trends 2000 (International Telecommunication Union) for 169 countries over the period ending in 1999 and employ the proportional hazards model.

The rest of the paper is organized as follows. Section 2 discusses common privatization incentives addressed in the literature on privatization and then posits hypotheses in the perspective of the general characteristics of the telecom sector. In Section 3, we discuss explanatory variables and empirical specifications while confining our duration analysis to nonrestrictive Cox proportional hazards model. Section 4 analyzes the empirical results and the policy implications of the findings follow in Section 5.

2. THEORETICAL FRAMEWORK

Even though policy initiatives in general vary on the socioeconomic characteristics, the most fundamental argument behind the privatization of the state-owned telecom enterprises (SOTEs) has been “the efficiency implications of government ownership and, more importantly, the movement from government ownership to privatization” (Megginson and Netter 2001: 329). For instance, when a common carrier network is owned and controlled by the government, managers of such a state-owned telecom enterprise may not have sufficient incentive for innovation or cost reduction. This generally leads to relatively lower levels of network penetration and poor quality of telecom services, specifically their managerial incentives are more likely to be aligned with the maximization of political rent than economic rent. Henisz and Zelner (2001) argues that such misaligned managerial incentives would lead to the diversion of resources from the telecom sector and result in lower infrastructure deployment. Further, as pointed out in Stiglitz (1998), Laffont and Tirole (1993), and Megginson and Netter (2001), an operational goal of a state-owned enterprise is often ill-defined not only due to the diffusive nature of state ownership but also due to the lack of governments' ability to commit to economic principles.

Another important argument of efficiency implications has been that state-owned enterprises are less likely to face the same financial discipline that private economic entities face. As suggested in Kornai (2000), Frydman, Gray, Hessel, and Rapaczynski (1999), and Berglof and Roland (1998), in the presence of little or no chance of bankruptcy, poor
financial management of the SOTEs may be translated into inefficiency arising from government funding or soft budget constraints. It is worth noting that full or partial privatization of the state-owned telecom operators that occurred in developed countries during the 1990s is a reflection of their telecom policy reforms designed for the gains in productive efficiency, the financial viability of telecom enterprises, and the accountability of management. In this context, privatization of the state-owned incumbent telecom operators can be viewed as an opportunity to gain economic efficiency.

In this study, we view the privatization of the SOTEs as an economic process in which privatization incentives develop within the telecom sector over a period of time. Moreover, since the stage of the telecom sector development in a country tends to vary systematically with the country’s overall economic development, we also consider macroeconomic factors that would influence the demand and supply sides of the market for basic telecom services. Thus we attempt to analyze the issue of the privatization of the SOTEs in the following perspectives: the level of infrastructure deployment (network penetration), productive efficiency in the provision of services, fiscal conditions a country's government faces, financial constraints imposed on the telecom sector, and a country's institutional conditions for the transition of state ownership to private ownership.

The hypotheses posited here are as follows: the privatization of a country's SOTEs is more likely to accelerate if i) the absolute level of network penetration is lower, ii) the provision of telecom services is less efficient, iii) the government's financial resources are more stretched, iv) the financial viability of the telecom sector is weaker, and v) a country's institutional environments are outward-oriented with a higher degree of the competitiveness of private sector participation in policy-making processes.

### 3. EMPIRICAL SPECIFICATION

#### A Model

An important benefit of duration model for policy analysis is that the impact of explanatory variables on the duration (until a policy is implemented) is separated from ex post impact of the policy on the explanatory variables. We employ the Cox proportional hazards model which is a simple generalization of the parametric duration models. In this study, the duration of interest is the time span until a country privatizes its state-owned telecom enterprises (SOTEs). With a set of explanatory variables observed in country \(i\) \((x_i)\), the corresponding hazard rate - as the rate at which country \(i\) privatizes its SOTEs, given that the state ownership lasts until time \(t\) - is specified as \(\lambda(t) = \lambda_0(t) \exp(x_i' \beta)\). Suppose that, for the time interval \((t_0, t_i]\), \(K\) cases of privatization of the SOTEs are observed in the sample of \(N\) countries. Then the partial log-likelihood function of the proportional hazards model for \(K\) observed events is given as follows:

\[
\log L = \sum_{i=d}^{K} \left[ x_i' \beta - \sum_j \exp(x_j' \beta) \right].
\]

#### Data and Explanatory Variables

In our study, we control for eight covariates that are expected to influence the duration until a country adopts privatization of its state-owned telecom operator. First, teledensity \((TDN)\), number of main telephone lines per 100 inhabitants, is considered as a possible predictor of privatization. The absolute teledensity varies significantly across countries and over time, depending on different stages of economic development. As of 1999, the teledensity in Sub-Saharan Africa varied from 0.13 to 22.4 with the average of 2.78 telephone main lines per
100 inhabitants, whereas the teledensity of high-income OECD members in Western Europe varied from 41.0 to 72.4 with the average of 57.43. A possible conjecture is that low teledensity under the state-owned telecom enterprises would serve as a stimulus to embrace privatization programs that help induce foreign or domestic private investments into the sector.

To incorporate productive efficiency implications into the analysis, number of main telephone lines per full-time employee in the telecom sector (EFF) is used as a proxy for the productive efficiency. As in teledensity, the variable EFF also varies systematically with real GDP per capita. For countries in South Asia, the number of main telephone lines managed by a full-time employee in 1999 varied from 23.21 to 62.82 with an average of 45.58 main telephone lines, while the number for the European OECD countries in the same year varied from 118.23 to 354, with an average of 215.69. If a country's low efficiency in the telecom sector is largely attributed to poor financial disciplines or weaker managerial incentives under state ownership, then such low efficiency may give rise to a stronger privatization incentive from within and increase the likelihood for a faster transition to private ownership. Such a view is widely supported in the literature on privatization.

Assuming that the overall performance of a country's telecom sector is a function of both demand and supply characteristics, a country's real GDP per capita (GDPPC) is included to control for the demand characteristics of a country's telecom sector. The variable GDPPC is also expected to capture the impact of a country's stage of economic development on its privatization incentives.

As noted before, levels of network penetration and productive efficiency vary as widely as the stages of economic development, and low levels of teledensity and efficiency have been typical of many less developed countries. To address how privatization incentives are affected by a country's fiscal constraints, the overall budget deficit for the central government as the percentage of GDP (OBD/GDP) is considered as a proxy for the fiscal condition a government faces. The rationale behind this inclusion is that privatization of the SOTEs is more likely to be stimulated by insufficient employment of financial resources in the sector as a result of poor government fiscal conditions.

Further, to explain the telecom sector-specific financial viability or constraints that are not accounted for by the variable OBD/GDP, revenue per main telephone line received by the SOTEs (REV/LINE) are controlled for. The variable REV/LINE is measured in 1995 constant US dollars and is used as a proxy for a financial viability of the telecom operators under state ownership. It is assumed that low revenues per main telephone line provide countries with a greater incentive to end the state ownership of the telecom operators.

In addition to a set of telecom sector performance indicators and overall fiscal condition, a time trend variable (TREND) and teledensity of mobile telephony (MOBILE) are considered. We assume that a key driving force behind privatization policies has been the emergence of technology leading to the erosion in the natural monopoly argument for the public provision of telecommunications services. The variable TREND controls for the impact of the evolution of technology on the issue of privatization. Moreover, rapidly expanding mobile telephone services have become both technological and economic substitutions for conventional fixed-line telephone services in many countries. Considering that “regions of the world appear to have deliberately pursued policies and strategies to develop mobile telephony (Banerjee and Ros, 2004, p. 129),” we include the variable MOBILE to examine the impact of a rapid growth in mobile telephony on the privatization of fixed network-based telecommunications under state ownership.

Finally, we assume that the transition of ownership can be better facilitated in an outward-oriented and competitive policy decision-making system. Building on the findings of Petrzzini (1993) that the reform of state monopoly is more likely to succeed when a
country has a lower degree of power concentration, our study examines how much a country's institutional characteristics facilitate private sector participation (or civil interaction) in the policy decision-making process. For the purpose, we consider the variable \textit{PARCOMP} as a measure for competitiveness of private sector participation in the decision-making process at a national level. The variable \textit{PARCOMP} is from Polity IV Project (Marshall and Jaggers, 2004) and the degree of competitiveness in the decision-making process is coded from 1 (repressed) to 5 (competitive). It is expected that the privatization of the SOTEs is likely to be implemented sooner in a country where civil interaction in decision-making processes is less restrained and the transfer of central power to competing groups is stable.

4. RESULTS AND POLICY IMPLICATIONS

The empirical results of the Cox hazards model are summarized in Table 1. Note that the table reports the estimated coefficients with robust standard errors but not estimated hazard rates. The empirical results can be intuitively interpreted by exponentiating the estimated coefficients. The hazard rate in the proportional hazards model is \( \lambda(t) = \lambda_0(t) \exp(x'\beta) \). Since \( \ln \lambda(t) = \ln \lambda_0(t) + x'\beta \), \( 100[\exp(\beta) - 1] \) gives the percentage change in the hazard rate for a unit change in an explanatory variable \( x_i \). The Wald statistics \( (\chi^2_{(8)} = 111.80) \) suggests that the collective impact on the likelihood of the explanatory variables is statistically significant.

First, the empirical results show that the hazard of privatization (or the end of state ownership in telecom enterprises) is positively related to the level of productive efficiency in the provision of telecom services. The positive coefficient of the variable \textit{EFF} (number of main telephone lines per full-time employee) is contrary to our initial expectation that a relatively lower level of productive efficiency would spur the privatization of the SOTEs. It could be inferred from the finding that, other things being equal, the implementation of privatization of the SOTEs is more likely when the provision of telecom services is relatively efficient even under state ownership, suggesting that a lower level of productive efficiency could retard the privatization attempt or process.

The positive coefficient of the variable \textit{OBD/GDP} (overall budget deficit as percent of GDP) is consistent with one of the previous conjectures that the privatization is more likely to be pursued in a country that faces greater fiscal distresses. Since the successful divestment of British Telecom in 1984, many countries, especially several governments in Western Europe, launched large privatization programs in an effort either to plug budget deficit or to reduce government interference in the economy (Megginson and Netter, 2001).

Another interesting finding is that the hazard for privatization of the SOTEs is positively associated with a time trend. The positive coefficient of the variable \textit{TREND} indicates that rapid technological progress has eroded not only the natural monopoly argument for the public provision of basic telecom services but also the pervasiveness of government intervention in network-based utility industries.

The empirical results also confirm that the privatization of the SOTEs is contingent to a significant extent on the regime characteristics or institutional environments of a country. Although a country's institutional characteristics tend to remain quite stable over time, the estimated coefficient of the variable \textit{PARCOMP} suggests that privatization of the SOTEs is likely to be implemented much sooner in a country where competition among groups for political influence in policy-making process is less disrupted.

We infer that the level of overall economic development has little impact on the privatization of the SOTEs since the privatization programs launched in the 1990s were carried out in both the developed and less developed economies. Also our empirical findings
do not support our assumption that a low level of network penetration or a weak financial viability of telecom enterprises under state ownership is an important factor for privatization initiatives. Thus there is no significant empirical evidence that disappointing network penetration or financial performances of the SOTEs have prompted the privatization initiatives. Another noteworthy empirical finding is that rapid growth and widespread private ownership in mobile telephony do not appear to have influenced the acceptance of privatization programs in conventional fixed-line telephony.

Finally, a distinctive feature of the proportional hazard rate model is that the hazard rate is assumed to vary with explanatory variables but not with time. Thus the ratio of hazard rates, \( \frac{\lambda_i(t)}{\lambda_j(t)} \), for any two individuals at any point in time remains constant over time. The validity of the assumption is tested using the techniques of Grambsch and Therneau (1994) and its test results are reported in Table 2. It shows that, at 10% level, there is no significant deviation from the proportional hazards assumption.

<table>
<thead>
<tr>
<th>Table 1. Coefficient Estimates for the Proportional Hazards Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanatory Variables</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>TDN</td>
</tr>
<tr>
<td>EFF</td>
</tr>
<tr>
<td>GDPPC</td>
</tr>
<tr>
<td>OBD/GDP</td>
</tr>
<tr>
<td>REV/LINE</td>
</tr>
<tr>
<td>TIME</td>
</tr>
<tr>
<td>MOBILE</td>
</tr>
<tr>
<td>PARCOMP</td>
</tr>
</tbody>
</table>

Number of subjects = 87
Number of Failures = 38
Log pseudo-likelihood = -132.0810
Wald \( \chi^2_{(8)} = 111.80 \)

Note: *** and ** indicate statistical significance at 1% and 5% levels, respectively.

<table>
<thead>
<tr>
<th>Table 2. Test of Proportional Hazards Assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanatory Variables</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>TDN</td>
</tr>
<tr>
<td>EFF</td>
</tr>
<tr>
<td>GDPPC</td>
</tr>
<tr>
<td>OBD/GDP</td>
</tr>
<tr>
<td>REV/LINE</td>
</tr>
<tr>
<td>TIME</td>
</tr>
<tr>
<td>MOBILE</td>
</tr>
<tr>
<td>PARCOMP</td>
</tr>
<tr>
<td>Global Test</td>
</tr>
</tbody>
</table>

5. CONCLUSION

In contrast to the conventional methodology of analyzing the ex post effects of privatization programs in the telecom sector, this study attempts to identify the relevant economic variables and institutional characteristics that facilitate (or impede) the process of
privatization of the state-owned telecom enterprises. Identifying such pertinent factors provides the concerned governments with policy choices that can accelerate or decelerate the progress towards eventual privatization of the telecom sector in their respective countries. In this respect, we demonstrate that the privatization incentives are not only shaped by a country's fiscal conditions but are also influenced by the degree of competitiveness of private sector participation in policy-making process. Our findings indicate greater fiscal budget deficits accelerate privatization since most governments deem the choice of privatization to be more attractive when faced with larger budget deficits. The finding is consistent with what has been observed in countries where state-owned telecom enterprises accounted for a significant part of total market capitalization. It is also indicated that the privatization of the SOTEs in an effort to reduce state's economic role or government interference is more likely when policy decision-making process is more open to private sector or civil interaction. The empirical results also reveal the significance of the impact of efficiency pertaining to the telecom sector, on its course to privatization.

Formulating an appropriate plan for the privatization of telecommunication is a challenging task for the policymakers in countries with state-owned telecom enterprises. We find that privatization can be better facilitated if a country's privatization initiatives are adequately designed to reflect on overall fiscal conditions of the country, the efficiency implications of the telecom sector, and the state's position on outward-oriented telecom policies such as privatization of the SOTEs.

Notes
2 A state-owned telecom enterprise (SOTE) refers to any state-owned common carrier network that provides circuit switching among public users like public switched telephone networks (PSTN).
3 In this study, privatization refers to both full and partial privatization. A telecommunications provider is considered partially privatized if the participation of private sector investments is allowed.
4 According to Telecommunications Trends 2000 (ITU), privatization of the SOTEs has been extensive in Western Europe and Latin America. As of 2000, 15 out of 17 high-income OECD countries in Western Europe and 19 out of 30 Latin American countries fully or partially privatized their SOTEs. On the other hand, the pace of privatization of the SOTEs has been relatively slow in Asia and Sub-Saharan Africa. For instance, only 14 out of 49 countries in Sub-Saharan Africa fully or partially privatized their SOTEs by the end of 2000.
5 See Megginson and Netter (2001) for a comprehensive body of information on methodology and main findings of recent empirical studies on the impact of privatization on telecommunications sector performance.
6 Although the implementation of privatization of a country's SOTEs is to some extent contingent on its existing political condition, we confine our analysis largely to economic view points.
7 Li and Xu (2002) examines forces behind telecommunications privatization in the perspective of political economy in that the privatization of a state-owned incumbent telecom operator is likely to depend on the telecom policies set by country’s political structure.
8 For example, Shleifer (1998) points out that the government’s effort to maintain political support is another source of inefficiency of the state-owned enterprises. He argues that politicians are sensitive to the trends of their political supporters - particularly a large number of employees of the public enterprises - and so they deliberately create policies to transfer resources to their supporters.

References


