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WELFARE EFFECTS OF ENTRY INTO MARKETS WITH SWITCHING COSTS*

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New entry into markets in which consumers have costs of switching between competing firms' products may be socially detrimental.

IN MANY markets consumers have costs of switching between products that are functionally identical. This note shows that entry of efficient low-cost competitors into these markets may be socially detrimental. In a linear model, entry reduces social welfare (as conventionally defined) in more than half of the relevant parameter space. In a more general model, there is always a range of values of switching costs for which entry reduces welfare, even if the entrant's production costs are lower than the incumbent's.

Switching costs include transaction costs and learning costs. Examples of the former include the costs of closing an account with one bank and opening another with a competitor, of changing one's long-distance telephone service, and of returning rented equipment to one firm and renting identical equipment from an alternative supplier. An example of the latter is the cost of switching to a new brand of computer having learnt to use and/or invested in the software for another brand, even if the brands are functionally identical.[1]

I. THE LINEAR MODEL

Consider a monopolist facing a potential entrant. Assume both firms have constant marginal costs c per unit and that there are no barriers to entry except that each consumer has a "switching cost" s of switching from the incumbent's product to the potential entrant's product. Assume linear demand (that is, the q^{th} consumer has reservation price net of switching costs $f(q) = \alpha - \beta q$ for one unit of the product). Assume that if the potential entrant decides to enter, there then follows a single period of Cournot–Nash competition in which the incumbent and new entrant choose outputs q^I and q^E respectively. Note that in any such post-entry equilibrium, the incumbent's price $p^I = f(q^I + q^E)$ and the entrant's price $p^E = p^I - s$, ensuring that some

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[1] For other examples and models of switching costs see Klemperer [1987] and the references cited there. von Weizsäcker [1980], Perry [1984], Bulow, Geanakoplos and Klemperer [1985] and Mankiw and Whinston [1986] discuss other circumstances under which new entry may be socially inefficient.

consumers are willing to switch to the entrant's product while others are willing to continue to purchase from the incumbent.[2]

The incumbent's monopoly output is $q^M = \frac{1}{2\beta}(\alpha - c)$ at price $p^M = \frac{\alpha + c}{2}$. Therefore, if $s \geqslant p^M - c = \left[\frac{\alpha - c}{2}\right]$, then in a post-entry Cournot–Nash equilibrium the incumbent's output $q^I = q^M$ and the new entrant's output $q^E = 0$. (This follows since if $q^I = q^M$, the entrant's price $p^E = p^I - s = f(q^I + q^E) - s$ is less than c for any positive q^E.) Thus, for $s \geqslant \frac{(\alpha - c)}{2}$, no entry will take place. Then the incumbent's (monopoly) profits $\pi^M = \frac{(\alpha - c)^2}{4\beta}$, and consumer surplus (the integral over all purchasing consumers of their reservation prices less purchase prices and any switching costs) is $\frac{(\alpha - c)^2}{8\beta}$. The sum, total welfare $W = \frac{3}{8}\frac{(\alpha - c)^2}{\beta}$.

If $s < \frac{(\alpha - c)}{2}$, however, then, in a post-entry Cournot–Nash equilibrium, the incumbent's output $q^I = \frac{1}{3\beta}(\alpha - c + s)$ and the new entrant's output $q^E = \frac{1}{3\beta}(\alpha - c - 2s)$. The incumbent's price $p^I = \frac{1}{3}(\alpha + 2c + s)$, and the entrant's price $p^E = \frac{1}{3}(\alpha + 2c - 2s) = p^I - s$. Thus, since the entrant earns positive post-entry profits ($p^E > c$) and since there are no fixed costs of entry or other barriers than the switching costs to entry, there will be entry if $s < \left[\frac{\alpha - c}{2}\right]$. In this case the incumbent's profits $\pi^I = \frac{1}{9\beta}(\alpha - c + s)^2$, the entrant's profits $\pi^E = \frac{1}{9\beta}(\alpha - c - 2s)^2$ and consumer surplus $= \frac{1}{18\beta}(2\alpha - 2c - s)^2$, so total welfare $W' = \frac{1}{18\beta}(8(\alpha - c)^2 + 11s^2 - 8(\alpha - c)s)$. The change in welfare, relative

[2] We are assuming that no consumers have switching costs of buying from the incumbent. It would be sufficient for our results, however, that all consumers with reservation prices above the monopoly price, $(\alpha + c)/2$, have previously bought from the incumbent (so pay no switching cost to do so again). This would arise naturally if the incumbent had been a monopolist for many periods prior to the threatened entry (without discounting) with consumers paying switching costs (or "start-up" costs) on their first purchase from the incumbent.

to the case in which there is no entry, is $W' - W = \frac{1}{72\beta}(5(\alpha - c)^2 + 44s^2 - 32(\alpha - c)s) = \frac{1}{72\beta}((\alpha - c) - 2s)(5(\alpha - c) - 22s)$ which is positive if and only if $s < \frac{5}{22}(\alpha - c)$. (Recall $s < \frac{(\alpha - c)}{2}$ for entry to occur.)

If $s \in \left(\frac{5}{22}(\alpha - c), \frac{11}{22}(\alpha - c)\right)$ entry will take place but reduce welfare. The welfare gain from the extra $[q^I + q^E] - q^M$ units produced is dominated by the inefficiency of the $q^M - q^I$ consumers who would have been served by the monopolist if there had been no entry, each paying the switching cost s to switch to the new entrant's product.

Thus entry reduces welfare over six-elevenths of the range of s for which it occurs.

A caveat is that we have defined welfare to be the sum of industry profits and consumer surplus. Consumer surplus itself is always increased by new entry, since the price consumers pay (including any switching costs), $p^I = p^E + s$, is always decreased. It is easy to show that if consumer surplus and firms' profits are given weights 1 and λ respectively in the welfare function, entry is desirable if and only if $s < \frac{7 - 2\lambda}{2 + 20\lambda}(\alpha - c)$, which is true whenever entry can occur if $\lambda \leqslant \frac{1}{2}$.

With more than one entrant, however, welfare losses are even more likely than in the model above. The reason is that additional entrants' output reduces the incumbent's output at a constant rate. Hence the ratio of the number of units of new output to the social losses from consumers switching from the incumbent, is independent of the amount of new entry. However, the social value of the extra units produced by successive entrants decreases as lower and lower reservation-price consumers are served (the q^{th} unit produced has social value $[(f(q) - s) - c]$). Therefore, if a single entrant reduces social welfare, additional entrants will reduce welfare even further. In a post-entry Cournot–Nash equilibrium with n identical new entrants, $q^I = \frac{1}{(n+2)\beta}(\alpha - c + ns)$, $p^I = \frac{1}{(n+2)}(\alpha + (n+1)c + ns)$, and each entrant sells $\frac{1}{(n+2)\beta}(\alpha - c - 2s)$ at price $p^I - s$. It follows that with n potential entrants, all will enter if $s < \frac{(\alpha - c)}{2}$ and welfare (consumer surplus plus profits) will be reduced if $s > \left[\frac{n+4}{6n+16}\right](\alpha - c)$. Thus the range of s over which entry reduces welfare *increases* in the number of entrants.

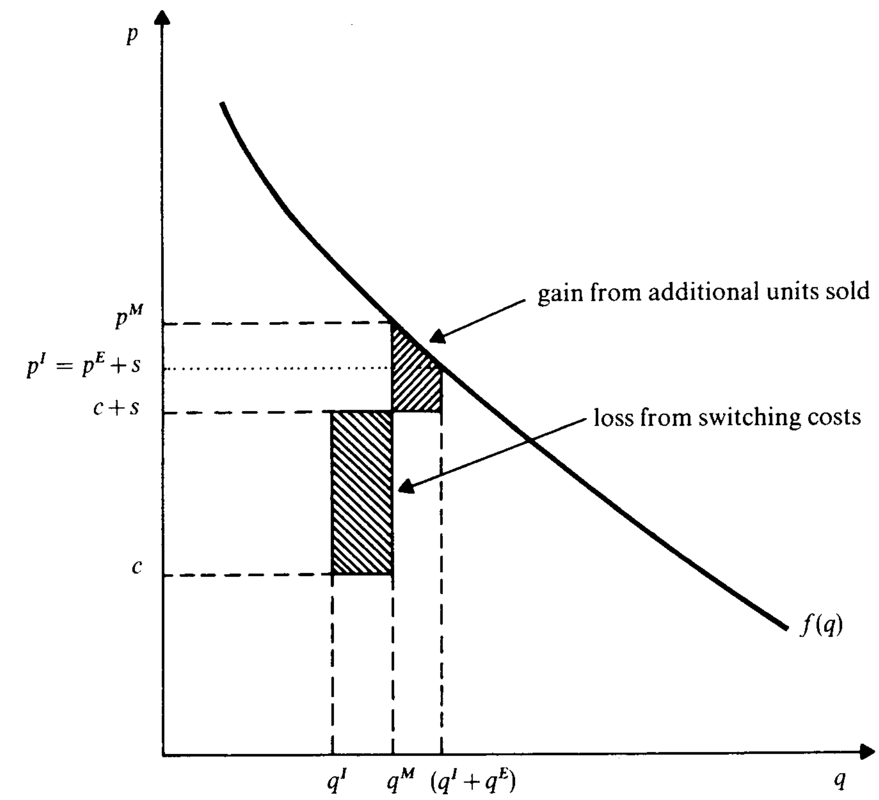
It is also easy to generalize the model to show that entry by a firm (or firms) with *lower* costs than the incumbent's costs c reduces social welfare if the entrant's cost advantage is less than $s-\frac{5}{22}(\alpha-c)$ per unit produced. Similarly, it is easy to show that entry into an oligopoly in which consumers have switching costs may reduce social welfare.[3]

II. THE GENERAL CASE

The range of switching costs for which entry is welfare-reducing depends on the form of the demand curve, $f(q)$. However, a simple condition guarantees that welfare is *always* reduced by a small amount of entry, that is, by entry when switching costs are at near-prohibitive levels. Entry causes a welfare loss of $[q^M-q^I]s$ when consumers, who would otherwise have been served by the incumbent, switch to the entrant. This loss is set against the gain in surplus from extra production: $\int_{q^M}^{q^I+q^E}[(f(q)-s)-c]\,\mathrm{d}q$. For small q^E, the social value $(f(q)-s)-c$ of each unit of extra production is also small, because the entrant sets its marginal revenue $\mathrm{MR}^E=c$ and (for small q^E) $\mathrm{MR}^E\approx p^E=f(q^I+q^E)-s$. Thus the gain is of second order while the loss is of first order: a small amount of entry will be welfare-reducing provided only that $[q^M-q^I]>0$, that is, that the incumbent's production is reduced by the new entry.[4] See Figure 1 for illustration. The result is unchanged if the entrant has lower costs than the incumbent: if the switching costs are large enough

[3] With multiple periods after entry, welfare in the second and subsequent post-entry periods would probably be higher than in a monopolized industry. However, entry would occur in industries with larger switching costs than those in which entry would occur with a single post-entry period, because entrants would be prepared to price even lower in the entry period to attract customers who would be profitable only in future periods. Therefore, there could be even greater welfare losses from switching costs in the entry period than in the single period model. A general multi-period model is beyond our scope. Assume, however, an infinite number of post-entry periods, discount rate r, and that if entry occurs both firms choose outputs that they will maintain in all future periods (this assumption probably understates the number of switches, so probably understates the welfare losses from switching costs). Then entry occurs if $s<\frac{1}{2}\left(\frac{1+r}{r}\right)(\alpha-c)$ and, if so, $q^I=\frac{1}{3\beta}\left(\alpha-c+\left(\frac{rs}{1+r}\right)\right)$, $q^E=\frac{1}{3\beta}\left(\alpha-c-\left(\frac{2rs}{1+r}\right)\right)$, $p^I=\frac{1}{3}\left(\alpha+2c+\left(\frac{rs}{1+r}\right)\right)$ (in every period), and the entrant's price equals p^I-s in the first post-entry period and p^I thereafter. Entry reduces welfare if $s>\frac{5}{22}\left(\frac{1+r}{r}\right)(\alpha-c)$, that is, over six-elevenths of the range of s for which entry occurs, exactly as in the single-period model.

[4] This condition is just that the incumbent's reaction curve slopes down, that is, in the terminology of Bulow, Geanakoplos, and Klemperer [1985], that the firms' strategic variables are strategic substitutes.



WELFARE EFFECTS OF ENTRY INTO
MARKET WITH SWITCHING COSTS

Figure 1

that the entrant's equilibrium production is small, entry reduces welfare if it reduces the incumbent's production.[5,6]

Our model with switching costs and common unit production costs c is formally equivalent to a model without switching costs but in which the entrant's unit costs are s higher than the incumbent's. While in our model the extra social costs s per unit of the entrant's output are paid by the consumers rather than by the entrant itself, the price consumers pay the entrant is s per

[5] In this model (in which every consumer has the same switching cost) entry cannot cause welfare losses if it is followed by price competition rather than by quantity competition, since the incumbent will simply lower its post-entry price so that no consumer switches. If, however, consumers have different switching costs distributed with density $g(s)$ on $[0, S]$, then with price competition an entrant will often make positive sales, causing a welfare loss from consumers switching, and total welfare may be reduced. (Total welfare will be reduced, for example, if each consumer has reservation price r for one unit, every period.)

[6] As in the linear model, consumer surplus is always increased ($p^I = p^E + s \leqslant p^M$): using the constancy of marginal costs, $q^M[f(q^M)-c] \geqslant q[f(q)-c]$ for all q implies $[q^M-q^E][f(q^M)-c] > [q-q^E](f(q)-c)$ for all $q < q^M$, $q^E > 0$ implies $q^I \geqslant q^M - q^E$ implies $f(q^I+q^E) \leqslant f(q^M)$ (with strict inequality unless marginal revenue is discontinuous at q^M).

unit lower. In both models, therefore, the effective prices consumers pay (including any switching costs) are $f(q^I + q^E)$, and firms' profits are $\Pi^I = q^I f(q^I + q^E) - q^I c$ and $\Pi^E = q^E[f(q^I + q^E) - s] - q^E c = q^E f(q^I + q^E) - q^E[c + s]$.[7] The results of the preceding paragraph are thus formally equivalent to the result that the entry into a monopoly market of a firm whose costs are just below the pre-entry monopoly price is welfare-reducing if the monopolist is thereby caused to contract output (Bulow, Geanakoplos, and Klemperer [1985]).

III. CONCLUSION

In a world in which switching costs are unavoidable, entry may be socially undesirable even when a new entrant has production costs as low as, or lower than, an incumbent—although industry output rises, the incumbent's price falls and the entrant's price is even lower than the incumbent's, a large amount of social surplus is dissipated by the consumers' cost of switching to the new competitor. It follows that public policy to reduce barriers to entry is not necessarily well-founded in industries in which a regime of no switching costs is unattainable.

Probably most entry into markets with switching costs is socially desirable, but perhaps more attention needs to be given to the welfare losses that can arise from switching costs.

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[7] This equivalence depends on all consumers paying the same switching cost. If consumers have different switching costs (or if some consumers buy several units but need only pay the switching cost once) the entrant attracts the consumers with the lowest switching costs per unit. To sell to an additional consumer with a higher switching cost than its previous marginal consumer, the entrant must reduce its price to all consumers. This is not directly related to a model without switching costs in which the entrant has increasing marginal costs, and in which selling to an additional consumer involves higher costs of production for only the marginal consumer.

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