WORKING PAPERS

ANTITRUST POLICY FOR DECLINING INDUSTRIES

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WORKING PAPER NO. 175

October 1989

BUREAU OF ECONOMICS
FEDERAL TRADE COMMISSION
WASHINGTON, DC 20580

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* The analyses and conclusions set forth in this paper are those of the authors and do not necessarily reflect the views of other members of the Bureau of Economics, other Commission staff, or the Commission. The authors wish to thank Pauline Ippolito and an anonymous reviewer for their assistance.

ABSTRACT

In the 1980s, the antitrust enforcement agencies have rejected the idea that mergers in declining industries should receive special consideration. This paper develops reasons why declining industry mergers should not be subject to a high degree of antitrust scrutiny. It argues that the gains to consumers through such interventions suggested by the "price test" are illusionary. Further, recent game-theoretic literature implies that important efficiencies are available through merger in declining industries. The paper presents a method for determining which type of industry structures are likely to be subject to these efficiencies.

I. INTRODUCTION

In the 1980s, there has been an ongoing debate in the antitrust community concerning the appropriate policy towards mergers in declining industries. Companies have asked the Department of Justice (DOJ) and Federal Trade Commission (FTC) to look favorably on mergers in declining markets to generate benefits for stockholders. Under the Reagan administration, the antitrust agencies rejected these requests, leaving firms in declining industries with only the ability to appeal to the special circumstance considerations currently used in merger analysis.

We believe it is time to reconsider this decision. In particular, there are two attributes of a declining industry that merit detailed examination. First, the traditional analysis ignored the special consideration that price increases and efficiencies deserve in the context of a declining industry. Second, recent economic literature suggests that the market solution to the declining industry problem (given the government has proscribed mergers) may not be efficient. Thus, current policy towards declining industry mergers may be imposing real welfare costs on society.

This paper highlights the efficiency reasons for a more permissive failing industry antitrust policy. In Section II, we review the existing literature on declining industries and antitrust in order to examine the current policy of focusing on post-acquisition price and giving declining industry mergers no special consideration. Section III discusses the potential for declining industry mergers to lead to anticompetitive price increases. We then consider the welfare tradeoff in declining industries as a special case of the classic Williamson (1968) analysis. We conclude that the price-based merger policy may be mistaken when applied to mergers in declining industries. Dynamic game theory models of exit patterns in declining

industries are evaluated in Section IV. We note that in the face of an active merger policy, it is not guaranteed that the least efficient firm or plant will exit a declining industry, because the act of exit confers external benefits on the remaining firms. We then present a method for determining which type of industry structures are likely to be subject to these efficiencies. We conclude that efficiency considerations suggest the government implement a permissive declining industry merger policy.

II. REVIEW OF THE LITERATURE

A. Background for the Declining Industry Problem

The concept of special antitrust consideration for particular firms involved in mergers can be traced back to the Supreme Court's *International Shoe* decision.[1] In this case, the Court created a failing firm defense that allows a firm to be sold to a rival when (1) but for the acquisition, the firm is doomed to exit the market and (2) no alternative purchaser exists. The failing firm defense is designed to allow a more efficient rival to take over a firm's assets as a last resort to keep the business in operation and thus minimize the transactions costs facing investors, customers and workers.

At first glance, it may appear that the failing firm defense should be sufficient for declining industries, because it creates an escape from the antitrust laws for firms in danger of business failure. This defense, however, is of little use when the problem involves the optimal approach to the removal of assets from an industry. In fact, the two prongs of the failing firm defense suggest that it is unlikely to apply in a declining industry. If the failing firm is in immediate danger of closing and no

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[1] *International Shoe Co. v. FTC*, 280 U.S. 291, 303-2 (1930).

alternative purchaser exists, the firms in a declining industry are likely to merely sit by and watch it exit. No firm will need to buy the business to close it down, because market forces are assumed to be leading to the closing.[2] Thus, the failing firm defense does not offer much help to declining industries.

Declining industries have also played a role in what has been loosely called "Industrial Policy". Under such a policy, the government accepts the role of masterminding the movement of resources from declining industries to growth industries. Thus, the government must identify declining industries and then facilitate the exit of resources from these markets. Due to various problems, Industrial Policy, at least in the U.S., appears to have fallen out of favor (see Schultze, 1983), although there is at least a small flicker of support for it (Katz and Summers, 1989).

In the United States, the antitrust laws were relaxed during the depression by the National Industrial Recovery Act (NIRA). Because NIRA led to higher prices for consumers and cartel profits for firms, it is generally considered a failure. Given that the NIRA policy applied to firms hurt by a general recession, its failure is not a strong argument against a relaxed merger standard for declining industries.[3]

In recent years, the Congress passed the Newspaper Preservation Act, which instituted a special antitrust policy for newspapers. This law allowed newspapers, with the approval of the Attorney General, to enter into joint

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[2] In a special case, Shughart and Tollison (1985) note that the more efficient firm would buy the less efficient firm in a declining industry, reduce its costs and increase output.

[3] Moreover, NIRA policies allowed firms to coordinate their actions, while a relaxed merger policy would only allow mergers to rationalize industry output to the competitive level.

production agreements to remain in business. The program was justified by pointing to the increase in economies of scale that was transforming the industry into a number of local natural monopolies (Carlson, 1982 at 671). Although the natural monopoly problem differs from a generic declining industry problem in that surviving firms are likely to be profitable, both situations require a rationalization of the number of competitors. By allowing joint production agreements, the government hoped to facilitate the exit of redundant production assets from the business, while maintaining some independence for the firms. Since only four firms used the program from its inception in 1970 to 1982 (Carlson at 692) and given the bureaucratic hurdles discussed by Carlson (at 680-683), it would appear to us that the program set too high a standard for firms to meet.

In conclusion, industrial policies for declining industries appear to be difficult to implement. Too broad like the NIRA, and they may lead to anticompetitive behavior. Too narrow like the Newspaper Preservation Act, and they may require bureaucratic paperwork that makes the program viable only for extreme cases. Thus, the experience with industrial policy has offered little direct hope of being efficiently applied to declining industries.

B. Current Antitrust Policy

The current merger policy is presented in the 1984 revision of the Department of Justice Merger Guidelines. In the statement accompanying this document, DOJ stated that it considered but declined to explicitly create a declining industry defense (1984 at S-16). The Guidelines, however, do discuss merger-specific efficiencies, lack of competitive significance, and failing firm considerations that may be used to justify a declining industry

merger.[4] Frankena and Pautler (1985 at 90) note that the FTC follows the same basic policy. Thus, it would appear useful to explore how the special considerations incorporated in the Guidelines could be applied to declining industries.

In practice, efficiency justifications for mergers are difficult to substantiate, because the antitrust authorities use a "clear and convincing" standard for merger-specific efficiencies. Because they involve predictions of how firms will change their operations in the future, by definition, such claims of efficiencies are speculative. By maintaining a high standard of proof (higher than that used for evaluating hypotheses with respect to the use of market power after a merger), the antitrust authorities are implicitly following the advice of Bork (1978) and Fisher and Lande (1983) in rejecting an explicit efficiencies defense policy. Given the high level of proof required, firms should not be optimistic that a merger otherwise perceived as offensive will be allowed because of the resulting efficiencies.

The competitive significance considerations may be used to approve a declining industry merger by analyzing a broad product market that includes as competitors the firms that have caused the industry to decline. For example, if a domestic industry is declining due to world competition, the use of a world market in place of a U.S. market may lower concentration below the threshold level used by the antitrust authorities. Thus, firms in industries where a broad market can be defined are more likely to be allowed to merge. On the other hand, firms in industries where the

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[4] On the other hand, the Guidelines (1984 at footnote 21, page S-12) suggest a declining industry is one factor that would suggest that entry is less likely. Thus, mergers in declining industries may be more likely to be challenged than mergers in growth industries.

Guidelines would focus directly on the declining market are unlikely to benefit from competitive significance considerations unless the acquired firm's business prospects are significantly worse than that of its rivals.[5] In general, there is no way to adjust the concentration statistic for an industry and decide not to challenge an otherwise apparently offensive transaction.

It is possible to infer additional details about current antitrust policy by observing government behavior. The weight of the evidence suggests that the government applies a price test in merger policy.[6] For example, the Reagan Administration's Merger Modernization Act of 1986 explicitly defines the ability to exercise market power as one or more firms maintaining prices above competitive levels for a significant period of time. FTC Chairman Daniel Oliver (1988) also explicitly endorsed a price test by identifying protecting consumers as preventing price increases or output reductions. One can interpret the price test as a simple summary statistic for the method of analysis described in the Guidelines. If the government concludes that prices will not rise after an acquisition, the deal is allowed to proceed, because either the merger raises no competitive concerns or the accepted efficiencies will lead to lower prices. On the other hand, if, as may be the case in the usual declining industry merger, prices are expected to rise after

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[5] The Guidelines list the situation of obsolete facilities in a market experiencing a long term decline as a specific example of when the competitive significance considerations are relevant.

[6] For a more detailed, but somewhat one-sided, discussion of this policy debate, see Lande (1988).

the merger, government enforcement action can be expected to protect consumers and their low prices.[7]

The economic justification for the price test appears to be based on Posner's (1975) interpretation of the Williamson (1968) tradeoff. Williamson called for a comparison of the efficiency savings from an antitrust policy (such as a decision to allow a merger) with the deadweight loss of increased monopoly pricing (the welfare loss to consumers of foregone consumption due to high prices). He ignored the transfer of surplus from consumers to producers caused by monopoly pricing. Posner (at 821) argues that the transfer and the efficiency benefits should be counted as part of the deadweight loss of monopoly, because firms would compete away these profits through socially wasteful rent-seeking behavior. For example, oligopolists would invest in cartel strategies to insure that they capture the available consumer surplus. In expected value terms, the resources expended (in the long run) on seeking oligopoly profits would equal the value of those profits. All of the resources expended in rent seeking would be lost to society, just like the deadweight loss of monopoly. Thus, any merger that leads to a price increase cannot benefit society. Of course, if prices fall, both consumers and some producers would be made better off and the merger would improve social welfare.

There is an assumption underlying this analysis that the antitrust agencies have failed to explicitly state. The real message of the Posner paper is that antitrust policy should keep price as low as possible given that

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[7] While we criticize the application of the price test to declining industries in this paper, we should point out that we feel it is a tremendous improvement from the previous antitrust policy of the 1960s and 1970s, which appeared to focus on whether competitors, rather than consumers, would be harmed as a result of a merger.

producers are allowed to make a competitive return on their investment. Let us say that the government was considering requiring General Motors and Ford to sell cars at their short run marginal cost. In the short run, GM and Ford would produce more cars, benefitting consumers. In the medium run, the car companies would drop out of the market, as they would not be able to cover their capital costs. In the long run, the government would eliminate the requirement (since consumers would demand new automobiles). GM and Ford would reenter the automobile industry. The stockholders of such companies, however, faced with the possibility of such future expropriations, would demand a higher return on their investment to cover this risk. This would result in higher long term prices for consumers.

In declining industries, the price test policy explicitly ignores the fact that prices are often below the long run competitive level and an upward price adjustment will occur in the long run. By enforcing a policy that prevents price from adjusting to the long-run competitive level, the government requires the firms in the market to suffer losses for a longer period of time. Thus, the same analysis used to justify the price test in normal industries may not apply in declining industries, because it ignores the long-term effect of expropriating capital from firms. The criticisms of the price test policy for a static model will be explored in the next section and for a dynamic model will be evaluated in the fourth section.

III. TRADITIONAL EFFICIENCIES AND DECLINING INDUSTRY MERGERS

A. Merger Policy in Declining Industries

Declining industries are an integral part of the free market system in which the economy constantly adjusts to provide consumers with the

maximum value of goods and services at minimum cost. In a world where all resources are perfectly mobile, any adverse shifts in supply or demand would generate economic losses that would induce firms to either exit or contract. Thus, the declining industry problem would quickly correct itself.

In the real world, assets are often sunk and thus have only minimal value in another use. A natural gas pipeline from off-shore gas wells may have no other use than shipping gas to shore and hence its cost is sunk.[8] It is the existence of sunk costs that creates the declining industry problem. After an adverse shift in either the supply or demand for a good produced with sunk costs, the sunk assets are fated to remain in the business until they depreciate or are rationalized (closed) through an acquisition. To an economist, this situation is not necessarily inefficient, because all assets are employed at their best use and consumers are served in a free market. Of course, businesses suffer losses as they sell product below long run cost, but these losses are incurred when the supply or demand shift reduced the value of their sunk capital.[9] Firms are compensated for this risk through their cost of capital which adjusts to guarantee firms the competitive expected return on investment.

B. Will Price Rise?

The antitrust authorities seem willing to assume that the reason for a declining industry merger is to raise prices. Using the short run monopoly model of Dowell (1984), however, it can be shown that because there is a

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[8] In contrast, the helicopter flying between the gas platform and the shore does not contribute to sunk cost, because if the demand for the services declines the helicopter can fly off and serve other users.

[9] On the other hand, if demand or cost conditions had shifted favorably, existing businesses would earn profits until new firms could enter and compete the profits back to the competitive level.

discontinuity in the relevant marginal cost curve, it is by no means certain firms will have the incentive to increase price after a merger.

After a shock to demand, firms in Figure 1 face a short run marginal cost curve equal to their variable costs up to their previous level of output Q_1 and equal to their full costs after that point. A firm (or group of firms) will face demand curve D_2 (lower than the pre-shock demand curve D_1) with marginal revenue MR_2. As Figure 1 shows, if the marginal revenue curve at Q_1 is greater than variable costs, then Q_1 will be the monopoly output and a firm will not find it profitable to reduce output.

The mathematical conditions for this to occur are as follows. Define the pre-shock price $P_1 = 1 = v+s$, where v is the proportion of variable costs and s is the proportion of sunk costs. Define d, the representation of the downward shock to demand, such that $P_1 - d = P_2$. We assume (as in Figure 1) that

(3-1) $\quad MR_2(Q_1) > v$

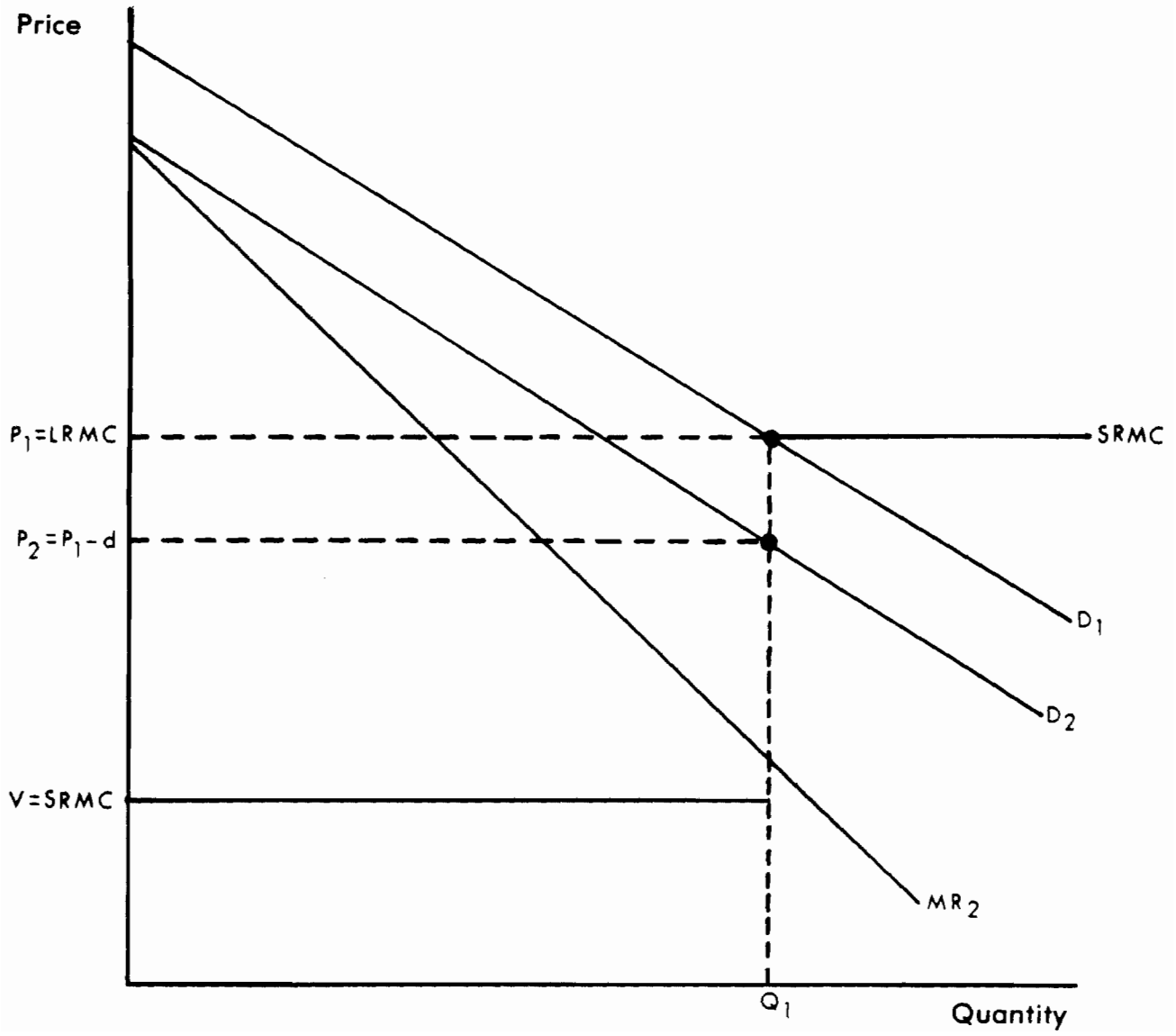
Let e_o equal the absolute value of the own elasticity of demand facing the relevant firm(s). We know that $MR_2(Q_1) = P_2 (1 - 1/e_o)$. Substituting into (3-1) and rearranging terms yields

(3-2) $\quad 1/e_0 < (P_2 - v)/P_2 = (s-d)/(s+v-d)$

Let MS equal the market share of the relevant firm(s). We also know that e_d, the industry elasticity of demand, equals e_0*MS. Substituting into (3-2) yields

Figure 1

Effect of Sunk Assets on Monopoly Price



(3-3) $1/e_d < [1 - (v/P_2)]/MS$

as the condition for a reduction in output not to occur.

For instance, let us assume that the market share of a combined firm is 60 percent, the market price downturn is 5 percent, and the percentage of industry short run variable costs is equal to 50 percent. In this circumstance, the industry elasticity of demand would have to be greater than (19/15) 1.267 for output not to be reduced.

Dowell's approach has been criticized by Schwartz (1985). In particular, Schwartz notes that the Dowell model is explicitly short term. In the longer run, firms would consider their relevant marginal costs to be their long run marginal costs and would thus reach a monopoly price above the competitive level. This critique does not apply in declining industry cases, because the analysis focuses on the short-run price below full cost and the resulting transition.

Schwartz also notes that the Dowell approach is likely to exclude those markets with inelastic demands (elasticities with absolute value of less than one) and that theoretical and empirical economic research indicates that those are the markets that are the most conducive to collusive behavior. This critique, however, fails to address the question of dominant firm behavior. Further, it is not entirely germane to the matter at hand. The Guidelines (1984 at para 2.11) define a market as the smallest group of firms which would find it profitable to raise price 5 percent. As Scheffman and Spiller (1987 at 143), among others, note, using the Lerner Index the 5 percent rule implies that the absolute value of the elasticity demand in an

antitrust case can be as high as (1/.05) 20. Thus, the antitrust authorities can be expected to bring a large number of collusion cases where the relevant market elasticities in absolute terms are between 1 (which appears to be the Schwartz threshold) and 20. Therefore, Schwartz's critique does not pertain directly to Dowell's model. Rather it is a criticism of the rules by which antitrust cases are brought.

C. Price May Rise, But There is No Free Lunch

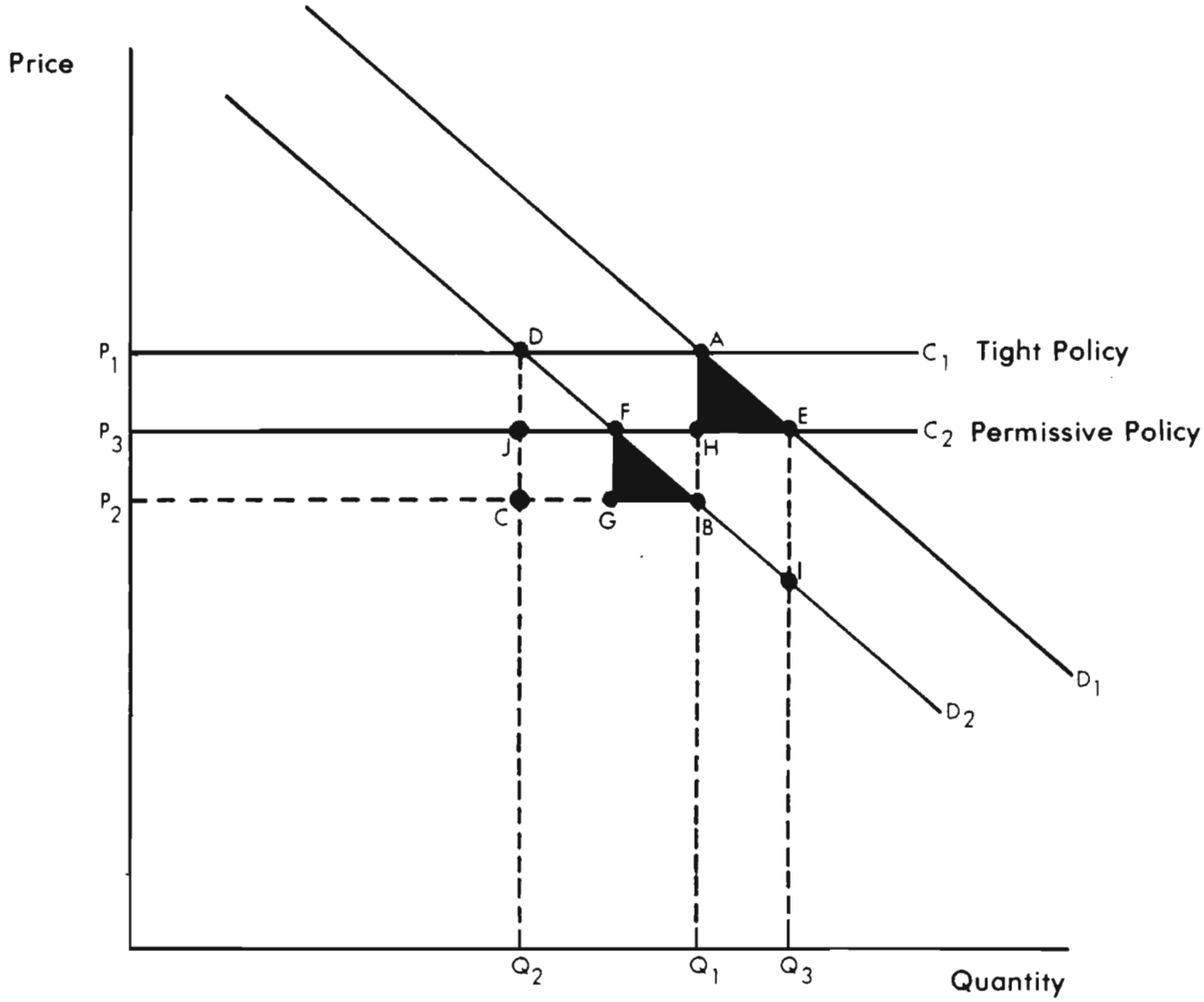
Given that the conditions of Part B do not hold and the merger will result in higher prices, the government's price-based antitrust policy appears justified in the simple world described in Part A. After an adverse supply or demand shock, the market responds by lowering the value of sunk assets. Businesses still earn normal returns on their variable costs, although substantial losses may be incurred in accounting terms on their sunk assets Consumers enjoy the fruits of the assets at low prices and economic surplus seems to be maximized. Allowing mergers in these declining industries to reduce output appears to make as much sense as dynamiting the plants to cut production. Fewer functioning assets means less product, higher prices and injured consumers. Thus, theory seems to provide a clear justification for a tough antitrust policy.

This story sounds like the antitrust agencies have found a free lunch. By simply blocking mergers designed to rationalize declining industries, the government can create value for consumers. Of course, there is no free lunch. Figure 2 compares the effects of a policy that blocks mergers with one that allows mergers to rationalize industry capacity. A tight policy allowing no mergers would generate a cost curve of C_1. Given an initial demand curve D_1, the industry produces the level of output Q_1 at price P_1

Figure 2

Welfare Tradeoff in Declining Industries

(Battle of the Dueling Triangles)



(point A). Now let demand decline to D_2. In the short run, price falls to P_2 as the firms in the industry are still able to produce Q_1 (point B). The firms incur losses of the rectangle ABCD due to the decline in demand and DCP_2P_1 due to the competition that leads to the maximum production level. This second rectangle could be recovered through a merger that rationalizes capacity and moves the market to point D. Since the merger leads to higher prices, it would be prohibited under a tight merger policy. In effect, the government expropriates DCP_2P_1 from producers and gives it to consumers. In doing so, the government also creates a consumer welfare benefit triangle DBC.[10]

Now let us consider the effects of a permissive merger policy that would allow mergers to rationalize production capacity to maintain prices at P_1. Because firms do not face the risk of ex post expropriation, their costs are lowered by rectangle AHP_3P_1 to line C_2. In expected value terms, this rectangle is equal to the previously expropriated rectangle DCP_2P_1. Thus, in expected value term the benefits to consumer of this rectangle (which occurs if there is no downward shock to demand) is equal to the benefits consumers would receive (DCP_2P_1) if the downward shock were to occur under a tight merger policy.

Assuming C_2 to be the relevant cost curve, the firm initially produces quantity Q_3 at price P_3 (point E). Thus, the lower costs under the loose merger policy generates a consumer surplus triangle AEH. Moreover, even if the industry were to decline, the lower cost structure would allow the firms

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[10] This analysis implicitly implies that the short run marginal cost (SRMC) curve is horizontal at P_2. The use of an upward sloping SRMC curve would generate similar results, while allowing for some reduction in quantity. We use the implicit SRMC to avoid further cluttering the graph.

to produce a higher level of output in long run equilibrium (point F instead of point D). Thus, the deadweight loss associated with a loose merger policy (FBG) is smaller than originally envisioned (DBC). It is uncertain whether this gain to consumers in expected value terms will be greater or less than the expected value of the triangle surplus FBG to consumers under a tight policy. As a rough rule, if the probability of a decline is slightly greater than 50 percent, the expected loss associated with no decline will be greater than the expected gain with a decline and a price-based merger policy would have the dynamic effect of reducing consumer welfare.[11]

The Posner analysis that considers the rectangle DCP_2P_1 as part of the social loss does not apply to declining industries. This rectangle is not susceptible to rent-seeking because it is transferred back to producers by the unilateral action of the merger partners in restricting output by closing a plant. No rent-seeking costs in the form of cartel coordination must be incurred, as it is simply part of the standard return on investment. Moreover, the firms in the industry do not have an incentive to compete to close plants, because the closing of a plant generates higher prices and more efficient production costs for all remaining players. Thus, the optimal rent seeking strategy is to sit tight (investing no resources) and wait for the industry dynamics to force another firm to incur the costs associated with rationalization of output.

We admit that it is possible that the net welfare loss triangle generated by a tight policy (FBG) may be greater in expected value terms than the loss triangle generated by a loose policy (AEH). Given, however, the

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[11] This result is an approximation based on calculations with a linear demand curve. See the derivation in the Appendix.

administrative costs and difficulties in determining which triangle is bigger in practice, as well as the relatively small welfare gains theoretically available in this "battle of the dueling triangles", this result strikes us as a very weak reed upon which to base antitrust policy.

D. Limitations and Expansions of the Result

It is necessary to consider a number of qualifications and generalizations to the analysis. There are three caveats (risk neutrality, the potential for government opportunism and transactions costs) that should be evaluated. On the other hand, the basic declining industry model has abstracted from efficiencies. Thus, a Williamson-like model will be more likely to support the permissive merger policy if rationalization leads to cost savings in the industry. The three qualifications are listed below followed by the efficiency analysis.

First, consumers may be risk-averse and industry downturns may coincide with economic recessions. In this case, even if the dueling triangles are of equal size, the expected value of the gain to consumers is greater under a tight merger policy. This gain, however, is likely to be slight and it again strikes us as an insufficient rationale for intervention.

Second, as it stands, a loose antitrust policy is not time consistent. Let us say firms believe the government is following a permissive policy and invest Q_3 worth of capacity at perceived cost C_2. A shock hits the industry and firms apply to merge. If the government rejects the merger by instituting a tight policy, firms will shift to investing at higher cost line C_1. In the meantime, however, the government can capture for the consumer the disequilibrium benefits associated with forcing the industry to produce at point I. Unless the government can credibly commit to following the

permissive policy, firms will be unable to justify the lower risk premiums necessary for the lower prices. Guidelines, stating a declining industry policy, may represent a way around this problem. If the government attempts to cheat on this policy, then the merging parties can use the government's own guidelines against it in court.

Third, a change to a more lenient declining industry policy generates adjustment costs in industries currently undergoing decline. In these industries, we can expect price increases without the higher investment in earlier periods that would have been undertaken if the government had always followed the lax policy. Given that some industries are in the adjustment period between points B and F, the change in policy will only create a deadweight loss comparable (though smaller in magnitude) to FBG. These losses may be offset by other long term benefits of the policy shift.

So far, our analysis has avoided the central issue of the Williamson paper - the existence of efficiencies resulting from a merger. The welfare tradeoff model in Figure 2 can be generalized to allow for efficiencies to make it comparable to the classic Williamson analysis. This would involve defining a new post-merger cost curve below the existing cost curves. Reinterpreting C_2 to be the post-merger cost curve facing the firms and assuming the merger raised price from P_2 to P_1, a social cost savings of DJP_3P_1 would be generated to trade off against the deadweight loss of FBG. Williamson (1968 at 32) notes that small cost savings are sufficient to offset substantial loss in welfare due to a price increase. For example, the welfare loss associated with a 20 percent price increase would be offset by efficiencies of 4 percent for an elasticity of two and 2 percent for an elasticity of one. These efficiencies could be even smaller if the deadweight

loss was reduced to consider the effect of the lower cost of capital associated with a permissive antitrust policy. Thus, efficiencies, if they exist, represent an additional reason for implementing a permissive merger policy in declining industries.

One would expect efficiencies to exist in many declining industries. If economies of scale exist in the industry, firms may be forced to operate at an inefficient scale as output adjusts toward equilibrium. By eliminating one firm through merger, the remaining firms can expand production and satisfy the new consumer demand with fewer resources. Of course, the sunk assets are prematurely scrapped, but the costs of continuing to use these resources (considered in a dynamic sense) are greater than the benefits of the marginal output they produce. Thus, industry rationalization is efficient and government merger policy should not block the functioning of the market. Given that efficiencies are likely to result from declining industry mergers, a rule allowing such mergers seems reasonable.[12]

Finally, it is necessary to address the possibility that a merger could lead to a real anticompetitive effect in a declining market.[13] Given concentration, ease of collusion and substantial entry barriers, it is possible that a merger will lead to a price increase above the long run competitive level. Such a possibility must be addressed with standard merger analysis. Even in this case, however, a pure price standard would prove suboptimal.

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[12] Dutz (1989) discusses one type of efficiency that can occur in a declining industry. In the Dutz model, a firm that is efficient at one stage of production and inefficient at another merges with a firm that has the reverse characteristics. Under this scenario, the merged firm is able to retire its inefficient factories because demand is falling.

[13] Returning to Figure 1, it can be seen that the short run monopoly price may be less than the long run competitive price. In this case, no further analysis is required.

It may be that the proper question to be asked is whether the merger would allow price to rise above long-run cost.

In conclusion, merger challenges in declining industries may not be justified. As we have seen, the deadweight loss of a price increase in declining industries may either not exist at all or be completely offset by another triangle associated with the higher investment under a permissive policy. Moreover, the apparent transfer of resources from consumers to producers caused by a merger to rationalize a declining industry does not exist, because producers would require risk premiums on capital if merger policy prevents the firms from rationalizing output in a declining industry. Thus, a case-by-case merger policy in a world with no enforcement costs would allow transactions in declining industries where the parties could substantiate significant efficiencies. Even if no efficiencies exist, a permissive merger policy is justified when sunk costs are large or the probability of decline exceeds 50 percent.[14] Alternatively, if enforcement costs are considered, it seems appropriate to allow declining industry mergers unless it is expected that the price will rise above the long run competitive level. Although such a rule will generate social costs in industries undergoing decline, these welfare losses are likely to be offset by future efficiencies.

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[14] By decline we mean a decline in the number of efficient sized firms necessary to meet demand for a product at zero producer profit. Such a decline could come about either from a decline in demand or a technology-driven increase in efficient size, as in the newspaper industry.

184-187 and Hendricks, Weiss, and Wilson, 1988) and as a "chicken game" in more popular applications. Since Firm 1 is larger than Firm 2 ($K_1 > K_2$), Firm 2 can survive longer than Firm 1 ($T(K_2) > T(K_1)$). Firm 2 knows that the losses it would incur in waiting out Firm 1 are smaller and the profits it will make after its rival exits are larger than the comparable figures for Firm 1. Absent any credible signs of irrationality Firm 1 can send Firm 2, it will exit the industry once industry profits become negative. In this game of "chicken," the player facing higher short run costs and lower long run profits "swerves" first. Ghemawat and Nalebuff generalize their model to n firms with different capacities. Under these circumstances, the largest firms exit first, the smallest last, in reverse order with respect to size.

Ghemawat and Nalebuff also relax their assumptions about equal costs in the context of a two-firm, two-plant model. Of course, the less efficient a firm is, the more likely it is to drop out of the industry. They show, however, that the size effect dominates the cost effect for a wide variety of circumstances. In their words (at 194), "Numerical examples ... suggest that the required cost advantage for large firms to outlast smaller ones may be surprisingly substantial."

Whinston (1988) extends the Ghemawat and Nalebuff model by assuming that there are three plants in the industry owned by two firms. In terms of the notation above, Firm 1 owns plants 1 and 2 with capacities and costs K_1, K_2, c_1, c_2, while Firm 2 owns plant 3 with capacity K_3 and cost c_3. Whinston points out that the exit of one plant will generate an positive externality for the owners of the other two plants, since the price they

IV. Efficiencies in Declining Industries: Game-Theoretic Contributions

Over the past thirty years, a great deal of time and effort has been spent in industrial economics describing when firms will enter a particular industry. Until recently, however, little attention has been paid to when firms will exit an industry. In the past few years, three articles (Ghemawat and Nalebuff, 1985; Whinston, 1988; and a complementary article by Fudenberg and Tirole, 1986) have addressed the (game-theoretic) incentives facing firms in a declining industry. This section will summarize their results and apply them to antitrust policy.

A. Review of the Literature

Ghemawat and Nalebuff (1985) defined a declining industry model of n single plant firms. Each plant has capacity K_i and per unit cost c_i. If a plant is to remain in operation it must produce its full capacity K_i at cost c_iK_i. This assumption is meant be a simplified representation of economies of scale in an industry. To represent sunk costs, the models assume that once a firm exits an industry it cannot reenter. It is also assumed that at some future finite point in time demand will be low enough so that no firm will be able to remain in the industry.

To simplify the analysis, assume that $n = 2$, $c_1 = c_2$, but that $K_1 > K_2$. Define the survival function $T(K_1, K_2)$ as the last point in time firms 1 and 2 can exist profitably in the industry. Past this point, both firms will lose money unless one of them exits. Under these conditions Ghemawat and Nalebuff show that the larger firm (1) will exit.

The intuition is as follows: Firms 1 and 2 are engaged in what is termed in the game theory literature as a "war of attrition" (Thomas 1984 at

receive for their product will rise.[15] If Firm 2 ceases production at plant 3 it will not benefit from this externality, since it will no longer be in the industry. If, on the other hand, Firm 1 exits with plant 1, it will receive part $[K_2/(K_2 + K_3)]$ of the externality. Given that costs and capacities of the plants are equal, in our game of "chicken" failure to exit will impose more costs on Firm 1 than Firm 2. Thus, at least one plant of Firm 1 will exit before Firm 2 closes down its plant. This is consistent with the general idea in economics that markets with externalities may perform sub-optimally.

Thus, the recent literature indicates that there are three criteria which determine the order in which plants will exit in a declining industry. First is the efficiency (cost of operating) of the plant. Second is the size of the plant. Third is size of the firm (number of plants) relative to the size of the other firms in the industry. The papers discussed above indicate that the second and third criteria can often dominate the first.

B. Application to Merger Analysis

Let us assume an industry with declining demand, barriers to exit, and economies of scale. There are ten plants in this industry. Plants 1 through 5 are owned by Firms 1 through 5 respectively, while Firm 6 owns plants 6 through 10. Plant sizes are assumed to be equal. Plant one has costs c_1 while plant 2 through 10 have costs $c_2<c_1$. Assume that we have reached time $T(K_1...K_{10})$. It is no longer viable for all 10 firms to continue operating. Given that these firms will not act anticompetitively (which is assumed in the models discussed in Part A of this section), it is optimal from the viewpoint of consumers for Firm 1 with Plant 1 to drop out of the

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[15] The externality to exit discussed here is very similar to the entry deterrence externalities presented in Baumann and Schwartz (1986).

industries are more subject to collusion because of a lower threat of entry, it appears highly likely to us that they would seek to block such a merger.

The industry structure postulated above is likely to generate exit externalities which could be captured through merger. The reason is that there is a high variation of firm size, and thus a high variation in the levels of the return to the externality of exit.

Consider a second industry structure. There are 10 plants, three of each being owned by three firms and one being owned by one firm. Here, it is much less likely that the high cost plant is owned by the small firm.[17] Further, the externality effect is much smaller. If the high cost plant is owned by one of the three large firms, the externality of exit is similar across them. If the high cost plant is owned by the small firm, the externality effect is only 60 percent (three-fifths) of what it was in our first industry.

One way to measure for this effect would be to break up the Herfindahl index as in the model of Clarke and Davies (1982). In their analysis, the Herfindahl is broken into two parts,

$$(4\text{-}1) \qquad H = 10{,}000^{*} [(1/n) + (v^2/n)],$$

where n is the number of firms and v is the variation of firm size.[18] The

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[17] Assuming that plant efficiency is not related to firm size, in the first market the chance of this happening is 50 percent, while in the second market it is 10 percent. Since efficiencies in this model occur at the plant and not at the firm level, we feel this assumption is appropriate.

[18] This formula is also derived in Clarke, Davies, and Waterson (1984) and Brown and Warren-Boulton (1988). We suggest calculating the coefficient of variation indirectly by subtracting the inverse of the number of firms from the Herfindahl index.

market.[16] The existence of exit externalities, however, imply that if the first plant's cost disadvantage is not substantial, Firm 6, in the absence of a deal between it and Firm 1, will dismantle one of its own plants rather than wait for Firm 1 to exit.

Let us now say that Firms 1 and 6 can merge. Firm 6 buys Firm 1 for a positive price and closes down Plant 1. Merging clearly increases the joint profits of the combined firm. (It is relatively straightforward to show that the derivative of firm profits with respect to cost is negative.) Thus, there is some range of prices that Firm 6 can buy Firm 1 (Plant 1) which will make the stockholders of both firms better off. Further, consumers are better off, since lower cost plants are in the market.

How would the antitrust authorities react to such a proposed merger? The pre-acquisition Herfindahl is 3000, increasing 1000 points to 4000 after the acquisition. This increase is well above the threshold limits in the Merger Guidelines and entry is unlikely. The parties to the acquisition tell the antitrust authorities that the only efficiency to the merger is that Plant 1 will be closed down. Given that the antitrust agencies appear to be unaware of (or unwilling to consider) the dynamic nature of the declining industry problem, the efficiency implications of the game-theoretic models discussed in this Section, and that the Guidelines state that declining

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[16] Consumer welfare at $T(K_1...K_{10})$ + epsilon is equivalent no matter who drops out, since output with 9 firms is the same in this example no matter which of the 9 firms are still in the industry. However, $T(K_1...K_9) < T(K_2...K_{10})$. Thus, if the high cost plant does not drop out of the industry, the survival times for all the plants will decrease. In other words, if the high cost plant stays in the industry it will force plants to exit faster than they otherwise would, decreasing output over time and thus consumer welfare.

first industry has a pre-acquisition H of 3000 and a variation coefficient (v^2/n) of 1333. The second has an H of 2800 and a variation coefficient of 300. Thus, using this method we can conclude that the first industry is much more likely than the second to incur sub-optimal exit patterns.

Given that important efficiencies associated with the externality of exit may exist in declining industries, it may be advisable to allow mergers even if the short run price will rise slightly above the long term competitive price. The variation coefficient method appears to offer an excellent method for determining what types of industries are prone to these externality effects. Unfortunately, at this time we cannot offer guideline numbers for policy implementation. To do so will require much more experience in dealing with this question.

V. Conclusion

There are a number of reasons not to enforce a strict merger policy in a declining industry. First, firms may have no incentive to raise price after a merger. If firms do have the incentive to raise price, government attempts to force prices below their long run equilibrium may serve to capture short run benefits for consumers. In the long run, however, such a policy of expropriation is likely to raise the cost of capital to firms and therefore eliminate any short run benefits the policy may generate. Given that the short run transfers are offset by changes in the cost of capital, the Williamson result that even small efficiency benefits can offset a substantial price increase points toward a permissive merger policy as long as price will not rise above long run costs. Finally, recent game theory literature implies that important externalities from exit exist in declining industries. Given

that the best method of internalizing these factors is by merger, a tight merger policy may result in inefficient exit from declining industries, and thus higher long term prices to consumers.

Our analysis suggests that a more lenient declining industry antitrust policy is appropriate. Whether the policy is implemented on a case-by-case basis or through rules depends on the overall efficiency of each approach. A case-by-case analysis would compare efficiencies to welfare triangles and then consider the coefficient of variation of the Herfindahl Index to capture exit externalities. A declining industry rule would attempt to allow acquisitions in declining industries as long as price does not rise significantly above the long run competitive level. Such a rule could be implemented by setting thresholds for the relevant Herfindahl level and coefficient of variation in the Herfindahl level upon which to base antitrust opposition to mergers.

Appendix

Comparing the "Dueling Triangles"

This appendix will derive a method for determining which of the "dueling triangles" of Figure 2 is larger in expected value. Let p equal the probability of industry decline. Consumers in a permissive policy regime receive triangle AEH with probability 1-p. Consumers in a tight policy regime receive triangle FBG with probability p. If the permissive policy is more favorable to consumers it implies

(A-1) $(1-p)\ AEH > p\ FBG$

With linear demand curves we know that

(A-2) $AEH = .5\ (P_1 - P_3)\ (EH), \qquad EH = k\ (P_1 - P_3)$

where k is a function of the slope of the demand curve. This implies

(A-3) $AEH = .5k\ (P_1 - P_3)^2$

Similarly,

(A-4) $FBG = .5k\ (P_3 - P_2)^2$

For the permissive policy to favor consumers implies

(A-5) $.5k\ (1-p)\ (P_1 - P_2)^2 > .5kp\ (P_3 - P_2)^2$

or

(A-6) $(1-p)\ (P_1 - P_3)^2 > p\ (P_3 - P_2)^2$

In expected value terms, we know that the area lost to producers in a downturn (P_1DCP_2) equals the area gain to producers under a permissive policy (P_1AHP_2). This implies

(A-7) $p\ (P_1 - P_2)Q_2 = (P_1 - P_3)Q_1$

Let $R = Q_2/Q_1$, $R<1$. (A-7) can be rewritten as

(A-8) $(P_1 - P_3) = pR\ (P_1 - P_2)$

Substituting into (A-6) and dividing both sides by p yields

(A-9) $(1-p)pR^2\ (P_1 - P_2)^2 > (P_3 - P_2)^2$

as the condition for the permissive policy to be favorable. We also know that

(A-10) $(P_1 - P_3) + (P_3 - P_2) = pR(P_1 - P_2) + (P_3 - P_2) = P_1 - P_2$

or

(A-11) $P_3 - P_2 = (1-pR)(P_1 - P_2)$

Substituting into (A-9) and dividing by $(P_1 - P_2)^2$ yields

(A-12) $p(1-p)R^2 > (1-pR)^2$

It can be shown that the smaller R is, the higher p must be. For simplicity, let R=1. (A-12) becomes

(A-13) $p(1-p) > (1-p)^2$

or

(A-14) $p > .5$

We expect R to be slightly less than 1. For instance, if demand declines by 5 percent R = .95. Thus, the needed p for the permissive policy to be optimal in a world without enforcement costs is slightly higher than .5.

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