Analysis of Telecommunication Sector
Efficiency & Regulatory Reforms

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In partial fulfilment of the requirements for the degree of
MASTER OF PHILOSOPHY IN ECONOMICS
Quaid-i-Azam University, Islamabad, Pakistan.
July 2001

CERTIFICATE

We accept the work contained in this dissertation as conforming to the required standard as partial fulfillment for the degree of *Master of Philosophy in Economics*.

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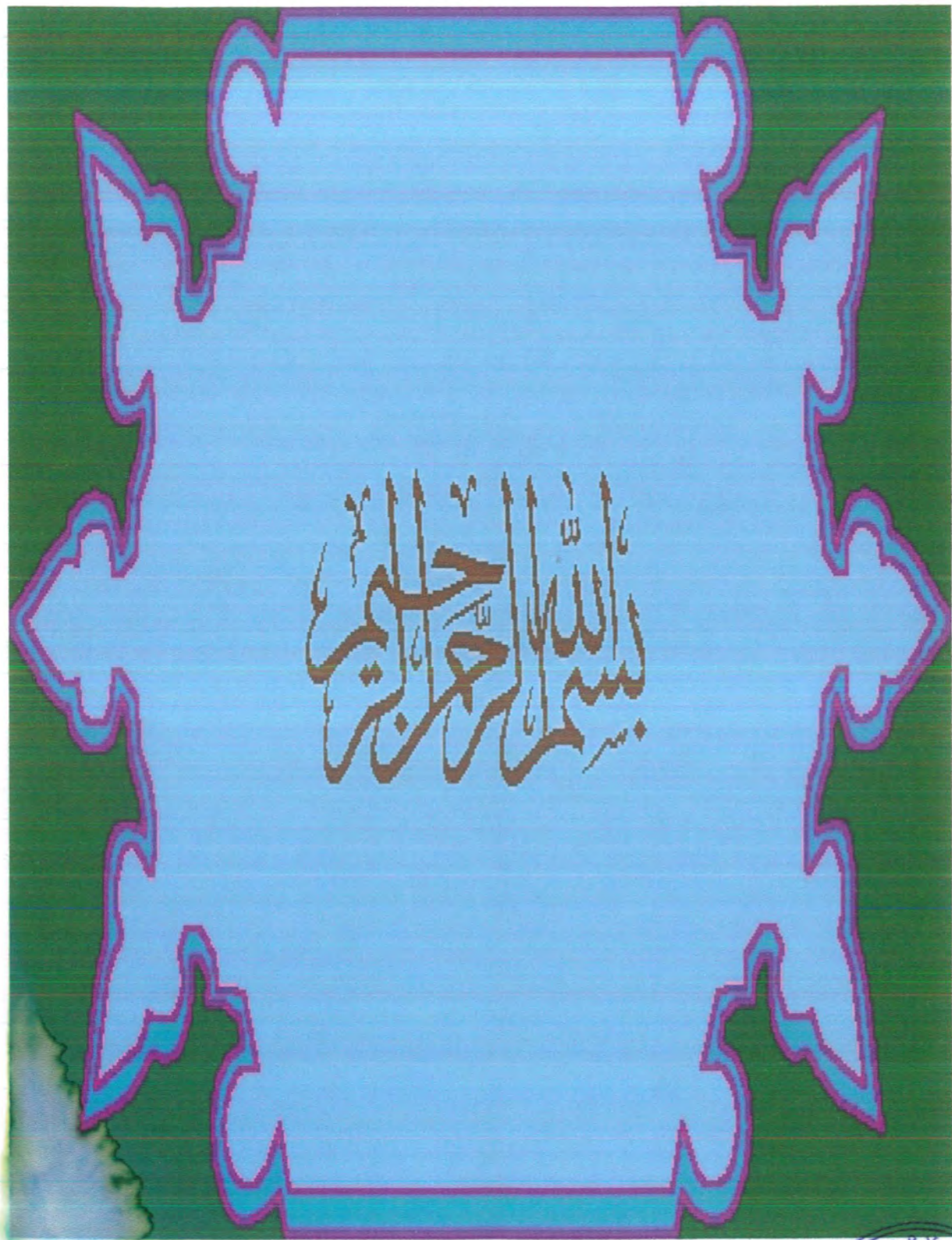**Supervisor**
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CONTENTS

List of Tables

List of Figures

ACKNOWLEDGEMENT

With all praises to Almighty Allah Who bestowed upon me and blessed me the ability to complete my dissertation.

I owe a great debt of sincere and profound gratitude to my supervisor Dr. Aliya H. Khan for her stimulating supervision, co-operation and constant encouragement, which led me to the successful completion of my research work. I also express my humble gratitude to Dr. Eatzaz Ahmed for helping me in handling the data. Special gratitude to Dr. Abid A Burki Chairman, Department of Economics for his keen interest in completion of this piece of research work and guidance from time to time. My sincere appreciations are also due to Dr. Fahd H. Khan and Mr. Muhammad Saleem, Director Economics Studies, Pakistan Telecommunication Authority, Islamabd, whom very ably guided me for successful completion of this dissertation and helped me in acquiring every possible information relevant to my research.

Words are often too inadequate to express one's real and heartfelt feelings but since they are only media of communication I find it difficult to articulate the depth of my indebtedness to my elder brother Muhammad Saeed Anjum whose moral and financial support never let me done to retreat from my mission.

I would also say humble thanks to my class-fellows and friends especially Muhammad Bilal and Miss Shirin Aslam for their due and sincere help and co-operation throughout the completion of this research. I also thanks to all my friends and colleagues at Askari Commercial Bank Ltd for sparing me from extra duties and responsibilities to complete my dissertation.

Words are too debilitating to express my devoted thanks to my parents, brothers and sisters for their prayers and moral support.

Abdul Majeed

DEDICATED TO

My Parents

My Supervisor

&

My Elder Brother

Chapter 1

INTRODUCTION

Since the early 1980s telecommunication sector in the world has witnessed dramatic changes and restructuring. These changes include corporatisation, privatization, regulation and competition. The extent and types of reforms varied worldwide but every region has been affected directly and indirectly. This wave of regulatory reforms has been felt across all the regions; from Europe to Asia and Africa to Latin America. Driving force behind all these efforts is to bring the telecommunication sector at its best possible and efficient frontier. In the early stages the main emphasis was given on the transfer of ownership from state-owned to privately-owned to meet the challenges of unmet demand of telecommunication services because the types of ownership and market structure of an industry are important determinants of key variables such as output, price and technical efficiency. Ramamurti (1996) analyzed four firms in Latin America and found evidence consistent with the short-run improvements in a number of variables after privatization including number of mainlines.

There is enough literature available on the theoretical aspects of privatization, regulation and competition in telecommunication sector but our empirical knowledge of their effects on its expansion and efficiency is much less comprehensive. Indeed the empirical work to date consists largely of case studies and non-econometric studies of effects of competition, privatization and regulatory reforms. This is because of the fact that regulatory reforms in most of these countries occurred recently and there was not enough data to analyze empirically the regulatory aspects and their effects on telecommunication sector.

The purpose of this study is to empirically investigate the effects of regulatory reforms on the telecom sector indicators. It will be among the pioneering works, which aim to investigate the impacts of these reforms using established econometric techniques. The study will also try to find out that what kind regulations are more suitable for which geographical region and whether there should be a separate independent regulatory body free from political influence, or the privatizing agency or commission should be given the powers of regulation. Lastly there has been a universal census on the efficient working of competitive markets. Till 1980s in almost all the countries the telecommunication sector had been monopolistically controlled by the public sector. It is also another objective of the studies to investigate that the countries, which allow competition in basic services, have shown higher

mainline expansion as compared to other countries, which do not permit competition in basic services.

This study takes into account the comparative analysis in the empirical testing of key telecom sector indicators. The group of countries that is selected for empirical investigation of the effects of regulatory reforms consists of those countries which have either fully privatized their telecommunication sector or have made a leap towards privatization. The main purpose of such kind of sample selection is to explore a clear picture of privatization, regulations and competition on performance of telecommunication sector. Region wise classification and grouping of countries into developed and developing countries make a further sub-division[1].

The thesis proceeds as follows. Chapter 2 shed lights on the historical background of telecom regulatory reforms and discusses the main nature of regulatory reforms. A brief discussion on economics of telecommunications is highlighted in Chapter 3. A survey of literature on the empirical work as well as on theoretical work is provided in Chapter 4. A descriptive analysis of data on basic telecom indicators exhibiting the effects

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[1] According to ITU grouping of countries, the countries which have GDP>$10,000 are considered developed countries and the countries which have GDP<$10,000 are developing countries.

of privatization, regulation and competition, and the methodology to empirically estimate these effects is portrayed in Chapter 5. The empirical evidence from the specified sample is presented and discussed in Chapter 6. The concluding remarks and the policy implications that stem out from the analysis are presented in final chapter 7.

Chapter 2

HISTORY AND REGULATION OF TELECOMMUNICATION SECTOR

2.1 HISTORY AND REGULATION OF TELECOMMUNICATION SECTOR

"Mr. Watson, come here, I want you." With these historic words Alexander Graham Bell called to his assistant Thomas Augustus Watson over the so-called "telephone" and an industry was born on March 10, 1876. A year later, on July 9, 1877, the Bell Telephone Company was formed and Alexander Graham Bell became the company's electrician and Watson in charge of research and manufacturing.

Telecommunications was not a very important or active sector at a political or regulatory level in Europe and other parts of the world until 1980s. It was assumed that private ownership or competition in telecommunication was unlikely to be beneficial where as a monopoly Telecommunication Company was viewed as an important ingredient in industrial policy.

However, the 1980s brought a wave of technological developments in the telecommunication sector along with the U.S. break-up of AT&T. Telecommunication began to move upwards on the " industrial policies: priority list of the European Commission. Privatization and liberalization in the United

Kingdom in 1984 offered a clear alternative to the model of government as monopoly operator of the telecom services.

The key to effective competition in telecommunication is a rule-based regime with open access, non-discrimination and interconnection rules that are fair to new incumbents and entrants.

2.2   THE STATE OF DEVELOPMENT OF TELECOMMUNICATIONS

Telecommunication systems have been developed at different rates across Europe and continued to vary markedly today. In 1975 there were 37 main telephone lines per 100 inhabitants in United States, compared to 51 in Sweden but just 24 in United Kingdom, 13 in France and 9 in Portugal. By 1990 the U.S. penetration rate had reached 55, but it was 68 in Sweden.[1]

Investment patterns in telecommunications have differed substantially between Europe and United States. In 1975, only France and Finland had annual per capita investment   in telecommunication infrastructure equal to that of the United States. In 1980, per capita telecommunications investment in five European countries exceeded that of the United States: Portugal, France, Germany, Norway and Switzerland[2]. By 1990 every European country except

[1] Leonard Waverman & Esen Siral *"European Telecommunication markets o the Verge of Full Liberalization"*
Journal of Economic Perspectives (1997)
[2] Statistics are based on ITU data

Greece and Spain invested more per capita in telecommunication than did United States. Today some European telecommunication systems are in fact more modern than that of the United States.

Thus privatization, liberalization and the movement to competition in European Telecommunications is not necessarily designed to build better infrastructure but to deal with inefficiencies in operation and lack of services and innovations associated with monopoly publicly owned systems. The pattern of calls also differs. Europeans make fewer local calls, a similar of national long distance calls and far more international calls than do Americans. There exist a wide variety of telecommunication privatization across Europe, ranging from 100 percent in the United Kingdom and Spain to likely full privatization in Germany.

Four relatively small countries have been at the forefront of innovative telecommunications deregulation: Australia, Chile, Guatemala and New Zealand. The regulatory reform efforts in these countries have been extremely varied. Chile was the pioneer with its 1982 General Law on Telecommunications. New Zealand attempted to jump straight from regulation to unrestricted competition in telecommunications, allowing free entry into the provision of telecommunications services as of April 1, 1989 whereas Guatemala enacted sweeping reforms in November 1996. All of these countries are experiencing facilities-based competition in all segments. Deregulation has had striking results on the price

and quantity of service in all four nations, and the intensity of competition in local telephone service has been especially changing.

The era of telecom privatisation and regularization in Asian and Far East Asian countries is not too long. Growth rates in telecommunications in most of the countries, since telecommunications was made a priority in the 1980s have been quite high compared to previous eras. Singapore started the privatisation of its telecommunication sector in 1990 with the sale of 11% share of its telecom sector while South Korea made the leap in 1991 with the sale of 20% of its stock. Singapore and South Korea have eliminated their waiting list, boasted very high teledensity and falling costs of services. Korea which have some form of competition since mid 1980 raised its teledensity from 7.34 mainlines per hundred inhabitants in 1980s to 55.47 in 1999 exhibiting average annual growth rate of 13.97 highest in the region. The efficiency indicators show that it reduced its employees per 100 mainlines ratio 7 in 1980 to 3 in 1995, therefore it is considered to have the most efficient sector as measured by employees per mainline. In Singapore the mainlines per hundred inhabitants increased from 21.68 in 1980 to 64.58 in 1999 with an growth of 43.7 percent. However, most of the increase in teledensity, the entire elimination of waiting list, and many of the cost efficiencies came about under state auspices. Privatisation and liberalization being new in these countries, it is not clear the degree to which the infrastructural growth and efficiency indicators can be attributed to them.

The other Asian countries where regulatory reforms have been introduced have quite positive effects on expansion as well as efficiency indicators are Malaysia which started privatization in 1990 and somehow India in 1994. The mainline growth rates 1990-95 of Malaysia are very high when the regulatory reforms in the form of privatization and market competition were implemented. Malaysia doubled its teledensity with in the span of five years from 1995 to 1999 with and cumulative annual growth rate of 7.98 per cent since 1980s. In India's case there are sufficiently high competitive pressures on the monopoly basic service provider

2.3   REGULATORY REFORM

Governments use regulations to support a very wide range of public policies. For instance, regulations help protect the environment, improve the safety of products, and maintain fair competition in markets. However, many rules on the books are unsuited to today's needs. They slow innovation and job creation, unnecessarily reduce competitiveness, or are too complex and burdensome to be effective. Such regulatory problems substantially reduce the prosperity and well being of citizens.

Almost all countries have launched programmes of regulatory reform to address these kinds of problems. The challenge for these governments is to reap the benefits of reform, while protecting important public interests and managing adjustment costs.

What is regulatory reform?

Regulatory reform means both better regulation and deregulation. In many cases, governments must continue to regulate in order to protect public interests in areas such as environmental quality, safety, and health. Here there is a need to develop instruments that are less costly, more effective, and which use and shape market forces to achieve public policy goals. Deregulation refers to the complete or partial elimination of regulations in a sector. The challenge is to find the right mix of market forces and government intervention to achieve policy objectives efficiently in changing economic and social conditions. Regulatory reform activity has significantly increased in many countries in recent years. Yet the pace and depth of reform vary considerably.

2.4   TYPES OF REGULATIONS

Regulation can be said to generally refer to policies where the government acts as a referee to oversee the market activity and the behaviour of private actors in the economy. Such government intervention in the marketplace is usually justified on the basis of market failures and the need to ensure societal well beings.

The purpose and the main objective of these sorts of regulations should be to yield benefits in terms of reducing costs, enhancing efficiency and stimulating innovation. However, this must be done without sacrificing or jeopardizing the basic objectives:

- Ensuring fair market transactions, protecting the environment and maintaining government oversight of private sector activities.
- Establishing right degree and right form of regulations.
- Intend to address the deficiencies in the existing infrastructure, which negatively affect the innovative process from research to diffusion.

Separate regulatory authorities are set up to achieve these objectives of regulation. The authorities regulate theses sectors in terms of entry, prices and services due to perceived natural monopolies, the need to correct market failures and the desires to promote universal access to networks among the other activities. Airlines, trucking, banking and insurance are the sectors where competition naturally exists, and regulators are concerned with the fair competition where as railroads, telecommunications, natural gas, electricity and cable television are sector where physical infrastructure exists and regulators aims to optimally utilize the existing infrastructure, are among the sectors, which have been heavily regulated. It was believed that in the absence of regulators' intervention, these industries would be characterized by the excessive entry, unstable prices, inefficient services, costly duplication of facilities and inadequate investments in innovation.

Regulations directly affect the innovative process, while innovation and technical change have significant impacts on regulations. To be successful, regulatory reform efforts must take into account the linkages between regulation and innovation. These regulatory reforms make sure that the regulations are fully responsive to changes in the economic, social and technical conditions surroundings them.

Regulations have numerous types of effects on innovations; especially in economic sphere they ensure a certain level of openness or competition in product markets, which further leads to research and innovations. The effects of insufficient competition in impeding technology diffusion are visible in the telecommunication sector, which remains under monopoly control in many countries. Of the 27 OECD (Organization for Economic Cooperation and Development) Member countries only eight allow competition in their telecom sector. Data shows that Internet penetration rate is five times higher in competitive than in monopoly markets.

Not only regulation and regulatory reform affect innovation and technology development but technology can also have a powerful effect on regulations, and it is more powerfully exhibited in telecommunication sector where the development of digital and other advances continue to revolutionize the sector. Information technology more specifically may alter the operations of the sector and bring into the question of structure of regulations.

These regulations are financial regulations, economic regulations, social regulations and administrative regulations.

1.   **Financial Regulations** *(Tariffs, License fees etc)*

Financial regulations in telecommunications involve the setting up of a tariff structure for service provider consistent with the users access to services which also protects the operators to bring in new investment that is an essential component of technological improvement of a sector. In addition to this license fee and annul tariff sent by the regulatory authorities have quite significant role on the performance of the   telecom service providers. The regulators restrict to producers from exploiting markets by imposing different bands of tariff, which differ across the countries from to region to region according to the prevailing economic conditions and purchasing power of the consumers.

2.   **Economic Regulations** *(Cost of service, Entry & Service Regulation)*

Competition law is a form of economic regulation intended to promote economic efficiency by ensuring that enterprises produce what consumers wants at the lowest prices. According to Schumpeter, concentrated market structures   favor technological progress mainly for reasons of static efficiency based on scale and scope economies. But other economists like Kenneth Arrow propose that monopolists and

oligopolists have little incentive to innovate because they already control all or most of the market. He has argued that the absence of competition will actually lead to less innovations; competition policy that focuses on eliminating monopoly and collusion should help dynamic efficiency.

3. **Social Regulations** *(Quality of Service)*

Social regulations are intended to protect the well being and rights of society at large which can include protection of the environment, health and safety in the work place, protection of rights of workers, and protection of buyers from fraudulent or incompetent behaviour by sellers. In the area of social regulations the question is not so much one of deregulating or introducing more competition, but of learning how to regulate better. Past experience shows that, while driving research, most environmental regulations have resulted in incremental technological improvements rather than true innovations.

4. **Administrative Regulations** *(Content regulations)*

Administrative regulations include different types of government rules covering the establishment and operations of business as a part of government oversight of producer-consumer relation: business operations, retail distribution and intellectual property. Many countries have taken innovative approaches to streamlining regulations, so that they will be less of a cumulative burden on business.

Reforms, which have promoted competition among firms, large or small, have stimulated innovations in most sectors, including telecommunication, utilities, financial services and retail distribution. Competition-enhancing reforms are also important to the diffusion of knowledge.

Does regulatory reform improve economy-wide performance?

Actual experience in many countries shows that regulatory reform, done properly, improves both economic and government performance. Although it is difficult to estimate economy-wide effects, an OECD study of five key sectors (electricity, telecommunications, air transport, road haulage and retail distribution) suggests that gains from far-reaching reform can be large. More heavily regulated countries, which include some European countries and Japan, can expect increased gross domestic product (GDP), to the order of 3 to 6 per cent, after ambitious reform programmes. Additional gains can be expected from market-opening reforms. Regulatory reform promotes the flow of goods, services, investment and technology between countries that benefit consumers, raise the standards of performance of domestic firms and boost GDP.

Other studies conducted in countries that have embarked on reform support the OECD estimates. Australia assesses its potential gains from reform to be around 5.5 per cent of total GDP. Japan estimates that reducing price and

productivity gaps with the United States through regulatory reform should increase domestic product by several percentage points. The European Single Market increased EU income by an estimated 1.5 per cent from 1987 to 1993, with the Commission projecting additional future gains.

As the world economy further integrates through trade and investment, producers of goods and services, as well as consumers and investors, share the benefits of more efficient and innovative economies.

Trade agreements thus can complement domestic efforts to reform regulations. The recent World Trade Organization (WTO) Agreement on Basic Telecommunications is a prime example. Mutual reform in this pivotal sector is expected to greatly expand output and benefit consumers and user industries in all participating countries. In addition to WTO agreements, agreements on mutual recognition of product standards and testing, such as in the European Single Market Programme, and commitments reached at the OECD have contributed to reform.

Regulatory reforms have had powerful effects on the quality, choice, and price of products and services in many sectors. This benefits not only individual consumers, but industries using the products or services in reformed sectors as well. For instance:

- Air transport: In the United States, real fares dropped by one-third from 1976 to 1993. More than half of the decline is attributed to deregulation. In European countries, following liberalization in 1993, authorities granted 800 new licenses, and more people are using low-cost economy fares.

- Finance: Market liberalization in OECD countries has been followed by a striking increase in the variety of financial instruments available to households and businesses. They include flexible savings accounts with near market interest rates, more flexible mortgages and financial derivatives.

- Pharmaceuticals: The time needed to bring new drugs to market in the European Union was reduced from five years to one under procedures centralized in the European Medicines Evaluation Agency.

- Telecommunications: Increased competition due to regulatory reform brought average prices for telephone services down by 63 per cent in the United Kingdom and 41 per cent in Japan. Long distance prices dropped 66 per cent in Finland.

Reform can also have transition costs and longer-term effects, such as business disruptions and failures, and can create new problems if done poorly. Failure to identify policy linkages and trade-offs, costs, risks and market incentives heightens the risk that regulatory reform can fail, or damage other public policies. The history of financial market reform shows how failure to prepare the ground can have serious consequences. In most cases, governments can reduce the magnitude and duration of costs of reform by

designing a comprehensive programme that includes targeted policies that preserve other public interests within competitive markets.

Regulatory reform's effect on jobs depends on the wider environment within which it takes place. Well-functioning labour markets and growth-oriented economic policies help ensure that new job opportunities created through reform translate into actual employment. In some sectors, reform can lead to net long-term job losses, particularly where firms have been heavily sheltered from competition. In other cases, early job cuts have been replaced by new jobs, often in the new firms. By boosting innovation, entrepreneurship, and business opportunities, broad-based regulatory reform can help create jobs in more productive and dynamic economies.

It must be recognized, however, that displacement due to the reform can be costly for both the workers affected and society, especially since some reformed sectors will lose jobs on a permanent basis. Here governments should adopt policies that increase the capacity of the economy to adjust, expand and raise aggregate employment, and policies that assist workers to take advantage of new job opportunities.

It is sometimes feared that competition in vital services such as communications, energy, and public transport will conflict with the objective of equal access or "universal service". This is because large-volume users have in

fact sometimes subsidised the smaller or individual users. In some cases of reform, negative effects have indeed occurred. However, experience shows that in many instances markets work just as well in providing universal service, and that governments can intervene where necessary with targeted policies that are more compatible with competitive markets. Many pro-competition reforms have included measures to ensure access to public services.

Reducing regulatory barriers and formalities for small and medium-sized enterprises is particularly important because these firms provide between 40 and 80 per cent of all jobs (depending on the country), and much innovation. Small and medium-scale businesses are particularly hard hit by the cumulative impact of administrative and other regulations. The cost of administrative burdens can be very high, and disproportionately so for smaller firms. Administrative requirements alone are estimated to cost European business 540 billion ECUs per year, equal to 3 to 4 per cent of total output. In Canada, very small firms spend 8 per cent of revenues complying with government paperwork, while larger firms spend 2 per cent. In the Netherlands small firms spend six times as much per employee as large firms on government paperwork.

2.5   INDUSTRY ADJUSTMENT TO THE ECONOMIC DEREGULATION

Neoclassical economic theory predicts that both a profit-maximizing monopolist and a perfectly competitive firm will operate on the technologically efficient

production frontier; that is, any profit-maximizing firm should always wish to minimize its costs, regardless of how much competition it faces. But a regulated firm is in a different situation. Although regulated firms can choose their technologies and operating practices, these choices are made subject to the state's control over prices, entry and exit and without the challenges posed by unrestricted competition from incumbent firms and new entrants, hence managers and employees face a rather different set of incentives in searching for greater efficiency. Nonetheless one can draw on some basic theoretical ideas to identify the central factors that will cause an industry to become more efficient as it adjust to deregulation.

An old-fashion view is that regulation improves welfare because it helps control monopoly. This view has been discredited because it is clear that regulation primarily limits competition among firms and this lack of competition causes an industry to accumulate substantial managerial slack or "X-inefficiency"; that is firms do not minimize the cost of producing a given level of output. When an industry is deregulated, unrestricted competition among incumbent firms and from new entrants forces the industry to shed such inefficiencies and to seek out innovations in marketing, operations, and technology.

Particular regulations can force firms to operate in an inefficient manner. Averch and Johnson (1962) showed that a hypothetical form of regulation, rate –of-return regulation, forced regulated firms to choose their inputs in an inefficient

manner; because the regulators determined a firms profits as a percentage of the firms capital invested. Such regulation leads to an operating inefficiency.

Finally regulations also prevent firms from responding effectively to external disturbances, such as recession or a large unanticipated change in prices or interest rates. An industry subject to regulation may, because of its cartel status be somewhat insulated from these shocks. Deregulated firms gain the ability to respond more effectively to external disturbances.

In short, an industry's adjustment to deregulation in theory may be shaped by intensified competition and increased operating freedoms that will cause the industry to become more technologically advanced to adopt more efficient operating and marketing practices and to respond more effectively to external shocks.

Chapter 3

ECONOMICS
OF
TELECOMMUNICATIONS

There exist three discrete economic stages for regulatory reforms that can be projected on the past experiences. These stages can be divided into short term (5) years mid term (5-10) years and long term (beyond 10 years, which permit us to anticipate the impact of regulation on industry.[1]

Stage I: Rapid expansion in new business creation combined with dramatic efforts to consolidate market share. It is characterized by a significant increase in merger acquisition, alliances and partnerships. New business entrants and initial public offerings position themselves to innovate new products and create new markets.

Stage II: In second stage the wave of mergers and acquisitions remains a prominent strategic feature embraced by corporations in telephony, computer and cable services. The principle emphasis in this stage is on securing market share and preventing competition from "seizing" traditional customers. The wave of initial public offerings (IPOs) also slows and new business entrants do not typically constitute an immediate strategic threat. The rate of absorption of new firms by older, established corporations accordingly diminishes.

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[1] James Shaw in "Telecommunication Deregulation" published by Artech House London

Stage III: And in final stage the new business entrants slow to a trickle, and competition declines as larger firms extend consolidation to primary and secondary markets. This stage often provokes consumer groups to demand re-regulations of the industry so as to mitigate the perceived harmful effects of industry consolidation.

3.1   ECONOMIC DIMENSIONS OF TELECOMMUNICATION REFORM

Ordinarily, macroeconomic analysis, as predicted by economists, is devoted to the evolution of the nation's money supply, resultant interest rates, employment rates, inflation and government budgeting.   Telecommunications innovations transform the nation's economy, while macroeconomic trends influence future consumption of telecommunications products and services. The nation appears to be headed for a telecommunications appetite that can broadly be described as requiring communication tools to contend with the emergence of a watershed change in the history of economic development.

The demand of telecommunications products and services is the product of both macroeconomic and microeconomic factors.   The demographic determinants of telecommunications consumption viewed from a macroeconomic perspective, include, income, saving, investment, and debt accumulation. These combined determinants influence consumer consumption.   The consumer spending for telecommunications products and services is growing exponentially

throughout the world. The appetite for communications services is fuelled by a growing need in developed nations to generate, monitor, distribute and interpret information efficiently. Such consumption is positively correlated with the complexity of work and need for enhanced productivity. However, it is also fuelled by insatiable demand or state of the art information in key industries: education, medicine, the science, entertainment, health care and business management.

If the intent of regulatory reforms is to encourage competitive markets, then we would identify three important overlaying characteristics to market supply and demand.

1. The number of buyers and sellers would be such that no entity could independently influence levels of price.

2. Fluctuations in pricing levels would have to remain unimpeded by government sanction, regulation or intervention of any kind.

3. Movement of buyers and sellers would remain mobile over time. Suppliers too would be free to move in and out of veteran and emerging product lines to secure their clientele.

The interaction of supply and demand defines price, with supply and demand curves ever changing. Thus price will ordinarily remain a constant if government asserts its regulatory powers to the end. Price stability, or

predictability will be sacrificed in the short run if deregulation is manifested in the way its sponsor's intended, but greater congruence between market supply and demand will be attained in the long run. The effect of this congruence would lead to equilibrium price, the state in which buyers want to buy the same quantity that sellers are prepared to sell.

We may conclude that the standard application of supply and demand analysis is appropriate to pricing for content providers. Those communication firms that supply content for infrastructure--telephony, television an computer thrive, survive or die by the prevailing dynamics of supply and demand. Those who manage control, design, or create networking infrastructure operate in fundamentally different environment. Costs for generating content for the infrastructure tend to be labour intensive; costs of developing that infrastructure are capital intensive and typically require a substantial time horizon to gain profitability. In short run the cost of labour is decisive in content of development; the cost of capital is key in infrastructure development. Thus the economies of scope (cost savings through multifaceted service provision) coupled with economies of scale (the decline in per-unit costs as production rises) are essential for network managers. Reducing network costs per subscriber while exploiting profit potential from an expanding array of value added network services is critical to the emerging deregulated environment as shown in the figure below:

COST/UNIT
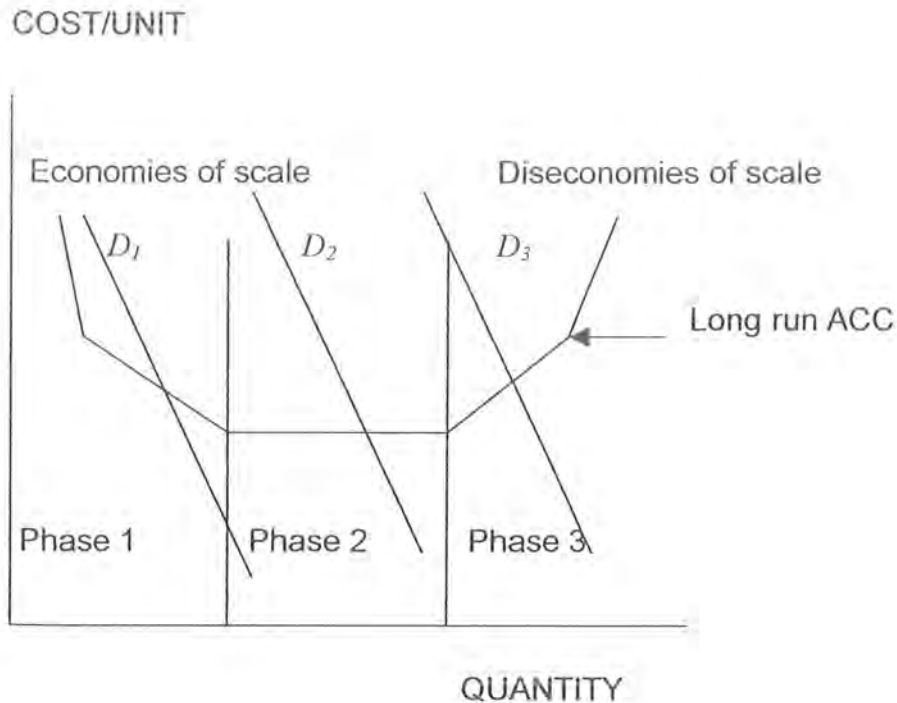
3.1

Large network providers obviously hold at least a short-term advantage during the early states of deregulation. These firms are best able to exploit the fundamental principles of economies of scope and scale; they are best positioned fundamentally. The above-cited figure depicts three different scenarios for economics of scale. The effects of regulatory reform may be more fruitful in telecom sector growth in Phase-I compared to Phase II and III. Phase I indicates the situation when large networks are available and regulating the industry will lead to higher growth since the cost per subscriber decreases. Most of the developing and Asian countries lies in this Phase as their teledensity is much lower than the capacity of the infrastructure. In second phase the

demands for telecommunications services is in accordance with the size of the prevailing networks. Attempts made to regulate by allowing competition will attracts private operator to adopt new innovation and technology to capture the maximum share of the market. In fact this face is revolutionary in the growth of telecommunication services as it tempts the market sharers to enhance their clientele by improving the quality of service as well as encourage innovate process to provide its subscriber a better and most efficient alternative. Whereas diseconomies emerge in Phase III where the entire network is fully utilized and cost for an additional subscriber rises, firms seeks to exploit economies of scope by designing new products.

This hypothetical telecommunication services model indicates that in the long run the average cost for servicing telecommunications subscribers falls due to the economies of scale; later cost of servicing subscribers rise in response to diseconomies of scale. In response the firms seeks to exploit economies of scope by designing new product line and generating added revenue.

Reforms, which have promoted competition among firms, large or small, have stimulated innovations in most sectors, including telecommunication sector.

Demand for Telecommunication Services

3.2 (a)
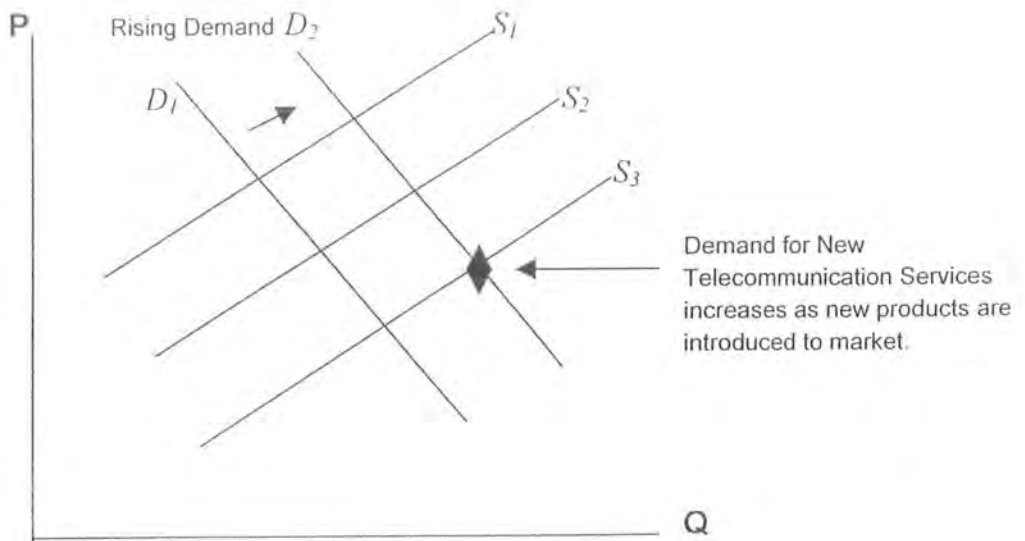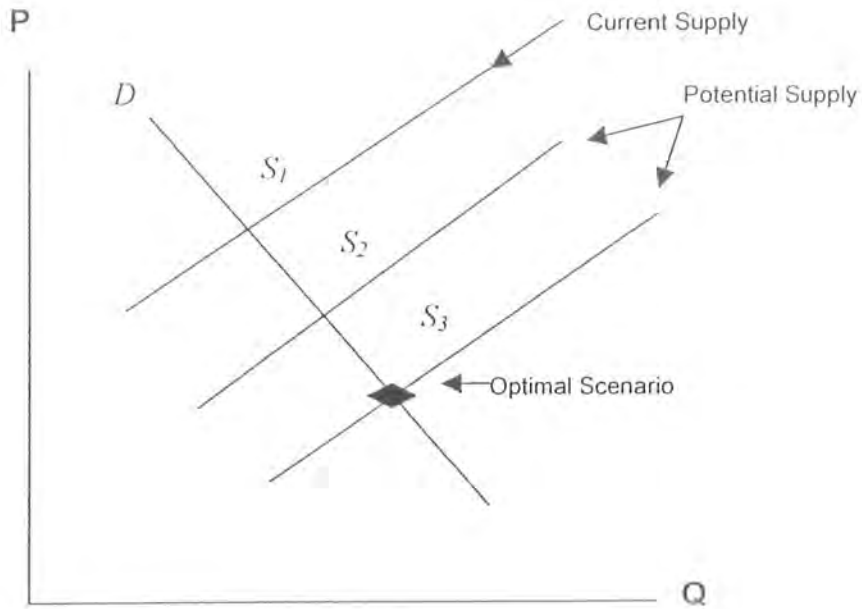
3.2 (b)

The reformers are content with the fact that constant innovation in the telecommunication sector would precipitate rapid substitution of veteran product lines in favour of new, cheaper substitutes. In short run the supply of telecommunication services will increase as depicted by 3.2 (a) i.e. through a downward shift of the supply curves resulting in a decline in prices. In response to that the consumer will become appetite to new products. So the customers' appetite for new information services increases the demand for the telecommunication services as array of new products is introduced in the market the result of which is that telecom service provider earns higher profits.

Chapter 4

REVIEW OF LITERATURE

To date, there have been surprisingly a few studies analysing the role of telecommunication industry in the development of an economy, yet this industry has emerged as a revolutionary   ingredient of the growth of the economies. Vickers and Arrows (1988) reviewed a broad range of studies and concluded that private ownership is superior to public ownership in competitive markets but not in non-competitive ones. It is also argued that ownership matters in the sense that changes in the structure of property rights are likely to have significant effect upon firm behaviour. Their main message is that managerial incentives structures are determined via a complex set of interaction among factors that include the type of ownership, the degree of product market competition, and the effectiveness of regulations.

Ambrose et al (1990) noted "simply moving a monopoly from the public to private sphere will not result in competitive behaviour." Indeed " private investors, worry of highly politicised processes, have long demanded independent regulators who are removed from government influence.

Gala et. al (1992) examined twelve enterprises (three of which were telecommunications firms) in their study of the welfare effects of privatisation

30

in Chile Malaysia, Mexico and Britain and came out with a positive overall assessment, but admitted problems in separating the effects of privatisation from contemporaneous changes in state policies regarding investment, labour regulation, and the organisational restructuring of state-owned enterprises.

Wellenius (1992) observed, "A single monopoly operating enterprise, whether state-owned or private, is increasingly unable to meet equally well the large, varied, and rapidly changing demands of all types of users. Competition, or a credible threat of competition, is likely to spur establishment operating enterprises to focus attention on customers, improve service, accelerate network expansion, reduce costs, and lower prices" Most agrees also that while privatisation can brings about great improvements, it must be combined with effective regulation.

On the effects of privatisation, Wellenius et al (1992) concluded from their case studies that initial results from privatising state telecommunications enterprises are generally very encouraging. Governments have successfully sold to consortia led by experienced foreign operating companies capable of providing expert managers. Especially management tools, and continued access to latest technologies, good financial performance, reflecting both major tariff adjustments and lower costs is allowing privatised companies to initially   finance accelerated investments largely from internally generated

funds. Also international markets have been increasingly willing to provide large amounts of capital for privatised companies in countries with sound macroeconomic and regulatory frameworks (e.g. Chile, Mexico, Argentina)

Wellenius et al (1992) sounded a note of caution from their case studies though. They noted, "the single most troubling issue in recent reforms is slow progress in developing regulatory capabilities. Where some developing countries have carried out satisfactory privatisation in little over one year, the telecommunication regulatory systems are only in their infancy."

Taylor and Taylor (1993) using data set of 1984-1991 analysed effects of telephone prices on basic residential access and estimated the demand equation for post divestiture long distance competition in United States, exhibiting the effects of the breakdown of AT&T on telephone penetration. They compared the decade before divestiture with the period after divestiture. During the 1972-1982 period, demand for residential mainlines was predicted to grow at an annual rate of 6.58% which averaged at 8.92% while during 1984-91 the demand grew at the annual rate of 11.81% in contrast with the predicted 10.79%. They concluded that competitive entry into the interstate long-distance service has resulted in vigorous competition in the large business market. In the aggregate interstate toll market, AT&T's market share had fallen and its demand curve had accordingly become more

elastic. Supply elasticities of competitive firms had increased during the periods.

In a similar study Hausman, Tardiff and Belinfante (1993) studied the effects of the break-up of AT&T on telephone penetration in the United stated and estimated a model for basic excess demand considering the Federal Communication Commission (FCC) regulations and State Public Utility Commission (PUC) regulations for the period 1984-88 and concluded that due to the price changes attributed to FCC interstate access-charge policy, prices fell in real terms about 30%. One of the results was that economic efficiency would occur if telephone prices were more cost-based and if the cross subsidy for basic residential access were reduced. Further the evidence from the period after the break up of AT&T during the 1980s tends to show that increased penetration resulted in part from the combined effects of higher monthly basic access charges and lower long distances charges and efficiency gains are likely to arise if long-distance calls prices are lowered. These changes can come about in either of two ways by FCC or PUC.

Kwoka (1993) presented an econometric study on the effects of privatisation and competition on Total Factor Productivity (TFP). He concluded that competition for AT&T and privatisation of British Telecom has resulted in significant gains in productivity, 17% and 25% respectively. On

the other hand Foreman, Peck and Manning (1988) compares elsewhere in Europe using TFP criterion. They conclude that British Telecom (BT) is less efficient than the control group.

Megginson et al (1994) compared pre and post privatisation financial and operating performance of 61 companies (in 32 industries, including telecommunications) from 18 countries. They found that " after being privatised, firms increase real sales, become more profitable, increase their capital spending, improve their operating efficiency, and increase their work forces."

Galal et al (1995) adopted a hybrid approach to study the effects of regulatory reforms. They compared the performance of the telecom sector in several countries before and after regulatory reforms. They attempted to explore how well countries were able to balance regulatory objectives: commitment, information, asymmetry and pricing issues. They found that the one in their sample (Chile) that resolved all three issues achieved the greatest improvement, while the one country (Philippines) that did not experience the worst performance. Countries that resolved some issues experienced mixed success.

Finding a linkage between telecommunication and employment Kelly and Minges (1995) carried out a region-wise comparative study and reached

the conclusion that employment in the world-wide telecommunication sector is dropping regardless of region or operator status (e.g. government run, state-owned, partly private or fully private). While the introduction of competition often results in new operators providing employment opportunities, the amount of new staff hired is substantially below the levels released by incumbent operators. There is no example of an overall increase in employment as a direct result of competition. The impact of privatisation on telecommunication employment is mixed. In some countries it has resulted in a drop in staff while in others it has resulted in an increase in staff. The statistics do not show that privatisation by itself results in relatively higher productivity growth in telecommunications sector.

Ramamurti (1996) examined the privatisation of telecommunications in Mexico, Argentina, Jamaica and Venezuela. He concluded that the most striking and consistent short-run result in the telecommunications sector was the rapid expansion of the network after privatisation. He found that three to four years after the privatisation, the network grew at 13 percent per annum in Mexico, 13% per annum in Argentina, more than 15 percent per annum in Venezuela and 18 percent per annum in Jamaica. In addition he found that labour productivity grew by double digits in these countries.

Klein (1996) argued on the basis of empirical analysis that ownership change by itself will often yield results, especially when it reduces the

government interference. But the regulation required in areas of natural monopoly can become over intrusive and undermine progress. Real competition is required to generate sizable and lasting welfare improvements. But in infrastructure sectors, the introduction of competition is complicated by the existence of complex transport and communication networks. Klein argues that policy makers need to understand how competitive forces can be brought to bear in network industries. In case of doubt, he contends, policy makers should not restrict the entry of competitive firms in such networks. If they do, entry restriction should be subject to an automatic test after a set period and review for the costs and benefits.

Petrazzini and Clark (1996) studied the effects of competition in Latin America and Asia. Using the existence of cellular firms as evidence of competition, they compared the performance of competitive and non-competitive markets. They found that cellular and mainline penetration in competitive markets is higher than in non-competitive markets.

A comparative study done by Waverman and Sirel, (1997) helped them to conclude that those countries which have implemented regulatory reforms in the publicly owned telecom industry have envisaged tremendous growth in the infrastructure as well as provision of the quality services. At the same time telecom revenue as well telecom investment increased tremendously for instance the telecom Investment per capita in France was

$47 in 1975, which rose up to $109 during the 1994 period. Where as the telecom revenue per capita grew from $82 in 1975 to $410 in 1994.[1]

In context of the labour market efficiency Peoples (1998) studied that regulatory reforms and the labour saving technology has eroded the bargaining advantage of the unions This erosion of bargaining power is compounded by the continued displacement of members by new labour saving technology and has increased share of non-union supervisory personnel and resulted in efficiency as well as productivity of the telecommunication.

Ros (1998) concluded that the countries, which permit competition in either local or long distance or international services, have higher level of efficiency than those countries that either have private network or do not permit competition. He argued that while countries that privatise their networks and prohibit competition in basic service may not experience lower network expansion than they otherwise would if they had also permitted competition, there are likely to be technical efficiency losses for prohibiting competition.

Singh (1998) evaluating the telecommunication privatisation and liberalization in India and the Far East dug out three main conclusions;

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[1] Based on ITU data

services remain beholden to pressures from larger user group and governmental prerogatives in most countries; introducing market competition is slow and messy and difficult to manage, and while "East Asia Model" continues to break down, the liberal alternatives poses serious problems as well. Above all, without adequate property rights and enforcement mechanisms in place, it is unrealistic to except markets to work efficiently.

In general there is broad agreement that competition is likely to be most effective method of promoting improvements in the telecom sector.

Walsten (1999) carried out an econometric study using fixed effect technique to explore the cross-sectional effects of competition, privatisation, and regulation in Africa and Latin America. His empirical analysis justifies the Ros (1998) results that competition is positively related with the network expansion. Walsten concludes that competition measured by mobile operators not owned by the incumbent is correlated with increases in per capita number of mainlines, payphones and connection capacity, and with the decrease in the price of local calls. Privatising an incumbent is negatively correlated with mainlines penetration and connection capacity. Privatisation combined with an independent regulator (which indicates that reforms are at least minimally addressing the issue of regulation), however, is positively correlated with connection capacity and substantially mitigates the negative effect on mainlines. The results indicate that reform effort tends to be

concentrated in the right areas: encouraging competition and emphasizing building of regulatory capacity when privatising an incumbent telecom provider.

Shirin (2000) attempted to evaluate the determinants of diffusion of mobile telecommunications using the data of some selected Asian countries by arguing that the development of information infrastructure depends crucially on changes in the regulatory framework of telecommunication sector, which eliminate restrictions on new entry in to industry. The role of technology, the timing of first license, and the introduction of competition were the other main determinants of diffusion of mobile telecommunications because the early adopters of the technology have a fairly long persisting lead.

Thus an empirical review of literature reveals that over the period, much emphasis is being given on liberalisation of the monopolistically owned telecommunications sector. Different types of regulatory reforms are implemented to enhance the productivity & quality of service and to meet the ever-rising demands of telecom services. Almost all comparative studies lead to one point of conclusion that the regulatory reforms have positive impact on the telecom sector growth, but these studies lack in the making any comments regarding other aspects of telecom sectors:

Firstly what types of regulatory reforms must be taken to improve the efficiency of telecommunication sector such as:

Secondly how these telecom sector reforms are contributing to the economic growth of the countries. Or what are the impacts the reforms on the telecom sector growth and then ultimately on economic growth

Thirdly, in which region these reforms are more result oriented and what manner these reforms should be implemented to improve the efficiency as well as quality of telecom sector.

THEORETICAL UNDERPINNINGS

Even though the economic literature contains well-established and testable hypotheses of effects of competition on firm and sector performance, still the theoretical effects of regulatory reforms in telecom sector are not clear. In addition, the telecommunications sector is characterized by significant economies of scale and by large amounts of assets non deployable in other uses. It becomes important to take into account these factors when determining the effects of reform on firm and industry performance in telecommunications.

According to the New Institutional Economics approach, North (1990) and Levy and Spiller (1996), *'Privatising is the transfer from public to the*

40

private sector of the ownership of productive assets, their allocation and pricing and the entitlement to the residual profit flow generated."[2]

According to this approach the type of reforms and ownership will have significant effects on behaviour and performance since changes in property rights will alter the incentive structures faced by decision makers. A change in the allocation of property rights leads to a different structure of incentives for management and hence to changes in both managerial behaviour and company performance. A switch from public to private ownership results in more precise and measurable objectives on part of the owners thus creating the environment and incentives to monitor and control management. Supervising management and monitoring is costly because under public ownership non-commercial objectives are pursued and individuals have less incentives to exert the effort to see that resources are used efficiently.

The new Institutional Economics literature also predicts that competition will have positive effects on technical efficiency. Competition generates information thus lowering costs for the owners of the firm, regardless of who owns the assets. Competition between the firms in the same market means that prices and profits reveal important information

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[2] The new institutional economics is a way of reasoning and approaching political economic problems. Its objective is to broaden out and modify the microeconomic foundation of economic theory by taking into account the important effects that institutions have on the performance of economics over time.

about the costs of an enterprise and efficiency of input use. If the market is competitive, profit and prices will assist the principal in determining equilibrium inputs needed to compete effectively. Thus, competition can have direct effects on the internal efficiency of the firm.

The institutional factors play important roles in the success or failure of privatisation. This success in return depends on the regulatory reforms affected by social and political institutions. Performance can be satisfactory as long as there are constraints on the discretions of the regulator. Variables such as the strength of the judiciary and type of presidential and regulatory system play important roles. Although these variables are important theoretical determinants, data constraints prevent them to be incorporated in the models.

Chapter 5

DATA DESCRIPTION AND METHODOLOGY

In order to analyze the impact of regulatory reforms on the telecommunication sector and examine the efficiency parameters, a time series data set of thirty countries over a period of twelve (12) years right from the period of implementation of regulatory reforms has been chosen. These statistics have been obtained from the "Year Book of Statistics 1998-97 & 1990-99", published by International Telecommunication Union (ITU). "World Telecom Reports (1988 to 1999)" of ITU were another big source of data mining. As before 1980's almost in every country, the majority of telecommunication services were in the hands of public sector and these services were not so much commercialized as today. But in early 1980's a revolution took place and the telecommunication sector showed tremendous growth exhibiting a technological shift and electronic media revolution. The objective behind the selection of the data for the 1988-99 period is that this era has shown enormous variations in the entire telecommunication industry, which may be much appropriate to dig out the efficiency parameters and draw a solid conclusion about the regularization of telecommunication sector.

Meanwhile to grasp the maximum variation, the data of thirty countries over a span of twelve years has been pooled employing dummies as control variables to estimate the uniform shifts over the period of twelve years. The

43

effects of reforms are to be ascertained by main lines per inhabitants and its growth and the efficiency of the entire sector is will be examined by the variation in the main lines per employee and its growth. Table 5.1 gives the list of countries, which have either fully privatized or partially privatized their telecom sector.

Table 5.1 gives the sector structure of countries that have been selected for the empirical analysis. In overall sample there are only seven countries which have fully privatized their telecommunication sector with cent per cent private sector privatization. But for our empirical investigation the countries, which have privatized more the 50% share of their telecom sector, are considered have privatized telecommunication sector and for the rest of the countries it is assumed that their telecom sector is publicly owned. Similarly the countries that have a separate regulatory authority for more than five years are assumed to have a regulated telecommunication sector.

Table 5.1

LIST OF COUNTRIES HAVING REGULATORY REFOMS

Sector Structure

Countries	Incumbent operator	Ownership	Date of Privatization	% share Privatized
Argentina	Telecom and Telefonica	Fully Privatizd	1990	100
Australia	Telstra Corportion	Fully Privatizd	1991	100
Barbados	BTCL	Partially Privatized	1991	36
Belgium	Belgacom	Partially Privatized	1996	49
Bolivia	ENTEL	Partially Privatized	1995	50
Brazil	The Telebras System,	Fully Privatizd	1998	100
Canada	The Stentor Alliance	Fully Privatizd	1987	100
Capverde	Cap Vert Telecom Sarl	Partially Privatized	1995	40
Chile	CTC	Partially Privatized	1987	69
Czech Rep	SPT Telecom	Partially Privatized	1994	49
Denmark	Tele Denmark	Fully Privatizd	1991	100
Germany	Deutsche Telekom	Partially Privatized	1996	26
Greece	OTE	Partially Privatized	1996	8
Guinea	Sotelgui	Partially Privatized	1996	60
Guyana	GT&T	Partially Privatized	1991	80
Hungry	H.T.C.	Fully Privatizd	1993	67.2
India	MTNL	Partially Privatized	1995	10
Indonesia	PT Telecom	Partially Privatized	1995	54
Ireland	Eircom	Fully Privatizd	1996	80
Israel	Bezaq	Partially Privatized	1990	24
Jamaica	Cable & Wireless Jamica Ltd.	Partially Privatized	1989	40
Japan	NTT	Partially Privatized	1985	34.6
Korea	Korea Telecom	Partially Privatized	1993	28.8
Malaysia	Telecom Malaysia	Partially Privatized	1990	22.65
Mexico	Telmax	Fully Privatizd	1990	51
Newzeland	TCNZ	Partially Privatized	1994	12
Pakistan	PTCL	Partially Privatized	1994	12
Portugal	Potugal Telecom	Partially Privatized	1995	49
Singapore	Singtel	Partially Privatized	1993	16.67
U.Kingdom	BT	Fully Privatizd	1984	100

Source: International Telecommunication Union

Descriptive Analysis

A cross-sectional analysis indicated in the Table 5.2 represents the average annual growth rate of the teledensity (mainlines per 100 inhabitants and residential mainlines per100 inhabitants). For the group of countries having GDP<$10,000/capita considered to be underdeveloped and developing countries, the cumulative annual growth rate (CAGR) from 1988 to 1999 of mainlines per 100 inhabitants is three times the other countries which are developed and GDP >$10000/capita. Similarly the CAGR in residential mainlines is as much as nine times higher in the countries with GDP<$10000/capita than the countries having GDP>$ 10000/capita. This is a result of the higher demand for telecom services in developing countries where waiting list for telecom services is always high. The privatisation regulatory reforms have positively affected the growth rate of telecom services. The reason of lower telecom growth rate in developed countries is that these countries already had higher teledensity and lower waiting list so therefore, there is not much growth in the teledensity in these countries. Similarly the countries which have privatised (>50% share) their telecom sector by allowing competition have 9.75 percent annual growth rate in mainlines which is higher than the annual growth rate of countries which are partially privatised (<50% share) of their telecom sector. This observation indicates that average annual growth in the telecom is higher in developing countries allowing privatisation. In the sample the countries which privatised telecom sector and have GDP<$10000/capita, the annual growth in the

mainlines is 1.8 times higher showing an annual growth of 7.43 percent in mainlines per 100 inhabitants and 5.8 percent in residential mainlines, than the countries which have although privately owned telecom sector, but higher GDP growth being developed countries. Another close look at the data indicates that the countries which have partially privatised their networks or, are in the period of transition, right after the implementation of regulatory reforms among the developing countries, have a tremendous growth in the telecom network as much as an annual growth in teledensity of 12.25 % as compared to the other group of countries.

Table 5.2

Cumulative Annual Growth Rate of Basic Telecom Indicators

Telecom Indicators	Telecom Sector		GDP (US$)		Publicly Owned GDP		Privately Owned GDP	
	Pvt	Non Pvt	<10000	>10000	<10000	>10000	<10000	>10000
Mainlines/100 inhabitants	9.75	9.49	12.44	4.18	12.25	4.42	7.43	3.9
Residential Mainlines100	6.67	6.89	9.73	1.04	9.6	1.91	5.8	0.01
ML/Employee	11.57	9.66	14.44	6.57	11.3	6.6	13.34	6.48
TR/Employee	6.61	8.47	7.73	7.95	8.29	8.87	4.06	6.97
TR/Mainline	0.72	-0.11	-2.22	3.01	-2.33	3.96	-1.24	1.89
%△Employment (1988-99)	-9.06	-2.72	8.28	-15.73	9.45	-18.3	0.73	-12.5
Employment (G)	-0.37	-0.13	0.73	-1.73	0.13	-2.2	0.22	-1.15
Quality of Service	92.70	50.77	84.21	52.65	48.77	76.95	95.35	42.21

Source: *ITU*

In Table 5.2 another indicator of telecommunication sector; mainline per employee growth justifies the same observation that is the countries which have privatised their telecommunication sector have 11.57 percent average annual growth in the teledensity where as the countries having

47

majority of the share of telecom sector in the hands of public have an annual growth of 9.66 percent. This deviation increases more in the case of under developed and developing countries allowing competition in the telecom sector. As far as the major reason that can be envisaged is that the waiting list and pending demand of the telecom services as well as the other value added services is always higher in the developing economies. With the implementation of regulatory reforms to enhance the telecom industry, the respective governments in these countries encouraged the private investors to invest in this highly profitable sector, which not only resulted in the growth of basic telephony services, but also led to higher annual investment in this sector.

Looking at the productivity and output side of the telecom sector, as shown in Table 5.2, there is not as much variation in the total annual revenue of telecom sector per employee among different group of countries and there is almost a constant growth in total revenue per employee. Similarly the total revenue/mainline does not exhibit any kind of dominating effect showing any positive are negative impact of telecom reforms. But a close look, at the sample data represents that the countries which are in the span of transition from state-owned to privately-owned telecom sector there is quite a reasonable improvement in the total revenue per employee and total revenue per mainline after the introduction of regulatory reforms. Information

48

Technology boom of 90s has also changed the productivity pattern of the countries.

On labour efficiency side of the telecommunication sector, the indicator that best explain that how efficient the labour is in the telecommunication sector, how faster it improved is the improvement in the quality of services and its other value added services. Quality of telecommunication sector which is measured by faults per 100 mainlines per year has also improved in the privatised economies by a reduction of faults per 100 mainlines per year by 92.70 percents which is almost as much as double of reduction in the faults of partially privatised countries. The same is the case for developing countries which have privatised the telecom network. This is another strong evidence for the effectiveness of privatisation empowered by regulatory reforms. The rate of reduction of faults in developed countries is low as compared to the developing countries mainline due the reason that the number of faults 100 mainlines per year in developed countries almost negligible.

Methodology

To estimate a system of equations, fixed effect model is incorporated as according to Kennedy[1] (1992), when the sample data is pooled time-series, use of fixed effect model is reasonable because to estimate the

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[1] Kennedy Peter (1992) "A Guide to Econometrics" The MIT Press.

variation across the countries this model gives best estimate which takes into account the excluded bias, or we may say, it estimates the mean effect of excluded variables.

The general form of model is

$$Y_{it} = \alpha_i + \beta x_{it} + \delta d_{it} + v_{it} + \xi_{it}$$

Where Y_{it} is the dependent variable (mainlines per 100 inhabitants, growth of mainlines per 100 inhabitants growth, mainlines per employee and mainlines per employee growth) and X_{it} is the vector of exogenous controlled variables.

β_{it} is 1Xk vector of parameters where K is the number of control variables for each regression estimate. δ is vector of dummy constants, d_{it} are dummies variables for nature of sector (privatisation, regulation and competition) to capture effects of reforms. α_i is scalar constant representing the effects of those variables peculiar to the *ith* country in more or less same fashion over time, v_{it} is the unit specific residual that differs between units but remains constant for any particular unit, while ξ_{it} is the usual residual and uncorrelated with itself.

Transformation of the Model

First equation that is estimated is the investigation of privatisation effects on the network expansion and efficiency of the telecom sector.

$$Y_{it} = \alpha_i + \gamma_t + \beta_1 (Pvt_{it}) + \beta_2 (X_{it}) + \epsilon_{it} \qquad (1)$$

To incorporate the effects of a regulatory authority on these indicators another equation including the regulation as dummy variables has be bee used.

$$Y_{it} = \alpha_i + \gamma_t + \beta_1 (Pvt_{it}) + \beta_2 (Reg_{it}) + \beta_2 (X_{it}) + \epsilon_{it} \qquad (2)$$

Transforming the model a little bit complex a third equation interacted with the competition in basic services is also estimated.

$$Y_{it} = \alpha_i + \gamma_t + \beta_1 (Pvt_{it}) + \beta_2 (Reg_{it}) + \beta_2 (Comp_{it}) + \beta_2 (X_{it}) + \epsilon_{it} \qquad (3)$$

The final equation that is estimated incorporates the privatisations combined with regulations-means the countries where privatisation is there but not separate regulatory body and both the function are performed by the same institution.

$$Y_{it} = \alpha_i + \gamma_t + \beta_1 (Pvt_{it} *Reg_{it}) + \beta_2 (Comp_{it}) + \beta_2 (X_{it}) + \epsilon_{it} \qquad (4)$$

To analyse the profitability of telecommunication sector and business opportunities for the producer in this sector, the variables of local call charges and telecom revenue per employee have been also introduced.

In all the above four equations, X_{it} is the control variable for GDP/capita local call charges (peak rate) and telecom revenue per employee. GDP/Capita and local call charges (peak rate) are supposed to be positively correlated with mainlines per 100 inhabitants, whereas qualitative variables regulations, privatisation and competition in basic services are other important factors which boost up the telecom sector and expected to have positive signs.

The construction of deterministic variables is based on the economic theory i.e. for the privatisation, a country is supposed to have privatised more than fifty percent of its telecommunication sector, for regulations the existence of a separate regulatory body for five years is made compulsory as it is the minimum term for regulatory reforms described by James Shaw and the impact of competition is to be captured by the existence of competition measured by the number of private operators.

Simple OLS technique has been employed for the estimation of fixed effect model and all the estimations have been done in E-views.

Chapter 6

EMPIRICAL EVIDENCE

This chapter presents the empirical evidence from estimating the equations as described in the methodology using fixed effects model. In our analysis the main emphasis has been given on two main indicators of the telecom sector; the expansion indicator measured by teledensity (mainlines per hundred inhabitants) and the efficiency indicator measured by mainlines per employee.

Results

Table 6.1 shows the results of estimation using mainline per 100 inhabitants as the dependent variable. It gives the results of equations with different specifications as discussed in the methodology. For the over all sample of 30 countries privatisation is negatively related with the mainlines per 100 inhabitants showing that privatising an incumbent operator will lead to a decrease in 1.68 mainlines per 100 inhabitants. Whereas we see that in equation 1 and 2 establishing a separate regulator along with privatising the incumbent operator is positively related with the teledensity showing an increase of 5.8 mainlines per 100 inhabitants. The privatisation combined the regulation is also positively related in the over all sample. As exhibited by equation 2 of Table 6.1 the competition in basic services is also positively

and significantly related with mainlines penetration. The GDP/Capita as is strongly and positively related with the mainlines per 100 inhabitants all specifications.

Table 6.2 displays the empirical results of privatisation, regulation and competition on the efficiency of the telecommunication sector using the mainlines per employee as the dependent variable. The same four specifications have been used here to grasp the effect privatisation, regulation, and competition on telecom sector efficiency. Equation 1 shows the impact of privatisation on mainlines per employee, which is negative. Whereas the equation 2 indicates that the mainlines per employees is positively correlated with regulation, showing an increase in the mainlines per employee. Although the competition in basic services has negatively related with the mainlines per employee while privatisation along with a separate regulator is related with a decrease. This explanation is consistent with the theory that competition brings about new investment, which requires additional workers. A privatised firm subject to price regulation meanwhile may face incentive to cut costs, leading it to reduce its workforce. GDP/Capita is positively related with mainlines per employee.

Table 6.1
Effects on Mainlines Per 100 inhabitants
Fixed Effects Estimation

Dependent Variable: Mainlines per 100 inhabitants
Mean of Dependent Variable: 26.40925

Variables	Equation 1 Co-efficient	Equation 2 Co-efficient	Equation 3 Co-efficient	Equation 4 Co-efficient
Constant	6.269253	5.19662	7.991253	7.120271
	(6.78843)*	(5.257431)*	(10.59644)*	
Privatisation	-1.168734	-1.441844		
	(-1.19033)***	(-1.47615)***		
Regulation	5.83432	5.938985		
	(0.980626)	(6.112882)*		
Competition in Basic Services		3.323195		2.612088
		(2.862684)*		(2.20973)*
Privatisation +Regulation			2.715234	2.408616
			(2.34646)*	(2.07702)*
GDP/Capita	0.001817	0.001736	0.001809	0.001746
	(35.81902)	(30.11887)	(33.87035)	(28.98143)
R-Squared	0.790103	0.794839	0.772645	0.775721
Number of Observations	360	360	360	360

Table 6.2
Effects on Mainlines per Employee
Fixed Effects Estimation

Dependent Variable: *Main lines per Employee (Efficiency Parameter)*
Mean of Dependent Variable: 820.0583

Variables	Equation 1 Co-efficient	Equation 2 Co-efficient	Equation 3 Co-efficient	Equation 4 Co-efficient
Constant	909.0972	693.4015	1084.878	1168.899
	(7.175240)*	(4.990398)*	(7.745128)*	(9.96351)*
Privatisation	-521.29141	-509.874	-491.289	
	(-3.505257)*	(-3.99985)*	(-3.54867)*	
Regulation		519.6369	481.4732	
		(3.522031)*	(3.496399)*	
Competition in Basic Services			-1179.323	-1197.815
			(-7.3647)*	(-7.311839)*
Privatisation + Regulation				-401.0066
				(-2.49829)*
GDP/Capita	0.015768	.014577	0.044094	0.048744
	(2.036283)*	(1.910411)*	(5.398718)*	(5.843083)*
R-Squared	0.43987	0.76177	0.198617	0.163986
Number of Observations				

Significance level: * 1%   ** 5%   *** 10%

Classification of Sample:

In order to have a clearer picture of the telecom regulatory reforms the data set has been divided into two categories:

i)   GDP-wise Categorization

ii)   Region-wise Categorization

In GDP-wise categorization, separate equations have been estimated for countries which have GDP>$10,000 per capita and GDP<$10000 per capita. In region-wise classification three regions have been taken into account namely Asian Pacific Region, European Region and American Region.

Regression Results for Countries having GDP>$10000/capita

Table 6.3 and 6.4 shows the results of equation estimated for the countries whose GDP>$10000/capita and which are considered as developed countries. The results of first specification show that for these countries privatisation is positively related with the teledensity, the co-efficient implies that the privatisation of an incumbent operator leads to an increase of 7.9 mainlines per hundred inhabitants whereas the regulation along with the privatisation is also positively related with the mainlines penetration as shown by equation 2 of table 6.4. The other interesting result for the higher income countries is that competition in basic services is also positively related with the improvement in mainlines per hundred inhabitants by a factor of 1.8 mainlines.

Table 6.3

Effects on Mainlines per 100 Inhabitants
Fixed Effects Estimation
Dependent Variable: *Main lines per 100 inhabitants (Teledensity)*
Mean of Dependent Variable: 46.98356

| Variables | GDP>$10000/capita | | | |
	Equation 1 *Co-efficient*	Equation 2 *Co-efficient*	Equation 3 *Co-efficient*	Equation 4 *Co-efficient*
Constant	24.25025	25.32482	28.88773	27.35459
	(12.65776)*	(14.09781)*	(19.85688)*	(13.68126)*
Privatisation	7.896281	5.194157		
	(7.468646)*	(4.53838)*		
Regulation		5.188268		
		(4.609118)*		
Competition in Basic Services				1.766736
				(1.116592)****
Privatisation + Regulation			10.11498	9.861468
			(10.96484)*	(10.38961)*
GDP/Capita	0.00089	0.000795	0.000696	0.000697
	(11.30124)*	(10.45997)*	(10.49014)*	(10.51334)*
R-Squared	0.543567	0.608615	0.66116111	0.664924
Number of Observations	132	132	132	132

Table 6.4

Effects on Mainlines per Employee
Fixed Effects Estimation
Dependent Variable: *Main lines per Employee (Efficiency Parameter)*
Mean of Dependent Variable: 925.1280

| Variables | GDP>$10000/capita | | | |
	Equation 1 *Co-efficient*	Equation 2 *Co-efficient*	Equation 3 *Co-efficient*	Equation 2 *Co-efficient*
Constant	2237.021	2429.391	953.264	
	(7.695619)*	(8.452751)*	(3.821146)*	
Privatisation	419.345			
	(2.711894)*			
Regulation	-472.5175			
	(-3.183405)*			
Competition in Basic Services	-1855.469	-342.9571		
	(-7.915495)*	(-2.513635)*		
Privatisation +Regulation		-1701.03	-587.045	
		(-7.478936)*	(-3.711006)*	
GDP/Capita	0.017433	0.008058	0.008951	
	(0.0822)	(0.845226)	(0.786371)	
R-Squared	0.398622	0.372173	0.9782	
Number of Observations	132	132	132	

Significance level: * 1%   ** 5%   *** 10%

On efficiency side the results presented in table 6.4 of the privatisation is again positively correlated with the mainlines per employee but regulation and competition in basic services are negatively related with the mainlines per employee.

Regression Results for Countries GDP<$10000/capita

Table 6.5 and 6.6 represent the estimation results for those countries, which have GDP<$10000/capita, considered to be developing countries. The regression results indicates that although privatisation is negatively related with the mainline penetration but presence of a regulatory authority at the same time is positively related with the mainlines per hundred inhabitants. However, the competition in basic services is not significantly related with the mainline penetration and has a negative sign.

Looking at the efficiency indicator, the same results are generated by the four specifications of the equations. Privatisation and competition in basic services are negatively related with the mainlines per employee, whereas regulation is significantly and positively related with the mainlines per employee.

Table 6.5

Effects on Mainlines per 100 Inhabitants
Fixed Effects Estimation

Dependent Variable: *Main lines per 100 inhabitants(Teledensity)*
Mean of Dependent Variable: 14.49781

Variables	GDP<$10000/capita			
	Equation 1 Co-efficient	*Equation 2* Co-efficient	*Equation 3* Co-efficient	*Equation 4* Co-efficient
Constant	2.864764	2.442496	1.11989	
	(3.841359)*	(3.083207)*	(1.710453)***	
Privatisation	-4.112394	-4.158112		
	(-4.94229)*	(-5.009388)*		
Regulation		1.1311877		
		(1.543968)***		
Competition in Basic Services	-3.23701			
	(-3.83134)			
Privatisation + Regulation			-2.299123	
			(-2.250586)*	
GDP/Capita	0.003866	0.003794	0.004009	
	(29.76487)	(27.56636	(30.45359)	
R-Squared	0.820908	0.608615	0.805837	
Number of Observations	228	228	228	

Table 6.6

Effects on Mainlines per Employee
Fixed Effects Estimation

Dependent Variable: *Main lines per Employee (Efficiency Parameter)*
Mean of Dependent Variable: 759.2285

Variables	GDP<$10000/capita		
	Equation 1 Co-efficient	*Equation 2* Co-efficient	*Equation 3* Co-efficient
Constant	712.0818	406.6032	786.0839
	(3.585086)*	(1.996072)**	(3.949472)*
Privatisation	-610.5323	-643.6061	-640.1798
	(-2.754964)*	(-3.01541)*	(-3.232047)*
Regulation		949.0431	724.7047
		(4.343779)*	(3.516793)*
Competition in Basic Services			-1265.825
			(-6.091594)*
Privatisation + Regulation			
GDP/Capita	0.08799	0.0359	0.114032
	(2.543901)*	(1.014546)	(3.234585)*
R-Squared	0.07488	0.14675	0.268479
Number of Observations		228	

Significance level: * 1%   ** 5%   *** 10%

privatisation is positively related with mainline penetration, so the improve the infrastructures the more labour force is inducted in the sector.

Table 6.7

Effects on Mainlines per 100 Inhabitants
Fixed Effects Estimations

Dependent Variable: *Main lines per 100 inhabitants (Teledensity)*
Mean of Dependent Variable: 27.72767

Variables	Teledensity			
	Equation 1 *Co-efficient*	*Equation 2* *Co-efficient*	*Equation 3* *Co-efficient*	*Equation 4* *Co-efficient*
Constant	8.362617	9.816227	9.476599	4.087362
	(6.79051)*	(7.871153)*	(6.870918)*	(2.396557)*
Privatisation	14.59773	17.77977		
	(6.808677)*	(7.9295.3)*		
Regulation		-7.597687		
		(-3.489244)*		
Competition in Basics Services				9.343704
				(2.565153)*
Privatisation + Regulation			10.18813	7.73538
			(3.154053)*	(2.565153)*
GDP/Capita	0.001494	0.001442	0.001565	0.001483
	(18.00053)	(17.87611)	(16.69229)	(16.85643)
R-Squared	0.797143	0.8164	0.738961	0.78119
Number of Observations	120	120	120	120

Significance level: *   1%

                  **   5%

                  *** 10%

Table 6.8

Effects on Mainlines per Employee
Fixed Effects Estimation

Dependent Variable: *Main lines per Employee (Efficiency Parameter)*
Mean of Dependent Variable: 618.900

| Variables | Mainlines per employee | | | |
	Equation 1 *Co-efficient*	*Equation 2* *Co-efficient*	*Equation 3* *Co-efficient*	*Equation 4* *Co-efficient*
Constants	153.7711	277.4334	929.4582	492.6517
	(1.324681)	(2.335019)*	(6.294581)*	(3.470353)*
Privatisation	-3.935396	266.7657	788.3346	
	(-0.019455)	(1.248799)	(3.862469)*	
Regulation		-646.3542	-1089.917	
		(-3.115719)*	(-5.61174)*	
Competition Basic Services			-1026.214	-552.2943
			(-6.183911)*	(-3.356623)*
Privatisation + Regulation				-670.1454
				(-2.669869)*
GDP/Capita	0.042327	0.037918	0.042526	0.052679
	(5.405104)*	(4.933238)*	(6.320057)*	(7.192835)*
R-Squared	0.209916		0.452867	0.336517
Number of Observations	120		120	120

Significance level: *   1%

             **   5%

             ***   10%

b)   ***American Region***

Table 6.9 and 6.10 shows the empirical results of the equations 1 to 4 for the American region. The co-efficient of equation 1 and 2 in table 6.9 show that for American region privatisation is significantly related with mainlines penetration with a negative sign. Why? The reason that may be found out from the theoretical literature is that most of these countries had high teledensity before the privatisation and implementation of regulatory reforms, that is why the privatisation wouldn't have been much fruitful in the expansion of the telecom network. Whereas the regulation variable is quite significant and positive in all specifications, indicating that regulation has improved not only quality of service but also the network expansion. Competition in basic service is negatively correlated with the mainline penetration.

Table 6.10 shows the results of Equations 1 to 4 using the mainlines per employee as dependent variable. Equation 1 captures only the results of privatisation, while equation 2 takes into account the regulatory aspects as well into account. Privatisation itself has negative relation with mainlines per employee and competition is also negatively related. However, regulation is significantly and positively related with efficiency of the telecom sector.

63

Table 6.9

Effects on Mainlines Per 100 Inhabitants
Fixed Effects Estimations

Dependent Variable: *Main lines per 100 inhabitants (Teledensity)*
Mean of Dependent Variable: 17.06778

| Variables | Teledensity | | | |
	Equation 1 Co-efficient	Equation 2 Co-efficient	Equation 3 Co-efficient	Equation 4 Co-efficient
Constant	8.779942	7.96897	3.561999	6.976232
	(8.70108)*	(7.718068)*	(4.56656)*	(6.962971)*
Privatisation	-8.153319	-8.260419		-5.924345
	(-7.59562)*	(-7.888968)*		(-5.144327)*
Regulation		2.511992		3.105738
		(2.554615)*		(3.320859)*
Competition in Basic Services				-4.360266
				(-3.888482)*
Privatisation +Regulation			-3.467156	
			(-2.994899)*	
GDP/Capita	0.002844	0.002747	0.002925	0.002899
	(37.11804)	(32.75192)	(29.61642)	(32.97783)
R-Squared	0.93067	0.93765	0.901032	0.943115
Number of Observations	360	360	360	360

Table 6.10

Effects on Mainlines per Employee
Fixed Effects Estimation

Dependent Variable: *Main lines per Employee (Efficiency Parameter)*
Mean of Dependent Variable: 1095.493

| Variables | Mainlines per employee | | | |
	Equation 1 Co-efficient	Equation 2 Co-efficient	Equation 3 Co-efficient	Equation 4 Co-efficient
Constant	3624.203	3041.882	1355.804	2768.126
	(10.28275)*	(9.431542)*	(4.623024)*	(8.705043)*
Privatisation	-3589.752	-3666.655		-3022.462
	(-9.564404)*	(-11.21042)*		(-8.269144)*
Regulation		1803.744		1967.474
		(5.872403)*		(6.628361)*
Competition in Basic Services			-1630.59	-1202.381
			(-3.74617)*	(-3.378475)*
GDP/Capita	0.05119	-0.018784	0.090279	0.023235
	(1.910768)****	(-0.717107)	(2.431151)**	(0.832813)
R-Squared	0.470912	0.602664	0.126685	0.642303
Number of Observations	108			

Significance level: * 1%   ** 5%   *** 10%

c) European Region

Table 6.11 and 6.12 show the results of the equations estimated for European countries, which made a leap towards the privatising and regulation of their telecommunication sector after 1980. Equation 1, 2 & 4 of Table 6.11 show that privatisation is negatively correlated with the teledensity (mainlines per 100 inhabitants). This result is similar to the one for American region but it is not significant. However, regulation is strongly correlated with mainlines penetration showing an increase of 6.06 mainlines per 100 inhabitants. The competition variable has negative sign for European region showing that the competition in basic services is not as successful in European region as in Asian region.

Table 6.12 shows the results of specified equations for mainlines per employee in the European region. In contrast to the result of Asian and American region, privatisation is positively and significantly related with the efficiency of telecom sector. GDP/capita is also positively associated with the efficiency of telecommunication sector

Table 6.11

Effects on Mainlines per 100 Inhabitants
Fixed Effects Estimations

Dependent Variable: *Main lines per 100 inhabitants (Teledensity)*
Mean of Dependent Variable: 39.55093

| Variables | Teledensity | | | |
	Equation 1 Co-efficient	*Equation 2* Co-efficient	*Equation 3* Co-efficient	*Equation 4* Co-efficient
Constant	20.79281	14.84723		19.08185
	(13.5813)*	(6.44908)*		(7.616)*
Privatisation	-2.028911	-1.966491		-2.823512
	(-1.315254)	(-1.35011)		(-1.98589)**
Regulation		6.068309		5.024724
		(3.342864)*		(2.868304)*
Competition in Basic Services				-6.862337
				(-3.472885)*
GDP/Capita	0.001305	0.001384		0.001537
	(15.61251)*	(16.62505)*		(16.97882)*
R-Squared	0.700302	0.72938		0.757747
Number of Observations	108	108		108

Table 6.12

Effects on Mainlines per Employee
Fixed Effects Estimation

Dependent Variable: *Main lines per Employee (Efficiency Parameter)*
Mean of Dependent Variable: 567.2503

| Variables | Mainlines per employee | | |
	Equation 1 Co-efficient	*Equation 2* Co-efficient	*Equation 3* Co-efficient
Constant	-99.9303	-197.736	-230.3415
	(-1.167606)***	(-1.466153)***	(-1.486169)***
Privatisation	311.5058	312.5326	319.1315
	(3.612275)*	(3.621839)*	(3.627929)*
Regulation		99.82461	107.8599
		(0.935706)	(0.99532)
Competition in Basic Services			52.83823
			(0.432271)
GDP/Capita	0.03509	0.036398	0.035225
	(7.511046)*	(7.462148)*	(6.292022)*
R-Squared	0.434104	0.438859	0.439875
Number of Observations		108	

Significance level: * 1%   ** 5%   *** 10%

Table 6.13 sets up a link between the mainlines penetration and local call charges in addition to the regulatory reforms: privatization, regulation and competition in basic services. In the over all sample monthly local charges are positively and significantly related with the mainline penetration showing that a 1 $ increase in the local call charges leads to an increase of 9.42 mainlines per 100 inhabitants whereas in American region it leads to an increase of 6.57 mainlines per 100 inhabitants. This result is quite consistent with the economic theory that given the low price elastic ties of call charges, higher prices lead to greater profit opportunities and in equilibrium lead to higher supply of mainlines.

Table 6.13

Effects on Mainlines per 100 inhabitants

Fixed Effects Estimation

Dependent Variable: *Main lines per 100 inhabitants (expansion parameter)*

	Mainlines per 100 inhabitants				
	Overall Sample		Asia	America	Europe
	Equation 1	Equation 2	Equation	Equation	Equation
Variables	Co-efficient	Co-efficient	Co-efficient	Co-efficient	Co-efficient
Constant	6.1574	5.041762	4.875875	5.664912	13.97052
	(7.00039)*	(12.695340)*	(2.894811)*	(5.39660)*	(6.353920)*
Privatisation	-3.06849	-1.849609	17.14157	-5.439757	-1.524569
	(-3.241166)*	(-1.868820)***	(7.320623)*	(-4.886321)*	(1.086344)
Regulation	6.497575	6.708075	-3.467292	0.721935	5.841351
	(6.943792)*	(6.788503)*	(1.570663)	(0.748228)	(1.338861)
Competition in Basic Services		2.9315421	5.39307		
		(2.582452)*	(2.925000)*		
Local Call Charges (peak rate)	9.422024			6.571855	
	(7.341926)*			(4.850475)*	
Total Revenue/employee		0.0000118	0.0000389		0.0000137
		(2.891565)*	(3.715833)*		(3.534345)*
GDP/Capita	0.001736	0.001633	0.001007	0.00265	0.001316
	(35.862440)	(25.303890)	(7.554915)	(33.716880)	(7.554900)
R-Squared	0.82	0.80	0.85	0.94	0.76
Number of Observations	348	348	120	108	108

An investigation of the impacts of regulatory reforms on residential mainlines which are almost 80% of the total mainlines shows that in the overall sample privatization is negatively related with the residential mainline penetration exhibiting privatizing an incumbent operator will lead to a decrease of 12.25 residential mainlines per 100 inhabitants. However presence of regulatory authority for the proper implementation of regulatory reforms is positively and significantly associated with the residential mainline penetration in all the specifications except Asian region. Local call charges also have a strong and positive relationship with the residential mainline penetration, which is a good indication form investors point of view that they have good prospects to enter in the market and compete.

Table 6.14

	Effects on Residential Mainlines per 100 inhabitants			
	Fixed Effects Estimation			
Dependent Variable: *Residential Main lines per 100 inhabitants (Expansion Parameter)*				
	Residential Mainlines per 100 inhabitants			
	Overall Sample Equation	Asian Equation	America Equation	Europe Equation
Variables	*Co-efficient*	*Co-efficient*	*Co-efficient*	*Co-efficient*
Constant	32.07511	27.1025	25.62341	55.06031
	(12.69534)*	(4.809958)*	(8.76524)*	(11.27813)*
Privatisation	-12.25821	23.20411	-14.73454	-14.46108
	(-4.893150)*	(2.979300)*	(-4.323892)*	(-5.219063)*
Regulation	2.523452	-22.21557	7.845597	7.854443
	(1.020760)*	(-2.997481)*	(2.969810)*	(2.301020)*
Competition in Basics Services	8.107209	12.77351	8.009241	-0.944649
	(2.857837)*	(2.017115)**	(2.729581)*	(-0.245347)
Local Call Charges (Peak rate)	16.77889		16.5647	
	(4.943755)*		(4.514272)*	
GDP/Capita	0.002463	0.002825	0.002042	0.00158
	(17.076840)	(11.001400)	(8.765200)	(8.961112)
R-Squared	0.61	0.65	0.79	0.54
Number of Observations	348	120	108	108

Significance level: * 1%   ** 5%   *** 10%

Table 6.15 depicts the effects of total revenue per employee on mainline penetration along-with the regulatory reforms. The results show that total revenue per employee is positively related with efficiency of telecommunication sector for over all sample as well as the three regions. It leads us to conclusion that as the profitability of the firms improves, their efficiency also improves, because high profit opportunities attracts the new operator to enter the market. In response results in an increase in mainlines per employee.

Table 6.15

Effects on Mainlines per Employee

Fixed Effects Estimation

Dependent Variable: *Main lines per Employee (Efficiency Parameter)*

Variables	Overall Sample Equation Co-efficient	Asia Equation Co-efficient	America Equation Co-efficient	Europe Equation Co-efficient
Constant	482.4813	104.2808	2880.392	-199.7823
	(3.33552)*	(0.890995)	(8.19573)*	(-1.464901)***
Privatisation	-426.6047	507.2979	-3660.787	313.5641
	(-2.872996)*	(2.466993)**	(-11.20812)*	(3.60221)*
Regulation	378.2742	-440.5359	1733.242	99.29487
	(2.546921)**	(-2.223487)**	(5.541314)*	(0.928660)
Total Revenue/employee	0.001408	0.004455	0.002208	0.000032
	(2.300399)**	(4.425653)*	(1.147310)	(0.132999)
GDP/Capita	0.011487	-0.009074	-0.027677	0.036239
	(1.324163)	(-0.709293)	(-1.014584)	(7.182509)
R-Squared	0.75	0.37	0.61	0.44
Number of Observations	348	120	108	108

Significance level: * 1%   ** 5%   *** 10%

Chapter 7

Conclusion
&
Policy Recommendations

In this study, an effort has been made to analyse the effects of regulatory reforms on telecommunications sector and to evaluate their validity as a policy measures suggested by the reformers. To capture the effects of privatisation, regulation, and competition, fixed effect model has been used in this econometric study. This study is among the pioneering efforts in empirical investigation of impacts of regulations on a selected set of countries from a worldwide data set.

The results are in some aspects consistent with the conventional wisdom that competition is associated with mainline penetration. Privatisation itself is significantly related with a decrease in mainlines penetration in almost all specifications. However, for the Asian Pacific region, privatisation is positively related with the mainline penetration, which might be a result of un-matched demand of telecom services with the existing infrastructure and huge waiting list. Privatisation may have relieved the burden with the provision of basic service in a quite short time. In contrast, privatisation is negatively related with the mainline penetration in the American and European region. The reason that might be forwarded for this interesting result is that these countries had high teledensity before they made the leap

to privatisation. That is why the privatisation has no significant positive impact on mainlines penetration in these countries. On the other hand, presence of a separate regulator has been significantly and positively related with the expansion of telecom network and efficiency of telecom sector not only in over all sample but in sub-sample classifications as well. Another tool of telecom regulatory reforms is competition in basic services, which has effects on telecom sector expansion and efficiency indicators. In over all sample of 30 countries, competition in basic services is positively related with mainlines penetration but negatively related with mainlines per employee.

Some of the main conclusions and policy implications that have emerged from this research are noted as follows.

The study shows that privatisation by itself is not an important tool for the expansion and efficiency of any sector in general and telecommunication in particular because in our analysis privatisation seems to be negatively related with the mainlines penetration in almost all specifications.

Presence of an autonomous and separate regulatory body has a strong positive relationship with the expansion as well as efficiency of telecommunications which leads to the conclusion that along with the privatisation there should be an autonomous regulatory body which should

have powers to have checks and balances on the activities of operators for full implementation of regulations.

For the developing countries where the problem lies with supply side for the provision of basic telecommunication services having high waiting list for basic services, privatisation of incumbent operators is still negatively related. The reason is that demand for telecommunications service is highly price elastic for these countries. Given that the privatised operator charges higher monthly subscription as well as call charges, the presence of a separate regulatory authority is necessary to modify the policies, which protect consumer as well as producer's rights.

In short, privatisation is negatively correlated in almost all specification and in categories. Privatisation combined with a separator regulator, however, is related with increase in mainlines penetration. Competition in basic services measured by number of private mobile operator has shown mixed results in different specifications, whereas interaction of privatisation and regulation mitigates the negative affect of privatisation on mainlines.

These results suggest that the reformers are correct to emphasize regulatory reforms along-with privatisation, since privatisation without attention to regulation may be costly to consumers. Allowing competition in basic services is major issue of today's reformers and new operators are

73

encouraged to enter the market. However, the reformer should be careful while granting exclusivity periods to these incumbent operators because this temporarily monopoly will affect the consumers and ultimately quality of services.

These results are encouraging and in favour of the implementation of regulatory reforms, still this investigation can be extended by using the volume of calls traffic generated per mainlines as dependent variable which may be best exhibited by how much volume of traffic has increased after the implementation of regulatory reforms. If privatisation combined with regulation has a positive impact then ultimately the volume of traffic per mainline should increase. Since so for the data on this variable is not available so the teledensity was used as a determinant of the telecom sector expansion. In future any study done using volume of traffic per mainlines will really capture good result taking into account the total volume of business generated.

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Appendix-A

Table A-1

Growth in Teledensity (%)					
For Countries GDP<$10000/Capita					
Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
Argentina	10.4	20.11	8.01	28.7	64.3	7.50
Barbados	23.29	42.71	6.87	61.8	82.1	2.86
Bolivia	2.59	6.17	10.50	9.3	18.7	6.45
Brazil	5.35	14.87	10.27	16.8	41.3	8.11
Cap Verde	1.95	11.21	18.83	10.2	58.9	17.04
Chile	4.91	20.7	15.01	16.1	70.9	13.75
Czech Rep	14.51	37.09	8.49	66	74.4	1.48
Greece	36.04	52.87	4.01	74.5	101.9	2.95
Guinea	0.18	0.59	17.24	41.6	53.2	2.24
Guyana	2.02	7.49	14.46	4.9	23.6	15.49
Hungry	8.21	37.9	13.62	15.3	82.5	16.02
India	0.51	2.26	17.54	1.2	2.75	7.67
Indonesia	0.48	2.91	18.80	1.2	10.75	22.34
Jamaica	3.63	19.91	17.09	9.5	34.45	11.60
Korea	24.54	43.79	6.85	79	101.3	2.23
Malaysia	7.37	20.3	12.15	26.5	74.2	9.15
Pakistan	0.62	2.22	15.86	1.25	10	21.59
Portugal	18.95	42.31	8.27	46.4	99.8	6.73
			12.44			*9.73*

Table A-2

Growth in Teledensity (%)					
For Countries GDP>$10000/Capita					
Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
Australia	42.93	51.97	3.12	89.9	97.4	0.80
Belgium	35.64	50.24	3.56	79.21	102.2	2.52
Canada	52.47	65.45	3.36	73.2	65.9	-0.85
Denmark	54.42	68.43	2.40	102.1	104	0.63
Germany	43.06	59.03	4.95	80.2	97.5	1.87
Ireland	23.82	47.77	7.08	66	69.5	0.55
Israel	32.63	47.33	6.04	80	119	3.47
Japan	41.06	55.75	3.16	87.8	106	1.61
New Zealand	42.67	49.57	2.68	98.3	102.29	0.34
Singapore	34.21	48.2	6.40	106	121.8	1.37
U. Kingdom	41.53	56.72	3.25	78	73	-0.83
			4.18			**1.04**

Table A-3

Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
	Growth in Teledensity (%)					
	For Countries Pvt Sector share >50%					
Argentina	10.4	20.11	8.01	28.7	64.3	7.50
Australia	42.93	51.97	3.12	89.9	97.4	0.80
Bolivia	2.59	6.17	10.50	9.3	18.7	6.45
Brazil	5.35	14.87	10.27	16.8	41.3	8.11
Canada	52.47	65.45	3.36	73.2	65.9	-0.85
Czech Rep	14.51	37.09	8.49	66	74.4	1.48
Chile	4.91	20.7	15.01	16.1	70.9	13.75
Guinea	0.18	0.59	17.24	41.6	53.2	2.24
Guyana	2.02	7.49	14.46	4.9	23.6	15.49
Hungry	8.21	37.9	13.62	15.3	82.5	16.02
Ireland	23.82	47.77	7.08	66	69.5	0.55
Mexico	0.48	2.91	18.80	1.2	10.75	22.34
New Zealand	42.67	49.57	2.68	98.3	102.29	0.34
U. Kingdom	41.53	56.72	3.25	78	73	-0.83
			9.71			**6.67**

Table A-4

Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
	Growth in Teledensity (%)					
	For Countries Pvt Sector share <50%					
Barbados	23.29	42.71	6.87	61.8	82.1	2.86
Belgium	35.64	50.24	3.56	79.21	102.2	2.52
Cap Verde	1.95	11.21	18.83	10.2	58.9	17.04
Czech Rep	14.51	37.09	8.49	66	74.4	1.48
Denmark	54.42	68.43	2.40	102.1	104	0.63
Germany	43.06	59.03	4.95	80.2	97.5	1.87
Greece	36.04	52.87	4.01	74.5	101.9	2.95
India	0.51	2.26	17.54	1.2	2.75	7.67
Indonesia	0.48	2.91	18.80	1.2	10.75	22.34
Israel	32.63	47.33	6.04	80	119	3.47
Jamaica	3.63	19.91	17.09	9.5	34.45	11.60
Japan	41.06	55.75	3.16	87.8	106	1.61
Korea	24.54	43.79	6.85	79	101.3	2.23
Malaysia	7.37	20.3	12.15	26.5	74.2	9.15
Pakistan	0.62	2.22	15.86	1.25	10	21.59
Portugal	18.95	42.31	8.27	46.4	99.8	6.73
Singapore	34.21	48.2	6.40	106	121.8	1.37
			9.49			**6.89**

Table A-5

Growth in Teledensity (%)					
For Countries: Publicly Owned Telecom Sector GDP<$10000/Capita					
Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
Barbados	23.29	42.71	6.87	61.8	82.1	2.86
Cap Verde	1.95	11.21	18.83	10.2	58.9	17.04
Czech Rep	14.51	37.09	8.49	66	74.4	1.48
Greece	36.04	52.87	4.01	74.5	101.9	2.95
India	0.51	2.26	17.54	1.2	2.75	7.67
Indonesia	0.48	2.91	18.8	1.2	10.75	22.34
Jamaica	3.63	19.91	17.09	9.5	34.45	11.6
Korea	24.54	43.79	6.85	79	101.3	2.23
Malaysia	7.37	20.3	12.15	26.5	74.2	9.15
Pakistan	0.62	2.22	15.86	1.25	10	21.59
Portugal	18.95	42.31	8.27	46.4	99.8	6.73
			12.25			**9.6**

Table A-6

Growth in Teledensity (%)					
For Countries Privatised Telecom Sector & GDP<$10000/capita					
Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
Argentina	10.4	20.11	8.01	28.7	64.3	7.50
Bolivia	2.59	6.17	10.50	9.3	18.7	6.45
Brazil	5.35	14.87	10.27	16.8	41.3	8.11
Chile	4.91	20.7	15.01	16.1	70.9	13.75
Guinea	0.18	0.59	17.24	41.6	53.2	2.24
Guyana	2.02	7.49	14.46	4.9	23.6	15.49
Hungry	8.21	37.9	13.62	15.3	82.5	16.02
			7.43			**5.80**

Table A-7

Growth in Teledensity (%)						
For Countries: Publicly Owned Telecom Sector & GDP>$10000/capita						
Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
Belgium	35.64	50.24	3.56	79.21	102.2	2.52
Denmark	54.42	68.43	2.40	102.1	104	0.63
Germany	43.06	59.03	4.95	80.2	97.5	1.87
Israel	32.63	47.33	6.04	80	119	3.47
Japan	41.06	55.75	3.16	87.8	106	1.61
Singapore	34.21	48.2	6.40	106	121.8	1.37
			4.42			**1.91**

Table A-8

Growth in Teledensity (%)						
For Countries Privatised Telecom Sector GDP >10000/capita						
Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
Australia	42.93	51.97	3.12	89.9	97.4	0.80
Canada	52.47	65.45	3.36	73.2	65.9	-0.85
Ireland	23.82	47.77	7.08	66	69.5	0.55
New Zealand	42.67	49.57	2.68	98.3	102.29	0.34
U. Kingdom	41.53	56.72	3.25	78	73	-0.83
			3.90			**0.00**

Table A-9

Growth in Teledensity (%)					
American Region					
Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
Argentina	10.4	20.11	8.01	28.7	64.3	7.50
Barbados	23.29	42.71	6.87	61.8	82.1	2.86
Bolivia	2.59	6.17	10.50	9.3	18.7	6.45
Brazil	5.35	14.87	10.27	16.8	41.3	8.11
Chile	4.91	20.7	15.01	16.1	70.9	13.75
Guyana	2.02	7.49	14.46	4.9	23.6	15.49
Jamaica	3.63	19.91	17.09	9.5	34.45	11.60
Canada	52.47	65.45	3.36	73.2	65.9	-0.85
Mexico	5.3	9.56	8.83	20.3	39.8	5.87
			10.49			*7.86*

Table A-10

Growth in Teledensity (%)					
Asian Pacific Region					
Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
India	0.51	2.26	17.54	1.2	2.75	7.67
Indonesia	0.48	2.91	18.80	1.2	10.75	22.34
Korea	24.54	43.79	6.85	79	101.3	2.23
Malaysia	7.37	20.3	12.15	26.5	74.2	9.15
Pakistan	0.62	2.22	15.86	1.25	10	21.59
Australia	42.93	51.97	3.12	89.9	97.4	0.80
Israel	32.63	47.33	6.04	80	119	3.47
Japan	41.06	55.75	3.16	87.8	106	1.61
New Zealand	42.67	49.57	2.68	98.3	102.29	0.34
Singapore	34.21	48.2	6.40	106	121.8	1.37
			9.26			*7.06*

Table A-11

Countries	ML100		CAGR	RES ML		CAGR
	1988	1999	1988-99	1988	1999	1988-99
Czech Rep	14.51	37.09	8.49	66	74.4	1.48
Greece	36.04	52.87	4.01	74.5	101.9	2.95
Hungry	8.21	37.9	13.62	15.3	82.5	16.02
Portugal	18.95	42.31	8.27	46.4	99.8	6.73
Belgium	35.64	50.24	3.56	79.21	102.2	2.52
Denmark	54.42	68.43	2.40	102.1	104	0.63
Germany	43.06	59.03	4.95	80.2	97.5	1.87
Ireland	23.82	47.77	7.08	66	69.5	0.55
U. Kingdom	41.53	56.72	3.25	78	73	-0.83
			6.18			*3.55*

Growth in Teledensity (%)

European Region

Appendix – B

Table B-1

Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline			
For Countries GDP<$10000/capita			
Countries	**MainLines/Empoyee**	**TR/Employee**	**TR/Mainline**
	CAGR 1988-99	**CAGR 1988-99**	**CAGR 1988-99**
Argentina	18.5	4.7	17.07
Barbados	4.13	8.2	4.95
Bolivia	3.95	3.17	6.53
Brazil	9.14	16.79	16.05
Cap Verde	13.39	0.96	-11.23
Chile	15.75	16.23	1.56
Czech Rep	11.26	18.56	9.79
Greece	7.27	12.33	7.51
Guinea	21.97	-0.47	-17.87
Guyana	20.17	-31.62	-39.01
Hungry	17.28	23.72	5.74
India	16.28	1.39	-11.81
Indonesia	18.4	2.76	-17.7
Jamaica	17.65	11.74	-4.59
Korea	0.16	8.95	5.28
Malaysia	13.3	10.09	-1.43
Pakistan	12.31	2.21	-13.01
Portugal	10.24	14.1	6.51
	14.44	**7.73**	**-2.22**

Table B-2

Countries	MainLines/Empoyee	TR/Employee	TR/Mainline
Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline			
For Countries GDP>$10000			
	CAGR 1988-99	CAGR 1988-99	CAGR 1988-99
Australia	3.78	6.51	0.87
Belgium	4.77	8.18	4.29
Canada	3.59	5.97	2.62
Denmark	2.51	5.86	4.04
Germany	4.69	6.54	3.43
Ireland	6.78	5.02	1.3
Israel	10.12	10.63	2.83
Japan	7.5	10.45	5.34
New Zealand	12.46	9.15	0.01
Singapore	10.24	11.04	3.83
U. Kingdom	5.83	8.2	4.65
	6.57	**7.95**	**3.01**

Table B-3

Countries	MainLines/Empoyee	TR/Employee	TR/Mainline
Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline			
Privatised Economies			
	CAGR 1988-99	CAGR 1988-99	CAGR 1988-99
Argentina	18.5	4.7	17.07
Australia	3.78	6.51	0.87
Bolivia	3.95	3.17	6.53
Brazil	9.14	16.79	16.05
Canada	3.59	5.97	2.62
Czech Rep	11.26	18.56	9.79
Chile	15.75	16.23	1.56
Guinea	21.97	-0.47	-17.87
Guyana	20.17	-31.62	-39.01
Hungry	17.28	23.72	5.74
Ireland	6.78	5.02	1.3
New Zealand	12.46	9.15	0.01
U. Kingdom	5.83	8.2	4.65
	11.57	**6.61**	**0.71**

84

Table B-4

Countries	MainLines/Empoyee CAGR 1988-99	TR/Employee CAGR 1988-99	TR/Mainline CAGR 1988-99
Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline			
Publicly Owned Telecom Sector			
Barbados	4.13	8.2	4.95
Belgium	4.77	8.18	4.29
Cap Verde	13.39	0.96	-11.23
Czech Rep	11.26	18.56	9.79
Denmark	2.51	5.86	4.04
Germany	4.69	6.54	3.43
Greece	7.27	12.33	7.51
India	16.28	1.39	-11.81
Indonesia	18.4	2.76	-17.7
Israel	10.12	10.63	2.83
Jamaica	17.65	11.74	-4.59
Japan	7.5	10.45	5.34
Korea	0.16	8.95	5.28
Malaysia	13.3	10.09	-1.43
Pakistan	12.31	2.21	-13.01
Portugal	10.24	14.1	6.51
Singapore	10.24	11.04	3.83
	9.66	**8.47**	**-0.11**

Table B-5

Countries	MainLines/Empoyee CAGR 1988-99	TR/Employee CAGR 1988-99	TR/Mainline CAGR 1988-99
Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline			
For Countries: Publicly Owned Telecom Sector & GDP>$10000/capita			
Belgium	4.77	8.18	4.29
Denmark	2.51	5.86	4.04
Germany	4.69	6.54	3.43
Israel	10.12	10.63	2.83
Japan	7.5	10.45	5.34
Singapore	10.24	11.04	3.83
	6.6	**8.78**	**3.96**

85

Table B-6

Countries	MainLines/Empoyee CAGR 1988-99	TR/Employee CAGR 1988-99	TR/Mainline CAGR 1988-99
Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline			
For Countries: Publicly Owned Telecom Sector & GDP<$10000/capita			
Barbados	4.13	8.2	4.95
Cap Verde	13.39	0.96	-11.23
Czech Rep	11.26	18.56	9.79
Greece	7.27	12.33	7.51
India	16.28	1.39	-11.81
Indonesia	18.4	2.76	-17.7
Jamaica	17.65	11.74	-4.59
Korea	0.16	8.95	5.28
Malaysia	13.3	10.09	-1.43
Pakistan	12.31	2.21	-13.01
Portugal	10.24	14.1	6.51
	11.30	**8.29**	**-2.33**

Table B-7

Countries	MainLines/Empoyee CAGR 1988-99	TR/Employee CAGR 1988-99	TR/Mainline CAGR 1988-99
Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline			
For Countries: Privatised Telecom Sector & GDP>$10000/capita			
Australia	3.78	6.51	0.87
Canada	3.59	5.97	2.62
Ireland	6.78	5.02	1.3
New Zealand	12.46	9.15	0.01
U. Kingdom	5.83	8.2	4.65
	6.488	**6.97**	**1.89**

Table B-8

Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline		
For Countries Privatised & GDP<$10000/capita		
Countries	MainLines/Empoyee	TR/Employee	TR/Mainline
	CAGR 1988-99	CAGR 1988-99	CAGR 1988-99
Argentina	18.5	4.7	17.07
Bolivia	3.95	3.17	6.53
Brazil	9.14	16.79	16.05
Chile	15.75	16.23	1.56
Guinea	21.97	-0.47	-17.87
Guyana	20.17	-31.62	-39.01
Hungry	17.28	23.72	5.74
	13.345	**4.065**	**-1.24125**

Table B-9

Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline		
Asian Pacific Region		
Countries	MainLines/Empoyee	TR/Employee	TR/Mainline
	CAGR 1988-99	CAGR 1988-99	CAGR 1988-99
India	16.28	1.39	-11.81
Indonesia	18.4	2.76	-17.7
Korea	0.16	8.95	5.28
Malaysia	13.3	10.09	-1.43
Pakistan	12.31	2.21	-13.01
Australia	3.78	6.51	0.87
Israel	10.12	10.63	2.83
Japan	7.5	10.45	5.34
New Zealand	12.46	9.15	0.01
Singapore	10.24	11.04	3.83
	10.455	*7.318*	*-2.579*

Table B-10

Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline			
American Region			
Countries	MainLines/Empoyee	TR/Employee	TR/Mainline
	CAGR 1988-99	**CAGR 1988-99**	**CAGR 1988-99**
Argentina	18.5	4.7	17.07
Barbados	4.13	8.2	4.95
Bolivia	3.95	3.17	6.53
Brazil	9.14	16.79	16.05
Chile	15.75	16.23	1.56
Guyana	20.17	-31.62	-39.01
Jamaica	17.65	11.74	-4.59
Mexico	4.98	-5.11	-7.57
Canada	3.59	5.97	2.62
	10.87	**3.34**	**-0.27**

Table B-11

Cumulative Annual Growth in Main Lines/Employee, TR/Employee & TR/Mainline			
European Region			
Countries	MainLines/Empoyee	TR/Employee	TR/Mainline
	CAGR 1988-99	**CAGR 1988-99**	**CAGR 1988-99**
Czech Rep	11.26	18.56	9.79
Greece	7.27	12.33	7.51
Hungry	17.28	23.72	5.74
Portugal	10.24	14.1	6.51
Belgium	4.77	8.18	4.29
Denmark	2.51	5.86	4.04
Germany	4.69	6.54	3.43
Ireland	6.78	5.02	1.3
U. Kingdom	5.83	8.2	4.65
	7.85	*11.39*	*5.25*

Appendix - C

Table C-1

%age Change in Employment in Telecom Sector				
For Countries GDP<$10000/capita				
Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
Argentina	56.11	19.75	-184.10	-7.84
Barbados	0.87	1.10	20.55	2.87
Bolivia	1.59	4.39	63.90	13.61
Brazil	104.42	142.39	26.67	5.33
Cap Verde	0.23	0.43	46.05	6.25
Chile	11.32	13.97	19.01	2.80
Czech Rep	30.21	23.68	-27.58	-1.57
Greece	30.33	21.59	-40.47	-2.59
Guinea	1.40	0.81	-72.20	-11.54
Guyana	1.02	0.76	-34.21	0.97
Hungry	22.12	17.30	-27.86	-1.31
India	362.00	421.00	14.01	1.83
Indonesia	41.57	45.00	7.63	1.00
Jamaica	3.46	3.19	-8.41	-0.01
Korea	52.07	68.96	24.49	2.61
Malaysia	28.17	25.04	-12.49	-0.83
Pakistan	44.69	59.24	24.56	2.75
Portugal	23.05	19.65	-17.32	-1.27
	814.62	888.25	8.29	13.06

Table C-2

%age Change in Employment in Telecom Sector				
For Countries GDP>$10000/capita				
Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
Australia	86.83	85.20	-1.88	0.45
Belgium	26.33	23.27	-11.62	-0.84
Canada	96.16	93.57	-2.69	0.10
Denmark	18.56	18.84	1.53	-1.60
Germany	216.00	226.00	4.63	0.54
Ireland	14.25	15.00	5.29	0.83
Israel	9.34	6.82	-26.98	-5.54
Japan	286.00	180.00	-37.06	-3.51
New Zealand	18.14	6.78	-62.63	-6.65
Singapore	11.62	8.40	-27.71	-2.28
U. Kingdom	244.40	202.00	-17.35	-0.48
	1027.62	865.88	-15.74	-18.98

Table C-3

Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
Argentina	56.11	19.75	-184.10	-7.84
Australia	86.83	85.20	-1.88	0.45
Bolivia	1.59	4.39	63.90	13.61
Brazil	104.42	142.39	26.67	5.33
Canada	96.16	93.57	-2.69	0.10
Czech Rep	30.21	23.68	-27.58	-1.57
Chile	11.32	13.97	19.01	2.80
Guinea	1.40	0.81	-72.20	-11.54
Guyana	1.02	0.76	-34.21	0.97
Hungry	22.12	17.30	-27.86	-1.31
Ireland	14.25	15.00	5.29	0.83
Newzeland	18.14	6.78	-62.63	-6.65
U. Kingdom	244.40	202.00	-17.35	-0.48
	687.96	**625.60**	**-9.06**	**-5.30**

% age Change in Employment in Telecom Sector
Privatised Economies

Table C-4

Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
Barbados	0.87	1.10	20.55	2.87
Belgium	26.33	23.27	-11.62	-0.84
Cap Verde	0.23	0.43	46.05	6.25
Czech Rep	30.21	23.68	-27.58	-1.57
Denmark	18.56	18.84	1.53	-1.60
Germany	216.00	226.00	4.63	0.54
Greece	30.33	21.59	-40.47	-2.59
India	362.00	421.00	14.01	1.83
Indonesia	41.57	45.00	7.63	1.00
Israel	9.34	6.82	-26.98	-5.54
Jamaica	3.46	3.19	-8.41	-0.01
Japan	286.00	180.00	-37.06	-3.51
Korea	52.07	68.96	24.49	2.61
Malaysia	28.17	25.04	-12.49	-0.83
Pakistan	44.69	59.24	24.56	2.75
Portugal	23.05	19.65	-17.32	-1.27
Singapore	11.62	8.40	-27.71	-2.28
			-2.73	**-2.19**

%age Change in Employment in Telecom Sector
Publicly Owned Telecom Sector

Table C-5

%age Change in Employment in Telecom Sector			
For Countries: Publicly Owned Telecom Sector & GDP>$10000/capita			
Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
Belgium	26.33	23.27	-11.62	-0.84
Denmark	18.56	18.84	1.53	-1.60
Germany	216.00	226.00	4.63	0.54
Israel	9.34	6.82	-26.98	-5.54
Japan	286.00	180.00	-37.06	-3.51
Singapore	11.62	8.40	-27.71	-2.28
	94.64	**77.22**	**-18.41**	**-2.21**

Table C-6

%age Change in Employment in Telecom Sector			
For Countries: Publicly Owned & GDP<$10000/capita			
Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
Barbados	0.874	1.100	20.545	2.870
Cap Verde	0.232	0.430	46.047	6.250
Czech Rep	30.210	23.680	-27.576	-1.570
Greece	30.327	21.590	-40.468	-2.590
Guinea	1.400	0.813	-72.202	-11.540
Hungry	22.120	17.300	-27.861	-1.310
India	362.000	421.000	14.014	1.830
Indonesia	41.567	45.000	7.629	1.000
Jamaica	3.458	3.190	-8.411	-0.010
Korea	52.073	68.960	24.488	2.610
Malaysia	28.168	25.040	-12.492	-0.830
Pakistan	44.690	59.240	24.561	2.750
Portugal	23.053	19.650	-17.318	-1.270
	49.244	**54.384**	**9.451**	**-0.139**

Table C-7

%age Change in Employment in Telecom Sector				
For Countries: Privatized Telecom Sector & GDP>$10000				
Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
Australia	86.83	85.20	-1.88	0.45
Canada	96.16	93.57	-2.69	0.10
Ireland	14.25	15.00	5.29	0.83
New Zealand	18.14	6.78	-62.63	-6.65
U. Kingdom	244.40	202.00	-17.35	-0.48
	91.96	**80.51**	**-12.45**	**-1.15**

Table C-8

% age Change in Employment in Telecom Sector				
For Countries: Privatized Telecom Sector & GDP<$10000/capita				
Countries	Employment (000)		1988-99	
	1988	1999	% age Change	CAGR
Argentina	56.11	19.75	-184.10	-7.84
Bolivia	1.59	4.39	63.90	13.61
Brazil	104.42	142.39	26.67	5.33
Chili	11.32	13.97	19.01	2.80
Guinea	1.40	0.81	-72.20	-11.54
Guyana	1.02	0.76	-34.21	0.97
Hungry	22.12	17.30	-27.86	-1.31
	24.75	**24.92**	**0.70**	**0.22**

Table C-9

%age Change in Employment in Telecom Sector				
Asian Pacific				
Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
India	362.00	421.00	14.01	1.83
Indonesia	41.57	45.00	7.63	1.00
Korea	52.07	68.96	24.49	2.61
Malaysia	28.17	25.04	-12.49	-0.83
Pakistan	44.69	59.24	24.56	2.75
Australia	86.83	85.20	-1.88	0.45
Israel	9.34	6.82	-26.98	-5.54
Japan	286.00	180.00	-37.06	-3.51
New Zealand	18.14	6.78	-62.63	-6.65
Singapore	11.62	8.40	-27.71	-2.28
			-9.81	**-1.02**

Table C-10

%age Change in Employment in Telecom Sector				
AMERICAN REGION				
Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
Agentina	56.110	19.750	-184.101	-7.840
Barbdos	0.874	1.100	20.545	2.870
Bolivia	1.585	4.390	63.895	13.610
Brazil	104.420	142.390	26.666	5.330
Chili	11.315	13.970	19.005	2.800
Guyana	1.020	0.760	-34.211	0.970
Jamica	3.458	3.190	-8.411	-0.010
Mexico	49.995	83.900	40.411	5.350
Canada	96.156	93.570	-2.689	0.100
			-6.543	**2.570**

Table C-11

%age Change in Employment in Telecom Sector				
EUROPEAN REGION				
Countries	Employment (000)		1988-99	
	1988	1999	%age Change	CAGR
Czech Rep	30.21	23.68	-27.58	-1.57
Greece	30.33	21.59	-40.47	-2.59
Hungry	22.12	17.30	-27.86	-1.31
Portugal	23.05	19.65	-17.32	-1.27
Belgium	26.33	23.27	-11.62	-0.84
Denmark	18.56	18.84	1.53	-1.60
Germany	216.00	226.00	4.63	0.54
Ireland	14.25	15.00	5.29	0.83
U. Kingdom	244.40	202.00	-17.35	-0.48
			-14.53	*-0.92*