# Merger Policy, Entry, and Entrepreneurship*

Robin Mason
University of Exeter and CEPR

Helen Weeds
University of Essex and CEPR

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**Abstract**

We assess the impact of merger policy on entry and entrepreneurship. When faced with uncertainty about its prospects, and foreseeing that it may wish to leave the market should profitability prove poor, a rational entrant considers possible exit routes. Horizontal merger reduces competition post-merger which, all else being equal, lowers welfare; but merger also provides a valuable exit route. By facilitating exit and thus raising the value of entry, more lenient merger policy may stimulate entry sufficiently that welfare is increased overall. We

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calculate the optimal merger policy in the form of a low, but positive, profitability threshold below which merger is permitted despite the adverse impact on post-merger competition. This may be viewed as an extension of the "failing firm defence" to include ailing, low profitability firms as well as imminently failing ones. Merger policy is compared with an entry subsidy, and the implications of strategic firm behaviour for the choice of merger policy are also examined.

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# 1 Introduction

Competition effects are central to merger policy in most major jurisdictions. In the U.S. and the U.K., a merger that results in a "substantial lessening of competition" (SLC) is liable to be prohibited. The merger test in the European Union—whether the transaction constitutes a "significant impediment to effective competition" (SIEC)—has a similar interpretation. Competition effects are typically assessed in a narrow and relatively static manner, taking account of the immediate and likely future impact in the market(s) in which the merging parties operate. The wider dynamic effects of merger policy on competition are typically ignored.

This paper argues that merger policy can have an impact on *ex ante* decisions, such as market entry or expansion, which affect competition in the long run. *Ex post*, horizontal merger creates a more concentrated market structure, reducing consumer surplus and incurring deadweight loss. But the possibility of future merger raises the expected value of entry. This increases firms' willingness to enter or expand, which has a beneficial effect on competition. Taking this dynamic effect into account, the optimal merger policy balances the welfare loss from concentration *ex post* with the welfare gain from entry *ex ante*.

On this dynamic view, optimal merger policy would clear some mergers

that currently would be found to cause an SLC (or SIEC) and hence be prohibited. In our model the treatment of such cases is more lenient than existing practice, with merger being permitted at a time when profits are low but nonetheless positive. This could be interpreted as an extension of the "failing firm defence" (FFD)—which permits an anti-competitive merger when one party is about to exit the market—to include ailing,[1] as well as imminently failing, firms.[2] But whereas the FFD is interpreted strictly, requiring the target to be on the verge of bankruptcy, the optimal policy in our model takes the form of a low, but positive, profitability threshold below which a merger is to be permitted, despite its negative impact on post-merger competition.

We identify four effects at play when setting merger policy. With the *entry encouragement effect*, more lenient merger policy stimulates entry, increasing competition and expected social surplus in the short-run, and in the long-

[1]In the analysis that we present, 'ailing' is not well-defined. We mean by the term a firm that has positive, but low profitability.

[2]The failing firm defence (FFD) is recognised in many jurisdictions, but the conditions governing its application are strict and it has been successfully used in just a handful of cases, in which firms face the prospect of imminent bankruptcy.

In the U.S., the FFD is explicitly included in the Department of Justice (DoJ) and Federal Trade Commission (FTC) 1992 Horizontal Merger Guidelines. Historically, three cases were important in its establishment and development: *International Shoe*'s acquisition of a financially troubled competitor in 1930; *Citizen Publishing Co.* in 1969, when the Supreme Court rejected a merger with a distressed newspaper company and set out stringent conditions under which the defence would be accepted; and *General Dynamics* in 1974, in which the Supreme Court concluded that the acquisition of a declining coal mining company was acceptable even though it produced a company with a large market share in a concentrated industry.

In the European Union, the formal basis for the FFD is less explicit; yet the Commission's case law has developed the concept of a rescue merger. The merger of *Kali und Salz* and *Mitteldeutsche Kali* in 1993 established the principle of the failing firm defence (Case No. IV/M.308, 1994). The principle was reinforced in 2001 when *BASF* was permitted to acquire its chemical industry competitors *Eurodiol* and *Pantochim*, which were both in receivership.

In the U.K., the Office of Fair Trading (OFT) published a restatement of its approach to failing firms in merger reviews in December 2008. In 2009 the OFT cleared the acquisition of 15 Zavvi stores by rival HMV under failing firm analysis.

run when merger does not occur. The *competition effect* reflects the loss of competition when merger takes place, reducing social surplus in the long-run. The *synergies effect* captures the possibility that this loss of competition may be mitigated by merger-specific benefits (e.g. technological synergies), raising welfare compared with the pre-entry situation. Finally, greater entry entails higher expected sunk costs, reducing social welfare; this is the *sunk cost effect*. In order for it to be optimal to use merger policy to encourage entry, the entry encouragement effect must outweigh the loss of competition, net of synergies, and sunk cost effects. We provide sufficient conditions for this to be the case, first when firms cannot manipulate profits to hit the policy threshold; and later, when an asymmetry of information between firms and the policy-maker allows "gaming" of the rule. We show that the possibility of strategic behaviour does not negate the role of merger policy in encouraging entry; indeed, in some circumstances it strengthens the case.

Three general conditions are necessary for our policy recommendation to hold. First, entry must be socially desirable, in that the short-run benefits from competition outweigh the social cost of additional fixed costs. Secondly, merger must increase the profits of the merging firms (in particular that of the entrant), so that the possibility of future merger attracts additional entry. Thirdly, there must be (at least) a short-run increase in competition due to entry. If any of these conditions fail, then merger policy should not be used in the way that we describe. The "worst case" for our story is a relatively unconcentrated Cournot oligopoly with homogeneous goods and no merger synergies; in this sort of industry, merger policy may be ineffective in encouraging entry, and excess entry could be a concern. Conversely, the most favourable conditions for our story involve differentiated goods Bertrand competition: here, merger policy to encourage entry can be both desirable and effective. Moreover our focus on merger to monopoly, the situation in which the failing firm defence is typically employed, further supports this hypothesis.

As well as suggesting a more lenient approach to merger control than the current FFD, our analysis questions current policy in more subtle ways. Assuming that the entrant is the acquired party, allowing the target to gain a larger share from merger encourages entry. Similarly, a target with a stronger bargaining position, perhaps due to the strength of a parent company, should be treated more, not less, leniently. Finally, more lenient merger policy incurs greater sunk entry costs; disregarding this, a consumerist policy-maker sets a more lenient merger policy to encourage early entry, whereas a policy-maker who considers industry profits sets policy more strictly.

Although our main focus is on the interaction between merger policy and the entry decision, note that similar considerations apply to any *ex ante* decision made by a firm. For example, the decision to build additional capacity, extend an existing product line, initiate a research and development project or undertake an advertising campaign could be analysed in a similar fashion. Like market entry, such decisions also enhance competition or generate surplus in other ways, benefiting consumers. What matters for dynamic analysis is that the decision involves a sunk cost or is costly to reverse, and that the returns are uncertain and are 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 business activities.

At an abstract level our argument is familiar: less *ex post* competition tends to bring about more *ex ante* investment, and optimal policy balances these two factors, also taking into account duplication of fixed costs. Patent systems reflect this balance, allowing a temporary monopoly in order to stimulate competition and innovation.[3] Also, again at an abstract level, merger policy in our model works like an entry subsidy. There are, however, some key differences. First, an entry subsidy would not entail the loss of competition and social welfare in the long-run when merger occurs; but instead it

[3]There is a long literature on the relationship between innovation and product market competition; see, e.g., Vives (2008).

incurs a social cost of funding and may have other drawbacks. We consider this further in section 3. Secondly, firms may respond strategically to merger policy in a way that does not arise with an entry subsidy; we explore this issue in section 4.

The idea that *ex ante* (entry) decisions are affected by *ex post* (exit) conditions is familiar from the real options literature; see, in particular, Dixit (1989). Noting that merger is an exit route, we extend this literature by incorporating explicitly the role of the policy-maker and optimal policy design. To our knowledge, we are the first to do this.

The literature on (horizontal) mergers generally is very large (see e.g., Jacquemin and Slade (1989) and Motta (2004) for surveys). Until quite recently the focus has been on static models, in which firms take only short-term considerations into account and merger occurs exogenously: see Salant, Switzer, and Reynolds (1983), Deneckere and Davidson (1985), Perry and Porter (1985), Farrell and Shapiro (1990), Kamien and Zang (1990) and McAfee and Williams (1992), amongst others. This literature focuses on two main questions: first, the private incentive for merger (i.e., whether or not it is profitable for the merging parties), and secondly, the welfare effect of merger in terms of its immediate impact on market conditions *after* merger takes place. Merger policy then balances the deadweight loss from increased market power against cost (and price) reduction from increased efficiency. By contrast, in this paper, we assess merger policy in view of actions taken *before* a merger is permitted. We therefore have an explicitly dynamic view of merger, arguing that the optimal merger policy should balance incentives for entry before merger against the deadweight loss after merger.[4]

Other, mostly more recent, papers look at merger in the context of dynamic oligopoly models. Pesendorfer (2005) assesses merger incentives

[4]A similar trade-off appears in Auriol and Laffont (1992). In that paper, the authors consider conditions under which it is socially efficient to have a duopoly market structure. In their model, the duplication of fixed costs in a duopoly can be justified by a number of competitive effects.

and welfare implications when both entry and further mergers may occur. Gowrisankaran (1999) uses the Ericson and Pakes (1995) framework to solve numerically for equilibrium merger, entry, exit, investment and production decisions.[5] He finds that the prospect of merger stimulates entry: with his parameters, the entry rate rises five-fold (from 0.3 to 1.6) when mergers are permitted. The mechanism is similar to ours: allowing merger provides another option to the potential entrant if it enters, and thus increases the value of entry. In Rasmusen (1988), an entrant incurs a sunk cost to enter an industry, knowing that the post-entry price will be below its average cost, but does so in the rational anticipation that the incumbent will buy it out. The same can happen in our model, but in addition we introduce the design of merger policy: determining when the incumbent should be allowed to merge with the entrant.

A number of papers consider the design of merger policy in a dynamic setting. Marino and Zabojnik (2005) look at the impact of post-merger entry on merger policy. Nocke and Whinston (2010) analyse merger policy when merger proposals are endogenous and subsequent mergers may also occur. These papers, however, consider only actions that may be taken post-merger. A few papers assess merger policy (and other antitrust measures) in the light of *ex ante* behaviour. Segal and Whinston (2007) study the effects of various antitrust policies (but not merger) on innovation using a reduced form approach, whereby the policy alters the profit flows of a competing incumbent and entrant, and also those of an uncontested incumbent. Since successful entrants then become incumbents, both changes influence the incentive to innovate. Norback and Persson (2012) model an innovator's choice between market entry and acquisition by an incumbent, assessing how this decision is affected by product market competition and by merger policy. They find that somewhat stricter merger policy increases the incentive to innovate for sale, by ensuring bidding competition for the innovation. Other papers consider

[5]See also Doraszelski and Pakes (2007).

predation in a context where merger may occur; see e.g., Saloner (1987) and Persson (2004). Saloner (1987) shows that the incentive for predation increases if the prey can then be acquired, a problem that might be worsened by the failing firm defence. Persson (2004) considers this question in an oligopoly setting, finding that the incentive for predation is then limited by bidding competition for the prey; he also assesses the failing firm defence in this context. Ottaviani and Wickelgren (2009) consider the impact of merger policy on the merger decision itself; however, their paper considers the optimal timing of intervention—essentially, whether or not to wait for further information—rather than the design of the merger rule.

One interpretation of our proposed policy is a version of the "failing firm defence" (FFD). A few papers analyse conditions under which failing firm mergers might be permitted. In addition to the papers noted above, in which the FFD is assessed in a model of predation and merger, Persson (2005) 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. The focus of this work is thus quite different from ours.

Turning now to the empirical literature: there is little direct empirical evidence concerning the relationship between merger control and entry. However, there is anecdotal evidence that prospective exit routes, including acquisition by a buyer within the same industry, are an important consideration for some investors and for the entrepreneurs they support. Venture capitalists (VCs) typically seek to cash in a project within three to five years; since most of these investments initially do not earn positive cash flows, exit is the primary way for a VC to realise a positive return. The identification of exit possibilities is an important part of the due diligence process that VCs conduct before they decide to enter. Schwienbacher (2010) surveys the literature on VC exits and provides empirical analysis of VC exits in Europe and the U.S. Data on exit routes in Europe show that divestment by trade sale

or "acquisition exit" to an existing firm, often one that operates in the same industrial sector as the target firm, was a more common exit route than initial public offering (IPO) throughout the period 1998-2005.[6] Schwienbacher (2010) also reports that for the U.S., the ratio of trade sales to IPOs is 1.3-1.6 on average (measured in number of exits). These data support the hypothesis that acquisition by an industry player is a potentially significant exit route, which may be taken into account by entrepreneurs and their financial backers.

Bankruptcy is also an exit route, specifically for firms experiencing financial distress. There is an established theoretical literature on the effect of bankruptcy procedures on *ex ante* decisions by firms and shareholders.[7] This theoretical literature is supported by growing empirical evidence of the importance of the relationship between bankruptcy procedures and *ex ante* decisions. Fan and White (2003) examine whether individuals are more likely to become entrepreneurs if they live in states in the U.S. with higher personal bankruptcy exemptions.[8] They find that households are more likely to own and start businesses if they live in states with higher bankruptcy exemption levels.[9] Armour and Cumming (2008) examine the relationship

[6]According to the European Venture Capital Association (EVCA) 2004 annual survey of pan-European private equity and venture capital activity, trade sales represented almost 24% of all divestments in that year, while public offerings (IPOs and sales of quoted equity) made up less than 12% of the total (other exit routes include sale to another VC or a financial institution, management buyout, and liquidation).

[7]Jensen and Meckling (1976) and Green (1984) argue that bankruptcy procedures can induce inefficient management decisions concerning investment, distribution of dividends and financing. Mooradian (1994) analyses the effect of bankruptcy protection on the *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. Many papers on bankruptcy procedures concentrate on *ex post* efficient division of bankruptcy value; see e.g., Hart (1995).

[8]Entrepreneurs filing for personal bankruptcy under Chapter 7 must give up all of their assets in excess of an exemption level in order to discharge their debts. Because exemption levels are set by the states they vary widely, while other elements of bankruptcy law are uniform across the U.S.

[9]Note that a higher level exemption may adversely affect the supply of funds to entrepreneurs, because financiers become less willing to lend. Nonetheless, the empirical

between bankruptcy and entrepreneurship for 15 countries in Europe and North America. They find the severity of personal bankruptcy laws (as measured by the time to discharge of pre-bankruptcy debts) to be a more statistically and economically significant determinant of self employment rates than GDP growth, stock market performance, and a number of other legal and economic factors.

These empirical findings accord 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. As part of its programme for enterprise and entrepreneurship, the European Commission highlights national bankruptcy laws as a factor which may facilitate entrepreneurial activity. The U.K. has reformed its bankruptcy regime to take account of the impact on entrepreneurial incentives: the Enterprise Act 2002 reduces the time to discharge 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.[10] However, reform of U.K. merger control—as part of the same Act—embodies no similar principle.

In summary: the extensive theoretical analysis and empirical evidence of the relationship between bankruptcy and *ex ante* decisions lends weight to the likely relevance of our argument that merger policy affects entry and entrepreneurship.

The rest of the paper is structured as follows. In section 2, we present a two-period, reduced-form model illustrating the trade-off between encourag-

evidence suggests that the demand effect dominates.

[10]The Department of Trade and Industry (DTI) White Paper, "Insolvency—A Second Chance" (2001), states, "[W]e have to recognise that in a dynamic market economy some risk taking will inevitably end in failure. Fear of failure can act as a powerful disincentive to potential entrepreneurs.... [T]he Government intends to legislate for a major package of reforms to personal bankruptcy, to modernise the framework and to encourage entrepreneurship and responsible risk taking."

ing entry and lower post-merger competition. Section 2.1 provides an explicit determination of equilibrium entry and merger decisions, and determines analytically the conditions under which it is socially optimal to relax merger policy to stimulate entry. Section 3 examines whether an alternative instrument might not be better for encouraging entry, formalising the comparison with an entry subsidy. In section 4 we consider the possibility of strategic behaviour by the firms to manipulate profit and satisfy the merger rule, and assess its impact on the policy-maker's choice. Section 5 concludes, with a discussion of market conditions affecting the feasibility and desirability of promoting entry, and the role and nature of uncertainty. An appendix contains longer proofs.

# 2 A Reduced-form Model

There are three players: an incumbent, an entrant, and the policy-maker. The incumbent operates in a market for two periods. At the start of period 1, the entrant chooses whether to enter or not. Following entry, the entrant competes with the incumbent in period 1 and, unless merger takes place, in period 2. The policy-maker sets policy at the outset (i.e., before the entrant chooses whether to enter and before any information is revealed) and cannot change this policy once it is set. (We therefore abstract away from commitment issues on the part of the policy-maker.) The policy that we consider concerns merger: the entrant may be permitted to merge with the incumbent in period 2, after information about profitability is received, if this profitability is sufficiently low.

We study a two-to-one merger for the following reasons. First, it allows us to focus on our central question, the impact of merger on entry behaviour, without needing to address issues considered elsewhere in the merger literature, such as who merges with whom or the impact of a merger on outside firms. Secondly, the failing firm defence (FFD), to which our policy rec-

ommendations relate, is typically employed in cases of merger to monopoly, where the merger would otherwise be regarded as highly anti-competitive.[11]

If it chooses to enter, the entrant incurs a sunk entry cost, $k$. This is distributed on $[0, K]$ according to the continuous and twice-differentiable distribution function $F(\cdot)$, with strictly positive density $f(\cdot)$; we denote the Mills' ratio $F(\cdot)/f(\cdot)$ by $\phi(\cdot)$. We shall assume that $\phi'(\cdot) \geq 0$; this condition is satisfied by a large number of distributions used in applications, e.g. uniform, exponential; although not e.g., the Pareto distribution. The entry cost is known to the entrant before it takes its entry decision, but is unobserved by the policy-maker at any stage. The entrant's per-period operating profit $\pi$ is a random variable (perhaps due to uncertainty over its operating costs or productive capacity) realised in the first period, after the entry decision is taken and the entry cost incurred. Moreover, the per-period profit is observed by the policy-maker only at the end of period 1. The common prior is that the per-period profit $\pi$ is distributed on the interval $[0, 1]$, according to the continuous and twice-differentiable distribution function $G(\cdot)$, with strictly positive density $g(\cdot)$.[12] The expectation of the profit is denoted $\bar{\pi} \equiv \int_0^1 \pi dG(\pi)$.

Per-period monopoly profit in the absence of entry, and the corresponding consumer surplus, are taken as the benchmark levels relative to which other outcomes are measured (i.e. no-entry monopoly outcomes are normalised to zero). If entry occurs, the incumbent's per-period profit relative to this benchmark is $-(\pi + \Pi_1) < 0$ while the corresponding consumer surplus is $C_D > 0$. For any realisation of $\pi$ it is assumed that the impact on joint profit

[11] One of the criteria for merger clearance under the FFD—that there exists no other realistic purchaser whose acquisition of the target would produce a better outcome for competition (regardless of the purchase price)—makes it more likely that an FFD case involves a single potential bidder and that merger is to monopoly.

[12] The restriction that the profit is non-negative is made for convenience: otherwise, the situation might arise in which the entrant's operating profit is strictly negative and exit is desirable. This consideration can be incorporated into the model, at the cost of greater complexity. The fundamental insights of the model are unaffected by the restriction.

$-\Pi_1 < 0$ (in accordance with the standard "efficiency effect"; see Tirole (1988)), but that $C_D - \Pi_1 > 0$. If merger then occurs, the merged entity's profit in period 2 is $\Pi_2 \geq 0$ and the corresponding consumer surplus is $C_2 \in [0, C_D)$, again measured relative to the no-entry monopoly benchmark. These values allow for the possibility of merger synergies, arising from physical or intellectual capital created by the entrant, which may render the post-merger situation superior to the pre-entry status quo; nonetheless, merger reduces consumer surplus compared with duopoly. The firms' incremental profit from merger, $\Pi_1 + \Pi_2$, is denoted $\Delta\Pi$: given the assumptions above this is always positive,[13] and its magnitude is at least equal to that of the profit loss from entry in period 1 (i.e. $\Delta\Pi \geq \Pi_1$). We assume that bargaining is efficient such that, if merger is permitted, it takes place. The entrant's payoff from merger (over and above its operating profit $\pi$) is its share of the merger surplus, $b\Delta\Pi$, where $b \in [0, 1]$ reflects the entrant's bargaining strength.

This reduced-form approach, adopted largely for its tractability, can encompass a number of standard merger models. It assumes that the entrant's profit gain and the incumbent's profit loss upon entry are positively related. For example, in the framework of McAfee and Williams (1992)—a Cournot model in which a firm's marginal cost depends negatively upon its capital stock—greater entrant capital stock raises the entrant's profit while reducing that of the incumbent. However, the impact of entrant capital stock on joint duopoly profits is not clear-cut; given this ambiguity, we do not assume any particular relationship between $\pi$ and $\Pi_1$. Merger synergies arise in McAfee and Williams (1992), as merger combines the capital stocks of the merging parties, but other merger models do not necessarily generate such effects. Accordingly, our reduced form model allows for the post-merger situation to differ from that prevailing pre-entry, specifically the possibility of synergies that benefit the merged firm and/or consumers, but does not require this

[13] Since this is merger to monopoly the issues raised by Salant, Switzer and Reynolds (1983) and others concerning the profitability of horizontal merger do not arise.

or place a particular form on these benefits. (The implication of possible linkages between the various outcomes is discussed in section 5.) One major restriction imposed by the reduced-form approach, however, is that $\Pi_1, \Pi_2$ and $\Delta\Pi$ are assumed to be constants, and hence independent of the realisation of $\pi$.[14] The loss of generality this entails is the cost of the added tractability of the approach.

The policy-maker's social welfare function (SWF) is $W = C + \lambda\Pi$, where $C$ denotes consumer surplus and $\lambda \in [0, 1]$ is the weight on firms' (combined) profits $\Pi$. In the special case of a fully consumerist policy-maker, no weight is placed on profits: $\lambda = 0$. Firms and the policy-maker use the common period 2 discount factor $\delta > 0$; as well as the rate of time preference, this reflects the time that elapses between entry and possible merger, and the duration of the post-merger interval.[15] Given that $C_D - \Pi_1 > 0$, entry is welfare-increasing for any $\lambda$ (this assumption is discussed in section 5). We also assume that the short-run welfare effect of merger is negative, i.e. $C_2 - C_D + \lambda\Delta\Pi < 0$; were this not the case, lenient merger policy would be optimal anyway, regardless of any impact on entry.

The policy-maker sets policy at the outset, before it knows the realisation of the entrant's profitability $\pi$. In addition, the policy-maker does not observe the entry cost $k$, either when setting the policy or when implementing it in period 2. The chosen policy is to allow merger in the second period iff the realisation of $\pi$ is sufficiently low—below $\pi_M$, say. (Note that the policy cannot be conditioned on the entry cost, as this is not observed by the policy-maker.) A higher choice of $\pi_M$ entails more lenient merger policy.

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

$t = 0$: the policy-maker sets $\pi_M$; $k$ is realised; the entrant decides whether to

[14] We are grateful to a referee for pointing out the importance of highlighting this feature.

[15] $\delta$ can be thought of as the ratio of the length of the post-merger period to that of the post-entry, pre-merger period, adjusted for time discounting. Thus it is possible to have $\delta > 1$ (and nothing in the analysis requires $\delta < 1$). We thank an anonymous referee for pointing this out.

enter or not;

$t = 1$: $\pi$ is realised; if entry occurred at $t = 0$ then the firms compete;

$t = 2$: if entry occurred at $t = 0$, then merger occurs if permitted; otherwise they compete.

The key question is: what is the (socially) optimal level of $\pi_M$? If merger is never socially desirable *ex ante*, then the optimal level is $\pi_M = 0$; conversely, if merger is socially desirable at all levels of $\pi$, then the optimal $\pi_M = 1$.

## 2.1 Optimal merger policy

If merger is not permitted at any profitability level (i.e., $\pi_M = 0$), then the entrant's expected value from entry is $V = (1 + \delta)\bar{\pi} - k$. Entry occurs iff $k \leq k_0 \equiv (1 + \delta)\bar{\pi}$. (Note that since the entry cost is entirely sunk and the flow profit is always non-negative, the entrant will continue to operate even when merger is not permitted.) Expected social welfare, relative to the no-entry benchmark, in this no-merger case is given by

$$W(0) = F(k_0)(1 + \delta)\left(C_D - \lambda\Pi_1\right) - \lambda \int_0^{k_0} k dF(k).$$

Similarly, if merger is permitted at any profitability level ($\pi_M = 1$), then the entrant's expected value from entry is $V = (1 + \delta)\bar{\pi} + \delta b \Delta\Pi - k$ and entry occurs iff $k \leq k_1 \equiv (1 + \delta)\bar{\pi} + \delta b \Delta\Pi$. Expected social welfare in this case is

$$W(1) = F(k_1)\big(C_D - \lambda\Pi_1 + \delta\left(C_2 + \lambda\Pi_2\right)\big) - \lambda \int_0^{k_1} k dF(k).$$

The relative magnitudes of $W(0)$ and $W(1)$ are ambiguous: allowing merger reduces period 2 welfare compared with duopoly, but on the other hand

entry occurs more often, raising welfare relative to the no-entry benchmark in period 1 and possibly also period 2 (if $C_2 + \lambda\Pi_2 > 0$).

We shall assume that the parameter values are such that $W'(1) < 0$, i.e., the policy-maker does not wish to allow all mergers. Intuitively, this will be the case when the benefits from increased entry and merger synergies are outweighed by the loss in competition and increase in sunk costs when the prospect of merger encourages entry.

If merger is permitted in period 2 for $\pi \leq \pi_M$, then it occurs; and so the expected value of entry is

$$V_M = (1+\delta)\bar{\pi} + \delta b \Delta\Pi G(\pi_M) - k.$$

Entry occurs iff

$$k \leq (1+\delta)\bar{\pi} + \delta b \Delta\Pi G(\pi_M) \equiv k_M(\pi_M). \tag{1}$$

Note that $k_M$ is an increasing function of $\pi_M$: more lenient merger policy encourages entry. Social welfare, relative to the no-entry benchmark, is given by

$$\begin{aligned} W(\pi_M) &= F(k_M(\pi_M))\big((1+\delta)(C_D - \lambda\Pi_1) - \delta G(\pi_M)(C_D - C_2 - \lambda\Delta\Pi)\big) \\ &\quad -\lambda \int_0^{k_M(\pi_M)} k dF(k). \end{aligned} \tag{2}$$

Note that the social welfare function $W(\pi_M)$ is differentiable in $\pi_M$; but at this stage we do not know whether it is quasi-concave. Looking at its first-order derivative identifies four effects that are involved in setting merger

policy:

$$\frac{\partial W(\pi_M)}{\partial \pi_M} = f\left(k_M\left(\pi_M\right)\right) k_M'\left(\pi_M\right)\Big(\left(1+\delta\right)\left(C_D-\lambda\Pi_1\right) - \delta G\left(\pi_M\right)\left(C_D-C_2-\lambda\Delta\Pi\right)\Big)$$
$$- F\left(k_M\left(\pi_M\right)\right)\delta g\left(\pi_M\right)\left(C_D-\lambda\Pi_1\right)$$
$$+ F\left(k_M\left(\pi_M\right)\right)\delta g\left(\pi_M\right)\left(C_2+\lambda\Pi_2\right)$$
$$- \lambda k_M'\left(\pi_M\right) k_M\left(\pi_M\right) f\left(k_M\left(\pi_M\right)\right).$$

- The *entry encouragement effect*: more lenient merger policy stimulates entry, increasing expected social surplus relative to the no-entry benchmark in the first period, and also in the second period when merger does not occur (i.e., when $\pi > \pi_M$) or if there are positive synergies from merger. This is the expression in the first line.

- The *competition effect*: when merger takes place there is a loss of competition compared with the immediately preceding situation, reducing social surplus in the second period compared with the first. This is the term in the second line.

- The *synergies effect*: if there are merger synergies, these partially mitigate the loss of competition. This is the term in the third line.

- The *sunk cost effect*: greater entry entails higher expected sunk costs, reducing social welfare (except in the case of a consumerist policymaker). This is the final term.

Our first result gives a sufficient condition for a lenient merger policy—meaning any merger threshold above $\pi = 0$—to be socially optimal.

**Proposition 1** *Lenient merger policy ($\pi_M > 0$) is optimal if*

$$C_D - \lambda\left(\Pi_1 + \bar{\pi}\right) - \frac{\phi\big((1+\delta)\bar{\pi}\big)}{(1+\delta)}\frac{\left(C_D - C_2 - \lambda\Delta\Pi\right)}{b\Delta\Pi} > 0.$$

**Proof.** The social welfare function $W(\pi_M)$ is differentiable in $\pi_M$. If the derivative of the social welfare function is positive at $\pi_M = 0$, then the optimal $\pi_M$ is greater than zero. Substituting $k'_M(\pi_M) = \delta b \Delta\Pi g(\pi_M)$ and evaluating, one obtains

$$\left.\frac{\partial W(\pi_M)}{\partial \pi_M}\right|_{\pi_M=0} = \delta g(0) f((1+\delta)\bar{\pi}) \times$$
$$\big((1+\delta) b\Delta\Pi\,(C_D - \lambda\Pi_1) - \phi((1+\delta)\bar{\pi})\,(C_D - C_2 - \lambda\Delta\Pi) - \lambda b\Delta\Pi(1+\delta)\bar{\pi}\big).$$

Since $\delta g(0) f((1+\delta)\bar{\pi}) > 0$, the proposition follows. ■

For lenient merger policy to be optimal in general, the benefits from increased entry and merger synergies must outweigh the loss in competition and increase in sunk costs. The sufficient condition in proposition 1 ensures that this is the case at the lowest possible level of the policy variable $\pi_M$.

A particular example helps to illustrate the proposition. Consider the case where the distribution $F(\cdot)$ is uniform on $[0,1]$, so that $\phi(x) = x$, and suppose that $\lambda = 0$ (the policy-maker has a consumerist SWF). The sufficient condition for lenient merger policy can then be written as

$$\frac{b\Delta\Pi}{\bar{\pi}} > \frac{C_D - C_2}{C_D}.$$

This is more likely to be satisfied when the profit gain from merger is large relative to the entrant's expected profit, the entrant's share of this surplus is high, the consumer surplus gain from duopoly is modest ($C_D$ is relatively small) and/or the consumer benefit of merger synergies is significant ($C_2$ is relatively large).

When the sufficient condition is satisfied, the optimal $\pi_M > 0$. Since we have assumed that $W'(1) < 0$, the optimal merger policy must be interior. We consider this case in the following proposition.

**Proposition 2** *If the condition in Proposition 1 holds, then the optimal*

*choice of $\pi_M$ is given by the (unique) solution of*

$$(1+\delta)(C_D - \lambda\Pi_1) = \left(\delta G(\pi_M) + \frac{\phi(k_M(\pi_M))}{b\Delta\Pi}\right)(C_D - C_2 - \lambda\Delta\Pi) + \lambda k_M(\pi_M) \tag{3}$$

**Proof.** See the appendix. ■

The interior solution given by equation (3) trades off the same four effects identified above: the entry encouragement effect, $b\Delta\Pi((1+\delta)(C_D - \lambda\Pi_1) - \delta G(\pi_M)(C_D - C_2 - \lambda\Delta\Pi))$; the competition effect, $\phi(k_M(\pi_M))(C_D - \lambda\Pi_1)$; the synergies effect $\phi(k_M(\pi_M))(C_2 + \lambda\Pi_2)$; and the sunk cost effect, $\lambda k_M(\pi_M) b\Delta\Pi$. Note that the entry encouragement effect is decreasing in $\pi_M$, while the competition, synergies and sunk cost effects are increasing in $\pi_M$.

This characterisation of the solution means that we can consider some of the comparative statics of the optimal policy. We do this in the next proposition.

**Proposition 3** *Comparative statics.*
*(1) The optimal merger policy $\pi_M$ is increasing in $b$.*
*(2) In the absence of synergies, the optimal merger policy $\pi_M$ is increasing in $C_D$ and decreasing in $\lambda$.*

**Proof.** (1) $G(\pi_M)$, $k_M(\pi_M)$ and $\phi(k_M(\pi_M))$ are increasing in $\pi_M$. Thus, for an increase in $b$, the first order condition (3) entails that $\pi_M$ increases.
(2) When $C_2 = \Pi_2 = 0$, (3) becomes $(1+\delta)(C_D - \lambda\Pi_1) = \left(\delta G(\pi_M) + \frac{\phi(k_M(\pi_M))}{b\Pi_1}\right)(C_D - \lambda\Pi_1) + \lambda k_M(\pi_M)$. The positive final term (the sunk cost effect) entails that at the optimal policy, $(1+\delta) > \left(\delta G(\pi_M) + \frac{\phi(k_M(\pi_M))}{b\Pi_1}\right)$. With higher $C_D$, the increase in $(C_D - \lambda\Pi_1)$ must be offset by an increase in $\pi_M$, which raises $G(\pi_M)$, $k_M(\pi_M)$ and $\phi(k_M(\pi_M))$. Similarly, higher $\lambda$ entails that $\pi_M$ decreases. ■

## 2.2 Discussion

Proposition 3 establishes that greater leniency is optimal when a greater share of the profit gain from merger accrues to the entrant. Assuming that the entrant is the acquired party, this finding implies that allowing the target to gain a larger share of the merger surplus encourages entry. Similarly, a target with a stronger bargaining position, perhaps due to the strength of a parent company, should be treated more, not less, leniently. This policy recommendation conflicts with established practice, which has tended to disallow the failing firm defence in cases where the supposedly "failing" firm is granted a significant share of the merger surplus[16] or is backed by a powerful parent.[17]

The proposition also demonstrates that, in the absence of merger synergies, a larger consumer benefit from competition raises the optimal merger policy. On the face of it, this result is not entirely obvious: a larger welfare gain from competition raises the benefit of encouraging entry but also makes the loss of competition entailed by merger more costly. At the optimal interior choice of $\pi_M$, the entry encouragement effect outweighs the competition effect: it must do so since the difference between the two effects equals the sunk cost effect, which is itself positive. The presence of synergies complicates this analysis, however, since it is then no longer necessarily the case that the entry encouragement effect outweighs the competition effect, the dif-

[16] A key obstacle to approval of the joint operating agreement (JOA) between the *Detroit News* and *Detroit Free Press* (U.S., 1988) was the division of profits between the two parties. The initial administrative law judge decided that the equal division proposed in the JOA was unduly generous to the "failing" newspaper, indicating that it was not in fact failing, and hence the FFD provision in the Newspaper Provision Act of 1970 did not apply. This decision was subsequently overturned by the Attorney General, but only after a delay of almost four years. See Kwoka and White (1999), Case 1, for further details.

[17] The U.K. Monopolies and Mergers Commission (MMC) prohibited the proposed sale of *ICI*'s loss-making fertiliser division to *Kemira Oy* (U.K., 1990) in view of adverse competition effects, despite recognising that *ICI* might exit the market in due course. 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.

ference being given by the sunk cost effect minus the synergies effect—which, for substantial synergies, could instead be negative. Note, however, that substantial synergies may themselves justify merger clearance, especially when the benefits are in large part passed on to consumers.

The proposition shows that, in the absence of synergies, a consumerist policy-maker[18] implements a more lenient merger policy. The consumerist policy-maker places less weight on the entrant's sunk cost; with the sunk cost effect being less important, this policy-maker prefers greater leniency. By contrast, a policy-maker who considers industry profits sets merger policy more strictly. This is the opposite of what might be expected in the current practice of merger control, where a consumerist policy-maker cares more about the loss of consumer surplus following merger and hence is more likely to prohibit the transaction. With merger synergies, this comparative static becomes ambiguous. Consider the effect of larger $\lambda$: with greater weight on profits, the policy-maker takes more account of the synergistic benefit to the merged firm $\Pi_2$, and so has a reason to favour merger. But this consideration conflicts with the sunk cost effect of greater leniency (the policy-maker who considers industry profits pays more attention to the increase in sunk costs), rendering the sign of the comparative static ambiguous. However, for sufficiently modest synergies, the sunk cost effect dominates and lower $\lambda$ favours greater leniency.

[18]This seems a reasonable interpretation of policy-maker objectives given the practice of merger control in most major jurisdictions. In merger assessments, regulators do not trade-off higher profits against consumer detriments, and cost savings are taken into account only if consumers benefit through lower prices.

There are also theoretical arguments as to why policy-makers might adopt a consumerist standard. Besanko and Spulber (1993) suggest that greater weight should be attached to consumer welfare to counter-balance the asymmetric information facing the policy-maker about possible cost savings from merger. Neven and Röller (2005) take into account lobbying by merging firms and the personal benefits this may bring to regulators; they show that raising the weight on consumer surplus can be an appropriate counter-balance to such lobbying.

# 3 Alternative Policies for Encouraging Entry

In this section we consider the following question: is merger policy the right tool for addressing the inefficiency of market power, or are there better, alternative policies?

We have modelled merger policy as a profitability threshold below which merger is permitted. Possible alternatives to the proposed merger policy include a subsidy for new entrants, or a subsidy paid to firms during hard times. From a theoretical perspective, an entry subsidy is very similar to the merger policy that we have analysed. One major difference is the scope for strategic manipulation of profits to hit a merger profit threshold, which we consider in section 4 below. Another is that an entry subsidy would not entail the loss of social welfare in the long-run when merger occurs. A third difference is that any subsidy paid by the policy-maker requires public funds to be raised through taxation, creating distortions elsewhere in the economy. Although perhaps less obvious than the distortion created by market power following a merger, this also entails a cost which should be taken into account in policy design. Even if it were the case that an entry subsidy creates a smaller distortion than merger policy, it might be politically unacceptable to increase taxation for this purpose, leaving merger policy as the preferred approach (its "cost" being more hidden, and deferred). For example, during the 2008 financial crisis, governments in several countries appeared to prefer merger with a rival bank to a public bail-out which would allow the struggling institution to survive independently, despite the resulting reduction in competition.[19]

There is a further reason why an entry subsidy may be an inappropriate

[19]On 18 September 2008, the U.K. government announced that it would waive competition rules to permit the takeover of troubled Halifax Bank of Scotland (HBOS) by Lloyds TSB, creating an institution with around one-third current (checking) accounts, 28% of the mortgage market and a leading position in life assurance and household insurance. Governments in other countries have also facilitated bank mergers, despite possible detriment to future competition.

policy: it may encourage transitory entry by firms that do not intend, or have little prospect of, remaining active in the market. This generates little or no benefit to consumers, while incurring the full cost of the subsidy. By contrast, the proposed merger policy encourages only entrants that bring effective and sustained competition: otherwise there is little or no merger surplus and no incumbent will pay a significant amount to merge with the entrant. (Underlying this argument is an assumption that industry participants are better placed than governments to determine which entrants pose a significant competitive threat. We believe this to be valid.) Thus merger policy avoids this additional source of inefficiency.

These ideas are formalised in an extension of the model of section 2 set out below. This captures the following features noted above: the social cost of public funds used to pay an entry subsidy, and the possibility of transitory entry by firms that have little impact on the market yet incur the full cost of the subsidy. Entry subsidy and lenient merger policy are compared, deriving conditions under which merger policy dominates.

## 3.1 Comparison of merger policy and entry subsidy

The model of section 2 is adapted as follows. The entrant's sunk cost is uniformly distributed on $[0, K]$ and its per-period operating profit is uniformly distributed on $[0, 1]$. In addition, an entrant can be either 'effective', with probability $1 - \rho$, and will operate as previously following entry. With probability $\rho$, the entrant is 'wasteful', and has minimal impact on the market, generating no significant increase in consumer surplus and having little effect on incumbent profit, yet which incurs a sunk entry cost with the same distribution. The wasteful entrant makes a small (but negligible) loss ($\pi = -\varepsilon$) in period 1 and thus exits the market at the end of period 1, at no further cost. The entrant knows its type prior to entry but, as in section 2, the post-entry profit of the effective type is revealed only in period 1, at which point this is known to the entrant, incumbent and policy-maker.

We compare two policies to promote entry: lenient merger policy, as described in section 2, and an entry subsidy. The entry subsidy operates as follows. Merger is not permitted, but an entry subsidy $E$ is paid to any entrant. This is paid upon entry, at the start of period 1, and is not conditional upon the entrant's subsequent performance or its duration in the market. The social cost of funds is $R \geq 1$, so that to pay a subsidy of $E$ actually costs $RE$.

The wasteful entrant formalises the possibility of transitory entry that generates little or no benefit to consumers. This entrant does not benefit from lenient merger policy as the incumbent will not offer to merge with it, for two reasons: it has minimal effect on the incumbent's profits, and since it is unprofitable it will exit the market at the end of period 1 anyway. The wasteful entrant does benefit from an entry subsidy, however: the subsidy is paid up-front when the firm enters the market, at which point the policy-maker cannot identify the entrant's type.

In the absence of policy intervention, the wasteful entrant can only make losses and hence such entry is deterred. The expected value of entry to a good type is $V = \frac{1}{2}(1+\delta) - k$, thus entry of this type occurs for $k \leq k_0 \equiv \frac{1+\delta}{2}$ (we assume that $K$ is sufficiently large to generate interior solutions). Social welfare, relative to the no-entry benchmark, in this no-intervention case is given by

$$W(0) = \frac{k_0}{K}(1+\delta)(C_D - \lambda\Pi_1) - \frac{1}{2}\lambda k_0.$$

With lenient merger policy, wasteful entry is again deterred: the incumbent will not offer to merge with such an entrant, being little affected by it and knowing that it will quit in any case. If merger is permitted in period 2 for $\pi \leq \pi_M$, then merger with an effective entrant occurs; thus the expected value of entry for this type is $V_M = \frac{1+\delta}{2} + \delta b \Delta\Pi \pi_M - k$ and entry occurs iff $k \leq \frac{1+\delta}{2} + \delta b \Delta\Pi \pi_M \equiv k_M(\pi_M)$. Social welfare, relative to the no-entry

benchmark, under merger policy $\pi_M$ is given by

$$W(\pi_M) = \frac{k_M(\pi_M)}{K}\big((1+\delta)(C_D - \lambda\Pi_1) - \delta\pi_M(C_D - C_2 - \lambda\Delta\Pi)\big) - \frac{1}{2}\lambda k_M(\pi_M). \tag{4}$$

Under the entry subsidy, the expected value of entry to an effective entrant is $V_E = \frac{1}{2}(1+\delta) - k + E$, thus entry of this type occurs iff $k \leq k_E \equiv \frac{1+\delta}{2} + E$. The value of entry to a wasteful entrant is $V_B = E - k$, thus entry of this type occurs iff $k \leq k_B \equiv E$. Social welfare, relative to the no-entry benchmark, with an entry subsidy $E$ is given by

$$\begin{aligned} W(E) &= \frac{k_E(E)}{K}\big((1+\delta)(C_D - \lambda\Pi_1) + (\lambda - R)E\big) - \frac{1}{2}\lambda k_E(E) \\ &\quad + \rho\left(\frac{k_B(E)}{K}(\lambda - R)E - \frac{1}{2}\lambda k_B(E)\right). \end{aligned} \tag{5}$$

To compare the two policies we assess the welfare effect of introducing each one, incrementally raising the entry of an effective type relative to $k_0$. This comparison is described in proposition 4.

**Proposition 4** *Lenient merger policy dominates entry subsidy when*

$$\frac{(1+\delta)}{2K}\left(R - \lambda - \frac{C_D - C_2 - \lambda\Delta\Pi}{b\Delta\Pi}\right) + \frac{1}{2}\lambda\rho > 0.$$

*This is more likely to be the case for: larger $R$; larger $b$; larger $\Delta\Pi$; smaller $C_D$; larger $C_2$; larger $\lambda$; and larger $\rho$.*

**Proof.** See the appendix. ■

## 3.2 Discussion

The model, and proposition 4, capture the two considerations noted at the start of this section in support of merger policy over an entry subsidy as a means of promoting entry. The social cost of entry subsidy is captured by

$(R-\lambda)$: each unit of funds transferred to an entrant costs $R \geq 1$ to raise and yields a social benefit that is weighted by $\lambda \leq 1$. (If public funds could be raised without creating distortions and the policy-maker weighted profits equally with consumer surplus, this term would be zero.) The social cost of merger policy is given by the ratio of the welfare change from the loss of competition, net of synergies, to the entrant's private gain from merger, $\frac{C_D - C_2 - \lambda\Delta\Pi}{b\Delta\Pi}$. On this basis, merger policy achieves higher welfare than an entry subsidy when its social cost is less than $(R-\lambda)$. This is more likely when $R$ is large and/or the entrant's private gain from merger is large relative to the welfare loss from merger (i.e. for larger $b$, larger $\Delta\Pi$, smaller $C_D$ and/or larger $C_2$). This relationship is affected by market conditions: for example, with inelastic demand the merging firms capture a higher proportion of the lost consumer surplus, reducing the social cost of merger policy. Synergy benefits retained by the merged entity also raise $\Delta\Pi$, favouring merger policy. Under the entry subsidy, by contrast, merger does not take place, thus potential synergies are not realised.

The second consideration, that of wasteful entry, is captured by the final term, $\frac{1}{2}\lambda\rho$. The greater the likelihood of an entrant that yields negligible benefits yet incurs the full cost of the entry subsidy (i.e., higher $\rho$), the stronger the preference for merger policy (which avoids this problem) over an entry subsidy (which does not). Note that even if the first consideration above, the social cost of each policy, favours entry subsidy over merger policy, wasteful entry may overturn this result.

The comparative static in $\lambda$ tells us that when the policy-maker puts a greater weight on profits (higher $\lambda$) it tends to favour merger policy. This is for two reasons: firstly, with greater weight on the profit gain from merger, the social cost of merger is lower; second, the greater weight on the sunk costs incurred by the wasteful entrant reduces the attractiveness of the entry subsidy.

# 4 Merger Policy with Strategic Behaviour

Policy-makers may be reluctant to use merger policy to encourage entry, fearing that the rule may be manipulated. If the policy-maker is unable (due to asymmetry of information) accurately to determine the level of achievable profits, the firms may be able to use this fact and distort their profits to pass the merger rule. In section 2 we assumed that the policy-maker can observe the entrant's true profitability $\pi$ perfectly, leaving no scope for strategic behaviour to improve the firms' position. We now relax this assumption to consider the possibility of strategic behaviour to manipulate the merger rule and investigate its impact on the policy.

In this section we show that merger policy can be a beneficial entry promotion tool even when the firms can strategically manipulate their behaviour to "game" the merger rule. We will consider the case where strategic behaviour raises period 1 welfare. For example, firms may cut prices in period 1 in order to reduce the entrant's profits to the level where merger is then permitted.[20] (We show in proposition (6) that in the opposite case, where profit-reducing strategies do not raise welfare in the short-run—e.g. wasteful expenditures by the entrant—that a lenient policy is never chosen.)[21]

Such behaviour may increase consumer surplus, and social welfare, in the short run: for example, a price cut that reduces entrant profit to $\pi_M$ also reduces the deadweight loss from market power. This possibility creates an interesting trade-off for the policy-maker in designing merger policy. In the first period, consumer surplus is increased by strategic behaviour; but in the second period, consumer surplus is lowered by the merger that follows. This is analogous to the familiar trade-off arising from predation, which generates the short-run benefit of heightened competition but at the cost of weaker

[20] In the Detroit newspaper JOA, referred to in footnote 16, the U.S. Department of Justice accused the parties of engaging in a price war in the expectation that poor profitability would result in merger clearance, making the war a "win-win" proposition.

[21] We are grateful to Kenneth Simons for encouraging us to consider this point.

competition in the long run. However, in our analysis an additional factor arises: the entry encouragement effect of strategies that raise the value of entry. In other words, strategic behaviour can benefit consumers not only by directly lowering prices in period 1, but also by increasing the extent of entry.

To examine this issue, the reduced-form model of section 2 is adapted and extended as follows. The entrant's sunk cost is uniformly distributed on $[0, K]$. In the absence of strategic behaviour, the entrant's per-period operating profit takes one of two values, $\pi_H$ and $\pi_L$ where $\pi_H > \pi_L > 0$, each with probability one-half. (These profit levels reflect competitive outcomes with variation in the entrant's marginal cost or capital stock, say.) Joint duopoly profit relative to the pre-entry benchmark is $-\Pi_1 < 0$ and the corresponding consumer surplus is $C_D$, where these values satisfy the conditions set out in section 2. Similarly, post-merger profit and consumer surplus are $\Pi_2 \geq 0$ and $C_2 \in [0, C_D)$ respectively. As before, we define $\Delta\Pi = \Pi_1 + \Pi_2$.

The entrant's achievable profitability is revealed to both firms in period 1, but not to the policy-maker, who instead measures the entrant's actual profit.[22] Accordingly, merger policy can be conditioned on the entrant's observed period 1 profit only, but the allocation of the merger surplus in period 2 (when this is permitted) is based on true not observed profitability (as this would determine period 2 payoffs in the absence of merger). The policy-maker adopts one of the following three approaches to merger: the strict policy forbids merger for any $\pi > 0$ (i.e., $\pi_M = 0$); the lenient policy permits merger in period 2 following an observation in period 1 of $\pi \leq \pi_L$ but prohibits it for $\pi > \pi_L$ (i.e., $\pi_M = \pi_L$);[23] while the laissez-faire policy

[22] We assume that accounting manipulation to satisfy the profit target is not possible: there must be some change in behaviour such that the entrant's measured profit is reduced to $\pi_L$.

[23] Given the entrant's profit distribution, any leniency threshold $\pi_M \in [\pi_L, \pi_H)$ would permit merger under the same circumstances in the absence of strategic behaviour. But the choice of leniency threshold might affect strategic behaviour, as it determines the amount

allows merger in period 2 regardless of period 1 profit ($\pi_M = 1$).

We do not model strategic behaviour in detail, but merely assume that this alters period 1 outcomes as follows. Clearly, strategic behaviour is relevant only when the entrant's profitability is $\pi_H$ (when $\pi = \pi_L$ the merger rule is satisfied anyway). With strategic manipulation the entrant's profit is reduced to $\pi_L$, perhaps by one or other firm (or both) deliberately increasing its output in order to push down prices. Relative to the pre-entry benchmark, combined duopoly profits under strategic behaviour are $-\Pi_S < 0$ and the corresponding consumer surplus is $C_S \geq C_D$. We assume that strategic behaviour raises welfare in the short-run: $C_S - \lambda\Pi_S \geq C_D - \lambda\Pi_1$. For the incumbent to be worse off in the short run by acting strategically than under non-strategic behaviour, we require $(-\pi_L - \Pi_S) < (-\pi_H - \Pi_1)$. For the incumbent and the entrant (respectively) to benefit overall from strategic behaviour, and hence to wish to participate, we require $\Pi_1 + \pi_H - \pi_L - \Pi_S + \delta(1-b)\Delta\Pi > 0$ and $\delta b\Delta\Pi - (\pi_H - \pi_L) > 0$; depending which firm instigates strategic behaviour these conditions may not both be required, but the second ensures that entry is encouraged and thus is necessary for our analysis. Combining these three constraints, we have

$$\min(\delta b\Delta\Pi, \Pi_S - \Pi_1) > \pi_H - \pi_L > \Pi_S - \Pi_1 - \delta(1-b)\Delta\Pi. \tag{6}$$

## 4.1 Without strategic behaviour

In the absence of strategic behaviour, the entrant's entry decision and social welfare under each policy is as follows. Under strict merger policy, the expected value of entry is $V_0 = \frac{1}{2}(1+\delta)(\pi_L + \pi_H) - k$, thus entry occurs for

of profit distortion that must be undertaken in order to game the policy. However, in a situation where the entrant satisfied the merger rule with a profit level other than $\pi_L$, the policy-maker could infer that strategic behaviour had taken place. We therefore rule out such possibilities.

$k \leq k_0 \equiv \frac{1}{2}(1+\delta)(\pi_L + \pi_H)$ and welfare is given by

$$W_0 = \frac{k_0}{K}(1+\delta)(C_D - \lambda\Pi_1) - \frac{1}{2}\lambda k_0. \tag{7}$$

Under laissez-faire merger policy, the expected value of entry is $V_1 = \frac{1}{2}(1+\delta)(\pi_L + \pi_H)$ $+\delta b\Delta\Pi - k$, thus entry occurs for $k \leq k_1 \equiv \frac{1}{2}(1+\delta)(\pi_L + \pi_H) + \delta b\Delta\Pi$ and welfare is given by

$$W_1 = \frac{k_1}{K}\big(C_D - \lambda\Pi_1 + \delta(C_2 + \lambda\Pi_2)\big) - \frac{1}{2}\lambda k_1. \tag{8}$$

Under the conditional, lenient merger policy, the expected value of entry is $V_M = \frac{1}{2}(1+\delta)\ (\pi_L + \pi_H) + \frac{1}{2}\delta b\Delta\Pi - k$, thus entry occurs for $k \leq k_M \equiv$ $\frac{1}{2}(1+\delta)(\pi_L + \pi_H) + \frac{1}{2}\delta b\Delta\Pi$ and welfare is given by

$$W_M = \frac{k_M}{K}\left(\left(1 + \frac{1}{2}\delta\right)(C_D - \lambda\Pi_1) + \frac{1}{2}\delta(C_2 + \lambda\Pi_2)\right) - \frac{1}{2}\lambda k_M. \tag{9}$$

The following proposition states the conditions under which the policy-maker chooses lenient merger policy in the absence of strategic behaviour.

**Proposition 5** *In the absence of strategic behaviour, the policy-maker prefers lenient merger policy to both strict and laissez-faire policy iff*

$$\lambda K \in \big(X, X + 2\delta(C_D - C_2 - \lambda\Delta\Pi)\big),$$

*where* $X = 2(1+\delta)(C_D - \lambda\Pi_1) - \big((1+\delta)\frac{\pi_L+\pi_H}{b\Delta\Pi} + 3\delta\big)(C_D - C_2 - \lambda\Delta\Pi)$.

**Proof.** The upper bound follows from the condition $W_M > W_0$ and lower bound follows from $W_M > W_1$, using (7), (8) and (9). Note that since $C_D - C_2 - \lambda\Delta\Pi > 0$, the interval is non-empty. ■

In the special case of a consumerist policy-maker ($\lambda = 0$) and no merger synergies ($C_2 = \Pi_2 = 0$), the condition for leniency to be the chosen policy

becomes

$$\frac{\pi_L + \pi_H}{b\Pi_1} \in \left( \frac{2-\delta}{1+\delta}, \frac{2+\delta}{1+\delta} \right). \tag{10}$$

Comparing $W_0$ and $W_1$, this case can be characterised fully: $W_0 > (<) W_1$ for $\frac{\pi_L+\pi_H}{b\Pi_1} > (<) \frac{2}{1+\delta}$. Thus, the policy-maker's preferred approach to merger can be described as follows:

$$\begin{array}{lll} \pi_M = 1 & \text{for} & \frac{\pi_L+\pi_H}{b\Pi_1} < \frac{2-\delta}{1+\delta} \\ \pi_M = \pi_L & \text{for} & \frac{\pi_L+\pi_H}{b\Pi_1} \in \left(\frac{2-\delta}{1+\delta}, \frac{2+\delta}{1+\delta}\right) \\ \pi_M = 0 & \text{for} & \frac{\pi_L+\pi_H}{b\Pi_1} > \frac{2+\delta}{1+\delta}. \end{array}$$

Intuitively, higher $b\Pi_1$ strengthens the entry encouragement effect, increasing the desirability of more lenient merger policy. Higher $\delta$ reduces both the upper and lower bounds for lenient policy, but also widens the interval over which it is chosen; with greater weight on, or duration of, the post-merger period compared with the post-entry, pre-merger interval, the balance is shifted towards stricter policy (the range over which $\pi_M = 1$ shrinks while that over which $\pi_M = 0$ increases).

## 4.2 With strategic manipulation of lenient merger policy

With strategic behaviour, $W_0$ and $W_1$ are as given above, but under lenient merger policy the expected value of entry is now $V_S = \frac{1}{2}\left((2+\delta)\pi_L + \delta\pi_H\right) + \delta b\Delta\Pi - k$; thus entry occurs for $k \leq k_S \equiv \frac{1}{2}\left((2+\delta)\pi_L + \delta\pi_H\right) + \delta b\Delta\Pi$ and welfare is given by

$$W_S = \frac{k_S}{K}\left(\frac{1}{2}\left(C_D - \lambda\Pi_1\right) + \frac{1}{2}\left(C_S - \lambda\Pi_S\right) + \delta\left(C_2 + \lambda\Pi_2\right)\right) - \frac{1}{2}\lambda k_S. \tag{11}$$

Comparing (11) with (9), the possibility of strategic behaviour affects welfare, and hence the policy-maker's choice, in a number of ways:

- The *direct effect*: strategic behaviour to achieve merger increases period 1 welfare (for $C_S - \lambda\Pi_S > C_D - \lambda\Pi_1$).
- The *competition effect*: merger now takes place for $\pi = \pi_H$ as well as $\pi_L$, reducing competition and welfare in period 2.
- The *entry encouragement effect*: the possibility of strategic behaviour stimulates entry (as $k_S > k_M$), tending to increase competition.
- The *sunk cost effect*: with more entry, greater sunk costs are incurred.

Effects similar to the first two exist in the analogous situation of predation, but the third and fourth are new.

An equivalent result to proposition 5 can be derived from (7), (8) and (11), demonstrating that leniency may be socially preferred to either strict or laissez-faire merger policy despite the presence of strategic behaviour.

**Proposition 6** *With the possibility of strategic behaviour, the policy-maker prefers lenient merger policy to both strict and laissez-faire policy iff*

$$\lambda K \in (Y, Y + D),$$

*where* $Y = 2(C_D - \lambda\Pi_1) + 2\delta(C_2 + \lambda\Pi_2) - \frac{2\pi_L + \delta(\pi_L + \pi_H) + 2\delta b\Delta\Pi}{\pi_H - \pi_L}(C_S - C_D - \lambda(\Pi_S - \Pi_1))$ *and* $D = \frac{2\delta}{2\delta b\Delta\Pi - (\pi_H - \pi_L)}\Big(\frac{b\Delta\Pi}{\pi_H - \pi_L}(2\pi_L + \delta(\pi_L + \pi_H) + 2\delta b\Delta\Pi)(C_S - C_D - \lambda(\Pi_S - \Pi_1))$ $- (1+\delta)(\pi_L + \pi_H)(C_D - C_2 - \lambda\Delta\Pi)\Big)$. *For such a case to exist we require both (i) strategic behaviour to raise welfare in period 1, and (ii) the entrant's share of the merger surplus to be sufficiently large.*

**Proof.** The upper bound follows from the condition $W_S > W_0$ and the lower bound follows from $W_S > W_1$, using (7), (8) and (11). For the interval to be non-empty we require $D > 0$; from parameter condition (6) we have $2\delta b\Delta\Pi - (\pi_H - \pi_L) > 0$; thus $D > 0$ requires both (i) $C_S - C_D - \lambda(\Pi_S - \Pi_1) > 0$, and (ii) $b\Delta\Pi$ to be sufficiently large. ■

In the special case of a consumerist policy-maker ($\lambda = 0$) and no synergies ($C_2 = \Pi_2 = 0$), the condition for leniency to be the chosen policy becomes

$$\frac{C_S}{C_D} \in \left( \frac{2\pi_H + A}{2\pi_L + A}, \frac{2\pi_H + A + 2\delta B}{2\pi_L + A} \right).$$

where $A = 2\delta b\Pi_1 + \delta(\pi_L + \pi_H)$ and $B = (1+\delta)(\pi_L + \pi_H) - 2b\Pi_1$. Since $\pi_H > \pi_L$, the condition requires $C_S > C_D$.

For leniency to be the chosen policy, strategic behaviour must raise period 1 welfare. If instead, as we have mentioned, strategic behaviour yields no direct benefit, then proposition (6) shows that the lenient policy is never chosen. For a consumerist policy-maker, moreover, when strategic behaviour yields no direct benefit the lenient merger policy is always dominated by full laissez-faire; i.e., it is always the case that $W_1 > W_S$ (though $W_0$ may in some cases be higher still). This is because, under both policies, entry brings a benefit of $C_D$ in period 1 and merger takes place just as often, giving the same loss of competition in period 2, but with strategic behaviour the entrant's period 1 profit is lower ($\pi_L$ rather than its potential profit $\pi_H$), weakening the entry encouragement effect. Meanwhile, the consumerist policy-maker ignores the greater sunk cost effect of the laissez-faire policy. However, this finding does not undermine our general argument that the impact of merger policy on entry may promote more permissive merger control: in many cases it is the laissez-faire policy, rather than stricter control, that is the preferred option.

Comparing (11) with (9), it is possible that strategic behaviour may increase the desirability of lenient merger policy: $W_S > W_M$ is more likely when the direct welfare gain from strategic behaviour and/or synergy benefits from merger are large. In the special case of a consumerist policy-maker and no merger synergies, it can be shown that $W_S > W_M$ when

$$\frac{C_S}{C_D} > \frac{(2 + 2\delta + \delta^2)\pi_H + (2\delta + \delta^2)\pi_L + \delta^2 b\Pi_1}{\delta\pi_H + (2+\delta)\pi_L + 2\delta b\Pi_1}. \tag{12}$$

For any set of parameter values $\{\pi_H, \pi_L, \delta, b\Pi_1\}$ there exists a critical ratio $\frac{C_S}{C_D}$ above which $W_S > W_M$, widening the interval over which the lenient merger policy is preferred. Taking a numerical example, for $\delta = 1$, $\pi_H = \frac{3}{4}$ and $\pi_L = \frac{1}{4}$, from (10) the critical values of $b\Pi_1$ determining the policy-maker's choice of merger policy in the absence of strategic behaviour are

$$\begin{array}{lll} \pi_M = 1 & \text{for} & b\Pi_1 > 2 \\ \pi_M = \pi_L & \text{for} & b\Pi_1 \in \left(\frac{2}{3}, 2\right) \\ \pi_M = 0 & \text{for} & b\Pi_1 < \frac{2}{3}. \end{array}$$

For $b\Pi_1 = \frac{2}{3}$, the critical value at which $W_M = W_0$ and the policy-maker is indifferent between strict and lenient merger policy, (12) implies that $W_S > W_M$ for $\frac{C_S}{C_D} > \frac{31}{17} \simeq 1.8$. With consumer surplus values that satisfy this condition, strategic behaviour increases the attractiveness of the lenient merger policy, making it the preferred choice. For $b\Pi_1 = 2$ (the critical value at which $W_M = W_1$), the corresponding threshold is $\frac{C_S}{C_D} > \frac{13}{11} \simeq 1.2$.

To conclude: the possibility of strategic behaviour does not negate the role of lenient merger policy in encouraging entry. Indeed, in some circumstances, it strengthens the case. For the lenient merger policy to be the policy-maker's preferred choice there must be some social benefit from strategic behaviour; if this is not the case, however, it may be that more lax merger control—the laissez-faire policy—rather than stricter control is the preferred option. Thus even this finding does not undermine our general argument, that the impact of merger policy on entry may promote more permissive merger control.

# 5 Discussion and Conclusion

We have argued that merger policy should assess competition in the dynamic sense, by taking into account the effect of the policy rule on incentives for entry (and *ex ante* investment decisions in general), not just post-merger competition. A more lenient policy—which could be characterised as ex-

tending the existing failing firm defence to ailing as well as imminently failing firms—may yield social benefits through its beneficial impact on entry, resulting in more effective competition overall. This paper provides a framework for determining the optimal degree of leniency, and shows that lenient merger policy will be optimal in certain circumstances: where the benefits from increased entry and short-run competition outweigh the costs of reduced competition in the long-run, net of any merger synergies, and the duplication of fixed costs. We compare merger policy with an entry subsidy, illuminating the relative costs of the two interventions and showing that under a range of circumstances lenient merger policy dominates a direct subsidy to entry. We also show that the case for leniency is not negated by the possibility of strategic behaviour to manipulate the merger rule, and may even be enhanced by it.

In this concluding section we review the key assumptions in our story, to assess the robustness of our story. Recall that the desirability of lenient merger policy relies on the entry encouragement effect (inducing more competition in the short-run, and sometimes also the long-run) outweighing the competition effect (the reduction in the long-run competition that merger permits), net of any merger synergies, and the sunk cost effect. We require, therefore, three general conditions to hold. First, entry must be socially desirable. Secondly, merger must increase the profits of the merging firms (in particular that of the entrant). Thirdly, there must be (at least) a short-run increase in competition due to entry. These conditions may not always be satisfied, especially if the situation is generalised beyond the two-firm case.

Previous work has shown that the first condition need not always hold in models of oligopoly. Mankiw and Whinston (1986) demonstrate that there is a tendency for excessive entry in homogeneous good industries. However, product differentiation mitigates this finding and may reverse it: product variety can lead to insufficient entry in equilibrium, so that entry encouragement is socially desirable. Moreover, competition authorities stress broader

factors such as selection and efficiency effects of competition in support of a general presumption that entry is beneficial.

The second condition, that merger increases the profits of the merging firms, has been much studied in the merger literature and does not always hold. In a Cournot model where firms have the same, constant marginal cost, Salant, Switzer and Reynolds (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, except when merger takes in most of the firms in the industry. However, other papers, such as Deneckere and Davidson (1985), Perry and Porter (1985) and McAfee and Williams (1992), develop models showing that merger between two firms can be profitable for the merging parties without requiring a highly concentrated market to be created; Deneckere and Davidson (1985) use differentiated products while Perry and Porter (1985) and McAfee and Williams (1992) build in capital stock affecting firms' cost structures. Werden and Froeb (1998) provide numerical analysis which suggests that merger may be profitable even when there can be further entry after merger.

In principle, then, lenient merger policy might not always be socially desirable or effective in encouraging entry. Based on the above, the "worst case" for our story involves a relatively unconcentrated Cournot oligopoly with homogeneous goods where there are no technological synergies from merger. In this case, greater entry could worsen welfare, and merger policy may anyway be ineffective in encouraging entry. On the other hand, the most favourable conditions for our story involve differentiated goods Bertrand competition. In this case merger policy to encourage entry is likely to be both desirable and effective. Moreover our focus on entry and merger in an already-concentrated market—the situation where the failing firm defence is typically employed—further supports this hypothesis.

The third condition, that there must be (at least) a short-run increase in competition, requires that merger cannot occur immediately upon entry. There must be a "first period" during which the entrant competes with the

incumbent(s), and its profitability is revealed. In the model this is simply assumed. In practice, policy could reflect this issue by requiring that merger be permitted only after the entrant has had low profitability over some sustained period. In any case, an incumbent is likely to be unwilling to pay much to buy out an entrant that has just entered its market, being uncertain how strong a competitive threat it poses: some period of competition is required to establish this before merger will be proposed.

Our model assumes uncertainty over the entrant's profitability $\pi$ and its sunk entry cost $k$. Profit uncertainty allows merger policy to be conditioned on the entrant's post-entry performance, while its entry decision (and, with variation in entry cost, the degree of entry) is based on expected profit. We have placed little restriction on the form of uncertainty, with the results in section 2 derived for general distribution functions. Nonetheless, the nature of these distributions has a bearing on the optimal merger rule. If the probability of low profit levels is small but encouraging entry is socially desirable, the optimal merger policy requires a higher profit threshold to influence entry behaviour. If the probability that the sunk cost $k$ is high goes up (e.g., there is a first-order stochastic dominance shift in the distribution $F$), then the expected cost of stimulating entry goes up. (In the terms used in this paper, the sunk cost effect is greater.) All else equal, this makes leniency less attractive and lowers the optimal merger rule.

An alternative model is possible, in which the sunk cost $k$ is fixed for all firms, and firms learn the profit $\pi$ before deciding whether to enter.[24] Here, the case for the optimal policy to involve leniency is even starker. If the policy-maker sets the threshold profit level for merger to be less than the level required for entry, then she can ensure that mergers take place only with firms that would not otherwise have entered. Provided the sunk cost $k$ is not too large, this policy must then improve overall welfare. This variant could be made more complicated by supposing that firms receive an

[24] We are grateful to a referee for suggesting this point.

imperfect signal of profitability before they decide to enter. This would not change the basic point that emerges from the simpler case.

An interesting aspect to uncertainty concerns the possibility of linkages between entrant profit and other outcomes in the model, causing these to shift with the underlying source of variability. If low entrant profitability is associated with a smaller impact on consumer surplus, then the social loss from permitting merger in this circumstance is low, increasing the optimality of lenient merger policy. However, for merger policy still to be effective in encouraging entry in this situation, there must nonetheless be a significant profit increase from merger and the entrant must be able to gain a significant share of this, despite its low profitability. In other words, if the low-profitability entrant's impact on the incumbent firm is significant while the benefit it confers on consumers is relatively small—e.g. a high-cost entrant that does little to reduce prices but steals market share from the incumbent—the case for lenient policy is enhanced.

# Appendix

## Proof of proposition 2

The first derivative of the welfare function $W(\pi_M)$ is

$$\frac{\partial W(\pi_M)}{\partial \pi_M} = \delta f\left(k_M\left(\pi_M\right)\right) g\left(\pi_M\right) \times$$
$$\Big( b\Delta\Pi\big( \left(1+\delta-\delta G\left(\pi_M\right)\right)\left(C_D-\lambda\Pi_1\right)+\delta G\left(\pi_M\right)\left(C_2+\lambda\Pi_2\right)-\lambda k_M\left(\pi_M\right)\big)$$
$$-\phi\left(k_M\left(\pi_M\right)\right)\left(C_D-C_2-\lambda\Delta\Pi\right)\Big).$$

The second derivative is therefore:

$$\frac{\partial^2 W(\pi_M)}{\partial \pi_M^2} = \delta \frac{\partial}{\partial \pi_M} \left( f\left(k_M\left(\pi_M\right)\right) g\left(\pi_M\right)\right) \times$$
$$\Bigg( b\Delta\Pi\big( \left(1+\delta-\delta G\left(\pi_M\right)\right)\left(C_D-\lambda\Pi_1\right)+\delta G\left(\pi_M\right)\left(C_2+\lambda\Pi_2\right)-\lambda k_M\left(\pi_M\right)\big)$$
$$-\phi\left(k_M\left(\pi_M\right)\right)\left(C_D-C_2-\lambda\Delta\Pi\right)\Bigg)$$
$$-\delta^2 f\left(k_M\left(\pi_M\right)\right)\left(g\left(\pi_M\right)\right)^2 b\Delta\Pi\Bigg( \left(\phi'\left(k_M\left(\pi_M\right)\right)+1\right)\left(C_D-C_2-\lambda\Delta\Pi\right)+\lambda b\Delta\Pi\Bigg).$$

The expression in large brackets spanning the second and third lines is zero at a turning point of $W(\pi_M)$. The final line is negative, since $\phi' \geq 0$, hence any turning point must be a maximum. Moreover, the same argument shows that equation (3) has a unique solution, since

$$\left(1+\delta\right)\left(C_D-\lambda\Pi_1\right)-\left(\delta G\left(\pi_M\right)+\frac{\phi\left(k_M\left(\pi_M\right)\right)}{b\Delta\Pi}\right)\left(C_D-C_2-\lambda\Delta\Pi\right)-\lambda k_M\left(\pi_M\right)$$

is single downward-crossing in $\pi_M$.

## Proof of proposition 4

Using the substitutions $\pi_M = \frac{k_M - k_0}{\delta b \Delta\Pi}$ and $E = k_B = k_E - k_0$, (4) and (5) become respectively

$$W(k_M) = \frac{k_M}{K}\left(\left(1+\delta\right)\left(C_D-\lambda\Pi_1\right)-\frac{\left(k_M-k_0\right)}{b\Delta\Pi}\left(C_D-C_2-\lambda\Delta\Pi\right)\right)-\frac{1}{2}\lambda k_M;$$
$$W(k_E) = \frac{k_E}{K}\big(\left(1+\delta\right)\left(C_D-\lambda\Pi_1\right)+\left(\lambda-R\right)\left(k_E-k_0\right)\big)-\frac{1}{2}\lambda k_E$$
$$+\rho\left(k_E-k_0\right)\left(\frac{\left(k_E-k_0\right)}{K}\left(\lambda-R\right)-\frac{1}{2}\lambda\right).$$

Differentiating each expression in the relevant entry threshold and evaluating at $k_M = k_E = k_0 = \frac{1+\delta}{2}$, we obtain

$$\left.\frac{\partial W}{\partial k_M}\right|_{k_M=k_0} = \frac{1}{K}(1+\delta)\left(C_D - \lambda\Pi_1 - \frac{C_D - C_2 - \lambda\Delta\Pi}{2b\Delta\Pi}\right) - \frac{1}{2}\lambda;$$

$$\left.\frac{\partial W}{\partial k_E}\right|_{k_E=k_0} = \frac{1}{K}(1+\delta)\left(C_D - \lambda\Pi_1 - \frac{1}{2}(R-\lambda)\right) - \frac{1}{2}\lambda(1+\rho).$$

We assume that both derivatives are positive, such that both policies are socially desirable. A merger rule that raises (beneficial) entry incrementally above $k_0$ is socially preferred to an entry subsidy having the same impact when $\left.\frac{\partial W}{\partial k_M}\right|_{k_M=k_0} > \left.\frac{\partial W}{\partial k_E}\right|_{k_E=k_0}$, i.e. for

$$\frac{(1+\delta)}{2K}\left(R - \lambda - \frac{C_D - C_2 - \lambda\Delta\Pi}{b\Delta\Pi}\right) + \frac{1}{2}\lambda\rho > 0.$$

The comparative statics in the proposition follow directly from this expression and are stated without further proof.

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