Predatory Pricing Rules: A Comment on Williamson's Output Restriction Rule*

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In a recent article in this journal,¹ Oliver Williamson presents a predatory pricing model in which an output restriction rule is shown to exhibit better welfare properties than either an Areeda-Turner type short-run marginal cost (SRMC) rule² or a short-run average cost (SRAC) rule. This Comment demonstrates that the comparative welfare advantages of Williamson's proposed rule are sensitive to what one assumes about the firm's long-run cost structure. Under more general (and perhaps more realistic) cost conditions, the welfare superiority of the Williamson output restriction rule cannot always be established.³

To illustrate this point, I shall keep within the Williamson framework by assuming, as Williamson does, that the dominant firm (DF) responds to entry by reducing entrant profits to zero subject to the prevailing rule, and the potential entrant assesses the feasibility of entry with respect to a residual demand curve.⁴ The DF is also assumed to operate on its long-run average total cost (LRATC) curve, to which the entrant also has access.⁵ I depart from the Williamson framework by allowing the LRATC curve to decline smoothly, rather than in a stepwise manner,⁶ before flattening out at its minimum. This assumption allows the level of entrant output to vary across different rules.

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1. Williamson, *Predatory Pricing: A Strategic and Welfare Analysis*, 87 YALE L.J. 284 (1977) [hereinafter cited as *Williamson I*]. Williamson re-emphasized this model while responding to critics in a subsequent article. See Williamson, *Williamson On Predatory Pricing II*, 88 YALE L.J. 1183 (1979).

2. This rule first appeared in Areeda & Turner, *Predatory Pricing and Related Practices Under Section 2 of the Sherman Act*, 88 HARV. L. REV. 697 (1975).

3. In a series of recent articles, other economists have discussed the Williamson proposal, implicitly assuming that the welfare properties he attributes to the output restriction rule obtain in the general case. See, e.g., Baumol, *Quasi-Permanence of Price Reductions: A Policy for Prevention of Predatory Pricing*, 89 YALE L.J. 1, 3 (1979); Joskow & Klevorick, *A Framework for Analyzing Predatory Pricing Policy*, 89 YALE L.J. 213, 240-41 (1979); Schmalensee, *On the Use of Economic Models in Antitrust: The ReaLemon Case*, 127 U. PA. L. REV. 994, 1023-28 (1979).

4. See *Williamson I*, *supra* note 1, at 294.

5. *Id.* at 295.

6. See *id.*

I. The Williamson Model Reinterpreted

The output restriction rule prohibits the DF from changing its demand adjusted level of output in the post-entry period for a term of between twelve and eighteen months. Subject to this rule, the DF is assumed to "make *pre-entry adaptive responses of a strategic kind*."⁷ It does this by choosing a pre-entry level of output, Q_o^{DF} , in Figure 1, so that, at any level of output, profits of the potential entrant are reduced to zero or are negative. The zero profit level of entrant output occurs at Q_o^E . There the residual demand curve of the entrant, RD_o , is just tangent to the LRATC curve at Q_o^E , and below it at all other points.⁸ Thus, if entry occurs under the output restriction rule, entrant output would equal Q_o^E , produced at an average cost of AC_o^E , while the DF's level of output would be Q_o^{DF} in both the pre-entry and, by requirement, post-entry periods. The DF produces Q_o^{DF} at minimum unit cost, building an optimum size plant for that level of output.

If the SRMC rule⁹ is imposed upon the DF, the situation changes as depicted in Figure 1. The DF is now prohibited from reducing its price below its SRMC in the post-entry period. Thus, as Williamson points out, the SRMC curve becomes the response curve of the DF.¹⁰ The residual demand curve, RD_{MC} , is, accordingly, less steeply sloped than RD_o .¹¹ Strategic DF behavior locates the SRMC curve (with its given curvature) such that, at some point, RD_{MC} is just tangent to the entrant's LRATC curve. This point occurs at entrant output level Q_{MC}^E . With its SRMC curve in place, the DF is assumed to maximize profits in the pre-entry period, producing where SRMC equals marginal revenue, MR, at output level Q_{PRE}^{DF} . Post-entry, the DF chooses level of output Q_{POST}^{DF} , where SRMC equals AC_{MC}^E , for this is the output level that makes entrant profits zero at Q_{MC}^E and negative at all other points, while still satisfying the SRMC rule restriction.¹²

II. Analyzing the Welfare Properties

As Williamson indicates, a comparative welfare assessment of the SRMC rule can be made using the output and cost levels of the output

7. *Id.* at 293 (emphasis in original).

8. RD_o can be computed by subtracting DF level of output, Q_o^{DF} , from the market demand curve, D.

9. A counterexample could also be generated using the SRAC rule.

10. *Williamson I*, *supra* note 1, at 295 n.35.

11. This is true because $RD_{MC}(Q) = D(Q) - SRMC(Q)$ while $RD_o(Q) = D(Q) - Q_o^{DF}$.

12. To see why this occurs at output level $SRMC = AC_{MC}^E$, note that if the DF expands output short of where $AC_{MC}^E = SRMC$, the entrant can secure positive profits at Q_{MC}^E . If the DF over-expands beyond $AC_{MC}^E = SRMC$, this violates the SRMC rule.

restriction rule as a benchmark.¹³ The effects may be looked at separately.

A. Entrant Output Effects (AREA 1)

As shown in Figure 1, entrant output under the SRMC rule, Q_{MC}^E , exceeds output under the restriction rule, Q_O^E . Thus, total industry output increases from Q_O^{TOTAL} to Q_{MC}^{TOTAL} , as depicted in Figure 2, providing a significant social welfare gain measured by AREA 1.

B. Entrant Cost Effects (AREA 2)

Figure 1 shows that the entrant's average unit costs under the SRMC rule, AC_{MC}^E , are less than the entrant's average costs under the output restriction rule, AC_O^E , as a result of the entrant's higher output level under the SRMC rule. Since what was produced by the entrant under the output restriction rule is also produced under the SRMC rule but at lower cost, a gain in welfare equal to AREA 2 is realized.

C. DF Output Effects (AREAS 3 and 4)

Both the DF's pre- and post-entry output levels under the SRMC rule, Q_{PRE}^{DF} and Q_{POST}^{DF} , are less than output level Q_O^{DF} . Thus there is a welfare loss equal to trapezoidal AREA 3 for Q_{POST}^{DF} , and AREA 3 + AREA 4 (also trapezoidal) for the Q_{PRE}^{DF} level of output.

D. DF Cost Effects

The SRAC curve indicates at what unit cost the DF is able to produce a given output level. Thus, the DF cost effects may be analyzed by noting the position of the SRAC curve in Figure 1 corresponding to the strategically placed SRMC curve. In this example, the average costs of producing levels of output Q_{PRE}^{DF} and Q_{POST}^{DF} are increased insignificantly above minimum unit cost. Therefore, relative to the output restriction rule, under which production always occurs at minimum average cost, an insignificant welfare loss is incurred. In other examples, this loss need not be as trivial.

Summarizing these four effects, one notes that the total social welfare loss arises from the DF's reduced output levels under the SRMC rule as compared to what they would have been under the output restriction rule. A measure of this loss is captured by $2(\text{AREA } 3) + \text{AREA } 4$ in Figure 2. Comparing the loss to the entrant's welfare gains, measured by

13. In determining these welfare effects, I follow Williamson in assessing the first order social benefits and social costs only. No second order effects are considered. See *Williamson I*, *supra* note 1, at 306-07.

AREA 1 + AREA 2, one can see graphically that the welfare benefits to society exceed the welfare loss. Therefore, in this example, a net welfare gain results from imposition of the SRMC rule rather than the output restriction rule.

III. Conclusion

The above results turn on the relaxation of Williamson's assumption concerning the shape of the LRATC curve. In justifying his approach, Williamson remarks, "[t]he step function assumption is attractive because it is realistic and because it facilitates the analysis."¹⁴ However, the realism of such a cost curve is highly questionable. The numerous empirical estimates of cost-scale relationships lend little if any support to Williamson's cost curve, which is characterized by a pronounced "discontinuity" at low output levels.¹⁵ A smoothly declining LRATC curve, on the other hand, is consistent with the empirical findings.

It is important to add that although a smooth LRATC curve was used as a counterexample, it can be shown quite easily that welfare may also be higher under the SRMC rule with a stepped LRATC curve that has a different pattern of steps than the one that Williamson uses in his analysis. In fact, any LRATC curve that causes the entrant's level of output and cost to vary as one shifts from the Williamson proposal to a cost-based rule will induce potentially significant welfare gains that may offset the cost-based rule's pre-entry welfare losses, as in the above example.¹⁶

Williamson acknowledges that if one assumes a smoothly declining average total cost curve, the cost-based rules will cause the point of tangency between the residual demand curve and the LRATC curve to shift after entry. He correctly foresees that the post-entry welfare effect may then be unfavorable to the output restriction rule. He asserts unconvincingly that "[a] weighted average of these two effects would probably preserve the

14. *Id.* at 315.

15. See, e.g., J. JOHNSTON, *STATISTICAL COST ANALYSIS* (1960); F. SCHERER, A. BECKENSTEIN, E. KAUFER, & R. MURPHY, *THE ECONOMICS OF MULTI-PLANT OPERATION: AN INTERNATIONAL COMPARISONS STUDY* (1975); Walters, *Production and Cost Functions: An Econometric Survey*, 31 *ECONOMETRICA* 1 (1963). Statistical cost analyses often assume a smoothly declining unit cost curve and therefore do not test the "stepped curve" hypothesis. However, in detailed production cost studies there is no indication that, when scale economies are present, unit costs decline in other than a smoothly continuous fashion. For an example in farm tractor manufacturing, see N. MACDONALD, W. BARNICKE, F. JUDGE, & K. HANSEN, *FARM TRACTOR PRODUCTION COSTS* 70-72, 134-42 (1969). For examples in electric generating, cement manufacturing, and steel-making, see D. HUETTNER, *PLANT SIZE, TECHNOLOGICAL CHANGE, AND INVESTMENT REQUIREMENTS* 95-98, 108, 119-24 (1974).

16. The welfare properties of the respective rules can be shown to vary not only with the shape of the LRATC curve, but also with the elasticity of the market demand curve in the critical region, the shape of the SRAC (thus SRMC) curves, the position of the LRATC curve, and the convexity of the LRATC curve in the critical region.

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rule ordering, however, since entry (and hence post-entry adaptations) is presumably the exception in industries given to the type of strategic behavior investigated here."¹⁷

It is not at all clear that entry is unlikely under the assumptions of the Williamson model. If the entrant were to enter either because of a mistake or a willingness to suffer short-term losses in hope of a later profit, severe losses, exceeding those suffered by the entrant, could be imposed upon the dominant firm. Uncertain of the entrant's tenacity, the DF's most rational response may be entry accommodation. Thus, given no compelling reasons for accepting the improbability of entry, both pre-entry and post-entry effects are relevant, and the welfare superiority of the output restriction rule is not necessarily preserved.

17. *Williamson I*, *supra* note 1, at 315.

Figure 1

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Figure 2