Efficiencies Defences for Mergers within a Dominant Group

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I. Introduction

Antitrust enforcement in a number of countries allows an efficiencies defence for horizontal mergers, joint ventures, specialization agreements and other horizontal arrangements.[1] These defences may be statutory, jurisprudential or administrative. They involve, in essence, a balancing of real per unit cost savings (improvements in technical efficiency) resulting from a merger or agreement against its anticompetitive effects.

In an earlier paper (Bian and McFetridge, 2000), we proposed four alternative interpretations of the efficiencies defence for horizontal mergers and specialization agreements provided in Sections 96 and 85 respectively of Canada's *Competition Act*. We called these four interpretations the total surplus standard, the price standard, the weighted surplus standard and the Hillsdown standard.. In the simplest terms, the total surplus standard allows any arrangement that does not reduce total surplus. The price standard allows any arrangement that does not increase price. The weighted surplus standard typically weights consumers surplus more heavily than profits and allows any arrangement that does not reduce weighted surplus. The Hillsdown standard, suggested by Canada's Competition Tribunal in its Hillsdown decision, allows any arrangement that entails cost savings in excess of losses in consumer surplus.

In our earlier paper, we derived and tabulated closed-form expressions for the respective percentage reductions in long-run marginal cost required for a merger or specialization agreement to satisfy each of the four efficiencies standards described above as well as a profitability constraint. We expressed these critical rates of cost reduction in terms of the number of firms in the relevant market prior to the merger, the pre-merger elasticity of market demand, a conduct parameter and a spillover parameter which reflects the extent to which efficiencies realized by the merged entity are replicated by competitors. We showed that the percentage reduction in marginal cost required to satisfy either the price standard (used by U.S. antitrust authorities) or the Hillsdown standard is frequently much higher than is required for a profitable, total surplus-increasing merger. The implication is that the adoption of either of these interpretations of Sections 96 and 85 would likely preclude a significant number of total surplus-increasing mergers or specialization agreements.

In this paper we offer a simple but useful extension of our earlier results. In Bian and McFetridge (2000), we assumed pre-merger symmetry, Cournot behaviour (as a base case) and no threat of entry. In this paper, we allow the market to be comprised of a competitive fringe as well as an initially symmetric dominant group of Cournot oligopolists. We then find the critical rates of cost reduction required to satisfy the total surplus, price and weighted surplus standards as well as the profitability constraint for mergers within the dominant group. Specifically, we solve for the critical rates of cost reduction in terms of the number of firms in the dominant group prior to the merger, the pre-merger elasticities of market demand and fringe supply, the market

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[1]For a summary, see McFetridge (1999).

share of the fringe and a spillover parameter which reflects the extent to which efficiencies realized by the merged entity are replicated by other members of the dominant group. While our analysis applies to specialization agreements, joint ventures and other horizontal agreements as well as to horizontal mergers, for simplicity, we set our discussion in a merger context.

Allowing for the existence of a competitive fringe adds to the realism and applicability of our model without adding to its complexity. Indeed, insofar as the price and total surplus standards and the profitability constraint are concerned, it turns out that allowing for a competitive fringe is merely a matter of replacing the elasticity of market demand with the elasticity of dominant group residual demand in the critical cost reduction expressions reported in our earlier paper. This is also true of the weighted surplus standard for some weighting schemes. For other weighting schemes, the addition of a competitive fringe changes the expression for the critical rate of cost reduction considerably.

As far as realism and applicability are concerned, it has been observed that there typically exist groupings of large firms and small firms within industries, that the two groups tend to behave differently especially with respect to the incidence of entry and exit and that while there is mobility between the two groups, the process is slow (Baldwin, 1995). It has also been observed that in antitrust case analysis it is often possible to identify only the larger firms in a market. It is then assumed that the balance of the market is supplied by so-called fringe participants which are not individually identified (Adelman, 1969). These fringe firms are generally assumed to be price-takers, hence the term "competitive fringe." There is some cross-sectional evidence to the effect that competition from fringe firms does constrain the exercise of market power (either unilateral or joint) by the largest firms in an industry (Gisser, 1986, 1989). The relative size of the competitive fringe as well as its ability to expand are often at issue in merger cases. This was true of both the *Hillsdown* and *Superior Propane* cases in Canada.[2]

The short-run elasticity of fringe supply depends on the production technology and on the extent of excess capacity within the fringe. The long-run elasticity of fringe supply depends on the consequences of entry into the fringe. If the fringe is characterized by constant cost, the long-run elasticity of fringe supply is infinite and mergers within the dominant group have no long-run price or output effect. If the fringe is subject to increasing costs (decreasing returns to scale, external to individual fringe firms but internal to the fringe itself), the long-run elasticity of fringe supply is finite and positive. In this sense, the assumptions we make regarding the elasticity of fringe supply for purposes of merger simulation imply something about both the

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[2] In *Hillsdown*, the fringe was comprised of smaller scale and specialized renderers as well as vertically integrated meat processors with small amounts of non-captive rendering business. See the Tribunal's decision, www.ct-tc.gc.ca/english/cases/hillsdow/155_a.pdf, pp.46-47 and pp.73-74. In *Superior*, the fringe was comprised of local (as opposed to national) propane distributors. See the Affidavit of John Pecman, www.ct-tc.gc.ca/english/cases/propane/001_b.pdf, pp. 10-14 and the response of Superior Propane and ICG Propane, www.ct-tc.gc.ca/english/cases/propane/023.pdf.

likelihood of new entry into the fringe and the ability of existing members of the fringe to expand.

While we assume Cournot behaviour within the dominant group in this paper, this could be modified to allow for more or less aggressive rivalry as we did in our earlier paper. There are a number of papers which make use of the assumption of Cournot behaviour within the dominant group (Howse, 1977; Gisser, 1986, 1989; Dickson, 1988 and; Willner, 1989).

Among the conclusions we can draw from our analysis are the following. First, given the number of members of the dominant group, the percentage reduction in marginal cost required to satisfy any of the interpretations of the efficiencies defence we examine decreases as the pre-merger fringe market share and elasticity of supply increase. Pre-merger fringe share and supply elasticity are substitutes in the sense that various combinations of them yield the same critical rate of cost reduction. The critical rate of cost reduction is, however, more responsive to changes in (pre-merger) fringe market share than to changes in (pre-merger) fringe supply elasticity.

Second, greater fringe competition pre-merger reduces the efficiency gain required to satisfy the price and total surplus standards in the same proportion. As a consequence, the relative burdens of satisfying the price standard and total surplus standards remain unchanged. Depending on the weighting scheme, the relative burden of satisfying the weighted surplus standard may either increase or remain unchanged.

Third, the introduction of a competitive fringe possibly composed of small businesses poses further complications for advocates of the use of distributional weights. Persuasive cases can be made for weighting fringe producers surplus either the same as consumers surplus or the same as the profits of the dominant group or somewhere in between. The choice of weights can make a large difference in the critical rate of cost reduction.

Fourth, the allocation of the remaining competitors between the dominant group and the fringe can matter. Our model implies that, for fringe supply elasticities in excess of (approximately) one, altering the pre-merger market structure by replacing a member of the dominant group with a competitive fringe of the same size decreases the critical rate of cost reduction. This result holds for any of the proposed efficiencies standards.

II. Market Equilibrium Before and After Merger

We assume homogenous product with a linear inverse market demand function, $P = a - bQ_t$ where Q_t is total market demand. Prior to the merger, the industry is assumed to be comprised of a dominant group of $n + 1$ firms with constant and identical marginal costs, c_0, and a competitive fringe with a supply function $Q_f = (P - g) / f$. The residual demand facing the dominant group is $Q_r = Q_t - Q_f$. We assume Cournot behaviour within the dominant group. The fringe firms are price-takers.

On these assumptions, the pre-merger market price is:

$$P_0 = \frac{[(a-c_0) + (g-c_0)b/f]}{(1 + b/f)(n + 2)} + c_0 \qquad \textbf{(1)}$$

We follow standard practice in defining the pre-merger elasticity of residual demand facing the dominant group as:[3]

$$\eta_r = [\eta_t + s_0\eta_f] / (1 - s_0) \qquad \textbf{(2)}$$

where η_r = pre-merger elasticity of residual (dominant group) demand
η_t = pre-merger elasticity of total (market) demand;
η_f = pre-merger elasticity of fringe supply and;
s_o = pre-merger fringe market share.

The parameters a, b, f and g can be expressed in terms of the elasticities defined above. Specifically, we have $b/f = s_0 \eta_f / \eta_t$; $g = P_0 (\eta_f - 1) / \eta_f$ and; $a = P_0(\eta_t + 1)/\eta_t$. When the elasticities of market demand and fringe supply and the fringe share are used to define the structure of the market, the parameters a, b, f and g are endogenous.

Substituting for the elasticities defined above in equation (1) yields:

$$P_0 = \frac{(n+1)\eta_r c_0}{\eta_r(n+1)-1} \qquad \textbf{(3)}$$

Noting that the pre-merger elasticity of market demand, η_t, can be written as $(P_0 /(a - P_0)$, we write pre-merger market demand, $Q_{t\,o}$ as:

$$Q_{t0} = \frac{a - P_0}{b} = \frac{P_0}{\eta_t\ b} = \frac{(n + 1)c_0\eta_r}{b[(1-s_0)\eta_r - s_0\eta_f][\eta_r\ (n + 1) - 1]} \qquad \textbf{(4)}$$

Recognizing that the pre-merger output of the dominant group, Q_r , is $(1 - s_0)Q_t$ and that the pre-merger output of any member of the dominant group, q_0, is $Q_r / (n+1)$ and defining the pre-merger profits of any member of the dominant group, π_0, as $(P_0 - c_0)q_0$, we can write the pre-

[3]See Church and Ware (2000, pp.125-6) and Carlton and Perloff (1999, http://occ.awlonline.com/bookbind/pubbooks/ carlton_awl/chapter4/deluxe.html)

merger profits of any members of the dominant group as:

$$\pi_0 = \frac{(1-s_0)\eta_r}{b[(1-s_0)\eta_r - s_0\eta_f]}\left[\frac{c_0}{\eta_r(n+1)-1}\right]^2 \qquad \textbf{(5)}$$

Pre-merger consumers surplus is:

$$CS_0 = \frac{b}{2}Q_{t0}^2 = \frac{1}{2b}\left[\frac{(n+1)\eta_r c_0}{[(1-s_0)\eta_r - s_0\eta_f][\eta_r(n+1)-1]}\right]^2 \qquad \textbf{(6)}$$

Pre-merger fringe producers surplus is:

$$FPS_0 = \frac{f}{2}Q_{f0}^2 = \frac{s_0}{2b[(1-s_0)\eta_r - s_0\eta_f]\eta_f}\left[\frac{(n+1)\eta_r c_0}{\eta_r(n+1)-1}\right]^2 \qquad \textbf{(7)}$$

Pre-merger total surplus is the sum of consumers surplus, the profits of the dominant group and the producers surplus of the fringe:

$$W_0 = CS_0 + (n+1)\pi_0 + FPS_0 \qquad \textbf{(8)}$$

Assume now that any two members of the dominant group merge, leaving the dominant group with n members. The merger enables the merged entity to realize efficiency gains which take the form of a α (x100) percent reduction in its (long-run) marginal cost. The other n - 1 members of the dominant group are able to replicate a fraction (χ) of the efficiencies realized by the merged entity so that each of them experiences a $\chi\alpha$ percent reduction in marginal cost. We assume that fringe firms are not able to replicate any of the efficiencies realized by the merged entity.

The post-merger market price is:

$$P_m = \frac{\dfrac{(n+2)c_0}{[\eta_r(n+1)-1]} - \alpha c_0[1+\chi(n-1)]}{(n+1)} + c_0 \qquad \textbf{(9)}$$

Substituting the post-merger market price in the market demand and fringe supply functions yields post-merger market demand and fringe supply, Q_{tm} and Q_{fm} respectively. The difference between these two is the post-merger output of the dominant group. If the non-merging members of the dominant group are not able to replicate all the efficiency gains realized by the merged entity, ($\chi < 1$), the dominant group is not symmetric post-merger. The merged entity will have a larger market share and profit than the non-merging members of the dominant group.

The merged entity's profit is:

$$\pi_m = \frac{c_0^2(1-s)\eta_r}{b(n+1)^2[(1-s_0)\eta_r - s_0\eta_f]}\left[\frac{(n+2)}{(n+1)\eta_r - 1} + \alpha(n - \chi(n-1))\right]^2 \qquad \textbf{(10)}$$

The total post-merger profits of all non-merging members of the dominant group are:

$$\Pi_m = \frac{(n-1)c_0^2(1-s_0)\eta_r}{b(n+1)^2[(1-s_0)\eta_r - s_0\eta_f]}\left[\frac{(n+2)}{(n+1)\eta_r - 1} + \alpha(2\chi - 1)\right]^2 \qquad \textbf{(11)}$$

Post-merger fringe producers surplus is:

$$FPS_m = \frac{f}{2}Q_{fm}^2 = \frac{c_0^2 s_0\eta_f}{2b(n+1)^2[(1-s_0)\eta_r - s_0\eta_f]}\left[\frac{(n+1)^2\eta_r + \eta_f}{[\eta_r(n+1) - 1]\eta_f} - \alpha(1 + \chi(n-1))\right]^2 \qquad \textbf{(12)}$$

Post-merger total producers surplus is the sum of the profits of the merged entity (equation (10)), the profits of non-merging members of the dominant group (equation (11)) and fringe producers surplus (equation (12)):

$$PS_m = \pi_m + \Pi_m + FPS_m \qquad \textbf{(13)}$$

Post-merger consumers surplus is:

$$CS_m = \frac{c_0^{\,2}}{2b(n+1)^2}\left[\frac{(n+2)m\eta_r - s_0(\eta_r+\eta_f)}{[(1-s_0)\eta_r - s_0\eta_f][\eta_r(n+1)-1]} + \alpha(1+\chi(n-1))\right]^2 \qquad \textbf{(14)}$$

Post-merger total surplus is the sum of equations (13) and (14).

III. The Efficiency Gain Required for a Profitable Merger

The percentage reduction in cost which the merged entity must realize in order to ensure that its post-merger profits are at least as high as the sum of the pre-merger profits of the merging firms is the value of α (x100) that equates the right hand sides of equations (5) and (10). The solution is:

$$\alpha_V = \frac{\sqrt{2}(n+1)-(n+2)}{[(1-\chi)(n-1)+1)][\eta_r(n+1)-1]} \qquad \textbf{(15)}$$

Equation (15) is identical to equation (8) in our earlier paper with the elasticity of dominant group residual demand replacing the elasticity of market demand. Equation (15) is negative for n = 1 implying that a merger leaving the dominant group with one member (a merger to dominance) is profitable with no synergies as long as the pre-merger fringe share is less than 100 percent and the fringe elasticity of supply is finite.

Equation (15) is positive for $n \geq 2$. This implies that, for mergers leaving the dominant group with two or more members, the realization of efficiency gains by the merged entity is necessary to ensure the profitability of the merger. The magnitude of the efficiency gains required for profitability increases with the extent to which these gains can be replicated by remaining rivals within the dominant group and decreases as the residual demand of the dominant group becomes more elastic.[4]

IV. The Efficiency Gain Required to Satisfy the Total Surplus Standard

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[4] The intuition underlying the negative relationship between the elasticity of demand and the percentage cost reduction required for profitability is that, with linear demand, the higher is the demand elasticity, the higher is the pre-merger marginal cost of dominant group members, c_0, relative to demand and the greater is cost relative to profit (and surplus). As a consequence, the percentage reduction in cost required to offset the loss in profit resulting from a given merger decreases.

In order to satisfy the total surplus standard, the sum of dominant group profits, fringe producers surplus and consumers surplus must be at least as high after the merger as it was prior to the merger. Thus, the rate of cost reduction which the merged entity must realize in order to keep total surplus from falling is the value of α that equates the reduction in consumers surplus with the sum of the increases in dominant group profits and fringe producers surplus. The solution is:

$$\alpha_W = \frac{\sqrt{N_2^2 + 4N_1N_3} - N_2}{2N_1}\left[\frac{1}{\eta_r(n+1)-1}\right] \qquad \textbf{(16)}$$

where: $N_1 = [\chi(n-1)+1]^2 + 2[n-\chi(n-1)]^2 + 2(n-1)(2\chi-1)^2$
$N_2 = 2(n+2)^2[\chi(n-1)+1]$
$N_3 = 2n+3$

Equation (16) is the same as equation (9) in our earlier paper with the elasticity of dominant group residual demand substituted for the elasticity of market demand. Equation (16) implies that, given the number of firms in the dominant group prior to the merger, the percentage cost reduction the merged entity must realize in order to keep total surplus from declining post-merger is a decreasing function of both the pre-merger fringe market share and the pre-merger fringe elasticity of supply.

The intuition behind this result is that in the dominant group case, the exercise of market power post-merger results in both a demand distortion and a production distortion. As a consequence, there are two deadweight loss triangles, one under the market demand function and one under the fringe supply function. Given that, for any post-merger price increase, the decrease in dominant group residual demand is the sum of the (absolute value of) the decrease in market demand and the increase in fringe supply, the sum of the areas of the deadweight loss triangles under the market demand and fringe supply functions respectively, must be equal to the area of the deadweight loss triangle under the dominant group residual demand function. In essence, with linear market demand and fringe supply functions, the trade-off model for mergers (or specialization agreements) within a dominant group is the same as the conventional Williamson (1968, 1977) trade-off model with the deadweight loss triangle under the dominant group residual demand function replacing the deadweight loss triangle under the market demand function.

V. The Efficiency Gain Required to Satisfy the Price Standard

The price standard requires that the post-merger price in the relevant market not exceed the pre-merger price or, equivalently, that there be no decrease in consumers surplus. The percentage cost reduction required to keep consumers surplus from declining is the value of α for

which the change in consumers surplus is zero. The solution is:

$$\alpha_P = \frac{1}{[\chi(n-1)+1][\eta_r(n+1)-1]} \tag{17}$$

Equation (17) is identical to equation (10) in our earlier paper with the elasticity of market demand replaced by the elasticity of dominant group residual demand. Equation (17) implies that, given the number of firms in the dominant group prior to the merger, the percentage cost reduction that the merged entity must realize in order to keep the market price from rising post-merger is a decreasing function of both the pre-merger market share of the fringe and the pre-merger elasticity of fringe supply.

VI. The Efficiency Gain Required to Satisfy the Weighted Surplus Standard

While the use of distributional weights has its advocates, we know of no basis in economics for choosing these weights and we do not support this approach. Moreover, once the principle that surplus is valued differently in different hands is accepted, there is no reason to stop at "consumers" and "producers" in aggregate. Fringe producers surplus need not be weighted the same as dominant group profits. Indeed, the importance attached by many governments to the promotion of small business might be taken to imply that fringe producers surplus be weighted more highly than dominant group profits and possibly as highly as consumers surplus.[5] For this reason, our model distinguishes among three groups, consumers, the dominant group and the competitive fringe for purposes of distributive weighting. Consumers surplus has a weight of 1, dominant group profit has a weight of ω, $0 < \omega < 1$, and fringe producers surplus has a weight of ω', $0 < \omega' < 1$. The weighted surplus standard is satisfied if:

$$CS_0 - CS_m \leq \omega\ [\pi_m + \Pi_{mn} - (n+1)\pi_0] + \omega'\ (FPS_m - FPS_0) \tag{18}$$

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[5] In a Canadian context, Section 1.1 of the Competition Act states that the objectives of the Act include promoting the efficiency and adaptability of the Canadian economy, expanding opportunities for small and medium-sized enterprises and providing consumers with competitive prices and product choices. The Competition Tribunal opined in its *Hillsdown* decision that all these objectives should be given equal weight. If fringe producers tend to be small and medium sized Canadian businesses, the Act could be taken to imply that fringe producers surplus should be weighted more heavily than dominant group profits and perhaps as heavily as consumers surplus. This interpretation of Act would be reinforced by the highly favourable tax treatment accorded small business in Canada. See McKenzie, Mansour and Brûlé (1998, Table 3.1.A).

Solving for the value of α at which (18) holds as an equality yields α_S:

$$\alpha_S = \frac{\sqrt{M_2^2 + 4M_1M_3} - M_2}{2M_1}\left[\frac{1}{\eta_r(n+1)-1}\right] \qquad \textbf{(19)}$$

where: $M_1 = [\chi(n-1)+1]^2 \{1- (1-\omega')s_0\eta_f/[(1-s_0)\eta_r]\}+2\omega\{[n-\chi(n-1)]^2+(n-1)(2\chi-1)^2\}$
$M_2 = 2[\chi(n-1)+1]\{(n+2)(n+2\omega)+(1-\omega')s_0[(n+1)^2+\eta_f]\}$
$M_3 = (2n+3)+2(1-\omega)[n(n+1)-1]+(1-\omega')[2(n+1)^2s_0\eta_r +s_0\eta_f]/[(1-s_0)\eta_r]$

The weighted surplus standard nests the total surplus and price standards. If $\omega = \omega' = 1$, profit and fringe producers surplus have the same weight as consumers surplus and equation (19) collapses to equation (16), the total surplus standard. If $\omega = \omega' = 0$, profit and fringe producers surplus have no weight and equation (19) collapses to equation (17), the price standard.

Of the many assumptions that might be made regarding the values of ω and ω', we consider two. First, we assume that the surplus of consumers and the competitive fringe have equal weights, i.e. $\omega'=1$, and are weighted more heavily than dominant group profits, $0 < \omega < 1$. In this case, equation (19) is the same as equation (13) in our earlier paper with the dominant group elasticity of residual demand replacing the elasticity of market demand and allowing for a competitive fringe does not change the relative burden of meeting the weighted surplus standard.
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The reason for this result is that when fringe producers surplus is weighted the same as consumers surplus, transfers between consumers and fringe producers net out. Only transfers between consumers and members of the dominant group matter. This implies that it is the area under the residual demand function between the pre- and post-merger prices which is the effective measure of the loss in consumers surplus due to the merger.

The second version of the weighted surplus standard we consider is that dominant group profits and the fringe producers surplus have the same weight, that is, $0 < \omega = \omega' < 1$. In this case, equation (19) is not a simple transformation of equation (13) in our earlier paper. In this regard, it differs from the first version of the weighted surplus standard we considered as well as the profit constraint and the total surplus and price standards. For them, only the residual demand schedule is relevant. For this interpretation of the weighted surplus standard, both the residual demand and fringe supply schedules are relevant and the introduction of a competitive fringe changes the burden of satisfying it relative to the total surplus and price standards. This is illustrated in the simulations discussed below.

VII. The Responsiveness of the Critical Rate of Cost Reduction to Changes in the Structure of the Fringe

It is apparent from Equations (15), (16), (17) and (19) (when $\omega' = 1$) that the market share

and supply elasticity of the fringe exert their respective effects on the critical rates of cost reduction through the elasticity of residual demand. By differentiating equation (2) we can show that the elasticity of residual demand is, in turn, more responsive to a given percentage change in the pre-merger share of the fringe than to the same percentage change in the pre-merger elasticity of fringe supply. More formally:

$$\frac{\partial\eta_r / \partial\eta_f \cdot \eta_f / \eta_r}{\partial\eta_r / \partial s_0 \cdot s_0 / \eta_r} = \frac{(1 - s_0)}{(1 + \frac{\eta_t}{\eta_f})} < 1 \qquad \textbf{(20)}$$

In the case of the weighted surplus standard when $\omega' \neq 1$, the relationship between the structure of the fringe and the critical rate of cost reduction is much more complex. We confine our analysis of it to the simulations reported below.

VII. Efficiencies Required to Offset the Anti-competitive Effects of Mergers Leaving a Single Dominant Firm

In this section we use the equations (15), (16), (17) and (19) derived above to calculate the percentage reduction in marginal cost required to offset the anti-competitive effect of a merger between the only two members of the dominant group under various assumptions about the pre-merger market share of the fringe and the elasticities of market demand and fringe supply. In this case, the merger is profitable regardless of whether the merged entity realizes any efficiency gains so that our analysis focuses on the three alternative interpretations of the efficiencies defence.

Our simulation results are reported in Table 1. The first line of the table is the case of no fringe. The cost savings required to meet the three efficiencies standards in this case are the same as in our earlier paper (Bian and McFetridge, 2000, Table 1). We then allow for a competitive fringe with three different pre-merger market shares and three different elasticities of supply. We assume for purposes of illustration that the weight of dominant group profits (ω) is 70 percent of the weight of consumers surplus. The weight of fringe producers surplus (ω') is assumed to be either the same as dominant group profits or the same as consumers surplus.

In the cases of the total surplus and price standards, the effect of increasing the pre-merger fringe share or elasticity of supply is to reduce the efficiency gains required to satisfy both standards and to do so in equal proportions. For example, the efficiency gains required to satisfy either the price or total surplus standard are just over half as large when there is a competitive fringe with a 30 percent pre-merger market share and a supply elasticity of one as when there is no competitive fringe. This is also true of the weighted surplus standard when fringe producers surplus has the same weight as consumers surplus.

The introduction of a competitive fringe also reduces the efficiency gain required to satisfy the weighted surplus standard when fringe producers surplus has the same weight as dominant group profits but does so by a smaller percentage. For example, the efficiency gains required to satisfy this interpretation of the weighted surplus standard are just under 60 percent as large when there is a competitive fringe with a 30 percent pre-merger market share and a supply elasticity of one as when there is no competitive fringe. Thus, the introduction of a competitive fringe reduces the absolute burden but increases the relative burden of meeting this interpretation of the efficiencies defence.

Other things being equal, allowing for a competitive fringe increases the likelihood of a successful efficiencies defence. The question remains as to whether there is anything to be gained by identifying additional competitors and including them in the dominant group as opposed to treating all outsiders as a competitive fringe. To shed some light on this question, we compare the efficiencies required to defend a merger between two of three symmetric Cournot oligopolists, with the cost savings required to defend a merger between two Cournot duopolists facing a competitive fringe which accounts for one-third of the market.

The results of this analysis are reported in Table 3. The first four lines in the table we compare the efficiencies required to defend a merger leaving two Cournot duopolists in the relevant market with a merger required to defend a merger leaving a single dominant firm with a competitive fringe. The difference in efficiencies required under the two market structures depends on the efficiencies standard. For example, substituting a competitive fringe for an equal-sized dominant group member reduces the efficiency gain required to satisfy the price standard for any positive fringe supply elasticity. Under the other standards, substituting a competitive fringe for an equal-sized dominant group member reduces the efficiency gain required to defend a merger for fringe supply elasticities between one and two.

The intuition behind this result is that there are two offsetting forces at work. As price takers, fringe members are more aggressive competitively than the (Cournot) members of the dominant group. This is offset, however, by the assumption that fringe members face an upward sloping marginal cost schedule while the marginal cost of dominant group members is constant. Thus, in our model, whether competition from within the dominant group is a more effective source of discipline on the merged entity than competition from outside it depends on the aggregate supply elasticity of the outsiders.

VIII. Efficiencies Required to Offset the Anti-competitive Effects of Mergers Leaving Two or More Jointly Dominant Firms

In this section we assume for purposes of illustration that there are two firms remaining in the dominant group post-merger. We then calculate the percentage reduction in marginal cost required both for profitability and to satisfy each of the three efficiencies standards described above under various assumptions about the pre-merger market share of the fringe and the

elasticities of market demand and fringe supply. We assume initially that the other member of the dominant group is unable to replicate any of the efficiencies realized by the merged entity so that the latter is the largest firm in the market post-merger. We then assume that all merger-induced cost savings cost savings spill over within the dominant group so that the dominant group remains symmetric post-merger.

Our simulations are reported in Table 2. When there are no spillovers, the profitability constraint is not binding. A merger which increases total surplus is also profitable. The efficiency gains required to satisfy either the price or total surplus standard when there is a competitive fringe with a 30 percent pre-merger market share and a supply elasticity of one are about 56 percent as large as when there is no competitive fringe. This is also true of the weighted surplus standard when fringe producers surplus has the same weight as consumers surplus. When fringe producers surplus has the same weight as dominant group profits, the efficiency gains required to satisfy the weighted surplus standard about 64 percent as large when there is a competitive fringe with a 30 percent pre-merger market share and a supply elasticity of one as when there is no competitive fringe. Again, the introduction of a competitive fringe reduces the absolute burden but increases the relative burden of meeting this interpretation of the efficiencies defence.

With a 100 percent spillover of efficiency gains within the dominant group, the profitability constraint is binding. Any merger that is profitable also increases total surplus and satisfies either interpretation of the weighted surplus standard. The efficiencies required for a profitable, total surplus-increasing merger are, again, insufficient to satisfy the price standard.

We also address the question of whether it matters whether remaining competitors (outsiders) are fringe or dominant group members. In this case, this involves the comparison of the efficiencies required to defend a merger leaving three Cournot duopolists in the relevant market with a merger required to defend a merger leaving a Cournot duopoly dominant group with a competitive fringe. This comparison is reported in Table 3. Again we find that substituting a competitive fringe for an equal-sized dominant group member reduces the efficiency gain required to defend a merger if fringe supply is relatively elastic.

IX. Conclusions

Most industries have a set of fringe participants. The ability of fringe participants to constrain possible post-merger price increases is frequently at issue in merger cases. The same issue is likely to arise in cases involving joint ventures and specialization agreements. Simulation models should allow for both the existence of a competitive fringe and for the possibility of fringe expansion in the event of price increases post-merger. Our paper suggests a simple way of doing this. We model the relevant market as a dominant group with a competitive fringe. Dominant group members play Cournot although it is possible to alter the model to allow for more or less aggressive within-group competition. Fringe firms are price takers and the

aggregate competitive impact of the fringe depends on its pre-merger market share and elasticity of supply.

We derive the percentage reduction in long-run marginal cost required to satisfy three suggested interpretations of an efficiencies defence, the total surplus standard, the price standard and the weighted surplus standard (with two different weighting schemes) as well as the profitability constraint. With the exception of one version of the weighted surplus standard, allowing for fringe competition in our simulation model is simply a matter of using (a higher) elasticity of dominant group residual demand in place of the elasticity of market demand. The elasticity of residual demand increases with both the elasticity of fringe supply and the fringe market share pre-merger but it is more responsive to the fringe market share.

Given the number of members of the dominant group, the effect of allowing for fringe competition is to reduce, possibly substantially, the percentage reduction in marginal cost required both for a profitable merger and to satisfy the proposed efficiencies standards we examine. Allowing for fringe competition does not change the relative burden of satisfying the profitability constraint and either the total surplus or price standards. It does increase the relative burden of satisfying one version of the weighted surplus standard.

We also find that, at least within the context of our model, if fringe supply is relatively inelastic, it may not matter very much whether outsiders in a horizontal merger are identified individually or are simply lumped together as a competitive fringe. If, for example, we compare the efficiencies required to defend a merger between two of three symmetric Cournot oligopolists, with the cost savings required to defend a merger between two Cournot duopolists facing a competitive fringe which accounts for one-third of the relevant market prior to the merger, they tend to be roughly similar for low elasticities of fringe supply. If fringe supply is relatively elastic, however, substituting a competitive fringe for an equal-sized dominant group member reduces the efficiency gain required to defend a merger under all the efficiencies standards we analyze.

Table 1

Percentage Cost Reduction for an Efficiencies Defence of a Merger to Dominance

Fringe Market Share (%)	Fringe Supply Elasticity	Market Demand Elasticity	Profitability Constraint %	Price Standard %	Total Surplus Standard %	Weighted Surplus Standard: $\omega = \omega' = 0.7$ %	Weighted Surplus Standard: $\omega = 0.7$, $\omega' = 1$ %
0	0	2	NA	33.33	8.87	12.22	12.22
10	0	2	NA	29.03	7.72	10.94	10.64
20	0	2	NA	25	6.65	9.73	9.16
30	0	2	NA	21.21	5.64	8.57	7.77
40	0	2	NA	17.65	4.69	7.47	6.47
10	1	2	NA	27.27	7.25	10.28	10.00
20	1	2	NA	22.22	5.91	8.66	8.14
30	1	2	NA	17.95	4.77	7.27	6.58
40	1	2	NA	14.29	3.8	6.06	5.24
10	2	2	NA	25.71	6.84	9.70	9.42
20	2	2	NA	20	5.32	7.80	7.33
30	2	2	NA	15.56	4.14	6.31	5.70
40	2	2	NA	12	3.19	5.10	4.40

Source: Equations (15), (16), (17) and (19).

Table 2

Percentage Cost Reductions Required for an Efficiencies Defence of a Merger Resulting in Two Jointly Dominant Firms

Dominant Group Membership Pre-merger	Spillover (χ)	Fringe Market Share %	Fringe Supply Elasticity	Profitability Constraint %	Total Surplus %	Price Standard %	Weighted Surplus Standard: $\omega = \omega' = .7$ %	Weighted Surplus Standard: $\omega = .7$, $\omega' = 1$ %
3	0	0	0	2.43	4.09	20	6.69	6.69
3	0	10	0	2.14	3.61	17.65	6.12	5.91
3	0	20	0	1.87	3.14	15.38	5.55	5.15
3	0	30	0	1.6	2.7	13.21	5.00	4.42
3	0	10	1	2.02	3.41	16.67	5.78	5.58
3	0	20	1	1.67	2.82	13.79	4.98	4.62
3	0	30	1	1.37	2.31	11.29	4.28	3.78
3	0	10	2	1.92	3.23	15.79	5.48	5.28
3	0	20	2	1.52	2.55	12.5	4.52	4.18
3	0	30	2	1.2	2.02	9.86	3.74	3.30
3	1	0	0	4.85	2.16	10	3.60	3.60
3	1	10	0	4.28	1.9	8.82	3.29	3.17
3	1	20	0	3.73	1.66	7.69	2.99	2.77
3	1	10	1	4.04	1.8	8.33	3.11	3.00
3	1	20	1	3.35	1.49	6.9	2.68	2.48
3	1	10	2	3.83	1.7	7.89	2.95	2.84
3	1	20	2	3.03	1.35	6.25	2.43	2.25

Source: Equations (15), (16), (17) and (19).

Table 3

The Effect of Substituting Fringe for Within-Group Competition on the Percentage Cost Reduction Required under Alternate Standards

Dominant Group Membership Pre-merger	Spillover (χ)	Fringe Share %	Fringe Supply Elasticity	Profitability Constraint %	Total Surplus %	Price Standard %	Weighted Surplus Standard: $\omega = \omega' = .7$ %	Weighted Surplus Standard: $\omega = .7$, $\omega' = 1$ %
2	0	33.33	0	NA	5.32	20	8.20	7.33
2	0	33.33	1	NA	4.43	16.67	6.85	6.11
2	0	33.33	2	NA	3.80	14.29	5.88	5.24
3	0	0	0	2.43	4.09	20	6.69	6.69
3	0	25	0	1.73	2.92	14.29	5.28	4.78
3	0	25	1	1.52	2.55	12.5	4.62	4.18
3	0	25	2	1.35	2.27	11.11	4.11	3.72
4	0	0	0	3.13	2.39	14.29	4.53	4.53

Source: Equations (15), (16), (17) and (19).

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