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ABSTRACT

Can the Failing Firm Defense Rule be Counterproductive?*

This paper studies the role of the failing firm defense (FFD) concept in merger control in a Cournot setting where: (i) endogenous mergers are motivated by prospective efficiency gains; and (ii) mergers must be submitted to an Antitrust Authority which might require partial divestiture for approval. It is shown that when the FFD concept is available in merger control, firms can strategically embark on a merger which makes other firms fail and then buy over the exiting outsider firm(s), leading to complete monopolization of the industry. This in turn implies that, in some circumstances, the consumers'-surplus-maximizing market structure cannot be achieved if the FFD concept is available, whereas it would be achieved if the FFD concept were ruled out.

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1 Introduction

This paper discusses the use of the *failing firm defense* (FFD) concept in merger control. The FFD is a legal and economic concept accepted by the EU and US competition authorities. According to the FFD, a merger or acquisition between competitors that would otherwise be prohibited by an Antitrust Authority (AA) may still be permitted when one of the merging participants is failing and absent the merger would not be able to survive in the industry. The rationale behind this defense can, for instance, be found in Section 11 of the U.S. Department of Justice and Federal Trade Commission's (new) Horizontal Merger Guidelines,[1] where it is stated that "[a] merger is not likely to enhance market power if imminent failure ... of one of the merging firms would cause the assets of that firm to exit the relevant market. ... [Moreover,] if the relevant assets would otherwise exit the market, customers are not worse off after the merger than they would have been had the merger been enjoined." Along the same lines, the European Commission's Horizontal Merger Guidelines highlight that "[t]he Commission may decide that an otherwise problematic merger is nevertheless compatible with the common market if one of the merging parties is a failing firm. The basic requirement is that the deterioration of the competitive structure that follows the merger cannot be said to be caused by the merger. This will arise where the competitive structure of the market would deteriorate to at least the same extent in the absence of the merger."[2] (para. 89)

Both in the US and in the EU, the FFD is well established in the case-law. In the US, the Supreme Court first recognized the FFD in 1930 in the leading case *International Shoe Co. v. Federal Trade Commission*,[3] where the Court allowed the merger between the largest (International Shoe) and the sixth largest (McElwain Company) shoe manufacturers in the US. Then, about forty years after this landmark decision, the Court clarified the FFD concept in *Citizen Publishing Co. v. United States*, which involved a joint venture between two competing newspapers in Tucson, Arizona.[4,5] In the EU, on the other hand, the FFD concept (also known as *rescue merger*) was first developed in the late $90's$ in the *Kali und Salz* case (Case No. IV/M.308) and further articulated in a more recent case in the chemical sector - the *BASF/Eurodiol/Pantochim* case (case No.

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[1] U.S. Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines (2010), available at: http://www.justice.gov/atr/public/guidelines/hmg-2010.html.

[2] European Commission, Guidelines on the Assessment of Horizontal Mergers under the Council Regulation on the Control of Concentrations between Undertakings (Official Journal C 31, 05.02.2004, p.5-18), available at: http://europa.eu/legislation_summaries/competition/firms/l26107_en.htm

[3] *International Shoe Co v Federal Trade Commission,* 280 U.S. 291 (1930).

[4] *Citizen Publishing Co. v. United States*, 394 US. 131 (1969).

[5] See Kokkoris (2007) for a detailed review of the case-law practice of the US antitrust authorities involving the FFD. See also Fina and Mehta (2011) for a discussion of two recent merger investigations by the Federal Trade Commission and the Department of Justice in which the defense has succeeded.

COMP./M.2314).[6]

Despite the fact that the FFD has been invoked by merging parties in a significant number of mergers, this defense has proven successful (at both the agency and court levels) relatively infrequently. As highlighted by the OECD (2009), "[s]o far the failing firm defence has been of limited application in the enforcement history under the Merger Regulation ... Limited practical experience has therefore been gained with regard to failing firm scenarios. It remains however to be seen whether the financial services sector or other economic sectors will give rise to an increase in this respect."[7] (para. 23) This observation then raises the question of why are the AAs so reluctant to accept the FFD in merger control? This paper presents a one possible theoretical explanation for this phenomenon.

The proposed model builds on Vasconcelos' (2010) endogenous merger formation game where: (i) mergers are motivated by prospective efficiency gains;[8] and (ii) merger proposals must be submitted for approval to a consumers'-surplus-maximizing AA which works with an enlarged tool box for merger control:[9] in addition to blocking or unconditionally approving the merger, the AA can also approve the merger subject to the condition that some of the acquired assets are divested. While Vasconcelos (2010) only considers situations where all firms in the industry are active both before *and* after the merger, this paper focuses instead attention on cases in which the outsiders to a merger may be pushed out of the industry if the merger is approved. By so doing, I show that when the FFD concept is available in merger control, firms can strategically embark on a merger which makes other firms fail and then buy over the exiting outsider firm(s), leading to complete monopolization of the industry. This result seems somehow consistent with the recent experience of the Italian pay-TV market, where the Australian media group Newscorp embarked on a two-step operation leading to a near-monopoly situation. Prior to the concentration, Stream and Telepiù were virtually the only providers of pay-TV services in Italy. In 2000, Newscorp created a 50/50 Joint-Venture with

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[6]For a review of merger cases in which the FFD has been involved and dealt with in the European Commission decisions, see Kokkoris (2006).

[7]In light of the current economic and market conditions, it is likely that there will be an increasing number of mergers involving failing firms.

[8]Each firm is assumed to be endowed with a fraction of the industry specific capital (as in Perry and Porter (1985)). Hence, a merger brings the capital of merging parties into a single larger and more efficient entity.

[9]The assumption that the AA appraises the merger proposals on the basis of their expected impact on consumers' surplus is in line with the current practice in most antitrust jurisdictions (see, for instance, Lyons (2002)). Besides, theoretical arguments have been presented in favor of the consumers' surplus standard in merger control. Besanko and Spulber (1993) highlight that, in a context where there is asymmetric information regarding prospective cost savings induced by a merger, "ex-ante social welfare is maximized when the enforcement authority screening the merger proposals makes its enforcement decisions on the basis of a welfare standard that gives strictly greater weight consumers' surplus than does the social welfare standard" (p.25). Neven and Röller (2005), on the other hand, show that, in an environment where merging firms and their competitors can influence (lobby) the AA, a welfare standard that gives a greater weight to consumers' surplus can be an appropriate counter-balance to such lobbying.

Telecom Italia so as to jointly control Stream. Then, a couple of years later, Newscorp proposed to the European Commission (EC) the acquisition Telepiù from Vivendi Universal, where the proposal specified that Stream and Telepiù would be merged into a combined pay-TV platform and Telecom Italia would hold a minority stake. Whilst not accepting the application of the FFD rule (invoked by Newscorp), the EC did take into account the financial difficulties faced by market operators (due to high programming costs coupled with limited rate of penetration of pay-TV in Italy). The merger was then authorized and the EC considered that approving it was more beneficial to consumers than the disruption that would have been caused in case at least one of the two main operators would have left the market.[10]

I also investigate the differential effects of the FFD rule in my setting by contrasting the full equilibrium outcome of the proposed endogenous merger formation game with that of a constrained game wherein the FFD concept is removed from merger control. By so doing, some important results regarding the dynamic policy of an AA towards horizontal mergers are obtained. First, if merger policy focuses attention on the effects of a single merger proposal, then I find that the FFD may be consumers' surplus enhancing for some parameter values, but it may also be counterproductive for others. In particular, the possibility that, under the FFD regime, firms embark on a two-step merger leading to a monopoly market structure in turn implies that, in some circumstances, the consumers'-surplus-maximizing market structure cannot be achieved if the FFD concept is available, whereas it would be achieved if the FFD concept were ruled out. Second, and perhaps most importantly, when a more dynamic view is taken of sequential merger review, then it is shown that only the negative effect of the FFD rule on consumers' surplus remains: the FFD rule can only be counterproductive.

The use of the FFD in this context has a benefit to consumers since industry specific capital (which enhances firms' efficiency) can remain in the industry instead of exiting. However, due to the fact that merger policy cannot be fully contingent on firms' strategies, the FFD can also trigger strategic mergers that become profitable due to subsequent rescue mergers and end up being counterproductive: if FFD were not an option, other mergers associated with higher consumers' surplus would take place. This result then provides a theoretical rationale for the fact that "competition authorities have in several cases shown some reluctance to accept the failing firm defense" (Mason and Weeds (2002, p.2)).

Even though there is a wide literature on the effects of mergers on consumers' and total welfare,[11]

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[10]See EC Case No. Comp/M.2876 - *Newscorp/Telepiù*; Article 8(2), Decision of 2/04/2003.

[11]A general discussion on the effects of mergers can be found in Motta (2004). For an economic analysis of the role of efficiency gains in determining the impact of mergers on welfare see Farrell and Shapiro (1990).

economic theory has not devoted much attention to the study of the FFD in merger control. Two noteworthy exceptions are Mason and Weeds (2002) and Persson (2005). Mason and Weeds' (2002) main focus is on the role of the FFD in encouraging entry into the market. In particular, they argue that a firm entering the market takes into account its ease of exit, anticipating that it may later wish to leave should market conditions deteriorate.[12] Hence, the possibility of mergers under the FFD argument in times of financial distress can encourage entry sufficiently so that consumers' welfare increases in the long run.[13] They also show that a consumers' surplus maximizing policy maker sets a lenient merger policy (i.e., allows the merger at an early stage of financial distress) to encourage early entry. Persson (2005), on the other hand, investigates the welfare consequences of the FFD, concentrating on the ex-post efficiency of sales of the failing firm's assets. He shows that the worst buyer from the consumers' point of view often acquires the failing firm and, therefore, suggests that the auction-selling mechanism should be improved. An important characteristic of the previous literature on the FFD is the assumption that an exogenous shock makes one firm failing. In contrast, the present paper endogenizes the cause of failure. The key argument is that if merger policy allows for rescue mergers ex-post (under the FFD rule), this will affect firms' ex-ante merger incentives. More specifically, firms in the initial industry structure may strategically embark on mergers for which they know rivals would be unable to survive in the industry in the absence of a subsequent (rescue) merger. This is because, in the proposed setting, even though all firms are assumed to be viable at the initial industry structure, rival firms' failure can be induced by the adoption of specific merger patterns.

This paper is also related to the literature on predation when mergers are possible.[14] One of McGee's (1958) critiques to predation strategies was that merging with the prey would be a more profitable alternative strategy than preying upon it since mergers allow for the preservation of high profits in the industry. This argument was, however, criticized by Telser (1966) and Yamey (1972) who emphasized that predation and mergers might be complementary rather than alternative strategies: by engaging in predation with the aim of taking over a rival, the potential buyer can induce a decrease in the price at which the rival is bought out later on, an argument later formalized by both Saloner (1987) and Persson (2004).[15] Saloner (1987) showed that predation may induce the

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[12]Relatedly, Bouckaert *et al.* (2011) study the strategic and welfare implications of the FFD rule in declining oligopolistic markets where firms produce and sell horizontally differentiated products. They find that if a merger can rely on a FFD, then temporary government intervention, through e.g. a bail-out as an alternative to rescue the failing firm, may provide higher consumers' surplus and lower producers' surplus, while raising social welfare.

[13]The increase in consumers' surplus resulting from earlier entry more than compensates for the (static) consumers' surplus decrease when the merger is permitted.

[14]See Chapter 7 in Motta (2004) for a detailed discussion of this literature.

[15]In addition to affecting the takeover terms, pre-takeover pricing also has an impact on the likelihood that the

target firm to revise downwards its beliefs about its future profits, thereby weakening its bargaining position in the merger negotiation following predation. Persson (2004), on the other hand, shows that "destructive" predation, i.e. predation that reduces the usefulness of the prey's assets (e.g. strong advertising campaigns to destroy the relative appeal of the prey's brand name), can be rational in a multi-firm setting since it mitigates the negative effects of the bidding competition for the prey's assets. In his setting, the acquisition price of the prey's assets is determined within a bidding competition involving all potential buyers and this bidding competition for the prey's assets is shown to be most harmful to the potential buyers when the use of the prey's assets exerts strong negative externalities on rivals.[16] Similarly to these papers, I find that when firms in the status quo industry structure strategically embark on a merger that will make other firm(s) fail, this will help the merged entity resulting from this (first) merger to be involved in a subsequent acquisition of the failing firm(s) coming at very good terms.

The rest of the paper is organized as follows. Section 2 lays out the formal framework. In Section 3, the equilibrium analysis of the proposed endogenous merger formation game is performed. Section 4 provides a formal analysis of the differential effects of the FFD rule by contrasting the full equilibrium outcome of the proposed endogenous merger formation game with that of a constrained game wherein the FFD concept is ruled out. In Section 5, I discuss a number of extensions of the proposed model, considering scenarios in which: (i) divestiture requirements cannot be requested, implying that the AA can only block or unconditionally approve the merger; (ii) small-sized merger proposals for which remedies could not be requested are always blocked by the AA; and (iii) sequential mergers are allowed. Finally, Section 6 offers some concluding comments.

2   The Benchmark Model

I consider a model in which there are four firms which operate in a market with linear demand $p = 1 - Q$, where Q is the industry output.

What distinguishes firms is the amount of capital they own. The total supply of capital is

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takeover will be permitted. Along these lines, Saloner (1987, p.166) highlights that "the current merger guidelines allow a 'failing-firm defense' under which a merger will be allowed if it appears that one of the firms will otherwise go bankrupt. If merger negotiations are preceded by predatory pricing that reduces the profitability of the rival, however, such pricing may improve the chances that the merger will be permitted."

[16]When the use of the prey's assets exerts strong negative externalities on rivals, then potential buyers' willingness to pay for the prey's assets is high mostly because they are interested in preventing other buyers from gaining access to those assets and not mainly because of those assets' contribution to increase their own 'direct' profits. Hence, any benefits from acquiring the prey's assets are competed away in the bidding competition amongst potential buyers of the assets.

assumed to be fixed to the industry (and equal to K units). Let k_i denote firm i's capital holdings, where $k_i \in \{1, 2, ..., K\}$. Hence, I normalize the smallest indivisible unit of capital assets to be one.

The cost function of a firm which owns k_i units of the industry capital and produces $q_i > 0$ units of output is given by:[17]

$$C(q_i, k_i) = \frac{\alpha K}{k_i} q_i + k_i f, \tag{1}$$

where $\alpha \geq 0$, $\sum_{i=1}^{4} k_i = K$ and $f > 0$.

This cost structure was proposed by Motta and Vasconcelos (2005). It assumes that each firm operates with a constant marginal cost of production, but the level of its marginal cost is decreasing in k_i. In addition, it is assumed that there exists a plant specific fixed cost f, which has to be paid for each unit of the industry capital owned by the firm.[18] This way of modelling the cost structure aims at capturing two distinct cost effects induced by a merger. First, a merger brings the capital of merging parties into a single larger entity and, therefore, gives rise to endogenous efficiency gains. Observe that a high value of α corresponds to a situation where (pre-merger) marginal costs are high and there are high efficiency gains from merging capacities, in the sense that the absolute decrease in the level of the marginal cost resulting from a merger is larger for higher α.[19,20] Hence, the higher the value of α is, the stronger the efficiency gains induced by a merger are.[21] Second, by creating a larger firm, a merger has also the effect of increasing fixed costs proportionally. This effect is captured by the parameter f.

In a Cournot-Nash equilibrium with n *active* firms, firm $i's$ equilibrium quantity, the market price and the individual profits are respectively given by:

$$q(k_i; \mathbf{k}_{-i}) = \frac{1 - \alpha K \left(\frac{n}{k_i} - \sum_{j \neq i} \frac{1}{k_j} \right)}{n+1}, \tag{2}$$

$$p(k_i, \mathbf{k}_{-i}) = \frac{1 + \alpha K \sum_{j=1}^{n} \frac{1}{k_j}}{n+1}, \tag{3}$$

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[17] In $q_i = 0$, the firm has no costs, $C(0, k_i) = 0$.

[18] This specification is used to rule out further scale economies due to sharing of fixed costs.

[19] Let $C'(k_i)$ denote the (constant) marginal cost function of a firm owning k_i units of the industry capital. Simple algebra shows that $\partial C'(k_i)/\partial k_i = -\alpha K/k_i^2 < 0$.

[20] If α is low, then the pre-merger level of the marginal cost is already low and there is no potential for significant efficiency gains resulting from a merger, implying that mergers in industries characterized by a low value of α will tend to be looked less favorably by Antitrust Authorities.

[21] This essential feature of a merger was first proposed by Perry and Porter (1985). In their framework firms' marginal cost is linear in output and mergers reduce variable costs. The same cost structure is also used by Vasconcelos (2005), who analyses the possible pro-collusive effects of a merger.

$$\Pi\left(k_i; \mathbf{k}_{-i}\right) = \left(q\left(k_i, \mathbf{k}_{-i}\right)\right)^2 - k_i f, \tag{4}$$

where $\mathbf{k}_{-i}$ is a vector of dimension $(n-1)$ including the capital holdings of firm i's rival firms.

In what follows, I assume that the total quantity of capital available in the industry is equal to four units ($K = 4$) and that this capital is equally distributed amongst the four firms in the status quo industry structure. Assume also that there are at least two potential entrants that have the expertise and required technology to enter in this market (at no cost) but do not have any unit of capital.[22],[23]

2.1 The Game

Before Cournot competition takes place, firms play the following three-stage game with the AA.

- In the *first stage*, one firm at the status quo industry structure is randomly selected and has the opportunity to propose a merger to the AA. This firm may propose a merger with all or a subset of its rivals. The proceeds of the merger are assumed to be shared equally by the merger partners.[24]

- In the *second stage*, the AA decides whether or not to authorize the proposed merger. At this stage, the AA can: (*i*) accept the proposed merger; (*ii*) reject the proposed merger; or (*iii*) conditionally accept the merger, i.e., accept the merger subject to the condition that some units of the merged entity capital are divested to an incumbent rival firm or to a new firm which is attracted into the market. If the AA does not authorize the merger, then the game will have come to a final node and product market competition occurs between the four symmetric firms in the status quo industry structure.

- In the *third* stage, if a merger proposal was previously approved by the AA and if the outsider(s) to this merger would be pushed out of the industry as a result of the merger, then the

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[22] There are several industries that are characterized by fixed capacity and difficult entry. Cases in point are the cement industry (availability of raw materials and environmental regulations make new production sites unlikely) and the mineral water industry (in most countries, mineral water must be bottled at the source, and existing sources are known and already exploited). These industries are probably characterized by a low degree of efficiency gains (i.e., by a low value of α). Other industries which might fit the assumption of fixed capital are those where entry is regulated by law and subject to licenses or authorization (e.g., radio, television, telecommunication services). In many countries, the use of the spectrum for a particular purpose is given (or auctioned off) by the government. Firms can only expand by buying licenses from competitors through mergers. Very often, scale and scope economies arise when more licenses are owned by the same operator, i.e. potential efficiency gains from a merger are large (α is high).

[23] The fact that there are at least two potential entrants ensures that, if a merger is approved under the condition that some of the acquired assets are divested, the AA will always have the option to allocate *each* divested unit of the industry capital to a new firm which is attracted into the market.

[24] Hence, the firm will propose the merger that maximizes the per-firm profit of the merged entity.

remaining active firm can make a take-it-or-leave-it offer to acquire the assets of the exiting outsider firm(s) through a *rescue merger*. This rescue merger will always be cleared by the AA under the FFD concept.[25]

Two notes are in order at this point. First, the AA is assumed to appraise the merger on the basis of its impact on consumers'-surplus. The major motivation for this assumption is that it describes the current practice in the major antitrust jurisdictions.[26] Second, when a merger is conditionally approved, there is only a discrete number of possible divestitures which can be selected. This is for two reasons. On the one hand, the randomly selected firm cannot be asked to divest all the units it proposed to acquire; only a subset of those units can be divested. On the other hand, it is assumed that a firm can only be asked to divest multiples of the smallest indivisible unit of this asset, which I normalized to be one.[27]

3   Equilibrium Analysis

In what follows, I seek the symmetric[28] subgame perfect Nash equilibria in pure strategies of the proposed three-stage game, following the usual backward induction procedure.

The focus of this paper is the case where firms outside the merger may exit the market post-merger. I thus restrict the space of parameters as follows:

Assumption 1 Let us restrict the set of parameters to (α, f) such that

(i) $\alpha < 1/4 \equiv \overline{\alpha};$ $f < \left((1 - 4\alpha)/5 \right)^2 \equiv \overline{f};$

(ii) $f > \left((1 - 6\alpha)/4 \right)^2 \equiv \widetilde{f}_2;$

(iii) $f > \left((3 - 20\alpha)/9 \right)^2 \equiv \widetilde{f}_3.$

Part (i) of the assumption is imposed to exclude the trivial case in which production is not viable at the status quo market structure.[29] Parts (ii) and (iii) imply that if a merger involving 2

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[25] According to this concept, a transaction can be regarded as a *rescue merger* if the competitive market structure would deteriorate in a similar fashion even if the merger did not take place (i.e. because the undertaking would exit the market). Approving a rescue merger is a way of keeping the assets of the exiting firms in productive use.

[26] As pointed out by Lyons (2002, p.1), "most major competition authorities operate under legislation and guidelines that reject this [total surplus] standard, and no major competition authority seems to apply it consistently. Instead, they overwhelmingly focus on consumers, including industrial consumers, to the exclusion of the welfare of merging firms."

[27] The idea here is that of divesting a plant or a group of plants.

[28] Firms endowed with the same amount of capital are assumed to have the same output and profit in equilibrium.

[29] If $\alpha \geq 1/4$, then $dC(q_i, 1)/dq_i \equiv C'(1) = 4\alpha \geq 1$, which in turn implies that $q(1; 1, 1, 1) = 0$. Likewise, four firms would not co-exist if $f > \overline{f}$ since $\Pi(1; 1, 1, 1) = \left((1 - 4\alpha)/5 \right)^2 - f$ (see eq. (4)).

or 3 firms is approved, then any outsider to this merger finds it optimal to exit the market in the absence of a subsequent merger.[30]

By restricting attention to exit inducing mergers, Assumption 1 implies that, in all following figures, I explicitly constrain all pairs of parameters (α, f) to lie below the $\overline{f}$ schedule and above the upper envelope of the $\widetilde{f_2}$ schedule and the $\widetilde{f_3}$ schedule.

Analysis of the third stage If the game arrives at the *third* stage, then the merged entity resulting from the previously approved merger can propose a rescue merger to the exiting outsider firm(s). As a preliminary remark, note that I model the acquisition of the failing firm as a take-it-or-leave-it offer made by the merged entity resulting from the previously approved merger. This formulation is fairly natural since Assumption 1 (parts (ii) and (iii)) implies that if the game arrives at the third stage, then the merged entity is the *unique non-failing firm* and, thus, the *unique potential acquirer* under the FFD rule.

Now, if the previous merger involves *two firms*, then the merged entity will be interested in proposing a rescue merger if $\Pi(4) \geq \Pi(2)$, i.e. if $f \leq \alpha(2 - 3\alpha)/8 \equiv f_2^r$. If instead the previous merger involves *three firms*, then a rescue merger will be proposed if $\Pi(4) \geq \Pi(3)$, i.e. if $f \leq \alpha(6 - 7\alpha)/36 \equiv f_1^r$. These rescue mergers will always be approved under the FFD concept.[31]

Analysis of the second stage At the *second* stage, the AA can be faced with three different merger proposals which I analyze in turn.

<div align="center">Scenario 1: Merger Involving 2 Firms</div>

When faced with a two-firm merger proposal, the AA cannot ask for a divestiture as a condition to clear the transaction.[32] Hence, merger control in this scenario amounts to a yes/no decision by the AA.

Two different reasons can justify why, in the absence of a subsequent rescue merger, the two merger outsiders would exit the industry after the merger (Assumption 1). First, if $\alpha \geq 1/6$,

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[30] Making us of eqs. (2) and (4), one may conclude that the equilibrium level of profits of an outsider to a two-firm merger or to a three-firm merger are given by $\Pi(1; 2, 1) = ((1 - 6\alpha)/4)^2 - f$ and $\Pi(1; 3) = ((3 - 20\alpha)/9)^2 - f$, respectively.

[31] From (3), very simple algebra shows that, for any $\alpha > 0$, $p(4) < p(3) < p(2)$. The AA clearly prefers to have a monopolist with the entirety of industry capital units than a monopolist operating with only a subset of those units of capital (after the failing firm(s) have exited the industry).

[32] The randomly selected firm at stage 1 is only buying 1 unit of capital and I have assumed that the acquiring firm cannot be asked to divest all the units that it bought.
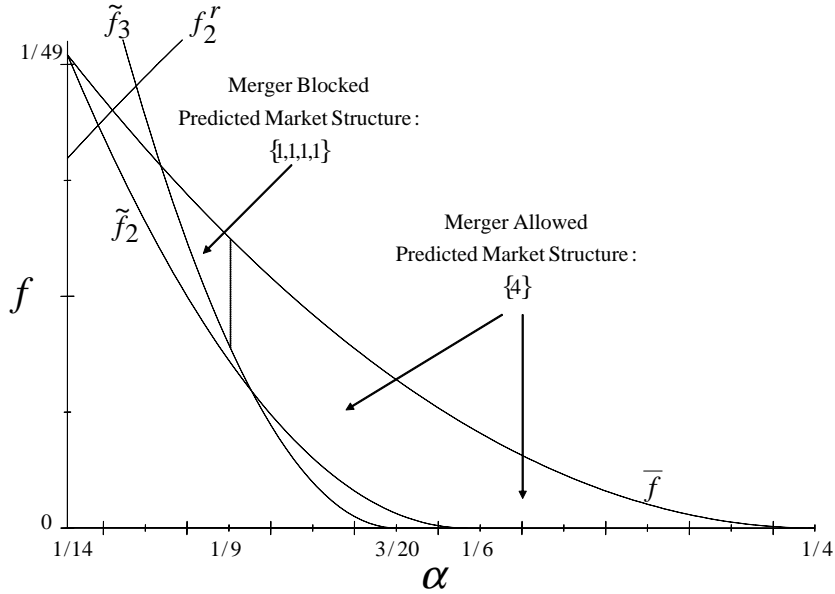
Figure 1: AA decisions - 2-firm merger proposal

the merger gives rise to very high synergies and the two (smaller) outsider firms would then be constrained to produce zero in the post-merger equilibrium.[33] Second, if $f > ((1-6\alpha)/4)^2 \equiv \widetilde{f}_2$, outsiders would not be able to recover their fixed costs in case the merger goes through.

It turns out that, for any pair (α, f) in the area of parameter values defined by Assumption 1, $f \leq \alpha(2-3\alpha)/8 \equiv f_2^r$ (see Figure 1). Therefore, the AA anticipates that if it approves this merger, a rescue merger will then follow the approved merger, leading to the final market structure $\{4\}$. So, the merger will be approved if $p(4) \leq p(1,1,1,1)$, or, equivalently, if $\alpha \geq 1/9$. Figure 1 illustrates this result.

SCENARIO 2: MERGER INVOLVING 3 FIRMS

If a three-firm merger is unconditionally approved, then, in the region of parameter values defined by Assumption 1, there are two possible induced (monopoly) market structures: $\{3\}$ and $\{4\}$. If the merged entity proposes subsequently a rescue merger so as to buy over the exiting unit of capital belonging to the outsider firm, the induced market structure is $\{4\}$. Otherwise, the final market structure is $\{3\}$.[34]

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[33]Making use of eq. (2), it can be easily shown that $q(1;2,1) = \max\{0, (1-6\alpha)/4\}$.

[34]Two different reasons can explain why the outsider to a three-firm merger would be pushed out of the industry in the absence of a subsequent rescue merger. First, note that making use of eq. (2), one may conclude that

The AA can, however, conditionally approve the merger. Two divestitures are possible. In both cases, one unit of capital is divested. If this unit of capital is divested to the merger outsider, then the induced market structure is $\{2, 2\}$. If instead the unit of capital is divested to an entrant, then, in the region of parameter values defined by Assumption 1, neither the new firm nor the outsider are able to make positive profits in equilibrium. This in turn implies that two units of the capital would exit the industry, unless a rescue merger occurs subsequently. However, as shown above, a rescue merger involving two exiting units of capital would always be proposed (and approved under the FFD concept), leading to the final market structure where a monopolist would own the entirety of the industry capital, $\{4\}$. So, the AA will prefer a divestiture to an entrant to a divestiture to the merger outsider only if $p(4) \leq p(2,2)$, i.e., if $\alpha \geq 1/5$.

So, what is the AA final decision? Two different cases should be addressed (as illustrated in Figure 2). If $f > f_1^r$, then a rescue merger would never follow the first (unconditionally approved) merger and, therefore, the AA would only unconditionally approve the three-firm merger if $p(3) \leq p(2,2)$. However, the previous condition is false for any parameter value in the region defined by Assumption 1. Hence, the AA will authorize the merger subject to the condition that 1 unit of capital is divested to the merger outsider (and the induced market structure will be $\{2,2\}$). If instead $f \leq f_1^r$, in case the first merger is unconditionally approved by the AA, a subsequent rescue merger takes place and the induced market structure is $\{4\}$. Since $p(2,2) < p(4)$ for $\alpha < 1/5$, the AA will conditionally approve the merger (requiring divestiture to the outsider) if $\alpha < 1/5$ and unconditionally approve it otherwise.

<div align="center">SCENARIO 3: MERGER TO MONOPOLY</div>

If faced with a merger leading to complete monopolization of the industry, the AA can require three possible divestitures: (i) divestiture of 2 units of capital to an entrant (leading to the market structure $\{2,2\}$); (ii) divestiture of 1 unit of capital to an entrant (leading to a monopoly market structure $\{3\}$ or $\{4\}$); and (iii) divestiture of 1 unit of capital to a first entrant and 1 unit of capital to a second entrant (leading again to a monopoly industry structure since the entrants will not be able to operate profitably with the unit of capital which is allocated to each of them). If one starts by studying the AA preferences over these possible divestitures, those preferences can be described

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$q(1;3) = \max\{0, (3 - 20\alpha)/9\}$. Hence, if $\alpha \geq 3/20$, the merger gives rise to very high efficiency gains and the outsiders would then be constrained to produce zero at equilibrium. Second, if instead $\alpha < 3/20$ and $f > \widetilde{f}_3$, then the single outsider firm would not be able to recover its fixed costs in the post-merger market structure.
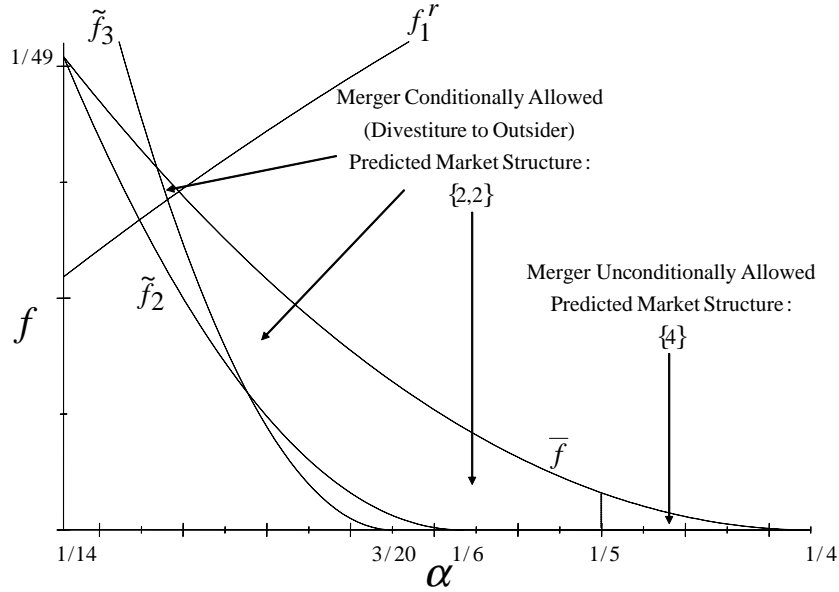
Figure 2: AA Decisions - 3-firm merger proposal

by a figure similar to Figure 2.[35] The conclusions are, therefore, that: (i) If $\alpha < 1/5$, the AA prefers the divestiture of 2 units of capital to an entrant (leading to the symmetric duopolistic industry structure $\{2,2\}$); and (ii) If instead $\alpha \geq 1/5$, the AA would be indifferent between unconditionally approving the merger and asking for a divestiture of 1 unit of capital to an entrant.[36]

Knowing the AA preferences over the three possible divestitures, one can now study the AA decision between fully approving the merger to monopoly and conditionally approving it. We know that $p(2,2) < p(4)$ for $\alpha < 1/5$. Hence, the AA final decision is to approve the merger subject to the condition that 2 units of capital are divested to an entrant if $\alpha < 1/5$ and to unconditionally approve it otherwise.

Analysis of the first stage At the *first* stage, the randomly selected firm is given the opportunity to propose a merger to the AA. Consider first the case in which $\alpha \geq 1/5$. In this region of parameter values, it is clear that the firm is indifferent between a merger involving two, three or

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[35] For each region of parameter values, the merger-plus-divestiture induced market structures are the same both in a merger proposal involving three firms (Scenario 2) and in a merger proposal involving all firms (Scenario 3).

[36] If a divestiture is required, the entrant is not able to operate profitably with that unit of capital in equilibrium and a rescue merger is going to follow the first (conditionally approved) merger, in which the merged entity resulting from the first merger buys back the divested unit of capital.

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all firms: in all cases, the final market structure is going to be $\{4\}$.[37]

Suppose now that $\alpha < 1/5$. When this is the case, then a merger between three or all firms will be remedied to generate the $\{2, 2\}$ market structure, implying that the randomly selected firm will be indifferent between these two possibilities. The firm may, however, opt for a two-firm merger proposal and the corresponding AA decisions are illustrated in Figure 1. Hence, two subcases should be distinguished:

(i) If $\alpha \in [1/9, 1/5)$, then if there is a two-firm merger proposal, the AA unconditionally approves it since it anticipates that this merger is going to be followed by a rescue merger leading to market structure $\{4\}$. Thus, the firm will submit for approval a two-firm merger rather than a merger involving a higher number of firms if $\Pi(4)/4 \geq \Pi(2; 2)/2$, which is true for all $\alpha < (1/4) \equiv \overline{\alpha}$ (Assumption 1).

(ii) If instead $\alpha < 1/9$, then the firm anticipates that only merger proposals involving three or all firms are going to be approved by the AA. Besides, the firm is indifferent between the two proposals: both will be remedied to generate $\{2, 2\}$.[38]

Figure 3 illustrates the full equilibrium outcome of the proposed game.[39]

This equilibrium outcome highlights that the FFD can encourage perverse behaviour by a merging firm that may embark on a two-step merger process leading to complete monopolization of the industry and reducing consumer welfare. Structural remedies enrich the toolbox available for merger control and, thus, allow the AA to be much more specific in its final decisions.[40] This implies that, when faced with merger proposals where remedies can be requested, the AA uses the opportunity to reshape the industry structure by reallocating the available assets in the industry so as to maximize consumers' welfare.[41] The problem is that this ability that the AA has to order a partial divestiture as a condition to approve a merger may induce firms to refrain from making merger proposals in which they anticipate asset transfers would be requested. Instead, they may strategically embark

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[37]Note that making use of eq. (4) it is straightforward to check that $\Pi(4)/4 \geq \Pi(1; 1, 1, 1)$ for all $\alpha < (1/4) \equiv \overline{\alpha}$ (Assumption 1).

[38]Using eq. (4), one may conclude that $\Pi(2; 2)/2 \geq \Pi(1; 1, 1, 1)$ for all $\alpha < (1/4) \equiv \overline{\alpha}$ (Assumption 1).

[39]For each relevant region of parameter values, this figure indicates the AA decision at stage 2 and the final equilibrium industry structure induced by this policy decision.

[40]Structural remedies allow for the reallocation of assets among firms that are not possible simply with mergers.

[41]As Rey (2003) highlights, "[d]epending on the scope of the proposed merger, the choice of assets to be divested can lead in some cases to a complete reshaping of the industry." (p.129) This implies that there is a change in the nature of merger control since "introducing the possibility of remedies considerably enlarges the toolbox and puts the merger control office in a position close to that of an industry-specific regulator." (p.130)
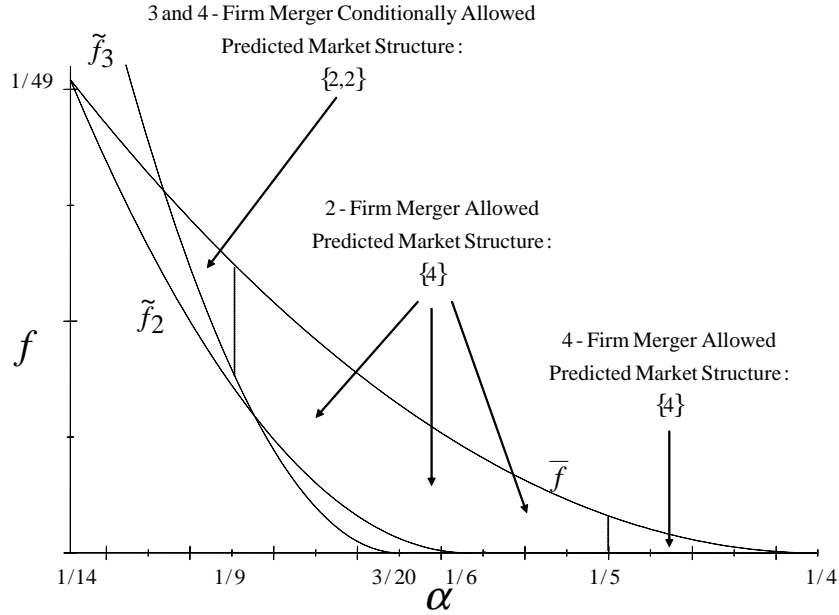
Figure 3: Equilibria of the Game (with FFD)

on small-sized merger proposals (in the present model, two-firm merger proposals) in which: (i) the acquired assets, being indivisible, cannot be partially divested; and (ii) outsiders are likely to be induced to exit, thereby enabling the merged entity (resulting from this small-sized merger) to completely monopolize the industry by forcing a permissive merger policy so as to buy over the failing outsider firms.[42]

So, in this model, the key economic characteristic that determines whether or not FFD can be counterproductive is *asset indivisibility*. The fact that capital is lumpy is a crucial assumption of the model. If the level of divestiture shrinks, the ability of the AA to implement the socially optimal industry structure is improved. In the limit, if capital were perfectly divisible and the AA could require a divestiture of any subset of the acquired assets, then the AA would always be able to use its power to ask for restructuring so as to implement the socially optimal industry structure (and firms would probably submit directly a merger proposal leading to this socially optimal industry structure).[43] So, by assuming that a firm can only divest multiples of the smallest indivisible unit of

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[42]Indeed, as extension Section 5.2 shows, if the AA could somehow commit not to accept small-sized merger proposals for which divestitures cannot be requested, the FFD would never be welfare-reducing: the AA would *always* be able to implement the consumers'-surplus-mazimizing market structure.

[43]Put another way, in the limit case where capital is perfectly divisible, there is no 'real' strategic game between the firms and the AA.

capital (one plant),[44] one creates a non-trivial game of strategic interaction between the firms and the AA, where remedies cannot be used with full flexibility and, thus, merging firms can strategically embark on mergers in which the AA cannot ask for partial divestiture of the acquired assets.

In practice, it is often the case that the assets to be divested are indivisible. The European Commission (EC), in the Notice adopted on December 2000 outlining its policy in relation to merger remedies,[45] raises two important points which help to understand why asset indivisibility is an important issue in reality. Firstly, the EC Notice emphasizes that the divested activities (capital assets in our model) must consist of a viable business, meaning that the business must be able to compete effectively with the merged entity.[46] As stressed in the Notice (paragraph 46), "in a typical divestiture commitment, the business to be divested normally consists of a combination of tangible and intangible assets, which could take the form of a pre-existing company or group of companies". Secondly, even if the acquirer of the divested assets is a firm already active in the industry, the EC does not look favorably at a "mix-and-match" approach where the divestiture package consists only of certain assets which could only operate in a stand-alone basis if combined with other assets already belonging to the purchaser of the divested assets (see EC Notice, paragraph 18). This approach is also in the light of the 1999 Federal Trade Commission Divestiture Study[47], which reveals that the likelihood of successful entry is much higher when an entire ongoing business is divested, whereas entry is significantly more problematic in case of divestiture of selected assets.

4   Ex-Ante Evaluation of the FFD rule

The objective of this section is two-fold. First, it aims at identifying the effects that the FFD concept has in comparison with a situation where FFD is not available. By so doing, it will identify parameter values in the model where the FFD rule is counterproductive. However, it will also show that there exist other parameter values in the model where the FFD rule is consumers' welfare increasing. Second, it addresses the question of whether the expected value of the FFD rule is positive or not.

Suppose that the FFD concept is removed from merger control. In this case, the endogenous

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[44]One can also interpret $k_i = 1$ as the minimum size of a viable line of business.

[45]EC, 'Notice on remedies acceptable under Council Regulation no. 4064/89 and under Commission Regulation no. 447/98', *Official Journal*, 2 March 2001, C 68/3.

[46]See EC Notice, paragraph 14.

[47]Federal Trade Commission, *A Study of the Commission's Divestiture Process* (1999), available at: http://www.ftc.gov/os/1999/08/divestiture.pdf.
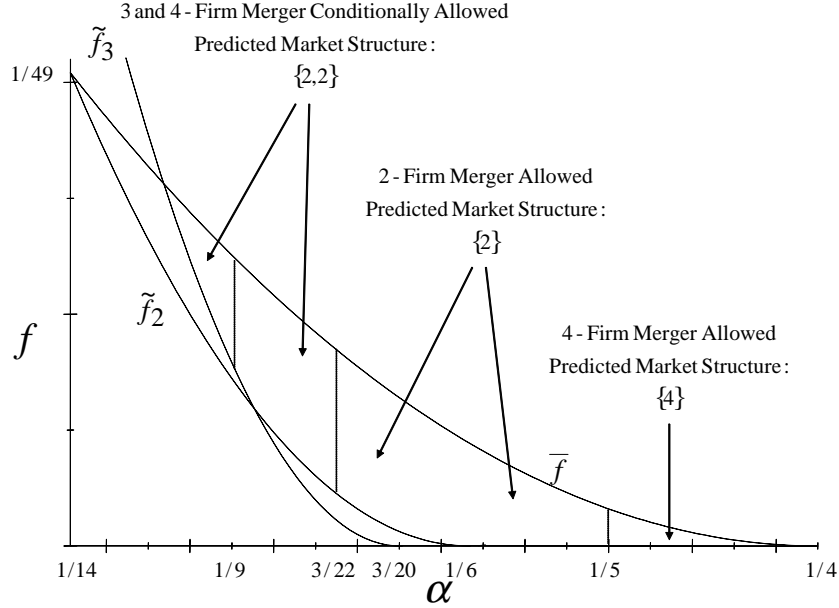
Figure 4: Equilibria of the Game (without FFD)

mergers formation game is only composed of the two first stages described in Section 2.1. In what follows I analyze the full equilibrium outcome of this constrained game. Assume first that $\alpha > 1/5$. In this case, any merger proposal is going to be unconditionally approved by the AA and all proposals lead to $\{4\}$. Hence, at stage 1 a four-firm merger is proposed.

Assume now that $\alpha < 1/5$. At the second stage, a merger involving three or all firms will always be remedied to generate the $\{2,2\}$ market structure. The AA may, however, also be faced with a two-firm merger proposal. Since the outsiders to this merger are constrained to exit if the merger is approved (Assumption 1), the AA will only clear the merger if $p(2) \leq p(1,1,1,1)$, i.e. if $\alpha \geq 3/22$. As for the first stage, two cases should then be distinguished. If $\alpha < 3/22$, the randomly selected firm anticipates that only merger proposals involving three or all firms are going to be approved, being indifferent between the two proposals (both lead to $\{2,2\}$). If instead $3/22 \leq \alpha < 1/5$, the firm has to decide between a merger involving two firms and a merger involving a higher number of firms. A two-firm merger will, however, be always preferred since $\Pi(2)/2 > \Pi(2;2)/2$. The full equilibrium outcome of this constrained game is illustrated in Figure 4.

Contrasting the results in Figures 3 and 4, one can understand how having the FFD concept makes a difference. From the analysis above it is straightforward to conclude that the consumers' surplus maximizing market structure is $\{2,2\}$ for $\alpha < 1/5$ and $\{4\}$ otherwise. Both in a regime

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with the FFD concept and in a regime where this concept is not present, the consumers' surplus maximizing market structure is attained when efficiency gains induced by the merger are sufficiently high ($\alpha \geq 1/5$) or sufficiently low ($\alpha < 1/9$).

The equilibrium outcomes differ, however, when $\alpha \in [1/9, 1/5)$. This is precisely the region where, under the FFD regime, the randomly selected firm strategically embarks on a merger which makes other firms fail and then buys over the capital belonging to the exiting outsider firms, leading to complete monopolization of the industry. Now, the final effect induced by this two-step strategy depends on the level of efficiency gains induced by the merger. In particular, two different cases should be distinguished which I discuss in turn. First, if $\alpha \in [3/22, 1/5)$, asset indivisibility can be used strategically by the randomly selected merging firm both in a scenario where FFD is possible and in a scenario where it is ruled out: in both cases, the merging firm avoids remedies by embarking on a small-sized (two-firm) merger proposal. Nonetheless, the final equilibrium outcome under a FFD regime ($\{4\}$) is welfare superior to the one obtained when the FFD is ruled out ($\{2\}$). In this region of parameter values, efficiency gains induced by a merger are sufficiently high so that the AA always decides to accept a two-firm merger proposal leading to a monopoly final induced market structure. However, the FFD in this context has a benefit to consumers since industry specific capital can remain in the industry (in the hands of a more efficient monopolist) instead of exiting.[48] Second, if instead $\alpha \in [1/9, 3/22)$, it turns out that asset indivisibility cannot be strategically used by firms when FFD is not available. Since, in this region of parameter values, efficiency gains induced by a merger proposal leading to a monopoly of the type $\{2\}$ are low, the AA decides to block two-firm mergers when the FFD is not available in merger control: only mergers involving three or all firms are approved under remedies conditions that generate the consumer surplus maximizing market structure $\{2, 2\}$. In case, however, FFD is possible, firms exploit asset indivisibility by embarking on a strategic mergers that, even though being initially small-sized, trigger subsequent rescue mergers (under the FFD) that lead to complete monopolization of the industry. This perverse behavior adopted by a merging firm explains why the FFD may be counterproductive: if the FFD was not an option, then other mergers associated with higher consumer surplus (namely mergers leading to the consumers'-surplus-maximizing market structure $\{2, 2\}$) would have taken place.

Since the FFD rule has been shown to be consumers' welfare enhancing for some parameter values and counterproductive for others, a natural question that one should raise at this point is

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[48] From (3), one may conclude that, for any $\alpha > 0$, $p(4) < p(2)$: consumers benefit when a monopolist owns the entirety of industry capital units rather than when it operates with only half of the available units of capital (after the failing outsider firms have exited the industry).

then whether the expected value of the FFD rule is positive or not. Put it another way, in what follows I investigate whether the negative effect induced by the FFD concept on consumers' surplus is sufficiently important to more than compensate for the positive one, or otherwise. In particular, if α and f are assumed to be uniformly distributed, one can then compute whether consumers' surplus ex-ante is higher with or without the FFD concept in merger control. This analysis is performed in Appendix A and the answer to the question raised above is that the net effect of the FFD concept is *positive*. Hence, under the particular assumption that the efficiency measure parameter and the fixed cost parameter are jointly uniformly distributed, one may conclude that the FFD turns out to enhance consumers' surplus from an ex-ante point of view.[49]

5   Extensions

In this section, we discuss a number of extensions of the proposed benchmark model.

5.1   Ruling Out Merger Remedies

So far, the AA has been assumed to have an enlarged tool box available for merger control since, apart from deciding to block or unconditionally approve the merger, it can also decide to conditionally approve the merger, i.e., to approve the merger subject to the condition that some of the acquired assets are divested. In this section, I investigate the case in which remedies cannot be asked, implying that the AA decision at stage 2 will have to be binary (clearance/prohibition).

When the AA does not have the power to restructure, then an approved two-firm merger will always be followed by a rescue merger leading to $\{4\}$ whereas an approved three-firm merger may or may not be followed by a rescue merger, depending on whether $f \leq \alpha \left(6 - 7\alpha\right)/36 \equiv f_1^r$ or otherwise.[50] Now, making use of eq. (3), very simple algebra shows that $p(4) < p(3)$ for any $\alpha > 0$. This implies that, when merger proposals cannot be subjected to remedies, the randomly selected firm at stage 1 may reach the market structure that maximizes industry profits, $\{4\}$, through two different channels. First, as in the benchmark model, it can embark on small-sized mergers which are then followed by a rescue merger leading to complete monopolization of the industry. Second, it

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[49]The assumed uniform joint distribution seems a natural starting point for this analysis regarding the ex-ante evaluation of the FFD rule. Clearly, there might exist an alternative set of joint distributions for which the overall ex-ante impact of the FFD on consumers' surplus is negative rather than positive. While relevant, the investigation of the robustness of this result to the adoption of alternative joint distributions is left for further research.

[50]Recall that $f < f_2^r$ in the region of parameter values defined by Assumption 1 (see Figure 1).
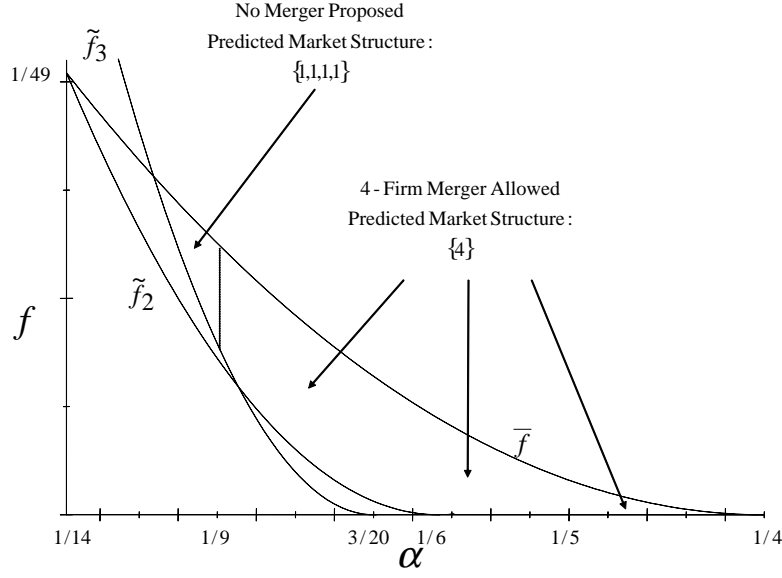
Figure 5: Equilibria of the Game (without Remedies)

may simply apply directly for a merger to monopoly. In any of these cases, the AA anticipates that the final market structure the merger will lead to is $\{4\}$ and, therefore, will only clear the merger proposal if $p(4) \leq p(1,1,1,1)$, i.e. if $\alpha \geq 1/9$. If instead if $\alpha < 1/9$, no merger will be approved by the AA and, hence, no merger proposal will be made by the randomly selected firm at stage 1. Figure 5 illustrates this result.

Now, by comparing Figures 3 and 5, one concludes that using divestiture requirements as a condition to clear a merger proposal has *no effect* on the efficiency of the FFD rule: the availability of remedies simply shuts down *one possible channel* for the randomly selected firm at stage 1 to reach $\{4\}$ when $\alpha \in [1/9, 1/5)$.[51] However, it should also be remarked that when remedies are not available, then the AA is no longer able to implement the consumers'-surplus-maximizing market structure $\{2, 2\}$ when efficiency gains induced by the merger are sufficiently low ($\alpha < 1/9$).

5.2   Blocking Two-Firm Mergers

As shown above, the reason why the FFD may be counterproductive in the proposed setting is that it opens the possibility for the randomly selected firm at stage 1 to strategically embark on a

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[51]Whenever $\alpha \in [1/9, 1/5)$, then, in the benchmark model, a merger proposal involving (three or) all firms will be remedied to generate the $\{2, 2\}$ market structure, whereas, in a no merger remedies scenario, a merger proposal to complete monopoly is unconditionally approved.
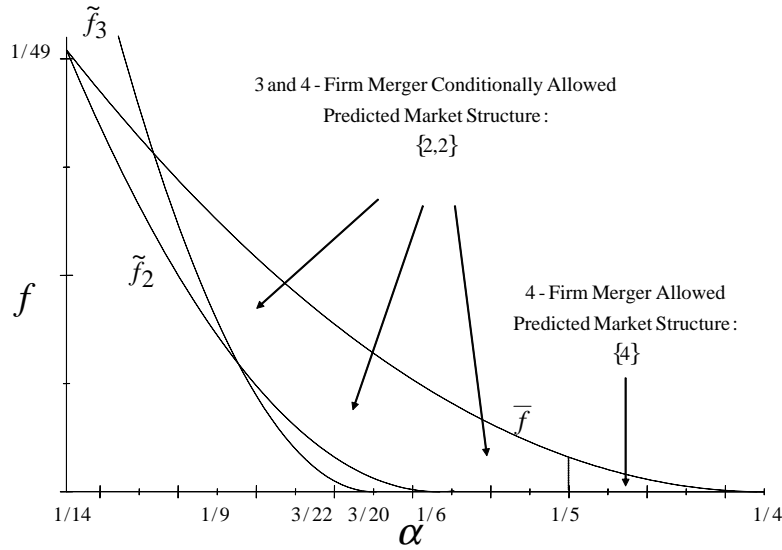
Figure 6: Equilibria of the Game When AA Always Blocks Mergers for Duopoly

two-firm merger, anticipating that: (i) no divestiture can be required as a condition to clear that merger proposal; and (ii) this merger will make outsiders fail, thereby opening the possibility that those outsiders are then bought over under the FFD rule by the merged entity resulting from the approved two-firm merger.

This being the case, in the proposed setting, the AA should worry most about mergers for duopoly. Clearly, in a constrained merger formation game where mergers to duopoly were be blocked, the AA would *always* be able to implement the consumers'-surplus-maximizing market structure. As illustrated by Figure 6, if $\alpha < 1/5$, any merger proposal (involving three or all firms) would be remedied to generate $\{2, 2\}$, whereas if $\alpha \geqslant 1/5$, then a four-firm merger would be proposed and unconditionally approved. Therefore, an important implication of this result is that the dynamic problems regarding the FFD rule could be made much less severe if AAs could somehow commit not to accept small-sized mergers for which divestitures cannot be required, on the one hand, and rivals are likely to be induced to exit in the absence of a subsequent merger, on the other. Put it another way, this model suggests that where the FFD rule is invoked, it is very important to ensure that the strategic adoption of specific merger patterns by the acquirer at an early stage is not the reason why the target firm(s) involved in the rescue merger is(are) failing.

In concluding this section, it should be highlighted that while the use of divestiture requirements *per se* has been shown not to affect the efficiency of the FFD rule (see Section 5.1), their availability

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is, however, crucial for the AA to be able to implement its preferred market structures in the constrained game analyzed in the current section (wherein the merger for duopoly is always blocked).

5.3 Sequential Mergers

A limitation of the previous analysis is that it allows for a second round of mergers only when outsiders to the first (previously approved) merger are driven out from the market. So, it is natural to wonder what would be the equilibrium outcome of the proposed game if one allows for more rounds of mergers.

The present section analyzes a modified version of the proposed endogenous mergers game allowing for sequential merger proposals. In particular, this modified version of the endogenous mergers game will consider the following two types of mergers that might follow an initial (proposed and approved) merger: (*i*) *rescue mergers*, i.e., mergers that occur after an initial merger causes outsiders to wish to exit the industry; and (*ii*) *defensive mergers*, i.e., if a merger between two firms is proposed and approved, the remaining two outsider firms will have the possibility (to propose) to merge with each other.

More formally, the timing of the modified version of the endogenous mergers game is the following:

- In the *first stage*, one firm at the status quo industry structure is randomly selected and has the opportunity to propose a merger to the AA. This firm may propose a merger with all or a subset of its rivals. The proceeds of the merger are assumed to be shared equally by the merger partners. So, amongst all feasible mergers, the firm will propose the merger that maximizes the per-firm profit of the merged entity.

- In the *second stage*, the AA decides whether or not to authorize the proposed merger. At this stage, the AA can: (*i*) accept the proposed merger; (*ii*) reject the proposed merger; or (*iii*) conditionally accept the merger, i.e., accept the merger subject to the condition that some units of the merged entity capital are divested to an incumbent rival firm or to a new firm which is attracted into the market. If the AA does not authorize the merger, then the game will have come to a final node and product market competition occurs between the four symmetric firms in the status quo industry structure.

- In the *third* stage, if the AA has decided to approve a merger at stage 2 and there is more than one outsider to this merger, then it is the turn of these outsiders to decide if they want

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to merge with each other in response to the initial merger and the AA's reaction.[52] If these outsider firms want to merge, they will have to ask the AA for authorization.

- In the *fourth* stage, in case a defensive merger by the outsiders to the first merger is proposed at the previous stage, the AA has to decide whether it wants to authorize it or not. If the defensive merger is approved, the merger game stops and product market competition occurs.

- In the *fifth* stage, if in the previous stages of the game a merger was proposed and approved by the AA and if the outsider(s) to this merger would be pushed out of the industry as a result of the merger, then the remaining active firm can make a take-it-or-leave-it offer so as to acquire the assets of the exiting outsider firm(s) through a *rescue merger*. If there is an offer and this offer is accepted by the target (exiting) firm(s), the rescue merger will always be cleared by the AA under the *failing firm defence* concept. However, in case there is an offer but it is rejected by the target firm(s), two cases should be distinguished. First, if there is only one exiting outsider (target) firm and this firm rejects the take-it-or-leave-it offer, the merger game stops here and the product market stage occurs. Second, if there are two exiting firms and they reject the take-it-or-leave-it offer, a further merger round is allowed.

- In the *sixth* stage, if in the previous stage the two exiting outsiders from a previous two-firm merger were not offered the possibility to participate in a rescue merger or rejected a take-it-or-leave-it offer to participate in a rescue merger, they are given the possibility to (re)consider submitting to the AA a (defensive) merger between themselves.

- In the *seventh* stage, if a defensive merger has been proposed in the previous stage, the AA decides whether or not to allow it and, after its decision has been made, product market competition occurs.

By seeking the symmetric SPNE in pure strategies of this seven-stage game, following the usual backward induction procedure, one obtains the final equilibrium market structures which can be represented by a Figure exactly equal to Figure 3:[53] when the FFD rule is available in merger control, the equilibrium outcome of this sequential merger formation game exactly coincides, for each region of parameter values, with the equilibrium of the benchmark endogenous merger formation game described in Section 2.1. Now, Figure 7 illustrates the full equilibria outcome of the very same sequential merger formation game when the FFD is not available in merger control.

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[52] As before, the proceeds of the merger are assumed to be shared equally by the merger partners.

[53] A mathematical appendix where the full equilibrium analysis of this extended version of the model is carried out
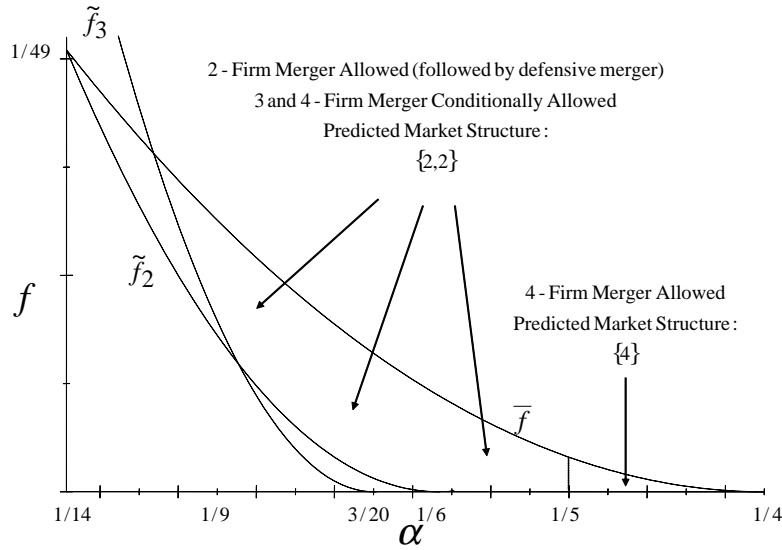
Figure 7: Equilibria of the Sequential Game (without FFD)

Interestingly, in this sequential merger game, the AA is *always* able to implement its preferred market structure when the FFD is not available in merger control. Hence, by contrasting the results in Figures 3 and 7, one concludes that, contrary to what happened in benchmark model (wherein the FFD rule was shown to be consumers' welfare enhancing for some parameter values and counterproductive for others), when a more dynamic view is taken of sequential merger review, then it becomes clear that the FFD rule can only be counterproductive. Put it another way, in this sequential version of the merger formation game, only the negative effect of the FFD rule on consumers' surplus remains: under certain circumstances, firms embark on small-sized (two-firm) mergers that ultimately lead to full monopolization of the industry rather than on a three- or on a four-firm merger that would lead to the symmetric duopoly market structure $\{2, 2\}$ (which would maximize consumers' welfare). This result then gives a theoretical rationale for the fact that "competition authorities have in several cases shown some reluctance to accept the failing firm defense, preferring to let the firms fight it out and give consumers the benefit of low prices during the ensuing war of attrition." (Mason and Weeds (2002, p.2)).

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is available upon request to the author.

6 Conclusion

The present paper studies the role of the FFD concept in merger control in a setting where firms compete *à la* Cournot in the product market and mergers are motivated by prospective efficiency gains.

In a setting where merger policy focuses attention on the effects of a single merger proposal, I find that the FFD rule may be consumers' surplus enhancing, but it may also be counterproductive. As for the latter effect, I show that when the FFD is available, this creates an incentive for firms to embark on mergers which force outsiders to exit the industry (either because the merger induced efficiencies are very high or because these outsiders are unable to cover fixed costs ex-post) and force a permissive merger policy. This in turn implies that, under some circumstances, the consumers'-surplus-maximizing industry structure is achieved when the FFD is ruled out, whereas it is not achieved when the FFD is allowed.

This analysis then suggests that there might be scope for improving the current design of the FFD law and calls for more stringent conditions which must be met to apply the concept of a rescue merger in industries characterized by fixed capacity and difficult entry. In particular, an important implication of the obtained results is that the identified counterproductive effect of the FFD rule could be removed if Antitrust Authorities committed not to approve small-sized merger proposals wherein divestitures cannot be required (and rivals are likely to exit the industry in the absence of a subsequent merger). Put it another way, this model suggests that where the FFD rule is invoked, it is very important to ensure that the strategic adoption of specific merger patterns by the acquirer at an early stage is not the reason why the target firm involved in the rescue merger is failing.

Interestingly, when a more dynamic view is taken of sequential merger review, then I find that the FFD rule can only be counterproductive. The obtained results thus provide a theoretical rationale for the fact that Antitrust Authorities have shown considerable reluctance to accept the FFD as a general merger rule, implying that the FFD has been successfully used in just a handful of cases.

In concluding, let me point out two limitations to the previous analysis. First, all results are derived for a particular merger model which can be considered somehow restrictive. An open question is, therefore, whether the obtained results would hold when other (more general) endogenous merger models are used. An alternative approach to specify a particular sequential merger formation game is to consider an endogenous merger formation game in the spirit of Kamien and Zang (1990, 1991) and Persson (2004) where the merger formation is depicted as an auction in which firms post bids for other firms and asking prices for their own, with the equilibrium market structure resulting from

this bidding.[54] While this approach has generality on its side, it is considerably more difficult to derive results. Second, it is an open question as to whether my findings will hold for other oligopoly models. In particular, it seems important to consider a more general oligopoly model where uncertainty (say, regarding the evolution of demand) is allowed since this is crucial to the motivation for the use of the FFD. This then calls for further research in order to determine the robustness of my findings.

A Consumer Surplus Ex-ante

Let A denote the region of parameter values defined by Assumption 1.[55] Now, suppose (α, f) is uniformly distributed in $[0, 1/4] \times [0, 1/25]$.[56] In addition, let $\widetilde{\alpha}$ and $\widehat{\alpha}$ be the values of α for which $\overline{f}(\alpha) = \widetilde{f}_3(\alpha)$ and $\widetilde{f}_2(\alpha) = \widetilde{f}_3(\alpha)$, respectively. Simple algebra shows that $\widetilde{\alpha} = 3/32$ and $\widehat{\alpha} = 3/26$. Then,

$$P(A) = 100 \left[\int_{3/32}^{3/26} \left(\overline{f}(\alpha) - \widetilde{f}_3(\alpha) \right) d\alpha + \int_{3/26}^{1/6} \left(\overline{f}(\alpha) - \widetilde{f}_2(\alpha) \right) d\alpha + \int_{1/6}^{1/4} \overline{f}(\alpha) d\alpha \right], \qquad (5)$$

where $\overline{f}(\alpha)$, $\widetilde{f}_2(\alpha)$ and $\widetilde{f}_3(\alpha)$ are defined in Assumption 1. Now, some algebra shows that $P(A) = 0.048796$.

In what follows, I compute the expected value of the price, conditional on the fact that attention is being restricted to region A of parameter values. This will be done both for the case where FFD is available and for the case in which FFD is removed from merger control. This exercise will allow me to address the question of whether consumers' surplus ex-ante is higher with or without FFD.

Consider first the case in which FFD is available. Then, making use of Figure 3 one concludes

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[54]Two other noteworthy endogenous merger models are Gowrisankaran (1999) and Horn and Persson (2001 a,b). Gowrisankaran (1999) considers a dynamic model where firms take merger, entry, exit, investment and production decisions. The price to pay is that the analysis becomes extremely complex, though: analytical results are not obtained in his model. Horn and Persson (2001 a,b), on the other hand, propose a model where merger formation is treated as a cooperative game of coalition formation, allowing for binding agreements and side payments.

[55]In the previous figures, area A is given by all pairs (α, f) in the region of parameter values underneath the $\overline{f}$ schedule and above the upper envelope of the $\widetilde{f}_2$ schedule and the $\widetilde{f}_3$ schedule.

[56]Note that 1/4 and 1/25 are, respectively, the vertical intercept and the hortizontal intercept of the $\overline{f}$ schedule (see Assumption 1).

that:

$$E\left(\left.p\right|A\right)|_{FFD} = \frac{100}{P(A)} \left[\int_{3/32}^{1/9} p(2,2)\left(\overline{f}(\alpha) - \widetilde{f}_3(\alpha)\right) d\alpha + \int_{1/9}^{3/26} p(4)\left(\overline{f}(\alpha) - \widetilde{f}_3(\alpha)\right) d\alpha + \right.$$
$$\left. + \int_{3/26}^{1/6} p(4)\left(\overline{f}(\alpha) - \widetilde{f}_2(\alpha)\right) d\alpha + \int_{1/6}^{1/4} p(4)\overline{f}(\alpha) d\alpha \right], \tag{6}$$

where $\overline{f}(\alpha)$, $\widetilde{f}_2(\alpha)$ and $\widetilde{f}_3(\alpha)$ are defined in Assumption 1 and $P(A)$ is given by eq. (5). Now, making use of eq. (3), some algebra shows that $E\left(\left.p\right|A\right)|_{FFD} = 0.56631$.

Consider now the case in which FFD is not available. Then, from Figure 4 one may conclude that:

$$E\left(\left.p\right|A\right)|_{No-FFD} = \frac{100}{P(A)} \left[\int_{3/32}^{3/26} p(2,2)\left(\overline{f}(\alpha) - \widetilde{f}_3(\alpha)\right) d\alpha + \int_{3/26}^{3/22} p(2,2)\left(\overline{f}(\alpha) - \widetilde{f}_2(\alpha)\right) d\alpha + \right.$$
$$\left. + \int_{3/22}^{1/6} p(2)\left(\overline{f}(\alpha) - \widetilde{f}_2(\alpha)\right) d\alpha + \int_{1/6}^{1/5} p(2)\overline{f}(\alpha) d\alpha + \int_{1/5}^{1/4} p(4)\overline{f}(\alpha) d\alpha \right], \tag{7}$$

where $\overline{f}(\alpha)$, $\widetilde{f}_2(\alpha)$ and $\widetilde{f}_3(\alpha)$ are defined in Assumption 1 and $P(A)$ is given by eq. (5). Now, making use of eq. (3), some algebra shows that $E\left(\left.p\right|A\right)|_{No-FFD} = 0.59087 > E\left(\left.p\right|A\right)|_{FFD}$. Hence, consumers' surplus ex-ante turns out to be higher with FFD than in a situation where FFD is removed from merger control.

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