

# Complexity, diversity, and antitrust

BY JOSEPH FARRELL\*

## I. LIFE AND DEATH

This article discusses some ways in which complexity affects antitrust. It is broadly based on my lunchtime talk at the American Antitrust Institute's June 2005 Roundtable on that subject. My choice of topic was inspired by a competition issue of personal importance to me: innovation in food allergy medicine. Since I'm told my nut allergy could well be deadly, this is a life-or-death issue.<sup>1</sup>

The *Wall Street Journal* reports that a biotech company named Tanox had a promising experimental peanut allergy treatment, TNX-901, in trials five years ago, but Novartis and Genentech, Tanox's "corporate

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<sup>1</sup> "Peanut or tree nut allergies affect approximately 3 million Americans and cause some of the most severe food-induced allergic reactions." Press release, University of Michigan Health System, Schools and parents create "peanut-free" zones to keep kids safe (Aug. 4, 2003), <http://www.med.umich.edu/opm/newspage/2003/peanutfree.htm>.

partners," insisted on its withdrawal.<sup>2</sup> The companies responded that they had "together strived to identify the most promising medicine" and picked Xolair, a Genentech drug already on the market for a different indication, as "the most promising project."<sup>3</sup> Of course the *Journal* didn't tell us all about the issue, but as a potential consumer I wondered: why not pursue *both* potentially life-saving treatments? Apparently Tanox thought it worth pursuing TNX-901 given the status of Xolair, which would be the normal market test if no "contract got in [the] way."

Isn't diversity of approach one of the benefits of competition? I'm thinking of complex instruction set versus reduced instruction set computers, of gas-guzzlers versus small cars in the 1970s, of advertising-supported versus subscription news media, of bundled pricing versus a la carte, of open-source versus closed-architecture software, of walled gardens versus a free-for-all web, of Wintel's modular design versus Apple's integration. I'm thinking of the many cases where nobody's judgments are very reliable, and there is real gain to diversification. How, if at all, should antitrust seek to protect such diversity against (let's assume) technical experts' best judgments about "the most promising project"?<sup>4</sup>

## II. VARIETIES OF COMPETITIVE BENEFITS

To explore the role of complexity in antitrust, I start by unpacking somewhat the benefits of competition. Almost as shorthand, we often stress the competitive benefit that undergraduates learn in Econ 1: competition brings price to cost. But this isn't competition's only benefit and probably isn't the most important.

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<sup>2</sup> *Silent Treatment: How Genentech, Novartis Stifled a Promising Drug. Biotech Firm Tried to Pursue Peanut Allergy Injection, but Contract Got in Way*, WALL ST. J., April 5, 2005, at A1.

<sup>3</sup> *Xolair is the Better Drug for Peanut Allergy Therapy*, WALL ST. J., May 19, 2005, at A15.

<sup>4</sup> I earlier pursued a related but distinct question (in more technical form) in collaboration with Richard Gilbert and Michael Katz. See Joseph Farrell, Richard Gilbert, and Michael L. Katz, *Market Structure, Organizational Structure, and R&D Diversity*, in *ECONOMICS FOR AN IMPERFECT WORLD: ESSAYS IN HONOR OF JOSEPH E. STIGLITZ 195* (Richard Arnott et al. eds., 2003).

Firms, like other organizations, surely differ in their levels of efficiency, and competition helps assign most of the production to the most efficient organizations. This “selection effect” isn’t quite my focus either, but it’s closer: I want to focus on the competitive benefits of a kind of biodiversity.

How can we minimize the harm wrought by the foolishness that each of us so clearly detects in everybody else? Sometimes, you should “put all your eggs in one basket, and *watch that basket*.”<sup>5</sup> That’s especially true in an unforgiving environment where an error by anyone harms everyone: we want very few, very carefully controlled, fingers on the nuclear button. Luckily, in many contexts errors can be forgotten while successes expand. There, we should pursue multiple experimental approaches, even some whose expected value would be negative without the option to forget errors or expand successes. And if experiments, errors, and successes correspond to competitors, then competition is a major pathway for that to happen.

But *can* we identify competitors with variation in approach? In order to have a flourishing variety of experiments, is it necessary to have many competitors, and is it sufficient? Strictly, it’s neither: multiple firms might all pick the same mistaken approach, and a wisely run monopoly might pursue multiple approaches. Indeed, one provocative economic model suggests that there is no relationship.<sup>6</sup> But I think experience and organizational dynamics suggest that each organization tends to gravitate to one or a cluster of approaches,<sup>7</sup> while opinions and strategies are more apt to differ among organizations. I’ll ask you to accept for today that having multiple

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<sup>5</sup> For attributions of this phrase to Mark Twain and to Andrew Carnegie, see [http://herbison.com/herbison/broken\\_eggs\\_watch.html](http://herbison.com/herbison/broken_eggs_watch.html) (last visited December 17, 2005).

<sup>6</sup> See Raaj Sah and Joseph E. Stiglitz, *The Invariance of Market Innovation to the Number of Firms*, RAND J. ECON., Vol. 18, No. 1 at 98; see also Farrell, Gilbert, and Katz, *supra* note 4.

<sup>7</sup> In his book, Andy Grove, former chief executive officer of Intel Corporation, relates how Intel tried to pursue both reduced instruction set and complex instruction set computers, but found the organizational stress of doing so too great. ANDREW S. GROVE, *ONLY THE PARANOID SURVIVE* (1996).

organizations helps ensure that multiple approaches will be seriously pursued. If so, then that's a biodiversity benefit of competition in the old-fashioned sense of many players and perhaps even low concentration.

For this evolutionary competition to work well, two things must be true. Many different approaches must be sampled and evaluated ("variation") and successes must expand while failures shrink or die ("selection"). Variation without selection is like fragmented enclaves protected against competition, perhaps by market division agreements or by tariffs. At the other extreme, strong and rapid selection can threaten variation, as in what biologists call monoculture, leading to short-run optimality but long-run failure. In general, good policy sustains some diversity or diversification.

Is monoculture a risk in competition policy? I think so, though it is not obvious. Having abandoned protecting competitors as a goal in itself, we tend to think that selection should be strengthened, not weakened. But it is crucial to distinguish *selection through the product market*—as when consumers flock to the best deal—from the very different *non-market* threats to variation, as when firm *A* buys firm *B* and kills *B*'s product. Perhaps more pointedly, I distinguish between selection by the product market and selection by the market for corporate control, just as ecologists distinguish between selection through "natural" reproductive success and selection by agribusiness selling to farmers.

Diversity is most valuable in complex markets, because in simple markets everyone knows what to do. Moreover, if indeed competition efficiently enhances diversity, it may do so largely by persisting with approaches that market leaders think unpromising. After all, if an alternative approach were *clearly* smart, even a monopoly could profitably pursue it. These arguments suggest that any diversity benefit from competition (a) arises mainly in complex markets, and (b) is itself apt to be complex, controversial and hard to pin down, let alone prove.

To sum up so far, then, I've reminded you that the traditional Econ 1 benefit of competition is not the full story. Econodiversity may well be another benefit; if so, it is the dark matter of competition—

potentially very important, but hard to pin down and prove. How should antitrust policy respond to this?

### III. DECISION THEORY AND THRESHOLDS OF PROOF

We're accustomed to viewing antitrust problems in the light of decision theory.<sup>8</sup> In principle, one formulates a Bayesian posterior probability  $p$  that a practice, or merger, is anticompetitive, assesses the gains  $G$  from stopping it if it is and the losses  $L$  from stopping it if it is not, and forms the expected gain from intervention,  $E = pG + (1 - p)L$ . If  $E$  is positive we should intervene; if it is negative we should not.<sup>9</sup>

If we hold fixed  $G$  and  $L$  and vary  $p$ , intervention should require  $p$  to exceed the threshold value  $p^* = L / [L + G]$ . If instead we demand a threshold a bit higher than  $p^*$ , we wrongly fail to intervene in a few cases where the net expected benefit of intervention is positive, but it is then only slightly positive, leading to a quite small loss in overall value. Thus, although the optimality of  $p^*$  really means something—it really is better to use that threshold than another—this logic hints that the overall gain from enforcement comes largely from the clear-cut cases. Demanding a higher standard of evidence before intervention—raising the threshold from near  $p^*$  towards one—sacrifices some gains but perhaps not all that much, especially if diligent enquiry can mostly uncover the truth—that is, if hard work can usually bring the posterior belief  $p$  near zero or near one.

In less technical terms, one might argue (a) that when a practice really is anticompetitive, you ought to be able to prove it—uncertainty is usually a matter of not having looked hard enough; and (b) that in the relatively few cases where that's not true, the conditional expected gain from intervention,  $E$ , is relatively small.

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<sup>8</sup> For a recent application of decision theory in merger policy, see, e.g., Michael L. Katz & Howard Shelanski, *Merger Analysis and the Treatment of Uncertainty: Should we Expect Better?*, in *ISSUES IN COMPETITION LAW AND POLICY*, (W. Dale Collins ed., forthcoming 2006).

<sup>9</sup> Obviously there is a lot missing here; perhaps most importantly, this formulation is most naturally interpreted as an ex post calculation, and there may be important ex ante effects of a rule.

If most of the gains from competition are predictable and provable, as the unilateral-effects literature might be misread to suggest, then that argument is sensible enough. If we add a laissez-faire presumption against intervention, one might infer that antitrust should intervene only after *proof* of harmful anticompetitive effect. I wonder whether some version of this thinking underlies the apparent evolution of antitrust standards, and merger standards in particular, away from the presumptions of *Philadelphia National Bank*<sup>10</sup> and the U.S. government's Horizontal Merger Guidelines and toward an *Oracle*<sup>11</sup> or *Arch Coal*<sup>12</sup> standard of requiring detailed prediction and proof.<sup>13</sup>

If so, it underestimates the role of complexity. First, in a complex market, even diligent enquiry will not bring the posterior probability close to zero or to one: there will often be irreducible uncertainty, as scholars in complexity science stress. Second, if indeed competition is an efficient response to complexity,  $G$  (and perhaps  $L$ ) will tend to be largest precisely when  $p$  is stuck in the middle like that. As a result, there may be many cases where  $p$  is far from zero or one, perhaps close to  $p^*$ , but where  $E$  is large. That in turn implies that an unduly high threshold does more harm than one might have thought.

In less technical language, suppose that competition is most valuable in the most complex markets and when it works least predictably; I talked earlier about why diversity considerations might make this true. Then, demanding overly strong *proof* of harmful effect from reductions in competition risks losing out on a lot of gains from protecting competition.

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<sup>10</sup> United States v. Phila. Nat'l Bank, 374 U.S. 321 (1963).

<sup>11</sup> United States v. Oracle Corp., 331 F. Supp. 2d 1098 (N.D. Cal. 2004).

<sup>12</sup> FTC v. Arch Coal, Inc., 329 F. Supp. 2d 109 (D.D.C. 2004).

<sup>13</sup> One layer down, even presumptions based on market share and concentration demand something that can be quite close to analysis of effects, at least in merger contexts, if we follow the Merger Guidelines' approach to market definition, which incorporates calculations of the profitability of price increases.

#### IV. SOME UNINTENDED CONSEQUENCES OF PLAYING WITH WORDS

Notwithstanding the logic above, there is a reasonable concern that, if intervention can take place without proof, we could get too much, and undisciplined, intervention. That concern leads to the view that there should be a *laissez-faire* presumption against intervention. I think this makes sense, but needs to be put in context: there are *two* reasonable presumptions that should form the background for antitrust policy.

First, having a *laissez-faire presumption* against intervention actually means something. It's not the same as just allowing defendants to prove convincingly and in detail *how* intervention would be harmful in a particular case. Why not do that instead? The answer surely is that intervention often has unintended bad consequences that are unpredictable and *can't* be detailed and proved in advance. This is why it's a presumption, and this presumption is thriving.

I believe the value of competition also deserves to be a presumption, not just something that participants are welcome to prove if they can. The reasons for this are very much like the reasons for a *laissez-faire* presumption: competition often has benefits that can't well be detailed and proven. The benefits of diversity may be among those.

Unfortunately, I don't think it's clear that a procompetition presumption is thriving. On the contrary, there sometimes seems to be an increasing demand for convincing and detailed proof that competition is good for consumers in each case.

The antitrust laws protect "competition," not just "good competition," and you might think this would amply establish a procompetition presumption and moot any demand for proof that competition is good. Unfortunately, it goes so far that it invites a redefinition that risks gutting the presumption. As students of antitrust have long pondered, any sales contract might "restrain trade" by foreclosing demand to late-arriving vendors. Any horizontal merger, even one among impotent fragmented rivals that creates fierce competition against a previously invulnerable market leader, reduces "competition" in a naive sense. But we can't mean to ban all of these things.

A seemingly neat fix redefines "competition" as "competition that benefits efficiency or consumers." This redefinition interprets a law protecting "competition" as protecting efficiency or consumers against *provable* harm from reductions in competition, while at the same time allowing reductions in naively defined "competition" that clearly benefit consumers. All that is good and helps explain why this redefinition is so widely accepted. But the redefinition fares much less well when we turn to the dark matter of competition. At worst, it *obstructs* any procompetition *presumption*, by demanding that we *prove* harm before we can even say that a practice or a merger "reduces competition." To implement the procompetition presumption that sophisticated economics suggests (and antitrust statutes call for), we may need a less effects-based, possibly more naive, definition of "competition."

Any presumption in favor of naively defined "competition" had better be only a presumption: defendants could claim that, despite reducing naively defined "competition," their merger or conduct does not harm efficiency or consumers. If we can become confident of that, antitrust shouldn't interfere; to that extent it was helpful to redefine "competition." Thus, where market behavior is predictable, presumptions will be overturned when they would be misleading, so they won't matter in the end. But when things are complex and intractable, presumptions govern.

Perhaps partly inspired by the seemingly neat redefinition of "competition," and partly by respect for the *laissez-faire* presumption, some courts have demanded stronger and more detailed proof of harm to consumers or efficiency before antitrust intervention. If all such harms were provable, demanding proof of them would make sense, and of course it's worth finding out what we can about harm. But requiring *proof* of harm and thus vacating the procompetition presumption could gut protection of competition in the most complex markets, where little is provable but competition may be most important.

While there is much to be said for a *laissez-faire* presumption, we should also sustain a procompetition presumption. Reconciling these two presumptions is a central challenge, but do not think that the

benefits of competition can generally be proven and that we can therefore costlessly redefine away the presumption that competition is good for efficiency and for consumers. In order to think straight about reconciling the presumptions, we mustn't build proven effect too deeply into the definition of competition, or antitrust may end up protecting only competition's most provable, and probably not its most important, benefits.