

Is telecommunications regulation efficient?

An international perspective

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The telecommunications sector has an important role for the economic development of the richest countries (Röller & Waverman, 2001) but also of developing ones. The opening to competition in this sector raised various debates on the way it must take place. For Africa and America, Wallsten (2001) concludes that a privatisation alone (without regulator) does not induce an increase in sectoral performances. However, we must underline that there is a broad variety of possible policies of *ex ante* regulation. Theoretical and practical choices of regulation vary from one country to another and lead to different performances. Their measures are difficult to perform and the economic research conclusions diverge rather largely on this subject. This impediment in analysing performances of regulation policies in the telecommunications sector can mainly be explained on the one hand by the speed of technical progress in this field. Due to this speed, it is also hard to put to the fore the respective roles of regulation policies and of firms. On the other hand, it can be explained by the youth of most of these policies and by the important changes that happen in a short period of time (e.g. the financial bubble...). Therefore, we should not conclude too quickly on the relations between regulation, opening to competition, privatisation and performances of the sector. Nevertheless, understanding these mechanisms is crucial in order to promote the sectoral policies in favour of long-term development of telecommunications and of the whole economy.

In this article, we investigate the question of the *ex ante* regulation efficiency in the telecommunications sector with an international perspective, by comparing the performances resulting from the different types of regulation. Since data are not always available and in order not to study a too “short” period of time, our research concerns a few developed countries (Canada, France, Finland, Italy, Japan, Norway, South Korea, Spain, Sweden, United Kingdom and United States)¹. Nevertheless, we consider that the main conclusions can be generalized to the other countries. The first part of the article will discuss the concept of economic efficiency. In section 2, we propose a first typology of the countries according to the applied types of regulation on the main “relevant markets” (fixed and mobile networks). In section 3, we establish, using a set of quantitative indicators, another typology of the countries according of the efficiency of their telecommunications sector. The comparison of these two typologies

finally leads to conclusions regarding the relevance to continue the current sectoral regulation policies (that are mainly based on a reduction of the domination of the historical operators and on the stimulation of competition). We will also propose research perspective on what could be another possible regulation, based on possible complementarities between *ex ante* and *ex post* policies.

I. THE ECONOMIC EFFICIENCY: A BASIS OF EX ANTE REGULATION POLICIES?

The welfare theory has shown the normative interest of perfect competition. This idea is a fundamental aspect of today regulation policies in the telecommunications sector. Indeed, various techniques of asymmetrical *ex ante* regulation in order are used to reduce the dominance of the historical monopoly and to introduce and stimulate competition. This action of the authorities must obviously be limited in time to be coherent. By the way, we should not forget that the only aim of these policies is not the competition (which is only one means) but efficiency.

Nevertheless, welfare theorists and to public decision makers are faced to two problems: what does an “efficient” economy mean? What happens and what must we do when markets are not perfect (what is obviously always the case)? To the first question, the economists answer that an efficient economy corresponds to an “optimal allocation of the rare resources between the agents” (at every moment but also from a dynamic point of view). This optimal allocation means no wasting, so that a modification of the allocation of the resources leads to a less interesting situation for at least one of the agents. However, the existence of such allocation efficiency guarantees neither its unicity, nor its optimality from an ethical or political point of view: the total welfare is maximum but its distribution between the agents is not considered. This explains why the regulation cannot simply rest on theoretical injunctions but has to be based, in a more or less explicit way, on political choices. The theory does not have anything to say about that except that it is almost unthinkable to reach an optimal allocation of resources without a paradoxical intervention of the State in the market. As for the second question, open competition is generally recommended with two exceptions: the existence of externalities or public goods, on one side, the one of a natural monopoly, on the other.

In the telecommunications sector, a hybrid and theoretically transitory solution was adopted by a vast majority of countries: that of sectoral regulation authority acting jointly with the competition authorities. This solution was largely discussed. Among the dissensions, the ethics of the regulator:

¹ It would also be difficult to compare countries with very different levels of development. However, the main points and the methodology of this article should apply whatever the country.

contrary to the “political economy” (Stigler, 1971; Stigler & Friedland, 1966), the “traditional public economy” is considering that the regulator is not interested and not sensitive to lobbying (Pigou, 1932; Scitovsky, 1954; Samuelson, 1954 or Musgrave, 1959). The “new public economy” of the regulation, based on incentive and the contract theory, tries to understand and correct the failings of the regulator (Laffont & Tirole, 1993). The efficiency of regulation is different and must be thought in each situation. Finally, “institutional economy” of the regulation (Calabresi, 1968; Dahlman, 1979; Coase, 1988) underlines the inefficiency of the regulation if the transaction costs (which results from the existence of the regulation) exceed those of other solutions (such as negotiation).

The absence of consensus about the concept of efficiency also concerns the way the regulation is applied. We can distinguish two main approaches. 1) A first attitude aims at developing competition thanks to asymmetrical decisions in favour of new entrants (Curien, 2000). This step generally consists of the reduction of the historical operator market shares (European situation) and sometimes in his breaking up (cf. AT&T in the United States). But it is sometimes economically unfounded because it takes too little account of scale and scope economies. 2) Another attitude aims at making the market “contestable” so that the monopoly (or dominant firm) cannot misuse its dominant position. This approach in term of “potential” competition avoids the previous paradoxical situation, which consists in defining *ex ante* the market structure. It also remains coherent with the situations where the monopoly (or oligopoly) is natural and sustainable.

In the first case, the market shares or the number of operators (and their evolution) constitute important indicators: the European approach, which is primarily “structuralist”, limits, by *ex ante* control, the operations (mergers, for instance), which lead to a reduction in competition. The American approach is more “behaviourist” and compares costs and advantages of the various situations without rejecting certain forms of market². The possible sanctions are thus taken *ex post*. In the second case, the level of “market contestability” (intensity of the entry and exit barriers) and the revenue of the dominant operator are the indicators of the correct behaviour of the market. These two points of view reflect a major debate on the criteria of efficiency of the regulation between economists. But what are those criteria?

It is interesting to note that OECD (2003a) is mixing indicators of competitive intensity and criteria of efficiency such as consumers benefit (Table 1). However, it is necessary to separate the indicators concerning the means to reach efficiency (competition, for instance) and those concerning the ends (efficiency itself). It is also necessary to specify what efficiency covers precisely and how this one can be measured. This table shows the importance given to the evolution of market structures and to its

possible contestability. The short-term benefits of consumers seem to be always preferred to other sources of social welfare (especially to the one regarding long term welfare). Indeed, in a long-term perspective, dynamic efficiency could suffer from the strict delimitation of relevant markets because it limits the possibilities of resources allocation between the various activities.

Category	Indicators
Market structures	Market share and its trends
	Entry barriers/Ease of entry
Supplier behaviour	Active competition in price and rivalries
	Absence of anti-competitive behaviour and collusion
	Provision of innovative services
	Profitability and its trends
Consumer behaviour	Access to information
	Ability to use information and market opportunities
	Costs and barriers to switching suppliers
	Countervailing buying power
Consumers benefits	A wide range of competitive services offered
	Consumer satisfaction with price and affordability
	Consumer satisfaction with the quality of services

Table 1: Indicators for the evaluation of telecommunications competition – Source : OECD (2003a).

Moreover, the alignment of the prices on the costs limits the dominant firm's revenue sometimes creating an artificial "revenue of regulation" for the other firms. Of course, this situation is not encouraging the main operators to carry out long term investments that are however necessary for the sector (Bourreau & Dogan, 2005) and for the economy. The fundamental question is thus the one of optimal dynamic resources allocation in a context of informational asymmetries. Several works point out the risks and limits of the sectoral regulation. Depending on the models, the adopted techniques of regulation, or the selected thresholds (Dechert, 1984), the literature highlights risks of over-investment (Averch and Johnson, 1962) as well as that of underinvestment (Bailey, 1973). Fears of the operators about the future regulator's behaviour also constitute a strong limitation to investment (Gilbert & Newberry, 1988). Long-term investment in the infrastructures or R&D is largely replaced by activity of service investment (in relation to demand expansion). But this situation is not sustainable in a long period perspective (Sidak & Spulber, 1998; Blondeel & Kiessling, 1999, Kahn & Al, 1999, Torturer & Dogan, 2003, 2005). Lastly, the regulator, as an institution, can be the cause of inefficiencies insofar as its framework of operation is relatively rigid, contrary to the authorities of competition: the definition of the relevant markets and the criteria of "power" on these markets are established per period and can quickly become inconsistent with the rapid technical and economic evolutions which characterize the sector.

² Cf. Institut Montaigne (2004), p.24-25.

Category	Indicators
OECD (2003a)	Cf. Table 1.
Investment	Infrastructures (operators and equipment suppliers)
	Commercial
Employment	Number of jobs
	Distribution of employment by type and qualification
	Welfare indicator
	Wages
Geographical distribution of activities	Diffusion of basic services
	Diffusion of advanced services
Innovation	Basic Research (operators and equipment suppliers)
	Development
	Relation between operators and equipment suppliers
Whole Economy	Previous sectoral indicators
	Growth and productivity gains explained by telecom
	Inequalities

Table 2: Criteria to measure efficiency of regulation policies, *for the market and for each relevant market*

We propose more relevant criteria in Table 2. They are completing those from Table 1 taking into account long-term dimensions like the risk of underinvestment that can be damageable for the sector and the whole economy. Due to the growing interactions between the telecommunications sector and the economy (Röller & Waverman, 2001) and the growing weight of the sector, this risk becomes a major issue. In the same way, regulation policies cannot ignore the importance for employment and research of threshold and spillover effects of co-operations. Lastly, regional development is also a factor of efficiency: the areas where infrastructures are developed have a higher attractive power (Martin & Rogers, 1995). The geographical diffusion and the price of the various services are thus particularly important. What are the choices of the regulators to deal with these antagonistic objectives?

II. A TYPOLOGY OF THE COUNTRIES ACCORDING TO THE TYPES OF REGULATION

The policy choices of regulators, in reality, are quite far away from satisfying the criteria defined in Table 2. The occurrences of the word “investment” in the regulators’ reports show the little of importance given to this question in the sectoral policy of many countries, contrary to trends of prices, market shares or number of operators (at least until the Internet bubble burst). The impact of these policies does not guarantee however an optimal resources allocation in the long-term. Which are then the national characteristics of the regulations?

The first distinction we can make between regulation policies is between mobile and fixed networks regulations. Generally, the regulation of the mobile network is not based on prices (at least until a recent period and except for England). It is based on the licenses attribution or the introduction of telephone number portability and has a significant impact on competitive intensity and on investment. What about the fixed network regulation?

In Europe, the regulation of the fixed network depends on the one hand on European Commission recommendations and on the other hand on national specificities. How do the National Authorities of Regulation (NRA) stimulate competition in the sector? In spite of policies' convergence, we can distinguish three groups of countries. The first one, made up of the countries of Continental Europe, aims at increasing competition on each identified relevant market³. It is based mainly on a prices regulation. This approach results in lowering the tariffs of networks access for new operators associated to a strong regulation of retail prices of the historical operator if it is dominant on the relevant market that is considered⁴. Its market shares are then reduced mechanically to the profit of new entrants. The second group, made up of the Scandinavian countries, differs primarily for historical reasons: the regulation is older and the number of operators is significantly higher there. The objective of stimulation of competition via sectoral regulation is thus not as important: the regulation policy centred on the prices is not a priority. The intensity of competition is guaranteed by measures such as additional licensing. Lastly, England, whose first reform of liberalization goes back to 20 years, is a particular case. Its regulation has been characterized for a long time by a very strong policy against the historical operator. It is now more reasonable, especially on the market segments on which BT is in a relatively weak position.

In North America, competition policies differ largely between the United States and Canada, in spite of initially comparable situations (generally private monopolies in each State or Province). These differences rest first on the date of liberalization: 1984 in the United States and 1993 (for a total liberalization) in Canada. The United States sectoral policy was mainly based on structural modifications of the market while Canada preferred to use *ex ante* regulation tools. However behaviours evolved with technical changes and with the development of cable networks: in the United States, the borders between local calls and long-distance calls tend to disappear. In Canada, even if since 2001 the CTRC uses the price-cap (maximum price) to control the market of local services, the Canadian policy (working groups on the rural access to broadband, programs with significant fundings... Cf CRTC, 2003) is always based on concerns related to the investment. This difference also distinguishes Canada's policies from the one implemented in the countries of continental Europe. The Canadian policy thus presents an original framework of industrial policy with a joint participation of private and public sectors⁵. The major

³ Taking into account a finer markets' segmentation makes this objective all the more difficult to reach.

⁴ This type of regulation is probably the most intense in Italy.

⁵ "The economic theory defines the concept of "industrial policy" as a correction by the State of the "market failures". The concept of "competition policy" is defined as the establishment of rules aiming at preventing the dominant positions or discriminating practices". More precisely, from an operational point of view, "the industrial policy is a sectoral policy that aims at developing the sectors that are important for reasons of national independence, technological autonomy, private initiative failures, decline of traditional activities, territorial or political balance deserve an intervention ". (Cohen & Lorenzi, 2000).

concerns of Canadian authorities cannot be summarized with the only stimulation of competition. Canadian governmental authorities, in agreement with sectoral authorities, take really into account of the risks of regional planning and underinvestment.

Japan and South Korea constitute interesting examples. Liberalized since 1985, the sector of Japanese telecommunications does not have *ex ante* regulation. The ministry in charge of the sector leads the regulation of the market and the sector remains characterized by a historical operator in situation of quasi-monopoly on all the segments (except the ADSL). Its goal is both the development (and the improvement) of the Japanese infrastructures of telecommunications and the increase in its use by the consumers (“e-Japan Strategy” program). The Korean situation is overall similar, even if we can underline several differences. This country has a regulation authority (KCC) but its attributions and its capacities are limited compared to its counterparts in the other Western countries. Its role is advisory and the ministry for information and communications makes the decisions. The political authorities are actively involved in the sector (in particular for broadband and mobile telephony). Their intervention is based on the association of public and private decision makers. The Korean and Japanese situations thus diverge basically from the European Union policy. The decisions on regulation in the telecommunications sector are fundamentally political choices (and not simply influenced by political choices, as in Canada). The strategy for the sector is thus to associate internal development of the sector and maximization of the positive externalities for the consumers and the whole economy (competitiveness, investment, growth...).

As a conclusion, this analysis of the national systems of regulation in the industrialized countries shows a rather clear classification of the nations according to the means of regulation implemented (and to the corresponding objectives). Table 3 presents the typology of the countries according to the type of regulation implemented. Naturally, this attempt of classification leads to unavoidable approximations. Of course, the models of regulation of fixed networks (we saw that mobile regulation was generally not prices based before 2003, except in England) are specific to each country. Nevertheless, three groups of distinct countries appear in our study. In the first one, we identified on the one hand the United States and on the other hand the countries of continental Europe (which are applying strictly the European Union recommendations). They are characterized by the absence of industrial policy. The regulation is mainly based on prices (but also by modification of the market structure in the United States). The authority of regulation, whose objective is the increase in competition, is strongly involved in the decisions of the sector⁶. The second group of countries is made of the Scandinavian countries. Contrary to the countries of the first group, the price-based regulation is almost inexistent. The operators fix their prices more or

less freely. The development of an effective competition does not seem to be the absolute objective there. The last group of countries is made of Canada, South Korea and Japan. They can be distinguished from the other countries by the public intervention in the telecommunications sector. Objectives are to be improvement of investment, of infrastructures and of quality of services. Competition does not seem the only vector of maximization of the social welfare.

		Main type of regulation		
		Price regulation (like price-cap)	Mixed regulation	Regulation based on the intervention on market structure
No (or weak) industrial policy	Independent NRA ⁷	France Germany Italy United Kingdom	United States	
	Independent NRA with governmental supervision	Spain		Finland Sweden
Active industrial policy	Independent NRA with governmental supervision	Canada	South Korea	
	No NRA		Japan	

Table 3: A typology of countries according to the type of regulation on fixed networks

Important questions are then: Did these various policies promote the same efficiency of the sector of telecommunications? Should we prefer one model to the other? Answering these questions requires to study the link between the economic performances and the decisions of the actors on the one hand, and the applied type of regulation, on the other hand.

⁶ The Spanish governmental supervision contrasts with the other countries of continental Europe but the last European directives will probably reduce the governmental intervention in Spain.

⁷ National Regulation Authority.

III. A TYPOLOGY OF THE COUNTRIES ACCORDING TO THE " EFFICIENCY " OF THEIR SECTOR OF TELECOMMUNICATION

The share of telecommunications revenue of the sector in the GDP and its variation constitute usual indicators of its vitality. Table 4 and Figure 1 show that France, Germany, North-American and Scandinavian countries (except Sweden) are relatively little specialized in telecommunications. The progression of the telecommunications weight in the economy has been weaker in these countries compared to the others (especially Japan, Italy, United Kingdom and Korea) during the 1995-2003 period.

	1995	1999	2003	Average annual growth rate		
				95-99	99-03	95-03
United Kingdom	2.45%	3.53%	4.67%**	9.53%	9.78%**	9.64%**
Korea (Rep. of)	2.05%	3.24%	4.08%	12.03%	5.99%	8.96%
Japan	1.77%	2.53%	3.94%	9.37%	11.66%	10.51%
Spain	2.02%	2.99%	3.55%	10.28%	4.35%	7.27%
Sweden	1.87%	2.95%	3.26%**	12.00%	3.36%**	8.22%**
Italy	1.82%	2.96%	3.23%*	12.85%	4.58%*	10.02%*
Finland	1.97%	3.15%	3.10%	12.39%	-0.37%	5.82%
Norway	2.19%	3.11%	3.06%*	9.18%	-0.82%*	5.74%*
Germany	2.02%	2.41%	2.98%	4.48%	5.42%	4.95%
United States	2.36%	2.90%	2.69%	5.24%	-1.86%	1.63%
Canada	2.05%	2.97%	2.62%	9.75%	-3.14%	3.10%
France	1.91%	1.96%	2.23%**	0.68%	4.46%**	2.28%**

* : 2001 ; ** : 2002

Sources: ITU, Eurostat, author's calculations

Table 4: weight of the sector of telecommunications in the national economies (total revenue of the sector on GDP)

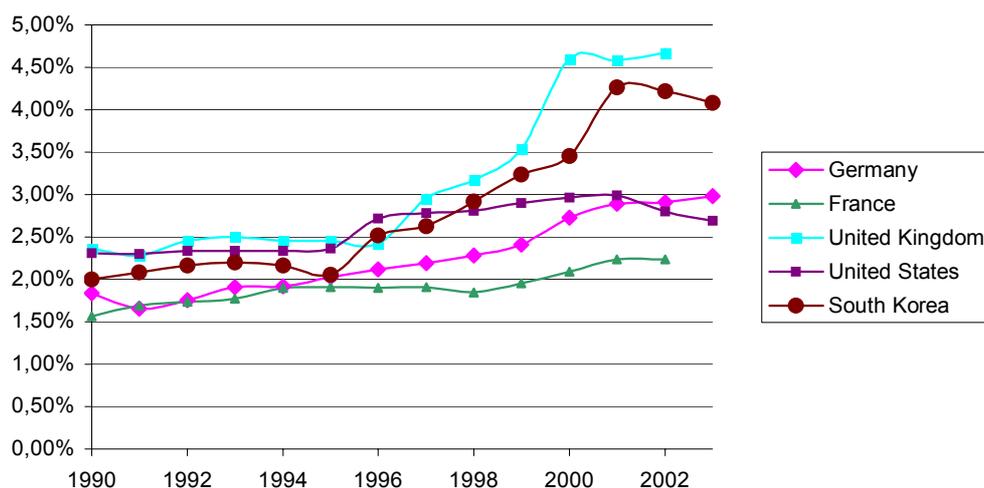


Figure 1 : evolution of the ratio between total revenue and GDP in 5 countries

However, this statement calls for comments and further analysis. It is why we propose a factorial analysis based on a set of variables (not using tariffs) provided by the ITU. We divided these variables by the GDP or the number of inhabitants in order to eliminate size effects. We also calculated the average

growth rates of all the variables for two periods (1998-2001 and 2001-2003). This work allows us to distinguish various groups of countries.

In this analysis, we point out that Korea is clearly characterized by the relative importance of investment and employment, as well as by the weight of the mobile revenue in the GDP. The Korean development of Internet before 2001 is also significantly stronger and this observation remains true when using the share of Internet revenue in the GDP or the revenue (in volume) between 2001 and 2003. Korea is also the only country of the panel whose investment and employment keep growing during the period 2001-2003 while all the other countries reduce their investments (from 15 to 40%) and lay off (except England). Let us remove South Korea of the panel in order to refine our typology of the other countries (Figure 2).

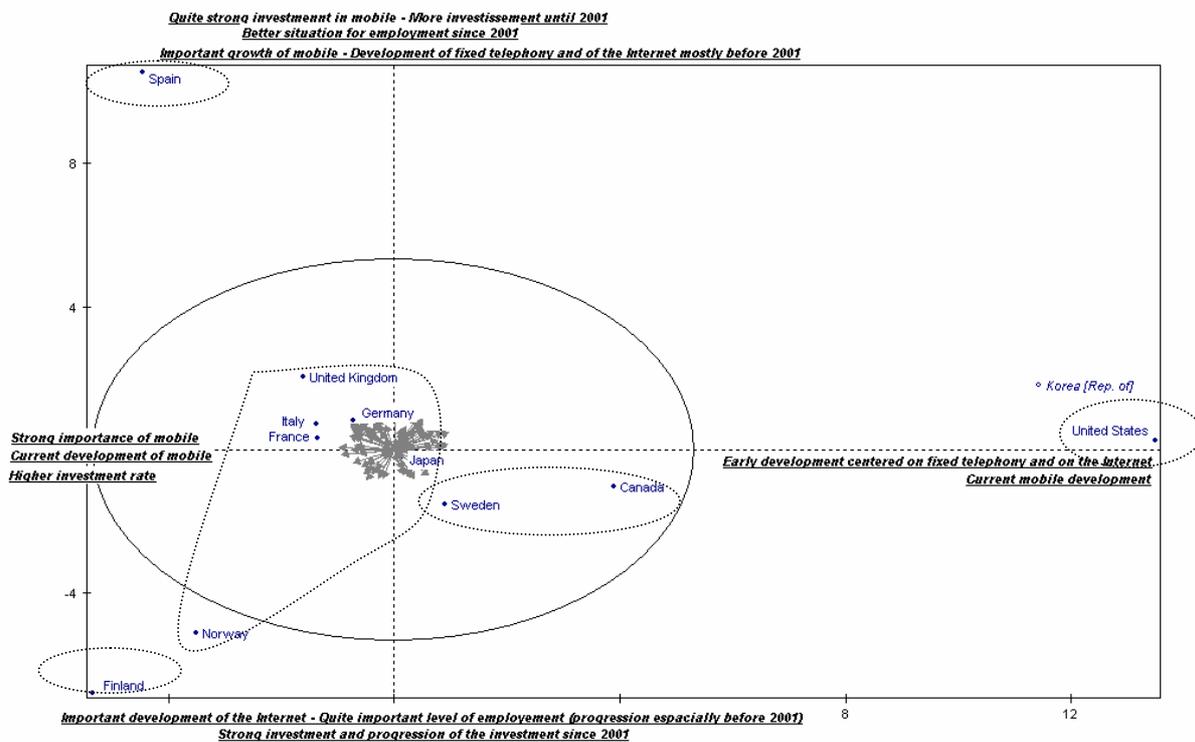


Figure 2 : factorial analysis of telecommunications sector

- Finland is characterized by a very strong position on the mobile segment (the revenue represents 1.6% of the GDP in 2002, just behind South Korea and Norway and far before the other countries). The development appears to be particularly strong since 2001 in both the mobile (+10.1%) and Internet (+11.4%) markets. Investments and employment in the sector are relatively heavier (0.6% of GDP invested in telecom and 0.9% of the population employed in the sector). Its regression is generally less important than elsewhere since 2001 (respectively -17.2% and -14.2%).

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- Spain is distinguished from Finland by an important slowing down of the overall investment in the sector (-36.3%) and the mobile (-42.8%) since 2001, after a period of strong development of the telecommunications sector (+83.7%, for the overall investment between 1998 and 2000).
 - The United States are characterized by a more significant development of the traffic and of the use of fixed network before 2000. The quality of service is notably worse in this country.
 - Lastly, a class gathers Canada, Sweden, Germany, Japan, France, Italy, Norway and United Kingdom. These countries are characterized by a less rapid slowing down of the share of the fixed telephony revenue in the GDP (-3% against -5% on average) and of the investment (-18% against -26% on the mobile and -24% against -26% in general) between 2001 and 2003. A slightly higher rise of the traffic in fixed telephony over this period is also put to the fore. These countries are thus relatively more dynamic, even if the bubble burst affects them all. Their situation in 2002 is characterized by the average rate of penetration of Internet (42%), of mobile (73%) and of overall investment (0.7%). The adoption of Internet is quite dynamic. It is not the case of employment (0.6%). And the progression of mobile has become less important. Finally, it is possible to distinguish Canada and, to a small extent, Sweden which, like the United States, experienced better results on the fixed telephony than in the other countries.

A more specific analysis of the three main relevant markets (fixed, mobile and Internet) allows us to refine this typology. It highlights the broad decline of fixed telephony: Its income drops everywhere in a very significant way (except in the United States). The French fixed telephony is the one that suffers the most. Except for Germany, our calculations (not detailed here) show a large acceleration in this decline during 1999-2003, including in the United States. This decrease has been caused in particular by the fall of the prices (cf Eurostat) and by the emerging substitutes. Surprisingly, we also note an increase in the fixed telephony operators as shown in the 10th report of the “Commission of the European Communities” (2004): it grew in the UE-15 from 635 in 1998 to nearly 1400 at the height of the bubble into 2001, before falling down under 1200 into 2003.

On the other hand, the highly dynamic mobile market is responsible for the main part of the sectorial growth over the period, in particular in the two Asian countries, in Spain, in Germany and in France (Table 5). Canada and, to a small extent the United States and some Scandinavian countries (Norway and Sweden), experienced a more moderate mobile development over the period. However, we must underline that the rate of mobile penetration in the Scandinavian countries already reached almost 100% in 2003, while it is only approximately 40% in Canada, 55% in the United States, 70% in Japan and Korea and between 70 and 100% in the European continent (ITU, 2005).

The Internet development is also important. The most advanced nations in 2003 are the Asian, Scandinavian and American countries, in particular for ADSL. On the other hand, continental Europe is characterized by more disparate profiles: whereas Germany situation is better, the other countries are relatively late, in 2003, either in the penetration of Internet, or in that of the broadband. Although the situation has already changed (as in France due to a strong price regulation), it would be interesting to analyse these changes in depth.

	Share of the revenue in the GDP				Internet penetration			
	Fixed Telephony		Mobile telephony		1999		2003	
	2003	Annual growth rate (1995-2003)	2003	Annual growth rate 1995-2001 (1995-2003)	Number of Internet subscribers for 100 inhabitants	of which cables and DSL	Number of Internet subscribers for 100 inhabitants	of which cables and DSL
Germany	1.10%	-3.78%	1.09%	32.80% (24.89%)	7.12	0.09%	27.87	19.83%
Spain	1.11%	-5.86%	1.54%	55.31% (42.68%)	5.57	0.03%	12.74	40.96%
Finland	0.62%	-3.32%	1.47%	24.31% (18.61%)	9.01	1.61%	25.27	37.23%
France	0.92%**	-5.04%**	0.70%	31.01% (27.82%^)	5.17	1.80%	17.57	31.93%
Italy	1.22%**	-2.39%**	1.39%*	26.77%^	5.06	1.98%°	30.94	12.94%
Norway	0.81%**	-4.87%**	0.78%	15.37% (13.87%)	15.73	0.64%	27.9	29.60%
United Kingdom	1.16%**	-3.09%**	1.09%	22.78% (20.75%^)	12.44	0.45%°	22.17**	13.85%**
Sweden	1.00%	-0.88%***	0.72%	7.11% (5.11%)	21.22	0.37%	35.77	24.13%
Canada	1.12%**	-3.63%**	0.58%	12.75% (11.23%)	9.48	26.64%°	22.11	64.35%
United States	1.87%	0.56%	0.74%	19.23% (15.5%)	16.19	3.96%	24.55*	15.73%*
Korea (Rep of)	0.94%	-4.34%	2.20%	37.11% (26.94%)	3	19.77%	24.08	88.93%
Japan	1.08%*	-1.36%*	1.66%	29.90%	9.59	1.78%	26.55	40.65%

° : 2000 ; * : 2001 ; ** : 2002 ; *** : 1996 ; ^ : 1995-2002 ; ^^ : 1996-2001

Sources: ITU, Eurostat, author's calculations

Table 5: Revenue share in GDP in fixed telephony and mobile markets and Internet penetration

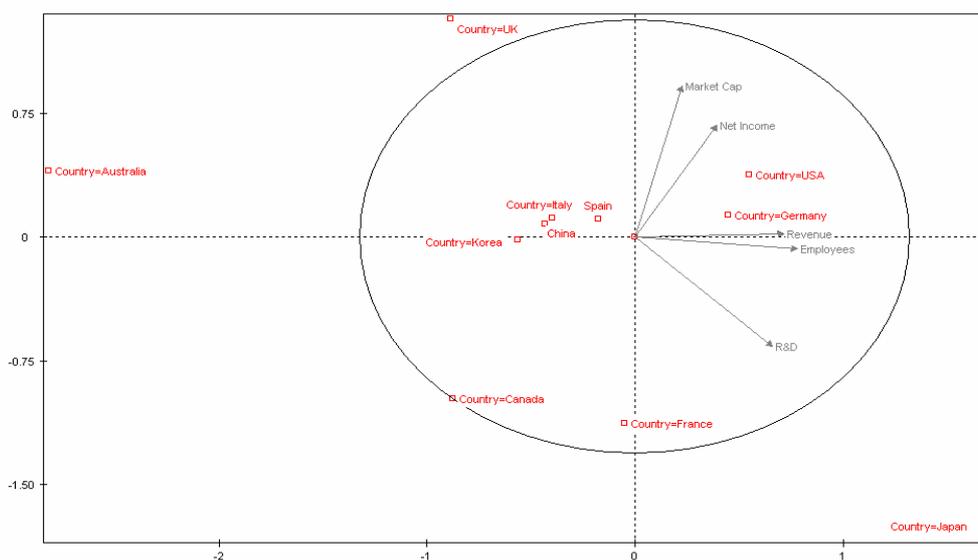


Figure 3: principal component analysis of telecommunications operators in 2003.

Lastly, we study other indicators of the sectorial development that concerns mainly the long term development of the sector. We thus analysed the behaviour of the 18 world larger telecommunications operators (OECD, 2004) according to their revenue, net income, employees number, market capitalization and R&D expenditure (Figure 3). For the considered year, we highlighted that a choice seems to be made between short and long term objectives: the first axis distinguishes the firms according to their size (the largest in Japan, United States and Germany). The other axis is more interesting. It stresses that, with identical revenue, firms whose results and market capitalization are higher are also those that invest less in R&D. The R&D is thus preferred by the large Japanese, Canadian and French companies but less by British and American ones. Germany, Korea, Spain and Italy have an intermediate behaviour.

Country	Total labour force						Average annual growth rate		
	1998	1999	2000	2001	2002	2003	98/00	01/03	98/03
United Kingdom	182000	203000	207000	220000	236000	-	6.65%	7.27%**	6.71%***
Canada	-	101400	103700	104900	105100	110800	2.27%	2.77%#	2.24%##
Norway	21070	23727	22756	22323	-	-	3.92%	-	1.94%*
Korea (Rep of)	90381	90857	93022	93386	94841 ^f	95966 ^f	1.45%	1.37%	1.21%
Germany	221900	221400	240700	240900	231400	226400	4.15%	-3.06%	0.40%
United States	1107800	1179700	1262600	1302100	1186500	1082600 ⁸	6.76%	-8.82%	-0.46%
Finland	19445	21601	24190	25015	22004	17433	11.54%	-16.52%	-2.16%
Italy	97682	100026	95809	90880	-	-	-0.96%	-	-2.38%*
Spain	96104	87632	90966	94394	89605	85169	-2.71%	-5.01%	-2.39%
France	155992	155297	154522	151191	145487	137414	-0.47%	-4.66%	-2.50%
Japan	229592	216694	193866	193866	202779	-	-8.11%	4.60%**	-3.06%***
Sweden	31467	30276	31411	29443	21620	20087	-0.09%	-17.40%	-8.59%

^f: forecasts, * : growth rate 98/01, ** : 01/02, *** : 98/02, # : 99-00, ## :99-03

Sources: national regulatory authorities, OECD, ITU, author's calculations.

Table 6: Level and growth of the total labour force in telecommunications

Employment (Table 6) is another significant indicator that has been affected by the bubble burst in all the countries except United Kingdom and Japan (and to a small extent, South Korea and Canada). Over the period 1998-2003, its development is bad in seven countries (Sweden, Japan, France, Spain, Italy, Finland and the United States⁹) and better in six others (little development in Germany, more important development in Canada and in South Korea¹⁰). Surprisingly, the British situation shows very good performance in terms of employment. The type of employment should however be analysed.

⁸ A forecast of 1054000 employees is given.

⁹ The situation is to be relativized for Italy and Japan since the available data stop respectively to 2001 and 2002. However, the European general situation during the period 2001 – 2003 seems to confirm the assumption of a new decrease of the number of Italian employees.

¹⁰ An analysis concerning this invariability would be probably instructive. Up to what point for example could the stability of the national regulations influence the perpetuation of the development of the sector?

<i>Investments share in the GDP in 2001 / Variation between 1995 and 2001</i>	Decrease	Relative stagnation	Increase
Weak	Germany (0.46%→0.37%)		Norway (0.24%→0.36%)
Intermediate		France (0.45%→0.49%) Sweden (0.51%→0.48%)	Finland (0.37%→0.54%) Italy (0.36%→0.47%)
High		Spain (0.60%→0.65%) Japan (0.66%→0.59%)	U-K (0.36%→0.98%) Canada (0.64%→0.71%) USA (0.53%→0.95%) Korea (0.89%→1.02%)

(Investments share in 1995 → Investments share in 2001)

Source: OECD

Table 7: Telecommunications investment on GDP

The third indicator of long-term efficiency is the investments share in the GDP - and its evolution - (Table 7). It shows, although our data do not take account of the bubble burst¹¹, that Asian countries, Canada as well as the United Kingdom and the United States are definitely more dynamic than the other countries. Finally, we can summarize the results about telecommunications sector's efficiency in Table 8.

		Investment		
		Weak	Intermediate	High
Performances of the sector in terms of Revenues / GDP (level and growth)	Weak	Germany	France USA	Canada
	Intermediate	Norway <i>Sweden</i> Italy	Spain Finland	
	High		UK	South Korea Japan

Bold: good performances in employment.

Italic: better performances in the fixed telephony relatively to the others countries.

Table 8: Typology of the countries according to the efficiency of their telecommunications sector

This table exhibits a typology of the countries using various criteria, taking into account short term (revenue/GDP) and long term (investment and R&D policies) development of the sector. Obviously, this typology cannot gather all the aspects that are characterizing the sector and its evolution. But it remains instructive when it is compared to the regulatory policies highlighted before (Table 3). Due to the weaker preference to invest in R&D in the largest American firm, United States has been classified in an intermediate situation of efficiency with Spain, Finland and France (where the historical operator continues to support the R&D). The United Kingdom, in spite lower R&D investment, appears to be among the most efficient. The other countries are in an intermediate or weak position. Finally, we can note that the countries having adopted an *ex ante* regulation of the sector, based on prices, show very

different results while the countries that adopted industrial policies for the sector appear among the most efficient ones. Let us also note that a more specific analysis of the mobile, less regulated by prices, highlights a true dynamism of these countries.

IV. CONCLUSION: WHICH ARE THE RELATIONS BETWEEN PERFORMANCE AND REGULATION EX ANTE ?

In this paper, we addressed the question of the regulation policies efficiency in the telecommunications sector, following a two steps approach. We first clarified the concept of efficiency. We pointed out the importance of the long term dynamic efficiency, that is fundamental for the whole economy: indeed, efficiency cannot be limited to objectives such as decreases in consumption prices or in market shares of the dominant operators.

Among regulation policies, we then pointed out two main types of procedure (not always antagonistic). They depend on economic but also on political concerns. The first one is competition oriented while the other one is industrial policy oriented. The first option can be justified by a belief that the market will be able to allocate the resources in the best way if a potential or effective competition really exists. The second one considers that the State must play a role to support actively the development of the sector.

Our analysis cannot definitely decide between those two approaches but can be considered as a step forward in the investigation of this question. This investigation is important for practical but also theoretical reasons because it is linked to many other questions addressed in the literature: it is related to the natural monopoly question (Albon & Al, 1997; Productivity Commission, 1999), to the type of regulation (Chunrong & Sappington, 2002), to the relations between privatization and competition on the one hand. On the other hand, it also related to quality of service, productivity, prices and investment decrease (Boylaud & Nicoletti, 2000, 2001; Li & Xu, 2002; Bortolotti and Al, 2002). Our research contributed to show that the countries that follow an active industrial policy invest more. These countries are not taking into account the only short term dimension but also the long term one. Korea is a very good example of this policy. Another contribution of our work is to show that the telecommunications boom is mainly explained by the development of a sector that is not regulated by prices (namely mobile network) while the one that is declining (fixed telephony) has been strongly regulated by the prices. Even if other explanations exist (less expensive development of mobile infrastructures, initial oligopolistic

¹¹ The figures of OECD should appear in July 2005 and thus make it possible to apprehend the bursting of the speculative bubble, which led to a very significant fall of investments in the majority of the countries according to the ITU (2005).

market structure), the applied regulation is a key feature in the sectoral development. It is thus necessary to raise the question of the relevance of the introduction of MVNO: their investments are very limited with often artificial implantations (because of an asymmetrical regulation). They are positive for the short term benefits of consumers but maybe not for the long term development of the sector. Wouldn't it be better to establish a contract with the main existing operators to require their involvement in short but also long-term sectorial growth?

We stress the importance of long-term investment as also shown in OECD (2003b, p.12-13). Our conclusions tend however to question or moderate the recommendations of this organization: the opening to competition cannot be regarded as a necessary nor a sufficient condition to the development of the investment. Accordingly, we propose complementary indicators to those provided by OECD (2003a) that do not take into account the only framework of competition as a vector of the sector development (even if the availability of homogeneous data still remains a problem). We underline that the identification of too many relevant markets (such as in the European Directive) implies the easier observation of powerful operators and thus limits the possibilities of resource allocation. The operators are thus facing a strong uncertainty concerning the regulators behaviours. A risk of under-investment results from this uncertainty: introducing this risk, prices regulation does not encourage the operators (especially dominant ones) to invest since the profitability of these investments is random. We consider that after a period of stimulation of competition, we must strongly take into account national paths and scale economies if we want to build a favourable framework to the long period sectorial development.

This article raised the question of the relevance of regulation policies and argued that one of the main problems, especially in Europe, is that a too weak importance is given to long term issues. In our opinion, it is now important to complete the set of indicators used by regulatory authorities in order to take into account the global interests of the sector and of the whole economy. In this perspective, we consider that further researches could be done, for example, following the idea that ex ante regulation could rest much more on industrial policy objectives while ex post regulation would check that dominant operators are not abusing from their dominant positions. A concentrated market would become acceptable if the profitability of the biggest firms is limited and mainly reserved for investment. The benefit of both approaches (in terms of industrial policy and competition policy) could thus add up, at least partially.

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