PART I

Economics of Antitrust-IP

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Economics of Innovation

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1.1. INTRODUCTION

This chapter examines what lessons the economics of innovation hold for the analysis of antitrust violations. Of course, the relationship between innovation and competition is itself a complex question whose analysis goes back all the way to the work of Joseph Schumpeter. The purpose here is not to adjudicate this general issue but instead to consider how the usual static tools used by lawyers and economists to assess antitrust matters hold up when innovation plays an important role. That is, can static tools be applied when there are "dynamic considerations" that are evident and may play an important role.

The reason why such considerations may pose a challenge is that innovation can shift the locus of competition away from traditional *in the market* analysis (that holds the firm and product composition as fixed) to analysis where competition is *for the market* (as Evans and Schmalensee usefully distinguished).[1] So rather than markets being modeled where competition is largely, say, price based and in which static instruments can impact on market power, in some industries, and at some points in time, competition is more akin to a series of winner-take-all contests where the winner is determined by a race to have the "best" innovations.

The reason this distinction is important for the analysis of antitrust policy is that, in many cases, policy precedes via a two-step procedure in which a regulatory body determines whether a particular practice should be limited or deterred. First, regulatory bodies begin by examining whether the firm possesses monopoly, or at least a substantial degree, of market power. They then examine whether, the practice under examination (say, exclusionary contracts) would have been undertaken in the absence of market power, and whether this practice could potentially damage competition. Evans and Schmalensee are concerned that firms possessing a

Significant parts of this chapter are drawn directly from Gans (2010).

[1] Evans and Schmalensee (2002).

substantial degree of market power are, to use software lingo, a feature rather than a bug in some industries.[2] Therefore, prohibiting certain practices (for example, product tying or below cost pricing) by firms who have market power will necessarily inhibit and reduce the profitability of firms in those industries and, as a result, subvert the means by which dynamic competition operates; it will eradicate the high market prize associated with successful innovative activity, namely, the ability to displace incumbent monopolists.

The consequence of this line of reasoning is the emergence of a debate focused on the argument that when dynamic considerations (that is, the notion that the incumbency prize is a key driver of innovation) are taken into account, antitrust authorities should be more cautious about interventions, since such interventions might weaken the potential for long-run competition in the industry.[3] The argument that authorities should be more permissive of short-run exploitation of market power is based on the idea that it leads to continual and frequent changes in market leadership. This process requires a distribution of rent from the market leader to consumers and puts pressure on incumbents to invest in innovation so as to maintain their market leadership.[4]

Countering this is the concern, voiced most aggressively by antitrust authorities themselves, that great vigilance is needed when the source of innovative pressure in an industry is from new entrants rather than existing incumbents. The argument is that those entrants face significant hurdles and bear considerable risks in attempting to raise the required capital to introduce new products to markets, and that unfair behavior on the part of incumbents should be restricted so as to give entrants the greatest chance of success.

Below-cost pricing is a good example of a practice that creates this type of tension. On the one hand, such pricing is, under usual antitrust analyses, indicative of predatory behavior whereby an incumbent sets low prices upon entry in the hope of facilitating the exit of any new potential competitors and deterring any future entry (for example, by sending the signal that entry is unprofitable). Given the inherent risks associated with entrant innovation, antitrust authorities have long been concerned that aggressive post-entry behavior may exacerbate the already suboptimal levels of innovation.

On the other hand, it is argued that, in some industries, winner-take-all competition does not necessarily award the market to firms with the better product but may instead award it to those firms who build up market share the quickest. This can occur in markets for network goods, where consumer value for products depends not only on the intrinsic utility of the good, but also on how many other consumers are consuming the same or a similar product. Firms in these markets will be willing to

[2] *Id.*
[3] Gilbert (2006; 2007); Manne and Wright (2009).
[4] Gilbert and Newbery (1982).

"pay for market share," even if this involves below-cost pricing for a short period of time. Proponents of this view argue that even a monopolist may choose to set low prices for a short period of time so as to increase market share, thus, boosting the consumers' utility from the product and hence its profitability. Hence, it is argued that observed low pricing is not necessarily predicated on competition or the deterrence of it. Thus, to deny firms the ability to build markets will itself further reduce the incentives for new product innovation in such industries.

Notice that both sides of the argument essentially appeal to "dynamic considerations." Specifically, the incentives for innovation in industry are likely to be damaged should anticompetitive practices be either permitted or prohibited. Certainly, a similar tension appears in the purely static environment – that is, below-cost pricing may be entry deterring but it is also good for consumers who are able to purchase low-cost products. The issue for antitrust policy is to determine what tools are required to analyze these issues, and to determine whether a violation has taken place. In both cases, the proponents argue for less weight to be placed on static considerations (such as current and prospective monopoly power) and more weight to be placed on dynamic factors (such as the rate and sources of innovation).

Here I argue that recent economic theory implies that dynamic considerations can often be addressed and analyzed using the same tools we would use for static analysis. I base this argument on the application of a formal model of the dynamic impact of antitrust policies on innovation. While the formal model is not exposited here,[5] it should be noted that it is premised on the "dynamic considerations" that are put forward by those who think such factors should change the analysis.

The analysis here is based on Segal and Whinston,[6] hereafter, SW. SW argue that, in innovative industries, antitrust policies have two major consequences. First, if effective, antitrust policies are likely to prevent rents from flowing from entrants to incumbents and in the process, hopefully allow consumers to capture some of these rents. Second, the potential loss in rents will lower the value of incumbency. In an industry where competition is characterized by sequential monopolists rather than persistent rivalry, innovation is driven by the desire for incumbency profits.

These consequences of antitrust policy mirror both sides of the debate over "dynamic considerations." The first, that rents entrants receive immediately upon entry may be lost should a practice be permitted, is what most concerns antitrust authorities. The second, that prohibiting certain practices could devalue the role of incumbency, is what most concerns those in fear of placing excessive constraints on incumbents. Yet, SW note that *both* consequences drive innovation and, importantly, both interact with each another. After all, the value of being an incumbent is equal to the profits that a firm expects to make as the market leader, less the profit that it expects to make if it is a laggard. Thus, while antitrust policy might reduce the

[5] An interested reader can find that in Gans and Persson (2013).
[6] Segal and Whinston (2007).

profits of a market leader, it does so by increasing the profits of a laggard, making it hard, at first glance, to determine the net effect on the value of incumbency.

The outline of this chapter is as follows. In the next section, I will provide a non-technical exposition of SW's model. In Section 1.3, I show that, in many cases, this implies that the conclusions that can be drawn by taking into account dynamic considerations can be achieved using the same tools that we apply for static analysis. Section 1.4 then considers an extension to the SW framework to consider an aspect of firm behavior in innovative industries that is neglected by antitrust scholars – namely, that entrants often do not end up competing head to head with incumbents, but instead end up cooperating with them. I argue that this poses special issues for the application of static antitrust analysis and provide suggestions as to how we should evaluate the consequences of static market power. Indeed, this is an area that is likely to require new tools in order for proper antitrust analyses to be conducted. A final section concludes.

1.2. MODELING INNOVATION DYNAMICS

SW consider an environment in which developing product improvements in an industry leads to innovation. Examples include computer processors with increasingly superior performance, software with improved capabilities, or mobile phones with more features. While these product improvements could result from the R&D activities of incumbents my focus is on improvements that arise from entrant investment in R&D – specifically, R&D conducted in firms with little or no presence in the product market. Indeed, the easiest way to understand the SW framework is to begin by considering a situation in which all new products are the invention of entrants rather than incumbents.

R&D in new products is fundamentally a process of applying resources (in particular, capital and labor) in those activities that are most likely to increase the chances of generating a new product in a short amount of time. Of course, the sooner that a firm hopes to innovate, the costlier it is to achieve. But, the cost associated with bringing forward the innovation date will be worthwhile if the "prize" from innovating is large enough – delayed innovation will result in a delayed prize.

In what follows I describe the formal model that considers this tension. Let w denote the prize an entrant receives if it successfully innovates. The details of the prize are discussed below, but in the meantime, we can conceptualize a supply function for industry innovative activity, $S(w)$. This function, $S(w)$, is literally the likelihood that a new product generation is developed today, and is increasing in w. The logic behind this idea is that a higher prize will encourage more entrants to expend more resources trying to innovate more quickly, thus increasing the likelihood of an innovation appearing today. Importantly, the innovation supply function is driven purely by the costs associated with R&D. As we will see below,

many practices that are of antitrust concern are not dependent on R&D costs, and as such do not impact upon this supply function. That said, the supply function does not depend only on the response of the winning innovator, but rather, depends on the response of all potential entrants. Thus, a higher prize could induce more research start-ups into the industry. One antitrust concern is that incumbent practices could deter these start-ups but, as we will see below, this concern has an effect on the level of the prize, w, but, *ceteris paribus*, does not change the nature of the innovation supply function itself.

1.2.1. *Determinants of the Innovation Prize*

One key question that needs to be addressed is: what determines the size of the innovation prize, w? In this model, the prize is simply equal to the profit that the entrant receives if it generates an innovation today. One component of this is the immediate post-entry profits of an entrant in competition with the incumbent. This includes any revenues that the entrant receives net of the costs associated with entry. The second component consists of the *additional* future profits that are associated with being the innovation leader, above and beyond those profits appropriated to the laggard in the industry, that is, the *incumbency advantage* or *IA* for short. I assume that the entrant receives this bonus because its innovation generates a product that is superior to the current incumbent's product, thus allowing the entrant to displace the existing incumbent. Antitrust policy will have an impact on both the immediate profits of the entrant and the *IA*. Generally, we focus our attention on how such policies favor the entrant's immediate profitability, increasing the short-term component of the prize; that is, we think of antitrust policy in a static sense. In contrast, the impact on *IA* – which captures the dynamic component – is subtle. Clearly, if antitrust policy were to increase (or weakly increase) the expected profits of the incumbent (rather than the expected profits of the entrant), then the impact of such policies on the prize associated with incumbency would be unambiguous. In order to determine precisely how antitrust policy affects expected profits, however, we need to understand what components make up the *IA*.

The first main driver of *IA* is the expected future rate of innovation. The rate at which future entrants choose to innovate depends on the prize that they expect from innovation. This implies that *IA* is decreasing in the rate of innovation; intuitively, the expected lifetime of incumbency is equal to the expected length of time between new product improvements. The higher the rate of innovation, the shorter the lifetime of incumbency. What this implies, is that w is decreasing in the rate of innovation. Specifically, the tradeoff associated with greater innovation is the reduction in the innovation prize. This market constraint on the rate of innovation and the prize associated with innovation is akin to the demand constraint firms face in the market; firms can only sell more units if they are willing to do so at a lower price. Here the market is unable to offer both a high rate of innovation and a high prize.

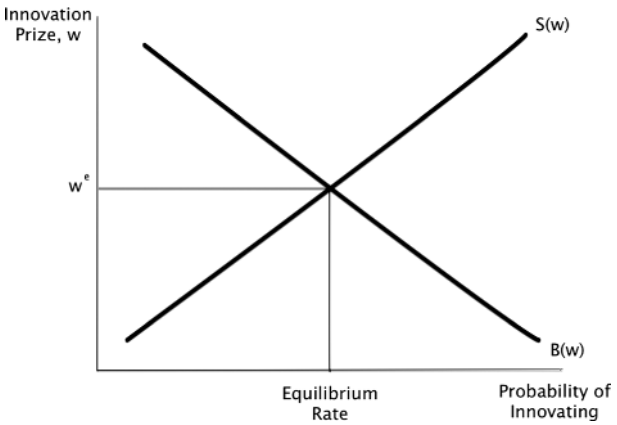

FIGURE 1.1: Equilibrium rate of innovation

This negative relationship between the benefits associated with innovation and the rate of innovation can be represented by a decreasing function, $B(w)$. We let $B(w)$ be the maximum likelihood of generating an innovation tomorrow in a market with innovation size w. Comparison of the supply and benefit functions associated with innovation highlights a fundamental tension. Since innovation supply is dictated by $S(w)$, a higher prize is needed if we want to encourage entrants to innovate more. In contrast, since $B(w)$ is decreasing in w, a lower prize is needed in order to sustain a higher level of innovation. SW note that the same tension between supply and demand exists in all markets. Moreover, as in any market, the innovation rate targeted must equal the innovation rate supplied, and so the intersection of $B(w)$ and $S(w)$ dictates the equilibrium level of w. Note from Figure 1.1, which illustrates this concept, if $w > w^e$, entrants want to supply a greater level of innovation than can be supported by the prize – hence, the prize will necessarily fall. In contrast, if $w < w^e$, the *IA* is too high and entrants do not want to supply too much innovation. Consequently, the innovation prize will rise to eliminate the shortage of innovation.

What is useful about this representation of antitrust policy is that it is relatively straightforward to examine the impact of policy changes on the equilibrium rate of innovation. For instance, if the only effect of antitrust policy was to increase immediate entrant profits, this would shift the B curve upwards and the new equilibrium point would result in a higher level of innovation. This is fairly intuitive as such profits are an important driver of the size of the innovation prize.

It is for this reason that it is so important that we understand *all* of the components that make up *IA*. SW use a dynamic equilibrium approach to analyze these components and the equations are presented in the appendix.[7] Here I will motivate the issues using a more intuitive approach by asking, *what is the maximum an entrant would be willing to pay to become an incumbent*?

[7] See Gans and Persson (2013) for details.

To begin with, note that the profit received by the incumbent in each period is less than it would receive were it a monopoly, since, in the presence of competition, it must compete with an entrant for profit. The maximum an entrant would be willing to pay to become the incumbent would be the additional amount it would earn if it were able to switch places with the incumbent. Were this possible, the entrant's payoff would rise by the difference between the incumbent's and its own profits in periods in which there is competition, and the monopoly profit in periods with no competition. There will always be competition in the period following the entrant's success in introducing a new product. Thus, the value of incumbency is a strict average (weighted by the probability of innovation in any given period) between the monopoly profit received when there is no competition (that is, when there is no innovation) and the difference between the incumbent and entrant profits when there is competition (that is, when an innovation occurs). In other words, the *IA* is a function of incumbency profits, weighted by the probability of entry.

1.2.2. *Impact of Antitrust Policy*

Two features of antitrust policy become particularly interesting once we view *IA* in this light. First, antitrust policy that increases immediate entry profits may lead to a change in *w*. As has already been noted, an increase in immediate entry profits raises the immediate payoff to the entrant from innovation. Note however, that a rise in immediate entry profits also reduces the incumbency advantage because the payoff associated with being an entrant also rises. Since the benefit attributed to the entrant is necessarily incurred in future periods, and thus discounted, whereas the rise in incumbency profits are immediate, the second effect is outweighed by the first. Importantly, however, this analysis demonstrates that once dynamic considerations are taken into account, the quantitative impact of antitrust policy may differ from the estimated cost or benefit derived from a static analysis.

Secondly, antitrust policy can affect the expected immediate payoff to the incumbent of innovation. Since the incumbent only receives this increase in profits in the absence of entry, the *IA* depends on the probability that the incumbent is not overtaken by a competitor. In this regard, if there is a practice that can reduce the probability that an entrant innovates, the incumbent will be willing to accept a reduction in its expected immediate payoff in order to reduce the probability of entry. That is, in an attempt to retain its incumbency advantage, the incumbent is willing to invest today in R&D deterrence tomorrow.

Putting these two features together generates an important result:

> *Outlawing any incumbent practice whose profitability is dependent on a reduction in entrant innovation will increase the equilibrium rate of entrant innovation.*

It is important to note that this argument assumes that prohibiting the practice will raise immediate entrant profits. Similarly, it is critical to acknowledge the fact that, while incumbents might engage in practices that raise their profits, this does not necessarily mean that such practices raise the incumbency advantage – the driver of entrant innovation. So, even though the prize for entrant innovation is dependent on the expected profits of an incumbent, practices that are themselves only profitable should future entrant innovation be reduced will, it turns out, lead to outcomes that erode the incumbency advantage.

This result is consistent with Ordover and Willig's[8] definition of predatory behavior as any behavior that eliminates existing rivals. SW essentially extends this definition to include behavior that reduces the likelihood of innovative entry.[9]

1.3. USING STATIC ANALYSIS

According to Evans and Schmalensee,[10] in industries where dynamic considerations are important, competition for the market is more important for welfare than competition within the market. An interpretation of this is that when investigating industries in which dynamic considerations are important, antitrust authorities can be somewhat relaxed about practices that allow dominant firms in the market to increase their profits since increased incumbent profits will serve to stimulate innovative entry.

The SW framework both captures and refines this argument. For example, if prohibiting a practice causes a disproportionately large fall in expected incumbent profits per period relative to the increase in immediate entrant profits, then the rate of entrant innovation may fall as a result of antitrust policy. In order to identify which policies will lead to a fall in entrant innovation, we must first examine in more detail a range of different policies.

Evans and Schmalensee[11] point to the case of Microsoft and the District Court's decision that Microsoft's promotion of Internet Explorer as a competitor to Netscape was, in fact, anticompetitive. Their argument relied on the conjecture that Microsoft would not have expended such a large quantity of resources into the promotion of Internet Explorer had it not come to the conclusion that it was in a "winner-take-all" race to be the dominant browser. Thus, the District Court concluded that the profitability of Microsoft's investment was contingent on Netscape's exit.

At first glance, this argument contradicts the result of SW described in detail above. By considering the broader case as put forward by the Department of Justice and its economic expert Franklin Fisher,[12] however, it becomes apparent that these

[8] Ordover and Willig (1981).
[9] For a discussion of how this framework can be applied in a real litigation matter see Gans (2013) in relation to the Intel antitrust suits brought by the EC and FTC.
[10] Evans and Schmalensee (2002).
[11] *Id.*
[12] Fisher (2000).