# A new strategy against hostile takeovers: a model of defense in participations

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# A New Strategy against Hostile Takeovers: a Model of Defense in Participations

**Abstract**

This article examines the efficacy of a "defense in participations" policy consisting of competitors acquiring cross equity participations within the same industry to prevent hostile takeovers. This *defense in participations* strategy provides disincentive for raiders as partial ownerships increase market power of competitors and then reinforce the "outsider effect". Also, we find conditions for a general result which states that takeovers are less profitable in an industry with participations rather than in an industry without any capital links. We provide information to regulators about the positive social impact of cross participations in the context of mergers, and expose an economic dilemma between a "laisser-faire" and an interventionist approach.

**Keywords** Takeovers · Defense · Participations · Regulation

**JEL Classification** G34 · L22 · L41



# 1 INTRODUCTION

A hostile takeover consists of buying shares of another corporation for the purpose of taking control of its management and of receiving its dividends. The raider (the acquiring firm) announces its desire to buy back targeted company's shares at a premium. The level of the premium is set to encourage shareholders to sell their stake and also partially reflects potential synergies[1] of the merger. According to Manne (1965) and Jensen (1986), the primary synergies

[1] The takeover by Hewlett-Packard of Autonomy is an example of an excessive premium paid by the acquirer based on miscalculated synergies and goodwill value.

arise mostly from a change in the management because poorly controlled companies are easy targets for raiders. Further, a substantial premium can prevent other competitors entering a bid race for the acquisition of the firm. Achieving better results than competitors is the best defense against raiders, but a hostile takeover does not always constitute a credible threat for underperforming managers. Indeed, Grossman & Hart (1980) state that in the case of a takeover both managers and shareholders will be harmed; however this idea is criticized by Deman (1994). Numerous other strategies against hostile buyouts have been imagined and implemented such as: Pac-Man[2], Shark Repellents, Crown Jewels, Poison Pills, or antitakeover provisions (ATPs). All these strategies do not directly modify the capital structure of the target. However, in the context of buyouts the question of capital appears to be crucial.

Most of the time, a takeover is preceded by a small acquisition of capital, a toehold which proves beneficial to take control of the firm because it increases the amount necessary for competitors to win the battle. Bulow et al. (1999) thus find that competitors have no incentive to overbid the toehold acquirer, because of the winner's curse effect[3]. The literature related to agency costs (Fama, 1980; Easterbrook, 1984), or to antitakeover amendments (DeAngelo & Rice, 1983; Garell & Poulsen, 1987), and to toeholds (Choi, 1991; Betton et al., 2009) has flourished. However fundamental questions on takeover incentives still remain. For example, Inderst & Wey (2004) examine the profitability of takeovers in Bertrand and in Cournot competing industries, where incentives increase along with substitutability and independency of goods respectively.

To achieve diversification, the cross participations can be acquired in the capital of rivals operating in the same or in different economic regions, into suppliers and clients firms, or unrelated businesses. Partial ownerships can also be also used to reinforce market power by linking profit objectives of firms at the horizontal level (Perotti, 1992; Reitman, 1994), in a vertical relationship (Greenlee & Raskovich, 2006), or in a mixed framework (Serbera, 2010). The theoretical (see e.g. Malueg, 1992; O'brien & Salop, 2000) and applied (see e.g. Reiffen, 1998) literature on partial ownerships is extensive but little exists on equity participations strategies as a defense to hostile takeovers. An historic example of a defensive strategy appeared during the first step of privatization of French State-owned companies (such as Saint-Gobain, Paribas, Société Générale) starting in 1986: the "noyaux-durs" (or literally hard cores in English).

There are several examples of "defense in participations" policies equivalent across the world:

-The "Keiretsu", which constitute a complex network of equity participations arranged by a bank and linking corporations in Japan[4] were widely studied in empirical literature (Flath, 1990; Brown & Fung, 2009).

-The "Deutschland AG" (Franks & Mayer, 1998; Lantenois, 2011) which uses capital arrangements to align the interests of the financial and industrial companies with those of the employees whilst reducing the number of supervisory boards.

-The "golden shares[5]" policy in the United Kingdom implemented during the Thatcher privatization era (see Yergin & Stanislaw, 1998). The British government started acquiring a

[2] The Pacman defense was named with reference to the famous video games' character; it consists of absorbing competitors or in increasing capital to enhance firm's value.

[3] This is related to the theory of auctions in incomplete information. This effect states that the winner of the auction overpays eventually ending up with a loss.

[4] Mitsubishi is an illustrative example of Keiretsu, its organization serves several purposes such as ease of financing, independence of governance, diversification or market power.

[5] The term of golden shares is generically used to designate this type of participations arrangement.

small percentage of (preferred) shares of strategic companies such as Rolls-Royces, allowing it to nominate board's members and apply a veto's power in certain circumstances.

All these "defenses in participations" consist of creating a core of shareholders through over-the-counter shares acquisitions following advices from investment banks. More precisely, freshly privatized companies were acquiring shares of capital in each other in order to constitute a stable pool of stakeholders able to prevent any hostile takeover. The connection between BNP Paribas and AXA acquiring around 5% of each other at the time[6] in France, and Deutsche Bank with an acquisition of 4.1% in Allianz in Germany, were famous examples of "golden shares". Since the end of privatizations in western countries, these strategies are no longer imposed, but existing shares still give governments a veto on major decisions such as takeovers. For example in 2012, BAE's merger with EADS (now Airbus) was blocked by the UK government which exercised its right to enforce the golden share rule. The particular case of the "noyaux-durs" policy has been criticized afterwards by Goldstein (1996). He notes firstly, the make-up of the core of shareholders was mostly based on financial considerations and missed the opportunity of creating synergies following the participations arrangement. Secondly, the process of acquisition of partial ownerships lacked transparency. As a consequence of its lack of transparency, the price paid by the State for the shares did not include the control premium and was below the market price paid by private investors.

More generally, despite criticisms of the opacity of the design and the implementation of these governmental policies, the use of partial horizontal ownerships (PHO) as a defense against hostile takeovers raises many questions. In the context of mergers' profitability and incentives, when silent participations are possible we can cite Foros et al. (2011). They assert that the accrued profitability resulting from a partial (but controlling) ownership arrangement is greater than after a full merger. This greater profitability comes from increased barriers to entry after the participations arrangement becomes publicly observable. In the case of a majority ownership, the two firms are controlled by the same managers. However, in this article, we study the impact of a *defense in participations* on takeover incentives in an industry where firms can acquire partial non-controlling (also called silent[7] or passive) and reciprocal shares (cross participations) in the capital of competitors. In our model with silent ownerships, each management remains in place and decides upon its own production despite internalizing rival's profit up to its participation level. By using passive participations instead of controlling ones, we are thus able to differentiate between the effect of participations and that of mergers. More precisely, this article highlights the influence of cross participations on takeover incentives by determining their profitability in a Cournot oligopoly model with $n$ firms producing differentiated goods.

Our model finds a simple solution where PHO constitute an effective defense against hostile takeovers by reducing incentives to raid protected firms inside the industry. As a more general result, we show that when comparing two different industries, a hostile buyout is less likely in an industry where companies use the *defense in participations* strategy rather than in an industry without any capital links between the firms. We refine the result on the efficiency of the *defense in participations* relatively to the number of competing firms, and we obtain the defense

[6] Ended in 2010

[7] Silent ownerships are a common practice between competing firms. In the case of listed firms all regulatory ownerships thresholds are regularly reported to financial markets regulatory agencies. The type of shares determines associated voting rights. As long as the ownership remains minority participation (below 50%) the only impact on other firm managers' decisions is the co-integration of profits. As a consequence, this assumption rules out decisions such as stopping activity or shutting down the partially acquired firm. In this paper we only consider participations through class B shares (giving a claim on capital and no voting rights); this allows us to call them silent.

is more powerful in a less concentrated industry. In this case, a weaker market power leads to reduction of expected profits following a merger. The intuitive explanation of the efficiency of this defense strategy in PHO mainly arises from an increased "outsider effect[8]" of merger (see Salant et al., 1983) brought by the cross participations.

This study adds an innovative defense strategy against hostile takeovers to already existing ones, and opens the field for regulation in various ways. In a conservative approach this defense is effective against hostile buyouts over strategic sectors (weapons, nuclear, communications) from foreign competitors, but in a more liberal one it raises barriers against the self-regulation of the market (even if it leads to less competition).

# 2 Model and Set-Up

Table 1 presents detailed notations for the Cournot-Nash oligopoly model composed of $n$ firms competing in quantities.

| | |
|---|---|
| $n$ | Number of firms in the industry |
| $\alpha$ | Cross partial ownership |
| $\gamma$ | Substitutability parameter |
| $p_i$ | Final price for good i |
| $q_i$ | Output of good i |
| $c$ | Marginal cost of production (constant) |
| $\pi_i$ | Profit of Firm i |
| $A$ | Demand Parameter (constant) |

Tab. 1. Notation

**Definition** A *defense in participations* is a mutual agreement in which two firms acquire cross participations in the capital of each other.
(i) In the context of the defense policy, participations are set at an equal percentage: $\alpha_{12} = \alpha_{21} = \alpha$.
(ii) Equity holdings are silent minority stakes, giving the acquirer no right in the other firm management decisions.

Within the industry $I = \{1,...,n\}$, Firm *1* and Firm *2* are linked by symmetrical cross partial horizontal ownerships (PHO). As a consequence, we do not consider the stage of

[8] In the context of an oligopoly, the "outsider effect" states that it is more beneficial to stay outside a merger than be part of it. As a reaction to the merger, outsiders increase their production more than the merged firm which internalize the profits of two firms, outsiders then end up more profitable.

participations choice in this model. Each firm behaves as an owner-managed[9] entity.

Firms individually produce quantity of a substitutable good. The magnitude of substitutability depends on the substitutability parameter $\gamma$, $\gamma \in ]0;1[$.We only consider substitutable goods in order[10] to study the impact of participations and takeovers in a quantity competing oligopoly. For simplicity we assume that marginal costs of production, transformation and retail are constant. We suppose that the demand curve is linear: $p_i = A - q_i - \gamma \sum_{j \neq i} q_j$ , $\forall i$, $\forall j$, $\in I$. Profit maximization considers operative profit (revenues minus costs), plus the share $\alpha$ in the capital of a rival (for linked firms only). The following figure illustrates the organization of the industry:

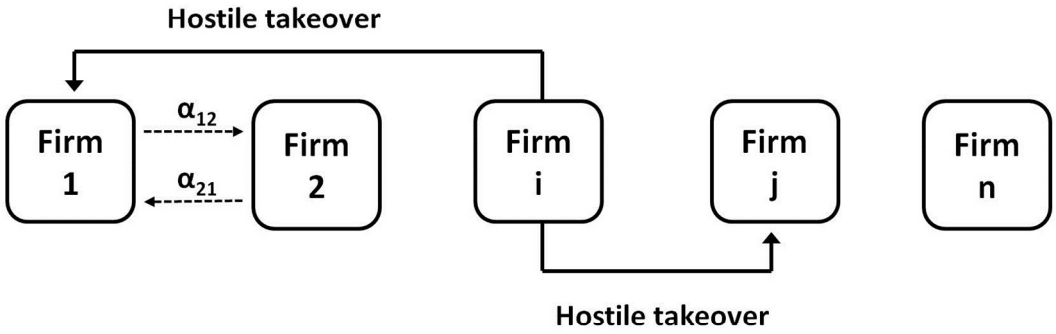


Fig. 1 The *defense in participations* in an oligopoly

We consider two distinct situations in this model. The first stage of the model discussed in Section 3 before any buyout. The second stage of the model discussed in Section 3.2.1-3.2.2 models the effects of the takeover. The effects of the takeover upon an unprotected firm (Section 3.2.1) and protected firms (Section 3.2.2) are discussed separately. By computing equilibrium profits we are able to compare pre and post-takeover profits and then derive firms' incentives to merge depending on their participations links $\alpha$.

# 3 Solutions

## 3.1 Pre-Takeover

We begin the resolution of the model by the first stage, before any buyout. Before a hypothetical buyout, the industry is composed of $n$ firms competing in quantities; each company behaves individually with the objective of maximizing its profit. Within the $n$ firms only Firms 1-2 internalize profits of each other relative to the cross participation $\alpha$. In the following, we

[9] The company is both manager and principal shareholder; we thus avoid conflicts of interest.

[10] When $\gamma = 0$, goods are independent and demand becomes inelastic, and as a consequence all firms produce the same output quantity up to their capacity constraints. Also, we set $\gamma \neq 1$ to differentiate consumer's demand vis-a-vis the firms' goods.

derive profits for Firms 1 and 2 linked by minority cross participations $\alpha$, $\alpha \in ]0;0.5[$:

$$\begin{aligned}\pi_1 &= (1-\alpha)(A-c-q_1-\gamma q_2-\gamma q_i-\gamma \sum_{j\in I\setminus\{1,2,i\}} q_j)q_1 \\ &+\alpha(A-c-\gamma q_1-q_2-\gamma q_i-\gamma \sum_{j\in I\setminus\{1,2,i\}} q_j)q_2\end{aligned} \quad (1)$$

$$\begin{aligned}\pi_2 &= (1-\alpha)(A-c-\gamma q_1-q_2-\gamma q_i-\gamma \sum_{j\in I\setminus\{1,2,i\}} q_j)q_2 \\ &+\alpha(A-c-q_1-\gamma q_2-\gamma q_i-\gamma \sum_{j\in I\setminus\{1,2,i\}} q_j)q_1\end{aligned} \quad (2)$$

Then, the profit of a firm without equity participations and representative of the majority of the industry can be calculated as

$$\pi_i = (A-c-\gamma q_1-\gamma q_2-q_i-\gamma \sum_{j\in I\setminus\{1,2,i\}} q_j)q_i \quad (3)$$

Solving simultaneously we obtain equilibrium quantities noted with a $^*$. We thus observe that quantities $q_1^*$ and $q_2^*$ set by linked firms (with participation $\alpha$) are inferior to quantities $q_i^*$ set by other firms without PHO: $q_1^* = q_2^* < q_i^*$, the inequality holds for $\gamma \in ]0;1[$. This expected result comes from partial internalization of cross profits. The more α increases, the more Firms 1 and 2 internalize profits of each other and cut their output. In turn, Firms 1-2 are incentivized to tacitly collude and this softens competition. But, in reaction to Firms 1-2 reduction in output, rival firms increase their own production and replace the lost quantities at the higher price. In the end, we obtain the traditional result of the "outsider effect" (see Salant et al., 1983): the one outside the participations benefit from the tacit collusion by capturing the additional revenue. Replacing equilibrium quantities found (1), (2) and (3) we thus obtain equilibrium profits. As the quantities from outsiders exceed insiders' ones, the same is true for profits[11]: $\pi_i^* > \pi_1^* = \pi_2^*$. In the following subsection, we study equilibrium profits of all firms in the industry after a takeover has happened.

## 3.2 Post-Takeover

In our study the raid is conducted by a firm outside[12] of the *defense in participations* in order to specifically test the solidity of this strategy of defense. We distinguish two cases for the buyout:
-Firstly, toward an unprotected (non-linked) firm
-Secondly, toward a protected firm (with participations).

### 3.2.1 Takeover of an Unprotected Firm

We then begin with Firm *i* taking over Firm *j*, both are unprotected. We note $\pi_M$ the expression

[11] Please refer to the Appendix for the expression of equilibrium profits relevant to incentives calculations in Section 4.

[12] As our research places in the context of a defensive economic policy, the consequences of a protected firm raiding a competitor are left for further research on the subject.

of the new merged entity's profits. It maximizes joint profits of firms *i* and *j* relative to $q_i$ and $q_j$:

$$\pi_M = (A - c - \gamma q_1 - \gamma q_2 - q_i - \gamma q_j - \gamma q_k - \gamma \sum_{l \in I \setminus \{1,2,i,j,k\}} q_l) q_i + (A - c - \gamma q_1 - \gamma q_2 - \gamma q_i - q_j - \gamma q_k - \gamma \sum_{l \in I \setminus \{1,2,i,j,k\}} q_l) q_j \quad (4)$$

Given the sum of these two concave[13] profit functions is a concave function, we are able to determine the equilibrium output of the merged firm. Moreover, a symmetrical equilibrium can exist because reaction functions $q_i(q_j,.)$ and $q_j(q_i,.)$ are symmetrical, and by equalizing $q_i$ and $q_j$ we obtain a unique solution of post-merger quantity marked with an $_M$: $q_M$. The profit expression of the other firms does not move, but now Firms *i* and *j* have to be separated from other unprotected firms. We then introduce the notation $q_l$ for quantities of unprotected outsiders. We first derive the profit expressions of the two protected firms:

$$\pi_1 = (1-\alpha)(A - c - q_1 - \gamma q_2 - \gamma q_i - \gamma q_j - \gamma q_k - \gamma \sum_{l \in I \setminus \{1,2,i,j,k\}} q_l) q_1 + \alpha(A - c - \gamma q_1 - q_2 - \gamma q_i - \gamma q_j - \gamma q_k - \gamma \sum_{l \in I \setminus \{1,2,i,j,k\}} q_l) q_2 \quad (5)$$

$$\pi_2 = (1-\alpha)(A - c - \gamma q_1 - q_2 - \gamma q_i - \gamma q_j - \gamma q_k - \gamma \sum_{l \in I \setminus \{1,2,i,j,k\}} q_l) q_2 + \alpha(A - c - q_1 - \gamma q_2 - \gamma q_i - \gamma q_j - \gamma q_k - \gamma \sum_{l \in I \setminus \{1,2,i,j,k\}} q_l) q_1 \quad (6)$$

These profit expressions being symmetrical ensures that equilibrium quantities will be symmetrical too. The profit expression for Firm *k*, unprotected and out of the merger, is derived as follows:

$$\pi_k = (A - c - \gamma q_1 - \gamma q_2 - \gamma q_i - \gamma q_j - q_k - \gamma \sum_{l \in I \setminus \{1,2,i,j,k\}} q_l) q_k \quad (7)$$

Solving simultaneously for quantities, we obtain the expression of equilibrium quantities noted with a $^{**}$. By ranking these quantities we find: $q_M^{**} < q_1^{**} = q_2^{**} < q_k^{**}$, $\forall \gamma > 0$. Here also we obtain that the more the profits are integrated (partially with participations or totally for the buyout), the more the reduction of joint output is important. In the case of the merged firms, the output's decision is commonly set but each firm produces individually[14]. We expect that the profits will follow the same ranking: bigger profits for the unprotected firms and out of the buyout, then the defended firms and then merged firms. By replacing equilibrium quantities found in (5), (6), and (7) we obtain equilibrium profits. The ranking[15] is expressed as follows: $\pi_k^{**} > \pi_1^{**} = \pi_2^{**} > \frac{\pi_M^{**}}{2}$ for any positive value of the parameters *n*, *c*, or $\gamma$. This comparison thus

[13] Please refer to the Appendix for the proof of concavity of the firms' individual profit functions.
[14] The two firms (having symmetrical profit functions) choose the same individual output.
[15] Please note that in this ranking we consider $\pi_M^{**}/2$ as the merged entity includes the sum of the two firms' profits with double $q_M$ quantities.

confirms the role of the "outsider effect" on profitability. This result appears as a preview for the study of buyout incentives in Section 4. In the following, we study the second case of a takeover equilibrium with one of the two protected firms being the target.

### 3.2.2 Takeover of a Protected Firm

We consider here that Firm *i* launches a raid on Firm 1, the following expression marked with a $'_M$ is a sum of: Firm 1's profit plus the portion $\alpha$ of profit held in Firm 2 plus the whole profit of the raider (Firm *i*):

$$\begin{aligned}\pi'_M = (1-\alpha)(A-c-q_1-\gamma q_2-\gamma q_i-\gamma q_j-\gamma \sum_{k\in I\setminus\{1,2,i,j\}} q_k)q_1 \\ +\alpha(A-c-\gamma q_1-q_2-\gamma q_i-\gamma q_j-\gamma \sum_{k\in I\setminus\{1,2,i,j\}} q_k)q_2 \\ +(A-c-\gamma q_1-\gamma q_2-q_i-\gamma q_j-\gamma \sum_{k\in I\setminus\{1,2,i,j\}} q_k)q_i\end{aligned} \quad (8)$$

$\pi_1$ and $\pi_i$ being concaves, then $\pi'_M$ is concave. Furthermore, the expression of $\pi'_M$ being asymmetrical, we obtain two non-symmetrical reaction functions as a result of maximization of a single profit. The profit expressions for the other firms (Firm 2 and Firm *j*) are as follows:

$$\begin{aligned}\pi_2 = (1-\alpha)(A-c-\gamma q_1-q_2-\gamma q_i-\gamma q_j-\gamma \sum_{k\in I\setminus\{1,2,i,j\}} q_k)q_2 \\ +\alpha(A-c-q_1-\gamma q_2-\gamma q_i-\gamma q_j-\gamma \sum_{k\in I\setminus\{1,2,i,j\}} q_k)q_1\end{aligned} \quad (9)$$

$$\pi_j = (A-c-\gamma q_1-\gamma q_2-\gamma q_i-q_j-\gamma \sum_{k\in I\setminus\{1,2,i,j\}} q_k)q_j \quad (10)$$

We derive reaction functions for Firms 2 and *j,* and then by solving simultaneously the four reactions functions we obtain equilibrium output quantities noted with a $^{***}$. We then derive a ranking: $q_1^{***} < q_i^{***} < q_2^{***} < q_j^{***}$ which is a consequence (once again) of the outsider's effect. More explicitly, profit internalizing firms tacitly collude and reduce their output relative to the magnitude of their holdings. Firm $j$ [16] which is not internalizing any rival's profit set the greater quantity of output at equilibrium for a uniform price and thus generates the greater individual profit. We also find a similar ranking for profits and quantities with $\pi_j^{***} > \pi_2^{***} > \frac{\pi_M'^{***}}{2}$. These differences arise from the magnitude of profit internalization and are a consequence of the "outsider effect". So far, we have computed equilibrium profits before the takeover, then in the case of raids on a protected and on an unprotected firm. In the following section we study firms' incentives for a takeover in a comparative static framework.

# 4 Incentives

[16] Firm *j* is representative of the *n*-3 firms outside of participation arrangements and of the takeover.

In this section we consider two cases:

1- When the raid is on an unprotected firm (Section 4.1).
2- When the raid is on a protected firm linked by participations (Section 4.2).

We first define and compute the insider's and outsider's "impact" of a takeover, and then we define and compute the takeover incentives in each case using the two impacts previously calculated.

## 4.1 Incentives to Raid an Unprotected Firm

We use here comparative static to obtain the impact on a raider of triggering a hostile takeover of an unprotected firm. Insider's impact is defined as the comparison between individual profits before the acquisition and joint profits[17] of the raider after acquisition. The impact of the merger on insider' profits is noted $I_M$ and is computed by subtracting from the new merged firm $(\pi_M^{**})$ the sum of the two unprotected individual firms $(\pi_i^*$ and $\pi_j^*)$ profits before the buyout. Thus,

$$I_M = (\pi_M^{**} - \pi_i^* - \pi_j^*) = (\pi_M^{**} - 2\pi_i^*) \quad (11)$$

The sign of equation (11) is ambiguous and depends on the value of parameters of the model. After a study of the difference in equilibrium profits (the impact $I_M$), the most crucial factor is the value[18] of the substitutability parameter $\gamma$. $I_M$ is positive for low values of $\gamma$. The profitability of the raid (on an unprotected firm) has to be positive to study the effects of the *defense in participations*, we thus pose it as a condition for the rest of the study. We then investigate merger profitability for low values of $\gamma$. Further, an increase in market power with higher values of PHO $\alpha$ and lower number $n$ of firms increases merger's profitability. Indeed, a buyout in a more concentrated industry[19] will always be more beneficial for the raider due to a greater increase in market power. Finally, it is straightforward to derive that the cost parameter $c$ decreases profitability of a merger for all positive values.

After the study of takeover impact on the insiders, we now study the outsider's impact on an unprotected outsider's firm in order to determine final incentives to merge (the comparison of the respective impacts). Outsider's impact $I_{out}$ represents the outsider's profitability of staying outside a raid on an unprotected firm within the industry. It is defined as the comparison between individual profits of a non-raider firm before the acquisition and its individual profits after acquisition. It is computed in a similar manner to equation (11), by subtracting the pre-takeover value of an unprotected outsider profits ($\pi_k^* = \pi_i^*$) from the value of an unprotected outsider post-takeover profit $(\pi_k^{**})$:

$$I_{out} = (\pi_k^{**} - \pi_i^*) \quad (12)$$

[17] The merged firm profit includes the sum of the two previous individual profits.
[18] All parameter solutions are graphically presented in the proofs in the Appendix.
[19] Reducing the number of firms from 4 to 3 leads to a bigger increase in concentration than a reduction from 100 to 99 (25% versus 1% respectively).

This expression has a positive sign for all (positive) values of the model parameters, meaning that outsider firms are always better off when there is a takeover in the industry. This phenomenon is due to the "outsider effect" which is reinforced when market power in the industry is stronger (i.e. for greater values of $\alpha$ and lower values of $n$).

Finally, we define incentives which trigger a takeover. These incentives are determined by subtracting the impact of staying out of a takeover from the impact of launching a raid: $I_M - I_{out}$. We obtain that $I_M - I_{out} < 0$ for all (positive) values of the model parameters. Further, this negative incentive is reinforced when market power in the industry is stronger (i.e. for greater values of $\alpha$ and lower values of $n$). We conclude that in an industry where cross participations are possible it is always more profitable for a company to stay outside of an acquisition on an unprotected firm rather than to trigger a takeover. This result is consistent with the results of the "outsider effect" of mergers.

## 4.2 Incentives to raid a Protected Firm

Using the same process as in Section 4.1, we note $I'_M$ the impact on insiders' profits of acquiring a firm protected by a *defense in participations*. In this case Firm *i* raids Firm 1 which is protected by a *defense in participations* with Firm 2. This insider's impact is derived by subtracting the sum of individual profits of the two insiders firms ($\pi_1^*$ and $\pi_i^*$) before the takeover from the profit expression of the new merged ($\pi_M^{'***}$) firm:

$$I'_M = (\pi_M^{'***} - \pi_1^* - \pi_i^*) \tag{13}$$

The sign of equation (13) is ambiguous, and as in the previous case it depends on the values of the parameter $\gamma$ in particular. For low values of $\gamma$ this expression is negative (whereas $I_M$ is positive). Further, this negative impact is reinforced when market power in the industry is stronger (i.e. for greater values of $\alpha$ and lower values of $n$). The cost parameter $c$ has a negative influence on profitability.

The impact on outsiders' profits in this case is noted $I'_{out}$. It is computed by subtracting pre-takeover profit of an unprotected firm ($\pi_j^* = \pi_i^*$) from the individual outsider profit after the buyout ($\pi_j^{***}$):

$$I'_{out} = (\pi_j^{***} - \pi_i^*) \tag{14}$$

In this case of a raid on a protected firm, outsiders' profit impact is negative for low values of $\gamma$, but greater than $I'_M$. Further, this negative impact is reinforced when market power in the industry is stronger (i.e. for greater values of $\alpha$ and lower values of $n$). The cost parameter $c$ has a negative influence on profitability.

In this case of a raid on a protected firm, we use the same method to obtain the choice's incentives to raid a rival firm or not. They are derived by subtracting outsider's impact from insider's impact: $I'_M - I'_{out}$. We find that $I'_M - I'_{out} < 0$ for low values of parameter $\gamma$. Further,

this negative incentive is reinforced when market power in the industry is stronger. The cost parameter *c* has a negative influence on profitability. Here also, the increase in profits for outsiders is more important. This leads us to conclude that in an industry where cross participations are possible it is always more profitable for a company to stay outside of an acquisition of a protected firm rather than to trigger it. This result is consistent with the "outsider effect" result of mergers.

In Section 4, we determined a firm's incentives to raid a protected or an unprotected rival in accordance with "the outsider effect" result of mergers. In Section 5.1, we test the efficacy of the defense in participations by comparing the values of the merger impacts $I_M$ and $I'_M$. Further, we expand the study area in Section 5.2 by comparing the impact of a takeover in a protected industry (with linked firms) with the impact of a takeover in an oligopoly industry where there are no PHO (a benchmark).

# 5 Results and Propositions

In this section, we demonstrate the efficiency of the *defense in participations* by comparing takeover incentives on a protected firm versus those on an unprotected firm in a protected industry (with firms acquiring participations). Further we expand the study tocompare takeovers in a protected versus an unprotected industry (the benchmark).

## 5.1 Within an Industry with Participations

We compare the insider's impact on an unprotected firm $I_M$ (positive for low values of $\gamma$) with the insider's impact on a protected firm $I'_M$. The whole expression $I_M - I'_M$ is positive, and these incentives (within the industry) are reinforced by market power. This leads to a simple conclusion: takeover incentives on an unprotected firm are higher than those on a protected firm in a protected industry. The following proposition states this result:

Proposition 1: *The holding of cross participations in the capital of a competitor is an efficient defense against a hostile takeover.*

This proposition is explained by the value of the takeover impact. Since it is lower on an protected firm due to an increased "outsider effect", a rational raider will prefer to raid an unprotected target.

## 5.2 Within an Industry without Participations

As a first step, we use an insider's impact in a common Cournot oligopoly benchmark to expand our study and result in a wider framework. The difference lies in the absence of participations in this case. This insider impact follows the same computation method used previously, i.e. comparing the sum of profits pre and post takeover. We note $I''_M$ the insider's impact in a common (no participations) industry competing in quantities: the benchmark. The sign of this expression is ambiguous, like in the participations' framework, and strongly depends on the value of the substitutability parameter $\gamma$. Here also, the takeover impact can still be positive for low

values of $\gamma$, and an increase in market power with a smaller number of firms (no participations $\alpha$ in this case) makes the takeover more profitable.

## 5.3 Comparison among Industries

As a second step, we now compare the insider's impact $I_M$ on an unprotected firm[20] (in the case with participations) to insider's impact $I_M^{"}$ in the benchmark. The sign of the difference $I_M - I_M^{"}$ is ambiguous, it is negative for low values of $\gamma$ when market power is strong enough, and especially when the number of firms is big enough. This comparison shows that takeover incentives (among industries) are greater when there is no *defense in participations*. We then can deduce that $I_M^{"} > I_M (> I_M^{'})$. This result highlights that a takeover is less profitable in an industry with participations as the incentives to merge are lower. We state this result in the following proposition:

Proposition 2: *A takeover is less profitable in an industry where two of the firms are linked with a defense in participations than in one where no firms have a participations arrangement.*

This proposition is explained by the value of the (unprotected) takeover impact in an industry where two of the firms are defended with participations. Since it is lower due to an increased "outsider effect", a rational raider will prefer to raid a target in an industry without a *defense in participations*.

## 5.4 Regulation

In contrast to literature results on the anticompetitive role of horizontal participations (Reitman, 1994; Gilo et al., 2006) alone or as a toehold before a full takeover (Jovanovic & Wey, 2014), our analysis exposes the social benefits of PHO in our model. Indeed, the fact that participations constitute hurdles to hostile takeovers leads in the end to a less concentrated industry, even if in the beginning participations have lessened competition. These results have an implication in terms of regulation as they highlight the competitive role of cross horizontal participations.

The *defense in participations* in Europe with the "golden shares", "Deutschland AG" or "noyaux-durs" defers to the regulation of the European Commission and to the ruling the European Court of Justice (ECJ) in the case of a dispute. Special rights of the Union's members on private undertakings are discussed and examined to determine whether or not this falls within the ambit of the free movement of capital and payments. Lustig & Weil (2002) relate three ECJ rulings on participations and their link with corporate governance. In the case of Belgium, the ECJ granted the decision of giving notice to the responsible ministry of any changes in participations for the "Société Nationale de Transport par Canalisation" as well as the "Société de Distribution du Gaz SA" relating to a change in network facilities. In the case of France, the ECJ rejected the use of "golden shares" to secure approval of the Ministry of Economic Affairs when ceilings[21] in participations were crossed for the "Société Nationale Elf-Aquitaine". Finally in the case of Portugal, the ECJ denied the justification of Portugal to use its participations to block

[20] Because we already shown that takeover incentives are greater on an unprotected firm than on a protected one.
[21] 10%, 20%, or 30%.

foreign share acquisitions in privatised companies. In these three cases the European Commission attacked the countries' decision to protect privatised companies using a *defense in participations* on the basis of an infringement of the "laisser-faire" of the market (free movement of capital and payments).

Our paper explores mathematically the competition approach on this topic, and our theoretical results on the potential competitive role of PHO send a contrarian signal to the regulation agencies and the courts. We argue that the regulators and governments could take into account the findings introduced by this theoretical research to expand their comprehension of the *defense in participations*. Though the *defense in participations* could be counter to the free movement of capital on markets, it should be allowed under specific countries' strategic circumstances (e.g. BAE-EADS merger) and also to counter the increase of concentration and market power in a particular industry.

# 6 Conclusion

In this article, we study takeover incentives in a Cournot oligopoly model with two firms linked by cross participations following an anti-takeover defense strategy. We show that within an industry, PHO reduce incentives of competing firms to raid a protected firm by decreasing takeover profitability. We thus demonstrate that the *defense in participations* is meaningful and efficient to block hostile takeovers, and also has a competitive aspect. This competitive aspect is proven by the comparison of takeover incentives between two industries, one with the *defense in participations* and a benchmark without participations. As the full integration of a rival's profits (buyout) is more harmful in terms of competition than partial ownerships, we suppose that authorizing PHO could thus have social benefits.

Theoretical literature (see e.g. Malueg, 1992; O'brien & Salop, 2000) and applied work (see e.g. Perotti, 1992; Reiffen, 1998) investigate participations but do not link them with takeover incentives. Further, numerous articles highlight the role and functioning of different forms of golden shares across several countries: (Flath, 1990; Brown & Fung, 2009) on Keiretsu, Franks & Mayer (1998) and Lantenois (2011) on Deutschland AG, Yergin & Stanislaw (1998) on UK golden shares, and Goldstein (1996) for French "noyaux-durs". In addition, Foros et al. (2011) derive the profitability of a partial (but controlling) ownership. The role of our article is to expose a theoretical study of the efficacy of the golden shares as a defense in participations in the context of mergers.

To complement this article, a reverse study of the consequences of cross participations on protected firms' incentives to raid competitors could be addressed in further research; this protection could be used in this case to "attack" competitors. This should prove decisive in the analysis of the influence of PHO on market concentration and on economic welfare. We believe that this paper sheds new light on the current analysis of competition in the case of a defense in participations. It also raises questions in the case of an "attack" and thus gives room for additional investigations. Therefore this study of equity strategies, against or supporting a buyout, could make policy makers change the current regulatory monitoring process and could intensify applied research on the subject.

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# Appendix

## Concavity of profits relative to quantities

To prove the concavity of profit functions we examine the second order condition and derive the sign of this expression.
We begin by the second order derivative of Firm *i*'s profit:

$$\frac{\partial^2 \pi_i}{\partial {q_i}^2} = -2 < 0$$

The second order derivative being negative, the profit function $\pi_i$ is strictly concave relative to quantities.

We now study profit functions of defended firms *1* and *2* linked by cross participations $\alpha$, their profit expressions are symmetrical:

$$\frac{\partial^2 \pi_1}{\partial {q_1}^2} = \frac{\partial^2 \pi_2}{\partial {q_2}^2} = -2 + 2\alpha < 0$$

The second order derivative is positive for partial ownership value of $\alpha < 1$.

## Expression of equilibrium profits

Pre-takeover profits:

$$\pi_1^* = \pi_2^* = -\frac{(\gamma-2)^2(\alpha\gamma+1-\alpha)(A-c)^2(-1+\alpha)}{\left(-4\alpha\gamma^2-4\alpha+\gamma^2+4-4\gamma+6\alpha\gamma+2\gamma m-\gamma^2 n+2\alpha\gamma^2 n-2\alpha\gamma m\right)^2}$$

$$\pi_i^* = \frac{(-2\alpha+2+2\alpha\gamma-\gamma)^2(A-c)^2}{\left(-4\alpha\gamma^2-4\alpha+\gamma^2+4-4\gamma+6\alpha\gamma+2\gamma m-\gamma^2 n+2\alpha\gamma^2 n-2\alpha\gamma m\right)^2}$$

Profits after a takeover of an unprotected firm:

$$\pi_M^{**} = \frac{(1+\gamma)(\gamma-2)^2(-\gamma+2+2\alpha\gamma-2\alpha)^2(A-c)^2}{2\left(-2\alpha\gamma^2+6\alpha\gamma+\gamma^3-\gamma^2-4\alpha-2\alpha\gamma^3-4\gamma+4+2\alpha\gamma^2 n-\gamma^2 n-2\alpha\gamma m+2\gamma m\right)^2}$$

$$\pi_k^{**} = \frac{(-\gamma+2+2\alpha\gamma-2\alpha)^2(A-c)^2}{\left(-2\alpha\gamma^2+6\alpha\gamma+\gamma^3-\gamma^2-4\alpha-2\alpha\gamma^3-4\gamma+4+2\alpha\gamma^2 n-\gamma^2 n-2\alpha\gamma m+2\gamma m\right)^2}$$

Profits after a takeover of a protected firm:

$$\pi_M^{'***} = \frac{9(\alpha-2)(193\alpha^3-475\alpha^2+392\alpha-108)(-c+A)^2}{2(-24\alpha n+39\alpha^2+11\alpha^2 n+30-69\alpha+12n)^2}$$

$$\pi_j^{***} = \frac{4(-24\alpha+11\alpha^2+12)^2(-c+A)^2}{(-24\alpha n+39\alpha^2+11\alpha^2 n+30-69\alpha+12n)^2}$$

## Sign study of impacts

In the following, we represent graphically the value of $I_M$ as a function of $\gamma$, $n$, and $\alpha$.

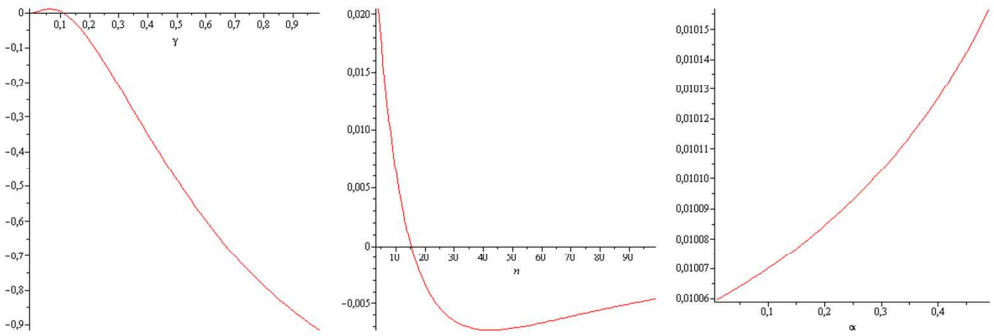


Fig 2. $I_M$ as a function of model parameters.

We highlight here the positive value of $I_M$ for low values of $\gamma$. Further, we expose the positive relationship between the unprotected merger's impact $I_M$ and the market power.

In the following, we represent graphically the value of $I_M^{'}$ as a function of $\gamma$, $n$, and $\alpha$.

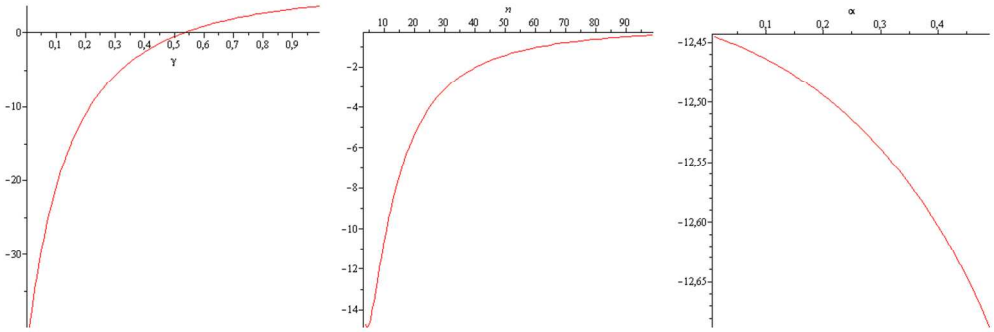


Fig 3. $I_M^{'}$ as a function of model parameters.

We highlight here the negative value of $I_M^{'}$ for low values of $\gamma$. Further, we expose the negative relationship between the protected merger's impact $I_M^{'}$ and the market power.

In the following, we represent graphically the value of $I_M^{''}$ as a function of $\gamma$, and $n$.

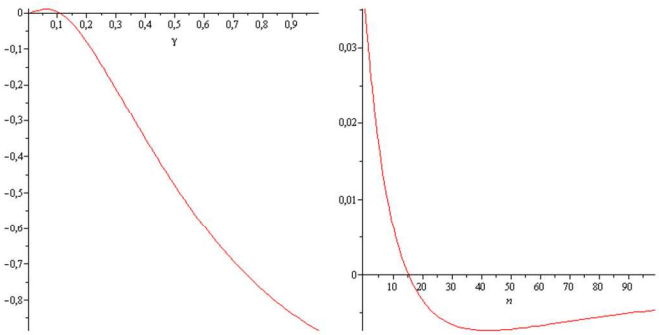

Fig 4. $I_M^{''}$ as a function of model parameters.

We highlight here the positive value of $I_M^{''}$ for low values of $\gamma$. Further, we expose the positive relationship between the benchmark merger's impact $I_M^{''}$ and the market power (a small number of firms, no participations in the benchmark).

The study of these takeover impacts describes the links between the profitability of a merger and the market power, depending on the type of takeover. In addition, we expose positive values of $I_M$ and $I_M^{''}$ for low values of $\gamma$, and this thus justifies the proposed condition.

## Sign study of incentives

In the following, we represent graphically the value of the incentives to raid a protected firm: $I_M - I_{out}$ as a function of $\gamma$, $n$, and $\alpha$.

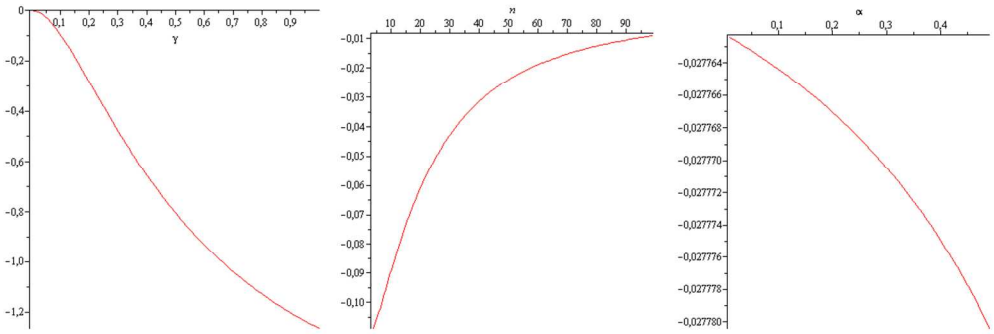

Fig 5. $I_M - I_{out}$ as a function of model parameters.

We highlight here the negative value of the incentives to raid an unprotected firm: $I_M - I_{out} < 0$ for all values of $\gamma$. Further, this negative incentive is reinforced when market power in the industry is stronger.

In the following, we represent graphically the value of the incentives to raid a protected firm: $I'_M - I'_{out}$ as a function of $\gamma$, $n$, and $\alpha$.

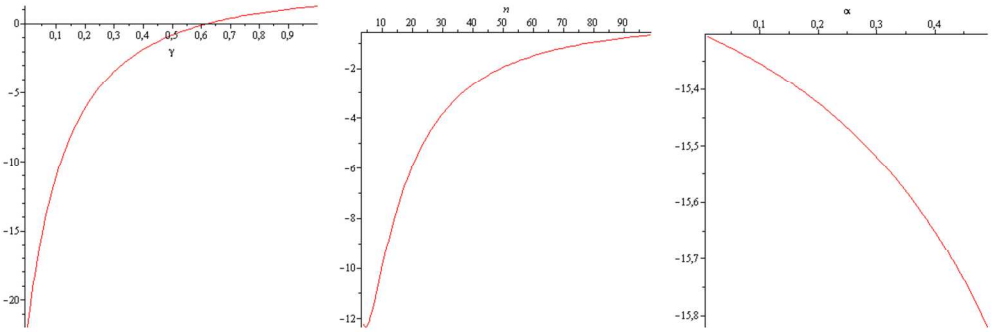


Fig 6. $I'_M - I'_{out}$ as a function of model parameters.

We highlight here the negative value of the incentives to raid a protected firm: $I'_M - I'_{out} < 0$ for low to average values of $\gamma$. Further, this negative incentive is reinforced when market power in the industry is stronger.

The study of these two differences allows us to expose that in an industry where cross participations are possible it is always more profitable for a company to stay outside of an acquisition rather than to trigger it. This result is consistent with the "outsider effect".

In the following, we represent graphically the value of the incentives within the same industry: $I_M - I'_M$, as a function of $\gamma$, $n$, and $\alpha$.

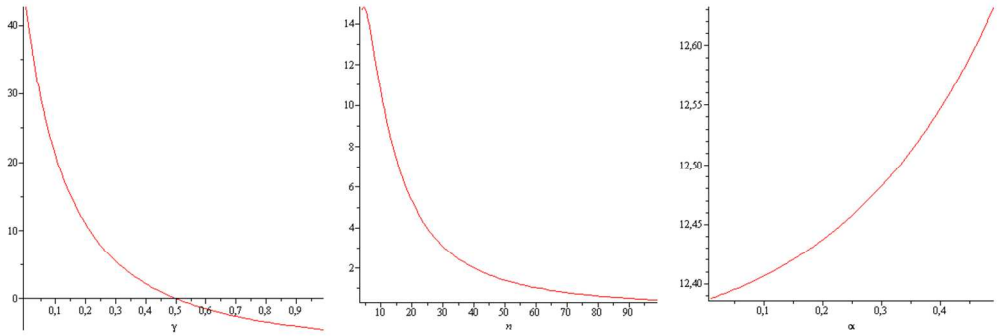


Fig 7. $I_M - I'_M$ as a function of model parameters.

We highlight here the positive value of the incentives to raid an unprotected firm versus a protected one in a protected industry. $I_M - I'_M > 0$ for low to average values of $\gamma$. Further, this positive incentive is reinforced when market power in the industry is stronger.

In the following, we represent graphically the value of the incentives among different industries: $I_M - I''_M$ as a function of $\gamma$, $n$, and $\alpha$.

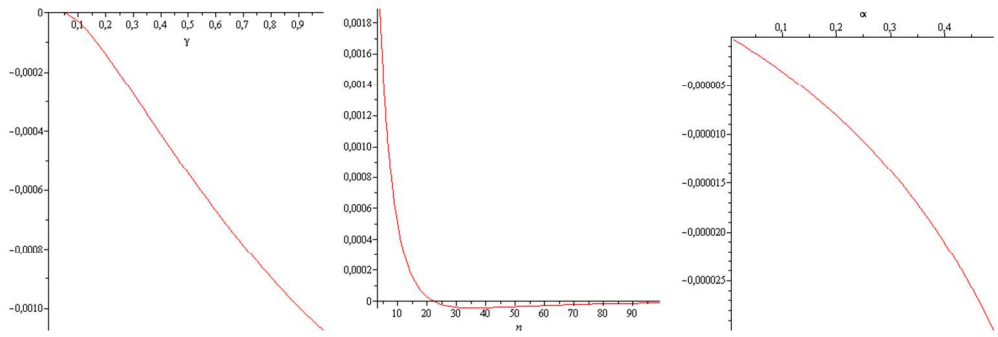


Fig 8. $I_M - I^{"}_M$ as a function of model parameters.

We highlight here the negative value of incentives to raid an unprotected firm versus the benchmark across different industries. $I_M - I^{"}_M < 0$ for low to high values of $\gamma$, and a sufficiently high value of $n$. Adding precisions for low values of $\gamma$ (but not extremely close[22] to 0) this result holds with the condition that $I_M$ and $I^{"}_M$ are positive. Further, the amount $\alpha$ of the participations decreases the profitability of a takeover in a protected industry in comparison to an unprotected one.

The study of these two differences yields $I^{"}_M > I_M (> I^{'}_M)$ which allows us to compare the incentives across the different industries in subsection 5.3 and to derive Proposition 2.

# References

Betton, S., Eckbo, B. E. & Thorburn, K. S. (2009). Merger negotiations and the toehold puzzle. *Journal of Financial Economics* 91 (2): 158-178.

Bradley, M., Desai, H., & Kim, E.H. (1988). Synergistic gains from corporate acquisitions and their division between the stockholders of target and acquiring firms. *Journal of Financial Economics* 21: 3-40.

Brander, J.A., & Lewis, T.R. (1986). Oligopoly and financial structure: the limited liability effect. *The American Economic Review* 76: 956-970.

Bresnahan, T., & Salop, S.C. (1986). Quantifying the competitive effects of production joint ventures *International Journal of Industrial Organization* 4: 155-175.

Brioschi, F.,Buzzacchi, L., & Colombo,M.G. (1989). Risk capital financing and the separation of ownership and control in business groups. *Journal of Banking and Finance* 13: 747-772.

Brown, C., & Fung, C. (2009). Keiretsu affiliation and stock-market-driven acquisitions. *Journal of Financial Research* 32 (4): 479-503.

Bulow, J., Huang, M., & Klemperer, P. (1999). Toeholds and takeovers. *Journal of Political Economy* 107: 427-454.

Chapelle, A. (2004). Separation between ownership and control: Where do we stand? *Corporate Ownership and Control* 2: 91-103.

Choi, D. (1991). Toehold acquisitions, shareholder wealth, and the market for corporate control. *Journal of Financial and Quantitative Analysis* 26 (3): 391-407.

[22] Please note that for values of $\gamma$ extremely close to 0, the difference can be positive if the amount of firms $n$ is tends to 4.

Cournot, A. (1838). *Recherches sur les principes mathématiques de la theorie de la richesse*. Paris: Hachette.
Charlety, P. Fagart, M.C., & Souam, S. (2009). Incentives for partial acquisitions and real market concentration *Journal of Institutional and Theoretical Economics* 165: 508-534.
Dasgupta, S., & Tao, Z. (2000). Bargaining, bonding and partial ownership. *International Economic Review* 41: pp. 609-635.
DeAngelo, H., & Rice, E. M. (1983). Antitakeover charter amendments and stockholder wealth. *Journal of Financial Economics* 11 (1): 329-359.
Deman, S. (1994). The theory of corporate takeover bids: A subgame perfect approach. *Managerial and Decision Economics*, 15: 383–397.
Easterbrook, F. H. (1984). Two agency-cost explanations of dividends. *The American Economic Review*: 650-659.
Farrell, J., & Shapiro, C. (1990). Asset ownership and market structure in oligopoly. *RAND Journal of Economics* 21: 275-292.
Flath, D. (1990). Shareholding Interlocks in the Keiretsu, Japan's Financial Groups. Working Paper 43, Division of Economics and Business, North Carolina State University.
Foros, O., Kind H.J., & Shaffer G. (2011). Mergers and partial ownership. *European Economic Review* 55: 916-926.
Franks, J., Mayer, C, (1998): "Bank Control, Takeovers and Corporate Governance in Germany", *Journal of Banking & Finance* 22: 1385-1403.
Gilo, D. Moshe, Y. & Spiegel, Y. (2006). Partial cross ownership and tacit collusion. *RAND Journal of Economics* 37: 81-99.
Grossman, S. & Hart, O.D. (1980). Takeover Bids, the Free-Rider Problem, and the Theory of the Corporation. *The Bell Journal of Economics* 11 (1): 42-64.
Goldstein A. (1996). Privatisations et contrôle des entreprises en France. *Revue Économique* 47 (6): pp. 1309-1332.
Grossman, S.J., & Hart, O.D. (1986). The costs and benefits of ownership: a theory of vertical and lateral integration. *The Journal of Political Economy* 94: 691-719.
Inderst, R. and Wey, C. (2004). The incentives for takeover in oligopoly. *International Journal of Industrial Organization* 22: 1067-1089.
Jarrell, G. A., & Poulsen, A. B. (1987). Shark repellents and stock prices: The effects of antitakeover amendments since 1980. *Journal of Financial Economics* 19(1): 127-168.
Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American economic review*: 323-329.
Jovanovic, D., & Wey, C. (2014). Passive partial ownership, sneaky takeovers, and merger control. *Economics Letters* 125 (1): 32-35.
Kremp, E. (1998). Structure du capital des entreprises françaises en 1996. *Bulletin mensuel de la banque de France*; 55.
Kwoka, J E. (1998). The output and profit effects of horizontal joint ventures. *The Journal of Industrial Economics* 40: 325-338.
Lantenois, C. (2011). La dissolution du cœur de la Deutschland AG, *Revue d'Économie Financière*. 104: 91-106.
Lindqvist, T. (2004). Mergers by partial acquisition. Working Paper Series, Research Institute of Industrial Economics 630.
Lustig, E., & Weil, K. (2002). Case law of the European Court of Justice on "golden shares" of Member States in privatised companies: Comment on the ECJ decisions of 4 June 2002. *The European Legal Forum* 5: 278-281.

Malueg, D.A. (1992). Collusive behavior and partial ownership of rivals. *International Journal of Industrial Organization* 10: 27-34.
Manne, H.G. (1965). Mergers and the market for corporate control. *Journal of Political Economy* 73: 110-120.
O'Brien, D.P., & Salop, S.C. (2000). Competitive effects of partial ownership: financial interest and corporate control. *Antitrust Law Journal* 67: 559-614.
Perotti, E. (1992). Cross-ownership as a Hostage Exchange to Support Collaboration. *Managerial & Decision Economics* 13 (1): 45-54.
Reiffen, D. (1998). Partial ownership and foreclosure: an empirical analysis. Journal of Regulatory Economics 13 (3): 227-244.
Reitman, D. (1994). Partial ownership arrangements and the potential for collusion. *Journal of Industrial Economics* 42: 313-322.
Reynolds, R.J., & Snapp, B.R. (1986). The competitive effects of partial equity interests and joint ventures. *International Journal of Industrial Organization* 4: 141-153.
Riordan, M.H. (1991). Ownership without control: Toward a theory of backward integration. *Journal of the Japanese and International Economies* 5: 101-119.
Ritzberger, K., & Shorish, J. (2002). The building of empires: Measuring the separation of dividend and control rights under cross-ownership among firms. Mimeo; Institute for Advanced Studies; Vienna.
Salant, S.W. Switzer, S., & Reynolds, R. (1983). Losses due to merger: the effect of an exogenous change in industry structure on Cournot-Nash equilibrium. *Quarterly Journal of Economics* 98: 185-199.
Serbera, J.-P. (2010). Partial horizontal and vertical ownership. *Applied Economics Letters* 18: 531-537.
Tirole, J. (1995). *The theory of industrial organization*, Cambridge and London: MIT Press.
Yergin, D., Stanislaw, J. (1998). The Commanding Heights. Simon and Schuster, New York.

## Websites References

http://www.worldfinance.com/strategy/corporate-governance-strategy/the-end-of-golden-shares.
http://www.bnpparibas.com/actualites/axa-bnp-paribas-mettent-fin-dun-commun-accord-leur-protocole-dactionnaires.
https://www.db.com/ir/en/content/ir_releases_2000_3464.htm.
http://www.worldfinance.com/strategy/corporate-governance-strategy/the-end-of-golden-shares.