Game Theory group project:
Free Mobile and the mobile operator cartel in France

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1. Introduction

1.1. Context

France has one of the most expensive mobile phone services in Europe[1]. The mobile services market is dominated by three companies: Orange, Bouygues and SFR. They were fined €535 million in 2005 for colluding, i.e. forming a cartel and infringing on the principle of competition. Today, it is suspected that an informal cartel still exists. Relative market share stability between the companies, similarity of offers, and consistently high prices relative to other EU states strongly imply that true competition hasn't occurred. In January 2012, Free Mobile entered the market as a fourth operator, challenging the cartel by offering lower prices.

This paper aims to analyse the aforementioned cartel and the consequences of a new entrant to this market in two parts:

1. Internal destabilisation: How and why was a cartel maintained for such a long time before Free's entry into the market?
2. External destabilisation: How does the entry of a fourth operator change the equilibrium between the existing firms?

1.2. Players

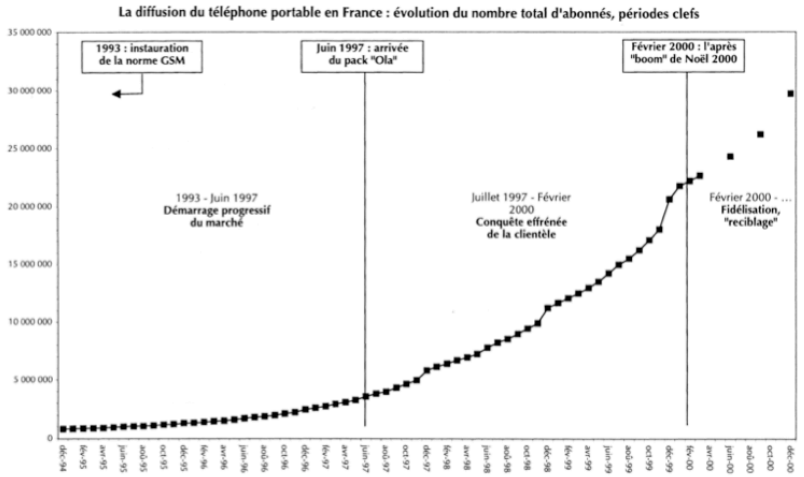
a) Existing members of the cartel

Orange

SFR

Bouygues Telecom

During the boom in mobile users up to 2000, the three companies competed for the highest number of customers. After 2000, the growth in the number of mobile users slowed down, leading the operators' strategy to change.



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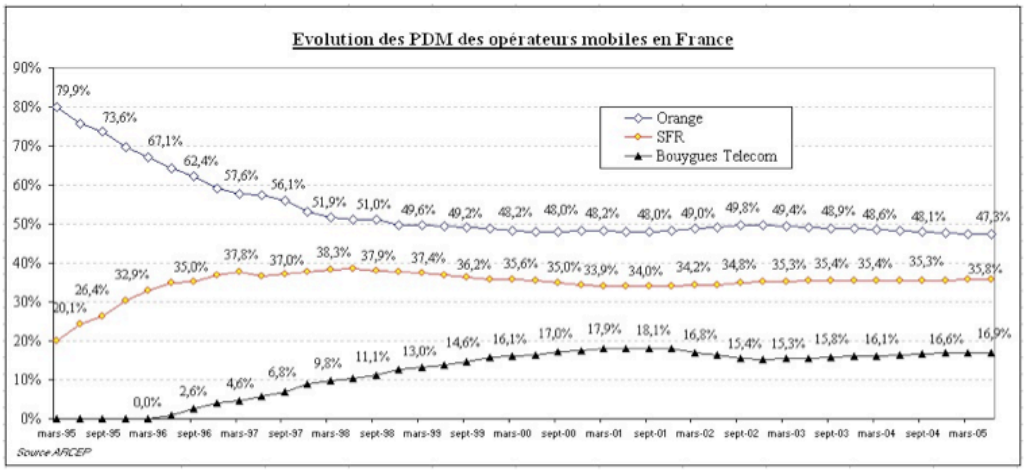
[1] Second most expensive in the European Union, after Spain with an average of €29.77 while Germany averages €17.41 and Austria, the least expansive Western European country, averages €7.31.
Source : European Commission – http://www.pub-news.fr/actualites-du-jour/comparatif-prix-forfait-mobile-europe/

[2] Source : « La diffusion du téléphone mobile en France », Arnaud LAPEYRE and all., in *Flux*, n°42, October-December 2000

In a perfectly competitive market, higher prices imply a loss in the share of customers, but since the three companies agreed to keep prices high simultaneously, they maintain a high mark-up while keeping a stable number of customers.



[3]

INSEE research[4] shows that between 2000 and 2003, the prices of mobile phone services in France stayed stable while the firms' profits increased (+90% for Orange, +55% for SFR and +15% for Bouygues).

Individually, each of the companies would gain new customers if they broke the agreement and lowered their prices. However, this would push all firms toward a price war and force them to set prices at marginal cost. Since this is a repeated game, all firms have an advantage in cooperating.

b) Fourth entrant into the market

Free Mobile entered the market with lower prices compared to its competitors (€19.99 per month with unlimited phone calls, SMS and internet), effectively challenging the status quo of the cartel.

1.3 Notes

We have assigned the first payoff to company A, the second to company B; and the third to company C. Let S_1, S_2, S_3 be their strategy sets respectively, each being either to stay in the cartel or to leave it. The payoff function is, for each company $i \in (A, B, C)$:

$$U_i : S_1 \times S_2 \times S_3 \times \rightarrow \mathbb{R}$$
$$(s_1, s_2, s_3) \mapsto U_i(s_1, s_2, s_3)$$

2. Internal destablisation: Cooperation in a repeated game

2.1. Game set-up

a) The game principle

The objective of this game is to study what incentives company x has to stay in the cartel or to leave it, depending on the other companies' behaviors. The model used to analyze this situation is a simultaneous game, in which every player is a company: $x \in \{A;B;C\}$. We assume all companies are

[3] Source : ARCEP
http://www.arcep.fr/index.php?id=7453

[4] Source : INSEE Reseach Paper, « Mesurer l'évolution des prix des services de téléphonie mobile : une entreprise difficile », François MAGNIEN, in *Economie et Statistique*, n°362, July 2003

equal and that they have perfect information. At every period, eg. at the end of every month, the firms have to simultaneously choose whether to stay or leave. It is an infinitely repeated game.

b) Payoffs

Payoff ≈ price (of the unlimited plan) x quantity (number of customers)

To build the different payoffs, we assume the sum of each operator's payoff decreases as competition on the market increases. The immediate payoff of leaving the cartel would be higher than if a firm stays, but the future payoffs would be much smaller.

(i) All operators stay in the cartel:

Each operators gains 15.

Total payoff of the industry $(TPI) : 3 \times 15 = 45$

(ii) One operator leaves, two stay:

The one that leaves gains more clients although it has lower profit margins: **payoff of 25**.

The two other operators maintain high profit margins but are likely to lose clients as soon as existing mobile phone contracts end, since their former clients will go to the new cheaper operator. They have a **payoff of 7.**

$(TPI) : 25 + 7 + 7 = 39$

(iii) Two operators leave, one stays:

The two which leave the cartel face lower profit margins but obtain new clients: **payoff of 8** each.

The third operator maintains high profit margins but no new clients are gained: **payoff of 1.**

$(TPI) : 8 + 8 + 1 = 17$

(iv) All operators break the cartel:

They make almost no profits on each client (perfect competition price) but they do not lose market share and still attract new clients. Each firm has an equal **payoff of 2**.

$(TPI) : 2 + 2 + 2 = 6$

c) Game

	Two companies stay	One company leaves	All companies leave
x stays	15 , 15 , 15	7 , 25 , 7 or 7 , 7 , 25	1 , 8 , 8
x leaves	25 , 7 , 7	8 , 8 , 1 or 8 , 1 , 8	2 , 2 , 2

2.2. Strategies

a) Solving the game

	Two companies stay	One company leaves	All companies leave
x stays	15 , 15 , 15	7 , 25 , 7 or 7 , 7 , 25	1 , 8 , 8
x leaves	**25*** , 7 , 7	**8*** , 8 , 1 or **8*** , 1 , 8	**2*** , 2 , 2

"Stay" is a dominated strategy. A member of the cartel will always be willing to break it regardless of the behavior of its partners if the game is played once.

Therefore, one should expect perfect competition. However, all firms would be better off not breaking the cartel if they value the future. Breaking the cartel is only profitable at the time you do it as this game is infinite.

b) Explanation for collusion

The company x will be willing to break the cartel if and only if:

$$U_x(leave) > U_x(stay)$$
$$25 + \delta^2 2 + \delta^3 2 + \delta^3 2 + \ldots > 15 + \delta 15 + \delta^2 15 + \delta^3 15 + ...$$
$$10 > \delta 13 + \delta^2 13 + \delta^3 13 + ...$$
$$10 > 13 \times (\delta + \delta^2 + \delta^3 + \ldots)$$
$$10 + 13 > 13 \times (\delta + \delta^2 + \delta^3 + \ldots) + 13$$
$$23 > 13 \times (1 + \delta + \delta^2 + \delta^3 + \ldots)$$
$$23 > 13 \times (\frac{1}{1-\delta})$$
$$23 \times (1 - \delta) > 13$$
$$23 - 23\delta > 13$$
$$10 > 23\delta$$
$$\therefore \delta < 0.43$$

Because the discount rate here is quite small, for *x* to leave the cartel, it will have to value the present more than the future. We can conclude that collusion between the companies can be sustained when the game is repeated infinitely, unless one company values the present very much.

The firms value the future, implying they have a δ that is less than 0.43. This explains why the cartel has been maintained. The evidence for this is how all firms colluded on prices since 2000.

3. External destablization: Will a new entrant challenge existing cooperation?

3.1. Game set-up

a) The game principle

The objective of this game is to study what incentives a company *x* has to remain or to leave a cartel, following the entry of a new firm to the market. The assumptions about the model used to analyze this situation are the same as before.

We assume the three original operators have the same cost structures but are different from Free's since Free has lower fixed costs: no shops, less marketing costs, cheaper customer service.

b) Payoffs

Free's payoffs do not matter. Free says it will offer prices that reflect perfect competition, thus its strategy will not be influenced by the reaction of the other companies.

We assume that if all firms leave the cartel, they will offer similarly low prices as Free since they will converge on a price war. But with such prices, they would make losses.

c) Game

It leads to this game:

	Two companies stay	One company leaves	All companies leave
x stays	2 , 0 , 0	-1 , -1 , 0 Or -1 , 0 , -1	-1 , -1 , -1
x leaves	7 , 7 , 7	0 , 2 , 0 Or 0 , 0 , 2	0 , -1 , -1

Note: the first of the three payoffs is the payoff of company x, what matters for us.

When *x* leaves and two companies stay, Free's entry has no impact on the strategy of the other players. **Payoff is 7** and no longer 15 because they lose clients. Payoffs would be (7,7,7).

When one firm leaves and two stay, the firm (let's say A) which leaves will be able to attract clients by proposing a price lower than the two firms in the cartel and higher than Free's price. This allows it to stay profitable (company A has higher costs than Free). With these prices, A will gain clients from companies B and C because it is much cheaper. At the same time, it will not lose clients and it will be a good competitor against Free. So company A makes a smaller profit for each client but increases the number of clients. Payoffs would be (2,0,0) OR (0,2,0) OR (0,0,2).

When two firms leave the cartel and one stays, they will compete with each other and have similar offers as Free. They will not make profits since their costs are higher than Free's. The company that stays in the "cartel" (keeping prices high) will have a payoff of 0. It will maintain a high profit margin on each client but will have increasingly less clients until with payoffs reach 0. Payoffs would be (-1,-1,0) OR (-1,0,-1) OR (0,-1,-1).

When all firms leave the cartel, perfect competition will occur and firms will compete based on prices, converging on prices similar to Free's. Due to cost structure asymmetry, they would lose money. All firms face losses but maintain the number of clients. Payoffs would be (-1,-1,-1).

3.2. Strategies

a) Solving the game

	Two companies stay	One company leaves	All companies leave
x stays	2 , 0 , 0	-1 , -1 , 0 Or -1 , 0 , -1	-1 , -1 , -1
x leaves	**7*** , 7 , 7	**0*** , 2 , 0 Or **0*** , 0 , 2	**0*** , -1 , -1

Regardless of what the other firms in the cartel do, a member is always better off if it stays in the cartel. This is true even when a new entrant such as Free emerges with more aggressive prices.

b) Implications

According to our model, we should not expect Orange, Bouygues and SFR to align themselves with Free Mobile. This could be advantageous for Free as well since it can remain a low-cost and low-price operator.

4. Conclusion

Orange, SFR and Bouygues justify their prices by saying they are part of a high-quality market with high costs and thus expensive contracts. According to them, Free is a low-cost operator that does not provide the same services and thus is not in the same playing field.

Interestingly, these operators are also offering lower prices now without dismantling the cartel. The firms are trying to maintain a high retention of their clients with their own low-cost offers. For example, Orange is easing up on client mobility by giving clients the possibility to switch to one of its low-cost offers despite an ongoing contract for another plan. This is to avoid losing clients to Free as soon as their contracts are over. The implication is that Orange, SFR and Bouygues are cooperating on lowering prices in order to compete with Free. Thus, the cartel is maintained in a way that tries to avoid the loss of clients.

NB: It has only been four months after Free's entry into the market and thus still too early to draw conclusions about Free's impact on the cartel and to be able to assess whether our model corresponds to reality. Around 2.2 million clients have reportedly switched to the new operator, but the trend for upcoming months remains unknown.[5] Many clients are still bound to one to two year contracts, making it difficult for them to switch operators. This creates a gap between rational clients' expected and observed behavior, and can help explain Free's limited impact on the cartel.

[5] "La ruée vers Free est terminée", *Le Monde, 13 April 2012*

Bibliography:

- ESCARGUEL F., *L'entrée de Free sur le marché de la téléphonie mobile,* Mémoire de master, Institut de recherche et d'études en droit de l'information et de la communication, 2010
- LAPEYRE A. and all., « La diffusion du téléphone mobile en France », in *Flux*, n°42, October-December 2000
- MAGNIEN F., INSEE Reseach Paper, « Mesurer l'évolution des prix des services de téléphonie mobile : une entreprise difficile », in *Economie et Statistique*, n°362, July 2003

- Internet Website of ARCEP : http://www.arcep.fr/
- Internet Website of the European Commission: http://ec.europa.eu/index_fr.htm
- http://www.alternatives-economiques.fr/mobiles---le-cartel-se-rebiffe_fr_art_633_44268.html
- http://junon.univ-cezanne.fr/u3iredic/?p=3797
- http://leg.u-bourgogne.fr/documents-de-travail/e2009-02.pdf
- http://www.pub-news.fr/actualites-du-jour/comparatif-prix-forfait-mobile-europe/