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A rational expectations critique of merger policy analysis

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Abstract

A stricter merger control policy increases the expectation of future price competition. In response, firms increase product differentiation to sustain higher prices. Failing to account for such policy-variant prices may lead to overestimation of the increase in consumer surplus due to the stricter merger policy, rendering the policy analysis subject to the Lucas Critique.

Keywords: Antitrust policy; Product differentiation; Merger; Lucas Critique

JEL classification: L41; L13; L12

1. Introduction

In the few months before their merger, Zdnet and Cnet, two online companies that provide information on high-tech products, made their products more and more substitutable.[1] Such product design changes are consistent with Jehiel (1992), who shows that in anticipation of price collusion (or equivalently merger) firms decrease product differentiation to increase the "pie" of future collusive profits and their respective shares from this pie via increasing their bargaining powers. On the other extreme, d'Aspremont et al. (1979) show that anticipating price competition leads firms to strategic

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[1] http://www.businessweek.com/bwdaily/dnflash/june2000/nf00613g.htm?scriptFramed.

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product differentiation to sustain higher prices in equilibrium. In general, however, uncertainty prevails about the future state of competition, and firms may adjust their product designs in response to changes in their expectations.

A major source of uncertainty for firms that are contemplating a merger is the antitrust policy. In the face of such uncertainty, firms consider the relative probabilities of merger and price competition, and engage in corresponding strategic product design and pricing decisions. In this paper, I consider the introduction of a stricter merger policy, which increases the expectation of competition. In response, firms increase product differentiation to sustain higher prices, decreasing consumer surplus both directly and indirectly through higher equilibrium prices. Thus, the principle of maximum product differentiation has an important implication for measuring the effects of the stricter merger policy on consumer welfare when assessing the merits of antitrust policy.[2]

2. Model

Consider a single market with a duopoly protected by entry barriers, which I model by a version of Hotelling (1929) linear city model specified in Mas-Colell et al. (1994). In the linear city, consumers' total measure is normalized to 1, and they are evenly located and indexed by $z\in[0,1]$. The two firms have fixed locations at respectively 0 and 1. The unit cost of production is $c>0$. The utility of a consumer from the product of firm i is

$$U_i(z,p_i) = v - p_i - td,$$

where $v>0$ is the common product valuation, p_i is the price of firm i, t is the rate that disutility increases as the consumer is located further away from the firm's product, and the distance $d=z$ when $i=1$ and $(1-z)$ when $i=2$. The parameter t also determines the specificity level of the product since the higher t is, the smaller the market share of a given firm and the less substitutable the two products are, ceteris paribus. Consumers can purchase at most one unit and purchase firm i's product if and only if $U_i\geq U_{-i}$ and $U_i\geq 0$. The consumer surplus in this market is given by the area under the utility curves and U_i's, and it decreases with both p and t.[3]

I define the merger policy as the expectation of the probability of a successful merger $\Pi_0\in[0,1]$ common to both firms. That is, in a "policy period", firms merge with probability Π_0 and keep on competing with probability $(1-\Pi_0)$. Thus, if there is no policy change, the expected consumer surplus in the current policy period equals

$$\mathrm{CS}_0 = \Pi_0 \mathrm{CS}^{\mathrm{m}} + (1-\Pi_0)\mathrm{CS}^{\mathrm{d}},$$

where CS^{m} and CS^{d} represent the respective consumer surpluses under merger (or multi-product monopoly) and duopoly. It is straightforward to show that merger decreases consumer surplus when firms determine only the prices and when the whole market is covered, i.e., $\mathrm{CS}^{\mathrm{m}}<\mathrm{CS}^{\mathrm{d}}$, so CS_0 decreases with Π_0.[4]

[2] The arguments in this paper on merger policy also apply to the policy towards price collusion.

[3] The consumer surplus seems to be the primary concern of the U.S. federal antitrust authorities (Lande, 1988).

[4] A technical appendix is available from the author for this and other results in the paper.

3. Firms' reactions

In this section, in response to a stricter merger policy $\Pi_1<\Pi_0$, each firm strategically changes its product specificity level t. Let x_i represent the design changes of firm i, so that the final product specificity level is $t-x_i>0$, where x_i may be positive or negative. The fixed (one-time) cost of the design change is given by $f(x_i)$, where $f(\cdot)$ is an even and strictly convex function, where $f(0)=0$ and $f'(0)=0$, so that the status quo is the minimum cost position and small design changes are almost free. After the policy change is in effect, the firms play the following game:

Stage 1: Firms choose x_i's
Stage 2: Antitrust Authority reveals the merger decision (merger is approved with probability Π_1)
Stage 3: Firms choose p_i's (if they merge, the central management chooses p_i's)

The equilibrium prices and designs in this game are functions of Π_1.[5] To find the equilibrium price of this three-stage game, consider two related games.[6] First, consider the game where duopoly is for certain, i.e.,

Stage 1: Firms choose x_i's
Stage 2: Firms choose p_i's

This game can be readily solved by finding the market shares from $U_1=U_2$ and maximizing the second stage profits with respect to x_i's. The equilibrium price equals $p^{d*}=c+t^{d*}$, where $t^{d*}=t-x^{d*}=t-f'^{-1}(-1/12)>t$, and f'^{-1} is the inverse of the derivative of f. The new consumer surplus in duopoly is given by

$$CS^{d*} = \int_0^1 \mathrm{Max}\left\{U_1\left(p^{d*}, t^{d*}\right), U_2\left(p^{d*}, t^{d*}\right)\right\}dz.$$

Note that $t^{d*}>t$ and $p^{d*}>p^{d}=c+t$, where p^{d} is the equilibrium price in duopoly without the design changes, and that U_i's decrease with both p and t. Thus, strategic product design changes decrease consumer surplus both directly and through higher prices, i.e., $CS^{d*}<CS^{d}$.

In the merger game, let T_i represent the equilibrium duopoly profits of firm i. Assume that ex post monetary transfers are possible, and that the firms divide the post-merger surplus over duopoly profits via the Nash (1950) bargaining solution.[7] Then, the game is a one-stage game where each firm i solves

$$\max_{x_i} \frac{1}{2}\left[T^{m} + T_i - T_{-i}\right] - f(x_i),$$

[5] In practice, Π_0, that is, the antitrust policy might be influenced by the degree of industry product differentiation, as Π_0 may decrease when the products are closer substitutes. The present model may be a good starting point of an analysis where Π_0 also depends on the degree of substitutability of products.

[6] I confine the analysis to symmetric equilibria in all the games I consider. The condition $3/4(2t-x_1-x_2)-f''(x_i)<0$, which implies sufficient convexity of f relative to the index of substitution $1/(2t-x_1-x_2)$ guarantees the existence of respective equilibria.

[7] This assumption can be justified on many indirect forms of payment, for example, underpricing of intermediary goods or research joint ventures, and even with no monetary transfers the results in the current paper still hold (Jehiel, 1992).

where T^{m} represents the multi-product monopoly's post-merger profits as a function of x_i. The equilibrium price in this game equals $p^{m*}=v-(t^{m*}/2)$, where $t>t^{m*}=t-x^{m*}=t-f'^{-1}(7/24)>0$. The consumer surplus is given by

$$CS^{m*} = \int_0^1 \mathrm{Max}\left\{U_1\left(p^{m*}, t^{m*}\right), U_2\left(p^{m*}, t^{m*}\right)\right\}\mathrm{d}z.$$

With product design changes the multi-product monopoly sets a higher price than without design changes, that is, $p^{m*}>p^{m}=v-(t/2)$. Notwithstanding the increase in consumer surplus due to less specific product designs in this case ($t^{m*}<t$), the effect of such higher prices is a net decrease in the consumer surplus, that is, $CS^{m*}<CS^{m}$. To see how consumer surplus decreases, note that in both cases the multi-product monopoly prefers to "barely cover" the market, i.e., the consumers who are indifferent to purchasing are also indifferent to the firms, given $v-c-(3/2)t^{m*}>0$. Since the market shares are symmetric, the multi-product monopoly with the higher price p^{m*} necessarily provides lower utility to all the consumers (except the consumers located in the middle, who have measure 0).

In the original three-stage game, the equilibrium specificity level equals $t^*=t-x^*=t-(\Pi_1\cdot x^{m*}+(1-\Pi_1)x^{d*})$. These average consumer surplus after the policy change is lower with reactionary product design changes than that without design changes if

$$CS_1^* = \Pi_1 CS^{m}(t^*) + (1-\Pi_1)CS^{d}(t^*) < CS_1 = \Pi_1 CS^{m} + (1-\Pi_1)CS^{d}.$$

Thus, CS_1 may overestimate the resulting consumer surplus. Furthermore, consumer surplus increases relative to the pre-policy change environment if and only if $CS_0<CS_1^*$. This result tends to hold if Π_1 is sufficiently low relative to Π_0 and if f is more convex, and consequently f'^{-1} is more concave.

4. Discussion

In contrast to the current paper, the literature generally assumes 'static' product designs between pre- and post-merger blockage. For example, Deneckere and Davidson (1985) suggest that all mergers decrease consumer welfare in a differentiated Bertrand model where product designs are unaltered. The current paper shows that the post-*merger blockage* strategic product differentiation to relax price competition also decreases consumer welfare, and these incentives need to be taken into account to properly assess the merits of a merger blockage, or in general a stricter antitrust policy. The following example illustrates how this static approach involves an overestimate of the post-merger blockage consumer surplus.

Example. Let $v=100$, $c=10$, $t=50$, $f(x)=(1/300)x^2$,and hence $f'^{-1}(x)=150x$. Also let $\Pi_0=0.75$ and $\Pi_1=0.05$. It is straightforward to show that $CS^{d}=v-c-(5/4)t$ and $CS^{m}=(t/4)$, so that $CS^{d}(t^*)=v-c-(5/4)t^*$ and $CS^{m}(t^*)=(t^*/4)$, where $t^*=59.69$. It follows that $p^{d}=c+t=60$, $p^{m}=v-(t^*/2)=75$, and similarly, $p^{d}(t^*)=69.69$ and $p^{m}(t^*)=70.16$. Finally,

$$CS_0 = \Pi_0 CS^{m} + (1-\Pi_0)CS^{d} = 16.25,$$

$$CS_1 = \Pi_1 CS^{m} + (1-\Pi_1)CS^{d} = 26.75,$$

$$CS_1^* = \Pi_1 CS^{m}(t^*) + (1-\Pi_1)CS^{d}(t^*) = 15.37.$$

Comparing CS_0 with CS_1* would be more accurate than comparing CS_0 with CS_1 to measure the effects of merger blockage on consumer welfare, because CS_1* incorporates post-merger blockage strategic product differentiation. In this example, CS_1 not only overestimates the post-merger blockage consumer surplus CS_1* by 74%, but CS_1* is even lower than CS_0, so blocking a merger based on a comparison of CS_0 and CS_1 would be to the detriment of consumers.

5. Conclusion

The fundamental argument in the current paper is that the competitive environment does not remain the same under different antitrust policies. This argument has implications for the proper measurement of the effects of antitrust policy on consumer welfare. In particular, a stricter merger policy tilts the expectations of firms about the future state of competition towards price competition as opposed to merger. To relax the forthcoming price competition firms engage in strategic product differentiation that has negative effects on consumer welfare both directly and indirectly through higher prices. The benefits of a stricter antitrust policy to consumers can be measured more accurately if post-*policy-change* strategic product differentiation by firms are taken into account. That is, an analysis of merger policy change is subject to the "Rational Expectations Critique of Policy Analysis" or the Lucas Critique (1976) if it does not account for the effects of changes in the expectations of the concerned agents due to the new policy.

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