ANTITRUST POLICY TOWARD MERGERS
WHEN FIRMS INNOVATE:
SHOULD ANTITRUST RECOGNIZE THE DOCTRINE OF INNOVATION MARKETS?

by

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1. INTRODUCTION

Technological changes have resulted in dramatic improvements in our standard of living. The recent and far-ranging developments in computers and communications have spurred new products whose widespread proliferation no one contemplated even a decade ago. In recognition of the importance of R & D in spurring such developments, it is appropriate to investigate whether antitrust should pay more attention in merger analysis to the likely effects of a proposed merger on R & D. One recent suggestion (Gilbert and Sunshine [1995]) has been that antitrust authorities should use the concept of an "innovation" or "R & D" market to examine the effect of a merger. I am skeptical of the benefits of following this suggestion.

If concern with technological change is motivating a reexamination of antitrust policy, it follows that this same concern should motivate a broader inquiry into our public policy toward intellectual property. Our patent and other laws governing intellectual property as well as government funding of research probably are more potent policies for influencing technological change than is antitrust policy. If antitrust policy were altered because of a heightened concern with the importance of technological change, I hope that economists and other analysts advocating such a policy will trace through the implications of their logic for other public policies toward intellectual property in order to make sure that contradictory public policies are not promulgated.

The evidence on mergers suggests that R & D intensive industries have not been (at least during the 1980s) the focus of much merger activity (Hall [1988] and Pound et al, :1986]). Accordingly, antitrust policy has probably mattered little in the overall rate of technological progress. The importance of merger activity in R & D intensive industries could, of course, change and may have already. In any event, when faced with a specific merger
involving two firms performing R & D, the antitrust enforcement agencies need to know what to do from an antitrust perspective since it is only antitrust policy, and not the general U.S., policy toward intellectual property, that antitrust enforcement agencies can decide in a specific case. Therefore will focus now on antitrust policy toward R & D and leave the broader issue of the proper policy toward intellectual property to another forum.

As a matter of logic, antitrust policy could be used to prevent mergers that would harm consumers by concentrating an "innovation" or "R & D" market. However, in practice, the ability of antitrust authorities to identify such instances is likely to be very low. This unreliability is in contrast to the greater reliability of using the Merger Guidelines to identify and prevent mergers that would result in higher prices for existing products. However reliable one believes our current capabilities are, believe a movement toward relying on the concept of innovation markets could easily lead to a vast decline in the predictability of enforcement policy and in the reliability of enforcement in improving welfare. The reason is simple. Current policy has focused mostly on the competitive harms that a merger would cause in the near future. A policy relying on potential competition in the far future in certain products or potential competition in the far future in yet unspecified and unknown products requires the analyst to predict the far future. But the far future is much harder to predict than the near future and any active antitrust policy which foregoes efficiency gains in the near future to achieve speculative competitive gains in the far future is likely to harm not help consumers.

I have organized my testimony as follows. In the next section, outline the exact chain of logic that is needed in order to apply antitrust with confidence to innovation markets then discuss how several links in that chain of logic are weak, both theoretically and empirically, Of course, once one understands the weak links, one could devise a narrow Policy aimed only
at those special cases where the logic applies. That would make sense if these special cases could not be addressed with existing policies and if the new policy were to be narrowly applied only to those special cases. I'm not convinced of either possibility. After discussing a recent case where the concept of an innovation market was applied, summarize my major conclusions

11. RATIONALE FOR ANTITRUST POLICY IN MERGERS

Mergers are generally viewed as a desirable reorganization of economic activities designed to achieve efficiencies. Some mergers, however, can also lead to a diminution in competition that causes prices to rise to consumers. There is virtually no theoretical dispute that a reduction in competition, all else equal, can lead to higher prices, and that such a reduction in competition is undesirable. There are several empirical studies of individual industries which show that the number of competitors or their concentration matters, although there is debate as to the level of concentration at which competition starts diminishing. Thus, there is both empirical and theoretical support for an antitrust policy aimed at mergers that concentrate an existing product market.

The current antitrust policy focuses on whether an anticompetitive harm will occur in the near future. If price would rise significantly in the first two years after the merger, the merger is likely to be enjoined. Arguments that significant efficiencies will be realized in year three and beyond are likely to fall on deaf ears. And for good reason. Predicting the future

1 There is debate about how important concentration is in different industries and how long lasting concentration's effects are.

2 I simply note that current policy appears to condemn a merger that raises prices to consumers even if the short-run (e.g., two year) predictable efficiency benefits out- (continued..
is hard. Future benefits from halting a merger, above or beyond the future benefits from letting the merger proceed, should be discounted for time and for the likelihood that those benefits ever actually occur. In contrast, the harm to competition is more immediate and more highly predictable. The current antitrust policy has led to a more predictable and sensible policy than existed prior to the 1982, 1984, and 1992 Merger Guidelines.

It is a small step of logic to extend antitrust policy to deal with a merger of two firms that do not currently compete, but would compete in the future in the absence of the merger -- the potential competition doctrine. As a theoretical matter, the issues are identical to those raised by merging firms who currently compete. The only difference is that any competitive harm will occur in the far, not immediate, future. As a practical matter, the difference is that one must now be able to predict the results of a diminution of competition in the far future. How can one be sure, if the merger were allowed, that other potential entrants would not enter in the far future? How reliable are such predictions? Because mergers tend to generate efficiencies in both the short- and long-run, enjoining a merger on grounds of potential competition likely involves foregoing a certain efficiency gain in the short-run for a speculative competitive gain in the future. Again, these future competitive gains must be discounted for the time until their realization, for the possibility that the potential entrant will enter and provide the hypothesized competitive gain, and for the possibility that other potential entrants might arise who could provide the same competitive gain.

2. continued)
weigh the short-run deadweight competitive harm.

3. Efficiencies can be generated even if the merging firms do not produce similar products.
It might seem that if the potential competition doctrine is just a small step in logic removed from the usual antitrust policy aimed at firms in actual competition, then the "innovation" market doctrine should be only a small step removed from the potential competition doctrine. After all, the only difference between the two doctrines is that one is about future competition in an existing product, while the other is about competition in R & D which leads to future competition in future products. Yet, it is no small step in logic to reach the conclusion that concentration of an innovation market is undesirable.

To reach such a conclusion, one must accept the theoretical and empirical validity of the following claims:

1. Reducing R & D expenditures is undesirable;
2. If there are fewer firms performing R & D, there will be less aggregate R & D and fewer new products;
3. There are not enough other firms to perform R & D and develop future products to compete with the future products developed by the merged firm.

Neither theoretical nor empirical analysis has established the general validity of any of these claims, will now discuss each claim in turn.

A. Reducing R & D Expenditures is Undesirable

R & D expenditure is an input, not an output. R & D is desirable only because it leads to the development of knowledge that ultimately benefits consumers, as would occur if new products embodying the knowledge were produced. But as with all inputs, efficiencies can cause output to be produced with less inputs. Hence, a merger that leads to less R & D...

4 There is a large literature on each of these topics. The interested reader is referred to Cohen and Levin (1989) for a survey and references.
expenditure can be efficiency enhancing if it allows the R & D to be conducted more efficiently. Elimination of duplicative efforts or fostering cross fertilization of ideas by allowing engineers currently in separate firms to freely interchange ideas can lead to less, but more productive, R & D expenditures. Whether this is likely or not in a particular industry is, of course, an empirical question. But the simple point is that less R & D expenditure may be desirable and result in no diminution of new products.

Even if one could show that less R & D will lead to fewer new products, the question still remains whether this is bad. Although it may seem odd to question the desirability of new products, it is well known that competition need not produce the socially desirable number of new products. More disturbing, we know that there can be a tendency for either too many or too few new products. Unlike output restrictions, which cause unambiguous antitrust harm, a restriction in the rate at which new products emerge may or may not be desirable. U. & policy toward intellectual property recognizes implicitly that greater incentives toward development are not always desirable. Hence, R & D subsidies or patent length are always limited. raise this issue not because favor slower growth but because a coherent antitrust doctrine aimed at preventing a diminution in competition in innovation markets must implicitly assume that less R & D is indeed undesirable -- and economic theory is ambiguous on this point. The economic evidence is helpful in resolving the ambiguity. For much R & D, it appears that the social rate of return exceeds the private one, suggesting that more R & D would be desirable.

It may be possible to figure out for particular industries whether more R & D is likely to be socially desirable. For example, one could examine private returns to R & D compared to public returns, determine whether the new products are likely substitutable with existing products, and determine whether the R & D is basic (which likely has high social returns) or more developmental where the gap between private and social returns is narrower. Such investigations could prove difficult.
In light of this empirical evidence and given my occupation as an academic devoted to producing R & D, will now assume for the remainder of my testimony that more R & D is desirable and examine the two remaining requirements for an antitrust policy aimed at R & D markets to be sensible.

B. Fewer Competing Firms will Lead to Less R & D and Fewer New Products

There is no theoretical or empirical consensus that reduced competition leads to less R &.D and fewer new products. With imitation possible by existing firms, a more concentrated market can permit the innovator to capture more of the value of his innovation. In this way, market concentration solves the appropriability problem. Indeed, patents are designed to create market power in order to solve the appropriability problem and thereby provide the incentive to innovate. Since the acquisition of market power through concentration can allow an innovator to appropriate the returns from innovative activity (without having to obtain a patent and certain innovative activity is best not patented), there is an obvious logical tension between an antitrust policy designed to foster R & D by preventing market power in R & D and an intellectual property policy designed to foster R & D by allowing the creation of market power through patents.

Various economic theories predict that competition can have an enormous impact on R & D activity. The problem is that depending on one's assumptions, the theoretical results can go either way. For Schumpeter (1943), market concentration aids innovative activity, Large firms can absorb the risks and costs of innovative activity. For Arrow (1962), a competitive firm typically will have a greater incentive than the established monopolist to invest in R & D if the monopolist is assured that no other firms can perform R & D.
reason for Arrow's result is that the successful competitive firm will gain the profits from producing for the entire market, while the monopolist will gain only the profits above the monopoly profits that it is already earning. It is not hard to alter the assumptions of the simple Arrow model and reverse his results.

More sophisticated theoretical models have investigated patent races where firms compete to be the first to discover an invention and patent it. In such models, competition typically leads to too much expenditure in the aggregate on R & D because firms ignore the effect of their R & D on lowering their rivals' payoffs (e.g., Loury [1979]). By altering one of Loury's assumptions so that firms are given the ability to cease R & D expenditures in response to new information, this result can be, though not always, reversed (e.g., Lee and Wilde [1980]).

In general, there are two conflicting forces in theoretical models of R & D competition. First is the appropriability problem for nonpatented inventions. As the number of firms increases, less R & D is encouraged. Second is the "business stealing" effect -- the fact that one firm ignores the harm imposed on its rivals as it expands its innovative activity. As the number of rivals increases, this generally leads to too much R & D (e.g., Tirole [1988] p. 399). The upshot is that theory is ambiguous on whether competition leads to more or less R & D and (as already explained in the previous section) whether more or less R & D is desirable.

The empirical literature provides no firmer foundation for an antitrust policy designed to prevent mergers that will concentrate innovation markets. Although some earlier research had suggested a link in which R & D increased as concentration rose to some mid-level and then decreased as concentration continued to rise, subsequent research has failed to confirm this.

result. In a recent assessment of empirical studies, Cohen and Levin conclude, "The empirical results concerning how firm size and market structure relate to innovation are perhaps most accurately described as fragile." These results leave little support for the view that industrial concentration is an independent, significant, and important determinant of innovative behavior and performance" (p. 1078). Baldwin and Scott (1987) write, "There is no unambiguous evidence of an important, generally valid, relationship between competition and innovative activity."

In summary, neither theory nor empirical work provides any general justification for an antitrust policy aimed at preserving competition in R & D markets. Moreover, even if one did believe that reductions in competition in R & D would be undesirable, one would be hard pressed to figure out how many competitors typically are needed before one should cease worrying about the likely anticompetitive effect of mergers on R & D. Specifically, would expect that concerns with collusion in R & D are likely to be less of an issue than would arise in a typical product market because information about R & D is often secret, the products likely to result from R & D may not even be describable, and the potential payoff from successful R & D, especially pathbreaking R & D, is likely to be large. These conditions make collusion more difficult. Therefore, if one does pursue an antitrust policy based on preserving competition in R & D, it follows that the levels of concentration that one should tolerate before bringing an antitrust challenge should be much higher than those that one normally would use.

Do economists really know so little about R & D and concentration that there is no basis at all for an antitrust policy aimed at preventing a lessening of competition in R & D? I believe have accurately summarized the literature. However, the empirical literature, for the most part, relies on cross-sectional studies across industries, which cannot effectively control
for the impact of industry-specific factors. Thus such studies, like similar ones for price and concentration, do not provide a sound methodology for uncovering a pattern, if one exists (see Carlton and Perloff [1994] p. 355). Moreover, industries probably vary too much for one theory to fit all. This means that a study of an individual industry over time could well find a stable empirical relationship between concentration and R & D activity, all else equal. Indeed, it is precisely the industry in which the merger is proposed that should be studied to see if a pattern exists. If no data are available to perform such a study, then there really is no other general economic literature to justify an antitrust challenge to a merger that concentrates R & D.

C. There are not Enough Other Firms to Produce the R & D in the Future

Of the three logical underpinnings for an antitrust policy aimed at preserving competition in R & D markets, find this one to be the most troublesome. The basic problem is similar to the one that arises in the application of the potential competition doctrine where all future competitors have to be identified in order to determine whether the elimination of a single one would harm competition. Identifying future competitors for a known product strikes me as generally pretty hard, especially as the time period lengthens. Identifying future competitors for unknown and unknowable products is likely to be an order of magnitude more difficult.

In order to define an innovation market, one must include the innovation activity of all those firms with R & D efforts that might result in products competitive to the ones that the
merged firm may develop. This means that there typically will be firms in the innovation market who do not currently compete in any way with the firms that propose to merge. Indeed, because the results of R & D can be very difficult to predict, the analyst may be unable to determine all, or even most, of the relevant firms who might produce competitive products in the future. This problem becomes increasingly severe the longer it takes before any new products are expected to come to market and the more uncertain and rapidly changing is the industry.

Indeed, it often is impossible to predict which industry, let alone which firm, will develop a particular type of new product. R & D in one product has frequently led to unpredictable applications elsewhere. For example, Teflon was discovered as a byproduct during an experiment on refrigerator gases. Teflon has since been used for a wide variety of applications such as microchip packaging, non-stick coatings, and artificial arteries. Research on dressings for wounds led a researcher to discover a new coating that leaves fabric waterproof but breathable. The company, Biotex, that developed this product did so as pan of its research on artificial hearts and is now venturing into the textile business. As a final example, in 1988, Wayne Matson developed a machine to analyze brain chemistry. Soon, it

It is not obvious that all R & D should be weighted equally in calculating market shares in an innovation market. For example, R & D that would lead to a product with an elastic supply curve should perhaps receive more weight than R & D that would lead to a product with an inelastic supply and low output levels. R & D that is closer to successful fruition should be weighted more heavily than R & D still in an exploratory phase. It is doubtful whether the analyst would have enough information to figure out how to do this weighting. Accordingly, any shares in an innovation market are likely to have only a very crude meaning.

Wall Street Journal (Feb. 5, 1990)
was clear that the machine had other uses and has since been used to identify the components of fruit juices. Moreover, spillovers of R & D in one industry into other sectors is very well documented (e.g., see Bernstein and Nadiri [1988]). For example, the microelectronics revolution has altered how thousands of manufacturing industries make their products, using automatic and flexible technologies enabling the production of more customized products.

These examples illustrate that it can be hard even to contemplate all the unlikely sources of many of tomorrow's products. How many economists would have predicted even five years ago that R & D in computers, cable and telecommunications would result in products that compete with each other? The implication is that innovation markets will tend to be quite broad so that it is unlikely in many cases that a merger should raise concerns about significantly diminishing R & D competition.

would think it rare, though not inconceivable, for the analyst to be able to identify today with a fair degree of confidence the firms who are likely to be pursuing R & D that will lead to competing products several years in the future. Perhaps in industries where government approval is needed (e.g., certain drug tests) or where government funding is required (e.g., certain defense industry contracting), such identification is possible. But the longer is the time period, the less reliable is the prediction. Moreover, the more dynamic the industry in its pace of technological change, the less reliable is the prediction. Finally, in those rare cases where the analyst can confidently predict that a merger will lead to a decline in competition in R & D which, in turn, will lead to a decline in competition in new products, it would seem likely that the potential competition doctrine could be used to prevent the
merger." This use of the potential competition doctrine might involve applying it to products that do not now exist but will exist in the future with a high degree of certainty. This seems like a logical and straightforward use (or extension) of the potential competition doctrine. I prefer the potential competition doctrine to the innovation market approach because the potential competition doctrine, unlike the innovation market approach, focuses on the effects in an output market of reduced competition (i.e., price, quality, speed of introduction), instead of the more general and harder to predict effect of reduced R & D on unspecified future products.

III. APPLICATION OF THE DOCTRINE

The doctrine that mergers can harm R & D competition has already been applied in merger analysis. One of the first such cases was the proposed acquisition by ZF Friedrichshafen AG of the Allison Transmission Division of General Motors. Let me just note that this industry involves truck transmissions, so any notion that the antitrust doctrine of innovation markets is needed now because new R & D industries have emerged is certainly not exemplified by this early application of the doctrine.

Allison makes automatic transmissions for certain types of trucks (e.g., refuse trucks) and buses. ZF also makes transmissions, including automatic ones, for certain trucks and

ii. It is possible to construct theoretical examples where potential competition doesn't apply but innovation market competition does. See Gilbert and Sunshine (1995). I think the empirical relevance of such examples is remote. I also note that the ability to construct theoretical examples where a merger of firms who do not compete in a particular market harms consumers in that market is not in any way limited to innovation markets. There are myriad such theoretical possibilities. Such theoretical possibilities should give rise to new antitrust doctrines only if these possibilities can be reliably identified, are empirically relevant, and cannot be handled by existing doctrines.
buses. The Department of Justice issued a complaint to stop the merger in November 1993, and the deal then died. In its complaint, the Department of Justice alleged that the acquisition would reduce competition in two product markets, one for refuse trucks and one for transit buses. It also alleged that competition would be adversely affected in the worldwide market for innovations in automatic transmissions. Specifically, the Department of Justice was concerned that ZF would not continue to engage in R & D in as vigorous a fashion after the merger.

Assume that it would have been possible to allay the competitive concerns about the two traditional product markets by having ZF license an independent third party, and further suppose that there were at least some efficiencies motivating the transaction, The transaction was stopped in November 1993, so consumers have so far been deprived of almost two years of benefits (indeed the Department of Justice can influence the size of the benefits that consumers receive by the type of license arrangement it accepts). So far, understand that no new products in automatic transmissions have emerged from ZF nor has ZF become a more vigorous competitor. In fact, understand that ZF has withdrawn from the refuse truck market.

I do not want to comment on whether it was wise to issue the complaint. simply point out that we should follow this case to see whether it turns out that U.S. consumers ever receive any benefit from the R & D that was the concern of the Department of Justice and, if so, when. Those benefits, if and when they emerge, should be discounted and compared to the immediate benefits that could likely have been achieved by a well structured settlement

12. served as a consultant for GM and ZF
Only by systematically keeping track of the subsequent evolution of industries will we be able to decide what are good antitrust enforcement policies.

IV. OVERALL ASSESSMENT

Antitrust policy to prevent mergers that reduce competition in existing product markets is based upon general theoretical and empirical research that shows that reduced competition, all else equal, harms consumers. There is no such widespread theoretical or empirical support for an antitrust policy aimed at preventing innovation markets from becoming concentrated.

Although there is a clear chain of logic by which a reduction in R & D competition in innovation markets can harm consumers, it is a chain of logic that is not one for which there is any general theoretical or empirical support. The chain of logic would have to be supported by the facts of the particular industry under investigation if one were to attempt to apply such a policy.

see the following practical problems with applying an antitrust policy toward mergers involving R & D markets

- the inability to determine whether a decline in R & D expenditures is undesirable;
- the inability to predict that total R & D and the resulting number of new products would decline as a result of merger;
- the inability to identify the other firms engaged now or likely to be engaged in the future in R & D that will lead to products that would compete in the future with the products flowing from the R & D of the merging firms.
Even if one can address these issues, it is important to remember that:

(1) A benefit today is more valuable than one tomorrow. If R & D takes a few years, as does product development, the benefits of preserving R & D competition should be discounted when compared to any immediate efficiencies from the merger. Moreover, benefits in the future are more likely to be uncertain compared to immediate efficiency savings.

(2) In dynamically changing industries, the products resulting from the R & D may be hard to predict, so it may be especially hard to figure out who is in the relevant R & D market -- a market which should logically include all firms doing R & D on products that will compete with each other in the future.

(3) Collusion in R & D is not likely to be a problem. Hence, higher concentration levels in innovation markets should be tolerated as compared to those used in more traditional merger analysis if innovation markets are used to evaluate mergers.

(4) The R & D competition doctrine is more speculative than the potential competition doctrine because it likely requires more difficult and less reliable predictions.

In summary, I am skeptical that any general antitrust policy aimed at preserving R & D competition in innovation markets will improve society's welfare. Application of existing antitrust doctrine, especially that of potential competition, can likely deal with mergers that harm society by reducing competition in R & D. If the concept of innovation markets is used, would caution against anything other than a very narrow application of the concept to those
rare instances, if any, where the potential competition doctrine cannot deal with the competition issues, and where the industries have a clear record that justifies a reliable prediction of a harm to consumers from a lessening of R & D competition. would be especially wary of any application of antitrust policy that would prevent a merger that would generate immediate benefits in order to preserve some speculative competitive gains far in the future. If antitrust agencies use the policy of preserving competition in innovation markets to prevent mergers in certain industries, urge that they follow the affected industries to see whether the predicted gains from increased R & D competition ever materialize and, if so, whether it was worth the wait
Bibliography


Wall Street Journal. 1990. Many Uses Are Seen for ESA's Analyzer. February 5,