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Product Differentiation

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Intellectual Property and the Economics of Product Differentiation

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Abstract

The literature applying the economics of product differentiation to intellectual property has been called the most important development in the economic analysis of IP in years. Relaxing the assumption that products are homogeneous yields new insights by explaining persistent features of IP markets that the traditional approaches cannot, challenging the extent to which IP allows rightsholders to earn monopoly profits, allowing for sources of welfare outside of price-quantity space, which in turn opens up new dimensions along which intellectual property can compete. It also allows for equilibria with different welfare characteristics, making the tendency towards systematic underproduction more contingent and suggesting a broader range of policy options for promoting optimality. This Chapter reviews the economics of product differentiation, examining both the monopolistic competition and spatial competition lines of this scholarship. It then surveys the literature applying these approaches to patent, copyright, and trademark.

1. Introduction

To date, economic analyses of intellectual property (IP) have been dominated by models that frame IP as monopolies and/or public goods. These approaches have given rise to general

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policy inferences, such as systematic underproduction, deadweight losses resulting from pricing above marginal cost, and the supposedly inevitable tradeoff between access to IP and the incentives to create it. These inferences in turn have led many commentators to call for calibrating different aspects of IP protection to mitigate these problems.

A new literature is emerging that relaxes the assumption implicit in these models that the relevant products are homogeneous and instead proceeds from the premise that all IP faces competition from imperfect substitutes. Allowing for the possibility of product differentiation provides new insights into the economics of IP. It helps explain persistent features of IP markets that the traditional approaches cannot. It challenges the extent to which IP allows rightsholders to earn monopoly profits. It makes the market dynamics more complex by opening up new dimensions along which companies can compete. This in turn allows for possible sources of welfare outside of price and quantity and yields equilibria with different welfare characteristics. The inevitable tendency towards systematic underproduction is replaced by a more contingent world in which either underproduction or overproduction is possible. It also suggests a broader range of policy options for promoting optimality in IP markets. These insights have led some commentators to call this literature "the most important development in the economic analysis of copyright in recent years" (Bracha and Syed, 2014, 1842).

This Chapter will review the economics of product differentiation and the literature applying that literature to IP. Section 2 introduces the economics of product differentiation. Sections 3, 4, and 5 survey the literature applying these approaches to patent, copyright, and trademark respectively.

2. The Economics of Product Differentiation

The seminal works in the economies of product differentiation are the monopolistic competition theory advanced by Edward Chamberlin (1934) and the spatial competition models pioneered by Harold Hotelling (1929). Each approach emphasizes different aspects of the underlying economics. Monopolistic competition models the market dynamics in the traditional price-quantity space of Marshallian economics and takes product differentiation indirectly. Conversely, spatial competition portrays differentiation directly and deals with price and quantity indirectly.

2.1. Monopolistic Competition

Monopolistic competition retains most of the assumptions underlying perfect competition, including free entry and the presence of a substantial number of sellers.[1] The key difference is that monopolistic competition relaxes the assumption that products are homogeneous and serve as perfect substitutes for one another. When products are differentiated, the structure of demand for any particular product allows producers to raise their prices without losing all of their demand, because they will be able to retain those customers who place the highest value the particular variant that they offer. Product differentiation thus provides each producer with a degree of power over price sufficient to justify modeling each product as facing a downward-sloping demand curve.

Monopolistic competition theory simplifies the analysis by assuming that consumer preferences are symmetric with respect to each product in the group. The differences across different products were abstracted away by product differentiation as consumer demand as

[1] Robinson (1933) proposed a related theory of imperfect competition at roughly the same time as Chamberlin. Chamberlin's approach focused explicitly on product differentiation and provides the more appropriate focus for this Chapter.

reflecting a generic preference for variety rather than for any particular form of differentiated product. Most importantly for purposes of this chapter, Chamberlin (1934, 57–64) recognized regarded patents, copyrighted works, and trademarks as examples of differentiated products to which his theory applied.

The primary effect of this assumption is to place each product in equal competition with all other products in the group rather than in localized competition with a smaller set of near neighbors. Chamberlin's original formulation also assumed that each producer faced identical cost curves. This allowed him to employ a single graph portraying the price-quantity response of a representative firm to model the entire market, although relaxing the symmetry assumptions were later shown not to affect the core analysis (Kaldor, 1935; Archibald, 1961).

Because monopolistic competition portrays market interactions in a classic price-quantity space, it is quite easily integrated into a conventional welfare analysis based on economic surplus. Profit-maximizing producers will produce at the quantity where which their marginal revenue and marginal cost curves intersect. Because monopolistically competitive producers face downward-sloping demand curves, in the short run they will set prices in the same manner as a monopolist, as depicted in Figure 1. This results in deadweight loss. Should price exceed average cost, producers may also earn short-run supracompetitive profits.

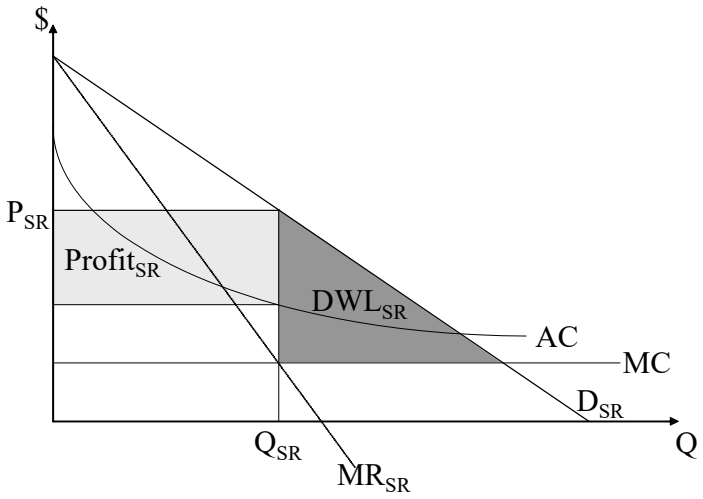

Figure 1: Short-Run Equilibrium Under Monopolistic Competition

Were entry impossible, this short-run equilibrium would be stable, and the long-run outcome would be the same as under the monopoly analysis. Monopolistic competition, however, assumes that entry by close substitutes is always possible. As a result, the presence of supracompetitive profits attracts other producers selling similar products. Because all of the products in the market are in equal competition with one another, new entrants take business equally from each of the incumbents, with the demand and supply curves representing the decision confronting a representative firm, with the entire industry constituting the sum of all such graphs. Entry causes the demand curve confronting each incumbent to shift inwards, as customers substitute purchases of the new product for those of the incumbents. Although some have suggested that the demand curve could either increase or decrease in slope, the increase in the number of imperfect substitutes should generally cause demand to become more elastic (Varian, 2010). The resulting long-run equilibrium is depicted in Figure 2.

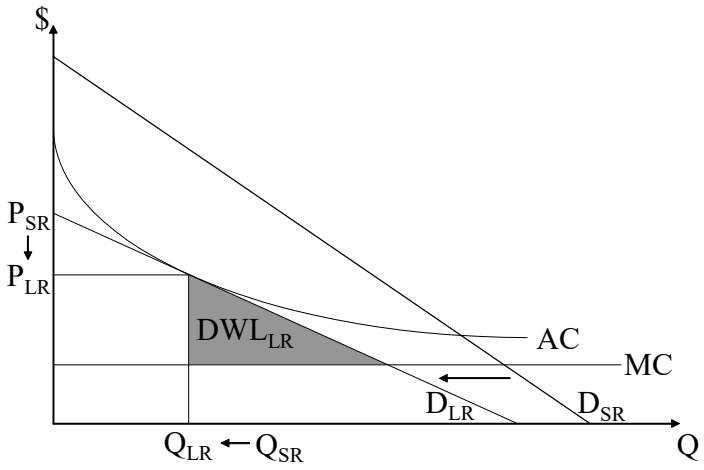

Figure 2: Long-Run Equilibrium Under Monopolistic Competition

Entry continues until no profits remain. Under Chamberlin's original formulation, this occurs when the surplus appropriated by each producer is just enough to cover the fixed costs of entry, a condition which exists when the demand curve is tangent to the average cost curve. There is, however, a well-known exception to Chamberlin's zero-profit result. The indivisibility of fixed costs may create a situation in which n products would earn small profits while $n + 1$ products would run losses. This so-called "integer problem" allows for an equilibrium in which n products each earn sustainable profits (Kaldor, 1935). So long as the economy is sufficiently "large" (i.e., so long as n is relatively sizeable), such profits will be negligible (Eaton and Lipsey, 1989).

As entry causes the demand curve to flatten, deadweight loss shrinks. Note that whether the market will reach long-run equilibrium on a flatter portion of the demand curve depends on the assumption that the relevant demand curve is linear. If the demand function is curved, it

could be tangent to the average cost curve at any one of a number of points. In that case, it is no longer inevitable that the market will reach equilibrium at a place where the spread between price and marginal cost is narrower. In addition, the tangency solution also presupposes that the producer is charging the same price to all consumers. Allowing for price discrimination raises the possibility that a firm might still earn supracompetitive profits even at the point of tangency, meaning that further entry would occur.

The equilibrium number of products can be determined by dividing the total surplus associated with the entire market by the fixed costs needed for entry. Indeed, as the size of the market expands or the size of the fixed costs declines, the number of products asymptotically approaches infinity and the deadweight loss approaches zero. In this way, as Yoo (2004) pointed out, that access to existing products may be promoted indirectly by stimulating entry instead of being promoted directly by reducing the scope of the entitlement. Whether an economy is "large" in this manner does not depend upon the size of the fixed costs relative to the size of the marginal costs, as suggested by the traditional approach. Instead, it depends on the magnitude of the fixed costs relative to the overall market. Markets for differentiated products are also biased against products whose demands are structured in a way that make it difficult for the producer to appropriate surplus (Spence, 1976a, 1976b; Koenker and Perry, 1981; Beath and Katsoulacos, 1991).

Chamberlin regarded the welfare characteristics of the resulting equilibrium as demonstrating the systematic inefficiency of markets. For example, Chamberlin observed that monopolistically competitive markets necessarily set prices above marginal cost. In addition, the fact that markets reach equilibrium on the declining portion of the average cost curve implied that the monopolistically competitive markets exhibit a sustainable tendency towards excess

capacity and that overall costs could be reduced if the total number of sellers were reduced and the existing sellers were permitted to increase their production. He also implied that many forms of product differentiation, particularly those associated with trademarks, are spurious and represent attempts to increase profits that do not yield any consumer benefits. The models demonstrated the existence of "wastes of competition" that can be as severe as the "wastes of monopoly" and required regulatory correction (Chamberlin, 1934, 104–09).

Chamberlin's work prompted a vigorous attack from the Chicago School, who appeared to regard its finding of endemic market failure as an attack on perfect competition as the benchmark for optimal economic performance (see, e.g., Stigler, 1949; Friedman, 1953; see Chamberlin, 1957, for his response). Subsequent development of the literature on monopolistic competition appears to have narrowed the scope of some of these disagreements. For example, Chamberlin's excess capacity theorem, which is often regarded as the theory's most significant result, is based entirely on measuring welfare on the price-quantity space. It ignores the fact that there may be compensating welfare gains from the product characteristics space (Bishop, 1967; Spence, 1976a; Dixit and Stiglitz, 1977), as Chamberlin (1950, 89) recognized in his later work.

A more trenchant criticism offered centers on monopolistic competition's failure to generate testable hypotheses (Archibald, 1961). As Paul Samuelson (1967) has noted, a theory should be measured by the insights that it provides, not for its elegance or for the simplicity of the policy inferences it is able to generate. Commentators have noted the difficulties in measuring monopolistic competition empirically (Spence, 1976a).

2.2. Spatial Competition

The fact that monopolistic competition depicts market interactions in the classic price-quantity space of microeconomics allows for a natural representation of economic welfare

associated with total surplus. This approach does not portray product differentiation directly. Spatial competition models, in contrast, adopt the opposite tack, making product differentiation the primary variable instead of price and quantity. The original formulations assumed that, rather than competing on price, firms instead vie for business by choosing a location along a linear geographic space. Because of transportation costs, customers derive greater utility from purchasing from sellers that are closer to their locations. Utility declines as the distance from the store increases until the entire surplus is completely consumed by transportation costs, at which point the customer decides not to purchase from that vendor. Spatial differentiation thus gives sellers a degree of power over price, as they can increase price without losing those customers who are situated closest (Hotelling, 1929).

Economists quickly recognized that the same framework could be used to model competition among products distributed along a characteristics space rather than a geographic space (Hotelling, 1929; Chamberlin, 1934; Kaldor, 1935; *see generally* Lancaster, 1977). Under this approach, customers decide whether to purchase a particular product based on how closely that product matches their ideal preferences. The decline in utility represented by transportation costs in geographic location models is replaced by divergence from a consumer's preferred characteristics.

Examples of two such characteristics spaces are depicted in Figure 3. The horizontal dimension depicts where along the continuum of characteristics a particular product is located. The vertical dimension in the graph represents the net surplus available from consumers occupying any particular location. Consumers' ideal preferences are assumed to be distributed uniformly across the characteristics space. Each product is produced by a different firm, and the surplus captured by each product is depicted by a triangle. The decline in utility resulting from

the good's divergence from the consumer's ideal preferences is represented by the slope of the triangle's sides. The slope of this line is determined by the structure of demand, as reflected in the relevant cross-price elasticities. If a product serves as a relatively good substitute for similar products, the slope will be relatively flat. If not, the slope will be relatively steep.

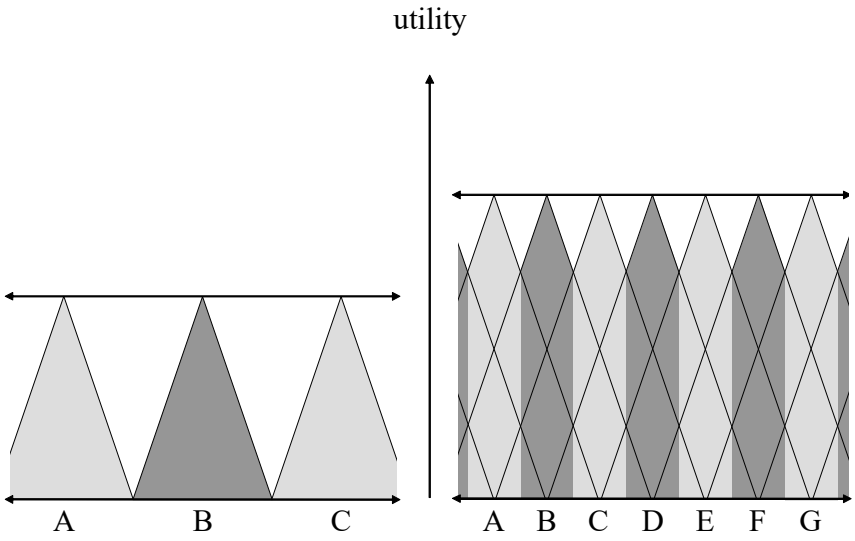

Figure 3: Impact of Fixed Costs on the Equilibrium Under Spatial Competition

Consumers are assumed to purchase whichever product lies closest to their ideal preferences. As noted earlier, the symmetric preference assumption posits that all products within a group are in equal competition with one another and that entry by a new product takes business from all incumbents evenly. This assumption is represented in spatial models either by positing that all products enter simultaneously or by assuming that incumbent products respond to product entry by costlessly shifting their position. The result is an equilibrium in which products are evenly distributed across the relevant product space. To ensure the existence of equilibrium, the characteristics space is typically modeled as a unit line or a unit circle. Moreover, firms face competition in the areas where two triangles overlap, but will act as

monopolists in the areas closer to the peaks of the triangles, which effectively means that they will face a kinked demand curve and the accompanying difficulties with defining equilibrium in terms of tangency (Salop, 1979).[2]

As was the case under monopolistic competition, entry by additional products divides the available surplus into increasingly smaller fragments until the size of those fragments equals the fixed costs of entry, at which point no product earns supracompetitive profits, subject again to a mild exception for fixed-cost indivisibilities. Again, the equilibrium number of products can be determined by dividing the total surplus by the fixed costs of entry. If the total surplus is significantly greater than the fixed costs of entry, the economy will be relatively "large" and the competition among sellers will be relatively substantial. As the available surplus increases or the size of the fixed costs approaches zero, the number of products will approach infinity and all customers will purchase products exactly matched to their tastes. If the total surplus is small relative to the fixed costs, the economy will be relatively "small" and products may well enjoy a degree of local monopoly or oligopoly power. Although entry by competitors remains possible under these conditions, the volume may be too low to support additional sellers (Eaton and Wooders, 1985; Eaton and Lipsey, 1989).

Spatial competition provides for a direct representation of product differentiation, although the fact that these models do not employ the price-quantity space of neoclassical economics means that price competition must be modeled separately and makes it more difficult to integrate spatial models into conventional analyses of economic welfare. In addition, spatial

[2] Interestingly, the assumption that prices are constant and endogenously determined can give rise to a different equilibrium in which products, rather than being spread evenly across the characteristics space, divide the market by entering at the same point (Hotelling, 1929). The oddities resulting from refusing to allow for price competition are well recognized. For example, the assumption that firms do not compete on price necessarily implies that effective competition exists only with respect to consumers located equidistantly from two works. This effect disappears, however, if the model is broadened to allow for endogenous pricing in which price competition is possible.

competition models are subject to a number of qualifications and refinements. Not all products can be organized into a simple spectrum of characteristics. Furthermore, while the assumption that utility falls linearly with distance is natural when measuring the impact of distance in a geographic space, it appears to be less plausible in a characteristics space, where the decay in utility could take just about any shape. As it turns out, the assumption that utility falls linearly is a strong one. For example, the assumption that utility decays quadratically instead of linearly leads to radically different results (d'Aspremont et al., 1979).

The two different depictions in Figure 3 illustrate how the relative size of the total available surplus affects the degree of competition. The available surplus in the right-hand graph is fifty percent larger than that in the left-hand graph. In both graphs, each individual product captures an identical surplus. As the graphs illustrate, increasing the size of the overall market yields a fairly substantial increase in the degree of competition. More sophisticated models that allow for price reactions among competitors further underscore the importance of the relative size of the economy. These models demonstrate that so long as marginal costs are nonzero, increases in the size of the economy cause prices to approach marginal cost and reduce profits by bringing the revenue captured by each producer more into line with fixed costs.

Furthermore, the analysis becomes significantly more complicated when one relaxes the rather restrictive assumptions that typify the basic model of spatial competition described above. More refined models allow for the possibility of sunk costs in location and sequential entry (Baumol, 1967; Hay, 1976; Prescott and Visscher, 1977; Eaton and Lipsey, 1980; Lane, 1980; Bonanno, 1987; Neven, 1987; Bhaskar and To, 2004). Other models relax the assumption that prices are fixed and allow prices to be determined endogenously (Salop, 1979; Eaton and Wooders, 1985). Still other models allow for the possibility that a single firm might produce

multiple products occupying multiple locations (Schmalensee, 1978; Eaton and Lipsey, 1979; Brander and Eaton, 1984; Judd, 1985; Bonanno, 1987). Still other models allow for the possibility that consumers base their purchases on multiple dimensions of characteristics, which means that firms compete with more than just two adjacent competitors. For example, if spatial competition takes place on three dimensions, each work may compete with as many as six adjacent neighbors. If competition expands to four dimensions, works may theoretically compete with as many as half the works operating in the product group (Archibald and Rosenbluth, 1975). An empirical assessment of the automobile industry concluded that differentiated products compete in as many as six dimensions (Feenstra and Levinsohn, 1995). Finally, the results change significantly when one allows for the possibility that consumer preferences are not distributed equally across the characteristics space (Kaldor, 1935; Eaton and Lipsey, 1976). The basic model is nonetheless sufficient to capture the key intuitions about how differentiated products compete and to provide useful insights into markets for differentiated products. As was the case with monopolistic competition, leading commentators on spatial competition have noted the difficulty in determining whether any particular equilibrium is optimal (Lancaster, 1977; Eaton and Lipsey, 1989)

2.3. Implications

Compared with the traditional approach, the predictions of the differentiated products approach to copyright fit better with features of real-world markets for IP. One of the most interesting aspects of the differentiated products approach is that it reconceptualizes the tension between access and incentives that motivates much of the economic analysis of IP. Chamberlin's primary point is that the fact that equilibrium prices in markets for differentiated

products exceed marginal cost raises questions whether marginal cost pricing represents the appropriate benchmark for efficiency.

In addition, two complementary insights reveal how product differentiation both creates and limits the degree of market power that producers enjoy. The downward sloping nature of demand curves associated with product differentiation also provides an explanation of how producers can maintain the power over price to engage in price discrimination in markets that are open to free entry and subject to competition (for the seminal work, see Spulber, 1979, 1981; Katz, 1984; and Borenstein, 1985; for a recent survey, see Stole, 2008). At the same time, the fact that products serve as imperfect substitutes for one another allows multiple producers to coexist and prevent markets from collapsing into natural monopolies even when average costs are constantly declining by permitting producers to compete on dimensions other than price (Maurer and Scotchmer, 2002). In so doing, product differentiation appears to provide a more realistic description of real-world markets.

At the same time, in contrast to perfect competition, in which entry generally promotes economic welfare, product differentiation gives rise to the possibility that entry may be excessive or insufficient. Whether a market will tend towards too much or too little entry depends on the extent to which the surplus that a new entrant appropriates is the result of *demand creation*, that is incremental sales to new customers who previously were not in the market or incremental welfare by permitting purchasers to consume products that provide a better fit with their preferences, or *demand diversion*, that is surplus redistributed from producers already in the market.[3] The entrant simply compares the total surplus it appropriates to its costs and enters

[3] The terminology used in this discussion is taken from Borenstein (1985). For similar analyses using other terminology, see Mankiw and Whinston (1986) ("business stealing effect") and Beath & Katsoulacos (1991) ("cannibalisation"). For other works recognizing the concept without employing a distinctive moniker, see Spence (1976a, 1976b); Koenker and Perry (1981).

whenever the former equals or exceeds the latter. While demand creation represents an incremental contribution to welfare, demand diversion does not. This causes firms to enter even when the fixed costs of entry exceed incremental benefits of doing so, in which case, entry is excessive. The greater the proportion of surplus comes from demand diversion, the greater the tendency towards excess entry. Indeed, Salop (1979) estimates that if surplus falls off linearly with distance, the equilibrium number of producers will exceed the optimum by a factor of two. As Eaton and Lipsey (1989) note, there is thus no invisible hand inexorably pushing markets for differentiated products towards optimality. While demand diversion in homogeneous product markets unambiguously produces excess entry, differentiated product markets may create either excess or insufficient entry (Mankiw and Whinston, 1986).

Yoo (2004) points out that the tendency towards excess entry created by demand diversion may be offset by the tendency toward insufficient entry created by producers' inability to appropriate the surplus they create. Whether entry levels will exceed or fall short of the optimum depends upon which effect dominates.[4] The possibility of insufficient entry created by incomplete appropriability also opens up the policy space by suggesting that access and incentives need not always be in conflict. If, on the one hand, entry is excessive, any strengthening of IP rights will push incentives to create in the wrong direction. If, on the other hand, entry is insufficient, strengthening IP rights can push incentives in the right direction while

[4] Although demand diversion allows a new product to capture the same *number* of buyers as would result under complete appropriability, it does not result in the capture of the *same* buyers. Instead, demand diversion substitutes buyers who already were purchasing other products for new buyers whose purchases represent incremental sales. Thus, although the total number of sales may reach optimal levels, the total surplus generated by those sales is likely to fall somewhat short of welfare-maximizing levels because the buyers who actually purchase the product are not necessarily those who place the highest value on the good. Some consumers may purchase goods that provide a better fit with their ideal preferences, while others may purchase goods in which the fit is worse. As a result, the equilibrium amounts to a close approximation of a first-best outcome that falls somewhat short of maximizing welfare.

simultaneously indirectly promoting access by stimulating greater price competition among the differentiated products.

3. Patent

During the early 1990s, economists produced a vibrant body of scholarship applying the economics of product differentiation to IP. This literature focused on the tradeoff between patent *length*, measured in the number of years of exclusivity included in the patent grant, and *breadth*, determined by the extent to which patents foreclose others from using similar technologies. For example, Gilbert and Shapiro (1990) offer a model that measured product differentiation by the ability to raise price above marginal cost to find that welfare would be maximized if patents were infinitely lived and patent were adjusted to provide the appropriate reward for investment. This is because adjusting patent duration gives rise to the familiar access-incentives tradeoff by both increasing the surplus contained within the patent grant and permitting increases in price, whereas Gilbert and Shapiro's measure of breadth implicates only the latter.[5] Gallini (1992) defines breadth in terms of the size of the cost to invent around a patent to present a model finding short-lived, broad patents would be optimal because longer terms hurt patent holders by increasing competitors' incentives to invent around the patent.[6] Klemperer (1990) models production differentiation directly in a Hotelling-style model, characterizing patent scope as the size of the characteristics space over which the patent gives the patentee exclusivity rights. He concludes that if consumer preferences are homogeneous across all products, infinitely lived, narrow patents would maximize welfare. If consumers have strong preferences for particular product characteristics, short, broad patents would improve welfare.

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5 Tandon (1982) proposed a similar model favoring infinitely lived patents limited by a compulsory license.

6 Denicolò (1996) presents a model yielding a similar result.

This literature recognizes the existence of additional policy instruments that would calibrate the strength of the patent grant. Gilbert and Shapiro define breath in a way that effectively focuses on appropriability of surplus. Klemperer demonstrates the ambiguous impact of demand diversion by showing how a high level of substitution among goods favors granting a narrow patent.[7] The result is a policy space that is richer and more nuanced than the previous literature which focused exclusively on calibrating patent duration (Nordhaus, 1969; Scherer 1972).

Later scholars extended this literature in important ways. Matutes, Regibeau, and Rockett (1996) look at the proper patent regime for basic innovations that benefit multiple markets. In order to minimize the period during which the inventor postpones disclosing its invention in order to have more time to develop the expertise to commercialize these multiple markets, Matutes et al. prefer a patent that is short in duration, but broad in scope. O'Donoghue, Scotchmer, and Thisse (1998) apply a conventional spatial competition model with substitutes from alternative technologies distributed along a quality scale to distinguish between *lagging* breadth, which is breadth that forecloses low-cost imitations, and *leading* breadth, which forecloses higher-quality innovations. They found patents that protected lagging breadth provided sufficient incentives for R&D. With respect to leading breadth, a long, narrow patent was superior in reducing R&D costs, while a short, broad patent would reduce market distortions. The authors conclude that a long, narrow patent is preferable when the hit rate of new innovations is high. Maurer and Scotchmer (2002) focus on independent invention, arguing for narrow breadth protection because the threat of independent invention would encourage

[7] See also Waterson (1990) using a similar spatial competition model to show how demand diversion can lead to excess entry.

licensing of the patent and discourage duplicative investments in R&D.[8] Beschorner (2008) frames his analysis as a tradeoff among patent length, breadth, and what he terms *height*, which is the degree of novelty required to justify receiving a patent, to conclude that a finite patent length would maximize welfare and that a monopolist would require a lower level of novelty than would be socially optimal. Further explorations of the other aspects of product differentiation theory are likely to follow.

4. Copyright

An equally dynamic body of scholarship has emerged applying product differentiation theory to copyright, this time conducted primarily by legal academics. The initial analyses used product differentiation to analyze competition between a work and inferior quality copies of the same work (Johnson, 1985; Liebowitz, 1986; Besen & Kirby, 1989), analyze competition between creative and noncreative works (Lunney, 1996), or to briefly mention the impact of demand diversion (Meurer, 2001).

4.1 Differentiated Products Competition Between Different Works

More complete analyses of competition between different copyrighted works began with Yoo (2004), who offered the most complete exploration of the dynamics and welfare characteristics of both the monopolistic competition and spatial competition approaches to product differentiation that has yet appeared in the literature. Importantly, it applies the traditional length versus breadth tradeoff to copyright, while adding a third dimension termed *intensity*, which refers to the proportion of the available surplus that copyright holders can appropriate through price discrimination and other similar mechanisms. He also notes that the size of the market relative to fixed cost determines the number of works in equilibrium. As the

[8] See Lemley and McKenna (2012) for a related argument appearing in the legal literature.

size of the market increases and the size of fixed costs decreases, pricing converges to the perfectly competitive outcome, although the problems of excess entry become worse, which opens the possibility of promoting access by increasing the number of surplus-generating activities contained within the copyright and facilitating copyright holders' ability to engage in price discrimination and relying on the ensuing price competition to reduce prices, although doing so could exacerbate problems of excess entry. He then analyzes the implications for copyright doctrines such as fair use, the first-sale doctrine, digital rights management, and derivative works.

Abramowicz (2004) employs spatial competition model to analyze the impact of demand diversion on optimal entry. Although he recognizes that whether a market will reach equilibrium with too much or too little entry, he relies on the findings of the circle model put forth by Salop (1979) and a simulation to suggest that excess entry is the more likely outcome. He acknowledges that Salop's result depends on the assumption that the welfare that individual consumers derive from consuming a particular work falls off linearly with distance in the characteristics space. He also addresses a wide range of other economic issues, including wealth distribution, winner-take-al markets, positional goods, and externalities, and noneconomic issues, such as democracy. Faulhaber (2006) similarly applies the Salop model along with sunk costs in location to provide a model finding excess entry in music. Lemley and McKenna (2012) are similarly concerned about excess entry, arguing for narrowing breadth by increasing the degree of similarity required to find infringement and narrowing leading breadth by construing fair use and derivative works doctrine to provide greater latitude to works that provide incremental contributions.

The divergent emphases of these two lines of research underscore the ambiguity of the welfare characteristics of differentiated product models, which both authors recognize. Bracha and Syed (2014) acknowledge the contribution of the Yoo and Abramowicz papers, but criticize both for drawing overly simple policy inferences. While both papers emphasize different sides of the divergent possible results, both acknowledge the inherent ambiguity of the differentiated products equilibria.[9]

The welfare ambiguity of product differentiation underscores the importance of the small empirical literature exploring the economic performance of markets for creative works. Like the theoretical literature, the empirical literature is divided. On the one hand, Goettler and Shachar (2001) empirically assess the spatial competition among the three major U.S. television networks, concluding that the networks' program offerings nearly fully achieved the optimum suggested by the underlying Nash equilibrium and that the shortfall was largely (but not completely) explained by the networks' adherence to the rules of thumb against airing sitcoms after 10:00 p.m. and against airing news magazines before 10:00 p.m. On the other hand, Berry and Waldfogel (1999) empirically study entry patterns in the radio industry, finding that the deadweight losses attributable to excess entry may be substantial. They acknowledge that their study focuses exclusively on advertisers and therefore ignores potential benefits users and that their assumption that the radio market is composed of homogeneous products causes them to ignore potential welfare benefits resulting from product differentiation.

[9] Bracha and Syed (2014) also place great weight on the distinction between the impact of product differentiation on supramarginal vs. inframarginal works. All of this is taken into account by the symmetry assumption, and the literature has long recognized that relaxing this assumption leads to inferences that are more ambiguous that Bracha and Syed suggest.

4.2 Spatial Competition and Impure Public Goods

A small literature also exists connecting the economics of product differentiation with the theory of impure public goods. The conventional wisdom is that IP is a pure public good and that as such exhibits a systematic tendency towards underproduction. Although most attribute that to the pricing problems inherent in zero marginal, a review of seminal works on public goods indicates that the problem is one of incentive compatibility inherent in the Samuelson condition, stemming from the inability to get consumers to reveal their marginal preference for public goods.

The literature on impure public goods associated with club goods (Buchanan, 1965) or local public goods (Tiebout, 1956) adds a congestion function to the standard public goods set up. The resulting equilibria tradeoff the incurrence of additional fixed costs against the reduction in congestion costs associated with creating an additional impure public good. Unlike the Samuelson condition, congestion is potentially incentive compatible. Numerous Nobel laureates have identified the connection between spatial competition and impure public goods, with the congestion function being replaced with the transportation costs function in the product characteristics space (Samuelson, 1958; Buchanan, 1965; Stiglitz, 1977).

Yoo (2007) applies the insights of impure public goods theory to copyright. As is the case with product differentiation, simple policy inferences disappear for impure public goods, including the systematic tendency towards underproduction. It similarly opens up the possibility of alternative policy approaches, such as promoting access by increasing the size of the market and stimulating entry that induces greater price competition. Because the shape of the congestion function can take any form, there is no necessary reason to believe that the equilibrium induced by the congestion function will prove optimal. Like markets for

differentiated products, markets for impure public goods can produce too many works or too few.[10]

5. Trademark

Of all of the forms of IP, Chamberlin (1934) devoted the most attention to trademarks, presenting an extended discussion of them in Appendix E of his book. He regarded the differentiation associated with trademarks as motivated primarily to promote monopoly and argued that lowering the standard for infringement would bring markets closer to the competitive ideal. He particularly questioned the need for extending trademark protection to descriptive words, color, shape, design, packaging and labels, when an "inconspicuous identification mark or the name and address of the producer" would suffice. Anything more simply conveys monopoly power to the mark holder. Chamberlin acknowledged that free imitation of trademarks would harm consumers by eliminating incentives to maintain product quality, but thought that an alternative regime centered on "defining quality standards by law" "has large possibilities" and "would be equally effective." He also acknowledged that trademarks can stimulate variety and give consumers wider choice, but such variety came at the cost of higher prices. Although Chamberlin conceded that theory provides no basis for how best to strike this tradeoff, on balance he nonetheless came down squarely against trademarks, arguing that weakening trademark protection would discourage "[u]seless innovation," would reduce the "wastes of advertising," and would focus producers less on creating monopoly and more on production, which in turn would create "[f]ewer 'business' men and more laborers." Innovations would still be protected by patent law and by first-mover advantages. If this were insufficient,

[10] For a related analysis, see Barnes (2011) arguing that impure public goods theory does not support strengthening copyright protection.

trademark protection should be only of limited duration, say five years (Chamberlin, 1934, app. E).

Chamberlin launched a tradition of scholars largely critical of trademarks as a source of spurious differentiation (see, e.g., Brown, 1948; Scherer, 1970, 1976; Comanor and Wilson, 1979; Schmalensee, 1979). Contemporary antitrust scholars raised similar concerns (Bain, 1956). These concerns reached their zenith in the late 1970s, exemplified by the FTC's case against Borden's ReaLemon lemon juice (for an overview, see Mensch and Freeman, 1990; McClure, 1996). The initial 1974 complaint and 1976 decision by the administrative law judge alleged that Borden's trademark promotion and advertising had created an entry barrier and required Borden to license its ReaLemon trademark to anyone wishing to compete with it. When the full Commission reviewed this decision, it similarly concluded that ReaLemon represented a classic case study of spurious and artificial product differentiation created by advertising and not by the superiority of its product or its greater efficiency. The Commission declined to impose compulsory licensing of the trademark, concluding that the remedy of preventing Borden from engaging in selective price reductions was sufficient. The U.S. Court of Appeals for the Sixth Circuit upheld this decision over a strong dissent from Judge Cornelia Kennedy. The advent of the Reagan Administration led the FTC to reverse itself and support Borden's request to vacate and remand the Sixth Circuit's decision. The Commission's revised 1983 order repudiated the reasoning of its initial 1978 order, concluding instead that trademark-driven product differentiation can promote competition, particularly by reducing search costs.

Combined with the FTC's abandonment of its *Cereals* case in 1981, which included similar claims of artificial product differentiation through advertising, and the *Maxwell House* case in 1984, the *ReaLemon* case is widely regarded as signaling the downfall of the

Chamberlinian critique of trademarks as a form of spurious product differentiation (Mensch and Freeman, 1990; McClure, 1996; Weinberg, 2005). Since that time, the economics of trademark has generally come to regard trademarks as a way to reduce search costs and to promote investment (for the leading statement, see Landes and Posner, 1987). Some scholars have continued to advocate a Chamberlinian approach (Lunney, 1999). Others have taken a more balanced approach, acknowledging that trademarks can represent a positive source of product differentiation and information for consumers, but looking for ways to limit the potential abuses of power (Barnes, 2009; Lemley and McKenna, 2014).

6. Conclusion

Product differentiation has represented a generative force in the economic analysis of IP. Not only does it offer a better theoretical explanation for a number of market features, it also provides a basis for formalizing both the access and incentives sides of the tradeoff in a way that yields insights into their structural interrelationship. Product differentiation also creates the possibility of excess entry. It also demonstrates the existence of circumstances under which strengthening IP protection can promote both access and incentives simultaneously. This stands in stark contrast to the position that dominates existing scholarship, which views these two considerations as being in inexorable tension.

It may seem counterintuitive that protection should be the greatest when high fixed costs and low substitutability cause the market to become the most concentrated, but this apparent paradox is resolved once one understands the complex manner in which access and incentives interact with one another. In this sense, the differentiated products approach captures some of the insights of classic property theory, which emphasizes the importance of well-defined property rights in ensuring optimal investment and deployment. In so doing, it corrects for the

blind spot that results when markets for IP are treated as monopolies and allows for serious consideration of the role of short-run profits in stimulating entry and promoting economic efficiency. At the same time, it moves beyond classic property theory by identifying ways in which a property right can be too strong.

It bears noting that the differentiated products approach cannot completely resolve the tension between access and incentives. The presence of a downward-sloping demand curve renders some degree of deadweight loss endemic. In addition, the fact that perfect price discrimination is impossible prevents rightsholders from appropriating the entire surplus created by their IP. As a result, markets may exhibit a systematic tendency towards having too few products. However, demand diversion makes it possible that the market will produce the optimal number of products. Any such solution to the incentives side of the tradeoff necessarily requires accepting a degree of inefficiency in terms of access. As the theory of the comparative second-best aptly points out, the differentiated products approach's inability to generate first-best outcomes is not by itself sufficient to justify rejecting it.

In addition, the differentiated products approach allows for a more nuanced analysis by making it possible for policymakers to distinguish among different aspects of IP protection. This represents a substantial improvement over the traditional approach, which tends to represent all aspects of the strength of IP with a single variable and fails to distinguish among different aspects of protection. In so doing, it identifies circumstances under which efficiency might best be served by making the right large (in terms of surplus-generating activities within its scope) and intense (in terms of the proportion of that surplus that producers are able to appropriate), but narrow (in terms of how close another product can come to an existing product without infringing the IP). Thus, the differentiated products approach does not amount to a blanket

endorsement for strengthening IP protection. On the contrary, the resulting theory allows for a degree of subtlety that is impossible under other approaches.

Although the application of product differentiation to IP has yielded some interesting insights, considerable additional work remains to be done before it can be fully operationalized. As noted earlier, further work should incorporate elements of cumulative innovation that take into account the extent to which existing IP serves as inputs to subsequent products. Furthermore, the differentiated products approach should be broadened to account for endogenous pricing as well as the preemptive strategies available when entry is sequential and when firms can occupy more than one location.

The models also should consider the implications of relaxing the symmetrical preferences assumption, either by allowing for variations in the distribution of consumers across the characteristics space or by allowing the extent to which particular products serve as substitutes for other products to vary. Relaxing the symmetry assumption allows for the possibility that the impact of entry by a new product will no longer be spread evenly across all of the incumbents. Instead, it suggests that the entry will affect only some of the products. This localization of competition has the effect of dividing the relevant market into subsegments, with the overall competitiveness of each subsegment determined by the size of the total surplus of the subsegment relative to the fixed cost. The lack of robust competition within a subsegment may limit the extent to which entry can push price towards marginal cost. It can also allow the "integer problem" to arise simultaneously with respect to multiple portions of the overall market, as the single "large economy" is chopped into a series of "small economies" that each are capable of supporting sustainable profits.[11] If these effects arise with respect to multiple

[11] Interestingly, the market need not be divided into discrete subsegments in order for this effect to occur. Variations in the density of firms across the product space can balkanize the industry into a chain of "overlapping

subsegments, the combined adverse impact may be quite substantial, although the resulting policy prescription may be the same as when consumer preferences are assumed to be symmetric.

Countervailing considerations exist as well. The discussion of spatial competition assumes that product characteristics vary along a single dimension, in which case products compete exclusively with their two adjacent neighbors. The localized nature of differentiated products competition can be substantially mitigated if spatial competition occurs along more than one dimension.

The inherent ambiguity of the outcomes under product differentiation suggests that the early fight between Chamberlin and the Chicago School may have been somewhat overstated. It also underscores that the study of product differentiation would benefit from more empirical work. Moreover, the policy instruments that follow from the differentiated products approach are by their nature extremely contextual and do not lend themselves to simple inferences. In addition, the interrelationships among the available policy instruments make calibrating them simultaneously an extremely difficult empirical exercise. The fact that the differentiated products approach is contextual and nuanced should not obscure its basic analytical power. Indeed, the intuitions that the theory reveals about the relationship between access and efficiency, the manner in which the various aspects of IP protection interrelate, and the true relationship between IP and public goods theory are sufficient to justify further inquiry.

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oligopolies," each comprised of a small number of firms engaged in localized competition regardless of how many firms are operating in the overall market. This can give rise to the same problems even in the absence of actual gaps in the product continuum (Kaldor, 1934; Eaton & Lipsey, 1989).

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