THE EFFECTS OF POLICY REFORMS ON THE PERFORMANCE OF THE TELECOMMUNICATION INDUSTRY IN SADC

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Abstract

This paper explores the effects of competition and regulation on telecommunications sector performance in 14 Southern Africa Development Community countries from 1999 through 2006. Fixed effects regression indicates that competition has a positive influence on the total number of mobile subscribers, and a negative impact on fixed lines in operations. On the other hand regulation has a positive impact on the total number of mobile subscribers and fixed lines in operations. The study allowed competition and regulation to interact, to determine whether competition is supported by regulatory policies. The interaction of the two reform variables resulted in a negative impact on the dependent variable, indicating that competition is not supported by effective regulatory policies. Therefore the study recommends that Southern Africa Development Community member states should encourage private sector investment and open up the market for fixed and mobile telephone supported by relevant regulatory policies.

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GLOSSARY

EU	European Union
GATS	General Agreement on Trade in Services
GDP	Gross Domestic Product
GNP	Gross National Product
ICT	Information Communication Technology
ITU	International Telecommunication Union
MTC	Mobile Telecommunication
NEPRU	Namibia Economic Policy Research Unit
OECD	Organization for Economic Co-operation and Development
RSA	Republic of South Africa
SATRA	Southern Africa Telecommunications Regulatory Authority
US	United States
USD	United States Dollar
WTO	World Trade Organization

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DEDICATIONS

This thesis is dedicated to my late brother, Cornelius Puleni Kambala and my daughter, Unotjari Kangurungumbe Jakobs.

DECLARATIONS

I, Benjamin Nghalukamo Jakobs declare hereby that this study is a true reflection of my own research, and that this work, or part therefore has not be submitted for a degree in any institution of higher education.

…… ……

Benjamin Nghalukamo Jakobs Date

CHAPTER 1

INTRODUCTION

1.1 Background Information

Southern African Development Community (SADC) is an economic bloc that comprises 14 member states. The member states face a formidable challenge in keeping pace with evolving developments in the global telecommunication sector. A modern telecommunication infrastructure is of cardinal importance for domestic economic growth and a prerequisite for participating in competitive world markets and for attracting new investments. The limited availability of telecommunication services constraints economic growth in developing countries.

According to the world telecommunications database of 2006, 13 out of 14 the SADC countries have separate regulatory bodies for their telecommunication industries (ITU, 2006). The telecommunications database of 2006 further indicates that, 4 and 8 of the 14 members' states have opened their fixed and mobile telephone sectors for competition, respectively.

Telecommunication reforms, the liberalization of telecommunication services and privatization of a state telecommunication operator took place approximately 20 years ago in the United Kingdom. There are currently no prescribed methods or models for telecommunication reforms. Governments when embarking upon reforms have to make choices pertaining to the privatization of a state owned investment and the establishment of pro-competitive regulations (Garisson, n.d.). The terms privatization and liberalization are often linked. However, liberalization is more complex than privatization. What distinguish these terms are policies and fundamental issues. Telecommunication reform has moved from a policy development phase to a policy implementation phase mainly because of three major market liberalizing events (Melody, 1999). First, being the World Trade Organization (WTO) agreement on Telecommunication services, by which 72 countries representing 90% of global telecommunication traffic committed themselves to specific programs of liberalization over specified future periods. Second, EU policy on full liberalization of telecommunication services in member states. Third the US Telecommunication Act of 1996, which liberalized the local market.

1.1.1 The history of Telecommunication Reforms

Telecommunication reforms in developing countries went through three era's (Noll, 2000). The first era was characterized by foreign government owning local telephone

companies during the colonial period. The second era has seen the acquisition of foreign-owned telephone companies by domestic national governments. Telecommunication reforms took center stage in the eighties, which signifies the third era. In 1980, only 2% of telecommunications operators in 167 countries had private owners. By 1998, the number increased to 42% (Xu, 2002).

1.1.2 Drivers of Privatization and Liberalization

The aspects of telecommunication reforms are driven by the following factors (Garisson, n.d.)

- Political ideology. This was a particularly important factor in the UK privatization where diminution of the public sector's role in the economy was a priority goal of the government.
- Reduction in public debt. The proceeds from the sale of a state operator are often applied to the reduction of public debt. Public sector budget obligations are further reduced by the removal of the former state operator's employees from the public payroll
- Poor performance of state operators. State operators frequently under-perform private operators; as the economic importance of the ICT sector increases, demands for improved operator performance also increase.

- Financial investment requirements of state operator. In order to address customer dissatisfaction with performance, state operators often require capital investment beyond limits set on public spending and indebtedness. Access to private capital becomes a critical requirement of the state operator.
- Role of ICT in economic competitiveness. Telecommunication liberalization is now seen as fundamental to successful development of the ICT sector and the broader stimulation of economic growth in other key sectors.
- Technological innovation business demand for advanced service at lower rates. Desire on the part of the government, often led by business and industry, to capture economic benefits of ICT innovation through rapid deployment of new technologies.
- WTO pressure – "Join in or be left behind". The combined effects of WTO agreements on basic telecommunication services and information technologies have set a global benchmark favoring liberalization; nations now risk falling behind economically if this benchmark is not met.

1.1.3 Elements of Telecommunication Reforms

The key elements of telecommunications sector reforms comprise the:

- Establishment of an effective independent regulator
- Introduction of competition

- Privatization of state-owned monopolies

The above stated terms are defined as follows:

Privatization

Is the conversion of a state owned enterprise into private sector ownership (Garisson, n.d.).

Liberalization

Is the opening of a monopolistic market to competitive provision of services (Garisson, n.d) or the lowering of entry barriers to all parts of the market, allowing third parties to compete with established providers of services (Love, 2005). Successful telecommunication reforms require governments to have clear goals for the sector and to adopt policies to achieve those goals.

1.1.4 Best Practices for Telecommunication Reforms

Telecommunication policy reforms in developing and transition economies follow one of two major strategies (Cowhey *et al,* 2000). Policy makers in transition economies with urgent investment needs choose to introduce competition and private sector participation immediately, whilst other countries may delay introducing competition indefinitely or introduce it in the medium term and make the timing of liberalization

contingent on the incumbent monopolist's performance. What distinguishes the strategies is the timing of the introduction of competition.

The reason for a worldwide recognition of liberalization in the telecommunication sector is the fact that liberalization focuses on the introduction of competition and privatization, and the objectives of telecommunication reforms are as flows:

- Increased accessibility
- Quality and affordability of service
- Attraction of foreign investment
- National economic development

Private companies, and not government, should be the provider of telecommunication services. Foreign investment, in the telecommunication sector turns is attracted by a transparent and predictable regulatory environment. Governments are expected to create independent, technically competent and sufficiently funded regulatory entities, to grant licenses, enforce competition and protect public interest. Universal service access depends on the success of privatization and competition.

1.1.5 The need for an Independent Regulator

According to Global Internet Policy Initiative (2002), the fundamental function of an economic regulator is to enforce competition and act as a surrogate for the market place

where actual competition cannot, or does not, exist. Therefore the role of the regulator in new markets focuses on facilitating the development of the market place and ensuring that the market power of the previous monopolies, or dominant players, does not damage the prospects and opportunities for commercial development in the sector by the newer participants. The regulator role is also that of creating a regulatory environment that protects the interests of consumers, service providers and investors. Developing countries must establish credible and effective regulatory institutions that will inspire confidence in, and optimism about, the newly emerging market. The latter is very crucial when transitioning from a monopoly to a competitive environment.

In view of the notion that there is no one regulatory model or practice that has proven to be more successful than others in fostering liberalized, privatized, and competitive telecommunication markets, regulatory frameworks generally incorporate the following principles for the establishment and operation of an efficient and effective regulatory authority:

- A legal and functional independence from network operators and service and equipment providers
- A free from direct political pressure
- A separate budget and the ability to hire and fire its own employees
- An adequate funding, expert staff and the necessary support facilities
- Administrative procedures which ensure assure that decisions are transparent

1.1.6 WTO and Telecommunication Policy Reforms

1.1.6.1 Introduction

The WTO was established on the 1st of January 1995, as an international organ for multilateral trade negotiations. "General Agreement on Trade in Services (GATS)" was established. The latter encompasses the provision of telecommunication services. The agreement aims at minimizing trade barriers in each country by removing those barriers through negotiations (Cowhey *et al*, n.d.).

1.1.6.2 The WTO Basic Telecommunication Negotiations

This was one series of negotiations which followed the Uruguay Round. The negotiations aimed at the introduction of competition, the reduction of service rates and diversification of services.

The World Trade Organization adopted a reference paper in 1997. The paper sets out basic rules for ensuring competition in the telecommunication sector. The following are the major points in the reference paper.

- Enforcement of competition – Governments must make sure that the incumbents do not engage in anti competitive practices

- Interconnection. Governments must ensure that new entrants are allowed to interconnect with major suppliers
- Universal service. Governments must maintain policy measures in order to achieve universal service. This will ensure that rural areas are not excluded from the telecommunication mainstream
- Independent regulator. The regulatory body must be separated from suppliers
- Resource Management. Governments must use procedures for the allocation and use of scarce resources

1.2 Statement of the problem

The lack of competition and the limited capacity of the various regulatory bodies to effectively execute their regulatory mandate in the telecommunications sector in the SADC region have a negative or adverse impact on the overall performance of the sector. Even though the region's total population equals 150 million, there are only 6 million fixed telephone lines, 60 million mobile subscribers and 189 thousands pay phones in operation, representing 3 percent, 26 percent and 0.08 percent of the total population, respectively (ITU, 2006). The gap in telephone penetration between developed and developing countries is on the increase and the challenges to counter this gap are enormous. Total telecommunication investment has declined by 39 percent between 1999 and 2006 (ITU, 2006). The tariffs for business monthly subscription and

residential monthly subscription for a fixed telephone line indicate increases of 51 percent and 35 percent, respectively (ITU, 2006). The aforementioned in comparison to other developing countries in Latin America reveals a grey picture. Hence the focus of this study is to assess the various aspects of telecommunications remedies that need attention and due consideration in the SADC region, with the aim of improving the performance of the telecommunication sector in the region.

1.3 Objectives of the study

The objectives of this study are to:

- Examine the effects of policy reforms on sectoral performance of basic telecommunications, investments in telecommunications and economic development, with focus on the benefits of an aggressive approach towards the introduction of telecommunications policy reforms in the SADC region;
- Draw a comparison between Latin America's and SADC's experiences with telecommunication sector reforms;
- Establish the relationship between telecommunication policy reforms on the one hand, and investment in telecommunications and economic development, on the other hand;
- Make recommendations as to the types of policy reforms SADC member states should adopt to attain desirable levels of investment in order to improve the

telecommunication sectors, with emphasis on the improvement of teledensity, productivity and affordable prices.

1.4 Importance of the study

The importance of studying the effects of telecommunication policy reforms on the performance of the telecommunication sector and economic development is of cardinal importance in view of the fact that telecommunication is a catalyst of economic activities. The telecommunication industry is one of the fastest-growing sectors in most countries. Its service revenue alone, equipment sales not included, accounts for approximately two to three percent of GDP in most countries (Li & Xu, 2002). To enhance innovation and investment in the telecommunication industries, SADC countries need to open up the sector for competition. SADC countries have a lot to learn from countries which have adopted more ambitious paths of telecommunication liberalization. Such countries have performed better after implementing telecommunications sector reforms, in terms of the number of telephone and cell phone subscribers per 100 people, as an indicator for telecommunication sector performance. Therefore understanding telecommunication reforms may have important policy implications.

1.5 Limitations of the Study

Specific telecommunication data are available from International Telecommunication Union by country and region. Data limitation is likely to exist in some areas and in such instances secondary data sources will be examined. Another shortcoming is that the quality of data from many developing country sources is often less than robust. The limited data available on the economic activities of developing countries will limit the measurement of some variables.

1.6 Outline of the Study

Chapter two of the study outlines important aspects of telecommunication reforms, giving a brief history, and how telecommunication reforms evolved over the years. In Chapter three, the study outlines the telecommunication environment of SADC and Latin America. Chapter four reviews existing literature on effects of telecommunication liberalization on performance of the telecommunication sector, while Chapter five presents the empirical analyses. Chapter 6 represents the results of the study. The conclusions drawn from the study and the recommendations are presented in Chapter 7.

CHAPTER 2

LATIN AMERICA AND SADC TELECOMMUNICATION ENVIRONMENTS

2.1 Introduction

This chapter draws comparison between Latin America and SADC in the areas of competition and the regulation of the telecommunication sector. The comparison is drawn from the trends in the telecommunication performance of Latin America and SADC. Statistics from the year 1999 through 2006 are provided. The various performance aspects, calculated as percentages of population, are aimed at giving meaning to the comparison of the two regions.

2.2 SADC Telecommunication Environment

2.2.1 Introduction

Even though telecommunication is recognized as a catalyst essential for economic growth, improved telecommunication has not been a central investment focus in developing countries. Despite having lower levels of economic development and of telecommunication as compared with the developed world, the potential for growth in the sector is evidenced by the rapid growth of cellular communication.

Telecommunication is essential not only for economic growth, but also to remain competitive within the increasingly information-oriented global economy, and a failure to develop telecommunication systems will only increase the development gap between the SADC region and industrial countries. Improved telecommunication creates efficiencies in other productive sectors, and the primary benefits of such efficiencies are; reduced transport costs, reduced transaction costs, improved marketing information and increased efficiencies in industrial production. Approximately 80% of telephones in developing economies are connected to business or to government agencies (ITU, 2006).

The global economy is moving toward an economic system based on continuous availability of information. Current advances in telecommunication technology have resulted in information exchange to develop as a valuable commodity. Hence, a modern telecommunication infrastructure is not only essential for domestic economic growth, but also for participation in increasingly competitive world markets and for attracting new investment. It is of paramount importance for lesser developed countries to accelerate their application of telecommunication technology or run the risk to fall behind in economic competitiveness.

SADC countries have begun to realize that inadequate telecommunication services will be a disincentive to new investment and will place existing industries at a competitive

disadvantage. The SADC region adopted policies for telecommunication sector reform in the 1990's. The policy framework made provision for privatization, an exclusive period, to be followed by an option to introduce competition. The primary concern of the exclusivity period has been the occurrence of slack implementation of proposed policy reforms (Love 2005).

Most SADC countries are taking the approach of managed liberalization, rather than opening up their telecommunication sectors to full competition. The ownership of the various telecommunication sectors are characterized by either, government owns 100% or part of the telecommunication operators. Most SADC member states are envisaging a second national operator being licensed in the near future, preceded by an exclusive period. At times these periods are extended, for example, in Namibia cabinet decided in 1999 to open the telecommunication sector to competition from 2002, yet it did not happen in the fixed line basic telecommunication (Motinga, 2003).

All the SADC member states have licensed mobile operators and have some limited competition in the mobile communication sector with the exception of Lesotho. On the other hand, Tanzania has a fully liberalized market with no foreign ownership restriction. Lesotho and Malawi are the only countries in the region that do not impose ownership restriction, while Zambia has a 60% domestic partner requirement, which is 29% higher than the regional standard (Mbekeani 2004).

Even though international experience with telecommunication sector reform varies, these experiences show that countries which adopted a more ambitious path of telecommunication liberalization have performed better after liberalization. Therefore these experiences of different countries, in particular Latin American countries, provide some useful lessons, to guide SADC on reforms envisaged for the telecommunication sector. This is because Latin America has taken an earlier and aggressive approach compared to other developing economies, and thus there are a number of experiences that will provide a basis for comparison and discussion relevant to Africa as well as SADC.

2.2.2 Level of Competition

Table 1 indicates the level of competition in the telecommunication sector of SADC. Eight countries in SADC have introduced full competition in the mobile telecommunication sector, while only four have introduced full competition in the fixed telephone sector. This is an indication that mobile telephone is emerging as the first competitive industry in SADC telecommunication sector. Investment in the mobile sector is attractive because it carries a relatively lower fixed network cost.

Table 1 Level of Competition SADC

Country	Domestic fixed Lines	Mobile
Angola(1)	**C**	**C**
	2003	
	1	**1**
Botswana(1)	**P**	**...**
	2006	**2006**
	0	**1**
DRC (1)	**C**	**C**
	1	**1**
Lesotho(1)	**C**	**C**
	2007	**1996**
	1	**1**
Mauritius(1)	C	C
	2003	1996
	1	1
Malawi(1)	**...**	**C**
		1999
	0	**1**
Mozambique(2)	**M**	**C**
	0	**1**
Namibia(2)	**M**	**M**
	0	**0**
Seychelles(1)	**P**	**P**
	1998	
	0	**0**
South Africa(2)	**C**	**P**
	1	**0**
Swaziland(2)	**M**	**M**
	0	**0**
Tanzania(2)	**M**	**C**
	0	**1**

Zambia(2)	**M**	**P**
	0	**0**
Zimbabwe(2)	**P**	**C**
	0	**1**
Totals C:	**4**	**8**
Totals M:	**6**	**2**
Totals P+D:	**3**	**4**

(1) - 2007 data; (2) - pre-2007 data - Source: ITU World Telecommunication Regulatory Database
Note: This table reflects what is legally permissible; therefore it may not reflect the actual number of operators in the market.
M - Monopoly; P - Partial competition; C - Full competition; ... - Not available

Date: year when partial or full competition was introduced

2.2.3 SADC Regulatory Environment

As far as a separate regulatory authority is concerned as indicated in Table 2, it is quite remarkable that twelve out of the total of fourteen countries in SADC have a separate regulator. This is attributable to the political will that exists among member countries for reforming the telecommunication sector.

TABLE 2 Regulatory Authorities SADC

Country	Year Created	Autonomous	Reports to	Financed by
Angola	1999	No	Sector Ministry	N/A
Botswana	1996	Yes	Sector Ministry	License and spectrum fees. Operators
DRC	N/A	Yes	Sector Ministry	Other
Lesotho	2000	No	Sector Ministry	Regulatory fees
Malawi	1992	Yes	Sector Ministry	License and spectrum fees. Operators and government
Mauritius	2002	Yes	Sector Ministry	License and Spectrum fees
Mozambique	1992	Yes	Sector Ministry	License Fees and Government
Namibia	1992	Yes	Sector Ministry	Government and License fees
South Africa	2000	No	Report to Parliament	Government
Tanzania	1994	Yes	Sector Ministry	License and spectrum fees. Operators
Zambia	1994	No	Parliament	License and spectrum fees. Operators
Zimbabwe	2000	Yes	Sector Ministry	License and Spectrum fees

Source: ITU World Telecommunications Regulatory Database

According to Stock and Deen-Swarray (2006), Namibia is lagging behind South Africa and Botswana in telecommunication reforms and performance because of institutional weaknesses and lack of political will. Telecom Namibia is regulated by the Post and Telecommunication Act of 1992, with the Ministry of Information Communication

Technology as a shareholding Ministry, while MTC and Cell One are regulated by the Communication Act of 1992. This is a clear example of an uncoordinated regulatory environment. The regulatory environment was put to test when Telecom Namibia, a fixed line operator, introduced a product called switch. The service allowed it's users to roam among different towns, within Namibia. Hence the investors into MTC and Cell One launched a complaint that they were assured by government that there will only be two mobile operators in the country. As a result Telecom Namibia had to limit the roaming facility to specified geographic areas and users are not allowed to use their phones between towns. The Communication Act was then revised with wider consultation and might be tabled in parliament in 2009. These types of scenarios are not very much welcome and appreciated by foreign investors. Telecommunication reform must be analyzed over two broad dimensions of entry barriers and regulatory independence. The latter are multi-dimensional phenomena.

The Namibian Communications Commission is the telecommunication regulatory body. Even though the body has an independent board, the administration thereof falls under the Ministry of Information Communication Technology. Thus the Commission is funded by the Namibian Government. It is quite clear that the regulator is not totally independent.

2.2.4 SADC Characteristics – Barriers to Entry

SADC telecommunication sector reform looks at the following as constituting barriers to entry:

- Demanding investment conditions, that makes it more costly for new operators to enter into the market;
- A limited number of fixed line operators and a large number of mobile operators, with the latter giving a measure of how easy it is to enter the telecommunication market;
- The absence of number portability in mobile telephone sector;

2.3 Latin America Telecommunication Environment

2.3.1 Early Years of Telecommunication Liberalization

Telecommunication operators in Latin America used to be state-owned enterprises. As with most states in developing countries, certain factors contributed to this scenario. Factors such as the absence of capital markets, national security, with the argument that such a sector cannot be left in the hands of foreign companies and the notion to control output to avoid high increases in tariffs with the repercussion of the government becoming unpopular. In the 1980's the telecommunication industry in Latin America was characterized by a lack of autonomy, financial resources, managerial and technical

expertise and as a result, the enterprise were failing to obtain funding to finance telecommunication networks. The latter was aggravated by the prevailing debt crisis that affected most of the Latin American countries. Chile allowed competition in basics telecommunication industry in 1978 and privatized its state owned companies in 1988, which was followed by Mexico and Argentina later on. The return to democracy in most of the Latin American countries has encouraged foreign investment in the sector (Giuterrez & Sandford, 1998).

2.3.2 Privatization and the need for a Regulator

Most Latin American countries embarked upon telecommunication reforms between the years 1984 and 1997, by privatizing their entities wholly or partially. The aim of privatization was to attract foreign direct investment in the sector and for the government to earn adequate returns. The model of privatization was based on offering an exclusive service provision to investors, as an incentive to invest in the sector. Telecommunication reforms in Latin America have led to greater privatization than in any other region of the world and Chile's initiatives, in particular, serve as an ideal model.

Prior to privatization, the growth rates of main phone lines were very close when comparing those that later privatized to those that did not, but after privatization, countries that restructured the ownership of state owned enterprises grew more rapidly than the countries that did not restructure their telecommunications sectors. There was a need for independent regulators in telecommunication in view of the economies of scale and scope of the industry and the existence of scarce resources, which cannot be left to the market alone. The governments of Latin American countries allowed a period of exclusivity to the new private owners after restructuring. The role of the regulator was to constrain the private owner's incentives to foreclose entry or to engage in anti competitive behavior during the (Giuterrez & Sandford, 1998).

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Table 3 indicates that 28 out of 32 countries in Latin America have a separate regulatory authority, indicating the benefits derive from early liberalization efforts from this group of countries.

TABLE 3 Regulatory Authorities – Latin America

Country	**Year Created**	**Autonomous**	**Reports to**	**Financed by**
Argentina	Not provided	No	Sector Ministry	Other
Bahamas	1999	Yes	Governer and Prime Ministry	License, Spectrum, Operators and government
Barbados	2001	Yes	Parliament	Government and Operators
Belize	1988	No	Not provided	Not provided
Bolivia	1995	Yes	Not provided	Spectrum fees
Brazil	1997	Yes	Not required	License and spectrum

				fees. Operators
Chile	1977	No	Sector Ministry	Spectrum fees, and government
Colombia	1994	Yes	Parliament	Operators
Costa Rica	1963	Yes	Parliament	Other
Dominican Republic	1998	Yes	Other	Spectrum fees and operators
Ecuador	1995	Yes	No requirements	License and Spectrum fees
El Salvador	1996	Yes	Sector Ministry	License and Spectrum fees
Grenada	2000	No	Sector Ministry	Spectrum fees
Guatemala	1996	Yes	No requirement	Auction fees
Guyana	1990	Yes	Parliament	Regulatory fees
Haiti	1969	No	Sector Ministry	License, spectrum fees and operators
Honduras	1996	Yes	Not provided	Government
Jamaica	1995	Yes	Sector Ministry	Regulatory fees
Mexico	1996	Yes		Government
Nicaragua	1982	Yes	No requirements	Not provided
Panama	1996	Yes	Parliament	Operators
Paraguay	1995	Yes	Parliament	License, spectrum fees and operators
Peru	1994	No	Parliament	Operators
St Lucia	2000	Yes	Sector Ministry	Spectrum fees
Suriname	1998	No	Sector Ministry	Government
Trinidad & Tabago	2004	Yes	Sector Ministry	Spectrum and regulatory fees
Uruguay	2001	No	No requirement	License and Government
Venezuela	1991	Yes	Sector Ministry	Spectrum fees

Source: ITU World Telecommunications Regulatory Database

2.3.3 Level of Competition

As in the case of SADC, Latin America also shows a rapid reform in the mobile sector compared to the fixed telephone sector. Table 4 indicates that 19 out of 32 countries introduced full competition in the mobile sector compared to 12 out of 32 in the fixed telephone sector.

TABLE 4 Level Of Competition Latin America

Country	Fixed Line services	Mobile
Antigua & Barbuda(1)	M	C
	0	1
Argentina(1)	C	C
	2000	1990
	1	1
Bahamas(2)	P	M
	0	1
Barbados(1)	P	P
	2004	2001
	0	0
Belize(2)	M	...
	0	0
Bolivia(2)	M	C
	0	1
Brazil(2)	C	C
	1	1
Chile(2)	P	C
	0	1
Colombia(1)	...	C
	1	1

Costa Rica(1)	M	M
	0	0
Cuba	M	M
	0	0
Dominica(2)	M	M
	0	0
Dominican Rep.(1)	C	C
	1	1
Ecuador(1)	C	C
	2000	2000
	1	1
El Salvador(1)	C	C
	1997	1997
	1	1
Grenada(1)	P	C
	0	1
Guatemala(2)	C	C
	1	1
Guyana(1)	M	P
Haiti(2)	P	P
	0	0
Honduras(2)	M	M
	0	0
Jamaica(1)	...	...
	2001	2001
	0	0
Mexico(2)	C	C
	1	1
Nicaragua(1)	C	C
	1	1
Panama(2)	C	P
	1	0
Paraguay(1)	M	C
		1995
	0	1
Peru(2)	C	C
	1	1
St. Kitts and Nevis(2)	...	...

	0	0
St. Kitts and Nevis(2)	...	...
	0	0
St. Lucia(2)	...	C
	0	1
St. Vincent and the Grenadines(1)	C	C
	1	1
Suriname(2)	M	M
	0	0
Trinidad & Tobago(2)	M	M
	0	0
Uruguay(2)	M	C
	0	1
Venezuela(2)	C	C
	1	1
	Local services	Mobile
Totals C:	12	19
Totals M:	12	7
Totals P+D:	5	4

(1) - 2007 data; (2) - pre-2007 data
M - Monopoly; P - Partial competition; C - Full competition; ... - Not available
Date: year when partial or full competition was introduced
Source: ITU World Telecommunication Regulatory Database

2.4 Trends in Latin America and SADC Telecommunication

2.4.1 Trends in Telecommunication Performance

Table 5 presents the trends in telecommunication performance from 1999 to 2006. Latin America's fixed lines in operation grew by 48 percent compared to a decrease of 6 percent in fixed lines in operation in the SADC region. Mobile subscribers in SADC

grew by 674, percent compared to 942 percent in Latin America. On the other hand, public payphones per 1000 in habitants decreased by 1 percent in SADC, while Latin America experienced a growth of 50 percent, in public payphones.

TABLE 5
Telecommunication Performance Statistics

	Fixed Lines		Mobile Subscribers		Public Payphones	
	Latin	SADC	Latin	SADC	Latin	SADC
1999	65,813,552	6,722,497	39,251,364	5,778,319	1,658,087	191,220
2000	75,193,613	6,276,533	62,378,346	9,520,435	2,095,138	198,333
2001	84,163,858	6,321,275	82,977,357	12,791,103	2,738,613	217,170
2002	87,224,033	6,293,405	99,782,178	17,021,338	2,035,525	202,315
2003	90,506,508	6,324,549	124,570,763	23,042,819	2,766,882	201,143
2004	93,836,266	6,395,774	172,972,234	29,123,009	2,875,658	195,491
2005	97,175,423	6,318,629	238,113,118	47,741,266	2,959,934	190,989
2006	97,379,778	6,334,778	303,973,907	60,190,020	2,492,957	189,749
% Growth	48%	-6%	674%	942%	50%	-1%

Source: ITU World Telecommunications Database

2.4.2 Trends in Telecommunication Performance as a Percentage of Population

Table 6 indicates the trends in telecommunication performance as a percentage of population from 1999 to 2006, to put the comparison between SADC and Latin America into perspective, considering that both regions are developing countries. The progressive trend in Latin America indicates that there is a lot that SADC can learn from Latin America. The trend of fixed line as a percentage of population in Latin America increased from 13 percent to 18 percent between 1999 and 2006, while in SADC

remained constant at 3 percent. Mobile subscribers increased from 8 percent to 55 percent as a percentage of population, whilst, in SADC they increased only from 3 percent to 26 percent as a percentage of population.

TABLE 6
Performance Statistics as a Percentage of Population

	Fixed Lines		Mobile Subscribers		Public Payphones	
	Latin	SADC	Latin	SADC	Latin	SADC
1999	13	3	8	3	0.33	0.10
2000	15	3	12	5	0.42	0.10
2001	16	3	16	6	0.54	0.11
2002	17	3	19	8	0.39	0.10
2003	17	3	24	11	0.53	0.09
2004	18	3	32	13	0.54	0.09
2005	18	3	44	21	0.54	0.09
2006	18	3	55	26	0.45	0.08

Source: ITU World Telecommunications Database

2.4.3 Trends in Telecommunication Tariffs

Table 7 presents the trends in telecommunication tariffs from 1999 to 2006. While the tariff for business monthly subscription increased by 6 percent in Latin America, in SADC it increased by 51 percent. The tariff for monthly mobile subscription indicates a decrease in SADC and in Latin America of 35 and 38 percent, respectively. The tariff for residential monthly subscription indicates an increase of 27 percent and 35 percent, in Latin America and SADC, respectively.

TABLE 7
Telecommunication Tariffs in US$

	Business Subscription		Mobile Subscription		Residential Subscription	
	Latin	SADC	Latin	SADC	Latin	SADC
1999	12	6	19	17	6	4
2000	13	6	17	13	6	5
2001	14	4	18	12	7	3
2002	12	5	16	12	6	5
2003	11	10	13	13	6	7
2004	12	9	13	12	7	6
2005	14	9	12	12	8	7
2006	13	8	12	11	7	6
% Growth	6%	51%	-38%	-35%	27%	35%

Source: ITU World Telecommunications Regulatory Database

2.4.4 Trends in Total Telecommunication Investment

Table 8 presents the trends in total telecommunication investment from 1999 to 2006. Latin America and SADC experienced declines of 8 percent and 39 percent, respectively, over the period.

TABLE 8
Total Telecommunication Investment

	Telecommunication Investment US$	
	Latin	SADC
1999	566,420,084	171,134,879
2000	688,334,518	149,992,668
2001	572,153,144	122,652,031
2002	418,369,560	134,825,767
2003	315,482,990	150,564,668
2004	403,626,158	94,414,427
2005	482,623,595	95,900,767
2006	522,217,771	103,580,620
%Growth	-8%	-39%

Sources: Author's own construct

2.5 Summary

The various trends in telecommunication as provided in this chapter indicate that SADC, compared to Latin America lags far behind. This can be attributed to a lack of political will in the area of telecommunication reforms. For SADC to gain from telecommunication sector reforms, like in the case of Latin America, drastic measures must be taken to address reforms in the telecommunication sector.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

This chapter reviews some of the existing theoretical and empirical literature in the area of telecommunication reforms. The literature reviewed addresses the aspects of liberalization and competition in the telecommunication sector reforms in developing countries and their impact on economic growth and development.

3.2 Theoretical Literature on Telecommunication Industry

Motinga (2003), reviewed the current wave of changes in the telecommunication sector in Namibia. Cabinet decided in 1999 to open up the telecommunication sector to competition from 2002. The mobile phone sector was to welcome a new entrant by 2003, but the process was delayed. Motinga argued that competition is essential for improving service provision. However, competition may only reduce costs of telecommunication services in Namibia provided the regulators closely monitor the behavior of the incumbent players, particularly in the fixed line services. The study highlighted the two important factors that contributed to the policy reversal. Firstly state-owned telecommunication firms performed quite poorly in terms of service delivery.

Waiting period for connections increased and the quality of those services were below par. In addition, these corporations often required large subsidies from the state, thus putting pressure on national treasuries. Secondly, international lending organizations started to put pressure on countries to divest, and thirdly a worldwide trend developed during the Thatcher years in the UK towards divesture and privatization. As far as the challenges to the natural monopoly arguments concerned the study found that recent developments such as cellular phones and the internet had negated those arguments. The natural monopoly argument was most plausible at the time when the telecommunication industry produced a single standardized or uniform product –voice-grade telephone circuit – and almost all services were local access and local calls. Things are much different in the 21st century as there are a variety of communication modes such as electronic mail through the internet, and mobile phones, and therefore there is room to further liberalize the telecommunication sector to enable different models to compete. According to, Motinga, liberalization means to open up closed markets to greater competition to allow prices as well as service and product quality to be determined within a competitive environment, so that prices are able to respond to changes in demand signals. On the other hand, liberalization does not say anything about the ownership of a firm or firms; it is rather about changing the pricing incentives and thereby the behavior of firms. At times liberalization is equated to liberalization in public debates and, according to the study, this is a serious misnomer. Motinga concluded that in monopolistic environments, competition in terms of pricing outcomes

and quality of service delivery does not come by itself and in most cases has to be induced through appropriate regulation. Experience from other countries that liberalized their telecommunication sector bears this out.

Allen (2003, argue that the main component of sector reforms include three areas namely; privatization, establishment of an independent sector regulator and the introduction of competition. These components are now well established as important elements of reform throughout the globe. They however have many variations and subordinate elements. Allen, explained these components as follows: privatization involves the sale of a portion of the operator to the private sector and outside investors, such that government dissolves all or a portion of ownership, while liberalization can proceed formally through a managed transition, with an attempt to legislate or license the boundaries of exclusive service provision until terms expire and laws are changed. Liberalization can also occur on less formal paths, involving little role for the courts or regulators through premise entry. The establishment of independent regulation is also an important determinant of successful reform policies. In a competitive environment, independence is needed to help ensure that outside investors will receive no less favorable treatment than any others. Regulatory independence is needed to strike a balance between return on investment and consumer desires for lower rates. Independence refers to independence from political and operational influence. Allen (2003) outlined some potential concerns with fast tracking reforms. According to the

study, the main concern with fast tracking is its potential impact on the financial health of incumbent monopoly fixed-line operator. Allen made a point of clarification in terms of what he is proposing for fast tracking liberalization that is not a proposal to reject privatization in favor of liberalization. Evidence is clear that both liberalization and privatization are needed to reform the sector and, ultimately lead to better service to consumers. The second concern is that even where liberalization occurs in advance of privatization, it need not jeopardize the financial health of the incumbent. The third concern is that liberalization can induce other sector reforms. The fourth concern is that some parts of the key elements of reform can precede even liberalization. The fifth concern is that of the value of the incumbent operations appearing to be declining over time or at least attracting less attention from outside investors. The sixth and the last concern is that the existing approach to the sector reform that requires delay to the opening of markets places the burden of creating artificial "value" on the shoulders of consumers in the sector. The study concludes that there is a strong theoretical and a well established empirical case for supporting the key elements of sector reform, including privatization, liberalization and establishment of a sector regulator.

3.3 Empirical Studies on Telecommunication Liberalization and Regulation

Gutierrez & Sandford (1998) examined the determinants of telephone lines per capita using economic , institutional and regulatory variables. In the absence of information on

total investment, they used lines as a proxy for telecommunication investment. The economic variables that they used had the expected impacts. Gross Domestic Product impacted investment positively while telecommunication services were found to be income-elastic. They introduced institutional indices to capture the effects of political democracy, economic freedom and a sound regulatory framework, which captures the degree of independence of the regulatory body. The study further revealed that regulatory framework and freedom factors impacted telephone lines per capita in a positive manner. The number of cellular phones per capita's positive impact was found to be consistent, as a result of cellular phones being a complement for fixed line telephony. This positive impact reflected a competition effect, whereby a competitive entrant in a liberalized sector stimulates improved performance. The study analyzed the determinants of the penetration level of lines in 19 Latin American countries. The equation estimated was given as follows:

$$MLINES_{it} = \alpha + X_i \beta_i + X_2\beta_2 + X_3\beta_3 + u_{it} \quad \text{.....(1)}$$

$X_i = (GDPC_{it}, TRADE_{it})$

$X_2 = (POPDEN_{it})$

$X_3 = (EFREEI_{it}, TREGUL_{it}, GOVTYPE_{it-1})$

Where *i*=country, *t*=time and where: $MLINES_{it,}$ represents main telephone lines installed per 100 inhabitants, *GDPPC,* represents *GDP* per capita in U.S $1990, *TRADE*, represents sum of exports plus imports over GDP, *POPDEN*, population per square km, *EFREEI,* economic freedom index, *TREGUL*, represents regulatory framework index in telecommunications (it takes a value of 1 if the regulatory body has the main characteristics and 0 otherwise) and *GOVTYPE* represents democracy index constructed according to Jagger and Gurr (1996).

The results were obtained by using panel data consisting of time series and cross section. The study noted an increase in the overall explanatory power of the model, when economic freedom index, regulatory framework and democracy index was introduced. The adjusted R-squared increased from 81.9% to 95, 2%, indicating that the institutional and regulatory variable does help explain the level of investment in telecommunication. It is evident that almost all regressors are statistically significant at conventional levels and have the expected coefficient signs.

Wallsten (2002) addressed the absence of econometric test of the effects of competition, privatization or regulatory changes. The study used original panel data covering 30 countries in Africa and Latin America from 1984 to 1997. He explored the effects on telecommunication performance of privatization, competition and regulation, using data from two primary sources namely the ITU and World Bank –Standford University

infrastructure database. He tested two hypotheses of reforms that were explored as follows:

$$ln(\text{sector performance}) = \beta_0 + \beta_1 \text{ regulator prior to privatization}) + \beta_2 (\text{private}) + \beta_3(\text{regulator*private}) + \beta_4 (\text{independent}) + \beta_5(\text{independent*private}) + \beta_6 * ln(\text{population}) + \beta_7 * ln(\text{gdp per capita}) + \alpha_1 + \gamma_1 + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$ln(\text{implied firm value}) = \beta_0 + \beta_1^* (\text{regulator prior to privatization}) + \beta_2^* (\text{exclusivity}) + \beta_3^* ln(\text{number of mainlines}) + \beta_4^* ln(\text{populatio}) + \beta_5^* ln(\text{gdp per capita}) + \beta_6 * ln(\text{international settlement payments}) + \varepsilon. \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The study found that competition is significantly associated with increases in the per capita number of telephone mainlines, number of payphones, connection capacity and with decreases in the price of a local cell. It revealed also that privatization is significantly associated with decreased mainline penetration and connection capacity and positively correlated only with payphones. On the other hand, privatization combined with the existence of a separate regulator is significantly associated with increases in connection capacity and labor efficiency and substantially mitigates the negative correlation with mainlines. The study's findings are in line with conventional wisdom that competition is the most effective agent of change and privatization without regulation may not improve the required quality of services. The weakness of this

investigation is that it approximates the degree of competition in fixed line telecommunication by the number of mobile operators not owned by the incumbent operator. The latter is inadequate considering the fact that many countries have introduced competition in mobile services while maintaining a monopoly in fixed line services.

Gutierrez and Berg (1998), examined the determinants of telephone lines per capita, using economic, institutional and regulatory variables. This was the first study that addressed the potential impact of a sound regulatory framework on the level of investment in the telecommunication sector. The study found that institutional factors have significant and positive impacts on the deployment of telephone mainline, while GDP per capita was also has a positive and statistically significant impact. Further to the aforementioned the number of cellular subscribers was found to have a positive impact on lines per 1000 inhabitants.

The study constructed a dichotomous index to show the degree to which regulatory framework in telecommunication allows the enforcement of regulatory powers. The latter characterized the regulatory development in the industry. The zero-one dummy variable in their analysis signaled the existence of an independent regulator. Considering the wide range of liberalization studies, this study did not attempt to classify the different types of regulatory regimes. The study showed that incentives programs such

as exclusivity periods have differential impacts on main lines per capita, and without a large database, reform elements were collapsed into a single index, to avoid the manipulation of data. The regulatory incentives influence sector performance, competition can provide powerful pressure for improved sector performance.

The study further introduced one variable, cellular subscriber per 100 inhabitants, in order to capture the role of competition from alternative technology. The study suggested that the variable of ownership warrants attention, because some countries have chosen to phase in privatization while others decided that strategic investors would be in a better position to introduce new managerial techniques. The introduction of these techniques would lead to the improvements in service quality and cost containment. A zero value was assigned to frameworks that lack the characteristics as afore mentioned and 1 otherwise. The study revealed some degree of subjectivity in the index, given the way how the index was formulated. The index allowed the study to utilize a larger sample of countries in their qualitative work. This was the first study that attempted to capture the role of regulation. The study refrained from introducing privatization as an independent variable because they wanted to isolate the effects of institutional and regulatory framework on network deployment. It is clear from the study that privatization is a driving force in the enhancement of the telecommunication network deployment. The results of the study was obtained by using panel data. The study concluded that economic and demographic variables have a greater impact on their

proxy of investment in telecommunication. Regulatory and political factors were found to be the driving force behind surge of modernization in the sector.

Boylaud and Nicolleti (2000) used an original international database on regulation, market structure and performance in the telecommunication industry to investigate the effects of entry liberalization on productivity, prices and quality of services in long-distance (domestic and international) and mobile cellular telephone in 23 OECD countries over the period 1997 to 2000, to assess performance in telecommunication. The approach taken in this study was to infer the effects of deregulation on performance by exploiting the variation of regulatory regimes and market outcomes over time and across countries. The empirical analysis was concerned with the effects of deregulation on performance, by comparing regulated outcomes against a benchmark in which regulation of entry and direct state ownership were reduced or eliminated. On the latter the study argued that it would be unthinkable to consider telecommunications as unregulated and perfectly competitive in countries that reduced these forms of state interference. Most often, they will be simply subject to a form of regulation that deals with the characteristics of the industry. For example, deregulation of entry in mobile telecommunication generally consisted of replacing legal monopolies by a system of multiple franchises that are generally assigned discretionally by the government. The focus was set on three measures of economic performance-labor productivity, prices and quality. Cross country productivity differentials are taken to signal gaps in the efficient

use of the labor input by the industry. This inference is correct only under the assumption that the input mix is the same across countries. Differences in prices are assumed to reflect in part efficiency gaps as well as other market distortions and carry important implications for consumer welfare, but also because it may be traded off against prices: consumers may be willing to pay higher prices for higher quality telecommunication services.

For each performance measure the following reduced-from model was defined, expressing for each country *i*, sector *s* and period *t* the dependent variable y_{it} as a function of a) country specific effects, f_I; b) a set of exogenous economic characteristics that are assumed to influence performance independent of regulation and market structure, $Z_s[i,t]$; c) a set of market structure indicators, $M_s\ [i;t]$, and d) a set of regulatory indicators $R_s[i,t]$:

$$y_{ist} = c + \alpha_{is} f_i + Z_s \beta_s + M_s \gamma_s + R_s \delta_s + \varepsilon_{ist} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The model was estimated for each service and for all services pooled using data techniques considering countries as the relevant individuals. For estimates pooling all sectors, sectoral dummies catching sector-specific effects were added. In general, the exogenous characteristics were assumed to account for country specificities in econometric structure and technology, over and above the country-specific effects.

Measurement of performance, regulation and market structure was necessarily approximated. The precise definition of the performance measure was dictated by the availability of data. Quality was regarded as a multi-faceted concept which includes relatively objective features such as variety, reliability and serviceability as well as more subjective factors such as user satisfaction. The study found considerable problems in measuring price performance. OECD tariff basket accounts for a number of cross-country idiosyncrasies, such as different patterns of demand, different average lengths of conversation and different regional distributions of international calls. However, the available data concern standard rates, which are not always a good indicator of market outcomes, especially in those countries and services more exposed to competition, where discounts are widely applied. In addition, cross-country/time series data on prices of digital mobile services are lacking and cross-country differences in prices reflected differences in price regulation. The coefficient of the variables expressing differences in economic structure and technology showed the correct signs, but their significance varied according to the service and measure of performance. Empirical results revealed some evidence of external effects on productivity, which are often positively affected by the size of the telecommunication sector relative to population. However, the sign of the coefficients depended on the effect of a third variable, the demand for telecommunication and productivity levels. The negative effect of telecommunication revenue per capita on the ratio of subscribers to employees in the mobile industry suggested that the demand for mobile services is relatively high where the fixed network

is undersized. The random effects specification could not be rejected in around half of the regressions, while the hypothesis of absence of country specific effects was uniformly rejected by both the F and Breusch-Pagan tests.

Gual and Trillas (2006) presented new data on telecommunication reform for a cross section of countries. The study measured telecommunications reform along two dimensions, one being entry barriers and the other regulatory independence. The study was based on data collected on a number of original variables reflecting telecommunication policies and institutions in 1998 for 37 countries. In order to reflect the key characteristics of any policy designed to lower entry barriers and to reflect an independent regulatory body, the original variables were initially aggregated in four indices, two for entry barriers and two for regulatory independence. The two indices on entry barriers were based on 12 indicators, while those of regulatory independence were based on information covering 11 indicators. The telecommunication variable was represented by the most widely used variable, namely mainlines per 100 inhabitants. As for the political variable, the study collected information on the general quality of government, interest groups, ideology, institution and the tradition of each country with regard to the state's involvement in the economy. The data were collected from web pages, legislative texts published by different regulatory studies, documents and working papers of the OECD and the ITU, studies carried out on behalf of the European Commission and articles from specialized journals. The econometric results revealed

that the principal components of entry barriers appeared to be significant and positive in some of the specifications. The latter maintained their magnitudes and signs, however when other explanatory variables were added, they appeared to be losing their significance. Their estimates were consistent with the hypothesis that less interventionist societies tend to have lower entry barriers to a large extent. The legal origin variable was statistically significant in all specifications, reflecting the fact that countries that have less interventionist judicial tradition are more prone to open up their telecommunication sectors. However the ideology variable did not have significant impact on entry barriers, even when the latter included privatization. Considering that their index of regulatory independence was not highly correlated with overall regulatory quality, they interpreted it as evidence that formal regulatory independence is compatible with different levels of general regulatory or institutional quality. Their regression results on the determinants of independence showed that independence is a substitute for ensuring commitment not to expropriate state owned enterprises. In some of the regressions, the results revealed that the size of the incumbent had a positive and statistically significant effect on the decision to create an independent regulatory agency. Theis was found to be a surprising result, and the study interpreted it as the incumbent preferring an independent regulator in the face of the forthcoming liberalization. The study provided new data for telecommunications reforms to be carefully measured. Therefore countries were ranked according to their policies.

3.4 Privatization and Competition: A Review

Ross (1999) looked into the effects of privatization and competition on efficiency and network expansion in 110 countries between 1986 and 1995. The focus of his study was on main lines per hundred inhabitants and main lines per employee, and on the other hand, he studied waiting lists, investment levels, access prices and usage charges. Ross found that privatized networks have higher penetration rates, higher penetration growth rates, higher productivity, lower fault rates and lower wait times. Ross, however, argued that the telecommunication regime would be competitive as long as any one of the basic service segments is competitive. This is misleading as the direct influence on mainline penetration is exerted by local competition.

Naesl *et al* (2005) studied whether improvements in the productive efficiency of the telecommunication sector across Latin American countries can be traced back to changes in corporate control, competition for the market, competition in the market for fixed line, competition from substitutes and government regulation. They estimated a reduced form equation which accounts for labour productivity (in part) in terms of proxies for these factors over a rich sample of 18 countries which had different experiences in the scope and timing of liberalization over the period 1983 – 2003. Their study uncovered some surprising effects of competition, regulation and privatization, in particular on teledensity. They found that privatization mattered for labour productivity

and led to network expansion only in the presence of competition and the study further found that competition might reduce prices and increase efficiencies.

Li & Xu (2002), using a comprehensive country level data covering the period from 1981 to 1998, examined the impact of privatization and competition in the telecommunication sector around the world. According to the study, privatization, which means the transfer of both the control rights and the residual cash-flow rights to private owners, contributed substantially to labour shedding, output growth, network expansion and improvements in labour productivity as well as total factor productivity, in the absence of government intervention. However, private firms do frequently face government intervention, than public ones. Privatization can also affect the monitoring of managerial efforts. Given politicians lack of profit motives, it is not surprising that managers of public enterprises face less incentive to reduce cost since they cannot capture cost directly. According to Li and Xu other benefits of privatization are associated with the public listing of ownership shares on stock markets. There are, however, qualifications to the benefits of privatization. Competition also makes it possible for the principal of a telecommunication service provider and the regulator to compare the firm's performance against that of its competitors. Their view is that it has been argued that when there are externalities and economies of scale and scope, privatization might worsen performance without proper regulation to internalize the externalities or increase productivity and profitability at the expense of neglecting non-

profit objectives, such as universal service. In addition externalities and universal services may be handled by regulation. How countries privatized is of cardinal importance. Therefore what must be considered is that privatization without simultaneous introduction of competition will simply create private monopolies interested in extracting monopoly rents by restricting output. Share issue privatization facilitated the development of mobile market segment. Granting a newly privatized operator a period of exclusive market access, on the other hand, reduced the gain from privatization, without entirely negating the gains. The presence of competitive pressure in the market was associated with more employment, higher output, faster network expansion and higher labour and total factor productivity. They found evidence of complimentarity between privatization and competition in that competition increased the gains from privatization and vice versa. The estimates show that half of the output growth between 1990 and 1998 was attributable to privatization and competition after controlling for input growth. Competition appeared to have a larger impact on labor and total factor productivity than privatization. In their view, that suggests that while there is a strong presumption that privatization and competition in the telecommunication sector improve economic performance, there remain significant qualifications. Whether the latter is true remains largely an empirical question on which their model is based. Li & Xu relied on several major sources of data, from the World Bank and World Bank – Standford data set on telecommunication reforms. The data from these sources encompasses data on whether a country allowed private equity participation or the

privatization dummy variable, the share of non-state ownership of the incumbent operators and a dummy variable indicating whether the country granted privatized operators a period of exclusive access to certain market segment. Li & Xu also included a dummy variable that indicates whether privatization was done through a public share offering (Share Issue Privatization SIP). For the period 1990 and 1998, they gathered data on the number of fixed phone operators and the number of mobile phone operators in a particular country, but they did not have data on operators' market behavior to come up with a conduct-based measure of the intensity of competition. They included the latter variables as indicators of competition. The model of the study examined how privatization and competition effected employment, investment, real output, fixed line density and mobile density. The functional specification they estimated is a fixed-effects treatment-response equation:

$$y_{it} = ý R_{it} + \beta' X_{it} + \alpha t + Øi + \varepsilon it \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

Where y is one of the outcome measures, *R* represents a vector of telecommunication reforms, and *X* a vector of control variables. The treatment-response specification estimates the effects of privatization and competition. By using fixed effects model, Li and Xu controlled for country-specific heterogeneity, which might influence both policy changes and the telecommunication performance. Without controlling the country-specific effects, country heterogeneity can result in inconsistent estimates of reform

effects. A time variant trend was included in the specification to capture the effects of technological innovation, which are expected to be significant given the rapid adoption of new technology in this sector around the world. They further included time-invariant variables like per capita income, population, and the degree of urbanization in their estimation. Since these variables affect the demand for telecommunication services in a country, they are expected to affect telecommunication outcomes. By analyzing the impact of competition and privatization on a comprehensive set of indicators of performance in the telecommunication sectors in 160 countries over a period two decades, Li & Xu found strong evidence that both privatization and competition improved performance.

McNary (n.d.), in his thesis for senior honors, compares the relative success of privatization and competition programs in improving telecommunication sector performance. The study took the view that many of the most difficult questions in economics are of primary importance in the telecommunication sector. Questions such as, what level of government regulation and ownership maximize economic welfare? In what markets and at what level should competition be allowed? How can competition be instituted in historically monopolized markets? Many governments have designated efficiency in the telecommunication sector as a requirement for accessing global markets. Rejecting a legacy of poorly performing state owned monopoly firms, several governments have privatized telecommunications and removed competition restrictions.

Using data on reform status compiled from the Economist's country profiles and recently released data from the International Telecommunication Union, McNary (n.d.) compared telephone network penetration rates in over two hundred countries between 1987 and 1998. McNary (n.d.) applied pooled time series regression analysis with fixed effects, controlling for various sector characteristics and macroeconomic indicators. He reviewed yearly profiles for important dates in privatization, competition and regulation over several years in two hundred and six countries. Special attention was paid to a clear and useful definition of the reform variables. Instead of a simple dummy variable, a continuous variable measuring the years of reform was used in the model. This follows the presumption that reform will have more impact over time and that the first year of reform is qualitatively different than later years. The result is a counter variable, starting at one in the year of reform and increasing every year thereafter. A separate dummy variable was created for countries that have always had a private-sector carrier or that always had several cellular providers. The competition variable in the study does differ significantly from other studies which define competition as government approval of competition in local, long-distance or international services. The cellular competition variable denotes the years of competition in the cellular service market, with cellular carrier with greater than one percent market share. The estimated coefficients from regression analysis revealed that cellular competition has a significant positive effect on penetration while privatization has a weak negative effect. Coefficient for years of cellular competition has a significantly positive effect. It is estimated that every sixteen

months of cellular competition increases penetration by approximately 5 percent on line per hundred people. After adjusting the model for endogeneity between historic firm performance and the decision to implement reforms, local fixed competition and cellular competition, are both found to have significant positive effects on penetration. Privatization is shown to have a significant negative effect.

3.5 The Impact of Telecommunication Reform on Economic Growth and Development: A Review

Savage *et al* (2003) developed a model for estimating the direct and indirect effects of telecommunication investment on economic growth and used the model to assess the effects of telecommunication liberalization on the economy. Using a panel of 46 countries from 1984 to 1999, they found a positive effect of telecommunication investment on aggregate economic output, and observed that the effect on output increases substantially after accounting for spillovers between the telecommunication and non telecommunication sectors of the economy. The effects of telecommunication investment are more pronounced in countries with competition, privatization and network penetration above 20 mainlines per 100 people. The study suggests that policies promoting telecommunication liberalization will benefit the economy, not just the telecommunications sector. However, policy makers should be aware that the spillovers can flow both ways and the telecommunication sector can also be hurt by downturns in

the broader economy. The study reveals that telecommunication productivity is affected by the extent of telecommunication market liberalization, measured by competition and privatization. To test the effects of network penetration and telecommunication market liberalization on telecommunication productivity and economic growth, the study assumed that investment affects telecom production across $I = 1,\ldots, N$ countries and $t = 1,\ldots, T$ years according to:

$$\delta_{1it} = \nu_0 + \nu_1 DEN_{it-1} + \nu_2 DEN^2_{it-1} + \nu_3 DEN^3_{it-1} + \nu_4 COMP_{it-1} + \nu_5 PRIV_{it-1} \quad \ldots\ldots(6)$$

Where δ_{1it} represents telecommunication productivity , *DEN* is teledensity, *COMP* is the combined market share of new facility-based entrants in international message telephone services (IMTS) markets and *PRIV* (privatization) equals one when the dominant local exchange carrier (LEC) is partially or fully privatized and zero otherwise. In their estimation they proposed a refinement to Kinal and Lahiri (1993) algorithm, for the study to obtain the elements of their estimator in lower dimensional, more tractable space.

Investment in Telecommunication is implanted within two-sector model of production that allows external benefits to feedback between the telecommunication and non-telecommunication sectors. The growth equation in the study allows liberalization and

network externalities to affect non-telecommunication output in response to the investment in the telecommunication sector, according to competition, privatization and network penetration. For estimation they refined and employed a simplified algorithm for computing a simultaneous equation error-component model in a parallel data of 47 countries from 1984 to 1999. The estimator used solved the dimensionality problem that has limited empirical application.

Mattoo *et al* (2001), conducted a study with three aims. In the first instance it explained how impact of liberalization of services sector on output growth differs from that of liberalization of trade in goods. Secondly it suggested a policy based rather than outcome-based measure of the openness of a country's service regime. Such openness measures are constructed for two key service sectors, basic telecommunication and financial services. Finally it provided some econometric evidence relatively strong for the financial sector and less strong, but nevertheless statistically significant, for the telecommunications sector – that openness in services influences long run growth performance. Their estimates suggest that countries with fully open telecommunication and financial service sectors grow up to 1.5 percentage points faster than countries that did not fully open telecommunication and financial service sectors. In order to undertake the cross-country regression analysis, two distinct approaches were undertaken. Firstly an index of openness for the telecommunication and financial services sectors was constructed. Given the distinctiveness of service sector, it was important that the indices

captured the two key elements that contribute to the dynamic benefits from service liberalization. In recognition of the fact that regulation plays a crucial role in delivering competition, particularly in the telecommunication sector, a third element was added, the nature of regulation in constructing the index for the telecommunication sector. The second approach of the study was motivated by the consideration that sometimes, partial liberalization may not bring about significant benefits. They considered the telecommunication sector fully liberalized only in the case of the introduction of competition. The key challenge of the study was to integrate the three key aspects of policy, namely competition, foreign ownership and regulation into an index. A cross-country regression for a sample of 60 countries for the period 1990-1999, was carried out, and their regression specification was as follows:

$$G_j = \alpha + \beta X_j + \gamma R_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(7)$$

Where G represents the independent variable, the average annual growth rate per capita GNP between 1990 and 1999 in country j, α is the constant term, X_j is the vector of standard growth controls for country j, R_j represents the vector of the openness to trade in services for country j. The standard growth controls included the natural log of per-capita GNP in 1990, a lagged value of the investment rate, the government consumption to GDP ratio as a proxy for the size of the government included distortions, the inflation rate, a proxy variable for political stability, an index representing the quality of

institutions, geographical and regional dummies, a schooling ratio, and an index of tariff and non-tariff barriers. The data for per capita GNP, the investment rate, the government consumption to GDP ratio, the inflation rate, and the primary education enrollment rate were obtained from the World Development Indicators database at the World Bank. In testing the significance of indices of liberalization, the results of the study suggest that both the extent of financial and telecommunication sector liberalization contribute meaningfully to explaining cross-country GNP growth performance. The telecommunication liberalization index was found positive and significant, albeit at the 10 percent level in the regression that included regional dummies. In testing for benefits of complete liberalization, the dummy variable for complete liberalization of telecommunication also had a positive and significant coefficient.

Alleman *et al* (1994), conducted a study to provide a framework to analyze the potential impact of telecommunication investment on the SADC region's economic development. The study utilized models and data which had been utilized in similar studies on the relationship between economic development and telecommunication in other regions of the world. A more precise definition of the relationship between telecommunication and economic development is made possible by economic techniques by using both quantitative and qualitative indicators to analyze the impact of equipment cost, calling price, tariff levels and other factors. The study reviewed the available procedures to determine their potential applications to the SADC region, and to suggest the most

appropriate methodology to further analysis of each country within the region. The study criticized and analyzed data on telecommunication services in the SADC, and estimated the evidence for, and consequences of, the inadequacy of these services, with the object to provide an overview of the telecommunication effects on the economies of Southern Africa Development Community member states. The study also explored policy alternatives and options in its conclusion. It looked at two distinct analytical approaches for reviewing the impact of telecommunication on economic development, namely macro-economics in orientation and micro-economics. Both approaches were found to have distinct advantages and disadvantages, and can be used in complementary ways. The study used a variety of data sources in developing the profile of Southern African countries in the study. South Africa skewed the data, because of its level of development which was much higher than the other countries. The skewed data was deceptive, because the data reflected the white South African economy only. The study worked with published and electronic versions of data available on SADC countries. Severe data deficiencies were found. The electronic version of the ITU data did not always agree with its published version of the database. Several data items were not reported for specific countries and, in some cases the country did not have some of the data for some or all the years. Data deficiencies could not be overcome within the context of the study. Telephone density was assumed to be related to GDP per capita as in the following model:

$D_{it} = \alpha\ Y\beta_{it}$ *or* $\ln D_{it} = \alpha\ \beta \ln Y_{it}$ ……(8)

Where D_{it} is telephone density and Y_{it} is GDP for the country in year t, respectively. α is the intercept and β is the slope, an indication of the relationship between telephone density relative to GDP. The result of the econometric analyses showed that an initial assessment of the quantitative relationship between telecommunication development and economic growth was derived from the available data for SADC, because of the difference in the size of the countries and the utilized growth rate of GDP and telephones. The relationship between the rate of telephone density and growth in per capita GDP was found to be positive. The study realized that making generalization about the relationship between telecommunications infrastructure investment and economic investment is problematic. Almost all the discussions, both theoretical and empirical, depict a positive relationship between these variables; however the strength of that relationship appeared to vary widely. The primary objective of the review was to formally define the interaction between telecommunication and economic growth, and apply the most appropriate methodology for SADC. After reviewing the various methodologies available to measure the potential impact of telecommunications on economic growth, and taking into account the data constraints, the study recommended that a direct macroeconomic correlation model be defined for each country in conjunction with the decision model.

3.6 Reforms in Developing Countries: A Review

Fink, Matto & Rathindran (2002) analyzed the effect of policy reforms in basic telecommunication on sectoral performance using a new panel data set for 86 developing countries across Africa, Asia, the Middle East, and Latin America and the Caribbean over the period 1985 to 1999. The tested five hypotheses in the panel data set, namely privatization leads to an increase in labour productivity, the introduction of local fixed-line competition will lead to an increase in productivity, the interaction of privatization and fixed-line competition will lead to an increase in productivity and the number of mainlines, the interaction of regulation with privatization and competition leads to an increase in labour productivity and the number of mainlines and that alternative sequences of reform do not have any impact on internal efficiency but matter for allocative efficiency. The following specification was assumed:

$$y_{it} = \alpha + u_i + \delta year + C_{it}\gamma + X_{it}\beta + þM + \varepsilon_{it}, \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Where y_{it} is the natural logarithm of the performance indicator, which is either teledensity or mainlines per employee in country i at time t the coefficient α is the constant term, while u_i is a country specific dummy variable that is intended to capture the effects of autonomous factors, including technological progress. The matrix of

control variables is C_{it} which includes *GDP per capita* and p*opulation* (both in natural logs). The model's telecommunication policy variables are represented by X_{it} which includes dummy variables for privatization, competition, and the existence of an independent regulator, with β being the corresponding vector of coefficients. In determining the effects of individual reforms on performance, the study expected mainline penetration to be higher in developing countries with higher per capita GDP and lower in developing countries with higher populations. The study indicated that privatization and the introduction of competition are likely to lead to an increase in labour productivity and an increase in the number of mainlines. The empirical estimates of the model suggest that both privatization and competition dummy variable are positively significant at 1% and 5%, respectively. The study also tested whether the effects of privatization and competition differ in the presence of an independent regulator. The study used labour productivity as a proxy for internal efficiency, measured by the number of mainlines per employee and aggregate output as crude proxy for allocative efficiency, while knowing that these proxies are imperfect. Internal efficiency is better measured by total factor productivity and output may be a deceptive measure of allocative efficiency. Their investigation revealed that both privatization and competition lead to significant improvements in performance. On the other hand, they found that a comprehensive reform program supported by the policies of competition and privatization, and an independent regulator produces the largest gains. However, the impact of policy reforms over the period of fifteen years had been dominated by the

improvements in telecommunication performance not directly attributable to the policy variables considered. The study further suggested that mobile competition can serve as substitute for fixed line competition in achieving higher mainline penetration and can, therefore, mitigate the harmful effects of exclusivity.

Chakraborty (n.d.) utilizing Granger Causality test within a panel cointergration framework, examined the possibility of a two-way link between telecommunication infrastructure and growth in a panel of selected developed countries. In addition, it investigated the role of telecommunication reforms, especially privatization of state-owned telecommunication providers, in explaining the aforesaid relationship. The study started by testing for non-stationarity in the two variables of GDP and telecommunication infrastructure. Prompted by the existence of unit roots in the time series, they tested for long run cointegrated relation between two variables at the second estimation using panel cointergration technique developed by Pedroni. Granted the long run relationship, they explored the causal link between the two variables by testing for granger causality at the final step. The results of the analysis suggested that there exists, in the selected set of developing countries, a long run cointegrated relationship between the two variables of telecommunication infrastructure and economic growth. Allowing for short run causality between the two variables appears to be bi-directional. The direction of causality, however, varies between countries with high and low degrees of telecommunication privatization. For highly privatized countries, the causality runs both

from telecommunication to growth and from growth to telecommunication. However, the two variables fail to reinforce each other for countries that are yet to achieve significant privatization. Causality for this latter group of countries runs only from telecommunication to growth, reflecting a weaker income effect in the absence of privatization.

Wallsten (1999) explored 30 African and Latin American countries from 1984 through 1997, even though not all data existed for all countries. However the available data allowed the study to begin exploring the effects of liberalization. An unbalanced panel was used to investigate the relationships between telecommunication performance measures and telecommunication liberalization. Telecommunication indicators included the number of main lines, the number of payphones, network connection capacity, telecommunication employees per main line and price of a three minute local call. The analysis attempted to explore the effects of privatization, competition and regulation on telecommunication services, using the variable above to measure service. The dummy variable for privatization did not capture the extent of privatization; it simply indicated whether the government sold part of the firm. On the other hand competition was measured by the number of wireless operators in the country not owned by the incumbent. The dummy for regulatory measure was represented by a variable indicating whether the country had a separate telecommunication regulatory agency not directly under the control of a ministry. The study used these data to explore the effects of

telecommunication reforms on telecommunication performance. Considering that countries differ in so many ways the study employed fixed-effect model to control for unobserved country-specific factors. It included also included year dummies to control for time trends. The equation was estimated as follows:

$$y_{it} = \alpha_i + \gamma_i + \beta_1 (cell_{it}) + \beta_2 (private_{it}) + \delta (Reg_{it}) + \emptyset (X_{it}) + \varepsilon_{it.} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (10)$$

where $y_{it,}$ represent, number of mainline per capita, number of payphones per capita, network connection capacity per capita, employees per mainline and the cost of a three minute call. Cell_{it}, is the number of mobile operators not owned by the incumbent and $private_{it}$ is a dummy variable indicating whether the incumbent is privatized. $Reg_{it,}$ is the dummy variable measuring whether there exists a separate regulator. X_{it} is a vector of control variables like per capita income, population, percent of the population living in an urban area, a dummy variable indicating whether the country passed telecom reform legislation, a dummy variable indicating whether a World Bank telecommunication project was active in the country-year, net World Bank aid as a percent of GDP, exports as a share of GDP, and a variable measuring the risk of expropriation. The study estimated this equation five times, using as the dependent variable the different telecommunication indicators. According to theory, privatizing a monopoly may not generate telecommunication improvements. Careful regulation is required to encourage a monopoly to improve performance. Hence to explore further the effects of regulation,

the study interacted the regulation dummy with privatization dummy and with the number of competitors, and estimated the following equation:

$$y_{it} = \alpha_i + \gamma_i + \beta_1 (cell_{it}) + \beta_2 (private_{it}) + \beta_3 (cell_{it} * reg_{it}) + \beta_4 (private_{it} * reg_{it}) + \delta (Reg_{it}) + \emptyset (X_{it}) + \varepsilon_{it.} \quad \ldots\ldots (11)$$

This equation enabled Wallsten to explore separately the effects of competition, privatization, regulation and how they interact. The result of the regression output was found to be consistent with conventional wisdom. Competition is associated with increased mainline penetration, payphones, connection capacity, and lower prices for local calls. Privatization by itself is significantly associated with an increase in payphone penetration. Privatization alone is correlated with decreases in mainline penetration and connection capacity. On the other hand privatization combined with the presence of a separate regulator is associated with increased payphone penetration, connection capacity and increased labor efficiency as measured by employee per mainline. Regulation interacted with competition had no significant impact.

Symeou and Pollit (2007), in their study of telecommunication in small economies indentified a lack of research in the field of telecommunication in the context of small economies. The study's central research question was whether there exist significant differences between small and large economies with regard to the effects of

liberalization and alternative technologies on universal service that would necessitate the consideration of smallness in the formulation of optimum policy. They examined this question with an econometric approach, using data for more than 140 economies for the period of 1980 to 2004. Telecommunication data were obtained from the ITU's telecommunication indicators database. They consisted of time-series, cross sectional data for 214 countries and jurisdiction for a number of telecommunication and other indicators. 112 of these countries fall into the category of small economies and data over the mentioned period were considered appropriate in terms of the completeness of the purpose of the study. With regard to the econometric model, the two dependent variables depicted the fixed network expansion and prices. For the assessment of the effects on teledensity two regression models employing a fixed effects transformation were assessed. The first one concentrated on the effects that competition has on telednsity in small economies, while the second model incorporated the effects of alternative technologies on teledensity. The study employed a fixed effects model. Small economies were defined as economies with maximum population of 9.2 million, GDP of less than USD$86.17 billion and no more than 19.3 thousand km^2 arable area. The econometric analysis showed that smallness has a significant leverage on the examined relationships which implied that different policy models should be developed for economies that meet these thresholds. The results also showed that teledensity in small economies appeared to be lower than in large economies. However, it is not that lower levels of teledensity reflected a poorer provision of service. The study showed that small

economies appeared to have lower prices than large economies, and concluded that economies of scale are not fundamental for the efficient operation of telecommunication firms. Structural competition policies, such as divestiture of the incumbent operator and condemnation of merger agreements on the grounds of their subsequent increase in the market concentration should be avoided as they may sacrifice efficiency.

3.7 Summary

The empirical results of the studies reviewed are in line with theory in the sense that telecommunication sector reform has a positive impact on the performance of the sector and investment in the sector has a positive impact on the economy, while reform encourages investment in the telecommunication sector.

CHAPTER 4

EMPIRICAL ANALYSIS

4.1 Introduction

This Chapter describes and explains the key dependent and independent variables and the methodology used to estimate the effects of telecommunication sector reforms, competition and regulation on telecommunication performance, tariffs and investment. It further explains the effects of economic growth on total investment in the telecommunication sector.

4.2 Data

The data on the variables used in this study were obtained from International Telecommunications/ICT indicators database. The dataset contains information on 14 SADC countries. Not all the data were available for all countries, especially the data on total annual investment in telecommunication, public payphones per 1000 inhabitants and faults per 100 main (fixed) line per year, hence the sample size differs depending on the indicators as mentioned in a particular analysis. Tables 6(a) and (b) shows the trends in these indicators. However, despite the lack of data on some of the indicators, the available data made it possible to investigate the relationships in our model.

4.3 Methodology

The study uses panel data econometric methodology to examine the following effects:

1. The effects of telecommunication sector reforms on;
    - Sectoral performance
    - Mobile and fixed line tariffs
    - Total annual investment in the telecommunication sector
2. The effects of economic growth on total annual investment in telecommunication.

The question that the study is addressing is that of the type of model to be used in panel data regression, considering that there are different models to be used in panel data, namely pooled, fixed and random effects. The study has used fixed effects in the model, because of two prominent reasons. First, since countries differ in so many ways, the study has employed the fixed-effects model to control for unobserved country-specific facts, as in the studies of Wallsten (1999) and Li & Xu (2002), by using fixed effects to control country-specific heterogeneity, which might influence both policy changes and telecommunication performance when country –specific effects are not controlled, heterogeneity can result in inconsistent estimates of reform effects.

4.4 The Econometric Model

4.4.1 Telecommunication Performance Equation

Based on the theoretical and empirical literature review, the study uses the following model to determine the effects of telecommunication sector reforms on *telecommunication performance* based on Wallsten 199:

$$Y_{i,t} = \alpha_i + \beta_1 (M_{i,t}) + \beta_2 (R_{i,t}) + \beta_3 (C_{i,t}) + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Where $Y_{i,t}$, represents the variables of telecommunication performance, which are fixed telephone lines and public payphones in operation, fault per 100 main fixed lines per year, and total number of mobile subscribers. The study has made use of total number of fixed lines, public payphones in operation, and total number mobile subscribers, compared to other studies that made use of mainline and mobile subscribers per 100 inhabitants to determine the penetration level in the sector. This study is not placing focus on penetration but the number of active fixed telephone users and mobile subscribers. Conventional wisdom indicates that there is a positive relationship between the mentioned variables and the telecommunication performance variable. $M_{i,t}$ represents the market structure in the fixed and mobile telecommunication sector. The market structure is captured by a dummy variable indicating the level of competition in the market. The dummy takes a value of 1 when the market has full competition and a value of zero otherwise. $R_{i,t}$, represents the regulatory measure in both the fixed and mobile telephone sectors. The regulatory variable is a dummy variable indicating

whether a separate regulatory body exists and whether the body is autonomous. The dummy variable takes a value of 1 if a separate regulatory body exists and the body is autonomous and a value of zero otherwise. As in the case of Boylaud and Nicoletti (2001), the indicators of sector reforms, regulation and competition, are not only dummies but variables constructed with the aim of obtaining some idea of the variation of regulatory regimes over time and across countries, to increase the precision and reliability of the coefficient estimates. The independent variables, regulation and competition, should have positive impacts on dependent variables. $C_{i,t}$ represents the following control variables: index of economic freedom; per capita income; households and quality of regulation. Index of economic freedom is derived from series of 10 economic measurements, created by Wall Street Journal and Heritage Foundation, with the objective to measure the degree of economic freedom of countries across the globe. The 10 series are, business, trade, fiscal;, government size, monetary, investment, financial, property and corruption. The distribution of the scores of the index is classified as follows, 80 – 100 free, 70 – 79.9 mostly free, 60-60.9 moderately free, 50-59.9 mostly un-free and 0-49.9 repressive. Quality of regulation is a World Bank index and forms part of the World Governance Index that reports aggregate and individual governance indicators for 212 countries and territories over the period 1996–2007, for six dimensions of governance namely voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption. The aggregate indicators combine the views of a large number of

enterprise, citizen and expert survey respondents in industrial and developing countries. The individual data sources underlying the aggregate indicators are drawn from a diverse variety of survey institutes, think tanks, non-governmental organizations, and international organizations.

These variables affect the dependent variable irrespective of how the latter is influenced by telecommunication reforms. Total fixed lines and public payphones in operation and the total number of mobile subscribers increase in proportion to the number of households. GDP per capita is a control variable for economic demography.

4.4.2 Telecommunication Tariffs Equation

The effects of telecommunication reforms, competition and regulation, on *telecommunication tariffs* are estimated as follows:

$$TRF_{i,t} = \alpha_i + \beta_1 (M_{i,t}) + \beta_2 (R_{i,t}) + \beta_3 (C_{i,t}) + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (13)$$

Where $TRF_{i,t}$ represents the various forms of tariffs used in the model, namely business monthly telephone subscription, residential monthly subscription and mobile monthly subscription. These are monthly rental fees that customers pay to make use of the respective services. The equation is examining the effects of market structure and regulation on the cost of providing a particular service in both the fixed and mobile

sector. $M_{i,t}$ and $R_{i,t}$ are the independent variables as explained above. In addition to the control variables as highlighted above, CPI is also introduced as a control variable for this equation. The CPI has a positive effect on the dependent variable, tariffs, the reasoning being that tariffs increase in proportion with inflation.

4.4.3 Total Investment in Telecommunication Equation

$$TIT_{i,t} = \alpha_i + \beta_1 (M_{i,t}) + \beta_2 (R_{i,t}) + \beta_3 (C_{i,t}) + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (14)$$

Where $TIT_{i,t,}$, represents total annual investment in both fixed and mobile telephone sector. The equation is examining the effects of market structure and regulation in both sectors on total annual investment in telecommunication. The independent variables take the same form and effect as outlined above.

As far as the control variable is concerned we have introduced gross fixed capital formation in addition to the ones that were highlighted above, and we have replaced household with population. Gross fixed capital formation is measured by the total value of producers' acquisitions, less disposals, of fixed assets during the accounting period plus certain additions to the value of non- produced assets (such as subsoil assets or major improvements in the quantity, quality or productivity of land) realized by the productive activities of institutional units.

4.4.4 Economic Growth Equation

$$GDP_{i,t,} = \alpha + \beta_1 TIT_{i,t} + \beta_2 TTS_{i,t} + \beta_3 POP_{i,t} + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (15)$$

Where $GDP_{i,t}$ is the variable representing the status of the economy. $TIT_{i,t}$ is total investment in the telecommunication sector. The latter includes both fixed and mobile telecommunication. $TTS_{i,t}$ is the total number of telephone subscribers in both the mobile and fixed telephone sector. $POP_{i,t,}$ is a control variable representing population. The equation is examining the effects of investment and subscribers within the telecommunication sector on economic growth. Total telephone subscribers and population are brought into the equation as control variables.

4.4.5 Reform Variable Interaction

In order to explore how competition and regulation interact, in accordance with Wallsten (1999), we derived the following equation, for both telecommunication sector performance and telephone tariffs:

$$z_{i,t} = \alpha_i + \beta_1 (M_{i,t} * R_{i,t}) + \beta_2 (C_{i,t}) + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (17)$$

Where $z_{it,}$ represents the dependent variable in equation (13), (14) and (15) , $M_{i,t} * R_{i,t}$ is the interaction between market structure and regulation in the fixed and mobile telephone sector and $C_{i,t}$ represents all control variables as mentioned above.

CHAPTER 5

RESULTS OF THE STUDY

5.1 Introduction

The results of the study are presented in Tables, 10 to 20. The results were obtained by using panel data consisting of time series and cross section. The results of the study are aim at determining whether they are consistent with theoretical literature, that says that competition and regulation is associated with the positive performance of the telecommunication sector, and lead to lower fixed and mobile telephone tariffs.

5.2 Effects of Sector Reforms on Fixed and Mobile Performance

5.2.1 Fixed Telephone lines in operations

The effects of telecommunication sector reforms on telephone lines in operation are reported in Table 10.

Table 10
Effects on Fixed Telephone Lines
Fixed Effects Estimations
Dependent Variable: Fixed Telephone Lines in Operations

	Coefficient	t-statistic
Competition	-0.090963	-0.096611
Regulation	1.354975	2.33642
Index of Economic Freedom	-0.345456	-0.850162
Per Capita Income	0.146964	0.24793
Households	7.117167	3.369609
Regulatory Quality	1.103302	1.365925
R-Squared		0.988252
Number of Observations		295

Sources: Author's own construct

Competition negatively influences fixed telephone lines in operations, meaning that a one percent increase in competition, causes a 0.09 percent decrease in fixed telephone lines in operation. However, a one percent increase in regulation causes a 1.35 percent increase in fixed telephone lines in operation. The control variable regulatory quality positively influences fixed lines in operations, reflecting the positive relationship of regulation and fixed lines in operation. On the other hand the control variable index of economic freedom negatively influences fixed telephone lines in operations, reflecting the negative relationship between competition and fixed telephone lines in operation.

5.2.2 Public Payphones

The effects of telecommunication sector reforms on public payphones in operations are reported in Table 11.

Table 11
Effects on Public Payphones
Fixed Effects Estimations
Dependent Variable: Public Payphone per 1000 inhabitants

	Coefficient	t-statistic
Competition	0.059584	0.167258
Regulation	-0.156294	-0.66355
Index of Economic Freedom	0.696259	1.292947
Per Capita Income	-0.167621	-1.8563
Households	4.152797	7.000631
Regulatory Quality	-0.004023	-0.01536
R-Squared		0.986145
Number of Observation		178

Sources: Author's own construct

The coefficient of competition is positively, while that of regulation is negative, indicating that competition has a positive impact on public payphones while regulation has a negative impact. Competition indicates an insignificant increase of 0.06 percent to public payphone per 1000 inhabitants, while regulation is correlated with an insignificant decrease of 0.16. The coefficient of the control variable, quality of regulation is negative, which reflects the negative impact of the regulation on the dependent variable. The coefficient of the Index of freedom is positive, reflecting the positive impact of competition on the dependent variable.

5.2.3 Fixed Line Faults

The effects of telecommunication sector reforms on fault per 100 main fixed telephone lines per year are reported in Table 12.

Table 12
Effects on Fixed Lines Faults
Fixed Effects Estimations
Dependent Variable: Fixed Line Faults per 100 inhabitants

	Coefficient	t-statistic
Competition	-0.168327	-0.288096
Regulation	-0.051138	-0.130564
Index of Economic Freedom	-0.594624	-1.958435
Per Capita Income	-0.837837	-2.01099
Households	-4.1603	-2.646699
Regulatory Quality	-0.537737	-0.926181
R-Squared		0.834547
Number of Observation		127

Sources: Author's own construct

The coefficients of competition and regulation are negative, indicating that competition and regulation have a negative impact on fixed line faults per 100 inhabitants. A one percent increase in competition causes a 0.17 percent decrease in fixed line faults per 100 inhabitants. A one percent increase in regulation causes a 0.05 percent decrease in fixed line faults per 100 inhabitants. The control variable, quality of regulation, is negatively related to the dependent variable, which reflects the negative impact of the regulation variable.

5.2.4 Mobile Subscribers

The effects of telecommunication sector reforms on total mobile subscribers are reported in Table 13.

Table 13
Effects on Mobiles Subscribers
Fixed Effects Estimations
Dependent Variable: Total Mobile Subscribers

	Coefficient	t-statistic
Competition	3.256535	0.2998
Regulation	20.18689	5.186651
Index of Economic Freedom	-2.86424	-1.069374
Per Capita Income	-0.540585	-0.231108
Households	181.7874	14.56579
Regulatory Quality	4.406671	0.828164
R-Squared		0.765176
Number of Observation		311

Sources: Author's own construct

Competition and regulation have a positive impact on total number of mobile subscribers. A one percent increase in competition causes 3.26 percent increase in total number of mobile subscribers, while a one percent increase in regulation causes a 20.18 percent increase in the total number of mobile subscribers. The control variable, regulatory quality is positive, reflecting the positive impact of competition on the total number of mobile subscribers.

5.3 Effects of Sector Reforms on Fixed and Mobile Telephone Tariffs

The coefficient of competition in the fixed telephone market is negative, while that of regulation is positive sign, as indicated in Table 14. On the other hand the coefficients of competition and regulation in the mobile market are positive, as indicated in Table 15. According to Wallsten (1999), price data are the least commonly-reported and among

the least reliable of telecommunication indicators. He argues that even if the price reported is accurate, it is not necessarily comparable across countries. The control variable of consumer price index is positively related to tariffs in both markets, showing that tariffs increase with inflation.

5.3.1 Business Telephone Monthly Subscription

The effects of telecommunication sector reform on mobile monthly subscription are reported in Table 14.

Table 14
Effects on Business Telephone Subscription
Fixed Effects Estimation
Dependent Variable: Business Telephone Monthly Subscription

	Coefficient	t-statistic
Competition	-0.298825	-0.88337
Regulation	0.205976	1.135227
Inflation	0.385601	3.664175
Index of Economic Freedom	-0.067553	-0.62872
Per Capita Income	0.305148	2.869956
Households	-0.82532	-1.33043
Regulatory Quality	-0.099267	-0.4409
R-Squared		0.832778
Number of Observation		264

Sources: Author's own construct

The coefficient of competition is negative, while, that of regulation is positive. The negative sign of competition clearly indicates that competition within the fixed line sector results in lower business telephone monthly subscription. A one percent increase in competition and regulation causes a decrease and increase of 0.30 and 0.21 percent, in

business telephone monthly subscription fees, respectively. A one percent increase in inflation causes business telephone monthly subscription fees to increase by 0.38 percent. The negative correlation of index of economic freedom and regulatory quality reflects the signs of the reforms variables.

5.3.2 Mobile Monthly Subscription

The effects of telecommunication sector reforms on mobile monthly subscription are reported in Table 15.

Table 15
Effects on Mobile Subscription
Fixed Effects Estimation
Depended Variable: Mobile Telephone Monthly Subscription

	Coefficient	t-statistic
Competition	0.474569	0.951474
Regulation	0.073509	0.252226
Inflation	0.286965	2.075591
Index of Economic Freedom	0.147924	0.739473
Per Capita Income	-0.695921	-1.87801
Households	-5.329925	-4.17456
Regulatory Quality	-0.156473	-0.54732
R-Squared		0.866574
Number of Observation		129

Sources: Author's own construct

Competition and regulation are positively related to the dependent variable, with competition related with an increase of 0.47 percent and regulation with an increase of

0.07 percent in monthly mobile subscription. Inflation has a positive impact on mobile telephone monthly subscription. The control variables, per capita income, number of households and quality of regulations are negatively related to mobile monthly subscriptions while consumer price index and index of economic freedom is positively related to the dependent variable.

5.3.3 Residential Monthly Subscription

The effect of telecommunication sector reform on residential monthly telephone subscription is reported in Table 16.

Table 16
Effects on Residential Telephone Subscription
Fixed Effects Estimation
Dependent Variable: Residential Telephone Monthly Subscription

	Coefficient	t-statistic
Competition	-0.243679	-0.748818
Regulation	0.101035	0.577727
Inflation	0.17721	2.151063
Index of Economic Freedom	0.294949	2.992647
Per Capita Income	-0.082091	-0.8062
Households	0.573334	0.967135
Regulatory Quality	-0.199897	-0.905317
R-Squared		0.802693
Number of Observation		272

Sources: Author's own construct

Competition has a negative impact on residential telephone monthly subscription, meaning that a one percent increase in competition result in an 0.24 percent decrease in

residential telephone monthly subscription. The sector reform variable regulation is positively correlated to residential monthly telephone subscription, with an increase of 0.10 percent in residential telephone subscription, while the sector reform variable, fixed telephone market structure, is negatively correlated, with a decrease of 0.24 percent in residential telephone subscription. Control variables, consumer price index, index of economic freedom, number of households are all positively related to the dependent variable; while per capita income and quality of regulation are both negatively related.

5.4 Effects of Sector Reforms on Telecommunication Investment

The effects of telecommunication reforms on total annual investment in the telecommunication sector are reported in Table 17.

Table 17
Effects on Telecommunication Investment
Fixed Effects Estimation
Dependent Variable: Total Investment in Telecommunication

	Coefficient	t-statistic
Competition Fixed	-1.051976	-1.437712
Competition Mobile	2.81303	3.14338
Regulation	0.401861	0.810129
Index of Economic Freedom	0.463118	1.193516
Per Capita Income	0.013504	0.48168
Gross Fixed Capital	0.660223	2.201195
Population	-3.323624	-1.510453
Regulatory Quality	-0.483194	-0.769588
R-Squared		0.891066
Number of Observation		143

Sources: Author's own construct

Competition in the mobile telephone market is positively related to the total annual investment in the telecommunication sector, while competition in the fixed telephone market is negatively related to total annual investment. Competition in the fixed telephone line market causes a decrease of 1.05 percent, while a one percent increase in competition in the mobile telephone market causes an increase of 2.81 percent in total annual investment.

5.5 Effects of Telecommunications Investment on Economic Growth

The effects of telecommunication investment on economic growth are reported in Table 18.

Table 18
Effects on Economic Growth
Fixed Effects Estimation
Dependent Variable: GDP

	Coefficient	t-statistic
Total Investment in Telecomunication	0.139249	0.569783
Total Telephone Subscribers	0.105232	0.150559
Population	16.81613	1.853536
R-Squared		0.648729
Number of Observation		185

Sources: Author's own construct

Investment in telecommunication is positively related to economic growth. A one percent increase in investment in the telecommunication sector causes a 0.13 percent increase in economic growth. Total telephone subscribers, for mobile and fixed

telephone is also positively related to economic growth. A one percent increase in the total number of telephone subscribers causes a 0.14 increase in economic growth. However the coefficients of total investment in telecommunication are statistically insignificant.

5.5 Reforms Variable Interaction

The interaction between the reform variables in the fixed and mobile telephone sector as reported in Tables 19 and 20 are meant to assess the impact of competition and regulation together on fixed telephone lines in operations and total number of mobile subscribers. The interaction of competition is further meant at determining whether competition is supported by regulatory policies.

5.5.1 Reform Variable Interaction Fixed Telephone Lines

Table 19
Effects on Fixed Telephone Lines
Fixed Effects Estimations
Dependent Variable: Fixed Telephone Lines in Operation

	Coefficient	t-statistic
Competition	-0.098208	-0.10415
Competition*Regulation	-0.414026	-0.553272
Regulation	1.342391	2.309683
Index of Economic Freedom	-0.338863	-0.832405
Per Capita Income	0.195981	0.326538
Households	7.175548	3.388241
Regulatory Quality	1.120588	1.384335

R-Squared	0.988267
Number of Observation	295

Sources: Author's own construct

The interactions of competition and regulation have an insignificant negative impact on fixed telephone lines in operation. A one percent increase in the interaction of the two reform variable causes a 0.41 decrease in fixed telephone lines in operation. Comparing Table 19 with Table 10, the individual impact of competition and regulation remained the same. The control variable, index of economic freedom has a negative insignificant impact on fixed telephone lines in operations, while the control variable, regulatory influences the dependent variable positively.

5.5.2 Reform Variables Interaction Mobile Telephone Subscribers

Table 20
Effects on Mobile Telephone Subscribers
Fixed Effects Estimation
Dependent Variable: Mobile Telephone Subscribers

	Coefficient	t-statistic
Competition	13.50223	1.011747
Competition*Regulation	-10.2461	-1.317844
Regulation	26.17146	4.378493
Index of Economic Freedom	-2.652546	-0.989955
Per Capita Income	-0.590599	-0.252814
Households	180.6132	14.4553
Regulatory Quality	5.050351	0.946486
R-Squared		0.76674
Number of Observation		311

Sources: Author's own construct

The interactions of competition and regulation have a negative impact on mobile telephone in operation. A one percent increase of the interaction of the two reform variable causes a 10.41 decrease in total number of mobile subscribers. Comparing Table 20 with Table 14, the individual impact of competition and regulation remained the same. The control variable index of economic freedom has a negative impact on total number of mobile subscribers, while the control variable, regulatory quality influences the dependent variable positively.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Introduction

Based on the knowledge of the effects of telecommunication regulation and competition on telecommunication sectoral performance, three new proxies are introduced in the study as performance indicators, compared to the previous studies. The three proxies are total number of mobile subscribers, fixed telephone lines and public payphones in operation. The previous studies used mainline per 100 inhabitants, mobile subscribers per 100 inhabitants and public payphones per 1000 inhabitants. The study reveals that the interaction of competition and regulation impacts, fixed telephone lines in operations and total number of mobile subscribers negatively, meaning that the opening up of telecommunication markets must be accompanied by independent and autonomous regulatory bodies. SADC countries have a lot to learn from Latin American countries in their quest to introduce and implement effective telecommunication sector reforms. This is in view of the fact that Latin America countries have implemented these reforms in the early eighties and are obtaining positive results as indicated in the various performance indicators.

The following are the main conclusions on the effects of sector reforms on sector performance:

6.1.1 Telecommunication Performance indicators

Reforms in the mobile sector are more rapid than in the fixed line telecommunication sector. Competition and regulation do not complement each other in the fixed telephone sector as they do in mobile sector.

6.1.2 Telecommunication Tariffs

Effective sector reforms result in enormous tariff reduction, as in the case of the mobile telecommunication sector. One of the reasons why the same effect is not present in the fixed line sector, is because low levels of penetration and the cross subsidization of services.

6.1.3 Total Investment in Telecommunication

The effects of sector reforms on telecommunication investment results indicated that competition in the fixed telephone sector has a negative impact on investment; while competition in the mobile telephone sector reveals a positive impact. The results reflect

the performance of the mobile telephone sector. The only logical explanation is the type of technologies applied in the various sectors and their related costs. The decline in total investment in the telecommunication sector in the SADC region can be attributed to this scenario.

6.1.4 Economic Growth

As far as the effects of telecommunication investment are concerned, investment has a positive impact on the economy, as expected.

6.1.5 Interaction of Sector Reform Variables

The negative results in the performance of fixed telephone line operation remain the same whether these variable are assessed individually or together. On the other hand, even though competition and regulation are positively related to the dependent variable in the mobile sector, the interaction of these variables causes a reduction in the number of mobile subscribers. This is attributable to the fact that opening of the market in the telecommunication sector is not supported by supportive and relevant regulatory policies.

6.2 Policy Recommendations

ICT, information and communications technology avail enormous opportunities for the creation of unprecedented wealth for developed countries, and for SADC to benefit from these opportunities:

- There's a need for SADC member states to make it their primary objective to create the right environment for doing business on a free trade basis. Hence, SADC countries should pay attention to the guidelines provided by the WTO in terms of the best practices for telecommunication sector reform. WTO commitments on telecommunications constitute a driving force for sector reforms in WTO member countries. SADC should embrace these guidelines, and not try to reinvent the wheel.
- The overriding SATRA policy objective must be to grow the region's telecommunication infrastructure rapidly and to ensure a competitive environment that will reduce price and make services affordable to most of its citizens.
- Improve services by eradicating misuse of monopoly powers and inefficient use of public resources.

- Remove policies that foster and encourage the dominance of the public sector in national economies, in order to attract modern industries and businesses and most importantly, to create a conducive environment to attract foreign investment.
- SADC countries should strengthen their regulatory authorities before opening up their fixed telephone lines sector, because the latter will lead to increase telecommunication investment and improve performance in the sector. Investors are also willing to pay a premium for telecommunication firms in countries with well established regulatory authorities.
- SADC countries should reduce the shareholding of the state in telecommunication. operators and remove entry barriers in the market
- Encourage private sector investment, both local and foreign.
- Ensure fair competition supported by relevant regulatory policies.
- Banks and financial institutions to be more involved in the sector from a funding point of view.

6.3 Recommendations for Future Research

The study did not take into account variables such as, the dominance position of the incumbent; inter connection fees among operators, and the individual performance of the various operators in the competitive environment. Moreover the data on regulation and investment needs improvement. It is therefore recommended that future research work should take the aforementioned variables into account and the improvement on some of the data. Moreover future research work must concentrate on gathering data on the performance of various operators.

REFERENCES

Allen, J. (2003). *Fast Tracking Telecommunications Reforms in Southern Africa*. Development Policy Research Unit School of Economics: University of Cape Town.

Alleman, J., Hunt, C., Michaels, D., Mueller, M., Rappoport, P., & Taylor, L. (1994). *Telecommunications and Economic Development: Emprical Evidence from Sothern Africa*. International Telecommunications Society. Sydney.

Boylud O., & Nicoletti, G. (2000). *Regulation, Market Structure and Performance in Telecommunications*, OECD Economics Dapertment Working Papers, No.237, OECD Publishing.

Chakraborty C. (n.d.) *Privatization, Telecommunication Adoption and Growth in Developing Countries: A Cointegration Approach.* Department of economics, Montclair State .University, Upper Montclair. USA

Cowley, P. & Klimenko M.(n.d.) *The WTO Agreement and Telecommunication Policy Reform*. University of California, Graduate School of International Relations and Pacific Studies. San Diego.

Fink, C., Mattoo, A., & Ratindram, R. (2002). *An Assessment of Telecommunications Reform in Developing Countries*. Policy Research Working Paper 2909. Washington

Garrison, W. (n.d.). *telecommunications and Liberalization.* The Kenan Institute of Private Enterprise.

Global Internet Policy Initiative (2002). *Best Practices for Telecommunications Reform*. A Project of Internews and the Center for Democracy and Technology. Washington.

Gual, J. & Francesc, T. (2006). Telecommunications *Policies: Measurement and Determinats*. IESE Business School, University of Navara Working Paper, No. 630,

Gutierrez, L., & Sandford, B. (1998). *Telecommunication Liberalization and Regulatory Governance: Lesson from Latin America.* Public Utility Research Center. Miami:University of Florida. Florida, United States of America.

International Telecommunications Union. (2006). *ITU-BCT Telecommunications Regulatory Database*. Geneva.

Lehr, W., & Glassman, J. (2001). *Competition in Telecommunications and Economic Growth*, Paper 127. Center for eBusiness @ MIT, MIT Sloan School of Management.

Li, W., & Xu, L. (2002). *The Impact of Privatization and Competition in the Telecommunications Sector around the World.* Woking Paper, The World Bank. Washington.

Love, D. (2005). An *overview of the South African Telecommunications Industry: From Pre-1994.* Unpublished honors research report, Witwatersrand, South Africa.

Mattoo., A. & Rathindran R (2001). *Measuring Services Trade Liberalization and Its Impact on Economic Growth: An Illustration.*

McNary, R. (2001). The *Network Penetration Effects of Telecommunications Privatization and Competition.* Mimeo, Standford University.

Melody, W. (1999). *Telecom Reform: Progress and Prospects.* Telecommunication Policy 23 (1999) 7-34. Delft University of Technology & LIRNE.NET.

Motinga D. (2003). *Liberalizing the Telecommunications Sector in Namibia: Better Regulation is the Key*. IPPR Briefing Paper No. 25.

Naesl., M., & Neven, D. (2005). *Competition, regulation and privatization in the telecommunication Sector in Latin American Countries*. Geneva:Graduate Institute of International Studies.

Noll, G. (2000). *Telecoomunications Reform in Developing Countries. Economic Policy Reform: The Second Stage*. Ed. Anne O. Krueger. Chicago: University of Chicago Press.

Petrazzini, Ben. (1995). *The political Economy of Telecommunications Reform in Developing Countries:Privatization and Liberalization in Comparative Perspective*. Preager;Wesport. Connecticut.

Ross, J. (1999). Does Ownership or Competition Matter? The effect of Telecommunications Reform on Network Expansion and Efficiency. Publisher Unknown.

Savage, S., schlottman A., & Wimmer B. (2003). *Telecommunications Investments, Liberalization and Economic Growth.* AEI-Brooking Joint Center for Regulatory Studies.

Scott., J. Schlottman., A. & Wimmer, B. (2003). "*Telecommunications Investment, Liberalization and Economic Growth.* AEI-Brooking Joint Center for Regulatory Studies. Joint Center.

Starr, P. (1998). *The meaning of privatization*. Yale Law Policy Review 6 (1998): 6-41.

Symeou, P., & Pollitt, M, (2007). *Telecommunications in small economies: the impact of Liberalization and alternative technologies on universal service.* Cambridge Judge Business School Working Paper Series 19/2007.

Stock & Deen-Swarray (2006). *Switch to Competition – Regulatory Challenges for Namibia's Telecommunications Sector.* NEPRU Policy Brief No. 18

Wallsten S. (2002). *Does Sequencing Matter? Regulation and Privatization in Telecommunication Reforms.* Policy research Working Paper 2817. The World Bank, Wasington, D.C.

Walsten, S. (2003). *Of Carts and Horses: Regulation and Privatization in Telecommunications Reforms*. AEI- Brookings Joint Center For Regulatory Studies.