International mergers and increases in retaliatory power

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Abstract

In two recent cases, the European Commission raised objections to proposed international mergers on the ground that they would increase the retaliatory power of the acquiring firm if another firm tried to enter its market. This paper builds a model of collusion designed to test formally the theory used by the European Commission in one of these cases, the Südzucker - Saint Louis Sucre merger. It shows that, contrary to the assertions by the Commission, the merger does not make collusion easier.

An executive summary can be found on the following pages.

Executive Summary

In two recent cases, the European Commission has expressed fears that international mergers could be used in order to increase the retaliatory power of a company which tries to keep control over its home market. In this paper, I examine this theory in the context of the Südzucker / Saint Louis Sucre merger, which the Commission authorized in 2001, subject to undertakings.

Südzucker, a German sugar producer, had notified the Commission of its proposed acquisition of Saint Louis Sucre (SLS), one of the four main French producers. Despite the fact that there is very little trade across national boundaries, the Commission feared that the merger would favor a form of collusion. It argued that the French firms provided potential competition on the South German market, and therefore prevented Südzucker to exploit its market power. The acquisition of SLS would enable Südzucker to threaten French firms who entered the South German market with retaliation on their home market.

The decision does not provide a careful analysis of the way in which this retaliatory power would be used, and no systematic comparison of the retaliatory power before and after the merger. In this paper, I propose such an analysis, and show that the conclusions of the Commission are not supported by standard economic models of collusion.

These economic models function as follows. The analyst first computes the outcome of competition between the firms, assuming that each one of them maximizes its own profits and takes the actions of the other firms as given. Then, she assumes that the firms agree on some collusive outcome, where they jointly choose to reduce their production in order to increase the price of the product (the theory is agnostic on whether this agreement is explicit or implicit). She analyzes the conditions under which the firms will abide by this agreement. In order to do so, she embeds her basic model in a dynamic framework, and assumes that period after period the firms choose the collusive strategy. Typically, this will imply that each firm will have a short run incentive to increase its production, taking advantage of the fact that its competitors have reduced their own. However, such an increase has a long run cost: the "collusive agreement" will collapse and the firms will return to the competitive outcome in which they all (including the "deviating" firm) have lower profits. The agreement is stable if the short run benefit of this deviation is smaller than the long run cost.

Therefore, whether or not the firms find it profitable to deviate from the collusive agreement depends crucially on the relative weight that they

assign to future costs compared to current benefits. When this weight, the discount factor, is large the firms will not deviate: they value highly the future costs of the collapse of collusion. On the other hand, when the discount factor is small, firms weigh current profits more, and the collapse of collusive agreement will be less of a deterrent to deviation. Economists often use the critical discount factor at which firms are just indifferent between respecting and not respecting the collusive agreement as a measure of the vulnerability of a market structure to collusion. The higher this discount factor, the less vulnerable it is.

In order to test the analysis of the Commission, I build a model along these lines, which attempts to represent some of the most basic element of the French and South German sugar markets. In this model, there are one firm in the South German market and four firms in the French market. It is more expensive for a firm to sell outside of its home market, so that a French firm finds it more costly to sell sugar on the German market than on the French market, and the South German firm finds it more costly to sell on the French market than on its home market. I then compute the way in which a merger between the South German firm and the French firm affects the critical discount factor. In all cases, the merger *increases* this critical discount factor, and therefore *reduces* the likelihood of collusion.

In the first part of the paper, I analyze the case which is the most favorable to the Commission's thesis. I assume that collusion raises prices, to the monopoly level, both in the French and the South German market. With or without the merger the collusive outcome is the same — the South German firm enjoys monopoly profits and the French firms share the market equally. The analysis show that the French firms have greater incentives to deviate, both with or without the merger. On the other hand, the cost of deviation is higher without the merger, and hence the merger increases the critical discount factor: it makes collusion less likely.

The subsequent sections test the robustness of the conclusions to various modifications of the model, and show that they continue to hold. First, I show that if the collusive agreement is simply that French firms are not to enter the South German market, without any collusion on the French market, the same general logic holds. Second, I modify the type of competition in the absence of collusion. Whereas the first part of the paper assumes that there is "Cournot competition", a rather weak form of competition, in the second part, there is "Bertrand" competition, where profits are competed away more aggressively. Here again, we find the same conclusion: the merger does not favor collusion.

In the decision, the Commission, answering statements by the parties, states that it did not believe that the enforcement of collusion would be

conducted through a general price war, but rather through the targeting of “strategic clients”. The conclusion discusses briefly this answer, stressing that the theory is ill-formed as the concept of strategic client is not a standard concept in economics, and that the Commission does not provide details on the identity of these clients, or the special role that they play.

Finally, it should be stressed that this paper is focussed on a discussion of the consequences of international mergers for collusion. It does not attempt to provide a realistic description of competition in the sugar industry, or of the role of antitrust enforcement in industries with heavy government involvement. My own understanding of these issues is very different from that of the Commission in a number of important dimensions that are not discussed here.

In two recent cases, the European Commission has argued that an international merger would allow the purchasing firm to retaliate against foreign firms that would enter its home market. First, in 2000, the Commission received a notification that Électricité de France wanted to acquire[1] a German electricity producer, EnBW. In its decision[2], the Commission expressed the fear that this acquisition would enable EDF to retaliate more easily against any German firm that would enter the French electricity market.

Similarly, in 2001, Südzucker, a German sugar producer, purchased a French sugar producer Saint-Louis Sucre (SLS). In its decision[3], the Commission expressed the fear that the merger would increase the "retaliatory power" of Südzucker with respect to French firms that would threaten to enter the South German market.

Neither of these two decisions contain a systematic analysis of the way in which this retaliatory power would be exercised. In particular, they do not explain how this power would be used, whether the threats made by the parties would be credible, or whether this power existed before the merger. Because this theory of "creation of retaliatory power" is new in the jurisprudence of the Commission, it would have deserved a thorough treatment before being used in decisions. The aim of this paper is to show that it may not be correct.

I will use a model that tries to represent some of the main features of the Südzucker-SLS case. It provides a better benchmark for discussing this theory since the creation of retaliatory power played a more important role in this decision that in the EDF-EnBW case. Also, the type of government intervention in the sugar market is more stabilized than in the electricity market, and it is easier to isolate competitive from regulatory concerns.

I find that in my model, the merger does not increase the retaliatory power of Südzucker. Two forces are at play. Favoring collusion is the fact that Südzucker is, after the merger, more present on the French market and hence can impose greater punishment. On the other hand, the merger increases the profits of the firms at the static equilibrium, and hence de-

[1]To be more precise, this was an operation in which EDF and OEW, another German electricity producer, jointly acquired EnBW.

[2]Case No Comp/M.1853 - EDF/EnBW, Regulation (EEC) No 4064/89 Merger Procedure, 07/02/2001; see §§71-72. There were other objections raised to the merger, which was eventually allowed, on the basis of the remedies offered by the parties.

[3]Decision by the Commissionof December 2001 on the Declaration of Compatibility of a Meerger with the Common Market and the EEA Treaties (Matter No. COMP/M.2530 - Südzucker/Saint Luis Sucre). This merger was also allowed on the basis of undertakings proposed by the parties.

creases the threat of punishment. (It should be stressed that in my model the merger is not profitable, for the same classical reasons first explained by Salant, Schwitzer and Reynolds (1983): the newly merger firm bears the brunt of output restrictions). This second effect dominates the first.

More precisely the model assumes that, before the merger, there are four firms in the French market and one firm on the South German market. There is a linear demand in both markets, and the size of the South German market is 40% of the French market. These figures represent a rough approximation of the data used by the Commission in its decision. It argued that the German sugar producers had allocated the market between themselves so as to have regional near-monopolies, Südzucker controlling the South German market. There were four firms in the French market: SLS, Béghin-Say, Sucre Union, Union SDA. From §58 of the decision, in 1999-2000, total French consumption (industrial and household sugar) was 2,170,000 tons and South German consumption 1,058,000 tons, 48% of French consumption.[4]

A firm can produce one unit of sugar for its home market at a cost normalized to 0, and one unit of sugar for the other market at a cost of t. It is straightforward to compute the Cournot-Nash equilibrium of this game — the example has been chosen so that at this equilibrium there are exports both from the French firms to the South German market and from the South German firm to the French market. To study the ease of collusion in that market, I assume that the firms play a repeated game, and I study the following equilibrium: the South German firm does not sell on the French market and the French firms do not sell on the South German market; in both markets, the price is the monopoly price (and the French market is shared equally between the French firms). The robustness of the equilibrium is measured by the lowest possible discount factor at which this outcome can be sustained by a fear of reversal to the static equilibrium. I then assume that the South German firm and one of the French firms merge, and conduct the same exercise (there are now left three French firms and one Franco-South German firm). I show that the minimum discount factor that supports collusion is greater after the merger: the merger makes collusion more difficult.

This main part of the analysis, presented in sections 1 and 2 is based on a model of Cournot competition between the firms. This modelling strategy was chosen in order to make the model as close as possible to what

[4]I disagree with a substantial portion of the analysis of market made by the Commission. However, the aim of this paper is to discuss the collusion theory and I therefore start from its characterization of the market to show that the collusion theory does not follow from the premises.

seems to be the implicit model of the sugar market of the Commission, who believes that there are monopolistic rents in the sugar market. I show that after the merger the maximum discount factor which can support collusion is *greater* than before the merger, as stated in proposition 1. Collusion is possible in a greater range of circumstances, which proves that the Commission's theory is misguided, at least in the case of the sugar market.

The collusive behavior modelled in sections 1 and 2 was chosen to give the best possible chance to the theory of the Commission, as it assumed that collusion increased the profits of the French firms to a quarter of the monopoly profits on the French market. This makes the threat of reversal to the non collusive outcome specially powerful. However, I have not found evidence of collusive behavior in the French sugar market. Therefore, in section 3, I examine the stability of a collusive outcome where the only agreement is that each firm keeps to its national market. Then, the French firms play a Cournot game. I prove that the merger does not change the incentives to collude.

In section 4, I revisit the same issues assuming that there is Bertrand competition, in order to test the robustness of the conclusions to the modelling strategy. Here again, I find that the merger does not facilitate collusion, although the results are slightly weaker than in the case of Cournot equilibrium: for most values of t the merger has no influence, either positive or negative, on the possibility of collusion.

In response to the parties, the Commission was a bit more expansive on its theory in the final decision: in particular it argued that it expected the punishment by Südzucker would be carried selectively, and focussed on "strategic customers". The discussion still falls short of a well formed theory, and I discuss it in the conclusion.

Collusion is not very well understood by economists, and full models of optimal collusion are extremely difficult to study. For instance, in their study of collusion under capacity constraints, Compte, Jenny and Rey (2001) must make restrictive assumptions on the punishment paths — *i.e.*, that the market shares along these paths are the same than when collusion is effective — in order to solve the model. In this paper, I use a simpler strategy and concentrate on trigger price strtegies, where collusion sustains monopoly pricing and is maintained by the threat of reversal to the static outcome. A full treatment would be of great interest, but quite difficult.

1 No collusion outcomes

1.1 No collusion outcomes without merger

There are two markets, the French market and the South German market. There are four French firms, firms 1, 2, 3 and 4 and one South German firm, firm g. The cost of production of each of these firms is normalized to 0. On the other hand, they incur a cost[5] of t per unit when they transport sugar to the foreign market. We assume $t \leq 1/5$, so that all the equilibrium quantities are strictly positive.

If the quantities sold on the French market are q_1, q_2, q_3, q_4 and q_g (I will not distinguish notationally between quantities sold on the French market and quantities sold on the South German market — the market will be clear from the context), the price at which firm 1 sells its sugar on that market is

$$p_1 = 1 - q_1 - q_2 - q_3 - q_4 - q_g.$$

Its profit on that market is

$$q_1(1 - q_1 - (q_2 + q_3 + q_4 + q_g)).$$

The profits of firms 2, 3 and 4 are obtained by easy substitution; on the other hand the profit of firm g reflects the fact that it faces a transportation cost t, and is equal to

$$q_g(1 - t - q_g - (q_1 + q_2 + q_3 + q_4)).$$

(Notice that the prices are gross of transportation costs; so that the French firms and the South German firm charge the same amount on the French market.)

The South German market is 40% of the French market. Therefore, the South German firm sells quantity q_g at a price

$$p_g = 1 - \frac{5}{2}(q_g + q_1 + q_2 + q_3 + q_4),$$

where q_1, q_2, q_3 and q_4 are the quantities sold by the French firms on the South German market. Its profits on the South German markets are therefore

$$q_g \left(1 - \frac{5}{2}(q_g + q_1 + q_2 + q_3 + q_4)\right). \tag{1}$$

[5] In its decision, the Commission insists on the fact that the transportation costs of sugar are very high, but provides no estimate of these costs. The fact that there is very little inter country trade is not a proof of high transportation cost, as production quotas are allocated (by the EU) so as to ensure that production is at least equal to consumption in nearly all member states.

Because the French firms face transportation costs when selling in the South German markets, the profits of firm 1 are equal to

$$q_1(1 - t - \frac{5}{2}(q_1 + q_2 + q_3 + q_4 + q_g)),$$

and the profits of firms 2, 3 and 4 are obtained similarly.

Without collusion and merger the equilibrium of the game between the four firms is easily computed. Because of returns to scale are constant, the games played in the two markets are independent of each other. Standard computations show that the equilibrium quantities in the French market are

$$q_1 = q_2 = q_3 = q_4 = \frac{1}{6} + \frac{1}{6}t$$

and[6]

$$q_g = \frac{1}{6} - \frac{5}{6}t.$$

On the South German markets outputs are

$$q_1 = q_2 = q_3 = q_4 = \frac{2}{5}\left(\frac{1}{6} - \frac{1}{3}t\right),$$
$$q_g = \frac{2}{5}\left(\frac{1}{6} + \frac{2}{3}t\right).$$

The comparative statics are interesting. A small increase in t from $t = 0$ leads to a decrease in the total quantity sold on each of the markets and in the aggregate production of the South German firm, but to an *increase* in the aggregate quantity produced by the French firms. As a consequence, the profits of each of the French firms (summed over the two markets),

$$\frac{7}{180} + \frac{1}{90}t + \frac{13}{180}t^2,$$

are increasing in t, whereas the profits of the South German firm,

$$\frac{7}{180} - \frac{17}{90}t + \frac{157}{180}t^2,$$

are decreasing in t, for $t < 17/157 \simeq 0.11$.

Note that when $t = 0$, the profits of the South German firm and of the French firms are the same, because in this case there is fundamentally only one big integrated market, but for $0 < t \leq 1/5$, the French firms have larger profits.

[6]It is in order to ensure that this q_g is indeed positive, that we have assumed $t \leq 1/5$.

1.2 No collusion outcomes with merger

We will represent the merger by assuming that the South German firm buys French firm 4. Because the new firm has two sources of supply, it will clearly choose to deliver all the quantity that it delivers in France from firm 4 and all the quantity that it wants to deliver in the South German market from the South German firm. Apart from this, the markets will still be independent.

Therefore, in the French markets, we will find ourselves with a classic Cournot type equilibrium. Firm 1 maximizes

$$q_1(1 - q_1 - (q_2 + q_3 + q_4))$$

(I am keeping the notation q_4 for the output of the merged firm in the French market), and the profit of the other firms are obtained by permutation. The equilibrium is

$$q_1 = q_2 = q_3 = q_4 = \frac{1}{5}.$$

In the South German market, the profits of the South German firm are the same as in (1), with q_4 set equal to 0,

$$q_g(1 - \frac{5}{2}(q_g + q_1 + q_2 + q_3)).$$

The profits of firm 1 are

$$q_1(1 - t - \frac{5}{2}(q_1 + q_2 + q_3 + q_g)).$$

The equilibrium is

$$q_1 = q_2 = q_3 = \frac{2}{5}\left(\frac{1}{5} - \frac{2}{5}t\right)$$
$$q_g = \frac{2}{5}\left(\frac{1}{5} + \frac{3}{5}t\right).$$

Conceptually straightforward computations make possible a computation of the benefits of a merger. We find that if t is "small", mergers are not profitable. This is not surprising, and the intuition for these types of results is well understood since, at least, Salant, Schwitzer and Reynolds (1983): the merged firm internalizes the increase in profits stemming from a decrease in production while the other firms free ride. More precisely, we

find that if $t \leq .125$, the merger is not profitable. For larger t, the merger is profitable; in this framework, this is due to the fact that the presence of the cost of transportation leads to efficiency gains, as the newly merged firm can transfer production to the local factories and not carry sugar through borders.

2 Collusion

We now embed the model of section 1 in a repeated game, where the firms play the same game in each period. We assume that the discount factor[7] is δ, and, as is standard in the literature, that the punishment for deviating from the collusive outcome is reversal to the static equilibrium.

In this section, I will only study collusion outcomes with the following properties:

- French firms only sell in the French market, and share the market equally,
- The South German firm only sells in the South German market.
- The prices charged in both markets is the monopoly price.

In this way, I represent the fear of the Commission that the South German firm will be able to keep the market to itself. Given that all firms are similar, it is natural to assume that the collusive agreement has the French firms sharing the market equally.

Let q be the common production, in the French market. It is chosen so as to maximize $q(1-4q)$ and we obtain

$$q = q_1 = q_2 = q_3 = q_4 = \frac{1}{8}.$$

In each period, each French firm makes a profit of

$$\frac{1}{16}.$$

On the South German market, only the South German firm produces $q_g = 1/5$, the monopoly production, and makes a profit of $1/10$.

[7]Remember that this discount factor should be thought as the loss of value of the numeraire over a period equal to the time it takes to spot a deviation from the collusive equilibrium.

2.1 Collusion without merger

2.1.1 Incentives of French firms

If they respect the collusion agreement, the French firms obtain a discounted profit equal to

$$\left(1+\delta+\delta^2+\ldots\right)\times\frac{1}{16}=\frac{1}{1-\delta}\frac{1}{16}.$$

Let us look at the incentives to deviate for firm 1 (obviously, the incentives will be the same for firms 2, 3 and 4). If it deviates from the collusion agreement, it will choose a production on the French market and a production on the South German market that will maximize its profits. On the French market it will choose a q_1 that maximizes

$$q_1(1-q_1-(q_2+q_3+q_4))$$

with q_2, q_3 and q_4 all equal to $1/8$. This yields $q_1=5/16$, and profits on the French market equal to $25/256$. On the South German market, firm 1 chooses q_1 to maximize

$$q_1(1-t-\frac{5}{2}(q_1+q_g))$$

with $q_g=1/5$. This yields

$$q_1=\frac{2}{5}\left(\frac{1}{4}-\frac{1}{2}t\right)$$

and profits equal to

$$\frac{2}{5}\left(\frac{1}{4}-\frac{1}{2}t\right)^2.$$

If it deviates, firm 1 obtains profits equal to the sum of the first period profits from deviating and the discounted value of the non collusion outcome from the next period onwards. This is equal to

$$\frac{25}{256}+\frac{2}{5}\left(\frac{1}{4}-\frac{1}{2}t\right)^2+\frac{\delta}{1-\delta}\left(\frac{7}{180}+\frac{1}{90}t+\frac{13}{180}t^2\right). \qquad (2)$$

This is larger than the payoff from keeping to the collusive path, i.e.

$$\frac{1}{1-\delta}\frac{1}{16},$$

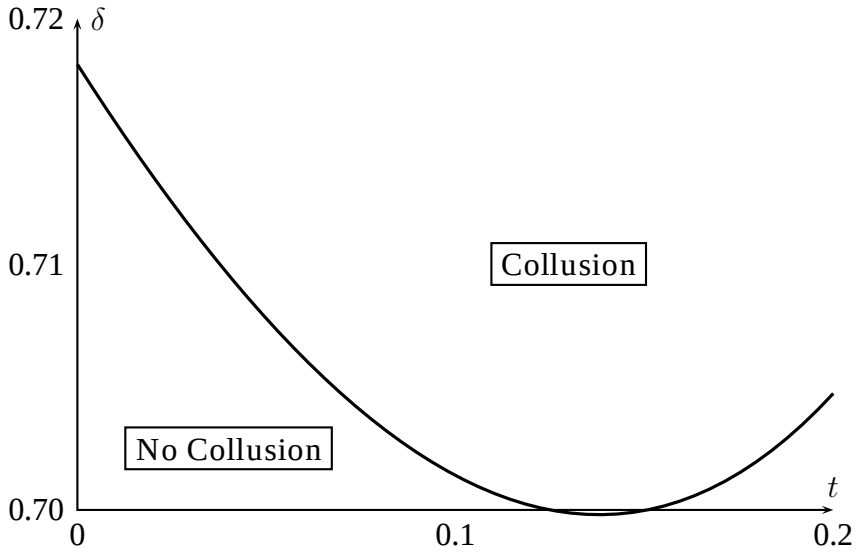

Figure 1: This figure represents, as a function of t, the variation of the smallest value of δ for which the French firms would respect the collusive agreement in the absence of merger, in the Cournot model of section 2.1.1.

if and only if δ is smaller than the solution to the equation

$$(1152 - 320\delta)\, t^2 + (-1152 + 1280\delta)\, t + 693 - 965\delta = 0,$$

i.e., if

$$\delta < \frac{9}{5} \frac{128t^2 - 128t + 77}{64t^2 - 256t + 193}.$$

The right hand side of this inequality is graphed on figure 1.

2.1.2 Incentives of the South German firm

The South German firm gains less than the French firms from deviating. Indeed, by not deviating it obtains profits of

$$\frac{1}{1-\delta} \times \frac{2}{5} \times \frac{1}{4} = \frac{1}{10(1-\delta)}.$$

If it deviates, it sells on the French market q_g chosen to maximize

$$q_g \left(1 - q_g - t - 4 \times \frac{1}{8}\right) = q_g \left(\frac{1}{2} - q_g - t\right),$$

which yields $q_g = 1/4 - t/2$ and profits equal to $(1/4 - t/2)^2$.

Of course, it does not change its output on the South German market. Therefore, in the period in which it deviates it makes profits of

$$\left(\frac{1}{4}-\frac{1}{2}t\right)^2+\frac{1}{10}.$$

Its total discounted profits if it deviates from the collusion path are therefore

$$\left(\frac{1}{4}-\frac{1}{2}t\right)^2+\frac{1}{10}+\frac{\delta}{1-\delta}\left(\frac{7}{180}-\frac{17}{90}t+\frac{157}{180}t^2\right)$$

and the benefits it gets from deviating are equal to

$$\left(\frac{1}{4}-\frac{1}{2}t\right)^2+\frac{1}{10}+\frac{\delta}{1-\delta}\left(\frac{7}{180}-\frac{17}{90}t+\frac{157}{180}t^2\right)-\frac{1}{1-\delta}\times\frac{1}{10}.$$

This is positive if

$$\delta\leq 45\frac{1-4t+4t^2}{89-44t-448t^2}.$$

The right hand side of this expression is represented on figure 2. Comparing this figure with figure 1, we see that the cutoff δ is smaller than for the French firms. Hence, whenever the South German firm has incentives to deviate, so do the French firms. We summarize this in the following lemma.

Lemma 1 *In the collusion model without merger, the binding incentive constraints are those of the French firms.*

2.2 Collusion with merger

In the collusion outcome after the merger, the productions will be the same in both markets, and, along the collusive path, the profits of firms 1, 2 and 3 are the same than without merger whereas the profits of the South German firm are simply the sum of the profits of firm 4 and firm g before the merger.

2.2.1 Incentives of French firms

The French firms (i.e., firms 1, 2 and 3) make the same collusion profits after the merger than before the merger. Furthermore, because the productions are the same with or without the merger, in the period in which

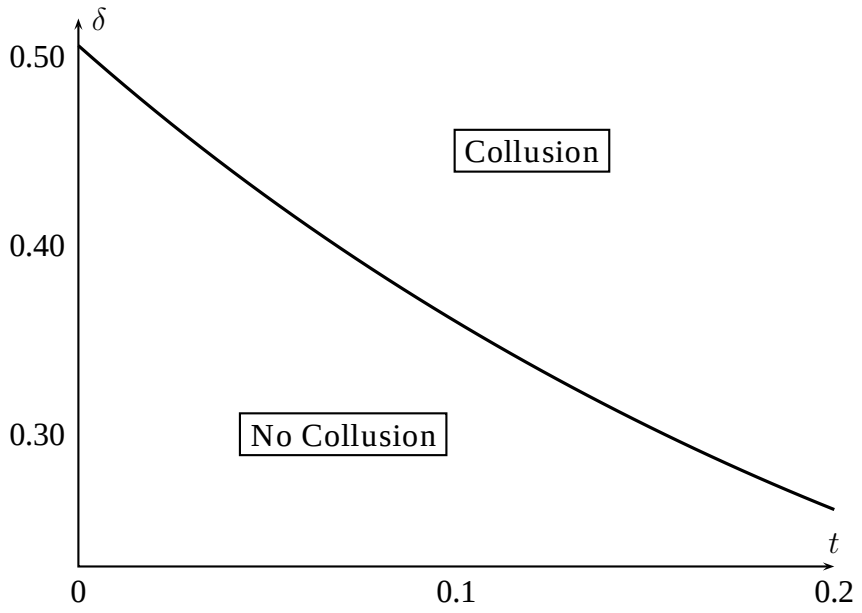

Figure 2: This figure represents, as a function of t, the variation of the smallest value of δ for which the South German firm would respect the collusive agreement in the absence of merger, in the Cournot model of section 2.1.

they would deviate, they would choose the same production as in the absence of merger. On the other hand, the reversal to the non collusive path is less costly (the French firms earn more with the merger) and therefore the incentives to cheat are higher.

More precisely, the gains from deviating are equal to

$$\frac{157}{1280} - \frac{1}{10}t + \frac{1}{10}t^2 + \frac{\delta}{1-\delta}\left(\frac{7}{125} - \frac{8}{125}t + \frac{8}{125}t^2\right) - \frac{1}{1-\delta}\frac{1}{16},$$

and we find that this is positive if δ is less than the value represented on figure 3.

2.2.2 Incentives of the South German firm

If it decided to deviate from the collusive outcome, the South German firm would keep its production constant in the South German market, and expand its production in the French market. Hence, its gains from the deviation would be exactly the same as those of the French firms. On the other hand, it would find the reversal to the non-collusive outcome more costly: the same amount on the French market, but there would also be losses

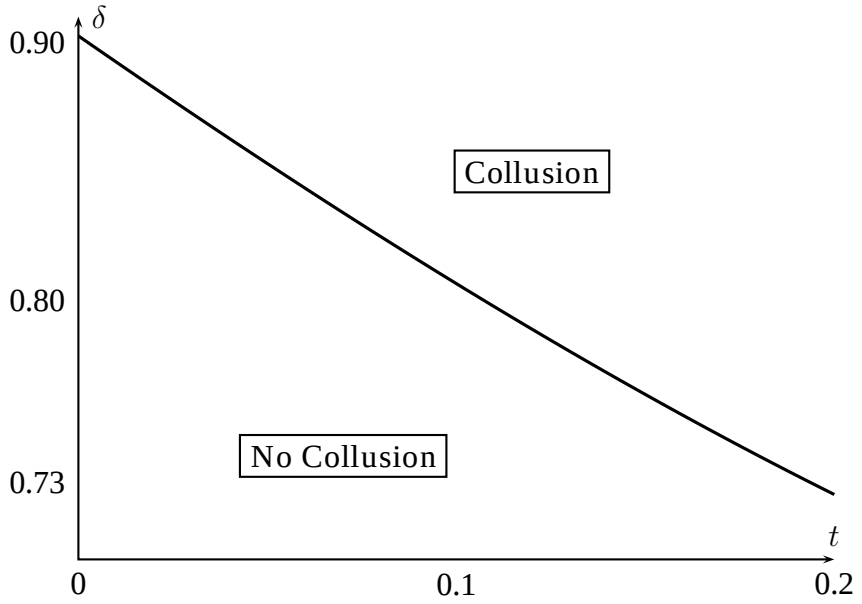

Figure 3: This figure represents, as a function of t, the variation of the smallest value of δ for which the French firms would respect the collusive agreement after the merger, in the Cournot model of section 2.2.

on the South German market. Therefore, we have proved the following lemma.

Lemma 2 *In the collusion model with merger, the binding incentive constraints are those of the French firms.*

2.3 Comparing collusion with and without merger

Comparing the preceding results, we obtain immediately the following proposition, which proves that the Commission's theory does not stand.

Proposition 1 *For all δ for which the collusive outcome is stable with the merger, it is also stable without the merger.*

Therefore the merger *does not facilitate collusion*, and actually can make it more difficult.

3 The consequences of competition in the French market

Up to this point, I have assumed that the collusive outcome yielded the monopoly price in the French market. Although in its decision the Commission seems to believe that there is evidence of excessive margins in the French sugar industry, I certainly do not find the analysis conclusive.[8] First, a comparison of costs and prices show them to be are in line with each other. Second, the structure of the market is not conducive to collusion. The purchasing side is very concentrated (a few large firms for industrial grade sugar, a very few large retailers for household sugar); each of the clients organize its own reverse English auction where it does not communicate the identity of the competitors and the price they offer. The quantity that the clients buy from each potential supplier varies considerably from year to year.

Under these conditions, it is of some interest to study the following scenario: collusion is limited to the fact that no firm enters the foreign market. I show that the same result as in the previous section holds: the merger does not favor collusion.

The no collusion outcomes with or without merger are the same as above.

Without merger collusion yields monopoly profits for the South German firm and Cournot[9] profits for the French firms: each of them produces $1/5$ and the price is equal to $1/5$. The per period profits of a French firm are $1/25$.

If the South German firm deviates, in the French market it produces q_g so as to maximize $q_g(1/5 - t - q_g)$, i.e., $1/10 - t/2,$ and obtains profits of $(1/10 - t/2)^2$. It finds it worthwhile to deviate if

$$\frac{1}{10} + (1/10 - t/2)^2 + \frac{\delta}{1-\delta}\left(\frac{7}{180} - \frac{17}{90}t + \frac{157}{180}t^2\right) > \frac{1}{10(1-\delta)},$$

which is equivalent to

$$\delta < \frac{9}{16}\frac{1 - 10t + 25t^2}{4 + 5t - 35t^2}.$$

[8] Clearly the price of beets is above the competitive price. My statement refers to the profits of the sugar companies, given the price of beets which is set by the Commission.

[9] As should be clear from the discussion that precedes, I believe that the actual type of competition in the French sugar market is more akin to Bertrand than to Cournot competition. I will study Bertrand competition in the next section.

If French firms deviate, they obtain the same profits as in section 2.1.1, except for the fact that their first period profits in the French market will be smaller (they have no incentives to change their production on the French market). Modifying (2) appropriately, we obtain

$$1/25 + \frac{2}{5}\left(\frac{1}{4} - \frac{1}{2}t\right)^2 + \frac{\delta}{1-\delta}\left(\frac{7}{180} + \frac{1}{90}t + \frac{13}{180}t^2\right).$$

It is worthwhile to deviate if

$$1/25 + \frac{2}{5}\left(\frac{1}{4} - \frac{1}{2}t\right)^2 + \frac{\delta}{1-\delta}\left(\frac{7}{180} + \frac{1}{90}t + \frac{13}{180}t^2\right) > \frac{1}{(1-\delta)25},$$

which is equivalent to

$$\delta < \frac{45\left(1-2t\right)^2}{\left(47 - 200t + 50t^2\right)}.$$

It is easy to check numerically that the French firms have more incentive to deviate, as is intuitively obvious: they can enter the South German market where prices are high, whereas the South German firm gains much less by entering the French market where the firms in place are already producing substantial amounts. Actually, when $t > \left(3\sqrt{10} - 5\right)/65 \simeq 0.07$, the French firms are better off in the no-collusion outcome than in the collusion outcome: they loose more by being barred from the South German market than they gain by not having the competition of the South German firm on their home market. Under these conditions, collusion is not sustainable whatever δ.

It is easy to prove that the merger makes collusion more difficult. It does not affect the collusive outcome. The merged firm has no incentives to deviate from the collusive path, as its production in both markets is already a best response to its competitors. For the French firms, the reasoning of 2.2.1 still applies. Their profits on the collusive path are the same with or without the merger, and the reversal to the non collusive path is less costly without the merger. The incentives to cheat are higher.

4 Collusion with Bertrand equilibrium

In this section, I discuss collusion when, in the static equilibrium, the firms play a Bertrand game rather than a Cournot game.

Without collusion, with or without the merger, if the firms play a Bertrand game, the price will be equal to 0 on the French market, and to t on

the South German market, with all South German consumers buying from the South German firm. The French firms make no profit, while the South German firm has profits equal to $t \times 2(1-t)/5$. Because all prices are the same with or without the merger, it neither increases nor decreases profits in the absence of collusion.

We will use two different scenarios to study collusion:

- scenario A uses a modelling of collusion similar to that of section 2: the firms coordinate on both markets to impose the monopoly price;
- scenario B uses a modelling of collusion similar to that of section 3: the South German firm maintains the monopoly price in the South German market, and tries to use its ownership of French firm 4 in order to prevent entry by the other French firms. In that scenario, the only profits that are increased by collusion are those of the South German firm.

4.1 Scenario A

In scenario A, with collusion, the price is equal to $1/2$ in both markets; assuming that they share the market equally, the profits of each of the four French firms are equal to $1/16$ (they each sell $1/8$ at price $1/2$). The profits of the South German firm are equal to $1/10$ (it sells $1/5$ at price $1/2$).

If it deviates from the collusive path, a French firm will do so by lowering its price to slightly below $1/2$ on both the French and South German markets; it will then sell $1/2$ on the French market and $1/5$ on the South German market, and obtain profits equal to

$$1/2 \times 1/2 + (1/2 - t) \times 1/5 = 7/20 - t/5.$$

After reversion to the static equilibrium, its profits will be equal to 0 in all subsequent periods. The deviation is profitable if and only if

$$7/20 - t/5 \geq \frac{1}{1-\delta}\frac{1}{16} \Longleftrightarrow \delta \leq \frac{23-16t}{28-16t}. \tag{3}$$

For the South German firm, the best deviation from the collusive path is to charge slightly below $1/2$ on the French market, while maintaining its price of $1/2$ on the South German market. In the period where it deviates, is profits will be equal to

$$1/2 \times (1/2 - t) + 1/2 \times 1/5 = 7/20 - t/2.$$

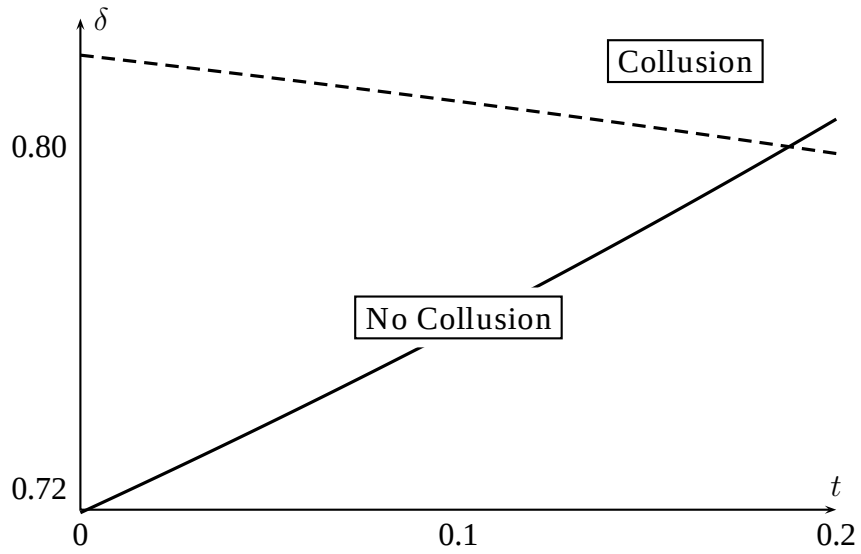

Figure 4: This graph represents the cutoff δ for collusion in Scenario A without merger as a function of t. The downard sloping dashed curve represents the cutoff δ for the French firms: they will respect the collusive agreement only if δ is above that curve. Similarly, the South German firm will respect the collusive agreement only if δ is above the upward sloping solid curve. The collusive agreement is therefore stable only if δ is above both curves.

After the breakdown of collusion, it will make per period profits equal to $t \times 2/5 \times (1-t)$. Hence, deviating from the collusive path is profitable if and only if

$$7/20 - t/2 + \frac{\delta}{1-\delta} \times \frac{2t(1-t)}{5} \geq \frac{1}{1-\delta}\frac{1}{10}$$

$$\iff \delta \leq \frac{5}{7-4t}.$$

Plotting these two limits, we obtain figure 4. As explained in its caption, the collusive agreement is stable only if δ is above both curves. We see that the incentives of the French firms to deviate are the binding constraint, except if t is very large, superior to $3/16 = 0.1875$, that is over 35% of the monopoly price. If t is superior to this limit, only the incentives of the South German firm are binding

With the merger, the incentives of the French firms to deviate are the same as without the merger, as they can make the same profits through their deviation, and the "punishment" is the same. If it deviates, the South German firm will charge a price of $1/2$ in both markets, and serve each

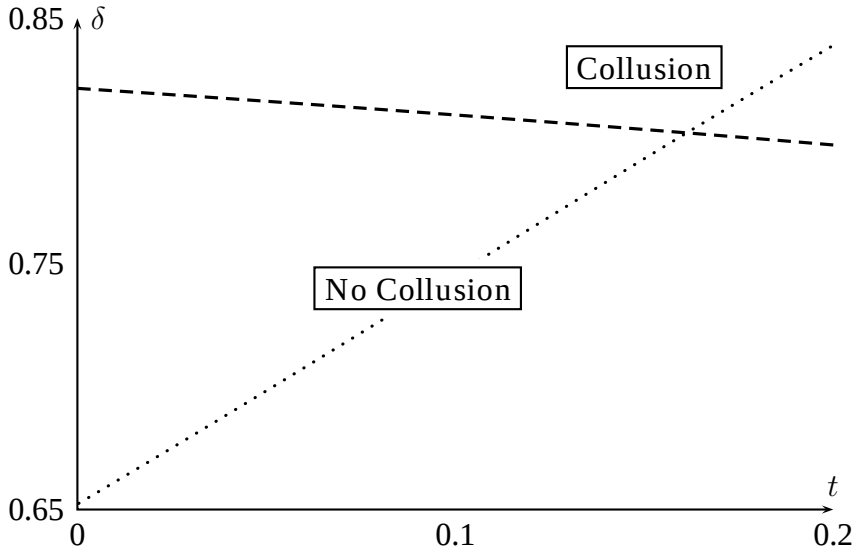

Figure 5: This graph represents the cutoff δ for collusion in Scenario A with the merger as a function of t. The downard sloping dashed curve represents the cutoff δ for the French firms: they will respect the collusive agreement only if δ is above that curve. Similarly, the South German firm will respect the collusive agreement only if δ is above the upward sloping dotted curve. The collusive agreement is therefore stable only if δ is above both curves.

market through its local subsidiary. Its profits in that period will therefore be equal to $1/4 + 1/10$. The deviation will be profitable if and only if

$$1/4 + 1/10 + \frac{\delta}{1-\delta}\left(\frac{1}{16} + \frac{2t(1-t)}{5}\right) \geq \frac{1}{1-\delta}\left(\frac{1}{10} + \frac{1}{16}\right)$$
$$\iff \delta \leq \frac{15}{23 - 32t + 32t^2}.$$

On figure 5, I have plotted the right hand side of this expression and the right hand side of (3). The collusive agreement will be respected only if δ is above both curves. We see that the incentives of the French firms to deviate are the binding constraint if δ is smaller than 0.161.

In order to study the effect of the merger on the incentives to deviate from the collusive path, without going through uninteresting computations, I have superimposed in figure 6 the curves of figures 4 and 5. We see that, if anything, the merger never makes collusion easier. For the most relevant values of t, the binding constraint is the incentives of French firms, and is the same with and without the merger. For larger values of t,

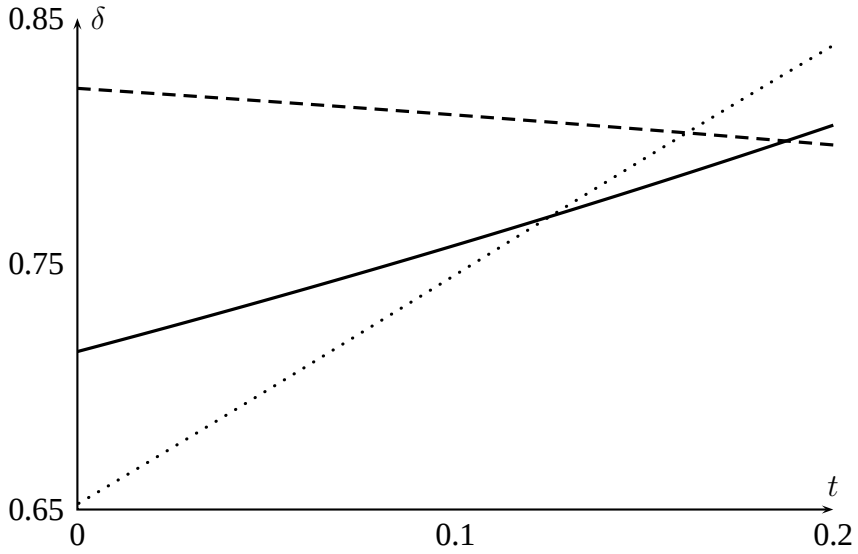

Figure 6: On this figure, we have superimposed the curves of figures 4 and 5. This shows that if collusion is feasible with the merger, it is also feasible without the merger, but that the opposite is not true for large enough t.

the binding constraint is the incentives of the South German firm, and the merger makes collusion more difficult.

4.2 Scenario B

Scenario B does not lead to a very interesting analysis, but I have included it because it may be closer in spirit to what the Commission had in mind in its decision: the South German firm is using its ownership of firm 4 in order to protect its monopoly on the South German market. However, the merger does not help the South German firm. Indeed, because there is Bertrand competition in the French market with or without collusion, French firms always have profits equal to 0, and they cannot be punished for entering the South German market.

In order to obtain a model that would indeed yield stable collusion with merger and no collusion without the merger, we would have to assume that there were only two French firms before the merger. Then, the newly merged firm could increase its price in the French market, and therefore give some profits to its French competitor, which would provide room for punishment in case of entry on the South German market. However, if this is possible, it is difficult to understand in this case why the French firms would not be able to collude even in the absence of merger

(and in the sugar market, there were more than two firms in France before the merger!).

5 Conclusion

This paper has shown that some cross-border mergers cannot be explained by the desire to acquire or strengthen retaliatory power, at least if we use the standard collusion models used by economists. From the decision, it seems that Südzucker presented objections to the Commission's theory consistent with the theory developed above:

> "In its Response to the points of complaint from the Commission, Südzucker argues that any retaliatory measures would be counterproductive for the group after the concentration, since they would lower the price level in France for the future subsidiary SLS and thus would harm the group. Rather, (it argues,) after the concentration Südzucker would necessarily be interested in avoiding such retaliation, because the results of it would affect it too, through SLS."[10]

The Commission's reply is somewhat surprising:

> "For one, it was not to be anticipated anyway that the parties would get themselves into a general price war that would damage business for all sides. For another, a general drop in the price level in France is also not to be expected for the reason that such retaliatory measures by nature are carried out selectively with respect to individual customers of the competitor, in order to attack the competitor in a targeted manner. Since, unless they have a market-dominating position, sugar manufacturers do not by any means have to offer their customers equal terms for equal service, targeted low-price offers for individual strategic customers of the competitors are easily possible and are also common in the industry."[11]

This is a puzzling statement, and beyond the reach of economic analysis, as the notion of "strategic customers" is not a standard concept in economic analysis, and is not defined by the Commission, who does not

[10] Decision, §129.
[11] Decision, §130.

even provide an example of a client it would consider strategic, or explain the tests that one should use in order to recognize them. It is specially puzzling in the context of the sugar industry, where the purchasing side of the market is extremely concentrated. It would seem that either there are no strategic clients, or that they all are!

The Commission seems to imply that by targeting these strategic clients, Südzucker-SLS would be able to decrease the profits of its competitor(s) while not suffering from a general decrease in price on the French market. I believe this is wrong. First, the punishment that can be imposed on the competitors is limited by their access to the export market at prices guaranteed by the Commission itself. Second, even if we assume away this possibility and Südzucker-SLS decided to increase its sales to one client, the targeted competitor would increase its sales to the other customers; this would put competitive pressure on SLS who would be forced to decrease its prices. The theory of the Commission seems to require each customer to be an independent market, which is clearly not the case.

More fundamentally, there is an interesting fundamental issue of the possibility of collusion in a market with the type of price support that the European sugar industry enjoys. It purchases its main raw material (beets) at regulated price. Through a mechanism that guarantees the price of exports, the Commission fixes the price of the lowest quality sugar. The only collusion that could occur would be on the amount of transformation of sugar into higher quality sugar, which seems very difficult given the lack of transparency of this part of the market.[12] Seen from another angle, the Commission fixes the total weight of sugar sold on the European market, which does reduce the possibility of collusion!

Of course the treatment of collusion in this paper is very simplified, and well short of a complete treatment. In particular, I have not computed the optimal punishment paths before and after the merger, but I do not know how to do it (very few optimal punishment paths have been computed in the literature). I see no reason why this would change the results. I have also not tried to "rescue" the Commission's theory of tar-

[12]Genevose and Mullin (2001) present a fascinating discussion of the organisation of collusion in the US sugar industry between 1927 and 1936, through the "Sugar Institute". It shows a very sophisticated organization which improved the transparency of the market to ensure that deviants from any collusive paths could be readily indentified. My understanding of the way in which the French market functions is that there is very little public information about the actual transactions between sugar producers and customers, and hence that, as opposed to what happened in the US, it would be very difficult to identify and punish deviations.

geting of “strategic clients” by providing a more precise definition (but I do not think this is feasible). My point has simply been to show that the Commission’s theory does not pass the test of the standard textbook model that I believe most economists would think is natural to study the issue. I do believe that the parties (and the general public, including firms that prepare mergers) are entitled to a fuller explanation of the reasoning behind the decisions in this and similar cases.

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