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Combination versus competition: The welfare trade-offs revisited

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Beiträge zur angewandten Wirtschaftsforschung

Nr. 10 (2005)

**Combination Versus Competition -
The Welfare Trade-offs Revisited**

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1 Introduction¹

With the Eastern enlargement of the European Union, integration of the European economies takes a substantial step forward. As a consequence, the decrease of barriers motivates and facilitates mergers and acquisitions as well as cooperations among firms. Primarily, this development has a favorable effect on economic welfare. Most combinations of firms are driven by the motivation to realize synergy effects. However, a horizontal cooperation or merger between firms tends to increase market concentration and can hence have a negative impact on competition. These two effects comprise the challenge to competition authorities as they have to evaluate the total effect on economic welfare.

The paper is organized as follows. In section 2, the assumptions of the framework that is developed in this paper will be explained. In the main part of the paper (sections 3), three scenarios are analyzed in which the efficiency effect of a combination is weighed against the concentration effect. Within these scenarios, several constellations can be differentiated by assumptions about the market structure and barriers to market entry. Section 4 concludes.

2 Assumptions

In his article from 1969, Williamson introduced the idea of a trade-off between the efficiency effect and the concentration effect due to a combination of firms. He assumes a combination, i.e. a merger or cooperation, of two firms forming a cartel or monopoly. The efficiency effect of the combination is a cost reduction of the combined firms as compared to the situation before the concentration. The concentration effect implies that the firms are now able to set a monopoly price. If the (positive) efficiency effect has a greater impact on total surplus (made up of producer and consumer surplus) than the concentration effect, welfare increases and competition authorities should approve the combination. Contrarily, if the concentration effect is larger the combination should be prohibited.²

¹ I would like to thank Dirk Lamprecht (University of Muenster) and Johann Eekhoff (University of Cologne) for their valuable comments. Many thanks also to Burkhard Kesting for valuable support work. I finally owe thanks to the Volkswagen Foundation for their support of this research project.

² See *Williamson* (1969).

The model that is developed in this paper changes some of the assumptions of the Williamson model in order to make it more realistic and to attain a broader application. Instead of a horizontal cost curve, as presumed by Williamson, an upward sloping cost curve is assumed. As synergy effects due to a combination should materialize within a few years, a short run perspective is adequate. In the short run, marginal costs can be assumed to rise and therefore the cost curve is upward sloping. This assumption, however, introduces the necessity to differentiate between fixed and variable costs. This problem will be solved in this paper using a new approach to include fixed costs into a market analysis.

A second assumption is the possibility of no barriers to entry. Finally, synergy effects can not only be realized by saving costs. An alternative efficiency effect of a combination is the innovation of a product (which includes the invention of a new product).

In the following, alternative scenarios for a welfare trade-off due to a combination of firms will be developed. In scenario 1, a combination is analyzed where a reduction of variable costs is weighed against the concentration effect. With the introduction of fixed costs to the model, the reduction thereof can be regarded in scenario 2. It was noted above that a synergy effect can also take the form of a product innovation. Scenario 3 is concerned with this possibility.

3 Efficiency effects versus synergy effects of a combination

3.1 Scenario 1: Reduction of variable costs

In this scenario the Williamsonian model will only be modified such that the cost curve is upward sloping and barriers to entry are taken into account. As the reduction of variable costs is regarded, fixed costs can be ignored.

Let us assume an equilibrium in point A with a competitive market structure in figure 1 where an average benefit is attained, as compared to other sectors of the economy. The marginal cost curve is MC_0 and the demand curve D so that p_0 and x_0 are the equilibrium price and quan-

tity.³ Now assume for simplicity that all the firms in the market decide to cooperate or to form a monopoly. This combination yields two effects. The efficiency effect is assumed to be a reduction of variable costs shifting MC_0 downward to MC_1 . As the firms are now able to exert greater market power they are assumed to charge the monopoly price p_1 which leads to a sold quantity of x_1 .⁴ The new equilibrium is described by the points B and R. Due to the described effects, consumer surplus is reduced by the area p_0ABp_1 . Producer surplus increases by the areas p_0GBp_1 and $ERCF$, where the latter describes the efficiency gain; it decreases by the area CAG . The net effect on producer surplus has to be positive because both the efficiency effect and the concentration effect have a positive impact on producer surplus.⁵ Total surplus rises by the area $ERCF$ and decreases by the area CAB (which is the dead-weight loss due to monopoly pricing).⁶ If the first area is larger than the second, i.e. the efficiency effect is bigger than the concentration effect, the impact of the combination on total welfare is positive and it should be approved by the competition authorities.

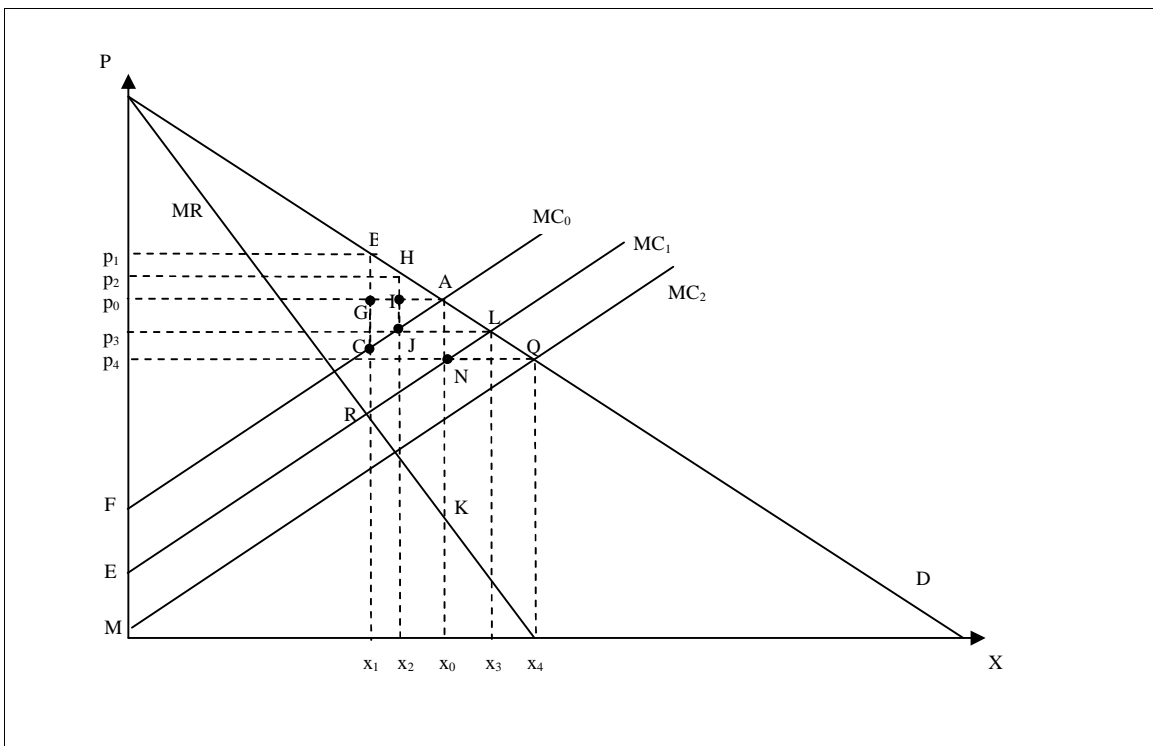


Figure 1: Reduction of variable costs

³ For a definition and the properties of a competitive equilibrium see *Frank* (2000), pp. 363-364 or *Wied-Nebbeling/Schott* (1998), pp. 174-178.

⁴ The monopoly equilibrium is determined by the optimization condition that marginal cost (MC) is to equal marginal revenue (MR). See *Frank* (2000) pp. 394-410, or *Varian* (1995), pp. 387-390.

⁵ The efficiency effect is equal to area $EDCF$. The concentration effect is positive for producers because they gain from setting the monopoly price p_1 is higher than the gain from charging the competitive price p_0 .

⁶ For the concept of producer, consumer and total surplus see *Frank* (2000), pp. 364-367, or *Varian* (1995), pp. 236-252.

However, the higher gains that are realized by producers in the market attract additional firms. The equilibrium described above (points B and R) can only be the final equilibrium in the case of a non-competitive market. If the market is completely competitive the incumbent firms are forced to set a price equal to marginal cost, i.e. p_3 . However, as firms attained an average gain in the initial equilibrium, the firms receive a higher benefit after the combination due to the cost saving. Therefore, new firms have an incentive to enter the market. In order to be able to compete this has to be an efficient entry, i.e. the new firms have to realize the same efficiency gains as the incumbent firms did by the means of the combination. Entry is worthwhile until benefits in the market are equal to the average benefit in the economy. Due to the entry of firms the marginal cost curve shifts to the right (from MC_1 to MC_2). The final equilibrium is somewhere below point L, say point Q, where p_4 is the equilibrium price and x_4 is the equilibrium quantity. As compared to the initial equilibrium, consumer surplus rises by the area $p_4QA p_0$. Producer surplus increases $MQNE$ by but decreases by $p_4NA p_0$. After the combination of the firms producer surplus is positive even though price is set equal to marginal cost because only part of the efficiency gain is redistributed to consumers.⁷ As new firms enter the market this higher producer surplus is distributed to a higher number of firms until an average benefit is reached. Therefore, the benefit for each producer is constant in the medium term and long run if the market is completely competitive. Total surplus increases by $MQAF$ which is equal to the efficiency gain.

An alternative situation in this scenario is that only some of the firms in the market decide to work together in a cooperation or monopoly. This would lead to an oligopoly where a price between p_0 and p_1 would be charged, for example p_2 .⁸ Like the monopoly case there would have to be barriers to entry, otherwise this price could not be charged. The effect on welfare would tend to be more positive than if a monopoly price is set (because of the smaller concentration effect) but more negative than a situation with a completely competitive market (where no concentration effect exists and price equals marginal cost).

Furthermore, the initial equilibrium may be oligopolistic. If there are barriers to entry, which is usually the case in an oligopolistic market, the price will be between p_0 and p_1 , say p_2 , and quantity would then equal x_2 . A combination will then lead to a more concentrated oligopoly

⁷ A full redistribution would only take place if the demand curve was completely inelastic, which in reality will rarely be the case.

⁸ An oligopolistic price will usually lie between the competitive (marginal cost) price and the monopoly price. See for example *Borchert/Grossekettler* (1985), pp. 13-111.

or even a monopoly with the price p_1 and the quantity x_1 . As before, the marginal cost curve will shift downward to MC_1 . The results will be similar to those described above with barriers to entry.

3.2 Introducing fixed costs into the model

In a lot of situations, cost savings are realized by reducing the fixed costs of the combined firms rather than variable costs. This is the case if the firms use the same assets for their production and, probably more importantly, if the same support functions such as controlling or marketing are used by all entities that are involved in the combination. All the mentioned forms of fixed costs have to be borne before the first unit can be produced. Therefore they could be interpreted as marginal costs of the first unit. However, a more realistic interpretation can be attained by taking a firm's investment rationale into consideration. In the case of substantial fixed costs, a minimum quantity is necessary in order to regain at least part of these costs. Whereas the exact quantity that will be sold as a result of an investment is not known ex ante, a firm will usually calculate with this minimum quantity.

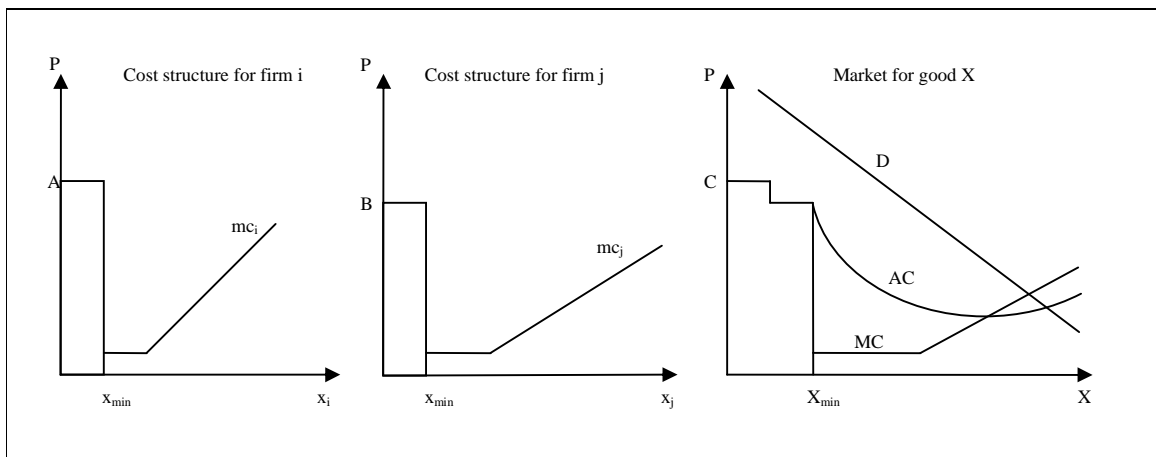


Figure 2: Derivation of the aggregate marginal cost curve in a fixed costs framework

The marginal cost curve mc_i in the left diagram of figure 2 exhibits such an individual investor's rationale. Let x_{min} be the minimum quantity that the investor takes into account. The fixed costs per unit of this quantity plus the variable costs add up to average costs equal to point A. For each unit produced in addition to the minimum quantity only the variable costs have to be borne leading to the flat part in the left diagram. At some point the capacity of the

fixed assets that are used in the production process will be fully employed and a re-investment will be necessary. Realistically, not all fixed assets will have the same capacity so that they will full employment occurs at different quantities. This phenomenon is approximated by the rising part of the individual marginal cost function in the left panel. Once this point is reached, it can be regarded as a new investment situation, like the one explained above. The diagram in the middle of figure 2 describes another investor's individual situation similar to the first investor.⁹ Capacities of the two investors are assumed to be different (the flat parts have different lengths), and so are the fixed costs that have to be borne in order to create these capacities. In order to derive the market curve of marginal costs, the individual marginal cost curves are aggregated horizontally. This results in the marginal cost curve MC in the right diagram of figure 2.¹⁰

For the functioning of market processes in this framework consider figure 3. The firms' cost structures were aggregated as explained above.¹¹ Assume an initial equilibrium in point A with price p_0 , quantity x_0 and an aggregate minimum quantity of x_0^{\min} . As fixed costs per unit of X are higher than the price firms bear a loss of $(L-p_0)$ per unit adding up to a total loss equal to area p_0SKL . Whether this is a stable equilibrium depends on the firms' profits. Let us assume that the marginal cost curve MC_0 contains the economy's average return in the form of opportunity costs. Then firms receive an equilibrium profit if the loss borne over the minimum quantity x_0^{\min} is compensated by the surplus over the other units $(x_0-x_0^{\min})$. In other words, firms receive the economy's average profit if the area of the loss (p_0SKL) is equal to the area of the surplus (SUHA). Let us denote this situation a "medium term equilibrium". If the market is competitive, i.e. barriers to entry are not prohibitively high, the market will always return to such a medium term equilibrium.

Consider what happens if positive profits are earned, i.e. if in the initial equilibrium in point A (p_0, x_0, x_0^{\min}) the area SUHA is larger than the area p_0SKL . In this case new firms would be attracted. Due to the additional capacities let the new minimum quantity equal x_1^{\min} increasing the fixed cost block to equal the area $x_0^{\min}, x_1^{\min}, F, K$. The flat part of the marginal costs will also increase, say by the distance HJ. The horizontal aggregation of the individual marginal

⁹ For simplicity, minimum quantities of the two investors are assumed to be the same. The analysis would not yield different results if this assumption was altered.

¹⁰ For the horizontal aggregation of individual marginal cost curves see for example *Wied-Nebbeling/Schott* (1998), pp. 166-167.

¹¹ In order to simplify the analysis the fixed costs are shown in one block disregarding different individual levels. They were added and then divided by the aggregate minimum quantity. This simplification does not lead to different results than the aggregation procedure described above.

cost curves results in a flatter aggregate cost curve MC_2 . Price will decrease to p_2 and the quantity sold will rise to x_2 . The new aggregate loss due to the fixed costs increases, now equalling area p_2IFL whereas aggregate surplus also increases to equal area $IGJR$. As the new (short-term) equilibrium in point R is further away from the monopoly equilibrium (point C) than the initial equilibrium (point A) each individual firm's profits will decrease. This process will continue until profits in this market are equal to the economy's average profits. This is true where the average cost curve AC intersects the demand curve (the average cost curves are not depicted in figure 3).

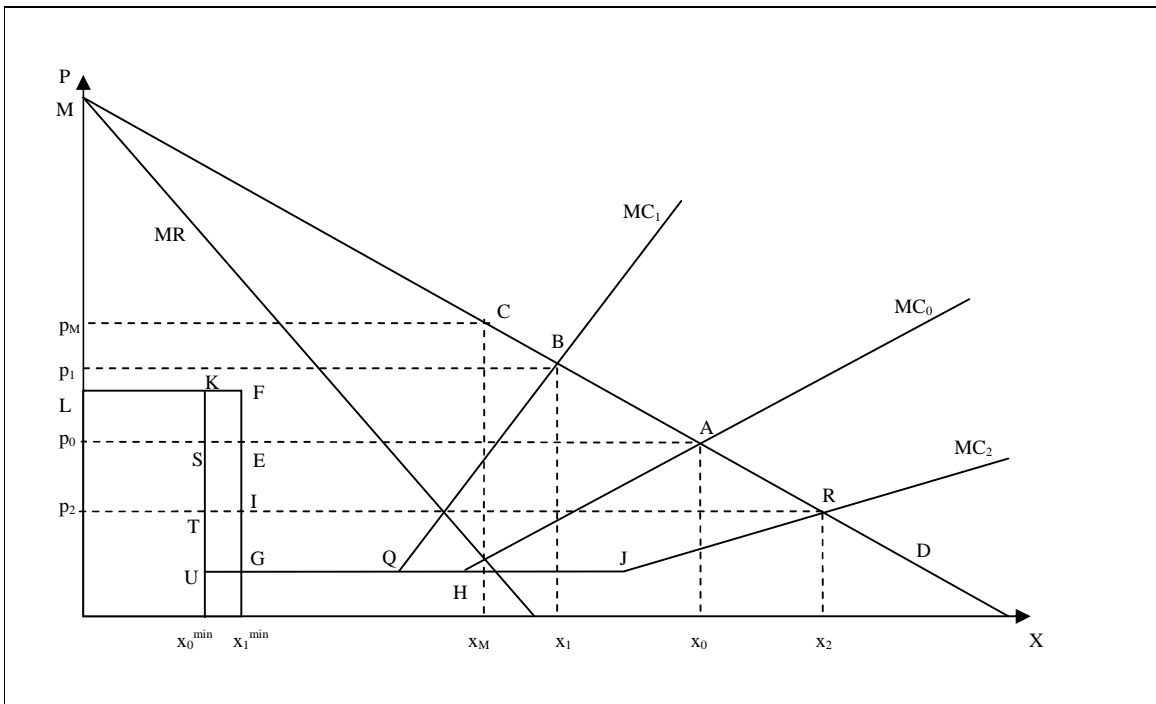


Figure 3: Market process in a fixed cost framework

On the other hand, a medium-term equilibrium where firms bear a loss on average cannot materialize besides the situation of a natural monopoly. In order to prove this hypothesis consider the right diagram in figure 2 once again. The marginal cost curve will always intersect the average cost curve in its minimum. Equilibria to the left of this intersection fall into the area of a natural monopoly. At the same time, an equilibrium in this area will imply an average loss as the demand curve and the marginal cost curve will have their intersection below the average cost curve. If average costs are higher than the price firms on average bear a loss. The case of a natural monopoly, i.e. an equilibrium to the left of the intersection of D and MC shall be disregarded in this paper, because in this case a monopoly is always the most efficient solution with no need for a trade-off. Hence, for a medium-term equilibrium that does not lie

within the area of a natural monopoly price will always be higher than (or at least equal to) average costs.

However, the market does not necessarily remain in a medium-term equilibrium. The fact that an average return is earned in the market does not necessarily imply that each individual firm receives an average profit. If cost structures and hence their productivities differ yields will also be different. Therefore it is possible that the economy's average return is earned in the market but some firms make profits and others incur losses. Let us assume an equilibrium in point A in figure 3 with price p_0 and quantity x_0 . Let the minimum quantity now be x_1^{\min} . In this medium-term equilibrium let the average profit be zero, i.e. the areas p_0EFL and $GHAE$ are equal. Yet, some firms earn profits higher than the economies average return and others bear losses due to different productivities of the firms' assets. Those firms that incur losses will leave the market eventually.¹² Hence, the minimum quantity will decrease, assumably to x_0^{\min} and therefore the block of fixed costs become smaller by the area $x_0^{\min}, x_1^{\min}, F, K$. The flat part of the marginal cost curve shortens and the curve will become steeper (MC_1). As the new equilibrium in point B is now closer to the monopolistic equilibrium C and since fixed costs have decreased, market profits will increase. These higher than average profits attract new firms will enter the market, which they are only able to if they employ efficient assets of production until an equilibrium is reached where all firms receive the economy's average return. Let us denote such a situation a long-term equilibrium. However, as a medium-term equilibrium is stable for a while (until re-investment in inefficient firms is necessary) and since competition policy should regard short and medium-term developments, it is sufficient to regard medium-term equilibria.

3.3 Scenario 2: Reduction of fixed costs

Synergy effects reducing the fixed costs of the partners are the more relevant part of a cost reduction as compared to the reduction of variable costs. They include the mutual use of new or existing assets, transport or service facilities, management capacities etc.

¹² If all marginal costs are lower than the price, as assumed here, it is worthwhile to produce with the existing capacities which in this case are sunk costs. Firms will exit the market as soon as their assets have depreciated and a re-investment would be necessary.

Consider the framework developed in the previous section. Assume a medium-term equilibrium in point A in figure 4 with a competitive market structure where price is p_0 and quantity equals x_0 . Let the minimum quantity be x_0^{\min} and the level of fixed costs equal to K. Now two of the firms decide to cooperation or merge hence realizing a reduction of their fixed costs. Hence, the average market fixed costs decrease from the level K to the level L.

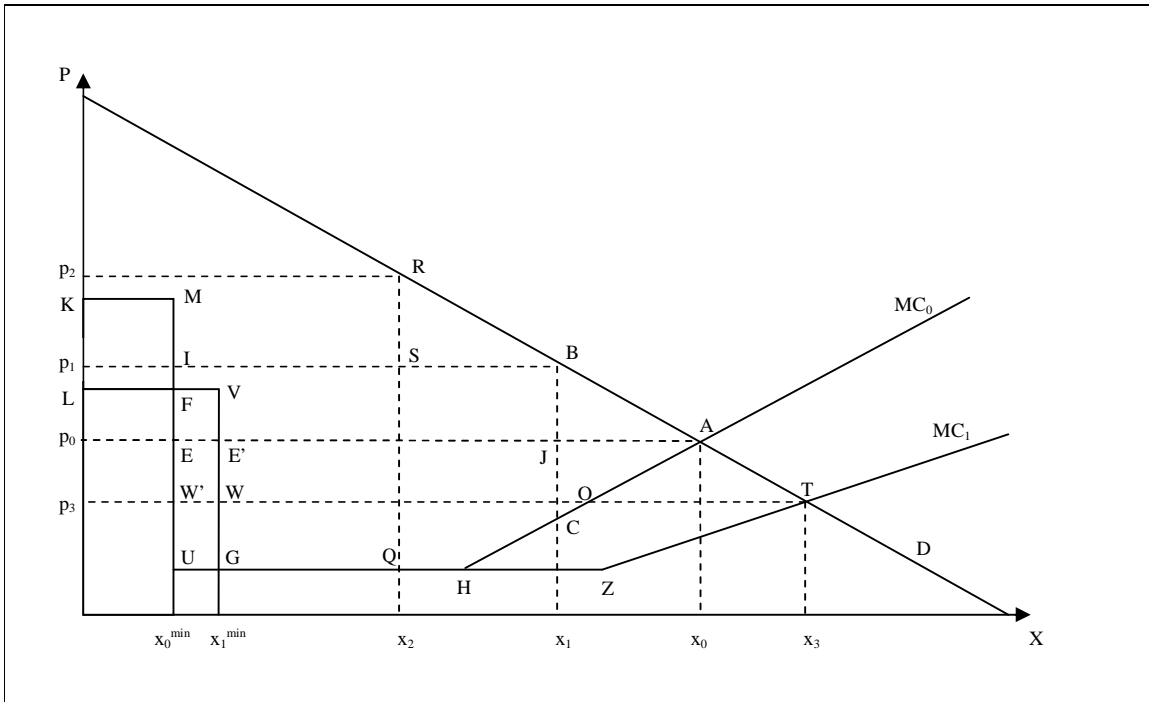


Figure 4: Reduction of fixed costs

If barriers to entry are not prohibitive new firms are attracted by the increased returns. Assumably the new firms enter using efficient assets of production with a fixed cost level of L per unit of X. Hence, the minimum quantity rises to x_1^{\min} increasing the block of fixed costs by the area $x_0^{\min}, x_1^{\min}, V, F$. The constant part of the marginal cost curve becomes longer and the rising part will be flatter (MC_1). Hence, price decreases to p_3 and quantity increases to x_3 (point T) moving the equilibrium further away from the monopoly situation (point C). Therefore the overall return to firms in the market decreases. Hence, for an average return to be attained as in the initial equilibrium (point A with x_0^{\min} and fixed costs per unit K) the losses over the minimum quantity that are incurred due to the fixed costs must be lower than initially. In other words, the loss in the new equilibrium which equals area p_3WVL must be lower than the loss in the initial equilibrium that was equal to area p_0EMK . Let this be true in the new equilibrium in point T. Hence, the overall profit (area $GZTW$) equals the loss over the minimum amount (area p_3WVL). Therefore, producer surplus increases by the areas

LFMK and HZTO and decreases by the areas UGVF and p_3OAp_0 . Consumer surplus rises by p_3TAp_0 . Total surplus clearly increases because both consumer and producer surplus increase (recall that each firm receives average profits but as firms have entered the market producer surplus has grown). The individual producers are no better or worse off than initially because they earn average profits. Only in the short run those firms that have realized the efficiency increase earn more temporarily. As total surplus rises (by the areas LFMK and HZTA minus UGVF) this scenario does not pose a problem to competition authorities. This result is owed to the fact of the free entry of firms.

Results change fundamentally if barriers to entry are prohibitive. Let point A again be the initial equilibrium with fixed costs per unit of K and a minimum quantity x_0^{\min} . Due to the combination of two firms the aggregate fixed cost level is reduced to L. The higher market profits form an incentive for other incumbent firms to realize similar synergies by the means of a combination. Assume these processes to lead to an increased market concentration and hence an oligopolistic market structure. Hence, firms will be able to set a higher price, say p_1 leading to a decrease in the quantity sold of x_1 . Producer surplus rises by the areas LFMK, LFI p_1 and EJBI and decreases by the area CAJ. Consumer surplus is reduced by the area p_0ABp_1 . The effect on total surplus is ambiguous. It rises by LFMK (efficiency effect) and decreases by CAB (concentration effect). In this situation a welfare trade-off becomes necessary where competition authorities have to estimate which effect is larger. In case of a combination that solely produces cost synergies a good indicator for the welfare effect is the price. If it rises the concentration effect is likely to be larger than the efficiency effect. However, this indicator ignores quantity effects. Furthermore, it cannot be employed if quality changes play a role, which will be shown later.

As in scenario 1 it is possible that the initial equilibrium exhibits an oligopolistic market structure where price p_1 is higher than the marginal cost price (p_0). Quantity would then equal x_1 . A price above the p_0 would have to be protected by market barriers against the entry of potential competitors. Assume the aggregate minimum quantity again to be x_0^{\min} and the level of fixed costs per unit of this quantity to equal K. A combination of two firms assumably leads to fixed cost savings represented by the area LFMK. Due to the increased market concentration firms will be able to set a higher price (say p_2) and hence quantity sold decreases to x_2 . For further analysis it is not important whether the oligopoly in the initial equilibrium consisted of two firms that now form a monopoly (or in case of a cooperation a collective mo-

nopoly) or if more than two firms were in the market initially and the combination leads to a more concentrated but still oligopolistic market structure. In the first case, p_2 would be the monopoly price, in the second case it would be below the monopoly price. As a result of the combination producer surplus increases by the areas LFMK and p_1SRp_2 and decreases by the area SBR. Consumer surplus decreases by the area p_1BRp_2 . The impact on total welfare is again ambiguous as it rises by the area LFMK (efficiency effect) and is reduced by the area QHCBR (concentration effect). Competition authorities would again be faced with a necessity of a welfare trade-off trying to estimate which of the two effects is larger.

3.4 Scenario 3: Product innovation

The motivation of firms to bundle their resources not only consists of the possibility of a cost reduction. A combination can also foster the innovation of a good that the firms could not have supplied individually. Examples range from additional services like an improved customer service or maintenance and repair services to a production process where each firm adds a component to the commodity for which it possesses a comparative advantage. The combination will then either imply a product variation from which the consumer receives additional utility or it could consist in a product innovation, i.e. the production of a new product. In the framework developed above it is not necessary to differentiate between these two alternatives. As a presumption of the framework consists in the homogeneity of products, the improved good will have to be regarded as a new commodity. For the conclusions it does not matter whether fixed costs are regarded. Hence, in order to keep the analysis simple, fixed costs will be ignored.

Assume an equilibrium with a competitive market structure in point A in the left diagram of figure 5 where the price of good X equals p_x^0 and a quantity of x_0 is sold. Let two firms decide to merge or cooperate in order to supply an improved commodity Y for which the marginal cost curve is MC_y^1 and the demand function is D_y (left diagram in figure 5). If market barriers are prohibitive a (cooperative) monopoly will emerge setting the monopoly price p_y^2 and selling a quantity of y_2 . The determination of the welfare effects is not as straight-forward as in the two scenarios above since it cannot be determined by regarding areas of gain and loss. A useful reference situation is the assumption of an equilibrium in a competitive market structure on the market for Y which would materialize in point B (price p_y^1 and quantity y_1). The

loss in total surplus as compared to this reference situation is represented by the area DBC stemming from monopoly pricing (concentration effect). Consumer surplus is lower than in the reference situation of perfect competition on the Y-market by p_y^1, B, p_y^1, C . However, in comparison to the initial equilibrium where commodity Y did not exist, consumers are better off because they still have the possibility to buy good X at the old conditions (and most likely for a lower price if demand for X decreases) and they now have the additional option to purchase the new commodity Y. In comparison to the reference situation (competition in the market for Y, point B) producer surplus in case of a monopolistic supply of Y (point C) is higher by the area p_y^1, E, C, p_y^2 and lower by DBE. As compared to the initial equilibrium it can be concluded that producers are better off because otherwise they would not choose to supply commodity Y.

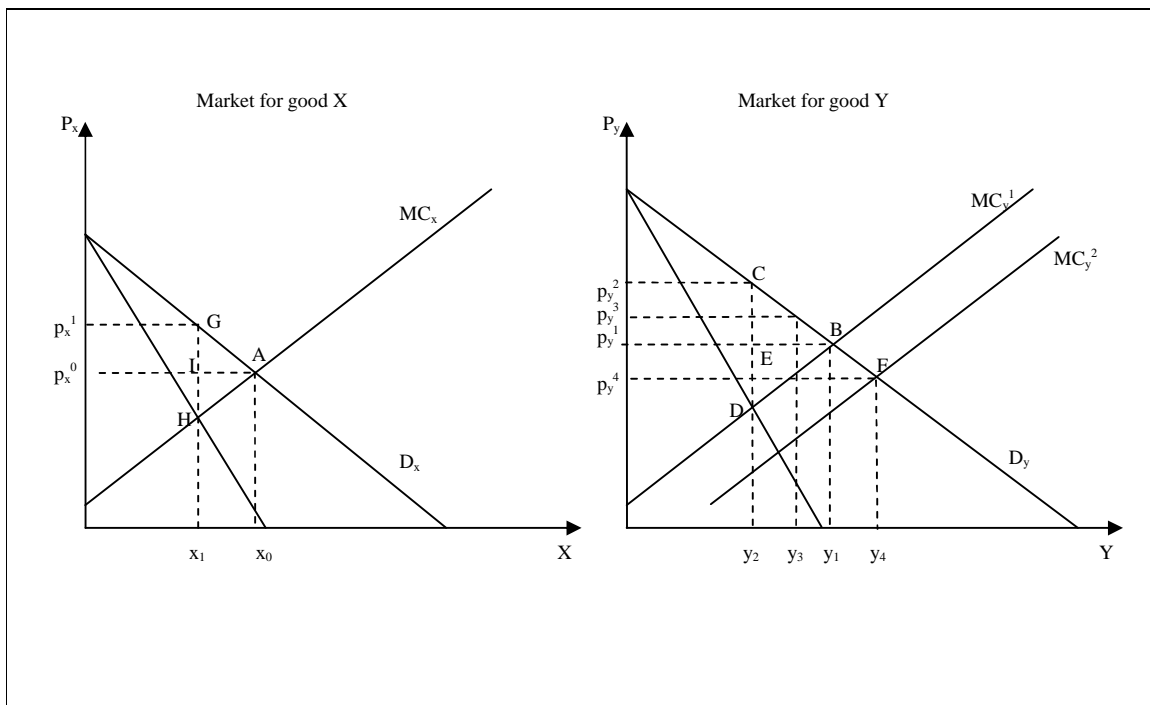


Figure 5: Product innovation

However, it is possible that due to a significant reduction of demand for the old commodity X firms will leave the market for X. Furthermore, the combination of the two firms on the market for Y mentioned above will most likely imply a combination of these two firms on the X-market as well. As a result, an oligopolistic rather than a competitive structure will emerge. As barriers to entry do not restrict the price to equal marginal costs, firms would be able to increase price, say to equal p_x^1 . Whereas producers would realize an additional surplus (gain-

ing p_x^0, I, G, p_x^1 and losing HAI), consumers suffer a loss of p_x^0, A, G, p_x^1 . This leads to a negative effect on total surplus on the market for X which is equal to area HAG.

If several firms enter the new market of Y in a short period of time, for example by imitating the pioneer firm that enters the market first by the means of a combination, the market structure in the new market for Y will be oligopolistic. Hence, a price above marginal cost (i.e. above p_y^1) but below monopoly price (i.e. below p_y^2) will be set, say p_y^3 . The results on welfare are comparable to those of a monopolistic market structure but the welfare loss due to the concentration effect is smaller as the oligopolistic equilibrium is closer to the competition equilibrium than the monopolistic outcome.

The conclusions for competition policy if market barriers are in place can be summarized as follows. If a combination renders the supply of a new (or improved) commodity, the effect on welfare will be positive as compared to the situation without the innovation if there is no concentration effect on the market for X, i.e. if good X is sold at marginal cost. Yet, there is still room for a welfare increase due to the concentrated market structure on the market for Y. Competition authorities should hence approve the combination and, if possible, try to attain a competitive market structure on the Y-market, for example by imposing remedies on the suppliers of Y. In case of an increased concentration on the market for X the welfare effect is ambiguous. A welfare gain is realized on the market for Y stands against a dead-weight loss on the market for X. Hence, in this situation a welfare trade-off is necessary.

In a situation without barriers to market entry firms in the market for Y will be disciplined by potential competitors and hence forced to set the marginal cost price p_y^1 where quantity y_1 is sold (point B). This case is identical with the reference situation mentioned above. In comparison with the initial equilibrium (where Y did not exist) consumers are better off as they have the additional option to buy a new (or improved) commodity (which is even sold at a marginal cost price). Producers are better off as well as they receive an additional surplus by selling Y. If the firms in this market receive an average return, point B will be the final (long-run) equilibrium.

On the other hand, if profits in the market for Y are greater than the economy's average profits, additional firms will enter the market until each firm earns average profits. This case is very plausible because in the beginning there are only a few (or only one) firms that reap all

the profits from selling Y . The entry of additional firms shifts the aggregate marginal cost curve from MC_y^1 to MC_y^2 . Hence, price decreases to p_y^4 and quantity rises to y_4 . As compared to the initial situation, consumer utility rises even further. Additional consumer surplus due to the market entry of new firms equals area p_y^4, F, B, p_y^1 . Producers are worse off as compared to the situation before the entry of new firms, however, after some temporary returns above average they receive the economy's average return. As both groups are (at least slightly) better off, welfare rises in comparison with the initial equilibrium before Y was supplied. In case of free market entry, the supply of a new (or improved) commodity clearly improves overall welfare.

4 Conclusions

The Eastern Enlargement is another step in the integration process of the European economies. The mergers and acquisitions as well as cooperations that are facilitated due to this development can have a positive and a negative effect on welfare. Primarily, the combination of firms is driven by the motivation to realize synergy effects. However, this efficiency effect must be weighed against the increased concentration which can be a consequence of the combination as well. In this paper, different scenarios were analyzed with or without barriers to market entry, with different synergy effects and market structures. The Synergy effects resulting from a combination can take the form of a cost reduction and alternatively of a product innovation. The results for the scenarios analyzing a variable and a fixed cost reduction are summarized in table 1.

In constellation a) of each scenario the results for a transition from competition to a monopoly are analyzed. Alternatively, the increased market concentration may merely lead to an oligopoly (constellation b). In constellation c) an oligopolistic market structure is assumed in the initial equilibrium and the transition to a collective monopoly is regarded. The transition from competition to a very concentrated market structure can happen if other firms try to attain the same synergy effects by forming a combination, following the example of the pioneering firms. Each constellation can be differentiated as to whether barriers to market entry are in place, besides constellation c). That is because it seems likely that barriers to entry have been in place in the initial oligopolistic market structure. While only the results of prohibitive and no barriers to entry have been analyzed, constellations with moderate barriers to entry will

yield results that will lie in the middle of these two extremes. The existence of fixed costs usually also implies barriers to market entry. Fixed costs imply the necessity for firms to invest in fixed assets in order to take up production. If these assets cannot be sold (or only at a significantly lower value) once the firm leaves the market, i.e. if they imply sunk costs, they work as barriers to market entry. Hence, in scenario 1 of table 1 the constellations with market barriers are more likely than those without.

Scenario 1: Reduction of variable costs					
<i>Market structure</i>	a) competition to monopoly	b) competition to oligopoly	c) oligopoly to monopoly		
<i>Market barriers</i>	no	yes	no	yes	yes
<i>Fixed costs</i>	—	—	—	—	—
<i>Price</i>	↓	↑↑	↓	↑	↑
<i>Quantity</i>	↑	↓↓	↑	↓	↓
<i>Consumer surplus</i>	↑	↓↓	↑	↓	↓
<i>Producer surplus</i>	↑ then →	↑↑	↑ then →	↑	↑
<i>Welfare</i>	↑↑	?	↑↑	?	?

Scenario 2: Reduction of fixed costs					
<i>Market structure</i>	a) competition to monopoly	b) competition to oligopoly	c) oligopoly to monopoly		
<i>Market barriers</i>	no	yes	no	yes	yes
<i>Fixed costs</i>	↓	↓↓	↓	↓↓	—
<i>Price</i>	↓	↑↑	↓	↑	↑
<i>Quantity</i>	↑	↓↓	↑	↓	↓
<i>Consumer surplus</i>	↑	↓↓	↑	↓	↓
<i>Producer surplus</i>	↑ then →	↑	↑ then →	↑	↑
<i>Welfare</i>	↑↑	?	↑↑	?	?

Legend

- ↑ positive effect
- ↑↑ strong positive effect
- ↓ negative effect
- ↓↓ strong negative effect
- constant
- ? effect unclear
- not applicable

Table 1: Cost reduction versus concentration

In order to evaluate a combination, competition authorities will look at the welfare effect (last row in each scenario of table 1). This total surplus is comprised by consumer surplus and producer surplus. However, these concepts cannot be measured directly. Hence, indicators are to be employed, such as market price and quantity as well as the development of fixed costs (where applicable). In the constellations with market barriers market price will increase as a consequence of a combination and hence quantity will decrease. The price increase will be stronger the more market concentration rises. Hence, the highest price increase stems from a transition from competition to a (collective) monopoly and quantity will decrease accordingly.

Hence, consumer surplus will be reduced and producer surplus increases. As the effect on total welfare is ambiguous, a welfare trade-off is necessary taking into account the specific circumstances of the situation.

Results change substantially if no barriers to market entry are in place. While price rises at first due to the combination, new competitors entering the market will exert a downward pushing the price below its initial level. Accordingly, quantity decreases at first and then rises above its initial level. Incumbent producers' profits are increased initially and then reduced to an average return due to the entry of new firms. Consumer surplus increases. Therefore, welfare increases in all constellations without market barriers. This result underlines the importance of free market entry.

Synergy effects due to a combination can also arise from a product innovation. Both forms of synergy effects, cost reductions and product innovations, oftentimes go hand in hand. However, an isolated analysis seems reasonable in order to determine the result of each form. The consequences of a combination with synergy effects taking the form of a product innovation are summarized in table 2. In constellation a) a monopoly on the market for the new commodity Y is assumed whereas in constellation b) an oligopolistic market structure will presumably materialize. In constellation c) a market structure change on the market for the old good "X" is assumed, i.e. a transition from competition to monopoly (presuming a monopoly on the market for the new commodity Y as well).

As we are now looking at two markets, the parameters of both can be regarded. The price for the newly developed good Y is measured against the price of the old good X, as these goods are very similar and substitutable. As a product innovation implies the addition to new properties to an existing commodity, it can be assumed that consumers are willing to pay more for the new than for the old good. Contrarily, the comparison of quantities for the new and the old good do not make sense if the commodities are not homogeneous. The changes in the quantity of Y are hence measured against its initial quantity after the market for the new commodity is created.

Scenario 3: Product innovation					
<i>Structure of y-market</i>	a) monopoly		b) oligopoly		c) monopoly
<i>Structure of x-market</i>	competition		competition		competition to monopoly
<i>Market barriers</i>	no	yes	no	yes	yes
<i>Fixed costs for good y</i>	—	—	—	—	—
<i>Price for good y</i>	?	↑↑	?	↑	↑↑
<i>Quantity of good y</i>	?	↓↓	?	↓	↓↓
<i>Price for good x</i>	→ or ↓	→ or ↓	→ or ↓	→ or ↓	?
<i>Quantity of good x</i>	→ or ↓	→ or ↓	→ or ↓	→ or ↓	↓ or ↓↓
<i>Consumer surplus</i>	↑↑	↑	↑↑	↑	?
<i>Producer surplus</i>	↑ then →	↑↑	↑ then →	↑	↑↑
<i>Welfare</i>	↑↑	↑	↑↑	↑	?

Legend
↑ positive effect
↑↑ strong positive effect
↓ negative effect
↓↓ strong negative effect
→ constant
? effect unclear
— not applicable

Table 2: Product innovation versus concentration

If no barriers to entry are in place, the price for the new commodity Y will be higher than the price for the old good X. As the market is competitive, the price is equal to the marginal costs for the production of Y. If the returns in the market are higher than the economy's average profits, new firms will enter the market. Hence, price would decrease, possibly below the price of X. Consumers are better off because besides being able to consume the old good X at its initial conditions, they have the additional option of consuming an improved good Y to its marginal cost price. Incumbent producers are better off at first and after the entry of new competitors every firm receives average profit. Therefore, if no market barriers are in place, welfare will increase after a combination realizing a product innovation.

The results for the constellations with market barriers are again very different from those with free entry. The price of the improved good will lie above the price of the old good not only because due to a consumers' higher willingness to pay but also due to an increased market concentration. The higher the concentration on the market for Y, the stronger will the price increase be. Quantity decreases accordingly. Producer surplus clearly rises. Consumers are better off as well with one exemption. If they can still consume good X at its initial conditions and then have an additional option to consume an improved good Y, they benefit from the combination. Only if an increased concentration also materializes on the market for the old commodity X, the effect on consumer welfare is unclear. Therefore, in case of a product innovation with market barriers in place, welfare increases if there is no concentration effect on

the market for the old good X. In case of a concentration in this market, the effect on welfare is unclear and a trade-off is necessary taking into account the specific circumstances of the situation. Furthermore, it should be noted that there is still room for an additional welfare increase if a more competitive market structure can be attained in the Y-market.

To sum up, one of the main conclusions of this paper is that barriers to entry play a very important role. If a market is competitive, welfare is increased in all three scenarios. In case of a product innovation, the effect on welfare is positive as well, unless there is a negative concentration effect on the market for the old good, i.e. the good without the properties that were added in the innovation process. However, there usually is still room for a welfare increase due to a concentrated market structure on the market for the innovated commodity. If synergy effects take the form of a cost reduction, the effect on welfare is always unclear if high barriers to entry are in place. Hence, a trade-off is necessary between the efficiency and the concentration effect by taking a closer look at the specific circumstances.

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