# About the importance of « organizational design » in the telecommunications sector

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## 1 INTRODUCTION

« Organizational design » means the structure of a sector, chosen by planners for efficiency reasons . They have several goals : a total surplus in the sector as big as possible, the growth of the sector, a big number of jobs created etc … An important goal is to attract investment, domestic and inward, towards the sector . We have an example, today, with the Central and Eastern Europe countries . With efficient decisions from the planners, investment is attracted, and investment in the sector is a condition for its development .

Examples of the questions to examine are:

- The structure of the sector of telephone
- The structure of the sector of radio-telephone
- The « good » number of firms in a sector
- Etc …

In this text, we shall examine the following questions:

- Joint production
- UMTS (Universal Mobile Telecommunications Services) licensing .

## 2 THE METHODS

To study these questions, we can use tools as TCE (Transaction Costs Economics) or the theory of games . We have to choose between these two methods . We shall make two remarks :

- There is no problem of joint production when there are numerous firms in the upstream sector and the downstream sector . It does not matter whether the firms are independant, whether there are exclusive links between a firm in the upstream sector and an other firm in the downstream sector, whether the firms are integrated . The result is always the same, the competitive equilibrium . The joint production problem exists only when there are a few firms in each sector, upstream sector and downstream sector . We have two distinct cases, monopoly and duopoly . Do these situations exist ? If they exist, what are the reasons ? These situations exist because of three reasons . The first is important investment . Today there is only one local telecommunications network in most the regions . We except the CBD (Central Business District) . There will be a change with the fixed wireless networks, but not all the zones will be covered, and they are poised to satisfy the needs of SMEs (Small and Medium sized Enterprises) .It is the same with the cable TV networks. There is only one cable TV network in a zone, if it exists . A network is in a monopoly situation, because of the huge investment to do to build this network, and a rentability which is not at a high level . Also, these networks are built entirely at the beginning (all the households in a zone are equipped at this instant) . If a part of the capacity is not used, there is a financial burden . The second reason is rare ressources . Obviously the spectrum used by radio-telephone is an example . The third reason is an emerging market . Some authors have examined this question, saying that there will be temporarily a few integrated firms . As the volume of the goods which are sold is insufficient, there are not numerous specialized and efficient providers . The firms in the sector prefer to be integrated . If we compare two situations, exclusive links between a provider and a firm, and integration, there is more efficiency in the second case, as it is shown by the theory of games . An example in the telecommunications sector is a BOT (Build Operate Transfer) contract in a developing country .
- The perimeter of a firm is an interesting question from two points of view, interaction and costs . In this text, we study the problem of interaction, by using the theory of games . In a context of monopoly or duopoly, what is the better solution, exclusive links between two firms (one in the upstream sector, the other in the downstream sector) or integration ? We suppose that the perimeter has no impact on the cost . The cost curve of the integrated firm is merely the addition of the cost curves of the two firms . At the opposite TCE permits to study the impact of the perimeter of the firm on the cost, but not interaction . This is shown in the following table :

| | Studied topics | Not studied topics |
|---|---|---|
| TCE | Cost | Interaction |
| Theory of games | Interaction | Cost |

Table 1 : comparison between two methods to study the joint production problem

It is justified in the case of the cable TV networks, if we suppose a large market of the TV programs.

## 3 THE CASE OF JOINT PRODUCTION

In a situation of joint production, and monopoly or duopoly, the integration is a better solution . Details are shown in the note at the end of the text . We shall examine two cases, a BOT contract in a developing country and cable TV networks .

### 3.1 BOT contracts

The better solution is integration . It is not efficient to have two tasks and two firms, one task for each firm . Perhaps the developing country will fear a too powerful firm, with many competences, able to achieve the whole project . However, the BOT (Build Operate Transfer) contract itself, is a protection (after several years, the equipment is the property of the country) .

### 3.2 Cable TV networks

Again, the integration is a better solution . There are several situations . If the partners are equal, we have a Nash equilibrium . The network operator could be a Stackelberg follower for three reasons :

- For any reason, a long term contract is necessary
- There are a few providers
- Because of the site specificity which exists for it, it is weak when its partner makes pressures
- There are commercial reasons . To obtain commercial goals, long term links with the partner are necessary . To attract consumers, particular kinds of products have to be sold . When the commercial competence exists, it is costly to change the provider . In fact, in the cable TV case, it seems that the same products are sold to all the consumers .

The network operator could be a Stackelberg leader . It is a case when the provider can be easily changed, as the products sold are the same for all the consumers, and are buyed on a large market . Of course, it is more interesting for the network operator to be a Stackelberg leader, than to be the equal of the provider (its profit is bigger) , but in any case the integration is a better solution .

Perhaps there is a duopoly (competition between cable and satellite) . The competitors are very different . For a cable network, there is a site specificity, and the network is installed wholly from the start . For satellite investment is made partly by the consumer, the network is installed gradually (only consumers are equipped with antennas) and there is no site specificity (the transmitters of a satellite beam towards many regions) .

It is a paradox, but it is not necessarily bad to have the capacity installed wholly from the start . Let us compare the two cases, capacity installed gradually and capacity installed wholly from the start, the other conditions being the same (in a situation of monopoly or duopoly) . The quantity sold is bigger in the second case . The profit is smaller, and it is important to avoid a large part of the capacity being unused . It would be a financial loss . For this reason, integration is a better solution, because the quantity sold is bigger .

Our conclusion is that integration is a better solution . We can suppose that with cable TV we have the case of Cournot competition . As it is shown in the note at the end of the text, this case is clear . Integration is a better solution for all the actors (except the competitor, of course) .

## 4 UMTS (UNIVERSAL MOBILE TELECOMMUNICATIONS SERVICES) LICENSING

We use a simple model from the theory of games, with two bidders . Each bidder has a project, the value of which is V (it is the profit when the project is achieved) . The optimal strategy is to propose the price $p = V/2$ . The bidder with the bigger value V is the winner . We can suppose that a bidder is more efficient than the other (its cost curve is below the cost curve of the other) , and it is the winner. The total surplus is bigger (if the winner is in a monopoly or duopoly situation ) . This surplus is $V + S$ (S, consumer surplus) in the monopoly situation . The planners can choose the requirements to maximise this surplus . A small change in the surplus leaves $V + S$ unchanged . For instance, if the requirements are a little more compelling, $dV + dS = 0$ with $dV < 0$ and $dS > 0$ . If we compare two countries with the same size of the market, we have two cases :

- The price is higher . There are no peripheral regions in this country, or their problems are not taken into account . According to the requirements, only the metropolitan areas will be covered .
- The price is lower . In this country, there are peripheral regions, and the coverage of these regions will exist, according to the requirements .

We can generalize and examine the bids with more than two bidders . A delicate question is the « good » number of licences being sold . Two hypothesis are possible . When the number of licences being sold grows, the number of bidders increases, or decreases . We prefer the second hypothesis . When the number of licences grows, it is sure that the value of the project V decreases (it is shown by the theory of games) . If the number of bidders increases, necessarily $V – p$ (p is the price) increases . We have to suppose that p decreases very much, and it is absurd since the number of bidders increases .

Logically the incumbents are among the winners . The value V of the project is bigger for them for two reasons:

- They have already customers, and a brand . They have commercial experience (but this argument can be challenged if the entrant is an incumbent in an other country) .
- The difficult problem of roaming agreements does not exist for them. Their customers will use the two networks of the firm, the 3G network in metropolitan areas (and possibly some other areas), the 2G network in regions without 3G network.

When the number of licences grows, rapidly it is bigger than the number of bidders, and the bid fails . The « good » number of licences being sold seems to be the number of incumbents, plus one or two .

## 5 CONCLUSION

In the telecommunications sector, planners have to solve important problems . Planners, and the actors themselves, have to take good decisions . Always there are three stakes:

- Cost
- Interaction
- Innovation

In this text, we have insisted on interaction . In the cable TV case, integration is a better solution from the point of view of interaction . Innovation has also a role . There is a supplementary reason for integration . If the cable TV network has to be upgraded to permit high speed Internet, coordination between two actors could be difficult .

Concerning UMTS licensing, bids seem to be a good mean to select the firms . Again, innovation has a role . When innovation is necessary, there is an uncertainty . It is wished that the firms are able to assess their UMTS projects exactly, to not pay for licences a too high price, though there is an uncertainty . Perhaps when the bid occurs, an oligopoly appears . It is easily explained . In the telecommunications sector, the rhythm is determined by technological innovation . The big firms have a « follow my leader » strategy , and when they buy rare ressources or assets of the same kind, at the same instant, the prices are high . High prices when bids occur, barreers to entry, and a small number of firms in the sector, are all aspects of the oligopoly .

## 6 NOTE . THE JOINT PRODUCTION AND THE THEORY OF GAMES

We suppose known the following notions : simultaneous game, Stackelberg game, strategic substitutes and strategic complements . In the case of joint production, we compare two firms E1 and E2, each producing a component, and choosing their prices p1 and p2, with an integrated firm E, choosing the price p . The interesting aspects of this problem are :

Statics . In any case, there is a bigger surplus with the integrated firm : the price is smaller, the quantity sold is bigger, the joint profit is more important . If the firms E1 and E2 are equal partners, it is a simultaneous game with a Nash equilibrium . If the firms are unequal partners, it is a Stackelberg game . In this case, the result (the price paid by the consumers and the quantity sold) does not depend on the particular firm which is the Stackelberg leader (if the costs are constant) .

An interesting question is the comparison between the two cases, the simultaneous game and the Stackelberg game, from the point of view of the surplus . The answer depends on the prices being substitutes or complements . If we suppose an axis of the quantities oriented towards the right (growing quantities towards the right) , the equilibrium points are located as follows :

substitutes : Mst, Ms, Mi

complements : Ms, Mst, Mi

Mst : equilibrium point of the Stackelberg game

Ms : equilibrium point of the simultaneous game

Mi : equilibrium in the case of the integrated firm .

Move from the equilibrium point . What spontaneous move is possible, if one wishes a bigger surplus ? Again, there are several cases :

Substitutes : if the partners are unequal, there is no move . If the partners are equal, again there is no move . It does not matter which firm is the first mover . It chooses the behaviour of a Stackelberg leader, and it is inefficient for three reasons:

Its profit shrinks .

The profit of the other firm increases .

The increasing of the quantity sold corresponds to less than the fall of the price accepted by the firm .

Each partner waits for the move of the other . Nothing happens .

Complements : if the partners are unequal, there is no move . If the partners are equal, there will be a move from Ms to Mst . It is an efficient move . The move is not beyond Mst, which is on the left of Mi.

In any case, the surplus is bigger with the integrated firm .

Duopoly . The same reasoning holds in the case of a duopoly . With an integrated firm, the equilibrum corresponds to a more intense competition . The two competitors can choose their quantities (Cournot competition) or their prices (partially substitutes products) :

Cournot competition : we suppose that quantities are substitutes and that the equilibium is stable . In particular, it is the case with a concave demand and not decreasing costs . The « reaction fonction » of the integrated firm is on the right of the same fonction in the case of two firms (equal or unequal partners) . The price is lower, the quantity sold is bigger . The joint profit is bigger . The profit of the other firm shrinks . The total surplus is bigger .

Partially substitutes products : we suppose that prices are complements and that the equilibrium is stable . In particular, it is the case with a concave demand and not decreasing costs . The « reaction fonction » of the integrated firm is on the left of the same fonction in the case of two firms (equal or unequal partners) . The two prices are lower, and the quantity sold (the number of units of the two different products) is bigger . The consumer surplus is bigger . We can say nothing about the joint profit . The profit of the other firm shrinks .

## 7 BIBLIOGRAPHY

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