

Effects of telecommunication sector liberalization: Case of Tunisian service firms

Mounira SNOUSSI*

(UAQUAP, ISG Tunis)

&

Hanan Sdiri

(UAQUAP, ISG Tunis)

Abstract:

This last decade, telecommunication sector is into full change. Since 2002, the Tunisian telecommunication sector was liberalized. This paper examines the effect of the telecommunication liberalization on Tunisian firms' innovation. In order to pay special attention to telecoms liberalization, we use a sample of 109 Tunisian service firms. We estimate logit models which explain the probability to innovate while insisting on telecommunication liberalization. The results of the logit model show that the liberalization of the Tunisian telecommunication sector inspires firms' innovation. We find also that have significant and positive impact on innovation autonomously of firm size and the type of the operator.

Key words: Telecommunication, Liberalization, Innovation, Principal Component Analysis, Logit.

* Corresponding authors :

PhD students : Institut Supérieur de Gestion in Tunis (UAQUAP)

Rue de la liberté, Cité Bouchoucha, 2000 Bardo, Tunis, Tunisia

E-mails: mounira.snoussi@gmail.com and sdirihanen@gmail.com

1. Introduction

Since 1980, the sector of telecommunication is budding thanks to new technologies. These companies are playing a big role in the economic development of a country (Hardly, 1980; Röller et Waverman, 1996 ; 1999 ; Greenstein and Spiller, 1995). In addition to this, after privatization and liberalization, the performance of the telecommunications industry in many countries has improved remarkably (Lam and Shiu, 2008).

This sector is whispered to offer substantial positive externalities to other industries specially among reducing transaction costs for businesses. Indeed, Roller and Waverman (2001) have found a positive relation between a country's telecommunications infrastructure and its economic growth. Given the telecommunications sector's economic, financial, and technological importance, its privatization developments have been at the forefront in many countries' privatization programs and have often been one of the most controversial.

The inefficiency of the incumbent (lack of control of the service provided, the budget of the state is often attuned by the resources of the telecommunications sector, redundancy, duplication of hierarchies, hyper decision-making power) on the one hand, and the accession of Tunisia to the WTO agreements and the association with the Euro-Mediterranean Partnership for the creation of the free trade area with Europe compels our country to adopt a new liberal mode of services (Mezouaghi, 2004), on the other hand, have prompted Tunisia to liberalize the telecommunications sector. More specifically, 11 May 2002, Tunisia enacts the license agreement to install and operate a second mobile telephone network.

In spite of the importance of the liberalization, few papers are interested to analyze the effect of the liberalization on firm innovation. The works which evoke the phenomenon of liberalization of telecoms conjugate it with the other recently liberalized sectors (postal, transport, electricity).

The sector of telecommunications offers many services to the companies and to the consumers. Consequently, it requires more various techniques and an increasing range of communication supports (voice, image, data transmission etc).

Its main focus is on the economic effects of the telecommunication deregulation in firms that belonging to service sector. To this end, the paper empirically investigates the linkages between liberalization and firms' innovation. Country-specific evidence on the economic gains of market and regulatory changes in the telecommunications industry abounds, but few studies have attempted to look at microeconomic evidence. Focus on single countries was partly related to the lack of data basis. Thus, we had to carry out our own survey of 109 Tunisian companies belonging to the service sector.

The paper is organized as follows. The next section reviews the literature on liberalization of telecommunication sector. Section 3 analyses the results and interpretations. The last section concludes the paper.

1. Liberalization of the telecommunication sector

The liberalization of the telecommunication sector plays the biggest role in the economic growth and development of a country (Cronin et al. 1991; Dutta, 2001; Datta and Agarwal, 2004). Furthermore, the regulation of the sector telecommunication in a competing environment ensures a collective welfare higher than that in the monopolistic context (Laffont and Tirole, 2000). The economic income of the investment on the telecommunications infrastructure is much greater than those on the telecommunication investment itself (Waverman and Röller, 2001).

Many studies established by the ITU demonstrate a positive correlation between economic development and the telephone density by showing that the GDP per capita is positively related to the telephone density. Consequently, a well-developed telecommunications system can increase the efficiency of economic, commercial and administrative activities, improve the welfare...

1.1. Economic effects

Norton (1992) demonstrates that the underdevelopment in infrastructure of telecommunication explains the difference of progress between countries. So, it is necessary to pitch a particular attention on the telecommunication sector because it can be the mainspring of economic development of countries (Röller and

Waverman, 2001). However, the improved telecommunications were not generally the center of investment for developing countries (Alleman et al., 1997).

Röller and Waverman (2001) show that the relation between telecommunication infrastructures and growth is non linear because of the externalities of networks. These authors noticed also that the economic growth in a group of 21 countries of OECD during the period of 20 years, on 1970-1990, could be attributed to the direct and indirect impact of the telecommunication sector. They argued also a country's telecommunications infrastructure has strong effects on economic growth.

Laffont and Tirole (2000) the regulation of the sector telecommunication in a competitive environment had been insured collective welfare upper to that in the monopolistic context.

1.2. The liberalization index

Based on the comparative experience of many experiences of sector liberalization (OECD countries, African countries) over the two last decades, it provides empirical evidence that liberalization of entry and the development of effective competition in telecommunications services generally lead to higher productivity, lower prices and better quality of services.

The liberalization index is measured according to the legal limitations among the competitors authorized on every market (number of authorized competitors). Boylaud and Nicoletti (2001) prove that the liberalization of the access and the development of the competition of telecommunication services entail generally an increase of the productivity, a decline of the tariffs and an improvement of the quality. Nevertheless, this indication is measured in a very general way. For more robustness, we shall adopt another technique (data analysis) to determine this index.

Several studies examine both the quality of GATS (General Agreement on Trade in Services) commitments and the actual state of liberalization. Such approaches have been pursued by Warran (2000) on telecommunication services, Fink et al. (2002), McGuire et al. (2000) and Kang (2000) on maritime transport services,

McGuire and Schuele (2000) on financial services, Kemp (2000) on education services and Kalirajan (2000) on distribution services. Special importance is accorded to macroeconomic studies to this phenomenon (Djiofack-Zebaze and Keck, 2008).

1.3. Knowledge – Intensive Business Services (KIBS)

Recently, there has been a significant increase in the attention paid to the activities of knowledge intensive business services. KIBS produce and diffuse knowledge, which is crucial for innovation processes (Muller and Zenker, 2001; Muller and Doloreux, 2009). Indeed, the overview of the literature on the question shows that the major frameworks are primarily directed towards the empirical studies and emphasizes the crucial role of the KIBS in the improvement of the innovation process. In particular, Hipp and Grupp (2005) present a new typology in order to obtain a better comprehension of the innovation in the services. In their paper, the authors deal with the knowledge intensive business services and highlight the specific role of human capital and innovation in the German service sector. They show that the inclusion of the KIBS, providing services based on professional knowledge, is of particular importance for the innovation process.

Leiponen (2005), studying the link between the innovation and the KIBS in Finland. It finds that even within KIBS there are several different innovation modes. Innovation in KIBS tends to be smaller scale and less institutionalized than in manufacturing. Moreover, Miles (2001) proves that the KIBS play a powerful role in the facilitation of the innovations through various economies.

Owing to the importance of this sector, we depict the effect of the telecommunication liberalization in this genus of firm's innovation.

2. Results and interpretations

2.1. Data

Considering the originality of our problematic, we don't have find data sets which contain the adequate information. Thus, we have to carry out our own survey of 109 Tunisian companies belonging to the service sector.

Table 1 and 2 displays descriptive statistics for 109 Tunisian companies. We find that 44% of our survey is informatics and telecommunication service companies.

Table 1: sectoral distribution

sectors	Freq.	Percent
Bank_insurance	14	26.61%
Compta_etud_training	15	26.61%
Develop_marketing	14	39.45
Infor_telecoms	18	55.96
Others	48	12.84%
Total	109	100%

Innovating firms are those who introduced new technological products and/or services during 2007. Our final sample contains 68 firms introduced innovating services to the market and 58 firms introduced innovating services to their firms.

Table 2: innovating and non innovating firms

Innovations for the market	Innovation for the company		Total
	No	Yes	
No	23	18	41
Yes	10	58	68
Total	33	76	109

2.2. Variables

We use Principal Component Analysis (PCA) in order to set up our variables. Our results (Tables 1, 2, 3) show that factor analysis is appropriate. It is confirmed by Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) statistical tests.¹

Bartlett test is greater than 0.5 for all tables. The KMO test is high while Bartlett's test is highly significant ($p < 0.001$).

2.2.1. Measure of the liberalization index

According to the PCA analysis, only one factor account for 58.21% of the variance shared by the 7 variables. The Eigen value and the percentage of variance accounted for by this factor are 4.074 (58.21%). The factor scores coefficient matrix is given in Table 3. A closer look at these scores reveals that the composite factors can be described as the liberalization index.

¹ The Kaiser-Meyer-Olkin measure of sampling adequacy tests whether the partial correlations among variables are small. Bartlett's test of sphericity tests whether the correlation matrix is an identity matrix, which would indicate that the factor model is inappropriate

Table 3: Results of PCA (1)

Items		Component		
Impact and reaction of the sector liberalization of in firm activities				
Uncertainties related to the future technological changes		0.708		
Impact of financial investment in new technologies		0.691		
degree of adaptation to the technological changes		0.692		
Reaction of the company following liberalization				
Observing the market (offers, tariffs...)		0.607		
Draw up conventions with operator(s)		0.858		
Cooperate with high developing companies		0.886		
Reorganize the information and communication process of the firm		0.853		
KMO	Eigenvalue	Bartlett		
0.831	4.074	Khi2	DF	Sign
	58.21%	418.684	21	0.000

This constructed variable is noted as V_1 for the remainder of paper.

2.2.2. Importance of the telecommunication services

In this case, we have three factors account for 68.85% of the variance shared by the 8 variables.

Table 4: Results of PCA (2)

Items		Components		
Eigenvalues		2.839 (35.483%)	1.543 (19.288%)	1.127 (14.088%)
Fixed phone		4.17E-02	-1.68E-02	0.865
Mobile phone		7.63E-02	0.209	0.820
Assistance and councils by the operators		0.810	0.128	5.62E-03
Quality of services (quality of the connections, stability of the network)		0.888	0.221	0.108
Availability of the service in the areas		0.901	8.00E-02	5.58E-02
Internet access by mobile phones		0.257	0.592	0.191
Internet access by broad band (DSL, ADSL,...)		0.257	0.592	4.919E-02
Services of data transmission by broad band		0.227	0.651	-2.12E-03
KMO		Bartlett		
0.638		Khi2	DF	Sign
		272.604	28	0.000

In our framework, the telecommunication services can be divided into three groups. The first axis gathers companies which attach an importance relating to the assistance of the operators and quality of service especially in areas. With regard to the second axe, we record the access to telecommunication Internet service. The third one is relating to the mobile phone access and fixed phone access.

These constructed variables are noted as V_2 , V_3 and V_4 for the remainder of paper.

2.2.3. Motivations of the operator choice

The first axis summarizes the information related to the commercial effort of the operator. It gathers promotion, development of customer loyalty and QoS. Thus, the efforts in marketing conjugated with the improvement of the quality of the service are important motivations for the choice of an operator.

The second axis is financial because it summarizes the information associated to the tariffs of fixed phones and internet. These services are connected. However, tariffs of the use of mobile phones and the presence of the infrastructure allied to the activities of companies have no effect on the formation of axes. The reasons of choice are particular to the Tunisian service firms.

Table 5: Results of PCA (3)

Items	Component		
Eigenvalues	3.728 (41.421%)		1.711 (19.012%)
Tariff of the fixed phone	-9.57E-02	0.835	
Tariff of the mobile telephony	0.502	0.434	
Tariff of the data transmission/use of Internet	2.4E-02	0.833	
Presence of infrastructure related to your activity	0.450	0.509	
Good quality of service	0.640	0.500	
Promotions	0.789	0.121	
Fidelity	0.850	-7.20E-02	
The nationality of the operator	0.696	-7.84E-02	
Weight of negotiation with the operator	0.766	0.189	
KMO	Bartlett		
0.706	Khi2	DF	Sign
	379.902	36	0.000

In fact, we shall consider the performance of companies as bi-dimensional concept of innovation, innovation of processes on one hand and innovation of product on the other hand. The innovation of processes is due to the increase of the quality of the telecommunication services.

These constructed variables are noted as V_5 and V_6 for the remainder of paper.

2.2.4. Other exogenous variables:

- Type of the operator is Tunisie Telecom which is the incumbent or the new entrant which is Tunisiana or both.
- Transaction by Internet which is a binary variable, this variable is related to telecommunication services.
- Dummy variables: branches of activities and firm size.

2.3. Liberalization effect on firms' innovation

The variable innovation (the dependent variable) is measured in two ways: either by the fact of making new innovations compared to the market, or compared to the company. They are dummy variables.

In order to pay special attention to telecoms liberalization, we estimate logit models explaining the probability to innovate (Table 6).

In table 6, different logit models explaining innovation are specified. It may be noted that the null hypothesis testing if the set of explanatory variables is equal to zero is strongly rejected by the likelihood ratio test for all our four specifications.

Table 6: estimation of the Logit models

Variables	Model I: y is innovations compared to the market		Model II: y is innovations compared the company	
	Coef.	mfx dy/dx	Coef.	Mfx dy/dx
V ₁	1.17 ***	0.25 ***	0.33	0.05
V ₂	0.08	0.01	0.89 **	0.14 **
V ₃	0.55 *	0.12 *	0.53 *	0.08 *
V ₄	-0.64 **	-0.14 **	-0.20	-0.03
V ₅	-0.33	-0.07	-0.57 *	-0.09 *
V ₆	-0.54 *	-0.11 *	-0.30	-0.04
Operator	-0.24	-0.05	0.26	0.04
Transaction by internet	1.52 **	0.35 **	1.26 *	0.23 *
Firm size	-0.08	-0.01	0.005	0.0008
info_telecom	1.04	0.22	2.14 **	0.31 **
develop_marketing	-0.88	-0.20	-0.90	-0.16
Comp_etud_training	-0.29	-0.06	-2.06 *	-0.43 *
Others	2.13 **	0.31 ***	1.52	0.16 **
Constant	-0.28		-0.66	
Log likelihood	-52.37		-42.96	
Pseudo R ²	0.25		0.34	
LR chi2(14)	35.73		44.79	
Prob > chi2	0.0007		0.0000	

Model I and II regress probability to innovate by variables related to telecommunication sector (constructed variables resulting from PCA, Transaction by internet, and type of the operator and dummy variables).

Liberalization index is strongly significant for firm's ability to innovate (being leader on the market). In fact, technological change and economical growth obliged our country to adopt a form of liberal regulation. This last has positive upshots: the Tunisian companies are familiarized with new technologies, appearance of new business sectors related to telecommunication and the computing technology.

Internet use (V3) has significant and positive impact on the probability to innovation (for both models). We find also that doing transaction by internet is significantly and positively related to innovation (according to the mfx). Consequently, Internet is strongly related to the technological change and the innovation. Our result is especially related to date choice which contains KIBS firms.

Moreover, we conclude that companies fastening an importance to tariffs of the vocal services introduce new products or services on the market.

The companies of telecommunication and data processing attaching an importance to the assistance of the operators and their quality of service introduce new services compared to the company. However, the offices of accountancy, audit and training have significant and negative impact on innovation (according to the mfx of model II).

These evidence shows the telecommunication sector involve innovation performance independently of the firm size. Finally, our results have important implication for the service sector in order to help the operators to be combined with firms needs.

3. Conclusions

This paper permits to map out a widespread structure and strategy of the firms in the knowledge-based economy. In a liberalization perspective, we investigate arguments capable of improving and increasing performance within Tunisian service firms. This paper depicts the determinants of the innovations while using telecommunication variables.

At first, we use PCA in order to summarize the mass of information which were collected. We obtain six constructed variables that will be used in order to estimate Logit model. Our results show that the liberalization of the Tunisian telecommunication sector inspires firms' innovation. Empirical evidence confirms that internet use have significant and positive impact on innovation autonomously of firm size and the type of the operator.

These findings suggest that upgrading and extending the telecommunications network should be a priority objective for policy-makers in order to facilitate growth in the region (Savage and Madden, 1998). In fact, Liberalization,

privatization, and technological change have not only radically changed domestic telecommunications markets, but also altered the whole economy.

It is necessary to highlight the impact of the liberalization of the sector telecommunication on the innovation of companies. Surprisingly, the type of the operator (incumbent or the new entrant) has no effect on innovation. Extension can be made in this context is to depict the determinants of the operator choice.

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