Chapter on horizontal mergers

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Abstract

This is a draft for the chapter on horizontal mergers of the book on "Competition Policy: Theory and Practice".
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[...]

The remaining sections of this chapter are organised thus. Section 2 analyses the case where all the remaining independent firms in the industry behave in a non-cooperative way both before and after the merger. We study a formal model for the economic analysis of the impact of mergers. It shows that a merger generally increases market power and will therefore be detrimental to consumers and social welfare. In legal terms, in the US, this amounts to analysing the *unilateral effects* of a merger. In the EU, this case would correspond to the case of *single firm dominance* provided that the merger creates a monopolist or a firm with sufficiently high market power that it can profitably increase prices even if it faces some (small) competitors.

The other important issue in merger investigations is that a merger might favour collusion in the industry (because the merger reduces the number of firms, or because it might increase symmetry in the market). In other words, a single firm might not be able to unilaterally raise prices above a certain threshold, but because of the merger new industry conditions might enhance the scope for collusion. Prices could then increase as firms would find it easier to attain a cooperative outcome. This issue falls under the name of *joint dominance* (or collective dominance; sometimes also oligopolistic dominance) in the EU and *coordinated effects* of a merger in the US.

2 Horizontal mergers: unilateral effects

We focus in this section on the *unilateral effects* of a merger, that is the case where the merged firm and its rivals do not coordinate their behaviour. In game theoretic terms, firms behave in a non-cooperative way (they do not collude) both before and after the merger. We first show that a merger is

likely to increase market power of the merging firms and decrease both consumer surplus and total welfare (section 2.1). This analysis will also suggest indicators and quantitative techniques can be used in the analysis of mergers. We shall then emphasise that if the merger increases efficiency in the merging firms, then the net effect on welfare of the merger is ambiguous, as the rise in market power can be outweighed by the price decrease possibly brought about by efficiency gains. The analysis of this trade-off will be the focus of section 2.2. Finally, section 2.3 studies other important variables which should be considered in the evaluation of the merger effects: in particular, we shall look at the importance of possible entry, at the power of the buyers in the industry and at the failing firm defence argument.

2.1 A merger increases market power

To understand why a merger increases market power, consider a simple example. Imagine that in a given town there are a few independent grocery stores. Competition constrains the market power of each store: if one of them tried to increase prices in a significant way, many among its current consumers would start and do their shopping at some other store. Anticipating this, the store considering the price increase will refrain to do so. Its market power, that is its ability to charge consumers a high mark-up, is therefore limited by the presence of the rival stores.

Such market power, however, will increase if two or more stores merged to give rise to a chain of grocery stores. The scope for a profitable price increase for the chain is much higher, as the number of competitors in the market is lower than those faced by a single store. For instance, if before the merger a price rise by store A would lead some consumers to switch to the neighbouring store B, after a merger between A and B the same consumers would have to find a more distant store C if they wanted to avoid the price increase. For some of them at least, the higher distance and the higher waste of time would not be worth the lower prices, and they will stay with their usual store despite higher prices. Therefore, a merger might make it possible to have mark-ups which could not be attained otherwise.[1]

[1]The technical section below formalises these arguments. Unlike this example, however, it considers for simplicity products which are symmetric substitutes, so that if all of them are sold at an equal price and one firm increases the price of its product, each of the other firms would receive an equal proportion of demand from some of the consumers which were previously patronising the firm which increases prices.

A similar way to look at it is as follows. Imagine that the merger involves m firms, so that it creates a new firm which sells m products. A contemporaneous increase in the price of each product sold by the merged firm would be profitable, because the number of independent firms is reduced, and consumers could redirect their demand only to $n-m$ rather than $n-1$ competing products as in the pre-merger case.

In the extreme case where after the merger only one firm is left in the industry, market power would be at its maximum, and the firm would be free to set the monopoly price. Indeed, the firm knows that consumers would not be able to switch to any competing product after a price rise. At the other extreme, if the industry was characterised by very high fragmentation of market shares (i.e., there are very many firms in the industry) and the merger involved only two such firms, their market power would not be considerable after the merger: if they tried to raise prices slightly above the pre-merger equilibrium level, they would find that consumers would switch demand to the numerous rivals, so that the price increase would not be profitable. Therefore, as we shall see below, mergers have a quite different impact on market power according to the characteristics of the partner firms and of the industry as a whole (see section 2.1.1 below).

In general, therefore, the merger increases (by some degree) market power of the merging firms, which in turn will increase prices. To be more precise, there exists a small difference on the predictions about the price effects of mergers made by different models in the industrial organisation literature. In particular, models which assume that firms' decision variable is market price predict that both the prices charged by the merging firms, and by the outsiders would rise; conversely, models which assume that firms' decision variable is quantity predict that the merging firms would reduce their outputs (that is, they would raise their price), whereas the outsiders would *increase* their outputs (they would reduce price).[2] This difference is not very important, however, as both models predict that the overall effect of the merger (in the absence of efficiency gains) is to reduce consumer surplus. This is because even in the models where firms set quantities, any possible increase in quantities sold by outsiders would be outweighed, from the point of view of the consumers as a whole, by the decrease in the quantities sold by the insiders.[3]

[2] See the technical section.

[3] A small qualification applies here. If firms choose quantities, the merging firms were

The effect of the merger on the firms is of some interest. In general, and apart from some theoretical and empirical qualifications which we make below (see sections 2.1.3 and 2.2.2), the merger will benefit the insiders, in the sense that the profit made by the new firm is higher than the sum of the profit made by the partner firms if the merger had not taken place. What is perhaps more surprising to some readers, though, is that in general the merger will also benefit the outsiders, that is the independent firms still operating in the industry. This is because the insiders, by increasing prices and/or reducing output, push the overall prices in the market up, to the benefit of the rivals as well. Indeed, the rivals might gain more than the insiders from the merger.[4] If there are no efficiency gains which modify the relative competitiveness of the different firms, therefore, the merger is beneficial to insiders and outsiders alike, and therefore unambiguously increase producer surplus.

We have therefore seen that the merger decreases consumer surplus but increases producer surplus. However, it is possible to show that the net effect on welfare, defined in the standard way as the sum of consumer surplus and producer surplus, is negative. In sum, because it increases market power, mergers hurt consumers and society at large. (It is the right moment to remind readers that we are considering here the case where the merger does not result in efficiency gains. If it does, as we explain below in section 2.2, the market power effect might be outweighed by the efficiency gains, and both consumers and overall industry profits - even though not necessarily those of outsiders - might increase.)

2.1.1 Concentration, market shares, capacities

We have already hinted above at the fact that - other things, and in particular the level of efficiency gains, being equal - the larger the number of independent firms operating after the merger the less likely that it will be detrimental to consumers. The intuition for this result is straightforward, as the ability of merging firms to exert market power clearly depends on the number of rivals. In the case of a merger to monopoly, for instance, the new firm will not face any restraint in its pricing decision. At the other extreme,

tiny and the outsiders large, it might be that overall effect on consumer surplus be positive. As we discuss later, this is a further reason not to worry about mergers between firms with low market shares.

[4] A merger can therefore be seen as a sort of "public good" (the public good being high prices) provided by the insiders.

in an industry which is extremely fragmented and in which each firm possesses only tiny market shares, the impact of a merger on the market price will be irrelevant. In the technical section 2.1.3 we show that the merger is the more likely to be detrimental the larger the market share of the firms which take part in the merger and the smaller the market shares of outsider firms. This gives us a rationale for using a concentration index, like for instance the Herfindahl-Hirschman Index (HHI)[5], as a first screening device for unilateral effects of mergers: Ceteris paribus, we should worry more about a merger in an industry which is already highly concentrated than about one which occurs in a fragmented industry.

For the same reasons, and whatever the existing *level* of concentration, we want to pay more attention to a merger which *increases* in a sensitive way industry concentration than to one which increases it only marginally. This gives us a rationale for using a proxy for the likely change in concentration (such as ΔHHI, that is, the difference between post- and pre-merger concentration) as an additional screening device.

These two indexes are used by the US agencies to screen mergers and decide which ones are likely to raise adverse competitive consequences and which ones are not[6]. If the post-merger HHI[7] is lower than 1,000 (low concentration), the merger will be approved. If the post-merger HHI is included between 1,000 and 1,800 (moderate concentration), the merger is approved as long as it does not result in an increase in concentration by more than 100 points. If the post-merger HHI is more than 1,800 (high concentration) the merger is not challenged only if it increases concentration by less than 50 points. In all the other cases, a merger raises "significant competitive concerns" and is likely to be investigated.

Another simple but useful indicator of the likely market power created by the merger is given by market shares. Farrell and Shapiro (1990), for instance, show that the lower the market share of the merging companies

[5]The HHI is the most standard index of concentration to be found in industrial organisation and it is the most often used in antitrust analysis. It is given by the sum of the squares of market shares (μ_i) of the firms in the industry:$\sum_{i=1}^{n} \mu_i^2$. It can vary between 0, when the market is entirely fragmented (each firm has a market share close to 0)and $10,000$ when there is only one firm in the industry, which has 100% of the market. (The index takes values between 0 and 1 if fractions instead of percentage values are used.)

[6]See US Merger Guidelines (1992, sect. 1.5).

[7]The (expected) post-merger HHI is computed by assuming that each firm keeps the same market share after the merger, and that the merging firms will simply have the sum of their pre-merger shares.

the less detrimental the effect on market prices. It might also be possible that a merger between small firms might decrease market prices even in the absence of efficiency gains. This is because they analyse the case of Cournot competition: with strategic substitutes the outsiders react to the lower quantity of the insiders by increasing their own output. When the insiders are small firms, their output reduction might be of a lower order of magnitude than the output expansion of the large outsider firms.[8] In a model based on Perry and Porter (1985), McAfee and Williams (1992) find that mergers which result in a new largest firm and mergers which increase the size of the largest firm always reduce efficiency. These findings justify using market shares of the merging firms as another possible screening device in merger control. If the merger involves firms with little market shares then it is unlikely that considerable adverse effects would arise. Put in other words, the level of efficiency gains needed to outweigh the possible price increase would be much lower for firms having small market shares.

Besides current market shares, the analysis of the relative productive capacity of the firms is very important in determining the market power enjoyed by the insiders. We have seen that the ability to raise prices by any given firm is constrained by the existence of rivals to which consumers can switch. It is therefore crucial that such rivals be effectively competitive, and in particular be able to satisfy the additional demand addressed to them. In other words, one has to look at the distribution of capacities within the industry to make sure that existing competitors are not already operating at capacity. Imagine for instance a situation where two merging firms had together only, say, 35% of the market, but were the only firms in the industry with spare capacity. In this case, market shares would clearly understate the market power of the insiders, which can profitably raise prices as outsiders would not be able to cover - at least in the short run - any additional demand.[9]

For the same reasons, consideration of market shares alone can be misleading in industries where there production depends on the availability of

[8] Obviously, this effect would not appear in a model like the one used in the technical section, where firms sell strategic complements. In that case, the price increase of the insiders is followed by a price increase of the outsiders, so that in the absence of efficiency gains no matter how small the market share of the merging firms, the merger would always increase prices.

[9] If new investments are required in order for the rivals to increase their production, then existing rival firms should be considered in a similar way as new (potential) entrants. See also the section on entry.

raw materials or other indispensable inputs. For instance, sellers of mineral waters depend on the water reserves of their sources; diamond producers depend on the reserves contained in their mines and so forth. Availabilty of such resources must be kept in proper consideration in order to assess market power correctly.

Of course, not only supply variables but also demand variables must be taken into account to understand to what extent the merging firms would enjoy market power. For instance, in industries characterised by very high switching costs, consumers would not easily change their providers, who will then enjoy market power.

2.1.2 Quantitative analysis of mergers: Elasticity of residual demand

We have sofar stressed that the adverse consequences on welfare of a merger come from the higher market power enjoyed by the merging firms. An equivalent way to express the same idea is to say that a merger reduces the "elasticity of demand" faced by the merging firms.[10] Take for instance the case of a merger which leaves just one firm in the industry. In this case, the demand faced by the firm has very low elasticity (the same elasticity as overall market demand): a rise in price of, say, one percent, would decrease demand of few decimal points. This is because consumers would not be able to switch to any other firm, their only alternative to buying the merged firm's product being not buying at all. At the other extreme, in the case where only two (small) firms out of a very large number of similar firms merge, the demand elasticity faced by the merged firm would be very high. Since consumers can buy from a number of competing products, a one percent increase in the prices charged by the merged firm would result in a decrease of something which could be as high as one hundred percent in the quantity demanded. In sum, the lower the elasticity faced by the insiders after the merger the higher their market power and in turn the more serious the consequences on prices

[10] This interpretation in terms of demand elasticity should not come as a surprise, given that in chapter *? we have already stressed the negative relationship between market power and demand elasticity. The concept of elasticity measures the following experiment. Imagine that there is an increase in prices by one percent; in which percentage would demand decrease? Formally, this is written as: $\epsilon = -\frac{\Delta q/q}{\Delta p/p}$ or, in marginal terms, as $\epsilon = -\frac{dq/q}{dp/p}$, where q is quantity demanded, p is price, Δ denotes the difference in quantities or prices and d the derivative.

and welfare, other market features being equal.[11]

This interpretation in terms of the elasticity of the demand faced by the merging firms allows us to understand a very useful quantitative technique to evaluate the effects of mergers, which is based precisely on the estimation of residual demand elasticities, and due to Baker and Bresnahan (1985, 1988). For a formal analysis, see section 2.1.4 below. Here we briefly recall the main features of this technique.

To start with, notice that the assessment of the market power of a firm, say, A would typically require a great amount of information. In particular, one would like to know how the market power of firm A is restricted by the presence of competitors B, C and so on. This would imply estimating the cross-elasticities of firm A with respect to all its competitors, to know to what extent a price rise by firm A would increase demand of each of the other firms (that is, to what extent previous consumers of firm A would switch to each of the other firms following A's price increase). Therefore, with n firms in the industry, one would have to estimate $n-1$ cross elasticities (plus one own elasticity), which would entail collecting a large number of data. Things are even more complicated than that because it is not said that a price increase by firm A would leave unchanged the price set by the other firms: To have a complete assessment of the market power enjoyed by a firm, one should also estimate to what extent a price increase by such a firm would be followed by each of the rivals. This would add complexity to the task of assessing market power.

The estimation of the residual demand function is a technique which considerably simplifies this task, and reduces the need of data. To assess the market power of firm A, this technique involves the estimation of just one coefficient. This is the elasticity of the residual demand function, that is the demand function faced by firm A once the reaction of all the other firms is taken into account. Instead of asking in what percentage a price rise of firm A would increase demand of firm B, C, and so on, this technique just asks in what percentage a price rise of firm A would decrease its own residual demand, that is the demand is left after that all the other firms have satisfied theirs. A low estimate of the residual demand elasticity would then suggest high market power of firm A, as a considerable proportion of consumers would continue to buy from firm A rather than switching to other

[11] For those more familiar with graphical analysis, lower firm's elasticity amounts to saying that the firm faces a steeper demand curve.

firms (or ceasing to buy the product). Vice versa, a high estimate would suggest low market power.

To be more precise, we should add that regressing the residual demand function of a firm alone would result in an estimator which is not consistent, as equilibrium price (and quantity) are jointly determined by both the demand and the supply schedules of a firm. This calls for the use of the *instrumental variable* method (for which in turn we need firm-specific cost data of the firm whose market power we would like to assess, see section 2.1.4 below) in order to solve the simultaneous relation problem and obtain consistent estimators.

Note that this technique cannot tell us whether market power is low because of competition from firm B, or C, or other, since the rival firms are considered as a collective, and their specific role in constraining the market power of firm A cannot be singled out. However, this method allows us to save on the data required to perform an econometric assessment of the market power of a firm. Since it is very often the case that data at the disaggregated level are scarce or difficult to obtain, this is an important step for the feasibility of the application of quantitative methods to the analysis of market power.

The application of this method to the analysis of mergers is straightforward. Imagine that we are interested in knowing the likely market power enjoyed by a firm which results from the merger of, say, firm A and B. We would have to use the technique briefly described above with a minor modification, that is we would have to compute two (*partial*) residual demand elasticities for each of the two firms.[12] For instance, for firm A, the first is the own elasticity, ϵ^{pr}_{AA}, which estimates the percentage decrease in the residual demand of firm A of one percent increase in A's price; the second is the cross-elasticity ϵ^{pr}_{AB}, which estimates the percentage increase in the residual demand of firm A of a one percent increase in the price of firm B. This is to understand how these two firms restrain each other market power. By subtracting the two elasticity estimates thus obtained, one obtains the value $(\epsilon^{pr}_{AA} - \epsilon^{pr}_{AB})$ which is an assessment of the market power enjoyed by the merging firm. This difference expresses the idea that when the insiders

[12]When estimating the residual demand of firm A one takes into account how an increase in the price of A redirects customers to all rivals, without separating the effect of competition from B or any other $(n-2)$ firms. With the concept of partial residual demand function, instead, the merging partner's reaction (B's reaction) is separated from that of the other firms.

coordinate their actions and increase their prices simultaneously, firm A will lose all the consumers going to all the other firms *minus* the consumers who would have gone to firm B if the merger had not occurred.

This way, with relative small data requirements, it is possible to obtain an estimate of the likely effects of a merger. This technique is increasingly being used by economic experts and in court proceedings, and although it is unlikely that merger appraisal will be based uniquely on it, it certainly usefully complements other information collected and the analysis of the market where the merger takes place.

2.1.3 Unilateral effects of horizontal mergers*

In this section we use a product differentiation model to show that mergers which do not entail efficiency gains enhance market power and decrease welfare. The case of efficiency gains will be studied in section 2.2. We consider here the case of unilateral effects of a merger. Therefore, we assume throughout that the merger does not facilitate collusion. In technical terms, we assume that all firms behave non-cooperatively both before and after the merger. For the analysis of the coordinated effects of mergers, see section 3.

The model. Let us use the following utility function, first proposed by Shubik and Levitan (1980):

$$U = v\sum_{i=1}^{n} q_i - \frac{n}{2(1+\gamma)}\left[\sum_{i=1}^{n} q_i^2 + \frac{\gamma}{n}\left(\sum_{i=1}^{n} q_i\right)^2\right] + y \qquad (1)$$

where y is an outside good, q_i is the quantity of the i-th product, v is a positive parameter, n is the number of products in the industry, $\gamma \in [0, \infty)$ is a non-negative parameter which representes the degree of substitutability between the n products. When $\gamma = 0$ the products are independent of each other, whereas if $\gamma \to \infty$ there exists perfect substitutability among the products, which are homogenous. This utility function being quasi-linear, the consumers' decisions on the outside good y do not affect their decisions taken with respect to the differentiated good, that we can analyse in a partial equilibrium framework.

From the maximisation of the utility function subject to the income constraint, we can derive the inverse demand functions as:

$$p_i = v - \frac{1}{1+\gamma}\left(nq_i + \gamma \sum_{j=1}^{n} q_j\right) \tag{2}$$

By inverting this system we can find the following direct demand functions:

$$q_i = \frac{1}{n}\left[v - p_i\,(1+\gamma) + \frac{\gamma}{n}\sum_{j=1}^{n} p_j\right] \tag{3}$$

Exercise 1 *Consider the utility function given by 1: 1) Derive the system of inverse demand function; 2) Find the direct demand functions of each product.*

Among the properties of this demand function, notice that the aggregate demand $Q = \sum_{i=1}^{n} q_i$ does not depend on the degree of substitution among the products, as $Q = \sum_{i=1}^{n} q_i = v - \frac{1}{n}\sum_{i=1}^{n} p_i$. Note also that in the case of symmetry $p_i = p_j = p$ aggregate demand does not change with the number of products n existing in the industry, as $Q = \sum_{i=1}^{n} q_i = v - p$.[13]

We assume for simplicity that all the firms have identical technologies summarised by the cost function $C(q_i) = cq_i$, with $c < v$.

Merger: equilibrium solutions It is convenient for later reference to consider first the case where there exists a multi-product firm, I, which sells the first m products in the industry, whereas the remaining $(n-m)$ products are sold by single-product firms. A merger between the "large" multi-product firm and a "small" single-product firm can then be studied by looking at the effect of an increase by one unit (from $m-1$ to m) in the number of products belonging to the large firm, all remaining firms still selling one product only.

To find the industry equilibrium write the profit functions of the multi-product firm and of each of the outsiders as follows:

$$\pi_I = \sum_{i=1}^{m} \frac{(p_i - c)}{n}\left(v - p_i(1+\gamma) + \frac{\gamma}{n}\left(\sum_{j=1}^{m} p_j + \sum_{k=m+1}^{n} p_k\right)\right), \tag{4}$$

[13] Another desirable feature of the formalisation we adopt here is that in principle one can analyse both price and quantity decisions of the firms. In what follows, we focus on price competition, but we shall indicate when quantity competition would lead to different results.

$$\pi_k = \frac{(p_k - c)}{n}\left(v - p_k(1+\gamma) + \frac{\gamma}{n}\left(\sum_{l=1}^{m} p_l + p_k + \sum_{\substack{j=m+1 \\ j\neq k}}^{n} p_j\right)\right), \qquad k = m{+}1, .., n \tag{5}$$

By taking the first derivatives $\partial\pi_I/\partial p_i = 0$ and $\partial\pi_k/\partial p_k = 0$, imposing symmetry on the prices of the multi-product firm ($p_i = p_I$ for $i = 1, .., m$), and of the outsiders ($p_k = p_o$ for $k = m+1, .., n$), the first-order conditions are:

$$\begin{cases} v + c\left(1+\gamma-\frac{m\gamma}{n}\right) + \frac{\gamma(n-m)p_o}{n} - 2p_I\left(1+\gamma-\frac{m\gamma}{n}\right) = 0 \\ v + c\left(1+\gamma-\frac{\gamma}{n}\right) + \frac{m\gamma p_I}{n} - p_o\left(2\left(1+\gamma\right) - \frac{\gamma(n-m+1)}{n}\right) = 0 \end{cases} \tag{6}$$

By solving the system one obtains the equilibrium prices as:

$$p_I(m) = \frac{c\left(n\gamma(4n-2m-1)+2n^2+\gamma^2\left(2n^2-nm-2n-m^2+2m\right)\right)+nv(2n+\gamma(2n-1))}{\gamma^2(2n^2-nm-2n-m^2+2m)+2\gamma n(3n-m-1)+4n^2}, \tag{7}$$

$$p_o(m) = \frac{c\left(n\gamma(4n-m-2)+2n^2+\gamma^2\left(2n^2-nm-2n-m^2+2m\right)\right)+nv(2n+\gamma(2n-m))}{\gamma^2(2n^2-nm-2n-m^2+2m)+2\gamma n(3n-m-1)+4n^2}. \tag{8}$$

One can check that $\partial p_I/\partial m > 0$ and $\partial p_o/\partial m > 0$, implying that the more concentrated the industry (the higher m for any given number of products n sold in the industry) the higher the equilibrium prices of both insiders and outsiders after the merger. Conversely, $\partial p_I/\partial n < 0$ and $\partial p_o/\partial n < 0$: a merger which involves a certain number of firms m will result in higher equilibrium prices the lower the number of firms in the industry. Therefore, the larger m with respect to n (that is, the larger the market share of the merging firms) the stronger the negative impact of the merger on consumer surplus.

To better interpret the effects of the merger on equilibrium prices, notice that from the FOCs6 one can derive the best reply (or reaction) functions of the merging firm (R_I) as well as of the outsiders (R_o). Figure 1 illustrates these functions in the space (p_o, p_I).

INSERT FIGURE 1 (STRATEGIC COMPLEMENTS, m products case)

They are positively sloped as the products are strategic complements. A merger has the effect of increasing the number of products m sold by the "large" firm and results in a shift upward of R_I and to the right of R_o, the final equilibrium prices being higher than at the pre-merger situation.

Exercise 2 *Consider the model presented in this section. (a) Prove that the reaction functions are positively sloped. (b) Show how an increase in m shifts the reaction functions.*

The intuition for this result is as follows. The larger the number of products sold by a firm, the higher the price it wants to charge. For a large firm selling several products, a marginal reduction in the price of one particular product would steal business not only to rivals but also to own products. In other words, a large firm internalises the fact that a price reduction imposes a negative externality on own products, and will set higher prices than a small single-product firm. A merger increases the number of products sold by a firm and thus raises the prices it wants to charge. Since products are strategic complements in this model, the outsiders will respond by increasing their prices as well.

The effects of a merger To show more formally the effects of a merger, let us focus our attention to the case where there exist n single product firms and a merger between two of such firms occurs. Therefore, we have to compare the equilibrium solution for the pre-merger case $m = 1$ with that of the post-merger case $m = 2$.

By replacing $m = 1$ in the expression (7) we obtain the pre-merger equilibrium price $p_b = p_I(1) = p_o(1)$:

$$p_b = \frac{\left(v + c\left(1 + \gamma - \frac{\gamma}{n}\right)\right)}{2 + \gamma - \frac{\gamma}{n}}, \tag{9}$$

where the index "b" stands for "Bertrand" solution (i.e., the solution of the one shot price game). The quantity sold by each firm at equilibrium is given by:

$$q_b = \frac{(v - c)(n + n\gamma - \gamma)}{n(2n + n\gamma - \gamma)}, \tag{10}$$

and the per-firm profit is:

$$\pi_b = \frac{(v-c)^2 (n + n\gamma - \gamma)}{(2n + n\gamma - \gamma)^2}. \tag{11}$$

Note that $\lim_{n\to\infty} \pi_b = 0$ and that $\lim_{\gamma\to\infty} \pi_b = 0$. The former means that whatever the degree of differentiation among the products, a firm operating in an industry with an infinitely large number of firms will receive zero profit. The latter limit represents the case of homogenous goods, when even a small number of firms will not be able to make positive profits since they compete in prices.

A merger creates a firm with two products. We can find the post-merger equilibrium values $p_I(2)$, $p_o(2)$ (we shall denote them for simplicity p_I, p_o) by replacing $m = 2$ in the expressions (7) and (8):

$$p_I = \frac{c\left(2n(n-2)\gamma^2 + n(3n-5)\gamma + 2n^2\right) + nv(2n + (2n-1)\gamma)}{2n((n-2)\gamma^2 + 3(n-1)\gamma + 2n)}, \tag{12}$$

$$p_o = \frac{c(n + (n-2)\gamma)(n + n\gamma) + nv(n + (n-1)\gamma)}{n((n-2)\gamma^2 + 3(n-1)\gamma + 2n)}. \tag{13}$$

After substituting, one obtains the quantities and per-product profits of the merged firm and the outsiders as:

$$q_I = \frac{(2n^2 + n(4n-5)\gamma + (2n^2 - 5n + 2)\gamma^2)(v-c)}{2n^2 (2n + 3(n-1)\gamma + (n-2)\gamma^2)^2}; \tag{14}$$

$$q_o = \frac{(n + (n-1)\gamma)^2 (v-c)}{2n^2 (2n + 3(n-1)\gamma + (n-2)\gamma^2)}. \tag{15}$$

$$\pi_I = (n + (n-2)\gamma) \left(\frac{c\left(n(n-2-3(n-1))\gamma - 2n^2\right) + nv(2n + (2n-1)\gamma)}{2n((n-2)\gamma^2 + 3(n-1)\gamma + 2n)} \right)^2, \tag{16}$$

$$\pi_o = (n + (n-1)\gamma) \left(\frac{-c\left(n(n-1)\gamma + n^2\right) + nv(n + (n-1)\gamma)}{2n((n-2)\gamma^2 + 3(n-1)\gamma + 2n)} \right)^2. \tag{17}$$

Lemma 1 *The merger increases prices and decreases consumer surplus.*

Proof.

The first part of the lemma has been shown above: The merger increases m from 1 to 2, and both insiders' and outsiders' prices increase with m. Since all the products are sold before and after the merger, consumers are worse off with the merger, since it raises prices of all the products. ■

Another intuitive way to understand this result is as follows. When firms behave non-cooperatively in the marketplace, each of them imposes a negative externality on all the others by choosing a price which is too low with respect to the price which would be optimal for the maximisation of joint-profits. If two firms merge, they will take into account the negative externality which impose on each other, and raise their price. The other firms will react by increasing their price (recall that in this model the products are strategic complements) but not as much as the merging firm.[14]

Lemma 2 *A merger always benefits the merging firms.*

Proof.

First, notice that $p_b < p_I$ and $p_b < p_o$.This follows from the result that $\partial p_I/\partial m > 0$ and $\partial p_o/\partial m > 0$, and recalling that $p_I = p_I(2) > p_b = p_I(1)$ and that $p_o = p_o(2) > p_b = p_o(1)$.

Denote the per-product profit earned by the merging firm as $\pi_I = \pi_I(p_I, p_O)$, where p_I denotes the vector of the own (two) product prices and p_O the vector of the other $(n-2)$ prices charged by the outsiders. Since goods are demand substitutes, it must be that: $\pi_I(p_b, p_b) < \pi_I(p_b, p_o)$. In other words, the equilibrium profits obtained by the merging firms before the merger must be lower than the profit they would get if the rival firms charged a price $p_o > p_b$. However, we also know that the best response of the merging firms to the price p_o chosen by the outsiders is $p_I > p_b$. Therefore, it must be: $\pi_I(p_b, p_o) < \pi_I(p_I, p_o)$. Whence, $\pi_I(p_b, p_b) < \pi_I(p_I, p_o)$. ■

The result that the merger *always* benefits the merging partners is not robust, as it critically depends on the assumption that firms compete in prices. It is useful to review briefly the literature on merger profitability.

Salant, Switzer and Reynolds (1983) assumed (i) quantity competition, (ii) homogenous goods and (iii) no efficiency gains from the merger, and found that a merger between two firms is always detrimental to the partners unless it gives them a monopoly (that is, unless $n = 2$). The intuition behind this result is that the merging partners internalise the negative pecuniary externality given by the too low prices in the industry, and reduce their outputs

[14]It is possible to show that when firms have the same technology, the larger the firm the higher the price it would charge: $p_m > p_k$ for $m > k$, m and k being the number of products sold by respectively a large and a small firm. See also Davidson and Deneckere (1985).

(which would tend to increase prices). The goods being strategic substitutes (as is the case with quantity competition and linear demand functions), the outsiders to the merger will respond by increasing rather than decreasing their outputs, which allows them to gain market shares but which moderates the increase in the price. As a result, insiders lose market shares and profits, as the lower quantity produced is not compensated by the price rise in the industry.

[INSERT FIGURE 2: STRATEGIC SUBSTITUTES]

Figure 2 shows graphically these arguments. The merger shifts the best reply function R_I of the insiders downwards , to R'_I. As a result a new equilibrium will be in point M, characterised by higher production of the outsiders and lower production of the insiders. Profits for the insiders decrease, as the iso-profit curve $\overline{\pi}'_I$ lies above $\overline{\pi}_I$. (See also exercise 2.)

This article opened a heated debate on the profitability of mergers, and subsequent research has showed that by removing any of the assumptions (i)-(iii) above, profitability of the merger is restored. As for (i), Davidson and Deneckere (1985) showed that when goods are strategic complements rather than strategic substitutes, the initial price increase of the merger firms is followed by a price increase by the outsiders (see again Figure 1 above). Their case corresponds to the analysis we are carrying out here.

Assumption (ii) is very special, in that with homogenous goods and no capacity constraints, a merger between two firms is equivalent to one of them disappearing altogether from the industry. Clearly, this is not a realistic description of a merger, which consists of two firms which *combine* their assets. This can be reproduced in a product differentiation model like the one we are analysing. It could be showed that by assuming quantity competition, but allowing for enough differentiation among the products, profitability is restored.

As for point (iii), Perry and Porter (1985) have showed that even under the assumption of homogenous goods and quantity competition, it is enough to allow for the possibility that there exist efficiency gains for the merger to be profitable. They do so in a model where the merger amounts to the partners joining their respective capital assets, which in turn gives them the benefit of economies of scale. For an analysis with efficiency gains, see section 2.2.6 below.

In conclusion, it seems reasonable to expect that the merger increases the

partners' expected profits[15].

Lemma 3 *The merger increases outsiders' profits.*

Proof.

We know that $p_b < p_I$ and $p_b < p_o$. Using the same notation as in the previous Lemma, and given that the goods are demand substitutes, we have that for each of the outsiders $\pi_o(p_b, p_b) < \pi_o(p_I, p_b)$. Further, we know that the best response of each outsider to the price p_o chosen by the merging firm is $p_o > p_b$. Therefore, it must be $\pi_o(p_I, p_b) < \pi_o(p_I, p_o)$. This allows us to conclude that $\pi_o(p_b, p_b) < \pi_o(p_I, p_o)$. ■

This result does not depend on whether firms compete on prices or quantities, and hinges on the free-riding effect enjoyed by the outsiders: when the merging firms increase their prices (or reduce their output), they reduce a negative externality which affects negatively all the industry. The outsiders will therefore benefit from the merger.

We can now state the following:

Lemma 4 *The merger increases producer surplus.*

Proof.

It follows trivially from the fact that the merger increases both the profits of the merging firms and of the outsiders, as established by the previous remarks. ■

Lemma 5 *The merger reduces net welfare.*

Proof. See Appendix.

2.1.4 Quantitative techniques for merger analysis*

Consider an industry with n single product firms. We want first to derive the residual demand faced by one such a firm, and see how it can be used

[15] However, some empirical works have suggested that mergers are ex-post unprofitable. See section 3.2 below for a discussion.

to estimate its market power. We then extend this approach to estimate the market power created by a merger.[16]

Direct demand faced by a firm $i = 1, ..., n$ can be written as:

$$q_i = D_i \left(p_i, \mathbf{p}_{-i}, \mathbf{y} \right) \tag{18}$$

where bold faced letters indicate vectors and $-i$ refers to all other firms but i. The vector $\mathbf{y}$ denotes a vector of exogenous variables which affect demand. For each of the firms, the first order conditions of profit maximisation are:

$$p_i = R_i \left(\mathbf{p}_{-i}, \mathbf{y}, \mathbf{w}, c_i \right). \tag{19}$$

This implies that the vector of the best reply functions of all firms but i is given by:

$$\mathbf{p}_{-i} = R_{-i} \left(p_i, \mathbf{y}, \mathbf{w}, \mathbf{c}_i \right) \tag{20}$$

where $\mathbf{w}$ denotes industry-specific cost variables, $\mathbf{c}_{-i}$ denotes the vector of all the firm- specific cost variables apart from those specific to firm i. By substituting back into the direct demand, we obtain the residual demand function of a firm i, $q_i^r = D_i \left(p_i, \mathbf{p}_{-i} \left(p_i, \mathbf{y}, \mathbf{w}, \mathbf{c}_{-i} \right), \mathbf{y} \right)$or, more simply:[17]

$$q_i^r = D_i^r \left(p_i, \mathbf{w}, \mathbf{c}_{-i}, \mathbf{y} \right). \tag{21}$$

The own price elasticity of this residual demand function will be given by:

$$\epsilon_{ii}^r = -\frac{dq_i^r / q_i^r}{dp_i / p_i} = \epsilon_{ii} - \sum_{j \neq i}^{n} \epsilon_{ij} \eta_{ij}, \tag{22}$$

where $\epsilon_{ii} = -\frac{\partial q_i / q_i}{\partial p_i / p_i}$ is the own price elasticity of the (standard) demand function, $\epsilon_{ij} = \frac{\partial q_i / q_i}{\partial p_j / p_j}$ is the cross price elasticity between firm i and firm j and $\eta_{ij} = \frac{\partial p_j / p_j}{\partial p_i / p_i}$ is the elasticity of best reply functions, and measures by how much a rival j increases its price following a price increase by firm i.

[16] The use of residual demand elasticities as a method to measure market power of one or more firms is due to Baker and Bresnahan (1985, 1988). Our presentation here differs from theirs mainly because we adopt prices as the strategic variables of the firms, for consistency with the rest of this chapter.

[17] Note that this way of proceeding amounts to assuming that the firm whose residual demand function we build behaves as a Stackelberg leader.

The equation to be estimated would then take the form:

$$\ln q_i = \alpha_i + \beta_i \ln p_i + \sum_{s=1}^{S} \gamma_{is} y_s + \sum_{l=1}^{L} \mu_{il} w_l + \sum_{k \neq i}^{n} \delta_{ik} c_k + v_i, \tag{23}$$

where α is a constant; β gives the estimate of the residual demand elasticity[18]; γ_{is}, μ_{il}, δ_{ik}, are the parameters of demand, industry-wide costs and cost other than firm i; and v_i is the error term.

However, regressing (23) alone would not give a consistent estimator, as there is a problem of simultaneity between p_i and q_i which are jointly determined in the supply-demand system (they are both endogenous variables, and p_i appears at the right-hand side of the equation). We then have to specify a supply function for firm i. This supply function would be defined implicitly by the first order condition of profit maximisation, $q_i + p_i \partial q_i \left(p_i, \mathbf{p}_{-i}, \mathbf{y},\right) / \partial p_i \; - \; MC_i \left(p_i, \mathbf{p}_{-i}, \mathbf{y}, \mathbf{w}, c_i\right) \partial q_i \left(p_i, \mathbf{p}_{-i}, \mathbf{y},\right) / \partial p_i \; = \; 0$ (where MC_i is the marginal cost of firm i), which after substituting and eliminating redundancies will become:

$$q_i = S_i \left(p_i, \mathbf{y}, \mathbf{w}, \mathbf{c}_{-i}, c_i\right). \tag{24}$$

Given that our objective is to estimate the residual demand function 23, and that the only variable in the system which is not correlated with the residuals is the firm-specific cost c_i, we can use c_i as the instrument for the price p_i.

By doing so, we obtain an estimate of the residual demand elasticity of firm i which in turn is an estimate of its market power: the lower the estimated value of ϵ_{ii}^r the higher the market power of the firm.[19] Note that this method has the great advantage that it saves on the amount of information needed to estimate market power: instead of having to estimate all the cross elasticities and best reply elasticities, we just have to estimate an elasticity. In other words, the only firm level data we need are those on the price, quantity and firm-specific cost of the firm whose market power we are interested in.[20]

[18] Because $\frac{d \ln q_i}{d \ln p_i} = \frac{dq_i/q_i}{dp_i/p_i} = \epsilon_{ii}^r$.

[19] Recall that the Lerner index of firm i, which measures its ability to set prices above marginal costs, is given by $\frac{p_i - c}{p_i} = \frac{1}{\epsilon_{ii}^r}$.

[20] Possibly complemented by data which can summarise $\mathbf{c}_{-i}$.

The same method can be applied to the analysis of mergers, to estimate the joint market power possessed by two merging firms. Suppose for instance that we are interested in the likely impact of a merger between the first two firms, call them 1 and 2, in our industry of n firms. By proceeding in a similar way as above, one obtains the (partial) residual demand functions for firms $1, 2$ as:

$$q_i^{pr} = D_i^{pr}\left(p_1, p_2, \mathbf{w}, \mathbf{c}_{-1\&2}, \mathbf{y}\right), \qquad i = 1, 2, \tag{25}$$

which in logarithm becomes:

$$\ln q_i = \alpha_i + \beta_{ii} \ln p_i + \beta_{ij} \ln p_j + \sum_{s=1}^{S} \gamma_{is} y_s + \sum_{l=1}^{L} \mu_{il} w_l + \sum_{k=3}^{n} \delta_{ik} c_k + v_i, \quad i = 1, 2; i \neq j$$

The system is closed by the two supply equations:

$$q_i = S_i\left(p_1, p_2, \mathbf{y}, \mathbf{w}, \mathbf{c}_{-i}, c_i\right), \qquad i = 1, 2. \tag{26}$$

By using the firm specific cost variables c_1 and c_2 as instruments for p_1 and p_2, and jointly regressing the two partial residual demand curves 26, the coefficients β_{ii}, β_{ij} give an estimate of the partial residual demand elasticities $\epsilon_{ii}^{pr} = -\frac{dq_i^{pr}/q_i^{pr}}{dp_i/p_i}$ and $\epsilon_{ij}^{pr} = \frac{dq_i^{pr}/q_i^{pr}}{dp_j/p_j}$.[21]

These coefficients provide an estimate not only of the market power of each of the two firms, but also of how much the market power of, say, firm 1, is constrained by firm 2 (and vice versa). Note that the value $\left(\beta_{ii} - \beta_{ij}\right)$ gives an estimate of the market power that the merging firms will enjoy in the market, as the difference in these two coefficients tells us by how much the demand faced by firm i decreases if both p_1 and p_2 increase by the same percentage after the merger. The lower the estimated value of this difference, the higher the market power that the merging firms are likely to enjoy, and hence the more adverse effects of the merger (other things being equal, of course).

Exercise 3 *Consider the model described in section 2.1.3, where a merger would create a firm having m varieties which faces $n - m$ single product*

[21] Baker and Bresnahan (1985) estimate the partial residual demands jointly for the two firms by the method of three-stage least squares, to increase the power of the estimators. See Baker and Bresnahan (1985, pp.436-37)

firms. For simplicity consider the case where there are zero marginal costs, $c = 0$. (a) Find the residual demand function facing the firm which sells m varieties. (b) Show that as the number of product m increases the elasticity of its residual demand function decreases.

2.2 Efficiency gains

Efficiency gains are certainly a crucial variable in the analysis of the impact of mergers. We have showed above that in the absence of efficiency gains a merger would lead to lower consumer surplus and lower net welfare,[22] but it is well established in the economic literature that efficiency gains might offset the enhanced market power of merging firms and result in higher welfare[23]. This is because the merger might cause the insiders to be more efficient and save on their unit costs. If these savings are large enough, they will outweigh the increase in market power and result in lower prices, to the benefit of consumers. The technical part at the end of this section is devoted precisely to the formal analysis of the trade-off between market power and (possible) efficiency gains.

To better illustrate the opposite forces at work, consider again the example made in the previous section 2.1, where two or more stores in the same town merge. We have seen that the merger allows them to exercise market power. In the absence of efficiency gains, this means that the new chain store would find it profitable to charge higher prices. But consider now the case where the merger allows the partner stores to rationalise their activities, better organise their transportation network, bargain harder with suppliers, save on the duplication of promotions (such as coupons and special offers sent to consumers) and so forth. In this case, the merger allows for the chain store operations to be run more efficiently than before, so that savings in unit costs will occur.

The new merged firm might of course still increase its prices (its sales decreasing but its mark-up increasing both because of the price rise and of the lower costs). This strategy would certainly be profitable because we

[22] This result is likely to hold across different model specifications. One exception is the circumstance mentioned above, where firms compete on quantities and the merger firms have very small market shares.

[23] The first to point out that efficiency gains might offset enhanced market power was probably Williamson (1968). See also for a recent and elegant contribution which emphasises the role of efficiency gains, Farrell and Shapiro (1990)).

have seen it was so even in the absence of any cost saving. However, it is not necessarily optimal (that is, *the most profitable* strategy) any longer. Indeed, because of efficiency gains, another profitable strategy might now be to reduce prices and attract new consumers. For instance, in the case where prices and unit costs decreased proportionally, the unit mark-up would be exactly the same as before the merger, but total profits would be higher as lower prices increase the chain store's demand.

In general, therefore, with efficiency gains the merging firms has two possible ways to increase their profits: to increase prices (reduce sales), or to decrease prices (increase output). Which of these two ways is the most profitable cannot be said a priori, but the higher the efficiency gains the more likely the second effect dominates. The technical part of this section shows in formal terms that if efficiency gains are large enough then the insiders to the merger will decrease sales price and both consumer and total welfare will increase.

Finally, it should be noted that the impact of merger on the distribution of firms' profits might be very different when there are efficiency gains. Indeed, outsiders might lose from the merger, and thus oppose to it, when the merger allows insiders to cut their costs: intuitively, this is because the merger changes the competitivity of the firms in the industry, to the detriment of the outsiders.

2.2.1 The nature of efficiency gains, and their assessment.

Sofar, we have been rather vague about the sources of possible efficiency gains. There are several reasons why firms which combine their assets might decrease their costs. The most obvious are the existence of economies of scale and economies of scope. Due to a merger, firms might be able to reorganise their production so as to improve division of labour and attain economies of scale; or they might benefit from lower costs due to joint production. Other possible gains might come from synergies in research and development, rationalisation of distribution and marketing activities, cost savings in administration.

From the theoretical point of view, one would like to draw a distinction between cost savings that will directly affect variable production costs, such as economies of scale and economies of scope, and cost savings that mainly affect fixed costs. The former type of efficiency gains is likely to have a direct

impact on prices,[24] while the latter type would affect fixed costs and thus would not modify the first-order conditions of the equilibrium in the product market. In other words, savings on fixed (i.e. independent of the volume of production) costs would not affect market prices. Efficiency gains might still lead to a positive welfare effect of the merger, but this would only come from an increase in profits due to lower duplication of fixed costs, since consumer surplus would not change. If competition agencies attach a higher weight to consumer welfare, or competition laws require that some of the firms' gains should pass on to consumers, then efficiency gains which are mainly due to savings on fixed costs should be looked at less favourably.

The US Merger Guidelines come to a similar conclusion but for different reasons. Efficiencies derived from technical rationalisation are easier to demonstrate than efficiencies obtained in the reduction of administrative costs, personnel savings and other fixed outlays:

> "...efficiencies resulting from shifting production among facilities formerly owned separately, which enable the merging firms to reduce the marginal cost of production, are more likely to be susceptible to verification, merger-specific, and substantial, and are less likely to result from anticompetitive reductions in output. Other efficiencies, such as those relating to research and development, are potentially substantial but are generally less susceptible to verification and may be the result of anticompetitive output reductions. Yet others, such as those relating to procurement, management, or capital cost are less likely to be merger- specific or substantial, or may not be cognizable for other reasons" (U.S. DoJ and FTC, Horizontal Merger Guidelines, revised April 8, 1997, section 4).

This quotation also serves us to highlight some important points. First, efficiency arguments should be accepted only as long as costs savings achieved by the merger could not be achieved otherwise. If, for instance,the firms claimed that the merger would create efficiency gains because it would reduce personnel cost, one should really wonder if such cuts in personnel could not be done even without a merger. If not, efficiency gains are not merger specific and they should not be accepted as an afficiency defence of the merger, as they could be obtained without allowing a potentially anticompetitive operation like the merger.

[24] In the model we present in the technical section, such gains would result in a reduction in the efficiency parameter e.

Second, another important issue in the discussion of efficiency gains is the assessment of the likelihood of the gains from a merger. There is in general an issue of asymmetric information between a competition agency and the merging partners: the latter are clearly more informed about the structure of production and the functioning of the market than the former. When efficiency gains are a crucial determinant in an agency's decision on the prohibition or acceptance of the merger, it is clear that the merging partners have an incentive to overstate efficiency claims. On the other hand, and for opposite reasons, the rival firms which fear the merger could jeopardise their competitive positions might have an incentive to understate the efficiency gains of a merger. Agencies will therefore want to rely on independent studies to try and evaluate efficiency considerations.

The problem of the assessment of the efficiency gains is even more complicated by the fact that the merging partners often have a genuine tendency to overstate the benefits from combining their activities and assets. Expected gains from the merger often turn out to be much higher than the actual ones, merging firms not having properly taken into account the costs of rationalising production and management activities and having been too optimistic in the assessment of possible synergies. This has led to an interesting empirical literature discussing the issue of merger profitability.

2.2.2 Are mergers profitable?

A number of econometric studies have studied if mergers are profitable, but the empirical evidence is not conclusive.[25] As for possible explanations of why mergers might decrease combined profits of the merging firms, Mueller (1985) finds that takeovers are unprofitable due to a decline, rather than an increase in efficiency, which offsets the benefits of higher market power. Roll (1986) suggests that managers of bidding firms overestimate their ability to run other companies and this makes them pay overpay for their targets. Morck, Schleifer and Vishny (1990) suggest that merger unprofitability is due to a divergence between shareholders' and managers' objective functions: while the former care about profits, the latter are interested in size, growth or risk-diversification of the company they run. According to Faulí-Oller and Motta (1996) unprofitable mergers might occur not because managers are irrational or they pursue objectives other than profit maximisation, but

[25] See among the others Ravenscraft and Scherer (1987), Caves (1989), Frank, Harris and Titman (1991).

because owners (rationally) give them contracts which include incentives to increase the firm's size, to make them more aggressive in the marketplace. These contracts might have the side-effect of inducing managers to take rival firms over even when it is not profitable for the owners.

To summarise, it has not been established whether mergers are on average profitable, and if not, it is not clear for which reason managers would systematically make mistakes. However, this literature is useful in that it emphasises the risk of exaggerating the possible benefits form the mergers. Agencies should be aware that even strictly internal and confidential documents might report too optimistic an assessment of the merger efficiency gains.[26]

Mergers as managerial discipline On a similar line, one should also be cautious in considering the argument that takeovers might improve efficiency via the substitution of less able managers with more successful ones. As a matter of fact, empirical works do not seem to fully support the managerial discipline theory[27]. McGuckin and Nguyen (1995) find mixed results in their analysis of an unbalanced panel of some 28,000 plants for the period 1977-1987: on the one hand, a change in ownership is generally associated with the transfer of plants which have an above average productivity; on the other hand, after a change in ownership the plants which have been transferred do show a higher productivity than before. Matsusaka (1993) studies stock market response to acquisition announcements. He finds that the market responds positively to bidders who retain the management of target companies and negatively to bidders who replaced their management, thus suggesting that the market does not like takeovers which aim at disciplining the management of the target companies.

Finally, for those readers who are still convinced that mergers occur because they inherently bring efficiency gains, and are thus by their own nature beneficial to social welfare, it is worth noting the result of the empirical analysis on the US airline industry carried out by Kim and Singal (1993, AER).

[26] Of course, we are not suggesting that a competition agency should play the role of a consultant, and discouraging a merger which is not profitable for the companies involved. The evaluation of business projects of a firm is not a concern for competition agencies. However, as we have seen, the assessment of efficiency gains is important for welfare considerations.

[27] Apart from the following references, see also Scherer and Ross (1990, p. 162 and pp. 166-167)

They analyse data from the period 1985-1988, a period where the antitrust agency, in line with the philosophy of the Republican administration, did not contest mergers. The authors find that prices increase on the routes served by the merging firms relative to a control group of routes which have not been affected by the merger. The authors conclude that it may be that mergers result in more efficient operations, but even if this was so, efficiency gains have not been enough to outweigh the exercise of increased market power, the final effect having been an increase in prices.

2.2.3 Competition agencies' approach to efficiency gains.

To conclude, our analysis suggests that, however difficult a task, competition agencies which scrutinise mergers should carefully assess the likely efficiency gains of a merger, and try and estimate whether these efficiency gains are likely or not to offset the higher market power enjoyed by the merging firms.

This is precisely the approach indicated by the US Department of Justice, which

> "...will not challenge a merger if cognizable efficiencies are of a character and magnitude such that the merger is not likely to be anticompetitive in any relevant market. To make the requisite determination, the Agency considers whether cognizable efficiencies likely would be sufficient to reverse the merger's potential to harm consumers in the relevant market, e.g. by preventing price increases in that market. In conducting this analysis, the Agency will not simply compare the magnitude of the cognizable efficiencies with the magnitude of the likely harm to competition absent the efficiencies. The greater the potential adverse competitive effect of a merger (...) the greater must be cognizable efficiencies in order for the Agency to conclude that the merger will not have an anticompetitive effect in any relevant market. When the potential adverse competitive effect of a merger is likely to be particularly large, extraordinarily great cognizable efficiencies would be necessary to prevent the merger from being anticompetitive." (US Merger Guidelines, revised April 8, 1997, section 4).

The EC Commission has a quite more ambiguous approach towards efficiency gains. By looking at the wording of the Merger Regulation No. 4064/89 one cannot say that an efficiency defence is explicitly allowed, but neither that this is ruled out. Art 1.1(b) says that in its appraisal of the

merger, the Commission shall take into account, among other things "...the interests of the intermediate and ultimate consumers, and the development of technical and economic progress provided that it is to consumers' advantage and does not form an obstacle to competition."

Jacquemin (1990, p.36) argues that the phrasing means that efficiency gains can be taken into account *only in so far as the merger does not form an obstacle to competition*. In other words, he excludes that an efficiency defence can be used in EC merger control.

The legislative history of the Merger Regulation has sometimes been mentioned as supporting the view that there exists no efficiency defence in the EC competition law. This is because in a previous draft of the Regulation a sentence which would have allowed for some efficiency defence has been suppressed from the final text, allegedly showing explicit intention of the legislators not to allow for such a defence. However, the legislators wanted in our opinion to exclude not an efficiency defence argument in general, but rather the possibility that it could be used to support industrial policy arguments. Some countries, such as France, wanted to allow mergers which could have created "national champions". This view was successfully opposed by countries such as the UK and Germany, which wanted to rule out the possibility that anticompetitive mergers could have been approved on the grounds that they could have strengthened European firms in the international marketplace. [28] Therefore, what the "travaux préparatoirs" of the Merger Regulation show is that social, political and industrial policy arguments may not be used in the assessment of mergers. Since we have seen that efficiency gains are a key aspect in determining the *economic welfare* impact of mergers, we can see no contradiction between the spirit of the legislators and the use of an efficiency defence.

Sofar, the EC Commission in its decisions has not explicitly ruled out the possibility of using an efficiency defence, but nor has it showed much sympathy for such an argument. Whenever cost reductions have been claimed by the merging parties, the Commission has dismissed those claims on various grounds[29]. The most interesting decision in this respect is Aérospatiale-Alenia/DeHavilland, where the Commission argued that the cost savings would have been negligible, had not been properly quantified, were not

[28] See Noel (1997, p. 503) and Goyder (1993).

[29] See Noel (1997, pp 512-514). Among the cases where the defendants have raised efficiency considerations are: Aérospatiale-Alenia/De Havilland, Accor/Wagon-Lits, MSG/Media Services, Mercedes-Benz/Kassbohrer.

merger-specific (as they could have been attained without the need of a concentration) and would have not gone in any case to consumers' advantage.[30]

2.2.4 Efficiency offence?

More puzzling is the fact that the Commission has sometimes used possible cost reductions as an argument *against* the merger. This occurred in particular in the AT&T/NCR case.[31] "Efficiency offence" arguments had previously been used in early US merger cases, such as the Brown Shoe 1962 case, but have been abandoned in the US as soon as economic efficiency has been established as the main objective of competition law. An efficiency offence argument seems to be compatible only with the objective of "protecting competitors" rather than "protecting competition" and therefore should be dismissed from merger control.

We have extended the model used to deal with efficiency gains in section 2.2.7, where we have formally considered a slightly more sophisticated possibility, namely that efficiency gains could give such a competitive advantage to the merging parties that (i) the rival firms would go out of the market and (ii) the net effect on welfare is negative. Our formal analysis below shows that it is *theoretically* possible that both circumstances occur at the same time, which would offer some sort of rationale for an efficiency offence argument.

However, it should be stressed such a possibility is quite a remote one, for many reasons. First, an extremely high level of efficiency gain should be created by the merger for all the remaining competitors to be put out of the industry; second, even in that unlikely event, the effect on welfare might still be positive; third, too strong assumptions (such as perfect symmetry, impossibility of the rivals to react by engaging in a similar merger, no capacity constraints) should be made to obtain the result that considerable efficiency gains might ultimately lead to rivals exit the industry *and* welfare to be reduced.[32]

[30] Case IV/M.053 (October 2, 1991), OJ L334/42, 1991, at 65.

[31] Case IV/M.050 (18 January 1991). See also Noel (1997, p. 512) and Neven, Nuttall and Seabright (1993, p.62).

[32] An even more sophisticated argument is that a merger might result in the merging firms to have a higher potential for predating the rival firms. This might be the case, for instance, if the merger creates a firm with such a long purse that it could later try to use it to push rivals out of the market (see Cestone and Fumagalli, mimeo). However, it is not clear that it is the merger regulation which should prevent predation from occurring: one

2.2.5 Efficiency gains: conclusions

In this section we have argued that efficiency gains are a crucial component to the understanding of the welfare effects of mergers. While the US Merger Guidelines have recognised explicitly the role of efficiency gains and given some leads as to how evaluate them, the EC Commission's treatment of efficiency considerations in the appraisal of mergers has been substantially more ambiguous. First, it is debatable whether the EU Merger Regulation allows for efficiency gains to be taken into account (we have argued that it does, but some commentators would differ). Second, in few circumstances, admittedly (and fortunately) at the beginning of the history of the EU review of mergers, efficiency gains have been treated as a "minus" rather than a "plus" in the merger appraisal, as cost efficiencies reached by merger insiders would have "hurt" their rivals.

Our analysis therefore strongly recommends that the EC Commission take into proper consideration the key role played by cost reductions in determining the net welfare effect of mergers. Otherwise, all the merger policy would be distorted and would not respond to the objective of increasing either consumer welfare or overall economic efficiency. A simple example should suffice to illustrate this point. Imagine that two firms in a given industry wanted to merge their activities. The two firms do not have any rival in the market and they are going to be a monopolist. But imagine also that it is unquestionable that the merger would entail such efficiency gains that, however cautious the estimates of the pricing behaviour of the firms, consumers would benefit from lower post-merger prices. This is a merger which would benefit consumers, but the failure to consider efficiency considerations, and the fact that it would create a dominant firm, will imply that this operation should be prohibited by the EU authorities.[33]

The EU Merger Regulation is therefore source of rather inefficient biases. On the one hand, restricting attention to mergers which create dominance

could argue in this case that there exist already antitrust laws which deal with attempts to monopolise and abuse of dominant position.

[33] To make our argument stronger and clearer, we are condidering in this example a very extreme case of merger, which increases total welfare because it increases both consumer surplus and producer surplus. But a merger might increase total welfare even in the case where consumer surplus decreases, provided that the increase in producer surplus outweighs the negative effect on consumers. The latter case would be however less straightforward if one takes into account that some regulators tend to give a larger weight to consumers than firms (profits) in antitrust enforcement.

implies that some welfare detrimental mergers might be approved. This is the case, for instance, when a merger will leave few firms operating in the industry, but none of these firms is dominant (and all together are not joint dominant, that is, it is unlikely they would collude). This merger increases prices, but lack of dominance implies it cannot be challenged. On the other hand, failure to account for efficiency considerations will result in beneficial mergers being blocked by the EU authorities. It is therefore imperative for the EU Commission either to interpret the Merger Regulation in a looser way, or to rewrite it to have more freedom in its merger policy, which should be pursuing only efficiency objectives.

2.2.6 Efficiency gains from mergers*

In this section, we illustrate how efficiency gains matter in merger analysis. For simplicity, we restrict our attention to the case where before the merger all firms are single-product firms and the merger creates a firm which sells two products, all outsiders still selling one product only.

The pre-merger case has already been analysed above in section 2.1, for the case where $m = 1$: equilibrium prices, quantities and profits are given by expressions (9), (10), (11) above.

A merger between two firms[34] creates a larger firm which will own and sell two product varieties. Unlike in section 2.1, we consider here the possibility that by combining their assets, the merging firms might gain in efficiency with respect to the single-product firms. For instance, there might exist scope economies which allow a firm to produce at a lower unit cost once the production of more varieties is combined. We model such cost savings by assuming that the merged entity will be able to operate at a unit cost ec, with $e \leq 1$. The lower the parameter e, the higher the efficiency gains entailed by the merger. In other words, the proportion of costs saved by the merger is $(1-e)\%$. Our discussion of the effects of the mergers will hinge on the role of parameter e, which is exogenously given. We shall show, among other things, that a merger is the more likely to be welfare improving the higher the efficiency gains created by the merger.

To find the industry equilibrium after a merger between the first two firms ($I = 1, 2$), write the (per-variety) profit functions of the merging firms (insiders) and of each of the outsiders as follows:

[34]The analysis could be extended to consider mergers between m firms, but we would lose in simplicity and not gain any further insights by doing so.

$$\pi_I = \frac{(p_I - ec)}{n}\left(v - p_I(1+\gamma) + \frac{\gamma}{n}\left(2p_I + \sum_{i=3}^{n} p_i\right)\right), \quad I = 1,2 \tag{27}$$

$$\pi_j = \frac{(p_j - c)}{n}\left(v - p_j(1+\gamma) + \frac{\gamma}{n}\left(2p_I + p_j + \sum_{\substack{i=3 \\ i\neq j}}^{n} p_i\right)\right), \quad j = 3,..,n \tag{28}$$

where we have used the fact that the (symmetric) products of the merging firm will be sold at the same price $p_1 = p_2 = p_I$. Once imposing symmetry on the outsiders, so that $p_i = p_j = p_o$, the first-order conditions associated to the maximisation problem of each firm are given by:

$$\begin{cases} v + ec\left(1+\gamma-\frac{2\gamma}{n}\right) + \frac{\gamma(n-2)p_o}{n} - 2p_I\left(1+\gamma-\frac{2\gamma}{n}\right) = 0 \\ v + c\left(1+\gamma-\frac{\gamma}{n}\right) + \frac{2\gamma p_I}{n} - p_o\left(2\left(1+\gamma-\frac{\gamma}{n}\right) - \frac{\gamma(n-3)}{n}\right) = 0 \end{cases} \tag{29}$$

By solving the system above in p_o and p_I, one obtains the equilibrium prices after the merger as:

$$p_I = \frac{c\left((n-2)(en+n+e-1)\gamma^2 + n(3en-3e-2)\gamma + 2en^2\right) + nv(2n+(2n-1)\gamma)}{2n((n-2)\gamma^2 + 3(n-1)\gamma + 2n)}, \tag{30}$$

$$p_o = \frac{c(n+(n-2)\gamma)(n+(n-1+e)\gamma) + nv(n+(n-1)\gamma)}{n((n-2)\gamma^2 + 3(n-1)\gamma + 2n)}. \tag{31}$$

After substituting, one obtains the per-product profit of the merged firm and the outsiders as:

$$\pi_I = (n+(n-2)\gamma)\left(\frac{c\left((1-e)(2-3n+n^2)\gamma^2 + n(n-2-3e(n-1))\gamma - 2en^2\right) + nv(2n+(2n-1)\gamma)}{2n((n-2)\gamma^2+3(n-1)\gamma+2n)}\right)^2, \tag{32}$$

$$\pi_o = (n+(n-1)\gamma)\left(\frac{-c\left((1-e)(n-2)\gamma^2 + n(n-e)\gamma + n^2\right) + nv(n+(n-1)\gamma)}{2n((n-2)\gamma^2+3(n-1)\gamma+2n)}\right)^2. \tag{33}$$

Our objective is now to find what are the effects of the merger on consumer surplus, firms' profits and net welfare, using as the benchmark the equilibrium solutions in the industry before the merger.

We examine each of these effects in the following subsections, under the assumption that the merger does not reduce the number of products which are sold in the market (we shall analyse in section 2.2.7 below what happens when this assumption does not hold).

The merger effect on consumer surplus. The following remark gives a necessary and sufficient condition for the merger to benefit consumers.

Lemma 6 *The merger is beneficial to consumers if and only if it involves enough efficiency gains, i.e. if and only if:*

$$e \leq \bar{e} \equiv \frac{c\left(\left(n^2-3n+2\right)\gamma^2+n\left(3n-4\right)\gamma+2n^2\right)-nv\gamma}{c\left(n+(n-2)\gamma\right)\left(2n+(n-1)\gamma\right)}. \tag{34}$$

Proof.

Since we are considering the case where all the products are sold before and after the merger, a sufficient condition for consumers to be better off with the merger is that prices of all the products are lower after the merger. However, it turns out that the condition for which $p_o \leq p_b$ coincides with the condition for which $p_I \leq p_b$, both of them requiring that $e \leq \bar{e}$. This implies that the condition is both necessary and sufficient. It is easy to check it is the case by doing some simple but tedious algebra. Write $\Delta p_o(e) = p_o(e) - p_{b.}$ The inequality $\Delta p_o(e) \leq 0$ is satisfied only by $e \leq \bar{e}$. Likewise, one can check that $\Delta p_I(e) = p_I(e) - p_b \leq 0$ is also solved only by $e \leq \bar{e}$. ■

The Lemma above can be read as follows. First, consumers will benefit from the merger only if it decreases prices. Second, prices decrease only if there are enough efficiency gains.

Note also that $\bar{e} < 1$ can be rewritten as $-n\gamma(v-c) < 0$. This implies that a merger which does not entail any efficiency gain (that is, a merger such that $e = 1$) will always increase prices and thus will never improve consumer surplus. This confirms the result already obtained in section 2.1.3.

[INSERT FIGURE 3: STRATEGIC COMPLEMENTS]

Figure 3 shows the effect of the merger in a graphical way. A merger with no efficiency gains shifts upwards the reaction function for the products of the merging firms (from R_I to R_I') resulting in higher equilibrium prices. However, efficiency gains tend to shift the insiders' reaction function downwards, so that with enough efficiency gains (eg., efficiency gains corresponding to a function R_I'') the post-merger equilibrium prices can be lower than the pre-merger ones. (See also exercise 4.)

It is only if there are efficiency gains that this tendency to increase prices can be reversed. On the one hand, insiders would still have an incentive to raise prices. On the other hand, if there exist efficiency gains, lower costs would tend to push their prices downwards (and being the products strategic complements, to push all the prices downwards). Whether the net effect is positive or negative, it depends on the size of the efficiency gains, as the Lemma makes it explicit.

The minimum level of efficiency gains required for consumers to gain from the merger is not a monotonic function of the degree of product differentiation in the industry [35]. The reader can check that $\frac{\partial \bar{e}}{\partial \gamma} \geq 0$ for $\gamma \geq \frac{\sqrt{2}n}{\sqrt{n^2-3n+2}}$. In other words, we cannot arrive at an unambiguous conclusion as to whether the merger is more likely to be improving consumer's utility (for any given level of efficiency gain) when product differentiation is higher or smaller. However, we should stress that in our model all the products are perfectly symmetric. Levy and Reitzes (1992) analyse a model with localised competition and prove the intuitive result that market power increases more when the merging firms sell neighbouring products. The US Merger Guidelines (2.2) recognise this point. See also Ordover and Willig (1993, pp.146-7).

The role played by the number of firms is more straightforward. The reader can check that $\frac{\partial \bar{e}}{\partial n} > 0$. The higher the number of firms the smaller the efficiency gains that are required to raise consumer surplus: since the critical value $\bar{e}$ increases, it is easier that the condition $e \leq \bar{e}$ be satisfied. In the extreme case where there exists an infinite number of firms in the industry, it is enough a small efficiency gain to have a decrease in prices: $\lim_{n\to\infty} \bar{e} = 1$. When a large number of firms operate in the industry, the extent to which prices increase after the merger between two of them is much reduced. Each firm internalises the externality on the price of the partner, but with a much larger number of outsiders the effect of the merger on prices becomes very marginal, and a lower efficiency gain can outweigh this negative effect.

[35] Note that $\lim_{\gamma\to\infty} \bar{e} = 1$. However, one cannot say that when goods are homogenous even a small efficiency gain would result in a price decrease. In fact, this section is based on the assumption that all the products are still sold after the merger. With homogenous goods and Bertrand competition, a small efficiency gain would put all the outsiders out of the market, which contradicts the assumption. See the next technical section for teh case where this assumption does not hold.

At the other extreme of the spectrum, $\lim_{\gamma\to 0} \bar{e} = 1$. In this circumstance, a merger would not add anything to the monopoly power of the firms, and even a small reduction in costs would make consumers better off.

At the other extreme, when there are only two firms in the industry the merger will create a monopoly and thus result in the maximal increase in market power: only extremely high efficiency gains might in principle outweigh the negative welfare effect due to higher prices.

This strengthens the rationale for challenging mergers which occur in a more concentrated industry (see above, section **??**).

The impact of the merger on producer surplus. Let us now look at the effect of the merger on the firms' profits, keeping our assumption that the merger does not force output of the non-deviating firms below zero. We shall show that the overall producer surplus always rises after the merger, because insiders always gain from the merger and such gains outweigh the possible losses made by outsiders when there are big enough efficiency gains. To do so, we move in successive steps.

The first step is to study the impact of the merger on the insiders' profits. In the price-competition setting we are analysing, the firms which undertake the merger always gain from it, independently of the efficiency gains, as the following remark states.

Remark 1 *A merger always benefits the merging firms.*

Proof.

Recall that even without efficiency gains, a merger is profitable for the merging firms (see Lemma 2). This implies that $\Delta_{Ib}(e) \equiv 2\left(\pi_I(e) - \pi_b\right) > 0$ for $e = 1$. Next, it can be checked that the function $\Delta_{Ib}(e)$ is convex:

$$\frac{\partial^2 \Delta_{Ib}}{\partial e^2} = \frac{c^2\left(n + (n-2)\gamma\right)\left(3n(n-1)\gamma + 2n^2 + (n^2 - 3n + 2)\gamma\right)^2}{n^4\left((n-2)\gamma^2 + 3(n-1)\gamma + 2n\right)^2} > 0, \quad (35)$$

To make sure that Δ_{Ib} is always positive we just need to check that the first derivative does not change sign on this domain. Since $\frac{\partial \Delta_{Ib}}{\partial e}(\bar{e}) < 0$, this amounts to checking that $\frac{\partial \Delta_{Ib}}{\partial e}(e = 1)$ is negative. Some algebra shows that:

$$\frac{\partial \Delta_{Ib}}{\partial e}(e = 1) = -\frac{c(v-c)(n+\gamma(n-2))\left(2n^2+3n(n-1)\gamma+(n^2-3n+2)\gamma^2\right)\left(2n^2+n(2n-1)\gamma\right)}{n^4((n-2)\gamma^2+3(n-1)\gamma+2n)^2} < 0. \quad (36)$$

The lower e (the stronger efficiency gains) the more profitable the merger. This completes the proof that the merging firms always gain from the merger. ■

The next step is to show that the merger always benefits the outsiders unless there are high enough efficiency gains for the merging firms.

Remark 2 *The merger increases outsiders' profits if efficiency gains are small enough, i.e. if* $e > \bar{e}$*:*

Proof.

We know from section 2.1.3 that if there are no efficiency gains, the outsiders gain from the merger: $\pi_o(p_b, p_b) < \pi_o(p_I, p_o)$, for $e = 1$. The next step is to define the function $\Delta_{bo}(e) \equiv (n-2)(\pi_b - \pi_o(e))$, whose sign will tell us whether outsiders gain from the merger. First, note that $\Delta_{bo}(\bar{e}) = 0$. When $e = \bar{e}$ we have $p_o = p_I = p_b$. Therefore, it must be also that $q_o = q_I = q_b$. This implies that $\pi_o = (p_o - c)q_o = (p_b - c)q_b = \pi_b$, since the merger does not affect production costs of the outsiders. Finally, it is easy to see that while π_b is not a function of e, the function $\pi_o(e)$ increases with e. Hence, $\Delta_{bo}(e)$ is decreasing on its domain. Therefore, $\pi_b \leq \pi_o(e)$ for $e \geq \bar{e}$. ■

This Lemma states that only if there are important cost reductions achieved by the merging firms will the outsiders lose from the merger. This result does not depend on whether firms compete on prices or quantities, and hinges on the free-riding effect enjoyed by the outsiders: when the merging firms increase their prices (or reduce their output), they reduce a negative externality which affects negatively all the industry. The outsiders will therefore benefit from the merger, unless the merger also brings a competitive advantage to the insiders.

We can now state the following proposition, which establishes that despite the outsiders might lose from the merger (if there exist important efficient gains for the merging partners), the additional profit gains made by the insiders outweigh the lower profits made by the outsiders.

Lemma 7 *The merger always increases producer surplus.*

Proof. See appendix.

The net welfare effect of mergers We can now look at the overall effect of the merger upon welfare, and establish the following sufficient condition:

Lemma 8 *The merger improves net welfare if it involves enough efficiency gains, i.e. if:*

$$e \leq \bar{e} \equiv \frac{c\left(\left(n^2-3n+2\right)\gamma^2+n\left(3n-4\right)\gamma+2n^2\right)-nv\gamma}{c\left(n+(n-2)\gamma\right)\left(2n+(n-1)\gamma\right)}.$$

Proof. A sufficient (but not necessary) condition for welfare to increase with the merger, is that both consumer surplus and producer surplus increase. The two Lemmata above have showed that for $e \leq \bar{e}$ consumers gain and aggregate profits also rise. Therefore, welfare increase in this interval. ■

This concludes our technical treatment of efficiency gains.

2.2.7 Efficiency offence: When the merger leads to exit of the outsiders.*

Sofar, we have considered the case where all the firms continue to sell after the merger. Nevertheless, it is conceivable that the merger, by making the merging partners more efficient with respect to the outsiders, might allow the former to push some of the latter firms out of the market. By using the extremely simple framework set up in section 2.2.6 above, we now analyse this possibility and its implications.

In order for the outsiders not to sell anything after the merger, it must be that $q_o \leq 0$. The quantity sold by the outsiders is given by equation (15), and it is easy to see that the merger leads to the merging firms to be the only seller if:

$$e \leq e_{ex} = \frac{c\left(n^2(1+\gamma)+(n-2)\gamma^2\right)-n\left(n+(n-1)\gamma\right)v}{c\gamma\left(n+(n-2)\gamma\right)}. \tag{37}$$

In other words, if the merging entity manages to become so efficient that its costs are reduced by more than $(1-e_{ex})\%$, then it will be the only firm in the industry. First of all, it should be noticed that, even theoretically, it is not always possible to reach enough efficiency gains to force the other firms out of the industry. Indeed, it can be easily checked that e_{ex} is negative when n is large enough and when γ is small enough, implying that if the industry is very fragmented and products are imperfect substitutes the merger will never result in outsiders exiting the industry, even in case of important efficiency gains for the insiders. It is also straightforward to see that $\frac{\partial e_{ex}}{\partial n} < 0$, and that $\frac{\partial e_{ex}}{\partial \gamma} > 0$. Therefore, the larger the number of firms the more difficult to evict the other firms from the market, while the more substitutable the

goods the easier to make the other firms exit the industry for any given level of efficiency gains. In the extreme case where the goods are perfectly homogenous, it is enough a marginal cost improvement to force the other firms out of the industry ($\lim_{\gamma \to \infty} e_{ex} = 1$).

When the merged firm is the only one left in the market, it will charge the monopoly price $p_m = (ec + v)/2$ for each variety. It is easy to check that the welfare level attained in this situation is given by:

$$W_M = \frac{3(v - ec)^2}{8}. \tag{38}$$

The merger is beneficial to society as a whole if $W_M > W_b$, where the latter indicates the welfare level before the merger and is given by $W_b = \frac{\left(\gamma^2(n-1)^2+4\gamma n(n-1)+3n^2\right)(v-c)^2}{2(2n+(n-1)\gamma)^2}$. It can be shown that $W_M > W_b$ if:[36]

$$e \leq e_w = \frac{v}{c} - \frac{2\sqrt{3n^2 + 4n(n-1)\gamma + (n-1)^2\gamma^2}}{\sqrt{3}c\,(n + (n-1)\gamma)}. \tag{39}$$

It can be checked that $\partial e_w/\partial \gamma < 0$ and $\partial e_w/\partial n < 0$. This means that the more substitutable the products and the larger the number of firms, the more difficult that a merger which gives rise to a (two-product) monopoly would be welfare improving. The reason behind this result is that a higher number of firms or less differentiated goods make the before-the-merger welfare level higher, due to stronger competition in the market.

Figure 4 helps understand the effects of a merger which gives rise to a monopoly of the merging firms (i.e., where $e < e_{ex}$). There exist two different possibilities:

- $e_w < e < e_{ex}$. In this case, the efficiency gain is enough for the merging firms to be the only seller, but its monopoly power goes to the detriment of consumers and total welfare.

- $e < e_w < e_{ex}$. In this case, the merger creates such an efficient firm that the lack of competition in the market is more than outweighed by the efficiency gains. Total welfare rises as a result.

[INSERT FIGURE 4: EFFICIENCY LEVELS]

[36] The second root of the associated equation is higher than one, and therefore it should be discarded.

In other words, even if the merger gave rise to a monopoly, it would not be possible to conclude that this is necessarily leading to a welfare loss, since the very same efficiency gains which oblige the rival firms to exit the market might benefit the consumers.

To better interpret the results obtained, we should consider that the example we have set up here is somehow extreme, for at least three important reasons. First of all, we are not considering possible capacity constraints, since we are implicitly saying that two merging firms have enough capacity to supply all the market demand which would have been supplied by n firms before the merger. This is a very strong assumption, which makes it possible for a single firm to cover all the market.

Second, symmetry between the rivals also biases the result strongly. When one outsider goes out of the market, all the outsiders also cease production. As a result, strong enough efficiency gains lead to monopoly by the merging firm, which in turn creates strong monopoly power and worsens welfare. In a more sophisticated model, one would like to assume a range of production costs for the outsiders, with some of them being forced out of the market by the merger efficiency gains, and some others not. The welfare impact of the merger would then be less adverse. In fact, it might lead to a more efficient outcome, made it possible by the shut down of the less efficient competitors.

Further, the model we are dealing with here is a static model, where outsiders are not allowed to react to a firm's merger. But if a merger leads to such high efficiency gains, it should be expected that the rivals would merge too. This would call for a more complete model where the number of mergers should be determined endogenously, something beyond the scope of the present work.[37]

To summarise, it seems fair to conclude that the possibility that a merger which entails efficiency gains might decrease welfare by forcing out most or all of the competitors seems unlikely, as it can be obtained only as the result of very strong assumptions.

2.3 Other variables which affect merger effects

Our discussion of the effects of a merger would be incomplete if we did not consider other important circumstances which determine the sign and

[37] There exists a small literature on endogenous mergers, which has been initiated by Kamien and Zang (1990, 1991). See also Horn and Persson (1996).

strength of such effects. In particular, three items which deserve consideration are: (1) The likelihood that firms which have sofar not operated in the sector could enter it after the merger: the easier and less costly entry the lower the market power which will be enjoyed by the merging firms. (2) The importance of the buyers: it is often argued (but we shall see that the claim is not unambiguously correct) that the stronger the power of purchasers the lower the market power after the merger, strong buyers supposedly constraining the market power of the (merging) sellers. (3) A merger might consist of a firm which is taking over a rival whose days in the business are counted anyhow. In this case, the acquisition of assets which might otherwise be liquidated at scrap value might enhance efficiency while the fact that the acquired firm was going to exit the industry implies that market power would not be modified by the merger. This is the so called failing firm defence.

2.3.1 Entry

The capacity of firms to raise prices after a merger (whether unilaterally of because of collusion) is limited by the existence of potential entrants in the industry. Firms which would find it unprofitable to enter the industry at pre-merger prices might decide to enter if the merger brings about higher prices or lower quantities[38]. By anticipating this effect, post-merger prices might not rise at all; or, if they do, the price increase would be transitory. After the potential entrants do actually become market participants, prices would decrease toward the pre-merger level (or possibly even further).

The importance of analysing entry opportunities in merger investigations is without doubt been underlined by the theory of contestable markets. As we have seen in chapter 2 (*the chapter on market power), the ability of a firm to exploit its market power is limited by the presence of other firms which would be attracted into the industry by high prices. Potential entrants restrain the power of setting high prices. As discussed in chapter 2 (*), the more extreme consequences of the the theory of contestable markets[39] are unlikely to be realistic: the existence of fixed sunk costs that firms have to commit in order to produce and sell in a new market is not to be understimated, and limits

[38] Entry might also take the form of imports from abroad. If after a merger prices rise, foreign firms' competitiveness increase. As a result, imports might discipline the market in the same way as local entrants.

[39] The extreme version of that theory maintains that monopolistic firms would sell at average costs, and therefore would not result in inefficiencies. See section *.*.

actual entry. Nevertheless, entry does prevent existing firms from setting too high prices. The extent to which potential entrants restrain market power of actual industry participants crucially depends on fixed sunk costs. The larger (and the more sunk, i.e. committed to the industry and not recoverable) the costs that an entrant has to incur the higher the scope for price increase.

As often is the case, the evaluation of the likelihood of entry involves a lot of difficulties. Antitrust authorities will have to judge whether there are firms which might consider entry, how likely they are to do so, what are the possibile barriers [40]they face and how long it might take for entry to be accomplished (the more it takes the higher the damage to consumers and social welfare). This is recognised by both the EC Commission and the US Department of Justice (see for instance Merger Guidelines, section 3)[41].

2.3.2 Entry: outline of a formal analysis*

We can understand the role entry plays in determining the welfare effects of a merger by extending the model we presented in section 2. It is not our intention here to develop a full study of the effects of entry but rather to indicate the main ingredients of the analysis through a very streamlined setting.

Consider a two-stage game where first firms decide on entry and then compete in prices. If firms enter, they have to pay a fixed sunk cost F. The rest of the model is like the one presented above in this same section.

In the absence of a merger, each firm will decide to enter anticipating the outcome of product market competition, that is of the price game. Therefore, the number of firms in the industry will be endogenously determined by the

[40]Barriers to entry can be of very different nature. They might be technological (know-how to be learned, but also patents might protect the existing firms), administrative (e.g. when government licenses or permits are needed to operate), linked to the financial market (firms might have problems in obtaining financing for the new venture), and so on. In many circumstances, consumer preferences might also be an obstacle, as when the existing market participants have built brand consciousness and loyalty throughout the years, and an entrant should invest heavily in advertising to win the confidence of the consumers. Switching costs of various nature might also be an important obstacle to new entrants.

[41]The US guidelines distinguish between committed and non-committed entrants. The former are firms which have to invest in new production capacity or market distribution and for this reason have to commit resources to the industry. The latter are firms which can switch quickly (within one year) from their existing production and the market in consideration without significant costs of entry and exit.

solution of the free entry condition[42]:

$$\pi_b(n) - F = 0, \tag{40}$$

where π_b are the non-cooperative (Nash) profits and n is the number of firms[43]. Call n^b the number of firms which solves the above equation.

In an industry where there is a firm which has two products (that is, where two firms merge), the insiders receive profits $\pi_I(n, e)$ and the outsiders profits $\pi_o(n, e)$. (The exact expressions are given above, in equation * and *.) The number of firms which will coexist in this industry is given by:

$$\pi_o(n, e) - F = 0,$$

Call n^o the number of firms which solves the above equation. It is clear that $n^o \geq n^b$ if and only if $\pi_o(n, e) \geq \pi_b(n)$. In turn, this occurs if $1 \geq e \geq \bar{e}$ (see Lemma 2), that is if efficiency gains are not too strong. The intuition is that if the merging firms get more efficient (e decreases, so that their costs are lower than outsiders' costs), they will decrease rather than increase their market price, and this will make entry more difficult, rather than easier.

The effect on prices and consumer surplus will therefore depend on the number of actual entrants and the extent to which efficiency gains occur (the latter affecting the former). If the merger attracts entry into the industry, so that $n^o \geq n^b$, the final effect on prices will be less strong than in the case no entry is possible: $p_o(n^o, e) \leq p_o\left(n^b, e\right)$, and $p_I(n^o, e) \leq p_I\left(n^b, e\right)$. Also, consumers would benefit from additional variety, which would also reduce the negative effect of the merger.[44]

[42]The condition is obtained in the case of the number of firms n being a continuous variable. If n is discrete, the free entry condition is given by: $\pi_b(n) - F \geq 0$; $\pi_b(n+1) - F < 0$.

[43]Strictly speaking the profit functions also depend on v, c, γ, all being parameters defined in section 2. Since we focus on the number of firms and these three parameters are exogenously given and not affected by mergers, we overlook them in what follows.

[44]It might also be conceivable that welfare after a merger followed by new entry is higher than its pre-merger level (see for instance Luis Cabral, 1998). However, we expect it to be unlikely in general circumstances: If entry reduced prices in a considerable way, this would undermine the profitability of the merger, which would not be carried out.

In a recent decision (see NERA, Global antitrust weekly number 26, 9-15 April 1999) the Bundeskartellamt approved an operation through which Kirch became a monopolist in the German Pay TV market. "The BKA argued that the withdrawal of competitors would create more opportunities for new entrants to enter the German market. The BKA

To conclude, this shows that if potential entrants are likely to enter after the merger, then the negative effects of the merger are likely to be reduced.

2.3.3 Power of the buyers

The merging firms' ability to charge high prices also depends on the degree of concentration of the buyers. A firm is clearly more free to exert market power if it faces a large number of dispersed consumers or buyers than if it faces one or few strong buyers[45]. A strong buyer can make use of its bargaining power to stimulate competition among the sellers, either by threatening to withdraw orders from one seller to give them to another, or by threatening to start upstream production itself[46].

Because of coordination problems, entry into the sellers' industry by new firms can also be easier when buyers are concentrated. Imagine for instance a situation where the merger creates a monopolistic firm (the reasoning would be similar if there are few sellers), and that potential entrants would have to make a considerable sunk investment to be able to operate in this market. If buyers are dispersed, and potential entrants have similar cost levels, orders are likely to be distributed across sellers. Winning orders from a few buyers might not be enough to justify this investment, and as a result no new firm might enter the industry, even though each potential entrant is more efficient than the monopolist. Because buyers are not coordinating in the decision of which seller to select, they might end up with having the monopolist as only seller in the industry, and hence face much higher bills than if entry had occurred. When instead there is just a single buyer (or all the buyers coordinate), then it will give its order to one of the entrant and this will be able to enter the industry. (See below for a brief formal exposition of this argument.)

Several empirical works have tried to test the countervailing power hy-

would ensure that there would not be any barriers to entry."

[It would be interesting to see this decision!]

[45] Galbraith (1952) is probably the first author who has argued that countervailing power of buyers can considerably restrain the market power of sellers.

[46] See Scherer and Ross (1990, chapter 14) for a discussion and a number of examples. An interesting case is in particular when a buyer produces itself a part of the inputs it needs (tapered integration). This makes it more credible to switch from suppliers to internal production and has the additional advantage of giving the buyer information about the cost of production in the upstream industry, information which can be very useful in the price negotiations.

pothesis, and there appears to be some evidence that buyer concentration negatively affects profitability of the sellers [47] However, the empirical literature does not shed any light on the most important question one should ask, which is "What is the welfare effect of buyers' power?". Indeed, from a competition policy point of view, we should not just content ourselves to the conclusion that concentrated buyers manage to get lower prices from sellers, but we should also see if final consumers also benefit from such a price reduction, or if buyers are the only ones who gain from it. If sellers are not able to impose high prices because of the pressure exerted by one or few powerful buyers, welfare would certainly increase if such a price cut is passed on to consumers. If this was not the case, then welfare might well decrease.

Consumers benefit from countervailing power if there exists enough competition among the buyers themselves. This argument has been formalised first by von Ungern-Sternberg (1996) and refined by Dobson and Waterson (1997), whose models shows that welfare rises with buyer concentration only when buyers are selling services (or products) which fiercely compete on the product market (or which are close substitutes). When the buyer-retailer market is characterised by strong competition conditions (e.g. because product differentiation is lower) price discounts obtained from sellers-manufacturers would be passed on to final consumers.

As a conclusion, it is important to keep in mind that the finding of the existence of strong buyer power is not by itself enough to guarantee that there is no danger from seller concentration. Antitrust authority should also check the likelihood that gains are not retained by downstream firms but are instead passed on to final consumers.

[KAI-UWE, CAN YOU SPARE SOME THOUGHTS ON THIS POINT PLEASE? The issue is: should we really be less worried about a merger when buyers are concentrated? It seems to me that the Dobson-Waterson type of result tells us that this is not the case: an upstream monopoly can result in higher final prices when buyers are very concentrated. But I wish I had thought more on the implications...]

[47] See Scherer and Ross (1990, pp.533-35) for a review of this literature, initiated by Lustgarten (1975). Among more recent work, Schumacher (1991) also supports the countervailing power hypothesis in a study based on US manufacturing industries, whereas Connor, Rogers and Bhagavan (1996) find no evidence of countervailing power in the US food manufacturing industries.

2.3.4 Failing firm defence

Still to be done.

3 Horizontal mergers: coordinated effects

Sofar we have considered just one of the possible mechanisms through which a merger can negatively affect welfare, namely the case of unilateral market power: merging firms will be able to unilaterally impose higher prices in the market. A second important mechanism is given by coordinated action, or joint dominance, where the merger does not pose a threat of market power by a single firm, but can create changes in the industry which increase the scope for collusion. In other words, before a merger firms might not be able to reach a collusive outcome, whereas the merger might create the structural conditions for the firms to (tacitly or explicitly) collude.

We can rely on the analysis carried out in chapter 4 (on collusion) to understand why the merger might favour the creation of collusion. There are two main reasons why this is possible.

- Reduced number of firms. Our analysis showed that the lower the number of market participants the higher the scope for collusion. Since the merger always decreases the number of independent firms in the industry, it also makes it easier for them to collude.

- More symmetric distribution of assets. We have seen that a more equal distribution of assets in the industry facilitates collusion. Therefore, whenever the effect of the merger is to increase symmetry among the firms, it will also increase the scope for collusion.[48]

The extent to which collusion (that is, joint dominance) might occur after the merger depends on a series of factors that we have already identified chapter 4, such as transparency of prices, existence of exchange of information among firms, frequency of market interactions and so on. The analysis of joint dominance will therefore have to take into account all such variables. It is clear that it is very difficult a priori to predict whether a merger might lead to joint dominance or not, but the more the industry contains elements which

[48] Of course, while the merger by definition reduces the number of firms in the industry, it is not true that a merger always increases symmetry in assets and market shares.

are likely to favour collusion the stricter the competition agencies should be towards the merger.[49]

We omit here a repetition of all the elements which favour collusion, and we focus instead on the same variables that we have analysed above, asking ourselves if the circumstances which make it more likely for a merger to raise unilaterally market power play the same role when coordinated action is the main concern.

Notice that either a merger raises concerns for single dominance or for joint dominance. It is unlikely that both concerns arise at the same time. Consider for instance the case of a firm which reaches a 40-45% market share after a merger. If this firm faces all rivals with fragmented market shares, say no other firm has more than 10-15% of the market, there might be a suspicion that unilateral market power exists after the merger. But if rivals are strong enough, say for instance there is another firm which covers 30%-40% of the market, then it is unlikely that the merging firms might exercise unilateral power. There would be instead a strong concern that the two largest firms might coordinate their actions and reach a collusive outcome.

3.1 Number of firms and concentration

The number of market participants and the distribution of their market shares greatly affect the likelihood to reach collusion in an industry. If the number of firms with relevant market shares is already very small, the further reduction in the number of independent competitors caused by the merger can give a boost to collusion, other things being equal. However, we cannot simply conclude that increased concentration (by necessity rising after the merger) is unambiguously signalling a higher propensity for the industry to find a collusive outcome. In fact, we know that a more symmetric distribution of market shares (which affects negatively concentration) might also favour collusion. In other words, it is not clear that a concentration index such as the Herfindhal-Hirschman Index (HHI) represents a proper screening device when it comes to analysing the possibility of joint dominance: this is

[49] What happens if collusion (or a strong suspicion of it) already exists in the industry? One might then argue that the merger would not change much and therefore should be allowed. We would not agree: a cartel, or tacit collusion, has some probability to break down (because of sudden downturns in demand, technological shocks or other changes). If a merger and the consequent reduction in the number of firms is allowed, then the probability that the cartel breaks down would be lower.

because HHI rises with asymmetry in market shares (recall that HHI equals the sum of squared market shares of each firm in the market), whereas theory suggests that it might be easier for the firms to collude when they have a similar distribution of assets and market shares.[50]

Consider for instance an hypotethical example of a market with four firms, selling respectively to 30%, 30%, 20% and 20% of consumers (call it *configuration 1*), and consider a merger between the first and the third firm, which would create a post-merger distribution of market shares of (approximately) 50%, 30% and 20% (*configuration 2*). There is no doubt that concentration increases after the merger (the HHI would pass from 2,600 to 3,800), but does the scope for collusion increase as well? In fact, the creation of a more asymmetric situation in the industry might cause the firms to find it more difficult to achieve a collusive outcome than before. A priori, and without knowing the industry, it is not easy to conclude that the scope for collusion is higher after the merger, the impact of a reduced number of firms being possibly outweighed by a more unequal distribution of assets.

For these reasons, competition agencies should be particularly strict against mergers which have the double effect of reducing the number of firms and increasing symmetry. This might occur in two ways. The first, and more obvious, is when two small firms merge and become on par with the largest (for instance, continuing the example above, a merger between the second and third firm in configuration 2 gives rise to a situation where there exist two rivals each with a 50% market share). The second possibility is that a merger also involves some transfer of assets (partial de-merger) which reestablishes symmetry. Consider for instance the same industry as in configuration 2, but this time a merger between the first and the third firm. This creates a duopoly with the largest firm having 70% and the second firm having 30% of the market (*configuration 3*). If the largest firm sells part of its new assets to the rival, say roughly corresponding to 20% of the market, the final outcome would be to create two firms with 50% each.[51] With the transfer of assets,

[50] See Compte, Jenny and Rey (1997), Kűhn and Motta (1999) and the technical section 3.2 below.

[51] For real cases where mergers and partial devolution of assets to rivals has occurred, see the discussion of the Nestlè-Perrier case below. Another case where a similar story has happened is the Allianz-AGF case, where two of the largest European insurance companies, Allianz and Generali, were competing for the French insurer AGF. In the end, the bidders reached an agreement whereby Allianz was taking over AGF but some of the latter's subsidiaries were sold to Generali. Surprisingly, the two merger cases were treated

concentration in the industry has decreased (the HHI falls from 5,800 in configuration 3 to 5,000) but the concern for joint dominance would certainly rise.

To conclude, industry concentration as measured for instance by the HHI is certainly a good indicator that a merger might create a single dominant firm (in the above case, a firm having 70% of the market might be able to exercise unilateral market power, depending on the structure of the industry), but might be misleading when considering the possibility that a merger creates joint dominance. For the latter, an inverse measure of dispersion of market shares, such as the variance, might be an indicator which provides additional hints about the facility of collusion.

3.2 Symmetry and collusion*

In this section, we consider the case where firms are asymmetric and analyse how the existence of asymmetries modify the scope for collusion. To deal with asymmetries we assume that firms do not necessarily produce the same number of products. This has some intuitive interpretation as to the size of the firms in the industry. A "large" firm is one which can supply a large number of products, while a "small" firm is one which can produce a more limited range of products. We assume the same demand function as in the rest of the chapter, but we also assume that the n products are supplied by firms which are possibly multi-products. Each of the firms has a number k of products, with $k \in [\kappa, K]$, with $\kappa \geq 1, K < n$. We assume for simplicity that there exist no economies of scope or multi-product economies, so that the production costs are identical for each product, independently of the number of varieties produced by each firm.

Firms meet in the marketplace an infinite number of times, and choose market price at each period. The collusive outcome can then be obtained through non-cooperative behaviour: firms anticipate that if they deviated from the jointly-maximising choice they would face a punishment from their rivals. We assume that firms discount future earnings at the same rate $\sigma \leq 1$. Denote the (per product) jointly maximisation profit as π_M,[52] the profit a firm obtains if it deviates as $\pi_D(k)$, and the profit in a punishment phase

separately by the EC and were both cleared without problem. [*Add references]

[52] Under a collusive agreement that involves all the firms, each product is sold at the same price $p_M = \frac{v+c}{2}$ and gives the same profit $\pi_M = \frac{(v-c)^2}{4n}$ which is independent of the number of product varieties produced by each firm.

as $\pi_P(k)$, k being the number of products sold by a firm. Each firm prefers to play the collusive strategy at time t rather than deviating if the following holds:

$$\pi_M \left(\sum_{t=0}^{\infty} \sigma^t \right) \geq \pi_D(k) + \sigma \pi_P(k) \left(\sum_{t=0}^{\infty} \sigma^t \right)$$

The condition is the more likely satisfied the higher the collusive profit π_M earned by a firm with k products if it does not deviate from the tacitly collusive behaviour, the lower the profit $\pi_D(k)$ it makes if it does deviate and the lower the profit $\pi_P(k)$ earned during the punishment phase (that is, the stronger the punishment in case of deviation). We assume here that the punishment take the simple form of "grim" strategies: after a deviation occurs, all the firms play the Bertrand price forever, that is they will always charge the price which represents the one-shot equilibrium action.[53] Therefore, $\pi_P(k) = \pi_b(k)$. Since $\sum_{t=0}^{\infty} \sigma^t = \frac{1}{1-\sigma}$, the condition for which a firm with k products prefers not to deviate is given:

$$\sigma \geq \sigma'_k \equiv \frac{\pi_D(k) - \pi_M}{\pi_D(k) - \pi_b(k)}.$$

where σ'_k is the "critical" discount factor. For the jointly maximising outcome to arise (that is for complete collusion to exist) we must have that $\sigma \geq Max(\sigma'_\kappa, ..., \sigma'_K)$. We shall prove that the firm which has the strongest incentive to deviate is the smallest one in the industry, so that for complete collusion to be sustained the condition $\sigma \geq (\sigma'_\kappa)$ must be satisfied, where κ refers to the firm having the smallest number of products in the industry.

To obtain this result we shall proceed as follows. When a firm decides whether to stick to the collusive prices or not, it compares the stream of monopoly profit $(\frac{\pi_M}{1-\sigma})$ with the profit it would make by deviating, which are composed of the profit in the deviation period plus the stream of profit in the punishment phase $(\pi_D + \sigma \frac{\pi_P}{1-\sigma})$. While the per-product monopoly profit is the same independently of the size of the firm, we shall show that - under certain conditions - both deviation and punishment profits are the higher the smaller the firms.

[53] These are not necessarily the optimal punishment strategies. For a generalisation to optimal punishement strategies of the model contained in this section see Kűhn and Motta (1999).

The intuition behind this result is as follows. A large firm has a number of varieties: when choosing prices, it takes into account the externality that it imposes on all the varieties it produces (a lower price reduces demand on all the other products), and this restrains its interest in reducing prices. A firm which has a lower number of varieties will also benefit from higher prices set by the larger firms, so that (deviation and punishment) profits decrease with the size of the firms.

We start from the profits in the punishment phase. The following lemma tells us that the smallest firm in the industry makes the highest per-product profit in the industry, and the largest firm the lowest per-product profit.[54]

Lemma 9 *At the non-cooperative equilibrium of the one-shot price-competition game the profits earned by each product variety can be ranked as follows:*

$$\pi_b(\kappa) > ... > \pi_b(k) > ... > \pi_b(K), \qquad with \qquad K > ... > k > ... > \kappa.$$

Proof.

See Appendix.[55] ■

We now have to analyse the ranking of the profits earned by a deviating firm. There exist two possible types of deviation by a firm. The first type is a deviation which consists of setting a price $p_D < p_M$ such that all other firms in the industry can still sell a (lower but) positive output. The second type of deviation involves setting a price $\widetilde{p} < p_D$ resulting in none of the other firms being able to sell and the deviating firm being a monopolist in the deviating period.[56] We show that in both cases it is the smallest firm which obtains the highest deviation profit.

Let us first consider the case where a deviation is such that all the products sell a non-negative quantity. We show that:

[54] This result is identical to the one obtained in Davidson and Deneckere (1985), who use a very similar demand function. Our proof is also similar to theirs.

[55] The proof consists of two steps. The first one is to show that the larger the number of products sold by a firm the higher the price it sets at equilibrium. The second one, a consequence of the previous result, proves that the larger the firm the lower the per-product profit it gets.

[56] It is easy to check that in the case considered here, where all the non-deviating firms charge the same joint-monopoly price, intermediate situations where some firms continue to sell but others do not sell after a deviation do not occur. This is because the quantity sold by a non-deviating firm is not a function of the own number of varieties, but only a function of the number of varieties sold by the deviating firm.

Lemma 10 *The per-product deviation profits when a deviation involves* $q_i \geq 0$, *for all* $i = 1, ..., n$ *can be ranked as follows:*

$$\pi_D(\kappa) > ... > \pi_D(k) > ... > \pi_D(K), \qquad with \qquad K > ... > k > ... > \kappa.$$

Proof.

We omit the proof of this lemma, since it involves exactly the same steps as the proof of Lemma 9. ■

For the case where the deviation leaves all the market to the deviating firm, we can prove the following Lemma.

Lemma 11 *The per-product deviation profits when a deviation by a* k*-products firm* i *involves* $q_i > 0$, *and* $q_j = 0$, *where* $j = k+1, .., n, \quad j \neq i$, *can be ranked as follows:*

$$\tilde{\pi}(\kappa) > ... > \tilde{\pi}(k) > ... > \tilde{\pi}(K), \qquad with \qquad K > ... > k > ... > \kappa.$$

Proof.

See Appendix. ■

The two Lemmata we have just proved are not enough to rank deviation profits of firms according to their size. We should check in which interval of values of γ the actual profit obtained by a deviating firm corresponds to π_D or to $\tilde{\pi}$, and then establish a ranking in that interval. In other words, for any given γ we are not sure whether two firms with, say, size l and m, would both choose a deviation leaving them with profit π_D or $\tilde{\pi}$. The previous lemmata indicate how to rank deviation profits of the same type, but do not tell us, for instance, how $\pi_D(l)$ would compare with $\tilde{\pi}(m)$. The next proposition does precisely this.

Proposition 12 *Write* $\tilde{\gamma}_{\min} = \min\{\tilde{\gamma}_\kappa, ...\tilde{\gamma}_K\}$ *and* $\gamma'_{\max} = \max\{\gamma'_\kappa, ...\gamma'_K\}$. *If* $\gamma \in [0, \tilde{\gamma}_{\min})$ *and if* $\gamma \in [\gamma'_{\max}, \infty)$,*then it is always the smallest firm (that is, the firm with the lower number of products,* κ*) which has the highest incentive to deviate, and the fully collusive outcome in the industry can be sustained only if the discount rate* $\sigma \geq \sigma_\kappa$, *where* $\sigma_\kappa = \sigma'_\kappa = \frac{\pi_D(\kappa) - \pi_M}{\pi_D(\kappa) - \pi_b(\kappa)}$ *for* $\gamma \in (0, \tilde{\gamma}_{\min})$ *and* $\sigma_\kappa = \tilde{\sigma}'_\kappa = \frac{\tilde{\pi}(\kappa) - \pi_M}{\tilde{\pi}(\kappa) - \pi_b(\kappa)}$ *for* $\gamma \in [\gamma'_{\max}, \infty)$.

Proof.

See Appendix. ■

3.2.1 Discussion and implications.

First of all, we should note that the proposition above gives a sufficient condition for the critical discount rate to coincide with the one which avoids the deviation of the smallest firm. In general, there will be other intervals where the parameter of substitution takes intermediate values for which this result still holds good, but a general proof gets difficult since in such intervals the smallest firm will have the highest profit under the punishment phase but not under the deviation, and it is impossible to give the general conditions on γ, n, k for which this happens. Nevertheless, the analysis above does show that there are good reasons for expecting that a tacitly collusive agreement to be undermined by the deviation of a small firm.

In other words, the above analysis shows that the extent to which an industry can sustain a collusive agreement mainly depends on the incentive constraint of the smallest firms in the industry to be satisfied. The implication of this analysis is that symmetry among the firms does help collusion. An industry where the existing number of product varieties are distributed evenly will reach more easily the fully collusive outcome than one where product varieties are distributed unevenly between small and large firms. [57]

The previous analysis suggests that asymmetries between large and small firms represent an obstacle for industry-wide collusion. It is therefore natural to wonder whether large firms could try to reach a collusive outcome without involving small firms. It is possible to show (details available from the authors upon request) that even when collusion does not involve all the firms in the industry it is still true that symmetry within the 'collusive group' helps. As in the case of industry-wide collusion, it is still the smallest firm within that group which has the strongest incentive to deviate from the collusive outcome.

3.3 Coordinated effects: Other variables to consider

In what follows, we briefly look at how efficiency gains considerations, potential entry and the existence of buyers' power affect the analysis of mergers when coordinated effects are to be dealt with.

[57] Compte, Jenny and Rey (1997) have found similar results in a model where firms' assets are given by capacity rather than number of varieties sold. The main difference is that in their paper it is the largest firm which has the strongest incentive to deviate, but symmetry helps collusion in their model as well.

3.3.1 Efficiency gains

The effect of efficiency gains in joint dominance analysis is slightly less clearcut than in single firm dominance. In general, an improvement of the efficiency of operations should be looked at very positively as it should improve cost conditions and decrease prices other things being equal. This is more so when the merger results in a firm which has lower costs, or a larger capacity, than the rivals, as these elements might disrupt collusion since they create a stronger incentive to deviate. It might be conceivable, however, that the merger and its efficiency gains restore symmetric conditions in the industry. Think for instance of a situation where the second and third largest firm an industry join their product portfolios and thus reach the same product range and technological level as the most important firm in the industry. It is possible that this might favour collusion by creating a more symmetric environment. However, it is unlikely that this effect might outweigh the potential welfare benefits of the efficiency gains. In particular, by not allowing such a merger, there is the risk that the gap with respect to the leading (more competitive) firm would worsen and in the long-run this could result in single-firm dominance. In general, therefore, efficiency gains should be seen as an effect of a larger order of magnitude.

3.3.2 Entry

The existence of potential entrants affects negatively the capacity of the incumbent firms to raise prices through coordinated effects. The likelihood that the merger creates joint dominance is lower when there are firms which are ready to commit resources and enter the industry in response of an increase in prices. Here the arguments are the same that we have already seen when discussing the role played by entrants in restraining the exercise of market power in the case of single firm dominance, and not much can be added to the discussion above.

3.3.3 Elements for an analysis of entry*

If we were to illustrate analytically the argument that entry disciplines the existing firms and reduces the scope for collusion in the industry, we would use a similar approach to the one above in section 3.3.1. If the merger allows firms to reach an equilibrium with a larger number of firms (n^m) than at the non-cooperative equilibrium (n^b), this would in turn negatively affect the

conditions under which collusion arises as a non-cooperative outcome of the game, as we know that the incentive compatibility constraint is less likely to be satisfied the larger the number of firms in the industry: the temptation to deviate from a collusive outcome would be higher.

3.3.4 Buyers' power

Most of the considerations we have made when talking about the role played by buyer power on the unilateral effects of a merger still hold when coordinated effects are considered. More concentration in the downstream market might also represent a more credible threat of entry into the upstream market were the upstream firms going to coordinate their behaviour and collude. This might happen through two different channels. First, a retailer endowed with market power might threaten to start production itself if prices for its inputs incerased above a certain threshold. Second, the retailer which enjoyes a large share of the downstream market might be able to stimulate entry from new firms. Consider for instance the case where entry into the market requires a fixed sunk cost investment either in production or in distribution. A potential entrant might find it unprofitable (or too risky) to enter the industry and commit resources to it if it was to serve only a small number of buyers (or if it was uncertain about the possibility to serve a large enough share of them). However, its resistence to enter the industry would be overcome if buyers were concentrated and it was to win a very large order from one of the very few buyers. See the ABB-Daimler Benz case for an illustration.

An additional element we have not considered above and which affects the extent to which collusion is possible after a merger is the frequency and the reduced size of the orders. We have seen in chapter * (on collusion) that the incentives to deviate from the collusive outcome increase when there are large and infrequent orders rather than small and frequent ones. This is because the expected payoff to be earned by a deviation becomes much bigger, while the expected losses would be reduced (as they would concern market orders which are likely to arrive in a more distant, and possibly more uncertain, period).

This remark has important consequences on the impact of buyers' power on joint dominance. Indeed, if the sellers face very few buyers, these are likely to use their bargaining power and use an aggressive procurement strategy. By unifying their orders they can extract better conditions from suppliers

which would be more willing to offer price reductions (and therefore deviate from a collusive strategy) if the size of the contract is large enough. If instead the buyers are fragmented, each order would be small and the sellers would be less likely to undercut each other. An implication of this is also that buyers might want to behave in a strategic way and group orders together instead of buying in regular small amounts. Snyder (1996) shows that by accumulating a backlog of unfilled orders a buyer can mimic a demand boom and force sellers to collude on lower prices.

4 What about joint ventures?

We should say something about horizontal joint-ventures here. The alternative would be to devote an additional chapter to all agreements between competitors, eg R&D joint ventures. Another possibility is to treat 'full-function' joint ventures in the merger chapter and R&D joint ventures in the collusion chapter.

5 Case studies

In this section, first we provide a note which summarises the various steps which should be touched upon during a merger analysis and the various variables that one should analyse before drawing a conclusion as to the suitability of the merger. Then, we discuss a few merger cases from the past history of the EC merger control, by making use of the theoretical considerations we have carried out throughout this chapter.

5.1 How to proceed in merger cases: a check-list

As we have seen, there are basically two questions that competition authorities should ask themselves before allowing a merger. The first question is (1) "*will the merger create single-firm dominance?*", that is enough market power for the merging firms to increase prices in a non-marginal way? If the answer to this first question is negative, there is still a second question to be addressed, which is (2) "*will the merger create joint dominance?*", that is would it modify the conditions of the industry in such a way that collusion among the firms operating in the market will be much more likely? We briefly recall here the aspects that should be considered in each of these questions.

5.1.1 Single firm dominance

The most direct way to assess the extent to which two merging firms might exercise market power is to ask whether they will be able to impose (non-marginally) higher prices after the merger. This might be done in some cases through the utilization of recent econometric techniques (*see chapter 3 on market power and market definition). In most cases, however, it will be impossible to carry out a direct estimation for lack of data. Furthermore, even when such an econometric exercise might be done, its results would not give a definite answer without any additional analysis. One should then resort to a more traditional approach, by first defining the relevant market in which the merger takes place and then assessing the degree of market power enjoyed by the merging companies. Throughout all this process, though, one should bear in mind that the basic question is whether the merger will result in the merging firms increasing their prices.

- Market definition. Defining the relevant market amounts to two different problems, which are:

  - Product market definition
  - Geographic market definition

  For each of these problems, it makes sense to try and use a wide set of information pieces. In particular, it is useful to consider:

  - Quantitative criteria (cross-price elasticities, price correlation tests, shipment tests and so on)
  - Qualitative criteria (consumer surveys, interviews with customers and suppliers)

Recall that all these elements should be seen as sheding some light on the SSNIP test. In other words, the correct way to define a market is through the following thought experiment: If products A and B were sold by the same hypothetical monopolist, would it be able to increase prices by a small but significant proportion in a non-transitory and profitable way? If the answer is yes, then A and B are part of the same market. If the answer is no, then the same test should be performed by extending the products to be considered to a further product, say C. And so on until an affirmative answer is obtained.

Therefore, all the information (quantitative and qualitative) gathered should be used to give an aswer to the SSNIP test.

- Market power. After having defined the relevant market, we can pass to the following step, which is to assess the market power enjoyed by the merging firms. To do so, the following variables should be taken into consideration among the others:

  - Market shares and distribution of capacities
  - Overall degree of concentration in the industry
  - Elasticity of market demand
  - Elasticity of supply of the rivals (and their excess capacity)
  - Potential entrants or production substituters (this involves an evaluation of the - endogenous or exogenous - sunk costs that entrants should incur, and of the extent to which other entry barriers exist and matter. In particular, one should pay attention to R&D and advertising outlays necessary to enter successfully the industry.)
  - Switching costs (would current customers find it easy to switch to other incumbent firms or potential entrants?
  - Power of the buyers

- Efficiency gains: these are crucial in a merger investigation. Claims of efficiency gains should be carefully checked and accepted only if they are merger-specific and the firms provide evidence and quantification of the likely gains. The most important sources for such gains are:

  - Economies os scale
  - Economies of scope (and extension of product line when customers want to deal with a supplier only)
  - Rationalisation of distribution and marketing activities
  - Synergies in reseacrh and development

An investigation which takes into account the above elements, might have two different outcomes. One can be that the merger would enable the firms

to significantly raise prices beyond the current level. In this case, the merger should be prohibited or allowed only if some remedies can be identified (such as divestiture in some particolar geographical areas or transfer of assets from the merging partners to new firms) and these conditions are fulfilled. The other outcome might be that the unilateral effects of the merger are not jeopardising competition in the industry. In this case, the investigation should deal with the possibility that collusion arises after the merger. Accordingly, the following elements should be considered.

5.1.2 Joint dominance

To understand whether the merger will make collusion more likely in the sector, a number of elements should be considered. Among the others[58]:

- Number of firms and concentration
- Distribution of market shares and capacities (firms' symmetry helps collusion)
- Existence of potential entrants (and switching costs)
- Buyers' power
- Observability of other firms' behaviour (exchange of information, competition clauses, resale price maintenance and other facilitating practices)
- Frequency of market transactions and magnitude of orders

5.2 Aérospatiale-Alenia/De Havilland

5.3 The Nestlè-Perrier merger

This is the first case of a merger which was challenged by the Commission of the EC on the grounds that it would have given rise to joint dominance.[59]

[58] There are a number of elements which are usually considered in joint dominance invetsigations but which have ambiguous effects on the scope for collusion. Among them are the degree of homogeneity of the products and the existence of excess capacity *in the industry*. We have seen that a priori is not clear whether product differentiation and excess capacity helps collusion or not.

[59] This discussion is based on the Commission Decision of 22 July 1992. This is the case IV/M.190 published in the Official Journal of the EC, L356/1, 5.12.92

In 1991 IFINT, an Italian company belonging to the Agnelli family, launched a bid to gain control of the French company Perrier, operating in the mineral water industry. The bid was followed by a counter-offer of Nestlé, a Swiss multinational, which had previously reached an agreement with BSN, both firms being active in the mineral water industry. After a period of uncertainty the takeover battle was won by Nestlé. Under the terms of the agreement, Nestlé would have sold the Volvic source of Perrier to BSN.

After a detailed investigation, the CEC decided that the operation would have resulted in joint dominance of the mineral water market in France by Nestlè and Perrier. Eventually, the merger was cleared subject to certain conditions (some of the Perrier sources should have transferred to an independent producer). In what follows the case is discussed by making use of the simple framework proposed in the lecture on mergers. Accordingly, we first analyse (1) whether the merger is supposed to increase market power and (2) to foster collusive behaviour in the industry. Our conclusion will follow.

As we have seen, the first step of an investigation into issues of market power consists of the identification of the relevant market. The delineation of the relevant market requires the definition of the product market and of the geographical market. We deal with each of these points separately.

5.3.1 Product market definition

The main problem for the definition of the product market is to decide whether mineral water belongs to the same industry as soft drinks and, if not, whether a distinction should be made between fizzy and still mineral water.

As a first thing a qualitative analysis is made. It is found that both consumer surveys and interviews with retailers indicate that mineral water and soft drinks are not enough substitutes to belong to the same market.[60] On the production side differences are also marked. There exist a number of regulatory constraints in the production of mineral water, especially in France. The most important are that: production of mineral water needs an authorisation; bottling mut be done at the source; and water must be

[60]The former has the image of a pure, natural product, it is associated to healthy living and it is thought to satisfy a basic need. The latter does not have any of these characteristics and it is consumed in a much more occasional way. This can be seen in a larger per-capite consumption of mineral water than soft drinks.

marketed with a brand name which is associated to the source. [61] None of these constraints apply to soft drink producers, whose main input is tap water and which do not have particular production and marketing requirements to follow.

As for quantitative criteria, first it is found that there exists a considerable difference in price levels, since soft drinks are sold on average at a mill price which is two to three times higher than the price of mineral water. This points already towards a certain separation of the two mearkets. It is also found that correlation coefficients of prices of different mineral waters range from .85 to 1, whereas the correlation coefficients between price of mineral water and price of soft drinks are either very low or negative: during the five years before 1992 mineral water prices tended to increase whereas soft drinks prices tended to decrease. [62]

As for supply substitution, it is limited. Because of the regulation on production and marketing, plants used to produce soft drinks cannot be switched to production of source water. In principle, it is possible to start production of bottled water by a process which purifies tap water (in some countries this is done). However, the CEC argues that there exists no evidence that this would be accepted by consumers as a reasonably good substitute for mineral water, nor is it known of any producer which is planning to enter the market in such a way.

The CEC also argues that no distinction should be made between markets for sparkling, still and flavoured waters. Despite some differences in prices, it appears that from the technical point of view it would be extremely easy for a producer to switch from sparkling to still waters and vice versa.

In the light of information available to us, the conclusion that the relevant product market is represented by bottled mineral water would seem difficult to object. However, at the stage of market definition the difference between mineral and spring waters is not analysed properly, whereas the CEC attaches much importance to it later in the Decision, when it analyses market power. See para. (55) and all the tables after (39). In particular, para. 84 of the Decision clearly indicates that local spring waters are not considered as a good substitute of mineral waters by most of wholesalers and retailers. This

[61] Spring waters, which have inferior characteristics with respetc to mineral waters have to bottled at the source but they can be marketed with a different brand name.

[62] Cross-price elasticities and demand elasticity are not computed, although the CEC argues that a small increase in the price of waters would not lead to a significant decrease in demand from mineral water to soft drinks.

should have taken into account when defining the relevant market.

5.3.2 Geographic market

The CEC defines the relevant market as the French market. It does not rely on specific tests here but on the following arguments: First, transport costs of mineral water are extremely high with respect to its value (between ten and twenty per cent for every 300 kilometers, depending on whether plastic or glass bottles are used). Second, there exists very low trade between EC countries, with the exception of Belgium where imports are high. Third, entry into the French market is also made difficult because this is a mature market with very established brand names, and a very large advertising effort would be needed to acquire considerable market shares. In the case of German producers, entry is also made more difficult by the fact that in Germany mineral water is mostly sold in glass bottles of 75 cl, while in France plastic bottles of different capacity are used.

The definition of the French market as the relevant market seems reasonable. The only possible alternative could have been to define the market as composed of both Belgium and France (a price correlation analysis could have been interesting from this point of view) but we doubt this would have affected the results of the investigation.

5.3.3 Single firm dominance (unilateral effects)

We now see whether the merger between Nestlé and Perrier raises fears of single firm dominance (or enough market power for a single firm to be able to impose much higher prices).

Nestlé, BSN and Perrier own several sources: Nestlé owns Vittel and Hépar; Perrier owns Perrier, Contrex, Volvic, St. Yorre, Thonon and Vichy, as well as a number of local spring waters; BSN owns Evian and Badoit.[63] The three firms hold 82,3% of the market in value and 76% in volume. Individual market shares are not published in the Commission decision, for business secrecy reasons. Some information about them can be found in John Sutton (1991, Table M.12), who estimates BSN share at about 25%, Nestlè at 20-25%, Volvic at 7% and other sources of Perrier at about 20-25%. Since it is found by the CEC that market shares have been stable over the recent years,

[63] Ferrarelle and San Pellegrino, two Italian waters present in the French market, are controlled by BSN and Perrier respetively.

Sutton's estimates are useful even if they refer to 1986. Neven, Nuttall and Seabright (1993, p.103) value instead the market share of Nestlè at 15.6% and that of Perrier at 31.9%. According to these estimates (consistent with the aggregate values given in the Decision), a merger of Nestlè and Perrier would result in a single firm having a market share of around 45%-55%, with the largest rival having a share of about 25% of the market, enough to start an analysis of single dominance. However, transferring theVolvic source to BSN the case for challenging a merger on the basis of single dominance is much weaker, because the largest competitor, BSN, would have more than 30% of the market. Furthermore, the analysis of capacities of the different sources reveals that Volvic had the largest capacity in the industry. [*ADD FROM COMPTE-JENNY-REY]

For these reasons, it would seem difficult to argue that the operation involving the merger of Nestlè-Perrier and the transfer of Volvic to BSN would have created single firm dominance.

5.3.4 Joint firm dominance (coordinated effects)

In this section, we analyse all the variables which might play a role in determining the ability of Nestlè-Perrier and BSN to reach a collusive outcome after the merger.

Concentration It is clear that the market is extremely concentrated, with three producers (two after the merger) having more than eighty percent of the market. The remaining market shares are divided by a number of fragmented producers, mainly selling spring waters locally. Neven, Nuttall and Seabright (1993, p.103) estimate (the lower bound of) the post-merger HHI at 2660 and the change in HHI at 1000, extremely high values if one considers the benchmark values of the US merger guidelines.

Demand elasticity There seems to be the scope for the firms to increase prices above marginal costs, if one believes the CEC's argument that market demand elasticity is low enough (no estimate is offered in the Decision).

Supply substitution and potential entry The only relevant firms in the industry seem to be Nestlé-Perrier and BSN. The local producers are too fragmented to jeopardise their position of strength. In principle they could

start to market their spring waters under a common brand name, but such waters have different features among themselves and appear as a product inferior to mineral water. None of the local producers seems to have enough financial power to start a massive advertising campaign.[64] This market is well described by a vertical product differentiation model where the product quality as perceived by the consumer depends on advertising outlays which are a sunk cost which would not be recovered by entrants. The endogenous sunk cost paradigm applies neatly to this industry. One of its implications is that we should expect persistence of concentration in such a sector even when the market size increases. [65]

The same is true for potential entrants from other countries or other industries. The role of transport costs and regulation has been emphasised above, as well as the fact that it is unlikely that a firm could successfully enter the market by introducing purified tap water. Further, the practice of giving price discounts linked to the volumes purchased and to the whole range of waters bought to a single company, as well as the existence of cooperative agreements between suppliers and buyers [66] make entry more difficult for newcomers.

Nature of transactions We are dealing with an industry characterised by short information lags and frequent transactions, which favour collusion.

Buyers' power As for the power of the buyers, it turns out that there are ten largest buyers of bottled mineral water account for around 70% of the total sales of the three water suppliers Nestlé, Perrier and BSN, with the first four large distribution groups (Intermarché, Leclerc, Carrefour, Promodes) representing 50% of purchases. Nevertheless, none of the buyers alone goes beyond 11%. Further, the leading mineral waters are brands toward which most consumers are loyal customers. Large customers would risk losing some of their clientele (and the loss would concern all the range of goods sold, not just water) if they replaced such brands with 'own labels', that is local spring waters which are sold under the distributors' brand name.

The majority of retailers and wholesalers interviewed by the Commission

[64] Promotion and advertsing expenditures for the major brands have been high for years, and amount to roughly 10% of the brand turnover. See para 96.

[65] See Sutton (1991).

[66] The nature of such agreements is not specified in the Decision. See para. 95.

indicate that the merger would further diminish their bargaining power with respect to both Nestlé and BSN. Their range of mineral waters would be broader and this would give them further power since discounts are usually given on the basis of the volumes purchased on the whole range of waters offered (see para. 83 and 84). This is an example of 'pecuniary' economies of scope from the merger: they do not represent a gain for the economy as a whole, but just a shift in bargaining power from purchasers to suppliers. [67] In conclusion, it does not appear likely that the market power of the producers might be limited condiderably by the bargaining power of the buyers.

Market transparency Observability of other firms' behaviour is a crucial element which eases the ability of the firms to reach the collusive outcome, through detection of deviations which in turn make possible punishment strategies. Market transparency is extremely high in this industry. According to the para. 62 of the Decision:

"The three national suppliers publish their list prices with the basic quantity rebates. Since they all supply the same customers, there is also a considerable feedback from these customers. In addition, the three suppliers provide the Chambre syndicale des eaux minérales with their monthly sales volumes and each one receives the monthly sales quantities broken down by brand of the other suppliers. In a narrow oligopoly such a practice further increases the market transparency and permits each supplier to follow the evolution of the market positions of the others."

We are therefore not particularly surprised to learn that the industry has known a strong parallelism in price. According to para 59 of the Decision:

The ex-works prices (before rebates and VAT) of the five major still mineral waters of the three national suppliers have constantly increased in a parallel way since at least 1987 (...). Whoever first increased its prices was always followed by the other two suppliers. There was no price decrease during the whole period considered. The price leader seems always to have been Perrier which has traditionally maintained the highest price level for most of its products."

Symmetry There seems to exist a certain degree of symmetry in the goods produced (they are few and well identifiable), and the technologies appear to be simple, since the production process basically consists of bottling. Nestlé acknowledges that the main brands of the three producers have a similar

[67] It seems that even Nestlé acknowledges that it would be difficult for a buyer to do without the whole range of goods supplied by the leading water producers. See para 86.

cost structure (para 63). Economies of scale are not important because of the regulation which contrains producers to bottle at the source. Further, transportation costs are incurred directly by the customers. [*Add FROM compte-jenny-rey]

Efficiency gains We know that if firms manage to collude it is unlikely that efficiency gains would pass over to consumers. However, it is possible that the merging firm would enjoy such efficiency gains to give it a much stronger competitive position than the rivals, thus possibly making deviations from collsuive behaviour more likely. This does not appear to be the case here.

The analysis of the production process and of the industry suggests that the merger does not allow for substantial economies of scale and of scope. Indeed, regulatory constraints do not allow firms to concentrate production of different mineral waters. Hence, no scale economies should be expected from the merger. Further, since each brand should be bottled at the source and marketed under its own name, it is hard to find any possible real economies of scope. By having a broader spectrum of brands, Nestlé and BSN might reap pecuniary scale economies at the stage of advertising and distribution, since they might be able to enjoy larger discounts from jointly advertising more brands and imposing better terms in negotations with retailers. But these are not economies which we would classify as efficiency gains, and they might instead allow the firms to charge higher prices.

Other possible economies, such as on research and development are irrelevant here given the characteristics of the industry. It is not clear at all that the merger would give rise to administrative economies or more efficient management of the firms. But these are hardly merger-specific economies and we knowe that they are extremely difficult to measure. For what we know, there might as well be a clash of corporate identities after the takeover, resulting in administrative losses.

5.3.5 Conclusions

The Commission maintained that with the acquisition by Nestlè of Perrier's assets and portfolio of brands and the transfer of Volvic to BSN, a collective dominant position would be jointly held by the two firms[68], due to their

[68]The Commission also argued that if Nestlé would have taken over Perrier and kept the Volvic brand for itself then Nestlé would have created a single firm dominant position.

symmetric situation in the industry and given the market environment which was favourable to collusive outcomes. However, the CEC decided to accept a remedy proposed by Nestlé. The merger with Perrier, plus the transfer of Volvic to BSN were allowed under the condition that Nestlé would have sold to an unspecified independent firm (other than BSN) the brands Vichy, Thonon, Pierval, Saint-Yorre plus some minor local pring waters. According to the CEC, these waters would represent a capacity of around 20% of Nestlé, Perrier and BSN together, even though the market shares of such brands are not very high.[69]

The Decision of the Commission was innovative, since it was the first time that the CEC adopted the concept of 'collective dominance' to block a merger. (The ECJ later confirmed that prohibiting a merger if it is established that collective dominance would result from it is compatible with the Merger Regulation. See the Kali+Salz case.)

From the economic point of view, our opinion is that the Commission should have blocked the merger *tout court*, with and without remedies. We have seen that the industry is extremely concentrated, that the market is highly transparent and that the firms have put in place a system of exchange of information which facilitates collusion. Even though price parallelism per se is not a proof of collusion, the existence of parallel price rises in the presence of such a mechanism of transmission of information suggests that the firms have been able to coordinate their behaviour to sustain the collusive outcome.

Further, the fact that Nestlé and BSN reacted immediately and of common agreement when an outsider like IFINT tried to enter the industry through the takeover of Perrier is a clear indicator of the coordination between them. Our interpretation of the events is that the incumbent firms had managed through time to coordinate themselves in such a way to reach a collusive outcome. When a potential entrant jeopardised the stability of this outcome, they reacted together to put an end to this threat.

Allowing the transfer of Volvic to BSN would only worsen matters, as it increases the degree of symmetry between Nestlè and BSN, which we have identified as one of the elements which facilitate collusiove outcomes.

For all these reason, we believe that the merger should have been denied.

[69] Neven, Nuttall and Seabright (1993, p.103) estimate the post-merger HHI after the remedy at 2310, and the change in HHI at 640, which are still very high values of concentration.

We also fear that the remedies adopted by the Commission would not be enough to promote competition in the industry. A priori, we have doubts that the firm buying the brands divested from Perrier would be a strong competitor in the medium-long run. The purchase of such brands should be agreed upon by the CEC but is negotiated by Nestlé. It is unlikely that Nestlé would find a competitor having the financial strength and the willingness to break the cosy habits in the market. The DGIV of the CEC is currently carrying out an investigation of the mineral water industry after the merger and the remedies. It will be interesting to see the result of such an assessment.

5.4 The ABB/Daimler-Benz case

This case [70] concerns the proposed joint-venture between Asea Brown Boveri (ABB), a Swedish-Swiss company, and Daimler-Benz, a German company, to form ABB Daimler-Benz Transportation. The joint-venture would incorporate all the activities of the parent companies in the sphere of rail technology. Since the parent firms would not continue to operate independently in the sector, the joint-venture falls upon the EC merger regulation, the turnover conditions for Community dimension also being met.

5.4.1 Product market definition

Defining the relevant market in this case is not easy. Rail technology can be divided into more detailed market segments. The first and most obvious division is between rolling stock (mainly rail vehicles) and stationary equipment and each of them can in turn be divided in a lower segmentation. The problem is that among such market segments there exist a number of relationships of complementarity and substitutability which make the analysis more difficult. For instance, and more obviously, rolling stock and stationary equipment can be sold independently when they need to be replaced, but they are basically complementary and need to be matched. Electrical and diesel locomotives are substitutes, but locomotives and passenger coaches are complements, although taken together they are substitutable with respect to complete train sets for mainline transportation. Further, when considering rail vehicles, one should probably draw a distinction (not explicitly made in

[70] The discussion is based on the Decision taken by the Commission of the EC on the 18.10.1996, case IV/M.580.

the Decision) between the mechanical and the electrical elements of vehicles (the latter account for 55-60% of the value added).

Transactions in this industry do not occur frequently. It is basically impossible to resort to quantitative tests such as price collinearity or cross-price elasticities.

The CEC has defined the relevant markets at the more disaggregated level. Therefore, fifteen separate markets have been found (see right-hand side column in table 1). This definition has been decided in the light of surveys with competitors of the parties involved in the joint-venture and with customers.

rolling stock	mainline trains	electrical locomotives
		diesel locomotives
		train sets for mainline transportation
		passenger coaches
		freight wagons
	regional trains	electrical multiple units
		diesel multiple units
	local trains and systems	trams (light rail and trolleys)
		metro vehicles
		automatic guided transportation
stationary equipment	wayside systems	catenary systems
		traction power supply
		train control and protection systems
	miscellaneous	maintenance and refurbishment
		information systems and ticketing

Table 1 - Product market definition in the rail technology industry

However, the most relevant distinction should have probably been at a less disaggregated level. Indeed, it appears from the Decision that customers tend to buy complete systems rather than buying different elements. The complete system might be supplied by a firm alone if this has the necessary technology for providing, say, both locomotives and coaches as well as both mechanical and electrical components. Else, a company which acts as the leading contractor will look for partners to which it will subcontract the elements it is not able to provide by itself.

5.4.2 Geographic market

The relevant geographic market is defined as the German market. This is because there exist a number of particular national product specifications (e.g. differences in mains voltage and frequencies, in track widths and safety systems) and because public procurement policies have always favoured local suppliers thereby separating effectively the markets in national ones. Indeed, it appears that imports into Germany have occurred very rarely.

Despite increased liberalisation in the transportation markets and a possible change in procurement policies away from the traditional national biases, this situation of market segmentation is not likely to change rapidly over the next years. Actually, it appears that the familiarity of suppliers with customers' specific requirements plays an important role. The existence of these 'switching costs' means that customers will tend to give preference to previous suppliers. It is only when a completely new system must be put in place that potential entrants will be on an equal basis with incumbents.

The necessity of adapting to different national technical standards works as a fixed exogenous cost of entry: such an investment would be worth in case of a very important contract but not of a small one. This will play an important role in the Commission's decision.

5.4.3 Market shares and concentration

Table 2 shows market shares [71] and concentration indexes [72] in eight selected product markets, namely those which raise substantial concerns. In the remaining product markets the joint-venture does not have enough market shares to think it could distort competition or create a dominant position.

[71] Market shares have been supplied by the parties and accepted by the Commission. They have been computed by looking at the orders won in the three years previous to the case considered here.

[72] The concentration indexes have been computed by using information provided in the Decision. Since information about market shares is incomplete - market shares do not add up to the total of the industry - the figures give the lower bound of concentration. The real HHI would be higher.

Product Market	Market shares (%)						HHI	Δ HHI
	ABB	DB	Siemens	DWA	LHB	Elpro		
electrical locom.	37	17	46	np	np	np	5032	1258
mainline train sets	5	26	46	18	np	np	>3401	260
reg. electr. m/units	18	26	25	17	14	np	>3046	936
reg. diesel m/units	0	49	23	np	19	np	>3291	0
trams	15	29	41	np	8	np	>3681	870
metro vehicles	42	22	19	np	11	np	>4578	1848
catenary systems	30	31	33	np	np	6	4846	1860
traction power supply	6	26	35	np	np	13	>2418	312

Table 2 - Market shares and post-merger Herfindhal-Hirschman Index of concentration in selected product markets

As the table shows, it is unlikely that the joint-venture between ABB and Daimler-Benz could create a single dominant position, since Siemens enjoys a strong market position in all the product markets considered. Nevertheless, the figures reported do show that the markets taken into account are extremely concentrated. If the merger had been proposed in the US, the Merger Guidelines would have clearly indicated a presumption against the merger, since all the concentration indexes are above the upper threshold of 1800 points.

Unfortunately, we do not have data about the other product markets and we are therefore unable to give market shares and concentration indexes at the more aggregate level (for instance, of mainline trains, regional trains and local trains and systems) which might be a more appropriate definition of the relevant market. None the less, it is likely from the data available here that even at that level of aggregation the merger would raise serious dangers of market distortions.

Overall, there is certainly not an issue of single firm dominance in this merger case, Siemens clearly being a firm in a very strong competitive situation in the German market. However, a quick glance at the combined market shares of ABB and Daimler-Benz reveals that the merger would establish a situation of market symmetry between the merging firms on one hand and Siemens on the other. Given also the very high industrial concentration levels, the possibility that the merger might lead to joint dominance should therefore be taken very seriously.

5.4.4 Joint dominance, or the coordinated effects of the merger

Let us consider the different structural variables which might affect the possibility that the merger enhances the scope for collusion.

Elasticity of supply of rivals and potential entrants The strength of the firms involved in the merger and of Siemens is probably understated by the table above. This is because the joint-venture and Siemens have the technology needed to supply both the mechanical engineering and the electrical components of a rail system, whereas most of the rivals are not 'full-line suppliers'. Since customers tend to demand the complete product sets, the capacity of ABB/Daimler-Benz and Siemens to exert market power is somehow enhanced by the fact that most of the competitors would not be able to satify orders alone (either because they lack of electrical technology, or because they do not supply the whole range of products necessary to provide the full-line product). Further, some of the existing rivals are relatively small firms which would not be able to cope with very large orders. Indeed, most of the orders won by the rivals have been obtained thanks to cooperation with either ABB or Daimler-Benz (and its subidiary AEG) or Siemens. In particular, one of the rare orders won by a foreign firm, was won by the Canadian firm Bombardier which had to rely on Kiepe, a subsidiary of Daimler-Benz/AEG, for the necessary electrical components.

A crucial point is to understand if the ability of the firms to raise prices would be limited by potential entrants. From this point of view, it should be taken into account that there exists only one firm which has the same characteristics as ABB/Daimler-Benz and Siemens, and this is the French firm GEC-Alsthom. The CEC interestingly remarks that it might not be a profitable strategy for GEC-Alsthom to act aggressively in the German market, since this would probably invite a retaliatory response by ABB/Daimler-Benz and Siemens in the French market.[73] We shall also note below that GEC-Alsthom is involved in a series of cooperative arrangements with the German companies, which render less likely an aggressive entry in the German market. The French company has recently acquired LHB but it is not clear whether this should lead to a more active involvement in the German market.

[73] The scope for collusion when multi-market oligopolists exist has been underlined in Chapter 4 on collusion. See among others Bernheim and Whinston (1990).

There are also other foreign firms which are operating in the rail technology sectors, but so far their interest in the German market has been rather limited, or their bids have been unsuccessful. It should also be recalled that the different technical specifications do represent an obstacle for foreign firms.

Finally, it should be noted that DWA - an independent firm - has been trying to create its own electrical engineering capacity through its subsidiary FAGA, but it is unclear whether these efforts are going to be successful in the future.

Power of the buyers The Commission's decision offers a detailed analysis of the different product markets identified. However, the different markets seem to share most of the basic features from the point of view of the technological, demand and supply conditions. The one point which is emphasised by the CEC as distinguishing the different product markets is the bargaining power of the buyers. This is the reason why - as we see below - the CEC would eventually declare the merger compatible with the common market in the national and regional trains markets but not in the local trains and systems markets.

The only client for mainline trains is given by the national railways company Deutsche Bahn AG. At the other extreme, there are a number of customers for local trains and systems: the Commission has identified 58 German municipal transport companies which have purchased trams, buses and metro systems. Somehow intermediate between the two cases is the situation for regional trains.

The Commission attaches a great importance to the fact that Deutsche Bahn is a monopsonist for the mainline transportation market, and as such able in principle to influence the structure of supply. If Deutsche Bahn decided to group orders in such a way to invite tenders for very large single orders, it would be able to attract the interest of foreign groups such as GEC-Alsthom, for instance. Facing very large orders, foreign firms would be willing to incur the fixed costs of changing their product specifications to meet the German technical standards.

The Commission maintains that Deutsche Bahn will be obliged to exert its bargaining power and therefore stimulate competitive behaviour by a number of factors, among which the fact that it has been transformed in a private law company, that there are pressures for it to behave accordingly to commercial rules, that it faces competition from other mean of transporta-

tion, and that EU public procurement directives should not allow national biases in assigning orders.

Surprisingly, Deutsche Bahn also declared not to be concerned by the creation of the joint-venture and maintained that there would still be enough competition in the market.

It is not clear whether Deutsche Bahn would fully exert the bargaining power it has, especially considered that it might still be subject to pressures to buy from a national source, since train sets for mainline transportation are seen as a matter of prestige and as a key reference product (para 73).

The situation is radically different for municipal companies, not so much because of their bargaining power is split (once an order is tendered, the municipal company is a monopsonist as well) but because the size of the orders is of a much smaller size and therefore less attractive to foreign companies, for which the fixed costs of adapting to the German specifications would be less worth incurring. Indeed, it appears that such local companies are much more worried about the joint-venture than Deutsche Bahn AG is.

As for regional trains, the presence of both Deutsche Bahn and smaller regional companies implies that the bargaining power of the buyers is less strong than for mainline trains but higher than in the case of local systems. However, the Commission attaches great importance to the fact that in the future Deutsche Bahn should play a bigger role in regional trains (para. 120). This is the main argument to justify the finding that in this product market the merger does not raise concern for the creation of a dominant position.

The CEC argues that there should be enough competition outside the duopoly since LHB and DWA are both in a strong position. However, it appears that their market shares have been acquired thanks to cooperation with either ABB or AEG.

Other factors affecting the scope for collusion We now have to ask ourselves about the factors which might facilitate (overt or tacit) collusion in the product markets defined above.

It is clear that after the merger there will exist in many of the markets involved in this decision two firms, namely ABB/Daimler-Benz and Siemens, which are by far stronger than the others. Also, the two firms are in a condition of symmetry and have similar technological capabilities and can offer similar product ranges, apart from minor differences (para 88).

As for the characteristics of the industry, a number of factors have to be

considered to assess the extent to which the firms can engage in collusive behaviour or attain a tacit collusion outcome. To start with, it must be said that the markets considered do not provide the best environment for a collusive outcome. Indeed, orders do not come frequently in this industry, and when they come they usually are of very large size. This increases the incentives for the competitors to deviate: the temptation to get a rare and important order is strong.

However, the two duopolists are likely to be the main competitors in all the procurement contracts involving rail technologies at different levels (national, regional and local). Also, there seems to be a certain transparency in the public bids which should allow the competitor to control and monitor the moves of the rivals. [74]

Nevertheless, the rail technology industry is characterised by a presence of a very complex network of cooperative agreements which involves all the main firms, which makes it difficult to perceive this sector as one where firms compete fiercely. The Commission maintains that: "On the market in main-line train sets, orders for the production of high-speed trains at least have in the past been placed with domestic consortia in which it was difficult to discern any internal competitive relationship. Thus Siemens, AEG and ABB collaborated on Deutsche Bahn's ICE 1. Siemens and AEG are currently collaborating on the ICE 2" (para 111).

Also, the main pressure towards competitive behaviour in the industry should come from outsiders, the main one being GEC-Alsthom. From this point of view, it is particularly worrying that the French firm has already collaborative agreements with ABB/Daimler-Benz and Siemens. In particular, Siemens and GEC-Alsthom plan to cooperate to market jointly their high-speed train technology outside Europe (para. 112). Fiat Ferroviaria, the Italian firm which has developed an innovative tilt technology is already cooperating with Siemens (and DWA).

In the product market concerning regional trains the cooperative arrangements between the firms are not absent either, since successful tenders have been made by Siemens with AEG, LHB with ABB, DWA with AEG, AEG with Siemens and DWA, Siemens with LHB and AEG.

In the local trains, the web of cooperative arrangements is also very well

[74] It is a pity that we do not know more about the way in which the bids are conducted. Apparently, they are extremely open since we are told that suppliers obtain further information even in the course of negotiations following the submission of tenders.

established, and each firm has been involved in cooperative arrangements with basically any other major firm (see para. 125 for a list).

Efficiency gains It is difficult to assess the possible efficiency gains arising from the merger, given that this issue is not covered in the discussion presented in the Decision. Probably, the most important source of gains lies in economies of scope, especially at the level of mainline trains technology. According to the Commission (para.72) Daimler-Benz/AEG does not possess the key technologies to be a full supplier of train sets for mainline transportation. Indeed, it would have obtained market shares in this product market only through cooperative agreements with Siemens, the leader in the sector. However, ABB had already the necessary technology to be afull-line supplier even before the merger (like Siemens). It is also possible that division of labour can be fostered between ABB and Daimler-Benz, resulting in economies of scale. Overall, however, it does not seem that the nature of the scale economies might possibly disrupt the scope for a collusive outcome.

5.4.5 Conclusions

The Commission declared the concentration between ABB and Daimler-Benz incompatible with the common market in the product market of trams (including light rail vehicles and electrical equipment for trolley buses) and metro vehicles, where a joint dominant position along with Siemens would have been created. As a consequence of the Decision, the parties committed to divest from the AEG/Daimler-Benz's subsidiary Kiepe, which possesses the electrical engineering technology which is a key element for supplying a complete product in the local rail technology. By maintaining this firm independent, other firms which possess the mechanical engineering technology will find an available partner for competing successfully in the local trains markets.

In our opinion, there are no major structural differences between the mainline, regional and local product markets in the rail technology. The decision taken by the CEC to find only the local trains product markets as incompatible with the common market is clearly driven by the different weight given to the buyers' bargaining power. While in the mainline and regional markets Deutsche Bahn is identified as a buyer with a very strong bargaining power, this is not the case for the municipal companies operating in the local markets.

However, it is far from clear that in the regional markets Deutsche Bahn would have the same power as in the mainline trains. More importantly, though, it is not clear that the bargaining power of the buyer would be able to limit market power in the industry, for at least two reasons. The first one is that Deutsche Bahn might not exert such power, for instance because it would be subject to political pressures to prefer national firms with respect to foreign suppliers. Secondly, because even if Deutsche Bahn was willing to invite bidding from outsiders it is not clear that a more competitive outcome would arise. The main firms in the rail industry have been involved in a number of cooperative arrangements both within and outside Germany, and the overall picture is not one of a very competitive industry. Further, the fact that national markets have been so far segmented along the national borders, with national firms enjoying a dominant position locally, seems to be hardly an environment where one would expect fierce competitive incursions in each other's home turfs.

[*Kai-Uwe, I know that the Bundeskartellamt was very negative on the DGIV decision, and they must have written something in the BKA Annual Report. Could you have a look at it?]

5.5 Kali und Salz

6 Exercises

Exercise 4 . *Consider the model as described in section 2.*

1. (a) Find the reaction functions of a firm i and a firm k (respectively, R_i and R_k) and draw them in the plane (p_k, p_i). Show that they are positively sloped and check that stability conditions are met.

   (b) Now assume that two firms i and j merge and as a consequence of the merger their unit production costs are ec, (with $e \leq 1$) while all the other firms have unit costs c. Derive the reaction function for product i and for product k under this assumption. Draw the reaction functions for product i and product k and compare them with the previous R_i and R_k. Do you expect the post-merger prices to be higher at the equilibrium?

   (c) Show the isoprofit functions of an insider and an outsider firm, before and after the merger, and use the figure to study the merger impact on firms' profitability.

Exercise 5 *(Quantity competition.) Use the inverse demand functions given in equation (2) to study the model where firms compete on quantities. Keep otherwise all the other assumptions made in the section.*

1. (a) Find the quantity q_c, price p_c, and profits π_c made by the firms at the symmetric Nash equilibrium in quantities (Cournot-Nash).

   (b) Now consider the case of a merger between two firms (which result in the merging firm having unit costs ec, with $e \leq 1$, instead of c), and derive analytically quantity, price and profits for both insiders and outsiders.

   (c) (Salant, Switzer and Reynolds, 1983) Assume now $e = 1$ and $\gamma \to \infty$. Under which conditions is a merger profitable?

Exercise 6 *(Figure of mergers with strategic substitutes) Consider the previous exercise.*

1. (a) Under the assumption that all firms are single product derive the reaction functions of a firm i and a firm k (respectively, R_i and R_k) and draw them in the plane (p_k, p_i). Show that they are negatively sloped and check that stability conditions are met.

   (b) Now assume that two firms i and j merge and as a consequence of the merger their unit production costs are ec, with $e \leq 1$, while all the other firms have unit costs c. Derive the reaction function for product i and for product k under this assumption. Draw the reaction functions for product i and product k and compare them with the previous R_i and R_k. Do you expect the post-merger prices to be higher at the equilibrium?

   (c) Show the isoprofit functions of an insider and an outsider firm, before and after the merger, and use the figure to study the merger impact on firms' profitability.

Exercise 7 *Salant, Switzer and Reynolds found that mergers are rarely profitable. a) Briefly describe the model they rely upon and explain the intuition for their result. b) Discuss why this result is not robust across different model specifications.*

Exercise 8 *Farrell and Shapiro present a model which tries to find general conditions under which mergers increase welfare. Can you describe their method very briefly, and comment upon the applicability of such a method for real antitrust cases?*

Exercise 9 *(Buyer power coordination, drawn from Fumagalli and Motta (1999)*[75]*). Consider the following multi-stage game, which deals with a seller industry where there is an incumbent firm, I, which has already sunk its market-specific costs, and a potential entrant, E, which has still to make this fixed sunk cost investment, F. We assume that the potential entrant would be more efficient, as it would have a unit variable cost c_E which is strictly lower than the cost of the incumbent, c_I. At t=0, N buyers call a procurement auction for the supply of an identical product or service. At t=1, the incumbent and the potential entrant make their bids. The bids are simultaneous for all the buyers. Each buyer observes the bid it has received and independently from each other decides whether to accept the incumbent's or the entrant's offer.At t=2 the incumbent fulfils all the orders it has received; the entrant observes all the bids it has received, and decides whether to actually enter the industry or not. In the former case, it makes immediately the necessary investment andd fulfils the orders. In the latter case, it stays out and pays a penalty $t \geq 0$ to all the buyers which had offered the contract to it. At t=3, the buyers whose orders have not been fulfilled by firm E offer the contract to the incumbent. Show that there exists an equilibrium where the potential entrant does not enter the industry and indicate under which condition this occurs.*

Exercise 10 *In a country there are three big hotel chains whose names are Mordor, Rohan and Shire respectively. All together, they own 100% of the market. Entry in this sector is extremely difficult, given that the country imposes strong restrictions on building licenses, especially in areas of natural interest and on the coastline, which is precisely where most hotels are. The three firms jointly own (each one with one third of the shares) the firm Tibboh, which is a travel company which coordinates hotel reservations. Mordor has made a public offer for the purchase of the totality of Shire's shares. The*

[75]This paper is itself inspired by two other papers: Rasmusen, Ramseyer and Wiley (1991) and Segal and Whinston (1996) which discuss a similar coordination mechanism but in the context of exclusive dealing.

antitrust agency of the country has denied the authorisation for the takeover, on the grounds that such a merger would create a dominant position. The firm has filed an appeal with the Court of Justice, and argues that the merger would allow for considerable scale and scope economies, as well as for the rationalisation of the sales of hotel services. Its claim is supported by a report from a leading economics professor who claims that the firm could save up to 30% of its costs thanks to the merger and that the consumers would clearly benefit from these efficiency gains. You are the judge.

Exercise 11 *Describe the most relevant features of the structure of the French mineral water industry. Use this description to say whether the merger of Nestlè and Perrier would have created single-firm market dominance or collective market dominance.*

Exercise 12 *"En el caso "Nestlé-Perrier", la Comisión hubiera tenido que dar más peso al argumento de las empresas de que la fusión permitía unas ganancias de eficiencia de las cuales se hubieran beneficiado también los consumidores ya que, como hemos visto en la teoría, la "defensa de la eficiencia" es un argumento importante que hay que tener en cuenta a la hora de permitir o prohibir una fusión." Dí si estás de acuerdo con esta frase, y explica por qué.*

Exercise 13 *Indicate which elements might help collusion in the French mineral water industry. Explain whether scope for collusion would have increased with the takeover of Perrier such as it was originally proposed by Nestlè. Argue whether or not in your opinion the conditions imposed by the Commission to allow the merger are an obstacle to collusion in the industry.*

6.1 Answer to exercises

A1.

1) It is straightforward and follows from the first order conditions.

2) The system of inverse demand functions can be written in matricial form as $p - v = -\frac{1}{1+\gamma} Aq$, where p, q are respectively the price and quantity $(n, 1)$ vector, v is a $(n, 1)$ vector having the scalar v in each entry, γ is a scalar, and A is a (n, n) matrix having element $n + \gamma$ on the diagonal and

element γ everywhere off the diagonal. It is immediate to check that the direct demand functions can be rewritten in matricial form:

$$q = -(1+\gamma)A^{-1}(p-v).$$

Our problem is therefore to find A^{-1}, that is the inverse of matrix A.

Define $d = \frac{\gamma}{n}$. It is easy to check that $A = n(I + dO)$, where I is the identity matrix having 1 on the diagonal and 0 off the diagonal, and where O is the matrix with 1 in all its entries. Therefore, it must be $A^{-1} = \frac{1}{n}(I + dO)^{-1}$.

It turns out that $(I + dO)^{-1} = I - \left(\frac{d}{1+dn}\right)O$. We can check this by recalling that the product of a matrix by its inverse must be I. This requires a few steps, as follows.

$(I + dO)\left(I - \left(\frac{d}{1+dn}\right)O\right) = I + dO - \left(\frac{d}{1+dn}\right)O - \left(\frac{d^2}{1+dn}\right)O^2$.

One can immediately check that $O^2 = nO$. The previous expression can therefore be rewritten:

$I + dO - \left(\frac{d}{1+dn}\right)O - \left(\frac{nd^2}{1+dn}\right)O = I + \left[d - \frac{d}{1+dn} - \frac{nd^2}{1+dn}\right]O =$

$I + \left[\frac{d+d^2n}{1+dn} - \frac{d}{1+dn} - \frac{nd^2}{1+dn}\right]O = I + 0O = I.$

We can then conclude that the inverse of matrix A is given by:

$$A^{-1} = \frac{1}{n}\left[I - \left(\frac{\gamma}{n+n\gamma}\right)O\right].$$

With few steps of algebra one can then simplify the expression $q = -(1+\gamma)A^{-1}(p-v)$and check that it corresponds to the system of direct demand functions in the text.

A3.

(a) From the FOCs (6) of the outsiders it is possible to derive the best reply function p_o^R of each of the outsider with respect to the price p_I set by the insiders. Given that $c = 0$, this simplifies to:

$$p_o^R = \frac{\gamma m p_I + nv}{2n + \gamma(n+m-1)}.$$

The residual demand function q_I^r for a variety produced by the multi product firm can be obtained by taking the demand (3) and imposing two conditions: (1) at equilibrium the prices of all symmetric varieties will be identical; (2) to see the market power enjoyed for any variety sold by the multi

product firm we shall consider a proportional increase in all the product prices set by the firm at the same time (if p_I increases, it increases simultaneously for all product varieties). We then obtain:

$$q_I^r = \frac{1}{n}\left[v - p_I\left(1+\gamma\right) + \frac{\gamma m p_I}{n} + \frac{\gamma\left(n-m\right)p_o^R}{n}\right].$$

By substituting the value of p_o^R one finds the explicit expression of the residual demand function of the insiders.

(b) To compute the elasticity of the residual demand function $\epsilon_I^r = -\frac{dq_I^r/q_I^r}{dp_I/p_I}$, find first the derivative:

$$\frac{dq_I^r}{dp_I} = \left(-1 + \gamma\left(\frac{m}{n} - 1\right) + \frac{\gamma^2 m\left(n-m\right)}{n\left(2n+\gamma\left(n+m-1\right)\right)}\right)\frac{p_I}{n}.$$

We can now calculate the elasticity as:

$$\epsilon_I^r = \frac{\left(\gamma^2(n-m)(n-1) + \gamma(3n-m-1) + 2n^2\right)p_I}{\gamma^2(n-m)(n-1)p_I + 2n^2(v-p_I) + \gamma n\left(v(2n-1) - (3n-m-1)p_I\right)},$$

and some calculations show that:

$$\frac{d\epsilon_I^r}{dm} = -\frac{\left(2n^2 + \gamma n\left(4n-3\right) + \gamma^2\left(2n^2\right) - 3n + 1\right)\gamma n v p_I}{\left(\gamma^2(n-m)(n-1)p_I + 2n^2(v-p_I) + \gamma n\left(v(2n-1) - (3n-m-1)p_I\right)\right)^2} < 0.$$

The larger the number of products sold by the merging firms the lower the elasticity of the residual demand function faced by each of its product, i.e. the larger its market power. It is also possible to show that $\frac{d\epsilon_I^r}{dn} > 0$: as we would expect, for given number of products m sold by the insiders, the larger the number of firms operating in the industry the higher the elasticity faced by the insiders (the lower the market power enjoyed by the merging firms).

7 Appendix

Proof of Lemma 5. Welfare is defined as the sum of consumer surplus and producer surplus. In the case of the merger, welfare is given by:

$$\begin{aligned} W_m &= U(q_I, q_o) - 2p_I q_I - (n-2)p_o q_o + 2(p_I - c)q_I + (n-2)(p_o - c)q_o = \\ &= v\left(2q_I + (n-2)q_o\right) - \frac{n}{2\left(1+\gamma\right)}\left(2q_I^2 + (n-2)q_o^2 + \frac{\gamma}{n}\left(2q_I + (n-2)q_o\right)^2\right) \\ &\quad -2cq_I - (n-2)cq_o. \end{aligned}$$

By replacing equilibrium quantities in the above expression we obtain:

$$W_m = \frac{\left(2\gamma^4(n-2)^2n^2+6n^4+4\gamma n^4(5n^2-5n-1)+3n\gamma^2(8n^3-16n^2+4n+1)+\gamma^3(12n^4-36n^3+24n^2-n+2)\right)(v-c)^2}{4n^2(2n+3(n-1)\gamma+(n-2)\gamma^2)^2}. \tag{41}$$

Welfare before the merger is instead given by:

$$W_b = vnq_b - \frac{n^2q_b^2}{2} - ncq_b. \tag{42}$$

By replacing quantities we obtain:

$$W_b = \frac{\left(\gamma^2(n-1)^2 + 4\gamma n(n-1) + 3n^2\right)\left(v-c\right)^2}{2\left(2n + (n-1)\gamma\right)^2}. \tag{43}$$

The difference in welfare $\Delta W = W_{me} - W_b$ is given by:

$$\Delta W = -\frac{\gamma(v-c)^2\left(\gamma^4(n-2)(n-1)^2+16n^4+4\gamma n^3(10n-7)+4\gamma^2n^2(8n^2-11n+2)+\gamma^3n(8n^3-15n^2+5)\right)}{4n^2(2n+(n-1)\gamma)^2(2n+3(n-1)\gamma+(n-2)\gamma^2)^2} < 0.$$

It is straightforward to see that the difference is negative, given that the numerator is always positive for $n \geq 2$. This proves that (when there are no efficiency gains) the merger always reduces welfare. ■

Proof of Lemma 7. **Proof.** We know that total industry profits increase when $e \in [\bar{e}, 1]$, as in this interval both insiders and outsiders gain from the merger. Therefore, we only need to show that aggregate profits rise in the interval $e \in [0, \bar{e}]$.

Denote the producer surplus after the merger as $PS' = 2\pi_I + (n-2)\pi_o$, and producer surplus before the merger as $PS_b = n\pi_b$. For producer surplus to increase with the merger, we must therefore have $PS' > PS_b$, or equivalently: $\Delta_{Ib}(e) \equiv 2\left(\pi_I(e) - \pi_b\right) > \Delta_{bo}(e) \equiv (n-2)\left(\pi_b - \pi_o(e)\right)$. To prove that this is the case in the interval $e \leq \bar{e}$, we move in three steps.

(1) $\Delta_{Ib}(\bar{e}) > \Delta_{bo}(\bar{e})$.
(2) $\frac{\partial \Delta_{Ib}}{\partial e}(\bar{e}) < \frac{\partial \Delta_{bo}}{\partial e}(\bar{e}) < 0$.
(3) $\frac{\partial^2 \Delta_{Ib}}{\partial e^2} > 0 > \frac{\partial \Delta_{bo}^2}{\partial e^2}$.

Taken together, these three conditions ensure that $\Delta_{Ib}(e) > \Delta_{bo}(e)$ for $e \leq \bar{e}$, as showed in Figure 3.

[INSERT FIGURE 5: PROOF OF PROPOSITION 3]

Let us start with (1). To show that $\Delta_{Ib}(\bar{e}) > \Delta_{bo}(\bar{e})$, recall that $\Delta_{Ib}(e) > 0$ on all its domain, and that when $e = \bar{e}$ we have $\pi_o = \pi_b$. Hence, $\Delta_{Ib}(\bar{e}) = 2(\pi_I(\bar{e}) - \pi_b) > 0 = \Delta_{bo}(\bar{e}) = (n-2)(\pi_b - \pi_o(\bar{e}))$.

As for point (2), we have to compute the derivatives and take their value in $e = \bar{e}$. After some algebra, one finds that:

$$\frac{\partial \Delta_{Ib}}{\partial e}(\bar{e}) = -\frac{2c(v-c)(n+(n-1)\gamma)\left(3n(n-1)\gamma+2n^2+(n^2-3n+2)\gamma\right)}{n^2(2n+(n-1)\gamma)((n-2)\gamma^2+3(n-1)\gamma+2n)} < 0,$$

$$\frac{\partial \Delta_{bo}}{\partial e}(\bar{e}) = -\frac{2c(v-c)\gamma(n-2)(n+(n-2)\gamma)(n+(n-1)\gamma)}{n^2(2n+(n-1)\gamma)((n-2)\gamma^2+3(n-1)\gamma+2n)} < 0,$$

The inequality $\frac{\partial \Delta_{Ib}}{\partial e}(\bar{e}) < \frac{\partial \Delta_{bo}}{\partial e}(\bar{e})$ can be re-written as:

$$-\frac{2c(v-c)\left(2n^3+n^2(4n-3)\gamma+(n^2-3n+2)\gamma^3+n(2n^2-2n-1)\gamma^2\right)}{n^2(2n+(n-1)\gamma)((n-2)\gamma^2+3(n-1)\gamma+2n)} < 0,$$

which proves point (2).

We are now left with point (3), which just consists of computing the second derivatives and showing that $\Delta_{Ib}(e)$ is convex whereas $\Delta_{bo}(e)$ is concave. It can be checked that:

$$\frac{\partial^2 \Delta_{bo}}{\partial e^2} = -\frac{2c^2(n-2)(n+(n-2)\gamma)^2(n+(n-1)\gamma)}{n^4((n-2)\gamma^2+3(n-1)\gamma+2n)^2} < 0.$$

This completes the proof. ■

Proof of Lemma 9. To prove this lemma, it is useful to make use of the following:

Remark 3 *At the non-cooperative equilibrium of the one-shot price-competition game the prices at which each product variety is sold can be ranked as follows:*

$$p_b(\kappa) < ... < p_b(k) < ... < p_b(K), \qquad with \qquad K > ... > k > ... > \kappa.$$

This remark tells us that the smallest firm in the industry charges the lowest per-product prices in the industry, and the largest firm the highest per-product prices.

We can prove this result by contradiction. Suppose that $p_b(m) \equiv p_m < p_k \equiv p_b(k)$ when $m > k$. The profit function of the firm having the first m products is given by:

$$\pi(m) = m\left[\left(\frac{p_m - c}{n}\right)\left(v - p_m\left(1 + \gamma - \frac{\gamma m}{n}\right) + \frac{\gamma}{n}\sum_{i=m+1}^{n} p_i\right)\right],$$

where we have made use of the fact that all the m products sold by the firm have the same price p_m. The first-order condition of the maximisation problem of this multi-product firm is given by:

$$\frac{\partial \pi(m)}{\partial p_m} = v - p_m\left(1 + \gamma - \frac{\gamma m}{n}\right) + \frac{\gamma}{n}\sum_{i=m+1}^{n} p_i \; - (p_m - c)\left(1 + \gamma - \frac{\gamma m}{n}\right) = 0,$$

which can be re-written as: $q_m \; = (p_m - c)\left(1 + \gamma - \frac{\gamma m}{n}\right)$, where q_m is the quantity sold by the firm for each of its m products. By analogy, the maximisation of its profit requires the following condition for a firm with k products: $q_k \; = (p_k - c)\left(1 + \gamma - \frac{\gamma k}{n}\right)$.

Since we have assumed that $p_m < p_k$ and that $m > k$, it must follow that $q_m < q_k$. But from the demand function, it must hold that $q_m = v - p_m(1 + \gamma) + \frac{\gamma}{n}\sum_{j=1}^{n} p_j$ and that $q_k = v - p_k(1 + \gamma) + \frac{\gamma}{n}\sum_{j=1}^{n} p_j$.

By subtracting the latter from the former we obtain: $q_m - q_k = (p_k - p_m)(1 + \gamma)$. Since $p_m < p_k$ by assumption, it must be that $q_m > q_k$, but this contradicts what we have found above. This completes the proof on the ranking of prices.

Let us now turn to our second step in the proof of the lemma, where we have to show that $\pi_m < \pi_k$ if $k < m$. Let us write the per-product profit π_m that the large firm with m products obtains at equilibrium as $\pi_m = \pi_m(p_m, .., p_m, p_k, .., p_k, p_{m+k+1}, .., p_n)$, where the first m prices p_m are those charged by the m products of the large firm, and the prices p_k (from $m + 1$ to $m + k$) are those charged for the k products of the smaller firm.

Consider now what happens if the k products from $m+1$ to $m+k$ charged the higher price p_m instead of p_k. Since we are considering products which are demand substitutes, it must be that π_m would increase. Therefore, it must be: $\pi_m = \pi_m(p_m, .., p_m, p_k, .., p_k, p_{m+k+1}, .., p_n) < \pi'_m = \pi_m(p_m, .., p_m, p_m, .., p_m, p_{m+k+1}, .., p_n)$.

Since firms are symmetric except for the number of products produced, the per-product profit earned by the large firm when both the small and the large firm charge prices p_m on all their product varieties must coincide with the per-period profit earned by the small firm when both firms charge prices p_m: $\pi'_m = \pi_m(p_m, .., p_m, p_m, .., p_m, p_{m+k+1}, .., p_n) = \pi'_k = \pi_k(p_m, .., p_m, p_m, .., p_m, p_{m+k+1}, .., p_n)$.

The previous expression π'_k gives the per-product profit earned by each of the k products of the small firm when it sells all its products at the same price p_m charged by the large firm. But at the non-cooperative equilibrium the best response of the small firm when the large firm sells its products at p_m requires charging the price $p_k < p_m$. Therefore, it must be that: $\pi'_k = \pi_k(p_m, .., p_m, p_m, .., p_m, p_{m+k+1}, .., p_n) < \pi_k = \pi_k(p_m, .., p_m, p_k, .., p_k, p_{m+k+1}, .., p_n)$.

This shows that at the non-cooperative equilibrium $\pi_m < \pi_k$ if $k < m$.

■

Proof of Lemma 11. Proof.

For the products sold by the non-deviating firms to be positive when a firm with k products deviates by undercutting its prices to $\tilde{p}$, we must have:

$$q_j = \left(\frac{1}{n}\right)\left(v - p_M(1+\gamma) + \frac{\gamma(n-k)p_M}{n} + \frac{\gamma k\tilde{p}}{n}\right) \geq 0$$

where $p_M = (v+c)/2$. [76]After some algebra, it can be checked that a deviating firm obtains all the market if:

$$\tilde{p}(k) = \frac{(\gamma k - n)v + (\gamma k + n)c}{2\gamma k}$$

Note that a large firm with many product varieties will find it easier to undercut a rival, since the RHS of the expression above increases with k. In other words, a large firm does not need to cut its prices as much as a small

[76]As indicated in the previous footnote, note that whether another firm is able to sell or not after a firm deviates by setting a price $\widetilde{p}$ depends on the number of varieties k of the deviating firm.

firm should do in order to be able to exclude the rivals from the market during a deviation period. (However, we shall see that the large firm has also less incentive to undercut.) A necessary condition for such a deviation to be profitable is $\tilde{p}(k) > 0$. Therefore, it must be that $\gamma > \frac{n(v-c)}{k(v+c)} \equiv \widehat{\gamma}(k)$.

Suppose now that such a deviation is profitable for a firm with k products and one with $r < k$ products. A firm with k products obtains from the deviation a per-product profit $\tilde{\pi}(k) = \tilde{\pi}(\tilde{p}(k), ..., \tilde{p}(k))$, corresponding to the situation where it sells k products all selling at the same price $\tilde{p}(k)$. By eliminating some products and keeping unchanged the price, the per-product profit will increase: $\tilde{\pi}(k) < \tilde{\pi}'(k) = \tilde{\pi}'(\tilde{p}(k), ..., \tilde{p}(k))$, where the price vector is now composed of $r < k$ identical elements $\tilde{p}(k)$.

Finally, it must be that $\tilde{\pi}'(k) = \tilde{\pi}'(\tilde{p}(k), ..., \tilde{p}(k)) < \tilde{\pi}(\tilde{p}(r), ..., \tilde{p}(r)) \equiv \tilde{\pi}(r)$, where the latter inequality comes simply from the fact that the optimal deviation price for a firm with r products is $\tilde{p}(r)$ and not $\tilde{p}(k)$. Hence, we have showed that $\tilde{\pi}(k) < \tilde{\pi}(r)$ for $k > r$. ■

Proof of Proposition 12. The first step is to compute explicitly $\pi_D(k)$. This can be done as follows. By replacing q_j in the first order condition above and solving with respect to the price, one obtains the optimal deviation price when all the firms have a positive output. This is given by:

$$p_D(k) = \frac{(2n + \gamma n - \gamma k)v + c(3\gamma n - 3\gamma k + 2n)}{4(n + \gamma n - \gamma k)}$$

By substitution one can find the optimal deviation profit:

$$\pi_D(k) = \frac{(2n + \gamma n - \gamma k)^2 (v - c)^2}{16n^2 (n + \gamma n - \gamma k)}$$

It is easy to check that $\frac{\partial \pi_D(k)}{\partial k} < 0$, which confirms that the higher the number of product varieties of a firm, the lower the deviation profits it can make. However, we also have to check if the deviation price $p_D(k)$ is consistent with all the firms selling a positive output. This is satisfied as long as $p_D(k) > \tilde{p}$. By substituting and solving with respect to γ, this condition can be expressed as:

$$\gamma < \gamma'(k) = \frac{n}{k}\left(1 + \frac{\sqrt{n^2 - k^2}}{n - k}\right)$$

Therefore, the function $\pi_D(k)$ has values in $\gamma \in (0, \gamma'(k))$,and it is increasing in its domain.

The next step is to study the function $\tilde{\pi}(k)$. If the deviating firm charges the highest possible price $\tilde{p}$ which guarantees it will be the only firm selling in the market, its profit is:

$$\tilde{\pi}(k) = \frac{(\gamma^2 k^2 - n^2)(v-c)^2}{4\gamma^2 k^3}$$

which is an increasing and concave function in its domain $\gamma \in (\widehat{\gamma}(k), \infty)$.

Since $\widehat{\gamma}(k) < \gamma'(k)$, we have that in the interval $(\widehat{\gamma}(k), \gamma'(k))$ both types of deviation give positive profits to the deviating firm. We should then try to see which type of deviation is optimal in this interval. The following can be shown.

Remark 4 *There exists a value $\tilde{\gamma}(k) \in (\widehat{\gamma}(k), \gamma'(k))$, which is obtained as the solution of the equality $\pi_D(k) = \tilde{\pi}(k)$, such that for $\gamma < \tilde{\gamma}(k)$ the optimal deviation profit is $\pi_D(k)$.*

Proof.

Unfortunately, to find the explicit form of $\tilde{\gamma}(k)$ turns out to be a difficult task. To prove this remark we proceed in two steps. First we prove that if $\tilde{\gamma}(k)$ exists it must be $\tilde{\gamma}(k) > \widehat{\gamma}(k)$. We know that in the point $\gamma = \widehat{\gamma}(k)$ we have $\tilde{p}(k) = 0$. Therefore, $\tilde{\pi}(k) = 0$, whereas $\pi_D(k \mid \gamma = \widehat{\gamma}(k)) > 0$. Therefore, by continuity there must exist an interval $(\widehat{\gamma}(k), \gamma)$ for which $\pi_D(k) > \tilde{\pi}(k)$.

Next step is to prove that $\tilde{\gamma}(k) < \gamma'(k)$. When $\gamma = \gamma'(k)$, we have:

$$\tilde{\pi}(k \mid \gamma = \gamma'(k)) - \pi_D(k \mid \gamma = \gamma'(k)) = \frac{(v-c)^2 (n-k)^2 \left(n^2 + n\sqrt{n^2-k^2} - k^2\right)}{4nk \left(n + \sqrt{n^2-k^2}\right) \left(n + \sqrt{n^2-k^2} - k\right)^2} > 0.$$

Since both functions are continuous and increasing in $(\widehat{\gamma}(k), \gamma'(k))$ from $\pi_D(k) > \tilde{\pi}(k)$ in $\gamma = \widehat{\gamma}(k)$ and $\pi_D(k) < \tilde{\pi}(k)$ in $\gamma = \gamma'(k)$, it follows that there exists only a point $\gamma = \tilde{\gamma}(k)$, where $\pi_D(k) = \tilde{\pi}(k)$. This completes the proof of the remark.

We can now establish the proposition. If $\gamma \in (0, \tilde{\gamma}_{\min}]$ then all the firms have deviating profits $\pi_D(k)$.In this interval, the incentive constraint of each firm will be given by $\pi_M \geq (1-\sigma)\,\pi_D(k) + \sigma\pi_b(k)$. But we have seen that π_M

, σ are identical for all firms, and that both the deviation profit $\pi_D(k)$ and the punishment profit $\pi_b(k)$ are the higher the lower the number of products of a firm. Therefore, the constraint is the most binding for the smallest firm in the industry, the one with κ products.Full collusion is sustainable only if $\sigma \geq \sigma'_k = \frac{\pi_D(\kappa)-\pi_M}{\pi_D(\kappa)-\pi_b(\kappa)}$.

If $\gamma \in [\gamma'_{\max}, \infty)$,then all the firms have deviating profits $\tilde{\pi}(k)$. The incentive constraint is given by $\pi_M \geq (1-\sigma)\,\tilde{\pi}(k) + \sigma\pi_b(k)$. In this case as well, both the deviation profit $\tilde{\pi}(k)$ and the profit in the punishment phase $\pi_b(k)$ are the highest for the smallest firm, and collusion can be sustained only if $\sigma \geq \tilde{\sigma}'_k = \frac{\tilde{\pi}(\kappa)-\pi_M}{\tilde{\pi}(\kappa)-\pi_b(\kappa)}$. ■

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Figure 1

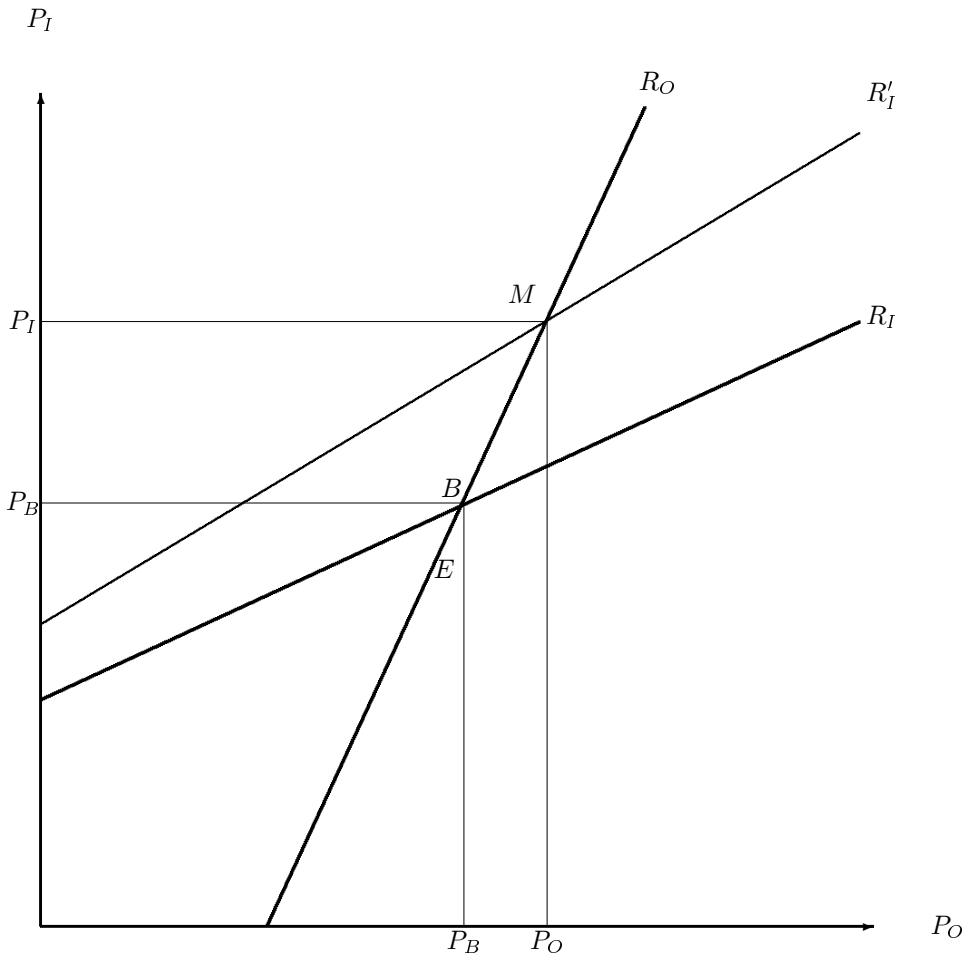

Figure 2

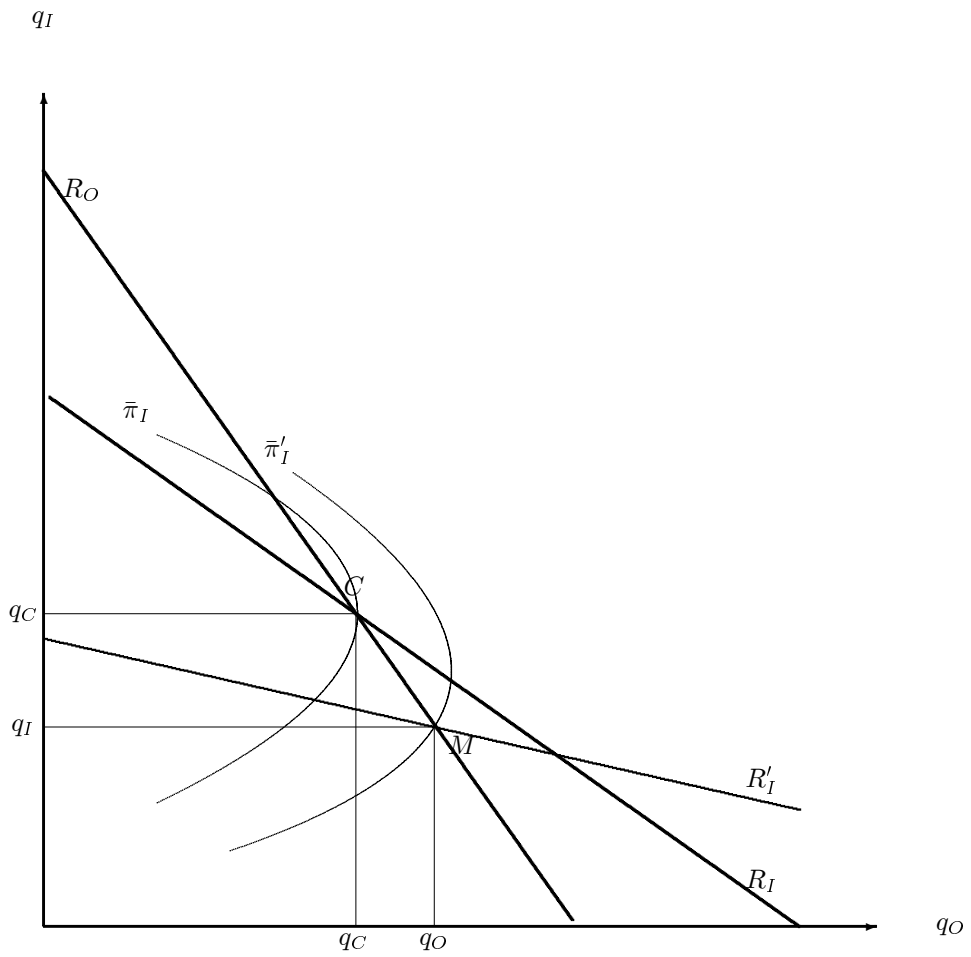

Figure 3

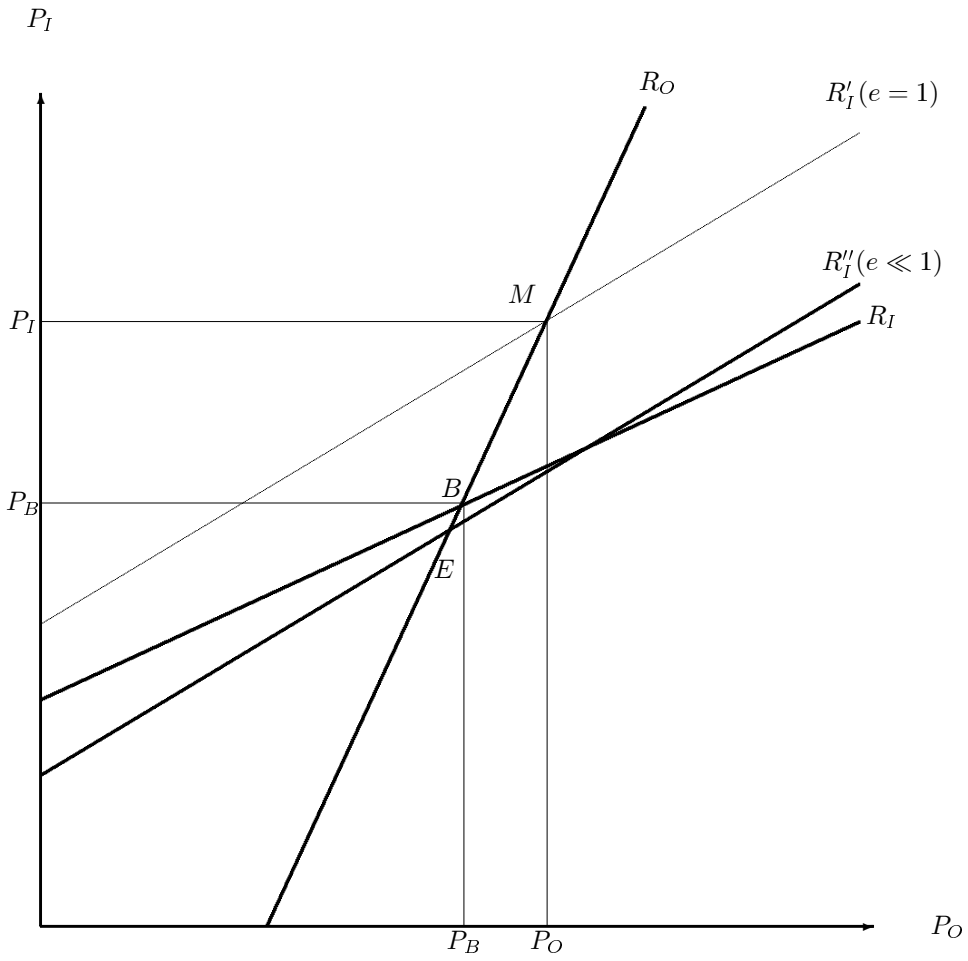

Figure 4

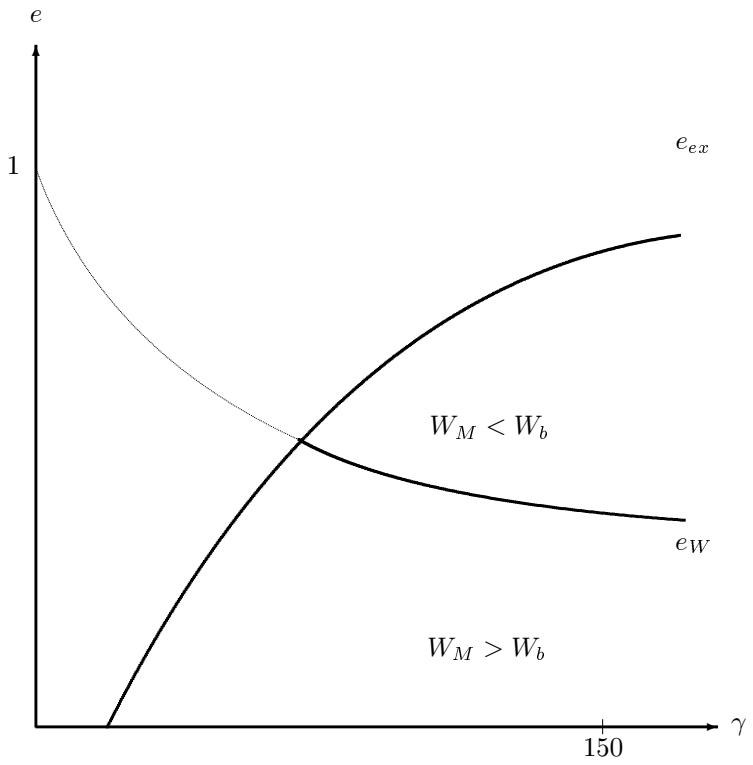

Figure 5