

Full Length Research Paper

Impact of competition on telecom sector's performance: A case study of Pakistan

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This paper empirically investigates the impact of competition on the performance of telecommunication sector in Pakistan using quarterly data for the period from 1999 Q1 to 2006 Q4. In this study, performance of telecom sector (Y) is taken as dependent variable which is explained by the factors such as Teledensity, number of public call offices (PCOs) per capita, number of internet connections per capita, number of subscribers and total revenue of Pakistan's telecom sector. Competition is the independent variable; by using the multiple regression models in log-linear form. The study found the positive and significant impact of competition on telecom sector performance. This study shows that competition is imperative for the overall development of telecom sector. Similarly competition in the telecom sector has greatly helped to increase the access of telecom services in far-flung areas of the Pakistan.

Key words: Competition, teledensity, public call offices (PCOs) per capita, internet connections per capita, subscribers, total revenue.

INTRODUCTION

Tremendous growth in telecom sector of Pakistan has been observed since the introduction of deregulation and privatization policies. Deregulation act 1996 and deregulation policy 2003 fully support the entry of new competitors to develop and grow the telecom sector. Telecom sector in Pakistan is growing after deregulation act 1996. Government liberalized policies have encouraged foreign and domestic companies to enter in competition. Entrance of new companies has increased teledensity and has given great relief to subscribers by lowering call charges and by providing best quality services.

The main objective of this paper is to study the impact of competition on overall telecom sector's performance in Pakistan. Most of the people are in view that the presence of many competitors has damaged the monopoly of few companies and has helped others to increase

their share in the market, like market share by subscribers of Mobilink, Paktel, Instaphone, Warid, Telenor and U-fone in 2004 to 2005 was 58, 7, 4, 4, 7 and 20%, respectively and in 2005 to 2006 was 50, 3, 1, 14, 10 and 22, respectively. Similarly market share by revenue of Mobilink, Paktel, Instaphone, Warid, Telenor and U-fone in 2004 to 2005 was 70.5, 4.9, 5.5, 0.3, 1.2 and 17.6% and in 2005 to 2006 was 59, 4, 2, 10, 7 and 18%, respectively (PTA, annual report, 2005 - 2006). However overall revenue of telecom sector has greatly increased as it can be seen in the Table 1

Similarly, competition has also greatly helped to increase overall teledensity, although fixed density has declined, as can be seen in the Table 2.

LITERATURE REVIEW

When the review of few important studies in the area of telecom sector was taken into consideration, it was seen that Wallsten (1999), examined the effect of privatization,

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Table 1. Total telecom sector revenue (Rs in million).

Service/company	2003-2004	2004-2005	2005-2006
Cellular	27,840	48,880	90,057
PTCL and NTC	78,356	79,658	71,581
LDI/LL/WLL	1,336	5,536	17,160
VAS	10,056	12,570	13,827
Total	117,588	146,645	192,626

Source: www.pta.gov.pk

Table 2. Teledensity.

Year	Fixed (%)	Cellular (%)	WLL (%)	Total (%)
1996-1997	2.04	0.1	-	2.14
1997-1998	2.15	0.15	-	2.3
1998-1999	2.24	0.19	-	2.43
1999-2000	2.32	0.22	-	2.54
2000-2001	2.56	0.52	-	3.08
2001-2002	2.50	1.16	-	3.66
2002-2003	2.69	1.62	-	4.31
2003-2004	2.94	3.31	-	6.25
2004-2005	3.43	8.29	0.17	11.89
2005-2006	3.37	22.16	0.66	26.19
2006-2007	3.32	40.64	1.06	45.04

Source: www.pta.gov.pk

competition and regulation on telecommunication sector performance in 30 African and Latin American countries

from 1984 to 1997. The study used the following two models:

$$y_{it} = \alpha + \gamma + \beta_1 (\text{cell}_{it}) + \beta_2 (\text{private}_{it}) + \delta (\text{Reg}_{it}) + \theta (X_{it}) + ut \quad (1)$$

$$y_{it} = \alpha + \gamma + \beta_1 (\text{cell}_{it}) + \beta_2 (\text{private}_{it}) + \beta_3 (\text{cell}_{it} \times \text{Reg}_{it}) + \beta_4 (\text{cell}_{it} \times \text{private}_{it}) + \delta (\text{Reg}_{it}) + \theta (X_{it}) + ut \quad (2)$$

where $Y = Y$ has five different definitions like number of main lines per capita, number of payphones per capita, network connection capacity per capita, employees per main line and the cost of three minute call; Cell = Number of mobile operators not owned by the incumbent; Private = Dummy variable indicating whether the incumbent is privatized; Reg = Dummy variable measuring whether there exists a separate regulator, and X = Control variables like per capita income, population, percent of the population living in urban areas, a dummy variable indicating whether the country has passed telecom reforms legislation, a dummy variable indicating whether world bank telecommunication project was active in the country-year, net world bank aid as a percent of GDP, and a variable measuring the risk of expropriation.

The study found that privatization itself can not generate many benefits and is negatively correlated with teledensity. Privatization combined with separate regulator is

correlated with increase in connection capacity and payphones per capita. Increasing competition in combination with privatization is best. Finally, the study suggested that privatizing a monopoly without regulatory reforms should be avoided.

Ros (1999) studied the effect of privatization and competition on network expansion and efficiency in 110 countries for the period from 1986 to 1995. The study found that countries with at least 50% private ownership of main telecom firms have significantly higher teledensity levels and growth rate. The study also empirically investigated that effect of privatization and competition is positive towards efficiency achievement.

Gort and Sung (1999), studied the effect of competition on the efficiency of the United States domestic telephone industry. They found that efficiency improved significantly in competitive markets and telephone company production exhibited constant returns to scale. They also

Table 3. Summary statistics (Sample period: 1999Q1 to 2006Q4).

Variable	COMP	TEL	PCOs	SUBS	INT.CON	REV
Mean	-4.7616	0.25775	4.8503	0.67145	6.3257	8.8193
Std.deviation	0.10184	0.75926	1.1778	0.81666	0.76442	1.3974
Coef of variation	0.021388	2.9457	0.24283	1.2163	0.12084	0.15845

observed that technological changes are best for productivity growth and cost reduction.

Petrazzini and Clark (1996) examined the effect of competition in Latin America and Asia. They compared the performance of competitive and non-competitive cellular markets and proved that competitive markets have higher teledensity.

Koski (2000), studied 61 world's major telecom companies for the period from 1991 to 1996 and found that competition in telecom sector enhanced the requirement for investment in research and development activities.

Kubota (2000) and Reynolds et al. (2001), examined that competition and regulatory reforms in telecom sector increase telephone access even amongst the poor. Dekimpe et al. (1988) examined that competition increases cellular density.

METHODOLOGY

Empirical work to measure the impact of competition on telecom sector's efficiency in Pakistan is based on the study of Wallsten (1999). Here this model is being followed with little modification, keeping in view of data availability and situation and requirements of telecom sector in Pakistan.

The model is given in log-linear form.

$$LY = \delta_0 + \delta_1 LCOMP + Q_1 + Q_2 + Q_3 + ut$$

Where, COMP = Competition; Y = Telecom sector performance which explained by the following factors:

1. Teledensity
2. PCOs
3. Subscribers
4. Internet connections
5. Revenue

It is hypothesized that:

$$\partial L TEL / \partial L COMP > 0, \partial L INT.CONC / \partial L COMP > 0$$

$$\partial L PCOs / \partial L COMP > 0, \partial L REV / \partial L COMP > 0$$

$$\partial L SUBS / \partial L COMP > 0$$

Specification of variables

Dependent variables

Teledensity (TEL): The main line penetration (main lines per capita or teledensity) is the most common indicator to measure telecom

sector performance as reported by International Telecommunication Union. Wallsten (1999) measured that the main lines penetration by teledensity. A main line "is a telephone line connecting the subscriber's terminal equipment to the public switched network and which has been a dedicated port in the telephone exchange equipment" (ITU, 1998). So this variable gives a picture of level of penetration of telephone and mobile and wireless in the country. Teledensity is taken as dependent variable and it includes fixed line, wireless and cellular density. Data for teledensity has been taken from various issues (2004 to 2006) of PTA annual reports.

Public call offices (PCOs) per capita: Is also taken as dependent variable. It is measured by total number of PCOs in the country in each year by population in millions. Since approach to PCOs is easy and cheap for a common man so it is considered as the most important indicator than teledensity. Data for total number of PCOs and population has been taken from various issues (2003 to 2006) of Economic Survey of Pakistan.

Subscribers (SUBS): This variable includes total subscribers of fixed line, mobile and wireless local loop services. Number of subscribers presents output of telecom sector. Data for this variable has been taken from PTA annual reports (2004 to 2005 and 2005 to 2006).

Internet connections per capita (INT.CONC): It includes the total number of internet connections in both rural and urban areas of Pakistan. It is measured by the total number of internet connections in a country in each year by population in millions. Data for number of internet connections has been taken from various issues (2003 to 2006) of Economic survey of Pakistan.

Revenue (REV): The total earnings of telecom sector are the strongest indicators of its performance. Data for revenue has been taken from PTA annual reports (2004 to 2006).

Explanatory variable

Competition (COMP): Is taken as an independent variable. It is calculated as total number of telephone, mobile and wireless local loop companies per million of the people. Data for number of companies has been taken from various issues of PTA annual reports. Data for population has been taken from various issues (2003 to 2006) of Economic Survey of Pakistan.

REGRESSION RESULTS AND ANALYSIS

Empirical investigation on the impact of competition on telecom sector performance has been taken using time series data for the period 1999 to 2006 (quarterly bases). Results of summary statistics, Augmented Dickey fuller (ADF) and regression analysis are given in Tables 3 and 4.

Table 4. Results of ADF test.

Variable	Level/difference	Without trend	Conclusion
COMP	Level	1.9371	I(1)
	First difference	-5.1322	
TEL	Level	0.28481	I(1)
	First difference	-6.0536	
PCOs	Level	-2.2547	I(1)
	First difference	-5.4238	
SUBS	Level	0.39767	I(1)
	First difference	-5.9271	
INT.CON	Level	-1.4414	I(1)
	First difference	-6.1709	
REV	Level	-0.52531	I(1)
	First difference	-5.6052	

95% critical value for ADF statistics for all variables: -2.9798 (without trend).

Table 5. Dependent variable: TEL

Variable	Coefficient	t-Statistic
Constant term	28.7049	7.0218
L Competition	5.9743	6.9603
Q1	0.00	None
Q2	0.00	None
Q3	0.00	None
R ²	0.64213	
Adjusted R ²	0.58911	
D.W	0.34752	
No. of observations	32	

Impact of competition on teledensity

The impact of competition on teledensity is given in Table 5 and the ECM results are given in Table 6.

Impact of competition on PCOs per capita

The impact of competition on PCOS per capita is given in Table 7 and ECM results are given in Table 8.

Impact of competition on subscribers

Table 9 shows the Impact of competition on subscribers. The ECM results are given in Table 10.

Impact of competition on internet connections per capita

The impact of competition on internet connections per capita is as shown in Table 11. The ECM results are given in Table 12.

Impact of competition on revenue

The Impact of competition on revenue is given in Table 13. The ECM results are given in Table 14.

Summary statistics of all variables are previously given, indicating mean, standard deviation and coefficient of

Table 6. ECM results.

Variable	Coefficient	t-Statistics
Constant term	28.0163	11.3062
DL Competition	5.8247	11.1833
Q1	0.071407	0.76821
Q2	-0.023802	-0.27003
Q3	-0.023802	-0.27003
PP(-1)	0.87353	7.2970
R ²		0.8177
Adjusted R ²		0.85813
D.W		1.6999
No. of observations		31

Table 7. Dependent variable: PCOs per capita.

Variable	Coefficient	t-Statistic
Constant term	53.1339	10.4241
L Competition	10.1402	9.4747
Q1	0.00	None
Q2	0.00	None
Q3	0.00	None
R ²		0.76878
Adjusted R ²		0.73452
D.W		0.32947
No. of observations		32

Table 8. Error correction model (ECM) results.

Variable	Coefficient	t-Statistic
Constant term	49.6514	17.1761
DL competition	9.4048	15.4798
Q1	0.058707	0.54664
Q2	-0.019569	-0.19113
Q3	-0.019569	-0.19113
PP(-1)	0.83026	7.8331
R ²		0.92965
Adjusted R ²		0.91558
D.W		1.7161
No. of observations		31

variation. In order to determine the order of integration of variables, Augmented Dickey fuller (ADF) test for unit roots was employed to find out that the variables are concluded to be integrated of the same order. ADF test shows that all variables have stationarity in the levels of 95% critical values without trend. All variables were in

first difference. So from unit root test, it is concluded that all variables are integrated by I(1).

Ordinary least square (OLS) estimation shows that the impact of competition was positive and significant on all dependent variables like teledensity, number of PCOs per capita, numbers of subscribers, internet connections

Table 9. Dependent variable: SUBS.

Variable	Coefficient	t-Statistic
Constant term	29.7467	6.2433
L Competition	6.1062	6.1037
Q1	0.00	None
Q2	0.00	None
Q3	0.00	None
R ²	0.57980	
Adjusted R ²	0.51755	
D.W	0.34802	
No. of observations	32	

Table 10. Error correction model (ECM) results.

Variable	Coefficient	t-Statistic
Constant term	29.1445	10.0726
DL Competition	5.9740	9.8231
Q1	0.081616	0.75167
Q2	-0.027205	-0.26424
Q3	-0.027205	-0.26424
PP(-1)	0.87357	7.2730
R ²	0.86130	
Adjusted R ²	0.83357	
D.W	1.6207	
No. of observations	31	

Table 11. Dependent variable: INT. CON per capita.

Variable	Coefficient	t-Statistic
Constant term	21.5547	5.0070
L Competition	5.8553	6.4779
Q1	0.00	None
Q2	0.00	None
Q3	0.00	None
R ²	0.60849	
Adjusted R ²	0.55048	
D.W	0.45280	
No. of observations	32	

per capita and total revenue of Pakistan's telecom sector. Serial correlation lies in all cases. So an error correction model (ECM) was applied. After applying ECM again the impact of competition was found positive and significant. This estimation indicates that with the increase in number of telecom companies, approach of common man to

various telecom services had been enhanced. Although individual subscriptions of the companies including PTCL have declined, but total number of subscribers has increased and this is the reason that telecom sector has shown great improvement in performance. It reveals the strong impact of competition on telecom sector's

Table 12. ECM results.

Variable	Coefficient	t-Statistic
Constant term	17.2167	6.4268
DL Competition	4.9370	8.7684
Q1	0.10285	1.0392
Q2	-0.034282	-0.36341
Q3	-0.034282	-0.36341
PP(-1)	0.75765	6.5208
R ²		0.84980
Adjusted R ²		0.81976
D.W		1.6017
No. of observations		31

Table 13. Dependent variable: REV.

Variable	Coefficient	t-Statistic
Constant term	55.7504	6.3715
L Competition	9.8562	5.3647
Q1	0.00	None
Q2	0.00	None
Q3	0.00	None
R ²		0.51596
Adjusted R ²		0.44425
D.W		0.34174
No. of observations		32

Table 14. ECM results.

Variable	Coefficient	t-Statistic
Constant term	51.0926	9.8663
DL Competition	8.8705	8.1496
Q1	0.10665	0.55414
Q2	-0.035551	-0.19402
Q3	-0.035551	-0.19402
PP(-1)	0.84920	7.5977
R ²		0.84812
Adjusted R ²		0.81774
D.W		1.7002
No. of observations		31

performance and also an indication that Pakistani market has capacity to absorb large telecom sector investment.

Conclusion

The major focus of this paper has been on searching into

the effectiveness of competition on the performance of telecom sector. This issue is really important since nowadays investment in telecommunication sector at global level is increasing year by year. There have been very useful research studies on telecommunication issues throughout the world but these have many missing links. Further more in Pakistan, this issue has so far received

little importance from research view point. This study is more relevant with the measurement of the impact of competition on the performance of telecom sector of Pakistan. It will be one of the pioneering studies on this hot issue in Pakistan.

This paper uses time series data (1999q1-2006q4), taken on quarterly basis to examine the impact of competition on the efficiency of telecom sector. ADF test was applied to check data stationarity and then estimated the data by using OLS technique.

ECM was also applied. Results indicate the positive and significant impact of competition on all dependent variables. The results match with the work of other researchers and two new variables that are subscribers and internet connections per capita showed their significant impact. This study can be of great interest to the students of telecom education as well as for the management and for present and potential investors of telecom companies and can open new ways of further and advance research for the betterment and development of telecom sector.

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