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Abstract

Since the 1970s, following US and UK experiences, developing countries have increasingly opted for private sector involvement in traditional public infrastructure projects. This paper reviews recent theoretical and empirical studies on privatization. Empirical work indicates a mixed picture, and economic theories are far from reaching any conclusion on privatization effects. In assessing the privatization effect, a frequently ignored but important perspective is the big push model, since public infrastructure has a positive externality effect on other private-sector productivity and is a main component of the big push into industrialization. In the big push model, the state ownership of public enterprises may be justifiable, until aggregate income grows sufficiently. In the case of telecommunications, the estimated performance improvement is on average 5.4% but it is dependent on the level of economic development. It is thus only those low-income and lower middle-income countries which can expect a significant positive privatization effect.

Key Words: Privatization Effect; Economic development; State-dependency; Network expansion; Telecommunications; Signed-rank test

JEL classification: C53; H11; L33; L96

1 Introduction

Since the 1970s, following US and UK experiences, both developing and developed countries have accelerated the privatization of traditional public industries, such as electricity, telecommunications, railways and water supply. The term privatization has various connotations, such as ownership transfer (divestment of assets and sale of shares), involvement of private activity (management and operation contract, and leases) and greenfield projects (franchising of public goods).¹ The total amount of privatization revenue from private sector participation transactions in OECD members was USD 47.1 billion in 2000 (OECD (2002)). In developing countries, the privatization activity for the same period amounted to USD 87.8 billion (the World Bank Private Participation in Infrastructure (PPI) Project Database). In the process of economic development and restructuring of the government sector, the timing and sequencing of privatization are clearly important, since such policy decisions are often irreversible and crucially determine the proceeding economic growth.

Although there are a number of theoretical and empirical studies on privatization, we are still far from any definitive conclusions; the estimated privatization effect may be both positive and negative. Shirley and Walsh (2000) point out that from 1971 to 1999, 32 studies out of 52 show the superior performance of private or privatized firms. 15 studies show no significant relationship between ownership structure and performance, and five studies conclude that the performance of publicly-owned firms are significantly superior to private firms.

Havrylyshyn and McGettigan (1999) also review the privatization effects in transition countries; while many empirical studies tend to find positive effects of privatization

¹See Cook and Kirkpartick (1988), Izaguirre (1998) and Ghosh (2000).

associated with corporate governance and firm restructuring in transition economies, some indicate the serious selection problem. In some cases, soon-to-be-privatized state-owned firms began introducing reforms and were already performing better than those not scheduled to be privatized, even before privatization (e.g. Pinto, Belka and Krajewski (1993)).

The main purpose of this paper is to review the recent theoretical and empirical studies, classifying them by purpose and level of data aggregation. In short, privatization seems to have a positive effect on operational and financial performances under the appropriate legal and institutional frameworks and disciplinary governance structures. The determinants of performance differ on a case by case basis.

Following a review of literature available, I place great emphasis on a frequently ignored but important perspective that multiple equilibria exist in public infrastructure investment and that the privatization effect is crucially dependent on the level of economic development. This assessment is motivated by the endogenous growth theory, and particularly by the “big push” model by Murphy, Shleifer and Vishny (1989), in which the initial level of aggregate income plays an important role in determining subsequent economic growth. It is predicted that the effect of transferring public infrastructure stocks to private investors, who aim to maximize their own profits, may be non-linearly correlated with the level of economic development. This implies that developing countries might not be able to expect the same effects of private sector involvement on performance improvements as developed countries, regardless of the above-mentioned worldwide privatization trend. They may result in a form of under-investment equilibrium. This is not only because of a deficiency in appropriate governance and legal structures but also because of lower aggregate income per se.

The following sections are organized as follows. In Section 2, I describe the recent trend of privatization in the world. In Section 3, I review the recent empirical studies on privatization. In Section 4, I consider several theoretical approaches to privatization. In Section 5, I discuss the multiplicity of equilibria in privatization effects, based on the big push model. Following this, in Section 6, I demonstrate a simple case study with cross-country data on telecommunications, showing that relatively high-income countries cannot expect a positive privatization effect associated with post-privatization telephone network growth.

2 Trend of Privatization

During the 1990s, privatization activities in OECD countries increased steadily in terms of amounts raised by privatization: USD 16.1 billion in 1990 to USD 67.1 billion in 2000, having reached a peak of about USD 100.6 billion in 1998 (source: OECD (2002)).² (See Figure 1.) The total amount of privatization revenue in developing countries is also reflected in the figure, for which data is provided by the World Bank PPI Project Database.³ The amount was approximately USD 13.1 billion in 1990 and USD 87.8 billion in 2000, each of which was almost corresponding to that of OECD member countries.

One of the most interesting characteristics of this global privatization is not its size and technique (e.g. operations and management contracts, and greenfield investments)

²The OECD Privatisation Database includes privatization transactions in all sectors, i.e. financial intermediation, public utilities (electricity, gas and water) manufacturing, telecommunications, transportation and others.

³The World Bank PPI Project Database includes only sectors such as airports, electricity, energy, natural gas, ports, railways, telecommunications, toll roads and water. Thus, it covers fewer sectors than the OECD Privatisation Database.

but the fact that developing countries have largely introduced privatization policies in faith, matching their pace to developed countries.

A natural question raised here is whether governments in developing countries can expect the same effects of private sector participation on performance improvements as developed countries. This question is quite meaningful in the following sense. As predicted in the big push model, if public infrastructure exhibits significant externalities in production at the initial stage of economic growth, premature privatization will have an adverse effect on economic growth and national-level expansion of public capital stocks. Thus, the privatization effects are crucially dependent on the level of economic development. In fact, it is noteworthy that in 2000 and 2001, a reversal of privatization policies was observed in New Zealand and the UK (OECD (2002)).

3 Earlier Empirical Studies on Privatization

In Table 1, I summarize recent empirical studies related to privatization, classifying them under six groups by two criteria: purpose and level of data aggregation. In the macro-data literature using data aggregated on a country- and industry-level, it is usually examined what roles economic development and macroeconomic stability play in privatizing public enterprises.⁴ However, two critical disadvantages of these macro-data studies are the ambiguity of causality and the wide variation in estimation results depending on aspects of researcher focus.⁵ In studies relying on firm-level data, it is possible to directly explore how and why post-privatization performances improved. However, except in the case of transition economies, the substantial establishment-level

⁴In Morrison and Schwartz (1996), Lighthart (2000) and Démurger (2001), it is shown that public capital stocks augment productivity growth in the private sectors. .

⁵See, for example, Moomaw (1998).

data are rarely available.

From the viewpoint of research purposes, there are at least three key questions to be addressed at different levels. The first is whether public capital stocks have a positive or negative effect on social productivity and welfare. This type of research is often conducted in regional and urban economics (i.e. localization and urbanization externalities).⁶ The second focuses on the potential rationales of state-owned enterprises (SOEs) providing such public infrastructure, based on the economic theory of market failure factors (e.g. economies of scale, asymmetric information and network externalities) and the principal-agency model (including political intervention).⁷ The third question is whether public enterprises will be operated better by public and privately-held firms, if both can potentially provide the public infrastructure.⁸

⁶The studies on the productivity effect of public capital stocks tend to rely on aggregated data. See, for example, Morrison and Schwartz (1996) and Lighthart (2000). One exceptional microeconomic work on public capital needs is Anas and Lee (1996), based on the World Bank's original data in Nigeria and Indonesia.

⁷Privatization is expected to reduce information asymmetry between principals and agents, strengthen market discipline and improve corporate performances, by transferring control rights from governments (politicians) to private investors who are supposed to be closer to market demand. See, for example, Barberis, Boycko, Shleifer and Tsukanova (1996), Claessens, Djankov and Pohl (1997), Frydman, Gray, Hessel and Rapaczynski (1997, 1998), and Claessens and Djankov (1998). Particularly, Cull, Matesova and Shirley (2001) show that financial incentives and regulation are important in privatization, since overly dispersed ownership may encourage managers to strip assets from the firms for their personal benefit and to over-borrow firms' debt under the government's guarantee to repay personal liabilities (i.e. Akerlof and Romer's (1993) "looting effect"). According to the principal-agency theory, political, institutional and legal frameworks are needed for shifting public enterprises away from governments to private investors effectively. The simplest model is Boycko, Shleifer and Vishny (1996), which proves that privatization of SOEs can raise the costs of politicians influencing them and thus improve economic efficiency. Also see Shleifer and Vishny (1994) and Hart, Shleifer and Vishny (1997). The related macroeconomic concern is that governments aim at financing their free-spending economic policies by privatization revenue, ignoring the social responsibility to offer public services universally. In general, privatization spurs economic growth by strengthening budgetary discipline and encouraging private sector investment. See Perotti and Oijen (1999) and Barnett (2000).

⁸For example, see Megginson, Nash and Randenborgh (1994) and Dewenter and Malatesta (2001).

4 Theories on Privatization

Regardless of the practical, implicit consensus among privatization authorities, few economic theories, in which privatization is characterized as a transition process as such, have yielded convincing conclusions. Instead, there are many static models. Two typical analyses are: (i) standard industrial economics literature focusing on market failure factors in production and consumption, and (ii) principal-agency theory, modeling political intervention and corruption.

As Jimenez (1995) summarizes, the rationale of allowing SOEs to have a monopoly on the market is based on traditional notions of market failure resulting from externalities in production and consumption, economies of scale, non-excludability, asymmetric information and the need to achieve social objectives such as creation of employment opportunity. Particularly, economies of scale strongly justify governmental monopoly in providing public services. Nevertheless, recent economic models limit the scope of state-owned natural monopoly. Firstly, the Demsetz competition model implies that if governments designed efficient auction mechanisms for inviting private firms to public sectors, they could contract out their public enterprises successfully. Secondly, according to the contestability approach, if there are no sunk costs, free entry and exit will lead to an efficient outcome. Finally, non-price competition through product differentiation also improves efficiency (i.e. a monopolistic competition approach).⁹

Another stream of static arguments is based on the principal-agent theory; publicly

⁹In reality, the accumulated empirical studies indicate the quite limited applicability of these static models. This is because it is often infeasible to implement the optimal auction mechanism and is difficult to avoid unpredictable bidding behavior and results, such as collusion and the winner's curse (e.g. Klemperer (1998) and Cramton and Schwartz (2000)). It is also difficult to find truly contestable markets; the airline industry was thought of as a good example of contestable markets, but is found to have significant entry barriers like incumbents held hub airports, as shown in Borenstein (1989). Moreover, if the electric power were able to be product-differentiated, the power market could be more competitive (e.g. Wilson (2002)).

owned enterprises are forced to address political objectives, mainly excess employment, rather than efficiency maximization. The simplest model is Boycko, Shleifer and Vishny (1996), which proves that privatization of SOEs can raise costs for politicians influencing them and thus improve economic efficiency.¹⁰ In contrast, Claessens and Djankov (1998) still claim that SOEs perform better than do privatized enterprises or private firms, because SOEs can account for social objectives and externalities in natural monopoly markets. Although the above static models have strong economic implications as to privatization, the dynamic transition from SOEs to private owned-enterprises still remains to be explored. Exceptional works that partly address a dynamic aspect of privatization are Mussa (1986), in which the optimal path of commercial policy in a program of trade liberalization is considered, and Glaeser and Scheinkman (1996), in which the sequencing of privatization across industries is modeled.

5 Big Push Model and Privatization

When considering the privatization effect, an assessment based on the endogenous growth theory, particularly the big push model, seems to be useful. As Murphy, Shleifer and Vishny (1989) point out, public infrastructure is an important component of the big push into industrialization. This is mainly because large public infrastructure stocks are likely to exhibit significant positive externalities on production in other sectors. In addition, this externality effect is unlikely to be taken into consideration by private investors, due to the absence of price discrimination allowing them to extract all the social surplus generated by the public enterprise. As a result, two separate equilibria

¹⁰For more arguments linking public enterprises with politically influential activities, see Shleifer and Vishny (1994) and Hart, Shleifer and Vishny (1997). Shirley and Walsh (2000) also provide a good summary of them.

coexist; the public infrastructure is either sufficiently provided up to the socially optimal level or not established at all.

This multiplicity is conceptually illustrated in Figure 2.¹¹ At the relatively low level of economic development, there are three equilibria, one of which is unstable. Below the critical point, the existing social capital will be disinvested. However, as aggregate income increases, the possibility of multiple equilibria diminishes.

In the context of privatization, if it is true that privatized firms maximize only their own profits without accounting for externalities, privatization at an earlier stage of economic development will result in a type of under-investment equilibrium. In other words, governments can be justified to own and foster public infrastructure until the national income increases sufficiently and the industrial and household demand for public capital stocks augments enough.

6 A Case of Telecommunications Privatization

In this section, I examine an empirical case, incorporating endogenous growth theory with privatization. I use data on the telecommunications industry, obviously the most likely infrastructure to be provided commercially.¹² Figure 3 reflects the number of private participation transactions in developing countries in the 1990s.¹³ Privatization

¹¹In Figure 2, capital investment $I(t)$ is assumed to be determined by a catastrophe model (e.g. Lange, McDode and Oliva (2001)):

$$aI(t)^3 - bk(t) - cI(t)Y(t) = 0$$

where $k(t)$ is capital stock and $Y(t)$ is an exogenous variable, such as aggregate income. δ is the depreciation rate.

¹²The data for network expansion in terms of installed telephone main lines used here is taken from the International Telecommunication Union (ITU), *Statistical Yearbook 1995* and *Yearbook of Statistics 2002*. The ITU also surveys regulatory frameworks in the world, including the year each country at least partially introduced private sector activity in the telecommunications industry (*Telecommunications Regulatory Database 1999*). For macroeconomic variables, I use *International Financial Statistics*.

¹³The data source is World Bank's PPI Project Database.

transactions in telecommunications amount to about USD 1.7 billion, or 42.8% of all transactions.¹⁴

There are several existing studies on telecommunications privatization, e.g. Singh (2000), Gutierrez and Berg (2000) and Wallsten (2001, 2002).¹⁵ In these studies, a little attention is paid to the potential influences of level of economic development on privatization effects. Significantly, Koski and Majumdar (2000) have an argument, directly relating telecommunications infrastructure capital to development, though it is irrelevant to privatization. Using the data of OECD member countries for the year: 1980 to 1995, they investigate the convergence in a telecommunications infrastructure stock. Based on the Wilcoxon matched-pair signed-rank test, it is found that the penetration rate of telephone lines and the estimated data envelopment analysis (DEA) efficiency measures are “ σ -converging” one another in developed countries.¹⁶

As shown in Table 2, 79 countries out of 122 around the world experienced telecommunication privatization until 2000, while governments have still responsibility for providing telecommunication services in 39 countries. In four countries, private firms are historically always providing basic telephone services.

Following the previous literature such as Wallsten (2002) and Gutierrez and Berg

¹⁴This is largely based on the recent remarkable technological progress experienced by the industry.

¹⁵Singh (2000) investigates the privatization effects in six Asian countries and concludes that network expansion is noticeable where adequate property rights framework is established. Gutierrez and Berg (2000) find that stable economic growth and liberalization policies encourage telephone network expansion within a sample of 19 Latin and Caribbean countries. Wallsten (2001) finds that in African and Latin American countries over the period from 1984 to 1997, privatization alone is insignificantly correlated with performance improvements. With an established independent regulator, however, it tends to be positively correlated. Moreover, Wallsten (2002) addresses questions about the most effective sequencing in reforming the telecommunications industry and shows that establishing institutional frameworks and an independent regulatory authority prior to privatization is conducive to post-privatization network provision. This is because the strong commitment to proceed with deregulation and market liberalization by governments significantly reduces the political risk premium for private investors.

¹⁶The σ -convergence refers to the inter-temporal convergence of distribution patterns of a variation statistic for a given cross-country performance over time. Thus, a performance measure being σ -converging implies that originally poorly performing countries are catching up with initially better performing ones. In addition, Koski and Majumdar (2000) confirm the convergence in intra-distributional performance, also called “ β -convergence.”

(2000), I use a standard measure of public infrastructure capital in the telecommunications industry, the number of installed telephone main lines per inhabitant. For every country experiencing privatization, I calculate this proxy measure for a seven-year period: three years before through after privatization. Then, I take an average of per capita mainline growth rate over the pre- and post-privatization.¹⁷ For non-privatization countries, I compute the mean of the variable over the period that the appropriate data is available. Excluding countries with missing data, I restrain my analysis for 89 countries: 47 that privatized their telecommunication enterprises from 1990 through 1997; 38 that kept the enterprises state-owned in 2000; and four that traditionally had private carriers.

Table 3 shows the mean annual per capita growth rate of main lines. This table clearly indicates that the endogeneity problem does matter in telecommunications privatization. That is, countries that experienced privatization had much lower network growth rates of 0.059 before privatization, compared with the growth rate of 0.096 for those who did not. After privatization, performance in terms of network expansion is improved significantly to 0.113 for 47 countries. Thus, there is a systematic pattern that shows telecommunications companies with poorer performance are more likely to be privatized.

To avoid this endogeneity problem, I restrain my analysis to the 47 countries that invited private firms to the formerly state-owned telecommunications industry. Following Megginson, Nash and Randenborgh (1994), I estimate the privatization effect on the network expansion by a non-parametric rank test, the Wilcoxon matched-pair signed-rank test.¹⁸

¹⁷I exclude the variable in the year of privatization.

¹⁸The empirical work on the financial and operating effects of privatization by Megginson, Nash and

Table 4 shows the Wilcoxon signed-rank test results. A main finding is that privatization increases the growth rate of telephone main lines by 4.4 percentage points. More importantly, however, the evidence indicates that the privatization effect seems to vary across regions, depending on the country's background characteristics; the effect is statistically indifferent from zero in almost all the regions but Sab-Saharan Africa. This evidence is not inconsistent with the previous work such as Wallsten (2001), showing that African and Latin American countries have not necessarily succeeded in improving market performances after privatization.

In Table 5, I show the results of the signed-rank test in medians by income group.¹⁹ It is only in relatively low-income countries that the post-privatization network growth rate in telecommunications is significantly increased. That is, although the privatization effect is in general positive, the upper middle-income countries can no longer expect a positive performance improvement with privatization. This may reflect the fact that the telecommunications capital stock converges on a steady state level as economy develops or may be caused by a complex relationship between aggregate income and post-privatization network growth. However, it is certain that the privatization effect differs according to the level of economic development.

Randenborgh (1994) is quite comprehensive, in the sense that their data includes 61 SOEs in 32 industries in 18 countries. In fact, some of them are from the telecommunications industry. The Wilcoxon signed-rank test reveals whether or not two underlying distributions differ in location measured by the median difference of the rankings of a country between the two observation years, say before and after privatization in my case. Letting matched pair of observations be (x_{j1}, x_{j2}) for $j = 1, \dots, n$, and denoting the difference as $d_j = x_{j1} - x_{j2}$, the test statistic is:

$$Wilcoxon = \frac{\sum_{j=1}^n r_j}{\left[\sum_{j=1}^n r_j^2\right]^{\frac{1}{2}}}$$

where $r_j = \text{sign}(d_j) \text{rank}(|d_j|)$. Note that $E(\sum_{j=1}^n r_j) = 0$, if the hypothesis is true that the distribution of d_j is symmetric around 0. For the Wilcoxon matched-pair signed-rank test, see Wallsten (2001).

¹⁹Economies are divided among income groups according to 2000 GNI per capita, calculated using the World Bank Atlas method. The groups are low-income, USD 755 or less; lower middle-income, USD 756-2,995; upper middle-income, USD 2,996-9,265; and high-income, USD 9,266 or more. See, for example, Global Development Finance 2002, The World Bank.

7 Conclusion

In this paper, I review the recent theoretical and empirical studies on privatization. In practice, privatization is becoming an important tool in restructuring public infrastructure sectors. The empirical work indicates a mixed picture; the privatization may or may not have a positive effect on improving operational and financial performances. Economic theories are far from reaching the conclusion of privatization effects. Most existing models tend to ignore the dynamic perspective that over economic development, public infrastructure is transferred from governments to the private investor, and thus the level of economic development per se may affect privatization effects significantly.

According to endogenous growth theory, and particularly the big push model, the initial level of aggregate income is notably significant for the following economic development, since public infrastructure has a positive externality effect on other private-sector productivity, and thus an initially large demand for public capital stocks will result in economic growth with increasing speed. Nevertheless, since private investors who purchased the former SOEs are likely to ignore such externalities and concentrate on maximizing their own private profits, it is likely that privatized enterprises will disinvest public capital stock, leading to an under-investment equilibrium. This perspective is closely related to a more practical question as to whether or not developing countries can expect the same privatization effects on market performances as developed countries.

In this paper, therefore, I focused on the influence of the level of economic development on the post-privatization growth rates in public infrastructure. In the case of the telecommunications industry, I found that although privatization generally spurred network expansion in terms of telephone main lines by 4.4% in medians (5.4% on average), the performance improvement was dependent on the level of economic development. It

is only the low-income and lower middle-income countries which can expect a significant positive privatization effect. Thus, it is important to account for economic development in assessing the privatization effects of public infrastructure stocks.

References

- [1] Ades, and Glaeser, E. 1999. "Evidence on Growth, Increasing Returns, and the Extent of the Market." *The Quarterly Journal of Economics*, **114**, 1025-1045.
- [2] Anas, and Lee, K. 1996. "The Benefits of Alternative Power Tariffs for Nigeria and Indonesia." Policy Research Working Paper No. 1606. The World Bank.
- [3] Barberis, Boycko, Shleifer and Tsukanova. 1996. "How Does Privatization Work? Evidence from the Russian Shops" *Journal of Political Economy*, **104**, 764-790.
- [4] Barnett, S. 2000. "Evidence on the Fiscal and Macroeconomic Impact of Privatization." IMF Working Paper No. WP/00/130. International Monetary Fund.
- [5] Borenstein, S. 1989. "Hubs and High Fares: Dominance and Market Power in the U.S. Airline Industry." *The Rand Journal of Economics*, **20**, 344-365.
- [6] Boycko, Shleifer, and Vishny, R. 1996. "A Theory of Privatization." *The Economic Journal*, **106**, 309-319.
- [7] Canning, D. 1998. "A Database of World Stocks of Infrastructure, 1950-95." *The World Bank Economic Review*, **12**, 529-547.
- [8] Claessens, Djankov, and Pohl, G. 1997. "Ownership and Corporate Governance: Evidence from the Czech Republic." World Bank Working Paper No. 1737. The World Bank.
- [9] Claessens, and Djankov, S. 1998. "Politicians and Firms in Seven Central and Eastern European Countries." World Bank Working Paper No. 1954. The World Bank.
- [10] Cook, and Kirkpatrick, C. 1988. "Privatisation in Less Developed Countries: An Overview." In Cook, and Kirkpatrick, C. eds., *Privatisation in Less Developed Countries*. Harvester Wheatsheaf. London.
- [11] Cramton, and Schwartz, J. 2000. "Collusive Bidding in the FCC Spectrum Auctions." mimeo.
- [12] Cull, Matesova, and Shirley, M. 2001. "Ownership Structure and the Temptation to Loot: Evidence from Privatized Firms in the Czech." World Bank Working Paper No. 2568. The World Bank.
- [13] Démurger, S. 2001. "Infrastructure Development and Economic Growth: An Explanation for Regional Disparities in China?" *Journal of Comparative Economics*, **29**, 95-117.
- [14] Dewenter, and Malatesta. 2001. "State-Owned and Privately Owned Firms: An Empirical Analysis of Profitability, Leverage, and Labor Intensity." *The American Economic Review*, **91**, 320-334.
- [15] Djankov, La Polta, López-de-Silanes, and Shleifer, A. 2000. "The Regulation of Entry." NBER Working Paper No. 7892.

- [16] D'Souza, and Megginson, W. 1999. "The Financial and Operating Performance of Privatized Firms during the 1990s." *The Journal of Finance*, **54**, 1397-1438.
- [17] Dutz, and Vagliasindi, M. 2000. "Competition Policy Implementation in Transition Economies: An Empirical Assessment." *European Economic Review*, **44**, 762-772.
- [18] Eberts, and McMillen, D. 1999. "Agglomeration Economies and Urban Public Infrastructure." In Mills, and Cheshire, P. eds., *Handbook of Regional and Urban Economics, Volume III*. Elsevier Science Publishers. North-Holland.
- [19] Frydman, Gray, Hessel and Rapaczynski, A. 1997. "Private Ownership and Corporate Performance: Some Lessons from Transition Economies." World Bank Working Paper No. 1830. The World Bank.
- [20] Frydman, Gray, Hessel and Rapaczynski, A. 1998. "When Does Privatization Work? The Impact of Private Ownership on Corporate Performance in the Transition Economies." C.V. Starr Center for Applied Economics, Economic Research Reports No. 98-32. New York University.
- [21] Galal, Jones, Tandon, and Vogelsang, I. 1994. *Welfare Consequences of Selling Public Enterprises: An Empirical Analysis*. The World Bank published by Oxford University Press.
- [22] Glaeser, and Scheinkman, J. 1996. "The Transition to Free Markets: Where to Begin Privatization." *Journal of Comparative Economics*, **22**, 23-42.
- [23] Ghosh, B.N. 2000. "Privatisation: The ASEAN Experience." In Ghosh, B.N. eds., *Privatisation: the ASEAN Connection*. Nova Science Publishers, Inc. New York.
- [24] Gupta, Ham, and Svejnar, J. 2001. "Priorities and Sequencing in Privatization: Theory and Evidence from the Czech Republic." William Davidson Working Paper No 323a. University of Michigan Business School.
- [25] Gutierrez, and Berg, S. 2000. "Telecommunications Liberalization and Regulatory Governance: Lessons from Latin America." *Telecommunications Policy*, **24**, 865-884.
- [26] Hart, Shleifer, and Vishny, R. 1997. "The Proper Scope of Government: Theory and an Application to Prisons." *The Quarterly Journal of Economics*, **112**, 1127-1161.
- [27] Havrylyshyn, and McGettigan, D. 1999. "Privatization in Transition Countries: A Sampling of the Literature." IMF Working Paper No. WP/99/6. International Monetary Fund.
- [28] Ingco, S. 1996. "Structural Changes in the Power Sector in Asia." *Energy Policy*, **24**, 723-733.
- [29] International Telecommunication Union. 1995. *Statistical Yearbook 1995*.
- [30] International Telecommunication Union. 1999. *Telecommunications Regulatory Database 1999*.

- [31] International Telecommunication Union. 2002. *Yearbook of Statistics 2002*.
- [32] Izaguirre, A. 1998. "Private Participation in the Electricity Sector: Recent Trends." Public Policy for the Private Sector, Note No. 154. The World Bank.
- [33] Jimenez, E. 1995. "Human and Physical Infrastructure: Public Investment and Pricing Policies in Developing Countries." In Behrman, and Srinivasan, T.N. eds., *Handbook of Development Economics, Volume III*. Elsevier Science Publishers. North-Holland.
- [34] Klemperer, P. 1998. "Auctions with Almost Common Values: the 'Wallet Game' and its Applications." *European Economic Review*, **42**, 757-769.
- [35] Knittel, C. 2002. "Alternative Regulatory Methods and Firm Efficiency: Stochastic Frontier Evidence from the U.S. Electricity Industry." *The Review of Economics and Statistics*, **84**, 530-540.
- [36] Koski, and Majumdar, S. 2000. "Convergence in Telecommunications Infrastructure Development in OECD Countries." *Information Economics and Policy*, **12**, 111-131.
- [37] Lange, McDade, and Oliva, T. 2001. "Technological Choice and Network Externalities: A Catastrophe Model Analysis of Firm Software Adoption for Competing Operating Systems." *Structure Change and Economic Dynamics*, **12**, 29-57.
- [38] Lighthart, J. 2000. "Public Capital and Output Growth in Portugal: An Empirical Analysis." IMF Working Paper No. WP/00/11. International Monetary Fund.
- [39] López-de-Silanes, Shleifer, and Vishny, R. "Privatization in the United States." *The Rand Journal of Economics*, **28**, 447-471.
- [40] Megginson, Nash, and Randenborgh, M. 1994. "The Financial and Operating Performance of Newly Privatized Firms: An International Empirical Analysis." *The Journal of Finance*, **49**, 403-452.
- [41] Moomaw, R. 1998. "Agglomeration Economies: Are They Exaggerated by Industrial Aggregation?" *Regional Science and Urban Economics*, **28**, 199-211.
- [42] Morrison, and Schwartz, A. 1996. "State Infrastructure and Productive Performance." *The American Economic Review*, **86**, 1095-1111.
- [43] Murphy, Shleifer, and Vishny, R. 1989. "Industrialization and the Big Push." *Journal of Political Economy*, **97**, 1003-1025.
- [44] Murphy Jr. and Feltenstein, A. 2001. "Private Costs and Public Infrastructure: The Mexican Case." IMF Working Paper No. WP/01/164. International Monetary Fund.
- [45] Mussa, M. 1986. "The Adjustment Process and the Timing of Trade Liberalization." In Choksi, and Papageorgiou, D. eds., *Economic Liberalization in Developing Countries*. IBRD, printed by Basil Blackwell.
- [46] OECD. 2002. "Recent Privatisation Trends in OECD Countries." *Financial Market Trends*, **82**, 43-58.

- [47] Perotti, and Oijen, P. 1999. "Privatization, Political Risk and Stock Market Development in Emerging Economies." Centre for Economic Policy Research Discussion Paper No. 2243.
- [48] Pinto, Belka, and Krajewski, S. 1993. "Transforming State Enterprises in Poland: Evidence on Adjustment by Manufacturing Firms." *Brookings Papers on Economic Activity*, **1993**, 213-261.
- [49] Saloner, and Shepard, A. 1995. "Adoption of Technologies with Network Effects: An Empirical Examination of the Adoption of Automated Teller Machines." *The Rand Journal of Economics*, **26**, 479-501.
- [50] Shirley, and Xu, L. 1998. "Empirical Effects of Performance Contracts: Evidence from China." World Bank Working Paper No. 1919. The World Bank.
- [51] Shirley, and Walsh, P. 2000. "Public Private Ownership: The Current State of the Debate." World Bank Working Paper No. 2420. The World Bank.
- [52] Shleifer, and Vishny, R. 1994. "Politicians and Firms." *The Quarterly Journal of Economics*, **46**, 995-1025.
- [53] Singh, J.P. 2000. "The Institutional Environment and Effects of Telecommunication Privatization and Market Liberalization in Asia." *Telecommunications Policy*, **24**, 885-906.
- [54] Waldman, and Jensen, E. 1998. *Industrial Organization: Theory and Practice*. Addison-Wesley Educational Publishers Inc.
- [55] Wilson, R. 2002. "Architecture of Power Markets." *Econometrica*, **70**, 1299-1340.
- [56] Wallsten, S. 2001. "An Econometric Analysis of Telecom Competition, Privatization, and Regulation in African and Latin America." *The Journal of Industrial Economics*, **49**, 1-19.
- [57] Wallsten, S. 2002. "Does Sequencing Matter? Regulation and Privatization in Telecommunications Reforms." World Bank Working Paper No. 2817. The World Bank.

Table 1: Recent Empirical Studies on Privatization

Data Level Purposes	Macro-data	Micro-data
Need of Public Capital	<p>Morrison and Schwartz (1996) - Significant cost-saving effect of public infrastructure investment on manufacturing firms, with a sample of U.S. state-level panel data.</p> <p>Ligthart (2000) - Significant growth effects of aggregate public capital in Portugal, with a sample period: 1965-1995.</p> <p>Demurger (2001) - Strong evidence of transportation facilities and urbanization economies facilitating economic growth, with a sample of 24 Chinese provinces from 1985 to 1998.</p> <p>Murphy, Jr. and Feltenstein (2001) - No large productive role of public infrastructure on private sector costs, with a sample of 14 sectors in Mexico.</p>	<p>Anas and Lee (1996) - Significant substitution effects of self-generation for public power in Nigeria and Indonesia, with a sample of 279 firms.</p>
Reasons for Public (Private) Provision	<p>Perotti and Oijen (1999) - Significant effects of decreasing political investment risk in "privatization-oriented" countries, with a sample of 22 emerging economies.</p> <p>Barnett (2000) - Significant privatization effects of decreasing governmental domestic financing, with a sample of 18 countries.</p>	<p>Barberies, Boycko, Shleifer and Tsukanova (1996) - Positive effects of new ownership on former SOEs restructuring, with a sample of 450 Russian retailers.</p> <p>Claessens, Djankov and Pohl (1997) - Significant positive privatization effects of major ownership by main banks and strategic investors, rather than mass privatization, with a sample of 706 firms in Czech.</p> <p>Fryman, Gray, Hessel and Rapaczynski (1998) - Not significant revenue increasing effects of insider privatization, with a sample of 506 firms in 3 transition economies.</p> <p>Cull, Matesova and Shirley (2001) - Strong evidence of Akerof and Romer's (1993) looting effect in privatized SOEs, with a sample of 392 firms in Czech.</p> <p>Knittel (2002) - Strong evidence of economies of scale and regulatory framework influences in U.S. electricity industry, with a sample of about 600 units.</p>
Performance Comparison of Private and Public Enterprises	<p>Wallsten (2001) - Little evidence of telephone network expansion by privatization alone, with a sample of 30 African and Latin American countries.</p>	<p>Megginson, Nash and Randenborgh (1994) - Significant privatization effects of raising profits and capital investment and lowering debt, with a sample of 61 cross-sectional firms in 18 countries.</p> <p>Ingco (1996) - Significant negative impact of state ownership on operating expenses, with a sample of 47 electric utilities in 34 Asian countries.</p> <p>D'Souza and Megginson (1999) - Significant increasing effect of privatization on output, efficiency and capital expenditures, but not for employment, with a sample of 85 cross-sectional firms in 28 developed countries.</p> <p>Dewenter and Malatesta (2001) - Significantly less ROA and ROE for SOEs than private firms, with a sample of largest 500 cross-sectional firms in the world.</p>
General Review	<p>Galal, Jones, Tandon and Vogelsang (1994)</p> <p>Jimenez (1995)</p> <p>Eberts and McMillen (1999)</p> <p>Havrylyshyn and McGettigan (1999)</p> <p>Shirley and Walsh (2000)</p>	

Table 2: Experience of Telecommunication Privatization

	Number of Countries
Always Private Provision	4
Privatization Experienced	79
1954~1989	12
1990	9
1991	3
1992	1
1993	4
1994	8
1995	6
1996	8
1997	11
1998~2000	17
State-Owned	39
Total	122

Source: ITU Telecommunications Regulatory Database, 1999.

Table 3: Average of Annual Telephone Mainline Growth Rates

Region	Non-Privatization Countries *		Privatization Experienced Countries **		
	SOEs	Private	Before	After	Difference
All	0.096 (0.095) (N=38)	0.218 (0.290) (N=4)	0.059 (0.092)	0.113 (0.115) (N=47)	0.054 (0.147)
Sub-Saharan Africa	0.075 (0.054) (N=18)		0.056 (0.109)	0.179 (0.145) (N=9)	0.122 (0.181)
Asia	0.147 (0.074) (N=4)	0.154 (0.000) (N=1)	0.080 (0.098)	0.125 (0.085) (N=11)	0.046 (0.130)
Europe & Central Asia	0.040 (0.038) (N=6)		0.042 (0.042)	0.069 (0.069) (N=17)	0.027 (0.081)
Middle East & North Africa	0.290 (0.227) (N=3)		0.053 (0.000)	0.033 (0.000) (N=1)	-0.020 (0.000)
America	0.085 (0.037) (N=7)	0.239 (0.352) (N=3)	0.068 (0.126)	0.124 (0.141) (N=9)	0.056 (0.189)

Note that the standard deviations are shown in parentheses.

* The individual observation is the average of annual network growth rates for the period: 1987-2000. Some data is calculated by only the available data.

** The individual observation is the average annual network growth rates for three years before (after) privatization.

Table 4: Privatization Effects on Network Expansion by Region: Wilcoxon Signed-Rank Test

Region	Obs.	Mean Before (Median)	Mean After (Median)	Difference (After-Before) (Median)	Z-Statistic for Difference in Medians
All	47	0.059 (0.035)	0.113 (0.079)	0.054 (0.044)	2.508**
Sub-Saharan Africa	9	0.056 (0.028)	0.179 (0.210)	0.122 (0.181)	1.836*
Asia	11	0.080 (0.082)	0.125 (0.126)	0.046 (0.044)	1.600
Europe & Central Asia	17	0.042 (0.035)	0.069 (0.042)	0.027 (0.007)	1.302
America	9	0.068 (0.025)	0.124 (0.069)	0.056 (0.044)	0.533

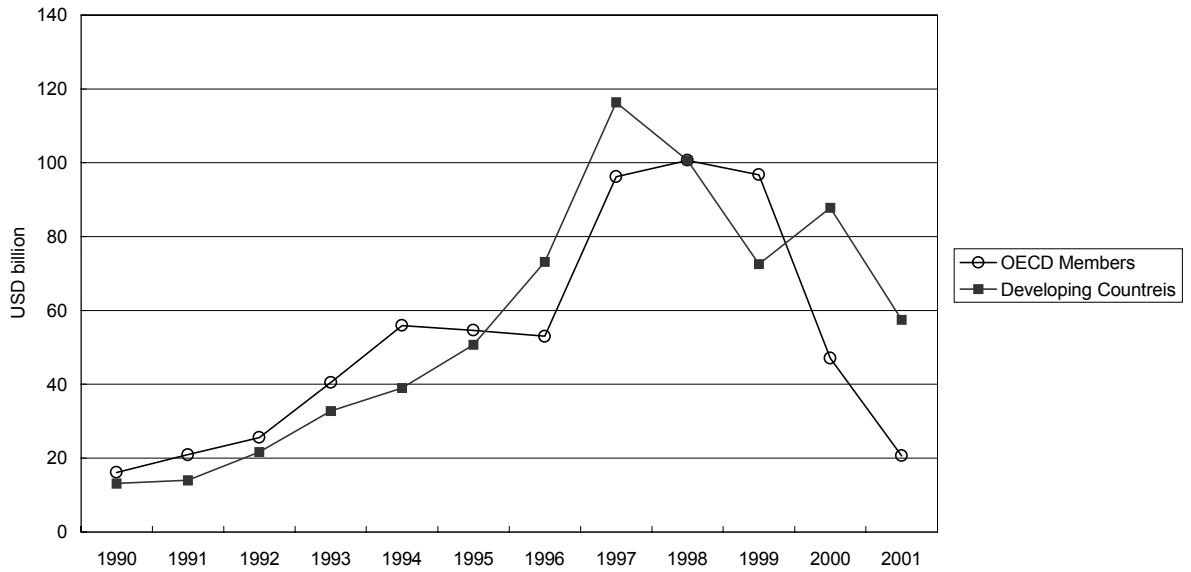
* Significance at 90%. ** Significance 95%.

Table 5: Privatization Effects on Network Expansion by Income Group: Wilcoxon Signed-Rank Test

Income Group	Obs.	Mean Before (Median)	Mean After (Median)	Difference (After-Before) (Median)	Z-Statistic for Difference in Medians
All	47	0.059 (0.035)	0.113 (0.079)	0.054 (0.044)	2.508**
Low-income	12	0.056 (0.020)	0.159 (0.128)	0.103 (0.108)	2.197**
Lower Middle-income	11	0.060 (0.014)	0.164 (0.139)	0.105 (0.125)	2.134**
Upper Middle-income	10	0.086 (0.075)	0.110 (0.103)	0.023 (0.028)	0.663
High-income	14	0.014 (0.043)	0.035 (0.026)	0.021 (-0.017)	-0.534

* Significance at 90%. ** Significance 95%.

Figure 1: Total Revenue from Private Participation in Infrastructure Projects



Sources: Author's calculations from World Bank's PPI Project Database and OECD Privatisation Database.

Figure 2: Multiple Equilibria in Public Capital Stock

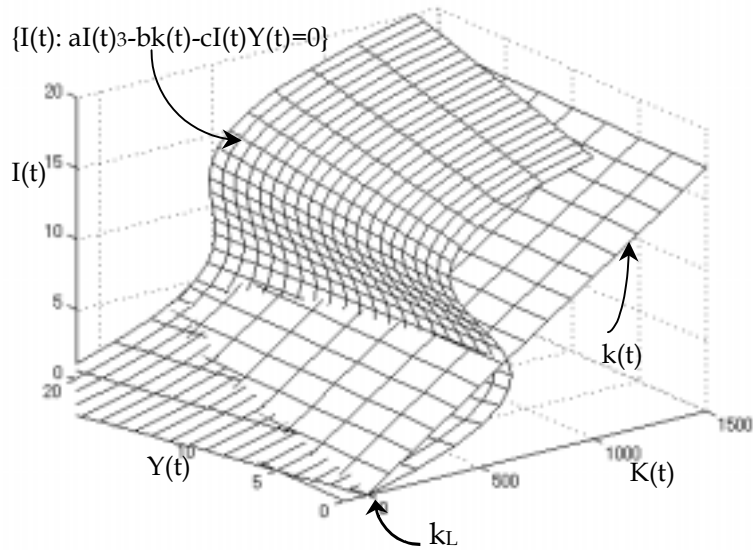
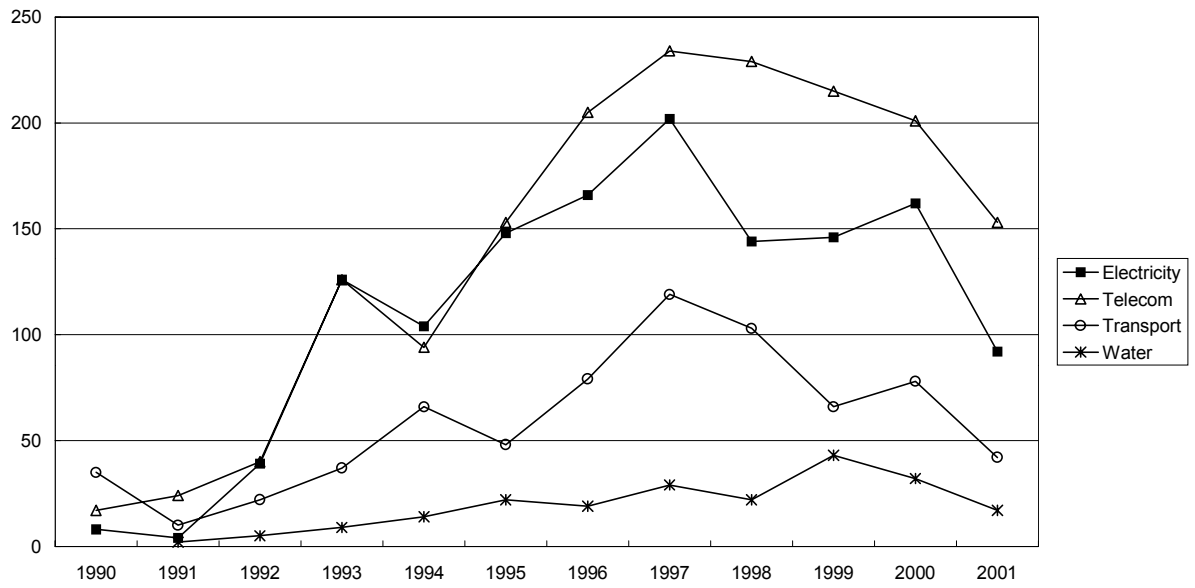


Figure 3: Number of Private Participation Transactions in Developing Countries



Sources: Author's calculations from World Bank's PPI Project Database.