The Failing Firm Defence: Merger Policy and Entry*

Robin Mason
Department of Economics, University of Southampton and CEPR
Helen Weeds,
Department of Economics, University of Essex and CEPR

20 March 2005

Abstract

This paper considers the 'failing firm defence'. Under this principle, found in most antitrust jurisdictions, a merger that would otherwise be blocked due to its adverse effect on competition is permitted when the firm to be acquired is a failing firm, and an alternative, less detrimental merger is unavailable. Competition authorities have shown considerable reluctance to accept the failing firm defence, and it has been successfully used in just a handful of cases. The paper considers the defence in a dynamic setting with uncertainty. A firm entering a market also considers its ease of exit, foreseeing that it may later wish to leave should market conditions deteriorate. By facilitating exit in times of financial distress, the failing firm defence may encourage entry sufficiently that welfare is increased overall. This view of the defence has several implications relevant to a number of merger cases. The conditions under which greater leniency is welfare-improving are examined.

Keywords: Merger policy, failing firm defence, entry, exit.

JEL classification: L41, K21, D81.

*We would like to thank seminar participants at Birmingham, Cambridge, Helsinki, Southampton, Tilburg and Warwick, the CEPR/IFS workshop on "Innovation and the Structure of Product Market Competition" the Network of Industrial Economists Annual Meeting, and the Office of Fair Trading for comments. We are particularly grateful to Pierre Regibeau and Juuso Vlimki for very helpful discussions. Obviously, they are not responsible for any errors. Robin Mason acknowledges financial support from the ESRC Research Fellowship Award R000271265. The latest version of the paper can be found at `http://www.soton.ac.uk/~ram2`.

1 Introduction

Should a firm that is in financial distress be allowed to merge with a rival; should the 'failing firm defence' (FFD) be accepted as a general merger rule? If so, at what point should merger be allowed; that is, how lenient should merger policy be? Policy-makers have, so far, viewed the FFD with some suspicion: the conditions governing the application of the FFD are strict and it has been successfully used in just a handful of cases in which firms face the prospect of imminent bankruptcy. This paper presents a new view of the FFD, emphasizing its role in encouraging entry into a market. The analysis provides a framework for determining how lenient merger policy should be towards failing firms. It challenges current policy conclusions in a number of ways.

The FFD, in one form or other, is recognized by many countries. In the U.S., the defence is included specifically in the Department of Justice (DoJ) and Federal Trade Commission (FTC) 1992 Horizontal Merger Guidelines. In the European Union (EU), the provision for the defence is less explicit; the Commission's case law has developed, however, the concept of a 'rescue merger'.[1] Policy discussions of the FFD mergers[2] have reached three broad conclusions. First, in the absence of any other benefits (such as avoiding [illegible] Td (or)Tj 14.729 0 Tds(to)Tj 1.47007 0 Td ncial

by regulators.[4]

The failing firm defence has been applied in a number of mergers where one (or more) party is experiencing financial difficulties. In the U.S., three cases in particular have been important in the establishment and development of the defence. The FFD was first used in 1930 in the case of *International Shoe*'s acquisition of a financially troubled competitor. The principle was developed further in the case of *Citizen Publishing Co.*, when the Supreme Court rejected a merger with a distressed newspaper company and set out stringent conditions under which the defence would be accepted. Finally, in the *General Dynamics* case in 1974, the Supreme Court concluded that the acquisition of a coal mining company was acceptable even though it produced a company with a large market share in a concentrated industry. The company being acquired was not in immediate danger of bankruptcy, but was declining in profitability. This raised the possibility of a 'flailing firm defence': justifying a merger on the grounds that one of the firms, while not in imminent danger, is at least in a position of financial weakness.

In European merger control, the case of *Kali und Salz* and *Mitteldeutsche Kali* (MdK) in 1993 established the principle of the failing firm defence (Case No. IV/M.308, 1994). Following a 30% fall in demand in the potash (fertiliser) market over the preceding five years, *Mitteldeutsche Kali* was facing bankruptcy (it was surviving only due to support from the Treuhand, which could not be continued due to EC Treaty provisions on state aids). Despite the combined market share of 98%, the European Commission found that MdK's market share would most likely go to *Kali und Salz* and permitted the merger on failing firm grounds. A recent merger in the chemicals sector reinforced the principle. In 2001, *BASF* was permitted to acquire *Eurodiol* and *Pantochim*, which were both in receivership, although this would result in market shares in excess of 45% in a number of solvents markets. No other buyer could be found and the Commission found that absent the merger the resulting reduction in capacity was likely to result in supply shortages and higher prices.

The break-up of the failed accountancy practice of *Arthur Andersen* (AA) in 2002,

[4] For example, the Australian position is "where anti-competitive effects are expected, a merger may nonetheless be permitted on wider ... grounds".

in which the various national divisions were acquired by other "Big Four" accountancy firms, may also be viewed on failing firm grounds. There could be little doubt that AA was no longer viable as a global player; the issue was rather whether an orderly acquisition was preferable to fragmentation of the national practices. The takeover of *British Caledonian* by *British Airways* in 1987 was accepted by the (then) Monopolies and Mergers Commission (MMC) on failing firm grounds, although some commentators would regard this merger as an example of the promotion of a "national champion." The case was complicated by the obstacles to foreign-owned bidders posed by existing airport slot ownership rules. In 1998 the joint venture (JV) between the cross-Channel ferry operators *P&O* and *Stena Line* was exempted from the provision on anti-competitive agreements of Article 85(1) of the EC Treaty. Although not in imminent danger of failing, the prospect of intense competition from the Channel Tunnel and the loss of revenues from the ending of duty free sales threatened the continuation of independent ferry operations. In reaching its decision, the European Commission discussed but decided to ignore the effects of the JV on local economies.[5]

However, competition authorities have in several cases shown some reluctance to accept the failing firm defence, preferring to let the firms fight it out and give consumers the benefit of low prices during the ensuing war of attrition. In the U.K., the proposed merger in 1997 between *Scottish Pride*, a failing dairy firm in Scotland, and *Robert Wiseman Dairies*, fell through and *Scottish Pride* went into receivership, due to the delay imposed on merger while a report by the MMC was considered by the Department of Trade and Industry (DTI). *Scottish Pride* was in clear financial distress; but the DTI was concerned about the merged firm's 80% share of the Scottish milk market.[6] Doubt has also been expressed in some cases as to whether the 'failing' firm was in fact failing. In the U.S., the *Detroit News* and *Detroit Free Press* reached a joint operating agreement (JOA) in 1988, in response to continued losses by both papers. In the JOA, the papers agreed to set prices jointly, but to retain independent editorial functions. A key obstacle

[5] See http://www.ebusiness.com/news/stories/102/10151.html.

[6] See http://www.competition-commission.gov.uk/wise.htm, http://www.oft.gov.uk/html/trading/tr-arch/nws16-3.htm and http://www.ukbusinesspark.co.uk/bpfood97.htm.

to the approval of the JOA was the division of profits. The initial administrative law judge decided that the equal division proposed in the JOA indicated that neither firm was failing, and hence the FFD provision in the Newspaper Provision Act of 1970 could not apply. This decision was subsequently overturned by the Attorney General, but only after a delay of almost four years.[7] In the fertiliser sector, the proposed sale of *ICI*'s loss-making fertiliser division to *Kemira Oy* in 1990 was blocked by the MMC due to possible adverse competition effects of the merger, despite the recognition by the MMC that *ICI* might exit the market in due course.[8] The strength of the parent company was something of an obstacle in this case, as the loss-making division could be supported by the parent for some time and exit was therefore not considered to be an immediate prospect.

There has been very little formal economic analysis of the failing firm defence. While the literature on mergers generally is very large (see Jacquemin and Slade (1989) for a survey), there are very few papers analysing the FFD specifically. The only exception that we have been able to find is Persson (2001), who analyses the welfare consequences of the FFD, concentrating on the *ex post* efficiency of sales of the failing firm's assets. He shows that the detailed provisions of the FFD do not ensure that the socially preferred buyer obtains the assets. In our model, merger policy is used as a means to encourage *ex ante* entry to an industry. Merger leads to a more concentrated market structure, and consequently lower consumer surplus and greater deadweight loss. But the possibility of merger in times of financial distress increases the expected profitability of operating in a market; this, in turn, increases the willingness of firms to enter the industry, reducing concentration and deadweight loss from market power in the long run.

We argue, therefore, that rescue mergers are desirable precisely because they increase firms' market power and so profits in times of financial distress. In effect, merger policy affects the *ex post* profitability, and therefore the extent, of entry. Entry occurs more often when firms are allowed to merge and thus increase profit when one of the firms is failing. If the entrant is also likely to be the first to exit (because the incumbent has some intrinsic advantage, for example), then allowing the failing firm to gain a larger share from merger

[7]See Kwoka and White (eds). (1999), case 1 for further details.
[8]See `http://www.competition-commission.org.uk/reports/293.htm`.

encourages entry. Finally, a lenient merger policy (allowing merger at an early stage of financial distress) harms industry profits more than it increases the entrant's profit. A consumerist social planner disregards this, and sets a lenient merger policy to encourage early entry. A social planner who considers industry profits sets policy more strictly.

Although our main focus is on the interaction between merger policy and entry decision, note that similar considerations arise with any *ex ante* decision made by a firm. For example, the decision to extend an existing product line, initiate a research and development project, or undertake an advertising campaign, could be analysed in a similar fashion. What matters for the analysis is that the decision involves a sunk cost, and that the returns are uncertain and affected by the prospects of future merger. We have chosen entry as an important example of such a decision; but the analysis can be applied to other issues.

The lack of formal economic analysis of the FFD extends to empirical study. We cannot, therefore, provide any direct evidence concerning the empirical importance of our argument. We note, however, that the analysis here bears many resemblances to that of the effect of bankruptcy procedures on *ex ante* decisions by firms and shareholders.[9] There is growing literature on this question. Jensen and Meckling (1976) and Green (1984) argue that bankruptcy procedure can induce inefficient management decisions concerning investment, distribution of dividends and financing. Mooradian (1994) analyses the effect of bankruptcy protection on *ex ante* investment policy of managers. Bebchuk (2002) shows how deviations from absolute priority in bankruptcy proceedings can bias managers in favour of choosing riskier projects. Even with this recognition of the importance of the relationship between bankruptcy procedures and *ex ante* decisions, there has been, to our knowledge, little empirical work in the area. Fan and White (2002) is a notable exception. They examine whether individuals are more likely to become entrepreneurs if they live in states in the U.S. with higher bankruptcy exemptions.[10] They find that households are more likely to own and start businesses if they live in states with higher bankruptcy

[9] Many papers on bankruptcy procedures concentrate on *ex post* efficient division of bankruptcy value; see e.g., Hart (1995).

[10] Entrepreneurs filing for personal bankruptcy under Chapter 7 must give up all of their assets in excess of an exemption level to discharge debts.

exemption levels.

This finding accords with the informal, widely-held view that the U.S. approach to bankruptcy, being less punitive than most European countries' regimes, is a factor in accounting for the higher rate of entrepreneurial activity in the U.S.. The U.K. has recently reformed its bankruptcy regime to take account of its impact on entrepreneurial incentives. The Enterprise Act 2002 reduces the period before debts are discharged to a maximum of twelve months in most cases. The reforms were undertaken with the stated aim of encouraging entrepreneurship: with bankruptcy now being less onerous, the hope is that more entrepreneurs will take the step of starting a business. However, recent reform of UK merger control—carried out under the same Act—embodies no similar principle.

In summary: the extensive theoretical analysis, and rather more limited empirical study, of the relationship between bankruptcy and *ex ante* decisions lends weight to the likely relevance of our argument that merger policy for failing firms affects entry.

The rest of the paper is structured as follows. In section 2, we present a two-period, reduced-form model to illustrate the trade-off between encouraging entry and increasing market power. In section 2.1, we provide an explicit determination of equilibrium entry, exit and merger decisions. In section 2.2, we determine analytically the conditions under which it is socially optimal to use merger policy to encourage entry; and characterize the dependence of policy on key model parameters. In section 3, we discuss how the analysis would change if the model allowed for strategic behaviour by the firms to manipulate profits to pass the failing firm test. There are three main objectives for the analysis. Section 4 considers the importance of the market structure assumption used in the model; and whether alternative instruments, other than merger policy, might not be better for encouraging entry. Section 5 concludes. The appendix contains longer proofs.

2 [redacted]ced-Form Model of the Failing Firm De-

[redacted]

O[redacted]mbent, operates in a market for two periods. The other firm, the en[redacted]hether to enter or not at the beginning of the first period, before in[redacted]s profitability is revealed; and whether to exit at the beginning of the se[redacted] this information is received. A policy-maker sets policy at the outset (i[redacted]rant chooses whether to enter and before the realization of market pr[redacted] policy that we consider concerns merger: the firms are allowed to m[redacted]tion about the market is received, if profitability is sufficiently low.

[redacted]od variable profit for the incumbent as monopolist be equal to $\pi(1)$; [redacted]n-cooperatively, both recei[redacted] $\geq 2\pi(2)$: the standard ‘[redacted]ed cost θK which must be[redacted] in each period in which the entrant operates. If the firms merge, the entrant's per-period profit becomes $\pi_E - \theta K$ while the incumbent's per-period profit is π_I. (Note that we therefore rule out any efficiency benefit from merger, in the sense that the entrant's fixed cost must 8727(,)Tj 7.0918 0 1795W

to the cumulative distribution function $F(\cdot)$ with bounded density $f(\cdot) > 0$ and support $[\underline{\theta}, \bar{\theta}] \subset \mathbb{R}_+$ where $\underline{\theta} \geq 0$. As a normalization, let $\int_{\underline{\theta}}^{\bar{\theta}} \theta dF(\theta) = 1$; hence $\underline{\theta} < 1 < \bar{\theta}$.

Per-period social surplus is $SS(1) \equiv CS(1) + \lambda\pi(1)$ when just the incumbent operates. Here, $CS(1)$ is the consumer surplus under monopoly and $\lambda \in [0, 1]$ is a weighting parameter. When both the incumbent and the entrant operate, variable social surplus (i.e., excluding fixed costs) is $SS(2) \equiv CS(2) + 2\lambda\pi(2)$; total social surplus is then $SS(2) - \lambda\theta K$. Let $\Delta SS \equiv SS(2) - SS(1)$. Finally, when a merged firm operates, variable social surplus is $SS(1) - \lambda\theta K$. There is discounting, with a common discount factor $\delta \in [0, 1]$.

A policy-maker sets policy at the outset, before it knows the realization of the variable θ. In addition, the policy-maker does not observe the entrant's fixed cost, neither when setting policy nor after entry. Its prior is that K is distributed on the interval $[\underline{K}, \bar{K}]$, where $0 \leq \underline{K} < \bar{K}$, according to the cumulative distribution function $G(\cdot)$ with bounded density $g(\cdot) > 0$. In this section, we suppose that the policy used by the policy-maker is to allow merger in the second period iff the realization of θ is sufficiently high—above θ_M, say. (Note that θ_M cannot be conditioned on the entrant's fixed cost, as this is not observed by the policy-maker.) In the next section, we discuss this form of policy and consider alternatives, such as setting a critical level for the entrant's profit.

In summary, then, the timing of the game is as follows:

$t = 0$: the policy-maker sets θ_M; the entrant decides whether to enter;

$t = 1$: θ is realised; production occurs;

$t = 2$: if the entrant entered at $t = 0$, then it decides whether to operate or exit, or merge if permitted.

The question is: what is the (socially) optimal level of θ_M? If merger is never socially desirable, then the optimal level is $\bar{\theta}$; conversely, if merger is socially desirable at all levels of θ, then the optimal $\theta_M = \underline{\theta}$.

In order to make the point as clearly as possible, we assume

Assumption 1 *(a) $\Delta SS > 0$: in the absence of fixed costs, duopoly is the socially preferred market structure;*

(b) $\pi_E, \pi_I \geq \pi(2)$*: the firms' variable profits are higher when they are allowed to merge (so that merger will occur if permitted).*

Hence merger policy can encourage entry, and entry can be socially desirable.

We also make assumptions about the distribution of the fixed cost:

Assumption 2 $\pi(2)/\bar{\theta} \equiv K_{\bar{\theta}} \geq \underline{K}$ *i.e., the lowest cost entrant is profitable at all values of* θ*, given the duopoly profit* $\pi(2)$*; and* $\pi_E/\underline{\theta} \equiv K_{\underline{\theta}} \leq \bar{K}$ *i.e., the highest cost entrant is not profitable at any value of* θ*, even when it receives the merger profit* π_E*.*

This assumption limits the number of cases that we have to consider, but has no significant effect on our results.

Assumption 3 *Let* $\phi(K) \equiv G(K)/g(K)$*. Then* $\phi'(K) \geq 0$ *for all* $K \in [\underline{K}, \bar{K}]$*.*

This assumption requires the Mills' ratio of the distribution to be non-decreasing. This condition is satisfied by a large number of distributions used in applications (although not e.g., the Pareto distribution).

2.1 Entry and fixed costs

In this section, we characterize the first-period entry decision, as a function of the entrant's fixed cost and the policy variable θ_M.

Consider first an entrant who is not allowed to merge with the incumbent. The expected profit of such an entrant is

$$\Pi_2(K) \equiv \pi(2) - K + \delta \int_{\underline{\theta}}^{\frac{\pi(2)}{K}} (\pi(2) - \theta K) dF(\theta). \tag{1}$$

The entrant holds a 'real option' on production in the second period: if $\theta > \pi(2)/K$, then the entrant exits after the first period; otherwise, it continues to operate. The entrant enters at the start of the first period iff $\Pi_2 \geq 0$; since the expected profit is strictly decreasing in K, there is a critical entry cost K_2, defined implicitly by

$$\Pi_2(K_2) \triangleq 0,$$

such that the entrant enters at the start of the first period iff $K \leq K_2$. Assumption 2 ensures that $K_2 \in [\underline{K}, K_{\underline{\theta}}]$.

This also defines the critical fixed cost for an entrant with $K \geq \pi(2)/\theta_M$. In this case, the entrant is not willing to operate as a duopolist in the second period when $\theta \in (\pi(2)/K, \theta_M)$. With an outside option of zero, this entrant cannot obtain any additional surplus when $\theta \geq \theta_M$ and merger is permitted. The entrant's expected profit from entry in this case is given by equation (1), and hence it enters iff $K \leq K_2$. Clearly, this case holds only when $\pi(2)/\theta_M \leq K_2$ i.e., when $\theta_M \geq \hat{\theta}$, where $\hat{\theta}$ is defined by the implicit equation

$$\hat{\theta} - 1 + \delta \int_{\underline{\theta}}^{\hat{\theta}} (\hat{\theta} - \theta) dF(\theta) \triangleq 0. \tag{2}$$

(It is immediate from the definition that $\hat{\theta} \in (\underline{\theta}, 1)$.)

Now consider an entrant with a fixed cost $K < \pi(2)/\theta_M$. This entrant is willing to operate as a duopolist in the second period for any realization of $\theta \leq \theta_M$ for which merger is not allowed. Consequently, the entrant receives a non-zero share of the surplus from merger, $\pi_E > 0$. The entrant's expected profit from entry in this case is

$$\Pi_M(K, \theta_M) \equiv \pi(2) - K + \delta \left(\int_{\underline{\theta}}^{\theta_M} (\pi(2) - \theta K) dF(\theta) + \int_{\theta_M}^{\frac{\pi(2)}{K}} (\pi_E - \theta K) dF(\theta) \right). \tag{3}$$

The entrant enters iff $\Pi_M \geq 0$; since Π_M is strictly decreasing in K, this means that the entrant enters iff $K \leq K_M$, where K_M is defined implicitly by

$$\Pi_M(K_M, \theta_M) \triangleq 0.$$

Note that $K_M(\theta_M)$ is a decreasing function of θ_M:

$$\frac{\partial K_M(\theta_M)}{\partial \theta_M} = -\frac{\delta \Delta\pi f(\theta_M)}{1 + \delta\gamma\left(\frac{\pi(2)}{K_M(\theta_M)}\right) + \delta \frac{\pi(2)}{K_M(\theta_M)} \frac{\Delta\pi}{K_M(\theta_M)} f\left(\frac{\pi(2)}{K_M(\theta_M)}\right)} < 0 \tag{4}$$

where $\Delta\pi \equiv \pi_E - \pi(2) > 0$ and $\gamma(x) \equiv \int_{\underline{\theta}}^{x} \theta dF(\theta)$. This means that the policy-maker

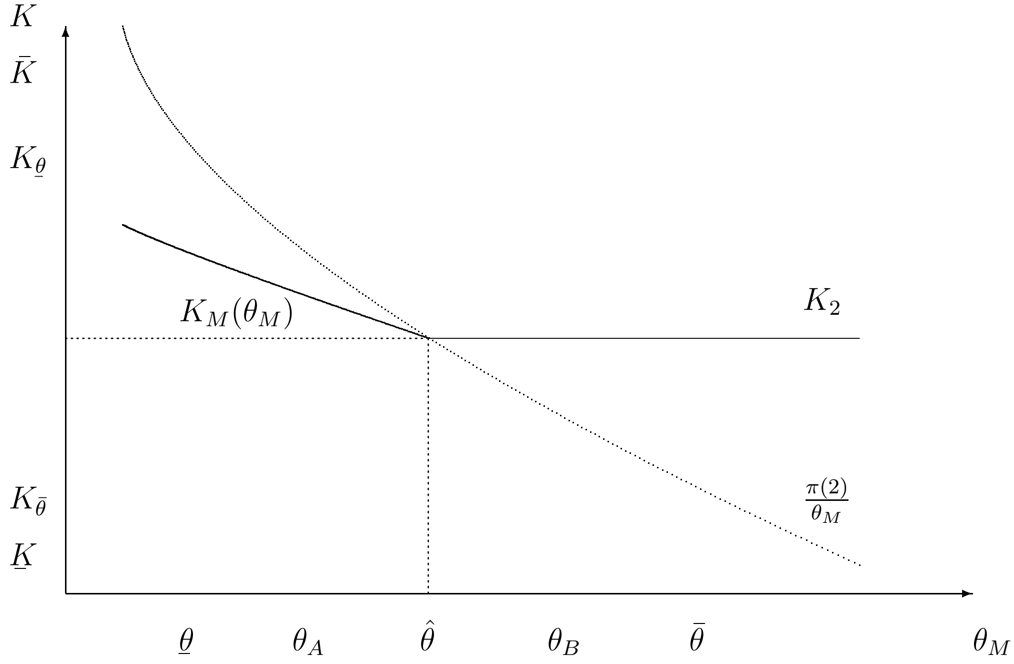

Figure 1: The critical fixed cost as a function of the policy variable θ_M

can use the variable θ_M to encourage entry: a lower θ_M (a more lenient policy) raises the critical fixed cost K_M so that there is entry by a greater mass of entrants. We refer to this as the 'entry encouragement effect'; and to $\partial K_M(\theta_M)/\partial\theta_M$ as the 'entry encouragement factor'.

It is easy to see that $K_M(\theta) > K_2$ for $\theta_M < \hat{\theta}$; and $K_M(\hat{\theta}) = K_2$. Figure 1 illustrates the entry and merger outcomes for different values of K and θ_M. For example, when θ_M is set at $\theta_A < \hat{\theta}$, an entrant with a fixed cost less than $K_M(\theta_A)$ enters at the start of period 1. In the second period, the entrant merges with the incumbent if the realization of θ is such that $\theta_A \leq \theta < \pi(2)/K$. It continues to operate as a duopolist if θ is below this range, and it exits otherwise. When θ_M is set at $\theta_B > \hat{\theta}$, an entrant with a fixed cost between $\pi(2)/\theta_B$ and K_2 enters at the start of period 1, without the prospect of merger in the second period.

Finally, it will be useful to define the fixed cost K_E: the critical cost for an entrant

when merger is allowed at any value of θ. The entrant's expected profit in this case is

$$\Pi_E(K) \equiv \pi(2) - K + \delta \int_{\underline{\theta}}^{\frac{\pi(2)}{K}} (\pi_E - \theta K) dF(\theta).$$

The critical fixed cost is defined implicitly by $\Pi_E(K_E) \triangleq 0$. Note that by definition, $K_M(\underline{\theta}) = K_E$; and by assumption 2, $K_E \leq K_{\underline{\theta}}$. We shall assume

Assumption 4 $(1 + \delta F(\hat{\theta}))G(K_E) > (1 + \delta)G(K_2)$.

The maximum amount of entry that can occur is when all entrants with a fixed cost below K_E enter. The minimum welfare loss that can be incurred while encouraging entry is when θ_M is at the highest possible level $\hat{\theta}$ that encourages entry, and when $\lambda = 0$. The expected welfare in this case is proportional to $(1 + \delta F(\hat{\theta}))G(K_E)$. The expected welfare when no merger is allowed (i.e., $\theta_M = \bar{\theta}$) is $(1 + \delta)G(K_2)$. Assumption 4 ensures that in this most favourable case, the policy-maker wants to encourage entry by setting $\theta_M < \bar{\theta}$.

2.2 Expected welfare

With entry determined, we can now analyse expected welfare. When $\theta_M < \hat{\theta}$, expected welfare is

$$\begin{aligned} W_M(\theta_M) \equiv\ & G(K_M(\theta_M))((1+\delta)SS(2) - \delta(1 - F(\theta_M))\Delta SS) \\ & + (1 - G(K_M(\theta_M)))(1+\delta)SS(1) - \lambda \int_{\underline{K}}^{K_M(\theta_M)} \left(1 + \delta\gamma(\frac{\pi(2)}{K})\right) K dG(K). \quad (5) \end{aligned}$$

That is, expected welfare varies according to whether there is entry or not. If there is entry, with probability $G(K_M)$, then there is duopoly in the first period. In the second period, there is duopoly if $\theta < \theta_M$; otherwise monopoly occurs (either through merger, or exit of the entrant). This accounts for the first line of the expression. If entry does not occur, with probability $1 - G(K_M)$, then there is monopoly in both periods. This accounts for the first term in the second line. Finally, entry incurs fixed costs; the second term in the second line gives the expected fixed costs in the two periods.

When $\theta_M \geq \hat{\theta}$, expected welfare is

$$\begin{aligned} W_2(\theta_M) \equiv\ & G\big(\frac{\pi(2)}{\theta_M}\big)\big((1+\delta)SS(2) - \delta(1 - F(\theta_M))\Delta SS\big) \\ & + \int_{\frac{\pi(2)}{\theta_M}}^{K_2} \left((1+\delta)SS(2) - \delta(1 - F\big(\frac{\pi(2)}{K}\big))\Delta SS\right) dG(K) \\ & + (1 - G(K_2))(1+\delta)SS(1) - \lambda \int_{\underline{K}}^{K_2} \left(1 + \delta\gamma\big(\frac{\pi(2)}{K}\big)\right) K dG(K). \end{aligned} \tag{6}$$

The first and second lines in equation (5) give the expected variable surplus (i.e., ignoring fixed costs) if entry occurs in the first period. Entry occurs with probability $G(K_2)$. In the second period, there is duopoly if $K < \pi(2)/\theta_M$ and $\theta < \theta_M$; or if $\pi(2)/\theta_M \leq K < K_2$ and $\theta < \pi(2)/K$. Otherwise, there is monopoly, either through merger (if $K < \pi(2)/\theta_M$ and $\theta \geq \theta_M$) or exit. The third line gives the expected surplus when entry does not occur (with probability $1 - G(K_2)$), and the expected fixed costs.

The expected welfare function need not be quasi-concave, for two reasons that are intrinsic to the problem. The first is that the entry encouragement effect is present only when $\theta_M \leq \hat{\theta}$: the critical fixed cost K_2 does not depend on θ_M. Hence a lower θ_M only allows greater concentration in the second period. So, if the policy-maker finds it optimal to set $\theta_M \geq \hat{\theta}$, then the optimal choice is $\theta_M = \bar{\theta}$ (i.e., $W_2(\theta_M)$ is decreasing in θ_M). This choice yields an expected welfare of

$$\begin{aligned} W_2(\bar{\theta}) = G(K_2)(1+\delta)SS(2) - \delta \int_{\underline{K}}^{K_2} \left((1 - F\big(\frac{\pi(2)}{K}\big))\Delta SS\right) dG(K) \\ + (1 - G(K_2))(1+\delta)SS(1) - \lambda \int_{\underline{K}}^{K_2} \left(1 + \delta\gamma\big(\frac{\pi(2)}{K}\big)\right) K dG(K). \end{aligned} \tag{7}$$

The second source of (potential) non-quasi-concavity is that the entrant's expected profit includes an option value. This means that we cannot, in general, determine the 'shape' of the entry encouragement factor $\partial K_M/\partial\theta_M$. We know that $\partial K_M/\partial\theta_M < 0$: see equation (4). We cannot, however, sign the second-order derivative $\partial^2 K_M/\partial\theta_M^2$; and hence we cannot sign the second-order derivative of the expected welfare function.

In the light of this lack of quasi-concavity, we proceed in two steps. The first is to

establish sufficient conditions under which the socially-optimal choice of θ_M is strictly less than $\bar{\theta}$ (in fact, strictly less than $\hat{\theta} < \bar{\theta}$). The second is to examine the properties of any interior solution to the expected welfare maximization problem. For this second step, we shall need one further technical condition:

Assumption 5 $\pi_E f(\theta) + \Delta\pi\theta f'(\theta) \geq 0 \quad \forall\, \theta \in [\underline{\theta}, \hat{\theta}]$.

The condition in assumption 5 bounds the curvature of the density $f(\cdot)$ of the state variable θ. The condition is immediately satisfied when the distribution function of θ is uniform or convex. When the density can be decreasing, the condition requires that the percentage rate of change in the density $-f'(x)/xf(x)$ is bounded above by $\pi_E/\Delta\pi$. For any given density, this condition is therefore satisfied if π_E is sufficiently small and/or $\pi(2)$ sufficiently large. (Since the density is assumed to be bounded, such values of π_E and $\pi(2)$ exist.)

Let

$$\begin{aligned}\Delta W(\theta_M) &\equiv W_M(\theta_M) - W_2(\bar{\theta})\\ &= (G(K_M(\theta_M)) - G(K_2))(1 + \delta F(\theta_M))\Delta SS\\ &\quad - \left(\int_{\underline{K}}^{K_2} \left(F(\frac{\pi(2)}{K}) - F(\theta_M)\right) dG(K)\right) \delta\Delta SS\\ &\quad - \lambda \int_{K_2}^{K_M(\theta_M)} \left(1 + \delta\gamma(\frac{\pi(2)}{K})\right) K dG(K).\end{aligned}$$

A necessary and sufficient condition for the socially optimal $\theta_M < \bar{\theta}$ is that $\Delta W(\theta_M) \geq 0$ for some $\theta_M \leq \hat{\theta}$. Proposition 1 states this condition in terms of the model parameters for the case of a consumerist poloicy-maker, who attaches a zero weight ($\lambda = 0$) to profits.

Proposition 1 *Suppose that assumptions 1, 2 and 4 hold, and that $\lambda = 0$. There exists a $\underline{\pi}_E > \pi(2)$ such that it is socially optimal to set $\theta_M < \bar{\theta}$ iff $\pi_E \geq \underline{\pi}_E$. Similarly, there exists a distribution function $\bar{G}(\cdot)$ such that it is socially optimal to set $\theta_M < \bar{\theta}$ iff the distribution function $G(\cdot)$ is such that $G(K_M) \geq \bar{G}(K_M)$ and $G(K_2) \leq \bar{G}(K_2)$.*

Proof. See Appendix A

The intuition behind this proposition is straightforward. It is optimal to set θ_M less than $\hat{\theta}$ if and only if by doing so, the policy-maker can encourage enough entry to offset the loss in welfare from merger in the second period. This in turn requires that the entry encouragement factor is great enough. Two conditions ensure this. First, that the entrant's surplus from merger, π_E, is sufficiently large, so that merger is sufficiently attractive to the entrant. Secondly, that the distribution of fixed costs $G(\cdot)$ is such that a large mass of entrants is encouraged by lowering θ_M below $\hat{\theta}$. (When $\lambda = 0$, the extra fixed costs that entry incurs do not matter for welfare.)

A simple continuity argument can then be used to move to cases where the weight attached to profits is low.

Corollary 1 *There exists a $\bar{\lambda} > 0$ such that for all $\lambda \leq \bar{\lambda}$, proposition 1 holds.*

Proposition 1 and its corollary ensures that for some parameter values, the policy-maker uses merger policy to encourage entry. In order to characterize optimal policy further, we suppose from now on that the conditions in the proposition are satisfied; and we examine the properties of an interior solution to the expected welfare maximization problem.

The first-order derivative of the expected welfare function $W_M(\theta_M)$ is

$$\frac{\partial W_M(\theta_M)}{\partial \theta_M} = \left((1+\delta F(\theta_M))\Delta SS - \lambda\left(1 + \delta\gamma\left(\frac{\pi(2)}{K_M(\theta_M)}\right)\right) K_M(\theta_M)\right) g(K_M(\theta_M))\frac{\partial K_M(\theta_M)}{\partial \theta_M} + \delta G(K_M(\theta_M))f(\theta_M)\Delta SS. \quad (8)$$

The first-order derivative gives the marginal benefit and cost from a small change in θ_M. A decrease in θ_M encourages entry (since $\partial K_M(\theta_M)/\partial\theta_M < 0$), which increases welfare in the first period and the second period when merger does not occur. These increases are shown in the term involving $(1+\delta F(\theta_M))\Delta SS$. Extra entry incurs additional fixed costs, shown in the term involving λ, in the first period and the second when the entrant does not exit. The expected value of the fixed cost is $\left(1 + \delta\gamma\left(\frac{\pi(2)}{K_M(\theta_M)}\right)\right) K_M(\theta_M)$. Finally, holding fixed the amount of entry, welfare is decreased in the second period when merger occurs; this is the final term in equation (8). The probability that entry occurs is $G(K_M)$;

a small increase in θ_M increases the probability of merger by $f(\theta_M)$; and the discounted value of the welfare change is $\delta \Delta SS$.

After substitution of the expression for $\partial K_M(\theta_M)/\partial \theta_M$, the sign of the first-order derivative is the same as the sign of

$$\nabla(\theta_M) \equiv \phi(K_M(\theta_M)) + \lambda \left(\frac{1 + \delta\gamma\left(\frac{\pi(2)}{K_M(\theta_M)}\right)}{1 + \delta\gamma\left(\frac{\pi(2)}{K_M(\theta_M)}\right) + \delta \frac{\pi(2)}{K_M(\theta_M)} \frac{\Delta\pi}{K_M(\theta_M)} f\left(\frac{\pi(2)}{K_M(\theta_M)}\right)} \right) \frac{\Delta\pi}{\Delta SS} K_M(\theta_M)$$
$$- \left(\frac{1 + \delta F(\theta_M)}{1 + \delta\gamma\left(\frac{\pi(2)}{K_M(\theta_M)}\right) + \delta \frac{\pi(2)}{K_M(\theta_M)} \frac{\Delta\pi}{K_M(\theta_M)} f\left(\frac{\pi(2)}{K_M(\theta_M)}\right)} \right) \Delta\pi. \quad (9)$$

Hence an interior solution θ_M^* is defined by the implicit equation $\nabla(\theta_M^*) \triangleq 0$. There may be multiple turning points of the expected welfare function; at any maximum, $\nabla'(\cdot) \leq 0$.

In the next proposition, we examine the comparative statics of an interior maximum.

Proposition 2 *Suppose that assumptions 1–5 hold. An interior maximum θ_M^* defined by $\nabla(\theta_M^*) \triangleq 0$ is:*

- *non-decreasing in the discount factor δ for all values $\delta \in [0,1]$;*
- *non-decreasing in the welfare weight λ for all values $\lambda \in [0,1]$;*
- *non-increasing in the consumer surplus difference $\Delta CS \equiv CS(2) - CS(1)$;*
- *if $\lambda = 0$, then it is non-decreasing in π_2;*
- *if $\lambda = 0$ and $\phi'(K) \leq 1 \ \forall \ K \in [0, \bar{K}]$, then it is non-increasing in π_E.*
- *Consider two distributions $\tilde{F}$ and F for θ with support $[\underline{\theta}, \bar{\theta}]$. If F first-order stochastically dominates $\tilde{F}$, then θ_M^* is weakly lower under distribution F than under distribution $\tilde{F}$.*

Proof. See Appendix B.

In order to understand these comparative statics, it is helpful to reconsider the basic story of the paper. It can be optimal to allow merger, despite the increase in market concentration that it causes, in order to encourage entry in the first period. In order for

this policy to be optimal, it must be possible to encourage entry, while not giving up too much surplus (either consumer surplus, from allowing a more concentrated market; or producer surplus, by encouraging entry).

Consider first the result involving the discount factor, δ. There are two effects to consider. The welfare loss from allowing merger occurs in the second period; when δ is higher, the first-period value of this loss is greater and so the optimal θ_M should be higher. Secondly, when δ is large, the present value of the additional profit from merger to the entrant in the second period is greater, and so the entrant should be more willing to enter. Moreover, the entry encouragement factor $\partial K_M / \partial \theta_M$ is larger. Hence the optimal θ_M should be lower. Hence the two effects point in opposite directions. The proposition shows the balance between the two: the loss from increased concentration outweighs the extra entry encouragement, so that θ_M^* increases with δ. (Note also that entry occurs when θ is relatively low; merger occurs when θ is relatively high. Hence the former event is less heavily weighted in the expected profit and surplus calculations. This reinforces the usual time discounting effect.)

One way to view this result is to interpret a low δ as a long time interval between E's entry and failure. When there is a long gap between entry and exit, this model suggests that merger policy should be set leniently. Since failure, exit and merger are distant prospects for the entrant, the policy-maker has to be lenient if it wants merger policy to have any entry encouragement effect. It is willing to do this, however, since the welfare cost of lenient policy is heavily discounted.

Proposition 2 also shows that the greater the weight attached by the policy-maker to profits, the less lenient is the optimal policy. Put differently, a consumerist policy-maker sets the most lenient policy. This result seems counter-intuitive at first. It arises because a consumerist policy-maker does not consider the reduction in profits caused by the entrants' fixed cost. Less surprising is the comparative static with respect to the consumer surplus difference ΔCS—the more duopoly benefits consumers, the more the policy-maker will encourage entry by setting a lenient policy.

The larger the additional profit from merger, the more the policy-maker is able to

encourage entry. This leads the policy-maker to set a more lenient policy, to increase the extent of entry in the first period. At first sight, this seems counter-intuitive: it may seem more reasonable that the policy-maker can set a high θ_M when merger profit is high, and still entry occurs with high probability. When the sufficient conditions ($\lambda = 0$ and $\phi'(K) \leq 1$) are satisfied, however, the entry encouragement effect outweighs the surplus loss from market power and the entrant's fixed cost. Note that the sufficient conditions are directly related to these two effects. $\phi' \leq 1$ ensures that the reverse hazard rate $1/\phi$ increases quickly with K, meaning that the additional mass of entrants that are encouraged to enter by the gain from merger, given by $\Delta\pi/\phi$, is large. $\lambda = 0$ limits the surplus loss (from reduced total profits) from the encouraged entry.

Finally, in duopolies that are more competitive (i.e., $\pi(2)$ is lower), the proposition establishes that if $\lambda = 0$, then the optimal merger point is lower. In a sense, this is the least surprising comparative static: the greatest need for entry encouragement arises when entry is relatively unattractive. The result can only be established, however, when $\lambda = 0$ i.e., when encouraging entry does not incur any surplus loss from a reduction in profits (either from moving from monopoly to a duopoly with low profits, or an increase in expected fixed costs).

The intuition for the final part of the proposition follows from three effects when F first-order stochastically dominates $\tilde{F}$. First, the entrant's expected payoff is higher under the distribution F, because the entrant's payoff function is a (discontinuous) convex function of θ, since $\pi_E > \pi(2)$. Consequently, the critical fixed cost K_M is higher under the distribution F. Assumption 3 then ensures that $\phi'(K_M)$ is greater. Consequently, the additional mass of entrants that are encouraged to enter, $\Delta\pi/\phi$, is smaller. Secondly, the distribution F places more mass on higher values of θ; in these states of the world, merger occurs and hence there is less second-period competition under F. Thirdly, since the critical fixed cost is higher under F, entry encouragement is more costly. All three effects reduce the benefit from lowering θ_M (i.e., setting a more lenient policy).

2.3 Summary

It can be optimal to allow merger, despite the increase in market concentration that it causes, in order to encourage entry in the first period. Secondly, in order for this policy to be optimal, it must be possible to encourage entry; in turn, this requires that the *ex post* profit from merger $\pi_E$is sufficiently large. Thirdly, the mass of entrants that can be encouraged to enter must be sufficiently large. Fourthly, the leniency of policy is greater in duopolies with less risk; when the period between entry and exit/merger is longer; where duopoly is more competitive or when the entrant receives more of the merger surplus (when the policy-maker cares only about consumer surplus). Policy is also more lenient when the policy-maker cares more about consumer surplus.

3 The Failing Firm Defence with Strategic Behaviour

The reluctance of policy-makers to use the failing firm defence is based on two fears: first, that they cannot accurately observe the true profits of firms; and secondly, that firms can use this fact and manipulate profits to pass the failing firm test. This has not been an issue in our analysis, so far, for two reasons. First, we have assumed that the policy-maker can observe θ perfectly and sets policy so as to allow merger iff $\theta \geq \theta_M$. Since the firms are not able to able to influence the level or observation of θ, there is no scope for strategic behaviour to influence the policy-maker. Secondly, we have taken a reduced-form approach to the mode of competition, so that strategic behaviour is not possible. In this section, we relax both assumptions and consider what effect strategic behaviour can have on policy. The full analysis of this situation is very complicated, however. We provide, therefore, only an outline of how the analysis would proceed, and discuss preliminary results.

Suppose that the policy-maker observes only the entrant's per-period profit; it does not observe underlying demand, costs, and prices or outputs. The policy-maker permits merger if and only if the entrant's profit is less than some critical value, π_M. Let the

per-period gross profit of the firms in a duopoly, and in the absence of any strategic behaviour toward merger policy, be $\pi(2)$. Let the per-period gross profit of a monopolist be $\pi(1) \geq 2\pi(2)$. Let the per-period profit received by the entrant when the firms have merged be $\pi_E - \theta K$. As before, the entrant knows its per-period fixed cost of operation before deciding whether to enter; but it does not observe θ until after its entry decision is taken.

In this situation, firms may distort their production decisions in the first period in order to ensure that the entrant's first-period profit hits the merger target level π_M. This possibility creates an interesting trade-off for the policy-maker. Consumer surplus is increased in the first-period by this strategic behaviour—the increase in output or cut in prices that is required to reduce the entrant's profit to π_M reduces the deadweight loss from market power. But consumer surplus in the second period is reduced by the merger that follows. This is analogous to the familiar trade-off from predatory behaviour that generates short-run benefits through increased competition, but the long-run costs through decreased competition.

Solving fully for equilibrium in this situation is difficult. In a technical appendix to this paper,[12] we detail the calculations required for a set of examples (including Cournot and differentiated-product Bertrand competition) with linear demand.[13] In this section, we consider only the case in which, if strategic behaviour occurs, it is the entrant who distorts its production decision. This is the easiest case to analyse; and numerical solution of examples suggests that it is the most relevant.[14] A number of possibilities arise for an entrant with fixed cost K, and for a merger policy profit level π_M. There are values $\theta_1(K, \pi_M), \theta_2(K, \pi_M)$ where $\theta_2(K, \pi_M) \leq \theta_1(K, \pi_M)$ such that

1. when $\theta \in [\theta_1(K, \pi_M), \bar{\theta}]$, the entrant's per-period profit is so low that merger is permitted without any distortion of first-period behaviour;

2. when $\theta \in (\theta_2(K, \pi_M), \theta_1(K, \pi_M))$, the entrant distorts its first-period behaviour to

[12] The technical appendix is available on request, and on the web at `http://www.soton.ac.uk/~ram2`.

[13] Even in these simple cases, fourth-order polynomials arise.

[14] Over a wide range of parameter values, equilibrium outcomes with the incumbent distorting its production decisions were not observed.

ensure that its first-period profit is no greater than π_M;

3. when $\theta \in [\underline{\theta}, \theta_2(K, \pi_M)]$, the entrant's per-period profit is so high that it is not profitable for the entrant to distort its first-period behaviour to achieve the profit level π_M.

There are five possibilities, depending on whether θ_1 and θ_2 fall in the interval $[\underline{\theta}, \bar{\theta}]$. For example, If $\theta_1(K, \pi_M) > \bar{\theta}$, then the entrant's (undistorted) per-period profit is greater than π_M for all values of θ. If $\theta_2(K, \pi_M) < \underline{\theta}$, then it is profitable for the entrant to distort its behaviour for all values of θ.

So, for intermediate values of θ ($\theta \in (\theta_2(K, \pi_M), \theta_1(K, \pi_M)) \cap [\underline{\theta}, \bar{\theta}]$), the entrant behaves strategically in the first period in order to be allowed to merge in the second period. $\theta_1(K, \pi_M)$ is given by

$$\theta_1(K, \pi_M) \equiv \frac{\pi(2) - \pi_M}{K}, \tag{10}$$

while $\theta_2(K, \pi_M)$ is given by

$$\theta_2(K, \pi_M) \triangleq \frac{\pi(2) - \pi_M}{K} - \delta \frac{\Delta\pi}{K} \leq \theta_1(K, \pi_M). \tag{11}$$

Both $\theta_1(K, \pi_M)$ and $\theta_2(K, \pi_M)$ are decreasing in π_M; $\theta_1(K, \pi_M)$ is decreasing in K.

In the remainder of the analysis, we deal with the case in which $\underline{\theta} \leq \theta_2(K, \pi_M) \leq \theta_1(K, \pi_M) \leq \bar{\theta}$. We shall not, therefore, derive entry decisions and expected welfare for all values of π_M. This would be necessary for a full analysis, since (as we showed in section 2.2) a key issue is whether it is socially optimal to use merger policy to encourage entry (that is, to set $\pi_M > 0$ in this case). Instead, we shall concentrate on values of π_M in which entry is encouraged and strategic behaviour occurs; and we analyse an interior solution of the expected welfare maximization problem. This is the main case of interest for this section; and concentrating on it shortens the discussion.

The entrant's expected profit is

$$\Pi_M(K, \pi_M) \equiv \int_{\underline{\theta}}^{\theta_2(K,\pi_M)} (1+\delta)(\pi(2) - \theta K) dF(\theta)$$
$$+ \int_{\theta_2(K,\pi_M)}^{\theta_1(K,\pi_M)} (\pi_M + \delta(\pi_E - \theta K))\, dF(\theta)$$
$$+ \int_{\theta_1(K,\pi_M)}^{\frac{\pi(2)}{K}} (\pi(2) - \theta K + \delta(\pi_E - \theta K))\, dF(\theta). \quad (12)$$

We are interested in the critical fixed cost $K_M(\pi_M)$, defined implicitly by $\Pi_M(K_M, \pi_M) \triangleq 0$; and in establishing that $\partial K_M(\pi_M)/\partial \pi_M > 0$, so that a more lenient merger policy (i.e., a higher value of π_M) can encourage entry. Total differentiation of the profit function in equation (12) yields

$$\frac{\partial K_M(\pi_M)}{\partial \pi_M} = \frac{F(\theta_1) - F(\theta_2)}{(1+\delta)\int_{\underline{\theta}}^{\frac{\pi(2)}{K_M}} \theta dF(\theta) - \int_{\theta_2}^{\theta_1} \theta dF(\theta) + \frac{\pi(2)}{K_M^2}\delta\Delta\pi f\left(\frac{\pi(2)}{K_M}\right)} > 0$$

where the inequality follows because both the numerator and denominator in this expression are positive.

To keep the account simple, we consider only the case of a consumerist policy-maker, who sets the weight λ on profit equal to zero. Let consumer surplus with a duopoly when there is no strategic distortion be $CS(2)$; and with a monopoly be $CS(1) < CS(2)$. Also, let consumer surplus with a duopoly which distorts production to achieve merger be $CS(\theta K + \pi_M)$. Note that this depends on the fixed cost θK and the profit level π_M, since these determine how much the entrant has to distort production for merger to be allowed. And it depends on the sum of these two terms (since the entrant's profit is additively separable in the fixed cost).

We assume that $CS(\theta K + \pi_M) > CS(2)$, so that the distortion (such as lowering price or increasing output) increases per-period consumer surplus. We also assume that $CS(\theta K + \pi_M)$ decreases in its argument—the higher the fixed cost and/or the higher the allowed profit level, the less the entrant needs to distort, and so the less the consumer gain from e.g., higher output or lower prices.

Let $\Delta CS \equiv CS(2) - CS(1)$ and $\Delta CS_D(\theta K + \pi_M) \equiv CS(\theta K + \pi_M) - CS(2)$. Expected welfare (consumer surplus) is then

$$\begin{aligned} W(\pi_M) \equiv & \int_{\underline{K}}^{K_M} \left((1+\delta)CS(2) - \delta(1 - F(\theta_2))\Delta CS - (F(\theta_1) - F(\theta_2))CS(2)\right) dG(K) \\ & + \int_{\underline{K}}^{K_M} \int_{\theta_2}^{\theta_1} \Delta CS(\theta K + \pi_M) dF(\theta) dG(K) + (1 - G(K_M))(1+\delta)CS(1). \end{aligned}$$

Differentiating with respect to π_M:

$$\begin{aligned} \frac{\partial W(\pi_M)}{\partial \pi_M} = & \ g(K_M)\frac{\partial K_M}{\partial \pi_M}(1 + \delta F(\theta_2))\Delta CS - \delta \Delta CS \int_{\underline{K}}^{K_M} \frac{f(\theta_2)}{K} dG(K) \\ & - g(K_M)\frac{\partial K_M}{\partial \pi_M} \int_{\theta_2}^{\theta_1} \Delta CS(\theta K_M + \pi_M) dF(\theta) \\ & + \int_{\underline{K}}^{K_M} \frac{1}{K} \Big(\Delta CS(\theta_2 K + \pi_M) f(\theta_2) - \Delta CS(\theta_1 K + \pi_M) f(\theta_1) \\ & \qquad + \int_{\theta_2}^{\theta_1} \frac{\partial \Delta CS(\theta K + \pi_M)}{\partial \theta} dF(\theta) \Big) dG(K). \end{aligned} \tag{13}$$

The first line of equation (13) is the counter-part to equation (8) (setting $\lambda = 0$ in the latter, and noting that the signs are reversed—more lenient policy corresponds to a *lower* θ_M in equation (8), but a *higher* π_M in equation (13)). So, equation (13) shows first the consumer welfare effect of entry encouragement, balancing the expected consumer surplus gain in the first period against the expected consumer surplus loss in the second. Secondly, it shows the consumer surplus loss in the second period from a more lenient policy, holding constant the probability of entry.

The additional lines in equation (13) shows the extra surplus effects that arise from strategic distortion. The first additional line shows that the possibility of distortion encourages entry. Since distortion increases consumer surplus in the first period, this term is negative, and so leads to a higher profit level π_M being optimal.

The second and third additional lines show the effect of strategic distortion on consumer surplus, holding fixed the amount of entry. $\Delta CS(\theta_2 K + \pi_M) f(\theta_2)/K$ measures the increase in consumer surplus that comes about because a higher π_M leads to more

distortion at low values of θ (i.e., for θ around θ_2). $\Delta CS(\theta_1 K + \pi_M) f(\theta_1)/K$ measures the decrease in consumer surplus that comes about because a higher π_M leads to less distortion at high values of θ (i.e., for θ around θ_1). Finally, the term $\int dF(\theta)\partial\Delta CS(\theta K + \pi_M)/\partial\theta$ shows how a change in the profit level π_M affects the behaviour of the entrant when it distorts. A higher profit level means that the entrant has to distort its production less to hit π_M, and so this last term is negative. The overall sign of these lines is ambiguous, depending on functional forms and the distribution of the state variable.

The effect of strategic distortion is complicated, therefore: there are a number of factors to take into account, and the direction of the overall effect is ambiguous, since the terms have different signs. In one case, however, we are able to establish an unambiguous result.

Proposition 3 *If the variable θ is distributed uniformly on an interval $[\underline{\theta}, \bar{\theta}]$, then the optimal merger policy (i.e., the choice of π_M that maximizes expected consumer surplus) is weakly more lenient (i.e., π_M is no lower) when the entrant is able to distort its first-period production to ensure merger.*

Proof. In equation (13), the terms in the third and fourth lines sum to zero, since $f(\theta_1) = f(\theta_2) = 1/(\bar{\theta} - \underline{\theta})$, and $\int_{\theta_2}^{\theta_1} dF(\theta)\partial\Delta CS(\theta K + \pi_M)/\partial\theta = \Delta CS(\theta_1 K + \pi_M) - \Delta CS(\theta_2 K + \pi_M)$. Hence there is only one non-zero additional term arising from strategic distortion—the second line of equation (13)—which is positive. $\square$

In the uniform distribution case, the only additional term that matters is the one relating to increased entry (i.e., the second line of equation (13)). The other terms net off gains in consumer surplus at some levels of θ with losses at others. When different values of θ have equal density, the gains and losses balance and therefore have no effect on the optimal choice of π_M.

4 Discussion

In this section, we discuss first alternative market structures, and the problem of excessive entry; and secondly, alternative policies to encourage entry. These issues affect either the

effectiveness or the desirability of using merger policy and the failing firm defence to encourage entry.

4.1 Market structure, excess entry and merger incentives

In previous sections, we have taken the actual and socially optimal market structures as given. The point that we make extends beyond the particular set-up, of a single incumbent and single potential entrant, that we adopt. We require two conditions for our argument: first, entry must be socially desirable; secondly, merger must increase the profits of the merging firms. Previous work has shown that these two conditions need not hold in general. Mankiw and Whinston (1986) demonstrate that there is a tendency for excessive entry in homogeneous good industries. Salant et al. (1983) show that the profit of a single, merged firm may be lower than the sum of the pre-merger profits of its constituent firms.

We cannot expect, then, lenient merger policy always to be socially desirable or effective in encouraging entry. From previous work, the 'worst case' for our story involves a Cournot oligopoly with homogeneous goods where there are no technological synergies from merger, and where a low weight is attached to producer surplus by the policy-maker. In this case, as we state above, free entry leads to excess entry (Mankiw and Whinston (1986)); and merger between any two firms is not profitable for the merging firms (Salant et al. (1983)). Moreover, any merger between a set of firms that is profitable must increase price and hence decrease consumer surplus (see Farrell and Shapiro (1990) for the case in which the number of firms is held fixed, and Spector (2003) when entry can occur after merger). With a low weight on producer surplus, welfare is therefore decreased by the merger.

On the other hand, the most favourable conditions for our story involve differentiated-good Bertrand competition, with a low weight attached to consumer surplus by the policy-maker. Mankiw and Whinston (1986) show that product variety can lead to insufficient entry in equilibrium, so that entry encouragement is socially desirable. Deneckere and Davidson (1985) and Perry and Porter (1985) show that merger between two firms is

profitable for these two firms; Werden and Froeb (1998) provide numerical analysis which suggests that this is true even when there can be further entry after merger. Any (profitable) merger increases price, and so decreases consumer surplus. With a relatively low weight attached to consumer surplus, however, welfare is increased by merger.

4.2 Alternative policies for encouraging entry

Is merger policy is the right tool for addressing the inefficiency of market power? Are there better, alternative policies?[15] One candidate is a subsidy for new entrants or a subsidy paid to firms during hard times. Although these policies might also be expected to stimulate entry, while avoiding the reduction in competition in some low demand states resulting from more lenient merger control, we argue that both carry disadvantages compared with the merger policy tool.

Any subsidy paid by the policy-maker requires public funds to be raised through taxation, creating distortions elsewhere in the economy. A direct entry subsidy paid to all entrants regardless of their financial strength or prevailing market conditions is poorly focused, entailing considerable waste. Moreover, an entry subsidy may encourage transitory entry by firms that do not intend, or have little prospect of, remaining active in the market, which generates little or no long-term benefit to consumers.

A subsidy paid to firms during a period of financial difficulties would be better targeted than an entry subsidy and, moreover, avoids creating an incentive for transitory entry. One difference between the policy tool we propose and a subsidy paid during hard times is that in the former case a natural lower bound emerges on the low demand states in which support is given to the failing firm, because the incumbent will not offer to merge with a firm that will exit anyway. In the case of a subsidy, the policy-maker would need to determine the lower threshold on the support that is offered in order to avoid paying a subsidy to a highly uneconomic firm far outweighing the benefit to consumers.

There are two reasons for preferring the merger policy tool as a means of setting this lower bound. First, a firm operating in the same industry is likely to be better informed

[15] We are grateful to a referee for encouraging us to discuss this point.

than the policy-maker about the viability of the failing firm and the state of the industry, and so is in a superior informational position to make this assessment. Secondly, a subsidy regime is susceptible to political pressures and lobbying which distort it from its original purpose. In particular, pressure may arise to increase the subsidy paid to uneconomic firms to satisfy regional or employment concerns. This may result in excessive subsidies which outweigh the benefits to consumers arising from the entry effect.

Finally, although this factor is omitted from our model, merger allows rationalization e.g., of unused capacity which tend to be beneficial for an industry in decline. A subsidy to keep a failing firm afloat prevents this rationalization from taking place, which may prolong rather than mitigate the problems in the industry.

5 Conclusions

We have argued that assessment of the failing firm defence in merger cases should take into account the effect of the policy rule on the incentives for entry (and *ex ante* investment decisions in general). A more lenient policy—which could be characterised as permitting the defence to be used by 'flailing' as well as imminently failing firms—may yield social benefits through its beneficial impact on entry, resulting in more effective competition in the long run. This paper provides a framework for determining the optimal degree of leniency, which balances the losses from increasing concentration after merger with the gains from hastening entry and competition.

This view challenges several of the conclusions that have been reached by policymakers. In particular, three assumptions underlying policy and/or practice in this area are questioned. The first is that a consumerist social planner (e.g., a competition authority) should be the most strict in implementing merger control. By contrast, in this model it is the consumerist authority that adopts the most lenient merger rule.

Secondly, the share of the merger surplus granted to the failing firm is important, but in a way that differs from the view adopted by competition authorities in certain cases. In the Detroit newspaper JOA, the (equal) share given to the 'failing firm' cast doubt on

the relevance of the failing firm defence to this case. By contrast, this paper argues that the beneficial effect of a more permissive merger policy on entry is reduced if the share given to the failing firm is small. If the failing firm defence is less likely to be accepted in cases where the share given to the failing firm is reasonably significant, the wider benefits of the policy will not be realised.

Thirdly, a failing firm that has greater bargaining power, perhaps because it is a division of a large corporate group, gains a greater share of the surplus from merger and its entry decision will be more sensitive to the merger rule. Thus, the outcome of the *ICI-Kemira Oy* case, in which a failing division was judged more harshly than may have been the case for a stand-alone firm in a similar financial position, also threatens to undermine the benefit of the policy. The failing firm defence can generate greater welfare gains in cases where the target gains a substantial share of the surplus than in those where the failing firm has little bargaining power.

Appendix

A Proof of proposition 1

When $\lambda = 0$,

$$\begin{aligned}\Delta W(\theta_M) = {} & (G(K_M(\theta_M)) - G(K_2))(1 + \delta F(\theta_M))\Delta SS \\ & - \left(\int_{\underline{K}}^{K_2} \left(F(\frac{\pi(2)}{K}) - F(\theta_M) \right) dG(K) \right) \delta \Delta SS.\end{aligned}$$

Hence $\Delta W(\theta_M) \geq 0$ iff

$$(G(K_M(\theta_M)) - G(K_2))(1 + \delta F(\theta_M)) - \delta \left(\int_{\underline{K}}^{K_2} \left(F(\frac{\pi(2)}{K}) - F(\theta_M) \right) dG(K) \right) \geq 0 \tag{A.14}$$

since $\Delta SS > 0$ (assumption 1).

If $\pi_E = \pi(2)$, then $K_M(\theta_M) = K_2$, and hence $\Delta W(\theta_M) < 0$. The left-hand side of the

inequality in equation (A.14) is increasing in π_E (since $K_M(\theta_M)$ is increasing in π_E). A sufficient condition for $\Delta W(\theta_M) \geq 0$ is that

$$(1 + \delta F(\theta_M))G(K_M(\theta_M)) \geq (1 + \delta)G(K_2). \tag{A.15}$$

For $\epsilon > 0$ sufficiently small, $1+\delta F(\hat{\theta}-\epsilon) \approx 1+\delta F(\hat{\theta})-\epsilon\delta f(\hat{\theta})$. For any $\eta > 0$, there exists a $\hat{\pi}_E > 0$ such that for all $\pi_E \geq \hat{\pi}_E$, $K_M(\theta_M) \geq K_E - \eta$. Hence for π_E sufficiently large, $G(K_M) \approx G(K_E) - \eta g(K_E)$. Therefore for sufficiently large π_E, for a given $\theta_M = \hat{\theta} - \epsilon$,

$$(1 + \delta F(\theta_M))G(K_M(\theta_M)) \approx (1 + \delta F(\hat{\theta}) - \epsilon\delta f(\hat{\theta}))(G(K_E) - \eta g(K_E)).$$

Assumption 4 ensures that for ϵ and η sufficiently small, the inequality in equation (A.15) is satisfied. The first part of the proposition therefore follows.

The second part of the assumption is immediate from equation (A.14).

B Proof of proposition 2

In this proof, we concentrate on establishing the comparative static of θ_M^* with respect to δ. The other comparative statics follow from equivalent arguments. First note that in a neighbourhood of the interior optimum, $\nabla(\theta_M)$ is decreasing in θ_M. Hence the comparative static that $\partial\theta_M^*/\partial\delta \geq 0$ is equivalent to showing that $\partial\nabla(\theta_M)/\partial\delta \geq 0$. By differentiation,

$$\begin{aligned}
\frac{\partial\nabla(\theta_M)}{\partial\delta} = \phi'(K_M)\frac{\partial K_M}{\partial\delta} - \frac{1}{\delta^2 f(\theta_M)}\frac{\partial K_M}{\partial\theta_M} - \left(\frac{1+\delta F(\theta_M)}{\delta f(\theta_M)}\right)\frac{\partial}{\partial\delta}\left(\frac{\partial K_M}{\partial\theta_M}\right) \\
- \frac{\lambda}{\Delta SS}K_M\frac{\partial K_M}{\partial\theta_M}\frac{\partial}{\partial\delta}\left(\frac{1+\delta\gamma\left(\frac{\pi(2)}{K_M}\right)}{\delta f(\theta_M)}\right) \\
- \frac{\lambda}{\Delta SS}\frac{\partial K_M}{\partial\theta_M}\left(\frac{1+\delta\gamma\left(\frac{\pi(2)}{K_M}\right)}{\delta f(\theta_M)}\right)\left(\frac{\partial K_M}{\partial\delta}\frac{\partial K_M}{\partial\theta_M} + K_M\frac{\partial^2 K_M}{\partial\delta\partial\theta_M}\right).
\end{aligned}$$

Clearly, $\partial K_M/\partial\delta > 0$. Assumption 3 therefore ensures that the first term is positive. Since

$$\frac{\partial}{\partial\delta}\left(\frac{1+\delta\gamma(\frac{\pi(2)}{K_M})}{\delta f(\theta_M)}\right) = -\frac{1}{\delta^2 f(\theta_M)} - \frac{\pi(2)^2}{K_M^3} < 0,$$

the fourth term (on the second line of the expression) is also positive. By total differentiation,

$$\frac{\partial^2 K_M}{\partial\delta\partial\theta_M} = -\frac{\Delta\pi f(\theta_M)}{(\Pi_K)^2}\left(1+\delta\frac{\Pi_\delta\Pi_{KK}}{\Pi_K}\right)$$

where Π_δ and Π_K are the first-order partial derivatives of the expected profit function Π_M with respect to δ and K, and Π_{KK} is the second-order partial derivative with respect to K. (Recall from equation (3) that

$$\Pi_M(K,\theta_M) \equiv \pi(2) - K + \delta\left(\int_{\underline{\theta}}^{\theta_M}(\pi(2)-\theta K)dF(\theta) + \int_{\theta_M}^{\frac{\pi(2)}{K}}(\pi_E - \theta K)dF(\theta)\right).)$$

It is immediate that $\Pi_K < 0$ and $\Pi_\delta > 0$. Assumption 5 ensures that $\Pi_{KK} \geq 0$, since

$$\Pi_{KK} = \delta\left(\frac{\pi(2)\pi_E}{K_M^3}f(\frac{\pi(2)}{K_M}) + \frac{\pi(2)^2\Delta\pi}{K_M^4}f'(\frac{\pi(2)}{K_M})\right)$$

and the first part of the assumption bounds the curvature of the density $f(\cdot)$. Hence the fifth term (on the third line of the expression) is positive.

Hence it only remains to show that the second and third terms in the expression together are positive, in order to establish that $\partial\nabla(\theta_M)/\partial\delta \geq 0$. Substituting in for the partial derivatives, using total differentiation of the expected profit function Π_M, gives the sum of these two terms as

$$\begin{aligned}-\frac{\Delta\pi}{\delta\Pi_K} - \left(\frac{1+\delta F(\theta_M)}{\Pi_K}\right)\frac{\Delta\pi}{\delta\Pi_K}\left(1+\delta\frac{\Pi_\delta\Pi_{KK}}{\Pi_K}\right)& \\ = -\frac{\Delta\pi}{\delta\Pi_K}\left(\frac{\Pi_K+1+\delta F(\theta_M)}{\Pi_K}\right) &- (1+\delta F(\theta_M))\Delta\pi\frac{\Pi_\delta\Pi_{KK}}{\Pi_K^3}.\end{aligned}$$

But

$$\frac{\Pi_K+1+\delta F(\theta_M)}{\Pi_K} = -\frac{\delta}{\Pi_K}\left(\gamma(\frac{\pi(2)}{K_M}) + \frac{\pi(2)\Delta\pi}{K_M^2}f(\frac{\pi(2)}{K_M}) - F(\theta_M)\right).$$

We now argue that

$$\gamma\big(\frac{\pi(2)}{K_M}\big) + \frac{\pi(2)\Delta\pi}{K_M^2} f\big(\frac{\pi(2)}{K_M}\big) - F(\theta_M) \geq 0.$$

In fact, we shall show that

$$\gamma\big(\frac{\pi(2)}{K_M}\big) \geq F(\theta_M).$$

From the definition of K_M,

$$\gamma\big(\frac{\pi(2)}{K_M}\big) = \frac{1}{\delta}\frac{\pi(2)}{K_M} + \frac{\pi(2)}{K_M}F(\theta_M) - \frac{\pi_E}{\pi(2)}\frac{\pi(2)}{K_M}F(\theta_M) + \frac{\pi_E}{\pi(2)}F\big(\frac{\pi(2)}{K_M}\big).$$

By construction, $\pi(2)/K_M \geq \theta_M$; hence

$$\begin{aligned} \gamma\big(\frac{\pi(2)}{K_M}\big) &\geq \frac{\theta_M}{\delta} + \frac{\pi(2)}{K_M}F(\theta_M) - \frac{\pi_E}{\pi(2)}\frac{\pi(2)}{K_M}F(\theta_M) + \frac{\pi_E}{\pi(2)}F(\theta_M) \\ &= \frac{\theta_M}{\delta} + F(\theta_M)\left(\frac{\pi(2)}{K_M} + \frac{\pi_E}{\pi(2)}\left(1 - \frac{\pi(2)}{K_M}\right)\right). \end{aligned}$$

Hence to show that $\gamma\big(\frac{\pi(2)}{K_M}\big) \geq F(\theta_M)$, it is sufficient to show that

$$\frac{\pi(2)}{K_M} + \frac{\pi_E}{\pi(2)}\left(1 - \frac{\pi(2)}{K_M}\right) \geq 1.$$

Let $x_M \equiv \pi(2)/K_M$, The task is to show that $x_M + (\pi_E/\pi(2))(1 - x_M) \geq 1$. From the definition of K_M, $0 \leq x_M \leq 1$. When $x_M = 1$, $x_M + (\pi_E/\pi(2))(1 - x_M) = 1$. $x_M + (\pi_E/\pi(2))(1 - x_M)$ is decreasing in x_M, since $\pi_E \geq \pi(2)$. Therefore $x_M + (\pi_E/\pi(2))(1 - x_M) \geq 1$ for all $0 \leq x_M \leq 1$.

Hence the sum of the second and third terms is positive. Therefore all terms in the expression for $\partial\nabla(\theta_M)/\partial\delta$ are positive. The comparative static with respect to δ follows.

References

Bebchuk, L. A., "Ex Ante Costs of Violating Absolute Priority in Bankruptcy," *Journal of Finance*, 2002, *57* (1), 445–460.

Deneckere, Raymond and Carl Davidson, "Incentives to Form Coalitions with Bertrand Competition," *RAND Journal of Economics*, 1985, *16*, 473–486.

Fan, W. and M. J. White, "Personal Bankruptcy and the Level of Entrepreneurial Activity," Working Paper 9340, NBER November 2002.

Farrell, Joseph and Carl Shapiro, "Horizontal Mergers: An Equilibrium Analysis," *American Economic Review*, 1990, *80* (1), 107–126.

Green, R. C., "Investment Incentives, Debt and Warrants," *Journal of Financial Economics*, 1984, *13*, 115–136.

Hart, O., *Firms, Contracts and Financial Structure* Clarendon Lectures in Economics, Oxford: Oxford University Press, 1995.

Jacquemin, A. and M. E. Slade, "Cartels, Collusion and Horizontal Merger," in R. Schmalensee and R. Willig, eds., *Handbook of Industrial Organization*, Vol. 1 Amsterdam: North-Holland 1989.

Jensen, M. C. and W. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics*, 1976, *3*, 305–360.

Kwoka, J. E. and L. J. White (eds)., *The Antitrust Revolution*, 3rd ed., Oxford University Press, 1999.

Mankiw, N. Gregory and Michael D. Whinston, "Free Entry and Social Inefficiency," *RAND Journal of Economics*, 1986, *17(1)*, 48–58.

Mooradian, R. M., "The Effect of Bankruptcy Protection on Investment," *Journal of Finance*, September 1994, *49* (4), 1403–1430.

Perry, Martin and Robert Porter, "Oligopoly and the Incentive for Horizontal Merger," *American Economic Review*, 1985, *75* (1), 219–227.

Persson, L., "The Failing Firm Defense," 2001. Mimeo.

Salant, Stephen W., Sheldon Switzer, and Robert J. Reynolds, "Losses from Horizontal Merger: The Effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium," *Quarterly Journal of Economics*, 1983, *98(2)*, 185–199.

Spector, David, "Horizontal Mergers, Entry, and Efficiency Defences," *International Journal of Industrial Organization*, 2003, *21* (10), 1591–1600.

Tirole, J., *The Theory of Industrial Organization*, Cambridge: MIT Press, 1988.

Werden, Gregory J. and Luke M. Froeb, "The Entry-Inducing Effects of Horizontal Mergers: An Exploratory Analysis," *Journal of Industrial Economics*, 1998, *46* (4), 525–43.