EMPIRICAL STUDY OF THE AESTHETIC FUNCTIONALITY ON COLOR TRADEMARKS

BY

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DISSERTATION

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ABSTRACT

Although trademark law permits the protection of "trade dress" (distinctive product shape, ornamentation, and packaging), the enforcement of too strong a property can stifle competition. U.S. courts apply the "aesthetic functionality" doctrine in trademark infringement cases to address this concern. "Aesthetic functionality" refers to non-reputation-based advantages protecting trade dress might provide. In a specific case, the judge decides whether the disputed trade dress is aesthetically functional. If so, the trade dress is denied protection, even if it identifies the source of the product to consumers. The doctrine applies especially relevantly to color trademarks, a sub-category of trade dress.

I explore the historical case law and point out three problems in determining a color's aesthetic functionality: (1) Judges lack tools to diagnose the de-facto advantage a color might have, and their decisions are often intuitive and speculative; (2) Judges rarely evaluate properly the substitutability of alternative colors; (3) a color's non-reputation-based advantage (pure attractiveness) is hard to isolate from its reputation as a trademark. This dissertation tries to address the first and second problems.

I review psychological and economic research--psychological studies of color effects and economic measures of anticompetitive costs--to improve the process of diagnosing a color's de-facto advantages and evaluating alternative colors' substitutability. At the end of the dissertation, I propose and illustrate three approaches to evaluate the anti-competitive effect of color in specific cases: psychological guideposts, market data analysis, and consumer survey tools.

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CHAPTER 1. INTRODUCTION

Trademarks evolved to meet the needs of a society where buyers cannot easily discern the source of commercial goods sold by remote producers. Trademarks are labels, telling consumers who produces the goods they purchase. Trademarks often consist of words and logos, but they can also be features of the product itself, such as its shape, color, packaging, or some combination thereof.[1] Non-word trademarks are also called "trade dress."

Protecting trade dress may have anti-competitive effects, as it prevents competitors from using certain product features/designs for an unlimited term (Brown 1948; Lunney 1999; Lemley 1999; Burgunder 1986). Trademark protection can enable trademarks owners to attract a disproportionate number of consumers, or allow them to raise prices, causing deadweight losses (Lunney 1999, 422-431). Courts developed the aesthetic functionality doctrine to protect against monopoly costs inherent in the trademarking practice.

This doctrine was articulated succinctly in the *Restatement (Third) of Unfair Competition* ("Restatement (Third)"): "If a design's 'aesthetic value' lies in its ability to 'confe[r]

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1. The Lanham Act defines trademark as "any word, name, symbol, or device, or any combination thereof". *See* Lanham Act, 15 U.S.C. §1127 (1946), as amended by Title I of HR 6163, 98th Cong, 2d Sess (1984), as enacted Pub L No 98-620 (1984). Although color(s) is not written in this definition, a single color can be protected as a trademark in US. *See In re* Owens-Corning Fiberglas Corp., 774 F.2d 1116 (Fed. Cir. 1985); Qualitex Co. v. Jacobson Products Co., 514 U.S. 159 (1995). Color combinations and color confined to a specific design can be protected as trademarks even earlier. *See* Brunswick-Balke-Collender Co. v. American Bowling & Billiard Corp., 150 F.2d 69, (2d Cir. 1945); Chevron Chemical Co. v. Voluntary Purchasing Groups, Inc., 659 F.2d 695 (5th Cir. 1981); SK&F, Co. v. Premo Pharmaceutical Laboratories, Inc., 625 F.2d 1055 (3d Cir. 1980) ; Transportation, Inc. v. Mayflower Services, Inc., 769 F.2d 952 (4th Cir. 1985).

a significant benefit that cannot practically be duplicated by the use of alternative designs,' then the design is 'functional'".[2] If a product's designs/features are aesthetically functional, they cannot be protected as trademarks.

Determining aesthetic functionality presents three main issues: (1) how to identify a trade dress's de facto aesthetic advantage; (2) how to evaluate substitutable trade dress that might eliminate anti-competitive consequences; (3) how to determine when protecting a trade dress hinders competition in situations where consumers buy the product partially due to the trade dress's ability to identify a reputable source of goods and partially due to trade dress's sheer attractiveness. This dissertation focuses on the first and the second issues, specifically considering color trademarks, an important subcategory of trade dress. Its goal is to demonstrate an empirical framework's ability to improve the courts' determination process regarding whether a color's trademark protection is impermissibly anti-competitive, as defined by US judicial decisions.

This dissertation contributes to both the theoretical and legal literature. In the academic literature, an influential strain of scholarship suggests that the doctrine is unmoored, unwieldy, and unworkable (Tal 2013; Krieger 1982; McCarthy 2010). This dissertation rebuts these arguments and shores up this doctrine by elaborating on historical cases, psychological rationales, and economic justification. Furthermore, it illustrates how the doctrine can be tested

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2. Restatement (Third) of Unfair Competition, § 17 cmt. c (1995)

via market data and consumer surveys. This dissertation greatly rebuilds the reputation of the doctrine of aesthetic functionality.

Second, human psychological responses to the trade dress stimuli can render a trade dress aesthetically functional (Hughes 2015). Existing aesthetic functionality doctrine commentary focuses on the field of law and economics; none approach this doctrine from a psychological perspective. This dissertation is the first study to systematically explore consumer psychology studies focused on color and reveal the psychology behind how color attracts purchasers. It imports psychological studies to interpret the legal doctrine of aesthetic functionality, which enriches and extends the academic literature.

This study also provides litigants/judges with empirical approaches to determine whether a color is aesthetically functional. These empirical approaches are more grounded in market realities than the current intuitive and speculative approaches taken by trademark offices and judges. This study empowers litigants and judges to better decide a color trademark's aesthetic functionality and base their decisions on a relatively objective, solid basis.

Chapter 2 of this dissertation explores trademark law's history and the development of the aesthetic functionality doctrine. The aesthetic functionality doctrine exists to avoid the anti-competitive costs associated with protecting trade dress. To determine whether competition is hindered, judges frequently ask the three questions: (1) whether the trade dress has a de facto aesthetic advantage, (2) whether an alternative, comparable trade dress exists, and (3) whether the trade dress's advantage is also caused by reputation.

Without empirical evidence, judges and litigants face challenges answering these questions. First, judges and litigants lack tools to diagnose trade dress's de facto aesthetic advantage. Mostly, they rely on intuition regarding what the anti-competitive consequences might be. Second, it is difficult for judges or litigants to decide whether alternative designs are sufficient and substitutable. Third, when an advantage is partially due to the plaintiff's reputation, as identified by the trade dress, and partially due to the pure attractiveness of the trade dress, the case law has not yet settled on a rational approach.

Chapter 2 makes two important points about trademark's history. First, trademark law has always denied trademark owners a broad property right in order to protect market competition. Second, courts protect competitive concerns unevenly, often relying on intuition and proxies in the absence of empirical evidence. Cases involving color trademarks illustrate both points eloquently.

Chapter 3 explores consumer psychology research and illustrates how colors evoke different levels of affective responses (pleasure, arousal, appraisal) and cognitive responses (attention, interpretation, memory, attitude). Studies show how different levels of affective/cognitive responses further evoke different levels of purchase intention. These affective/cognitive responses determine how colors influence purchase intention.

Psychological studies also provide guideposts to determine whether a color might enhance purchase intention. Context matters, such as where and how the color is used, the product type, and whether local culture influences color preference. Based on these factors, color evokes varying affective responses – such as arousal, pleasure, or appraisal – or stronger consumer psychology cognitive responses – such as attention, memory, interpretation or attitude – compared with other colors. One color can enhance purchase intention more than other colors.

These contextual factors and the affective/cognitive responses constitute psychological guideposts that can direct judges/litigants in determining whether a disputed color confers a legally relevant advantage over alternative colors.

Chapter 4 explores economic research on trademark law that theorizes how trademark protection can have anti-competitive effects. Some commentators conclude that trademark protection can enhance product differentiation, giving the trademark owner the power to restrict a product's output and raise its price. Economists pinpoint when deadweight losses and monopoly costs might develop in a market. Economic studies not only justify the aesthetic functionality doctrine but also suggest two proxies to predict when protecting a color would hinder competition. One involves "inelasticity" or "monopoly pricing effects," which measures a color's power to maintain sales at a higher price. If demand for one color is less elastic than for other colors, it might have more pricing power. The other proxy is denominated simply as "quantity" or "distributive effects." Even when protecting a color does not confer a pricing advantage, it may allow a trademark owner to exclusively control a segment of the market, conferring an advantage over the quantity of goods sold in relation to new entrants.

For example, imagine a market for a product where 10 colors have equally superior attractiveness, and each is owned by a single producer. In this context, protecting a color has no monopoly pricing effect because, in the absence of collusion, no producer can raise her price without losing sales. However, competition is hindered. No producer outside the 10 with an equally good product can effectively enter the market without using one of the 10 superior colors. Color protection, in this instance, locks in a percent of the market for each producer and locks out potential competitors. Supreme Court precedent establishes that the aesthetic

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functionality doctrine prevents color from conferring this non-reputation-based advantage on a producer.

Chapter 5 conducts empirical research, using market data and consumer surveys. Market data reveals that some colors have significantly higher market share than other colors (suggesting the "quantity" effect). I also describe consumer surveys that show some colors have less elasticity than other colors according to the formula for arc price elasticity of demand.

Based on the empirical research, I propose and illustrate three approaches to measure the distributive effects (quantity) and monopoly pricing effects (inelasticity): (1) psychology guideposts, (2) market data, and (3) consumer surveys. Psychological guideposts help judges/litigants in two ways. First, psychological guideposts show the importance of context and direct judges/litigants to consider contextual factors. Second, psychological guideposts suggest what colors might substitute for disputed colors. Market data indicates when a color's distributive effects (quantity) are significant, and consistency between multiple studies can prove the stability of some color preferences. Lastly, a properly-designed consumer survey can directly measure color preference and the potential for monopoly pricing (inelasticity).

This study does not try to quantify precisely how large an effect on the market should qualify as "anti-competitive", which is a job for courts in specific cases. Competitors need not show damage amounting to an anti-trust violation, although according to the guidelines of U.S. Department of Justice and the Federal Trade Commission, 5% price increase is often considered

as anti-competitive in merger cases.[3] In color trademark cases, providing a dead weight loss caused by monopoly pricing (inelasticity) is probably enough, though something less than that, such as the distributive effect (quantity) is clearly contemplated by the Supreme Court's "non-reputational advantage" language.

Chapter 6 summarizes the dissertation, describes the study's limitations, and proposes directions for future research. This study concentrates on only one dimension of color – hue. Future studies might explore color's functionality by looking at other two dimensions – saturation and value. Moreover, future studies might research color combinations rather than single colors. Additionally, this study only provides methods to measure the competitive distance between the disputed color and alternative colors in evoking distributive effects (quantity) and monopoly pricing effects (inelasticity). Future studies might further explore how much purchasing power varies between a disputed color and alternative colors as a measure of competitive disadvantage.

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3. U.S. Dep't of Justice & Fed. Trade Comm'n, Horizontal Merger Guidelines, §4.1.2 (2010).

CHAPTER 2. MONOPOLY CONCERN IN TRADEMARK LAW—LOOKING AT HISTORY

Trademark law, from the beginning, has never been about simply protecting a personal property right of the trademark owner. The law has always tried to achieve a balance between preventing consumer confusion (passing off[4]) and avoiding monopoly costs[5] in order to nurture an efficient market through fair competition.

2.1. The Monopoly Concern in Trademark Law

2.1.1. Early history of trademark law - What is a trademark in modern common law?

In medieval England, marks called "merchants' marks" and "production marks" were attached to products (Schechter 1925). Merchants' marks were used by merchants to indicate the ownership of the physical goods in transit (Schechter 1925). By these marks, the merchants claimed physical goods shipped at sea (Schechter 1925).

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4. Passing off refers to imitating others' marks to pretend that the marked products are produced by the mark owner. Passing off was described in a manuscript held in the collection of the College of Arms in London, a royal UK corporation responsible for the granting of new coats of arms and relevant business (Dawson 2003). The manuscript described a trade mark dispute in 1740 where an Italian merchant used a coat of arm on tillets (coverings made of coarse cloth, used to wrap), in order to distinguish them from others' products. The author of the manuscript described another firm using the same coat of arms on tillets, "passing off their goods for Meyer's (the Italian merchant)" (Dawson 2003, 116).

5. The term "monopoly costs" is used to describe the negative welfare effects associated with any actionable restriction on competition, not merely technical violations of US anti-trust law.

A production mark, on the other hand, was attached to a product to indicate which craftsman produced the product, often called a "mark of origin" (Schechter 1925). If the product was ill-made, the craftsman could be tracked down and punished by his guild (Schechter 1925). Production marks were mandatory, and guilds used the marks to manage production in two respects. First, the mark facilitated product quality control by making producers traceable. Second, through mark registration, and other methods (e.g., output control), the guilds prevented competition from craftsmen outside the guild (Schechter 1925).

However, neither merchants' marks nor production marks were true modern trademarks. A modern trademark (1) indicates the source of the goods rather than evidences ownership of the goods (Schechter 1925, 20); and (2) represents an asset (good will or reputation) rather than a potential liability to a controlling guild (38). Merchants' marks were not used to show consumers the source/producer but served as ownership evidence of physical goods. Production marks were marks of origin, but goodwill/reputation did not necessarily attach to production marks. They were just a private means of internal control. In a guild system, consumers lived close to these craftsmen, and they did not rely on the marks to know the goods' quality (Schechter 1925). Craftsmen had little reason to claim a right to his mark since no benefit attached to it (Schechter 1925). Therefore, production marks were not modern trademarks either.

The modern trademark concept did not arise until the late 18th and early 19th century in England (Schechter 1925, 128-131), when national and international markets developed as a result of the Industrial Revolution. Production marks became valuable symbols representing goodwill/reputation (129). Protecting a trademark as a right against counterfeits became

necessary. In a statute[6] aimed at the textile trade, Parliament indicated that a mark was a privilege instead of a mandatory duty: "That it shall and may be lawful to and for every trader, dealer and weaver of linen manufacture, to weave his name, or fix some known mark in any piece of linen manufacture by him made, if he shall so think fit" (Schechter 1925, 128), and if someone infringes such a mark, redress should be made to the owner: "he shall forfeit; the sum of one hundred pounds, for the use of the person, whose mark shall be so counterfeited…" (Schechter 1925, 128).

The seeds of modern trademark law were sown even earlier than the 17th century. The first common law action protecting a trademark was *JG v. Samford* in 1584, a case of an infringement on a clothier's trademark (Bently 2008). The plaintiff clothier had gained great reputation, and another clothier used the plaintiff's mark on his ill-made cloth to pretend the cloth was the plaintiff's. The judge decided that the case was actionable. The case was cited in dictum in *Southern v. How* (1618), relating to sales of counterfeit jewels (Stolte 1997). Another two 17th century cases related to trademarks were *Waldron v. Hill* (1659), involving a scythe-maker, who brought an action for the use of his mark, and *W.E. v. R. M.* (1670) relating to cheese-making (Bently 2008). By the late eighteenth century, the Common law courts were ready to permit the actions against trademark imitation on the grounds of these sorts of intentional, damaging misrepresentations (Bently 2008) .

2.1.2. The monopoly concern in early trademark law

The conflict between monopoly concerns related to trademark protection and the scope of a producer's rights arose during trademark law's initial stage. Doctrines policing competition

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6. 13 George I, c.26, 1726

were explicitly revealed in early trademark cases where those marks retained some guild functions to restrict the competition. As we will see, the hesitance to treat trademarks as a property also indicated this monopoly concern.

Anti-monopoly sentiment at the dawn of trademark law stemmed from the decline of English guilds which had emphasized orderly trading and control of resources rather than free competition (Schechter 1925). Additionally, tensions between the Crown and Parliament arose over royal trade privileges whereby favored courtiers were given (or purchased) exclusive trading rights (Schechter 1925). At the time, the term "monopoly" was used not only in the economic sense, but also referred to the royal privileges granted to individuals with certain trade advantages.

For example, the Crown was entitled to grant an exclusive right, called a "patent," to practice a trade which others could not practice (Nachbar 2005, 1327-1333). In 1571, Robert Bell questioned royal trade privileges in the House of Commons, stating that "by Licences a few only were enriched, and the multitude impoverished." (1328). As opposition to royal "patents" and other mercantilist practices grew, Elizabeth I and Parliament achieved a compromise whereby Elizabeth I revoked a few unpopular monopolies and agreed to have other cases subjected to the common law courts (1329-1333) .

Anti-monopoly sentiment peaked in the famous Case of Monopolies (*Darcy v. Allen*) (1602)[7], a test case to void a patent to exclusively import, make, and sell playing cards. (Nachbar 2005, 1355). According to Coke's report the patent was voided on the ground that such a patent was "an abrogation of the right of all subjects to engage in a trade and as a harm to the public in

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7. Darcy v. Allen, (1603) 77 Eng. Rep. 1260 (K.B.).

the form of reduced employment and higher prices" (1327) . *Darcy v. Allen* looks a bit like a

modern anti-trust case and illustrates the growing pro-competition nature of English law. The

case influenced a later trademark case, *Blanchard v. Hill*[8], in 1742, which voided a trademark on

the grounds that the charter which the trademark was based on was "a plain monopoly."

(Schechter 1925, 136) .

    Blanchard v. Hill (1742) was important because the result overruled a guild mark system

granted by the Crown with a clear monopoly purpose, while endorsing the pro-consumer

function of trademark law first articulated in *JG v. Samford* (1584) (Bently 2008, 7), which was

aimed at enforcing the fair competition and eliminating deception. It was litigated well after

Darcy v. Allen (1602), and after the Statute [Against] Monopolies was passed in England in

1624. In 1628, Charles I, granted a charter to a Company to produce playing cards and forbad the

import of foreign playing cards (Dawson 2003). Members of the Company had to submit a duty

of 2 shillings per gross pack to the king (Dawson 2003). To facilitate collection of the duty, each

member had to have a mark of his own name or invention enrolled in the Company office and

attached to the wrapper of each pack (Dawson 2003). The mark system also worked for tracking

and punishing playing card counterfeiters (Dawson 2003).

    The system operated for over a century, until in 1742 when Christopher Blanchard, a

member of the Company, sought to enforce the mark "The Great Mogul" against Thomas Hill,

who was not a member, but who used the Mogul mark on his playing cards (Dawson 2003).

Blanchard applied for injunctive relief against Hill before the Count of Chancery (Dawson

2003).

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8. Blanchard v. Hill, (1742) 2 Atk. 484 (Ch), 26 Eng. Rep. 692.

To Lord Hardwicke, the case was not a pure trademark case but a case of illegal monopoly because the disputed mark was a vehicle to enforce the exclusive rights of the Company in the playing card market. At the beginning of the decision, Lord Hardwicke asserted there was no prior case of restraining one trader from using another's mark unless there was fraudulent design.[9] He distinguished the case of *JG v. Samford,* in which the imitation of a cloth mark was held actionable. He characterized *Samford* as "not the single act of making use of the mark . . . . but doing it with fraudulent design, to put off bad cloths by this means, or to draw away customers from the other clothier."[10] In the main part of the decision, Lord Hardwicke, examined the clauses in the company charter upon which the marks were established and asserted that (1) the charter itself was an illegal monopoly[11] and (2) the mark established by this charter was void.

The case helped to build an economic rationale for trademark law which, according to Dawson, permits both *trade* and *trade mark* to flourish (Dawson 2003, 134). It affirmed the core function of trademark law as protecting consumers from fraudulent design, thereby fostering fair competition. In rejecting Blanchard's plea, the case exemplifies the anti-monopoly concern in two ways. First, it condemned the anti-competitive ends of the trading companies. Second, it suggested that even in the absence of an illegal mercantile cartel, a single trademark owner had

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9. *Blanchard,* 2 Atk. 484, 485, 26 Eng. Rep. 692 (Ch.).
10. *Blanchard,* 2 Atk. 484, 485, 26 Eng. Rep. 692 (Ch.).
11. Lord Hardwicke pointed out that "the design of granting this charter was to raise a sum of money for the crown", and the clause "prohibiting the importation of cards from foreign parts" was illegal and the clause "that confines the making of cards to London and ten miles about it, which is a plain monopoly, and directly against law". *Blanchard,* 2 Atk. 484, 485, 26 Eng. Rep. 692 (Ch.). Some scholars pointed out Lord Hardwicke was influenced by *Darcy v. Allein* (Schechter 1925; Dawson 2003; Corre 1996; Morris 2017).

no exclusive property right to his mark, but rather merely protection against fraudulent competition.

From the beginning of the development of trademark law of England, judges hesitated to consider the trademark as traditional private property (Bently 2008). What they wanted to protect was the fair business order—that producer's trades not being unfairly transferred to others (Schechter 1925) (Bently 2008). Trademark imitation was actionable as a deceit (tort) claim. The plaintiff needed to prove a defendant's intent to denote its products were those of the plaintiff. Fraudulent intent was the heart of the deceit action (Dalley 1995). In *Sykes v. Sykes* (1824) the judge enjoined a defendant's use of a version of the plaintiff's word mark "Sykes Patent" on its shot-belts and powder-flakes (McKenna 2007). The court concluded that the defendant illegally marked its products with the intent to imply the products were produced by the plaintiff. Yet, a mere claim of imitation was not enough, since sometimes imitation was a way to fairly compete.

However, an unintentional yet deceptive imitation of a mark was actionable. In *Millington v. Fox* (1838)[12], the defendant's business was outside England and he did not know the plaintiff's marks.[13] The case was decided in the court of equity, and the Lord Chancellor Cottenham held that the trademark infringement should be enjoined even in the absence of intent to defraud (Schechter 1925, 138-139). The Lord Chancellor Cottenham, stated that:

> ….having previously come to the conclusion that there was sufficient in the case to shew that the Plaintiffs had a title to the marks in question; and they undoubtedly had a right to the assistance of a Court of Equity to enforce that title. At the same time, the case is very different from the cases of this kind which usually occur, where there has been a fraudulent use, by one person, of the trademarks or names used by another trader.[14]

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12 . Millington v. Fox (1838) 3 My. & Cr. 338.
13. The case failed to discuss actual or likelihood of confusion either. See *Millington,* 3 My. & Cr. 338.
14. *Millington,* 3 My. & Cr. 338.

Millington marked a trend that sought to protect trademarks as property without evidence of fraudulent intent. This move toward propertization of trademarks was confirmed in *Edelsten v. Edelsten (1863)*, which differentiated the two kinds of cases and asserted that in a court of law the remedy was by action on deceit, but in the court of equity a trademark could be protected without proving fraud on the part of the defendant (Bently 2008, 14-15, 21).

The propertization trend would significantly extend the strength and scope of trademark protection and threaten to stifle free competition (behavior which did not confuse consumers). Not surprisingly, the prevalence of free-trade ideology in late 19th century prompted other judges to push back against the concept of a trademark as an exclusive, private property (Bently 2008). Judges hesitated to rely on a pure property rational and reached out to find deceit and confusion on the facts of the cases before them. For example, in *Edelstein v. Vick* (1853)[15], the Vice Chancellor Wood stated that the plaintiff acquired property in the disputed marks, but his holding was also based on deceptive intent made evident by the similarity of the two marks.[16]

Even judges who relied on property rhetoric did not treat trademarks as an absolute property. They required proof of actual/likelihood of deception or confusion, which was not usually required in a tangible property claim. For example, in *Welch v. Knott* (1857), the court recognized the trade custom wherein soda water bottles were re-used and consumers did not rely

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15. Edelstein v. Vick, (1853) 11 Hare, 78.
16. "It is impossible to examine what is his (the defendant) object, except by his actions. He does, in fact, here produce labels which…..have such a degree of similarity that I think any court and jury would be bound to presume that it is not a fortuitous concurrence of events, but that there must have been a design …… to enable the article to pass in the eyes of other persons who might see the labels, as the particular manufactures of the plaintiff". *Edelstein*, (1853) 11 Hare, 78.

on the label on those bottles to know the seller. [17] The injunction was refused, as no actual confusion existed. [18] Similarly, the court in *Edelsten v. Edelsten* (1863) was satisfied with the deception likelihood provided by the resemblance of two marks.[19] These cases suggest that judges cabined the property claim within the right to protect a plaintiff's trade mark against unfair (deceptive) transferring. The property right judges described was not based on the exclusive use of the trademark.

To summarize, early trademark cases were based on deceit (tort) claims, but later property rhetoric emerged to police cases of confusion where deceptive intent might not exist. Perhaps concerned about establishing an anti-competitive monopoly right, judges were not so confident while moving from the deceit to a property-like trespass claim. They either relied on both deceit and property rhetoric to justify their injunctions or narrowed the scope of protection by requiring evidence of likely/actual consumer confusion in a claim.

Trademark law in the United States has a similar history. Increasing trade and business prosperity led to an expanded need for trademark protection, often accompanied by traditional property rhetoric. For example, in the 19th century, courts started to protect technical (defined below) trademarks as property without deceptive intent. Expressing monopoly concerns, they did not extend property-like protection to non-technical marks.

US courts divided trademarks into two categories. One was technical trademarks, marks which were "fanciful, invented, arbitrary, distinctive, or non-descriptive[20]" (McClure 1979, 316).

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17. Welch v. Knott, (1857) 4 K. & J. 747. 751, Eng. Rep. 310, 312
18. *Welch,* 4 K. & J. 747. 751, Eng. Rep. 310, 312
19. Edelsten v. Edelsten, (1863) 1 De G J & S 185.
20. Fanciful marks refer to those terms invented such as "PEPSI", "KODAK", and "EXXON"; Arbitrary marks refer to terms in common language but not describing the quality or

Technical trademarks were either coined from thin air (modern examples would be "Exxon," "Kodak," "Spotify," and "Pepsi") or had a meaning unrelated to the marked products such as "Brother" for printers or "Apple" for computers. Courts found these marks inherently distinctive and immediately had the capacity to identify the source. Courts treated technical trademarks more like traditional property. Initially, in technical trademark cases, deceptive intent was not required (317).

Another category was nontechnical marks, marks descriptive of qualities or attributes, generic words, geographical terms, and personal names (McClure 1979, 316). Courts were reluctant to allow any individual to monopolize nontechnical marks as property[21], so they asserted such marks could only be protected by unfair competition principles, a tort similar to the deceit action in England (McClure 1979, 318). This division was clear in *Apollo v. Perkins* (1913), in which the judge asserted that "a technical trade-mark,….is treated as property, and an infringement thereof carries with it the presumption of fraud; but where….a technical trade-mark right is not established, and fraud-unfair competition-in the use of the mark must be proved"[22]. In unfair competition, deceptive intent was required (likelihood of consumer confusion would eventually suffice). In *Elgin v. Illinois* (1901), the US Supreme Court clarified this point in

characters of the designated goods/services. For example, Apple for computers. Distinctive marks mean the marks are able to identify the producer. Descriptive marks mean the marks directly describe the quality or characters of the designed services or goods (Callmann 1981 § 17A:4).

21. Judges might be influenced by some prevalent ideas on the monopoly concern. Francis Upton, in 1860, in "A Treaties on The Law of Trademarks" advised that an exclusive right to anything was a monopoly and would restrict the individual's freedom of trade. He asserted that the exclusive property in trademarks should be applied "with extremist caution" (Vandevelde 1980)

22. Apollo Bros. v. Perkins, 207 F. 530 (1913).

dictum: "…… where an alleged trade-mark is not in itself a good trade-mark [non-technical mark]……. such circumstances must be made out as will show wrongful intent in fact or justify that inference from the inevitable consequences if the act complained of " (Coffin 1903).

Importantly, even in cases involving technical marks, courts still talked about deception, falling well short of establishing a traditional property right in a trademark. The rhetoric of property really described an easing of the burden of proof. For example, in cases involving technical marks, deception could be presumed from the similarity between the plaintiffs' and defendants' marks.

2.2. The Monopoly Concern in Trade Dress Protection and the Emergence of Functionality Doctrine

Concerns about the possible anti-competitive effects of broad trademark protection can be seen most clearly in cases involving "trade dress," where the plaintiff claimed the shape of its product or style of its packaging as an indication of source. To balance monopoly concerns over granting rights over product shapes and the need to protect source indicators, the functionality doctrine emerged in the end of 19th century and early 20th century as a serious limitation on the protection of trade dress.

The modern term "trade dress" has been used to mean (1) total image of a business, including service or some subset of the total image, (2) the appearance of a product's packaging, and (3) the appearance of a product itself (Callmann 1981). In the 19th century, it was recognized that trade dress could indicate origin through extensive use and advertisement. Courts recognized a legitimate need to protect trade dress against the fraudulent imitation.

Courts generally treated trade dress as a non-technical trademark. The protection of trade dress was based on the unfair competition (fraud) claim. In *Moorman v. Hoge* (1871), the court asserted that a peculiarly shaped barrel was not a (technical) trademark since it was not something independent from the article or package.[23] In *Dixon v. Guggenheim* (1870), the court found a package was not a technical trademark, but the defendant's stove polish packages were a fraudulent imitation of the plaintiff's based on similarities in the size, shape and labels.[24]

A few courts described trade dress as property. But again, the property right was not treated as exclusive. First, courts frequently discussed fraudulent intent to help justify an injunction. Second, judges often required a likelihood of consumer confusion before issuing an injunction. In *Cook v. Starkweather* (1872), the court found the plaintiff had acquired a property interest in the barrel's peculiar design.[25] The invasion of the property right was evident from the similarity of the trade dress, which probably misled consumers.[26]

Eventually, regardless of the unfair competition or "property" labels, courts focused on whether the trade dress similarities would likely confuse consumers. In unfair competition, fraudulent intention was evidenced by a misleading resemblance, and in property-style cases the invasion of the right was also supported by a misleading resemblance.

Concerns over potential anti-competitive effects of trade dress protection were articulated nicely in *Fairbanks v. Jacobus* (1877), where the plaintiff applied for an injunction to restrain the appearance of the defendant's platform scales.[27] The court admitted that the appearances of the

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23. Moorman v. Hoge, 2 Sawyer 78, 2 Sawy. 78 (1871).
24. Dixon Crucible Co. v. Guggenheim, 2 Brewst. 321 (Pa. 1869).
25. Cook v. Starkweather, 13 Abb. Pr. N.S. 392 (1872).
26. *Cook*, 13 Abb. Pr. N.S. 392 (1872).
27. Fairbanks v. Jacobus, 8 F. Cas. 951 (1877).

two platforms were almost impossible to distinguish, but the court asserted that if an injunction issued, "… all the colors, all the unessential forms, could be monopolized as trade-marks, and exclusive rights would be created, not limited in time….".[28]

To avoid monopoly effects while protecting legitimately distinctive trade dresses against deceptive imitation, courts developed two approaches. One line of cases established a tort approach (Bone 2015). The courts distinguished between "necessary" and "unnecessary" parts of trade dress. Unnecessary parts were often the ornamental, detailed, minor parts of the product, the imitation of which implied fraudulent intent and amounted to unfair competition. Necessary parts were the basic or mechanical parts of the product, the imitation of which was permissible regardless of the copier's intent. For example, in *Enterprise Mfg. Co. v. Landers* (1904), the judge found that the defendant not only copied the size and the general shape of the plaintiff's coffee mill but also imitated its detailed ornamentations.[29] The judge held that such imitation showed an intent to fraud and was actionable.[30] This approach reduced the monopoly danger because the copying of basic or mechanical parts (in the absence of a patent) was necessary for healthy competition.

Another balancing rhetoric was developed in cases distinguishing a trade dress right belonging to the public and a right belonging to the producer (Bone 2015). If the trade dress was the general size, shape, or design, the right to copy belonged to the public; therefore the defendant had the right to imitate. If the trade dress was peculiar or out of the ordinary, plaintiff might be able to enjoin a confusing imitation. For example, in *Globe-Wernicke Co. v. Fred*

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28. *Fairbanks*, 8 F. Cas. 951.
29. Enterprise Mfg. Co. v. Landers, Frary & Clark, 131 F. 240 (1904).
30. *Enterprise Mfg. Co*, 131 F. 240.

(1902), a case involving the alleged passing off of bookcases, the judge found that when the defendant had the right to imitate the trade dress, his motive was irrelevant.[31] The judge found that competitors had the right to make bookcases of any size unless the appearance was peculiar and out of the ordinary.

All these approaches finally converged on what became known as the modern doctrine of "functionality".

2.3.   The Development of the Doctrine of Functionality

The initial basis for the doctrine of functionality lay in courts' concerns that unfair competition claims might stifle competition if there were no limits put on them (Thurmond 2004, 259). The doctrine of functionality emerged to avoid potential monopolies of useful trade dress. The functionality doctrine eventually focused on whether protecting a trade dress would hinder the competition.

Through common law decision making, courts gradually identified three elements to help them decide whether competition was hindered. First, courts speculated whether the trade dress would bring the commercial success or a competitive advantage to the plaintiff. Second, courts inquired after comparable alternative trade dress for the defendant to adopt. Third, courts asked whether commercial success or competitive advantage were solely attributed by the source

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31. The judge asserted "the intention (assumed by the resemblance in size, styles and materials) is not material if the defendant has the right to do that which is complained of [e.g. to copy the shape of the goods]. On the other hand, if the thing done is wrongful the lack of intention would not excuse. In either case, the motive is immaterial to any question involved in the present inquiry." Globe-Wernicke Co. v. Fred Macey Co., 119 F. 696 (6th Cir. 1902).

identified by the trade dress. The evolution of the modern doctrine of functionality came

gradually and in several distinct stages.

2.3.1. 1877 to the Restatement of Tort (1938)

Courts identified two different sorts of functional product attributes. First, "utilitarian"

functionality referred to trade dress with mechanical or useful attributes that helped the product

perform. Shortly thereafter, courts developed the concept of aesthetic functionality, which

referred to ornamental trade dress that lacked mechanical function, but would hinder competition

if trademarked. However, elements identifying when an ornamental trade dress would hinder

competition developed much more slowly.

The earliest trademark documents with the word "functional" can be traced to 1877,

when the Patent and Trademark Office rejected the registration of "a narrow strip of leaf-tobacco

placed as a wrapper around the mouth-piece or end of a cigarette" as a trademark.[32] The

Commissioner of Trademarks asserted that "the mark in question was a functional part of the

cigarette, and was consumed with it."[33] The Commissioner asserted that the trade dress served "a

practical and perhaps a very useful purpose. Being composed of tobacco, it is an addition to the

material of the cigarette, strengthens the wrapper, is probably more agreeable to the taste than the

paper of a cigarette."[34] The commissioner further reasoned that such trade dress was a common

right of all to use, and if it was given to the applicant, the trade would be "seriously

embarrassed."[35]

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32. *In Re* Jacob Gordon, Vol.12 no.13, Official Gazette. 518 (1877)
33. *In Re Jacob Gordon*, 518.
34. *In Re Jacob Gordon*, 518.
35. *In Re Jacob Gordon*, 518.

Around 30 years earlier than the courts, this Commissioner recognized the potential monopoly consequence brought by some trade dress protection and developed the concept of functionality to reject the registration of such trade dress.

Some courts limited the scope of functional trade dress when the trade dress was necessary to the product, namely, those with engineering and utility functions. For example, in *Daniel v. Electric* (1916), the corrugation design of the rubber hose was determined functional because it enabled the hose to be stronger, durable, and minimized kinking.[36] In *M.J. Lewis v. Lewis. (1931),* the judge asserted that unfair competition cannot be predicated on the imitation of "merely a mechanical device designed to perform a strictly mechanical function, and is without ornamental or non-functional features."[37] These cases focused on what we now call "utilitarian" functionality and left open the possibility that purely ornamental features identifying product source would qualify for protection.

Other courts recognized that some ornamental features might convey important cultural meanings and thus trade dress protection might hinder the competition. In *Coats v. Merrick Thread Co.(1893),* the court found it was hard to sell a new six-cord thread without the black and gold colored labels indicating high quality.[38] Similarly, in *Columbia v. Mallory (1915)*, the judge noted that red color denoted that sheaves were made of manganese, which indicated the quality of the sheaves.[39] In *Abbott v. Standard (1923)*, the court found that "plaintiff can have no

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36. Daniel v. Electric Hose & Rubber Co., 231 F. 827 (1916).
37. MJ Lewis Products Co. v. Lewis, 57 F.2d 886 (E.D. Pa. 1931).
38. Coats v. Merrick Thread Co., 149 U.S. 562 (1893).
39. Columbia Engineering Works v. Mallory, 75 Or. 542, 147 P. 542 (1915).

monopoly on either color, broadly, or functional characteristics of flat tubular coin wrappers"

because the colors of the wrappers signaled the denominations of the coins.[40]

Even in cases where the trade dress lacked any discernable message or meaning, courts

began to find a need for competitors to copy, and the "aesthetic" functionality doctrine was born.

For example, in *Flagg v. Holway (1901)*, the disputed trade dress was the shape of a zither

(musical instrument). The court found that where the public preferred a particular shape for a

product, the defendant had the right to satisfy that desire.[41] A fuller rationale was provided in

Heide v. Wallace & Co (1905), where the court explained that "by asserting appropriation for

that purpose of an especially attractive size and shape, a manufacturer could obtain for himself

alone the advantage to result from the superior attractiveness so attained, he might readily, not

merely protect himself against unfair competition, but relieve himself from any competition."[42]

In *Viavi v. Vimedia (1917)*, the court found that "Neither the use of the same colors, or of the

same form of containing vessels, cartons, or labels, alone constitutes unfair competition ….

especially when these features serve (the) purpose of utility, convenience, or **attraction.**"[43]

(emphasis added).

In this period, courts did not develop detailed factors that would help determine whether

competition was, in fact, hindered. Courts simply decided whether the disputed trade dress was

functional or not, with little detailed reasoning. No standard tests were applied.[44]

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40. Abbott Coin Counter Co. v. Standard-Johnson Co., 290 F. 418 (1923).
41. Flagg Mfg. Co. v. Holway, 178 Mass. 83, 59 N.E. 667 (1901).
42. Heide v. Wallace Co., 135 F. 346, 347 (1905).
43. Viavi Co. v. Vimedia Co., 245 F. 289, 293 (1917).
44. We can find this trend in many cases. See *Daniel,* 231 F. 827; *MJ Lewis Products Co.*, 57 F.2d 886; *Coats*, 149 U.S. 562; *Flagg Mfg. Co.*, 178 Mass. 83, 59 N.E. 667, *Heide*, 135 F. 346; *Viavi Co.*, 245 F. 289.

Once the trade dress was determined to be functional, it was declared unprotected. Even when trade dress was non-functional, plaintiffs still faced two significant hurdles: (1) the trade dress had to have the secondary meaning[45] and (2) there had to be a likelihood of consumer confusion.[46]

2.3.2. Restatement of Torts (1938) to 1946

The *Restatement of the Law of Torts* (First) ("Restatement (First)") expressly defined the doctrines of utilitarian functionality and aesthetic functionality.[47] The *Restatement (First)* started to refine the role played by the commercial success of trade dress in determining aesthetic functionality. It expressly stated that if a product's commercial success was attributed solely to the source's reputation as indicated by the trade dress, then the trade dress was not aesthetically functional. Courts followed this guidance and began to inquire about consumer motivation: were

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45. The secondary meaning (or the acquired distinctiveness) referred to the trademarks or trade dress' capacity to identify the producer, which was not inherent but acquired in long-term use. At this stage, all trade dress were treated as not inherently distinctive. But consumers can connect the trade dress with the source after a long-time use. The trade dress could not be protected if the trade dress has no secondary meaning. For example, in *Rathbone v. Champion (1911),* the plaintiff argued that the defendant had no right to copy the nonfunctional parts. But the judge rejected the plaintiff's argument by pointing out the lack of the public knowledge and the reputation of the plaintiff's product, which mean that the feature had no source identifying function.

46. The consumer confusion was another requirement in trade dress infringement. If there was no likelihood of confusion, or the defendant could distinguish the sources by labeling, the imitation was allowed. For example, in *Coca-Cola v. Gay-Ola (1912)*, the judge decided that the color of the drink of Coca-Cola was nonfunctional. But for the bottling part of the output, the judge allowed the imitation of the beverage color and requested the defendant to label the bottles prominently to avoid the confusion. While for the soda unbottled, on which no label can be attached, the defendant was forbidden to use the brown color if they could not find reasonable methods to avoid the confusion.

47. Restatement (First) of Torts §742 (1938).

they buying the product because the ornamentation was pretty, or were they buying it because the ornamentation signaled a trusted source?

Moreover, although the *Restatement (First)* did not suggest that courts should examine the existence of available alternative trade dress, cases in this period also considered the existence of alternative designs in determining aesthetic functionality. The three elements determining whether the competition was hindered emerged gradually during this period. The three elements are (1) whether the trade dress has an aesthetic advantage, (2) whether the alternative trade dresses are equally good, and (3) whether the advantage is caused by the product/service source's reputation.

The *Restatement (First)* stated that the \ functionality determination was actually a determination regarding whether the trade dress protection would hinder the competition.[48] Comment a to § 742 stated, "…The determination of whether or not such features are functional depends upon the question of fact whether prohibition of imitation by others will deprive the others of something which will substantially hinder them in competition."

Based on the competition rationale, the *Restatement (First)* defined what kind of trade dress was functional in both a utilitarian sense and an aesthetic sense. The utilitarian function was elaborated in §742: "a feature of goods is functional . . .if it affects their purpose, action or performance; or the facility or economy of processing, handling or using them."[49] To summarize,

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48. Some scholars believed that the competition test was applied only to the aesthetic functionality. The wording "such features" in this test should refer to the features mentioned in the aesthetic functionality paragraphs. Other judges and scholars whom interpreted the competition test in the Restatement (First) were applied on both utility functionality and aesthetic functionality.

49. In §742 comment a, it further stated that "a feature is functional… because it contributes to efficiency or economy in manufacturing them or in handling them through the marketing process. It may be functional, also, because it contributes to their utility, to their durability or to

a utility functionality included two aspects: (1) the function of improving the product usage or performance, and (2) the function contributing to the efficiency/economy in manufacturing/marketing process of the products.

Aesthetic functionality was defined in § 742, comment (a): "When goods are bought largely for their aesthetic value, their features may be functional because they definitely contribute to that value and thus aid the performance of an object for which the goods are intended."[50] The definition essentially measured the aesthetic value through its sales contribution ("When goods are bought largely for their aesthetic value"). This definition implied that in deciding aesthetic functionality, a court might ask whether the trade dress increased sales, because commercial success associated with the trade dress implied that forbidding imitation would disadvantage competitors. Comment (a) offered several examples. The heart-shaped candy box was functional due to the need to use its shape to effectively compete in the Valentine's Day sweets market. A distinctive printing typeface may also be functional in the aesthetic sense, even though other types of printings were also readable.[51]

Following *the Restatement (First)*, courts used commercial success as evidence of the aesthetic functionality. For example, in *Ainsworth v. Gill (1938)*, Judge Kirkpatrick emphasized the pleasing design of an electric light contributed to the sales. "The design is what really sells

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the effectiveness or ease with which they serve their function or are handled by users.".
Restatement (First) of Torts §742 cmt. a (1938)
    50. Restatement (First) of Torts §742 cmt. a (1938)
    51. Restatement (First) of Torts §742 cmt. a (1938)

it,"[52] wrote the court, and changes to the design might ruin the product as "a sales proposition."[53]

In *J.C. Penny v. H.D. Lee (1941)*, the disputed trade dress was a four-in-one bib pocket with round corners. The court stated that it might be aesthetically functional if "... it will contribute materially to a general sale of the goods."[54] The judge found that the bib pocket had a clear commercial appeal.

Nonetheless, Comment (a) of §742 in *the Restatement (First)* also pointed out that if the marketability of the goods was solely caused by the reputation of the source of the product identified by its ornamentation, then the feature was not functional.[55] This provision provided that if consumers bought a product solely due to the producer's reputation/goodwill represented by the trade dress, this source value/advantage substantial to the purchase should not be held as the aesthetically functional. Think of the Jaguar hood ornament. Consumers don't buy the car because of the little ornamental statue, but it may signal a trusted product source that influences their purchase.

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52 "… the defendant could not possibly… produce something notably different from the plaintiff without losing something of very substantial value and affecting the performance in the sense that presenting an attractive appearance is part of its performance---as it undoubtedly is." Ainsworth v. Gill Glass & Fixture Co., 26 F. Supp. 183, 187 (E.D. Pa. 1938).

53 "…the defendant or anyone else who wants to make a mechanically good fixture designed on simple, modern lines is practically driven to shallow hemisphere or dish shape, the rather awkward helmet shape, or something else not nearly as satisfactory as the shallow cone. That, in turn, means the plaintiff really gets the monopoly which he is asking under his patent." *Ainsworth*, 26 F. Supp. at 187.

54. JC Penney Co. v. HD Lee Mercantile Co., 120 F.2d 949, 954 (8th Cir. 1941).

55 "[A} feature which merely associates goods with a particular source may be, like a trade-mark or trade name, a substantial factor in increasing the marketability of the goods. But if that is the entire significance of the feature, it is non-functional; for its value then lies only in the demand for goods associated with a particular source rather than for goods of a particular design." Restatement (First) of Torts §742 cmt. a (1938)

However, the *Restatement (First)* did not explain what to do when marketability was partially caused by the source and partially by the pure attractiveness of the trade dress. In response, some courts speculated as to the motivation of the majority of consumers. In *J.C. Penny v. H.D. Lee (1941),* the court noted that "part of plaintiff's evidence naturally indicated a demand for the design as an identification of Lee (the plaintiff) overalls, but the testimony of most of the witnesses tended rather to establish a purchaser's interest in obtaining the features of the design…"[56] With this evidence, the court decided that the trade dress was aesthetically functional.

Although not mentioned in *Restatement (First)*, the availability of the alternative designs was also considered in some cases.[57] This factor was very important in determining aesthetic functionality, because if there were many alternative designs available, then trade dress protection of a single design would not hinder competition

2.3.3. Lanham Act (1946) to 1982

Trademark law was finally codified into federal law in 1946 after long debate. The Lanham Act was a victory for trademark owners and was generally seen to expand trademark rights, but it was silent on issues of functionality. After 1946, courts continued forge ahead on their own, sometimes expanding and sometimes limiting functionality doctrines.

The peak of the aesthetic functionality doctrine was *Pagliero v. Wallace (1952),* which defined the broadest scope of aesthetic functionality and restricted trade dress protection most severely.[58]

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56. *JC Penney Co.,* 120 F.2d at 954.
57. *JC Penney Co.,* 120 F.2d at 954; *Ainsworth*, 26 F. Supp. at 187.
58. Pagliero v. Wallace China Co., 198 F.2d 339 (9th Cir. 1952).

Pagliero decided whether the plaintiff's china pattern (see fig. 1) could be imitated by the defendant. The court stated, "'functional' in this sense might be said to connote other than a trade-mark purpose. If the particular feature is an important ingredient in the commercial success of the product, the interest in free competition permits its imitation in the absence of a patent or copyright."[59] This standard was consistent with the commercial success standard in the *Ainsworth* and *J.C. Penny* cases decided before the Lanham Act. The judge found one of the essential selling features of china was the upper surface's attractive design. Trademark protection of the design would immunize the plaintiff from one form of imitative competition.

Figure 1. Wallace china green shadowleaf (Photograph from Plantdreaming (2019))

In one sense, the *Pagliero* court went farther than *Ainsworth* and *J.C. Penny* by disavowing the need to consider the existence of the alternative designs. This enlarged the scope of aesthetic functionality and likely overestimated the anti-competitive consequences of protection. If many comparable alternative designs existed, competition might not be hindered by the protection of the disputed design.

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59. *Pagliero*, 198 F.2d at 343.

Later cases narrowed the broad functionality scope developed in *Pagliero*[60] in two respects. First, courts began to question the relevance of commercial success in finding a design functional. Second, some judges returned to the consideration of alternative designs after *Pagliero*.

For example, the court in *Keene v. Paraflex (1981)* criticized the commercial success standard in *Pagliero* as too broad.[61] The court was concerned with disincentivizing the creation of good designs. Nonetheless, the court found that (aesthetic) functionality was related to the product's utility. The court found that the design of a outdoor wall-mounted luminaire served to match modern building styles (e.g. crisp clean lines). The court considered features driven by aesthetic context and environment as aesthetically functional.[62] The relevance of context was also applied in determining the aesthetic functionality of product colors. In *Deere v. Farmhand (1982)*, the defendant sold farm tractor loaders to farmers. The defendant colored their loaders with the same green color used by the plaintiff on its loaders. The court decided the green color of the loader was aesthetically functional because the farmers preferred to match their green John Deere tractors.[63]

After *Pagliero*, some courts began considering alternative designs again to determine aesthetic functionality. In *Keene*, the court noted the number of the alternative designs was

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60. For cases which narrow the functionality rule in *Pagliero*, 198 F.2d 339. *See also* Keene Corp. v. Paraflex Industries, Inc., 653 F.2d 822, 825 (3d Cir. 1981); Application of Mogen David Wine Corporation, 328 F.2d 925,931-933 (C.C.P.A. 1964); *In re* DC Comics, Inc., 689 F.2d 1042, 1048-1049 (C.C.P.A. 1982); Ideal Toy Corp. v. Plawner Toy Mfg. Corp., 685 F.2d 78, 81 (3d Cir. 1982).
61. *Keene,* 653 F.2d at 825.
62. *Keene,* 653 F.2d at 826.
63. Deere & Co. v. Farmhand, Inc., 560 F. Supp. 85, 95-97 (S.D. Iowa 1982).

limited and decided the design was functional due to the limited number (12 to 15 in this case)

of alternative luminaire designs. In *Application of Mogen David Wine (1964)*, the disputed

trade dress was a wine decanter. Judge Rich, in the concurring opinion, rejected the claim of

aesthetic functionality. He believed the competitors would not be hindered in competition

since so many shapes were available.[64]

2.3.4. 1982 to1990

During this period, the landmark case of *In re Morton-Norwich Products, Inc. (1982),*

a case on utilitarian functionality,[65] confirmed the necessity of considering the availability of

alternative trade dresses.[66] This move was followed by other courts determining the aesthetic

functionality.[67]

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64. Judge Rich also asserted in this case: "they [the competitors] might even excel in competition by producing a more attractive design under the stimulus of a prohibition against copying under the principles of unfair competition law." *Application of Mogen David Wine Corporation*, 328 F.2d at 933. This assertion implied that Judge Rich thought it was a competition among different designs, instead of a price competition on the same design.

65. *In re* Morton-Norwich Products, Inc., 671 F.2d 1332 (C.C.P.A. 1982).

66. In another case *Inwood v. Ives (1982)*, the Supreme Court defined a functional product feature as "essential to the use or purpose of the article or if it affects the cost or quality of the article." This test was consistent with the *Restatement (First)* description of the utility function. *Inwood* test itself did not include the check of the alternatives, but judges citing *Inwood* often further checked the alternatives.

67. Hartford House, Ltd. v. Hallmark Cards, Inc., 846 F.2d 1268 (10th Cir. 1988); Qualitex Co. v. Jacobson Products Co., 514 U.S. 159 (1995); Sabert Corp. v. Ullman Co., 53 U.S.P.Q.2d 1597 (1999). This trend might be influenced by changing economic views on trademark law. The Harvard School believed the trademark and trade dress protection enhanced the product differentiation and product differentiation hindered the free competition, while the Chicago School believed the product differentiation would not hinder the competition, and trademark and trade dress protection would encourage the competition instead of hindering it. In later 1980, Chicago School became prevalent among scholars and accordingly influenced the understanding of some judges on the economic consequences of the protection of an aesthetic trade dress. I will elaborate these economic studies in later sections.

In re Morton-Norwich Products, Inc. (1982), the disputed trade dress was the shape of a plastic spray bottle. Judge Rich asserted that a utilitarian feature was not necessarily legally functional. Judge Rich developed the concepts of de-facto and de-jure function. "De-facto function" referred to usefulness in a lay sense. "De-jure function" mean functional and unprotectable as a matter of law because of superiority in function or economy of manufacture.[68] In other words, the de-jure functional feature would work better than alternative designs. Judge Rich further provided four factors to decide de-jure function: (1) the existence of a utility patent; (2) advertising that touts the utilitarian advantages; (3) whether the design results from a comparative simple or inexpensive method of manufacture; (4) the availability of alternative designs.[69] In this case, the judge found the spray bottle was merely de-facto functional, holding that "a molded plastic bottle can have an infinite variety of forms or designs and still function to hold liquid. No one form is necessary or appears to be 'superior.'"[70]

The emphasis on alternative designs in *Morton-Norwich* as a measure of whether competition might be hindered influenced later decisions. Courts began focusing on the availability of alternative designs more frequently. In *Hartford v. Hallmark (1988)*, the disputed trade dress was the design of greeting cards. The judge asserted that the determination of aesthetic functionality should rest on the availability of alternative appealing designs. The judge found many design alternatives are available for greeting cards to denote

68. *In re Morton-Norwich Products,* 671 F.2d at 1337-1338.
69. *In re Morton-Norwich Products,* 671 F.2d at 1340-1342.
70. *In re Morton-Norwich Products,* 671 F.2d at 1342.

the "emotional non-occasion genre" and therefore the design was not functional in the aesthetic sense.[71]

2.3.5. 1990 Restatement (Third) of Unfair Competition

The Restatement (Third) of the Law of Unfair Competition[72] (hereinafter "*Restatement (Third)*") summarized most prior case law related to the aesthetic functionality. First, the definition of the aesthetic functionality provided by the *Restatement (Third)* still connected commercial success with the aesthetic functionality. In comment (c) of §17, functionality was found "when aesthetic considerations **play an important role** in the **purchasing decisions** of prospective consumers, a design feature that substantially contributes to the aesthetic appeal of a product may qualify as 'functional.'"[73] This description implied that judges should consider whether the trade dress influenced the consumers' purchasing decisions.

Second, the *Restatement (Third)* also emphasized that a finding of aesthetic functionality in law would be made only when alternative designs were limited (the assumption might be that several aesthetic designs were equally attractive).[74] For example, the *Restatement*

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71. *Hartford,* 846 F.2d 1268.
72. Why is the number "Third"? *The Restatement (Second) of Torts* was published in 1979 and the material relating to trade practices was omitted because these subjects were gradually governed by legislation and divorced from the principles of torts. The American Law Institute started to formulate a Restatement (Third) of the Law of Unfair Competition (hereinafter "*Restatement (Third)*") including the subject of trademarks which were published in 1990. The name is the Restatement (Third) to indicate the third series of revisions of the Restatements, but it is essentially the first *Restatement of Unfair Competition.*
73. Restatement (Third) of the Law of Unfair Competition §17 cmt. c (1995)
74. Comment c. of §17: "Because of the difficulties inherent in evaluating the aesthetic superiority of a particular design, a finding of aesthetic functionality ordinarily will be made only when objective evidence indicates a lack of adequate alternative designs. Such evidence typically is available only when the range of alternative designs is limited either by the nature of the design feature or by the basis of its aesthetic appeal." *Restatement (Third) of the Law of Unfair Competition* §17 cmt. c (1995)

(Third) endorsed *Keene*, where the court found the alternative designs of the architecturally compatible luminaire were limited. [75]

However, the *Restatement (Third)* did not give a clear guide in cases where commercial success might be partially attributable to the attractiveness of the feature and partially attributable to the reputation of the source. In §17, the Restatement (Third) emphasized that the functionality should be "…apart from any benefits attributable to the design's significance as an indication of source."[76] Comment (b) of §17 further elaborated, "If the benefit afforded by the design resides **solely** in its association with a particular source, however, the design is not functional."[77] In mixed motive situations, the *Restatement (Third)* did not guide the courts in determining whether the feature was aesthetically functional or not.[78]

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75. Restatement (Third) of the Law of Unfair Competition §17 cmt. c. illustrations (1995)
76. Restatement (Third) of the Law of Unfair Competition §17 (1995)
77. Restatement (Third) of the Law of Unfair Competition §17 (1995)
78. The Reporters' Note on comment b. of §17 listed the cases of *Warner v. Gay (1983)*, *Vuitton v. J. Young (1981)* and *Boston v. Dallas (1975)* to support that when the commercial success was caused by the reputation, the feature is not functional. But comment b also mentioned another series of contrary cases, such as *Job's daughter (1980), Plasticcolor v. Ford Motor (1991)*, etc. In these cases, the advantages might be also attributed to the source. However, the features were considered aesthetic functional. The Reportors' Note did not provide a clear instruction which side was to be followed.
  The Restatement (Third) tried to distinguish the two series of cases. It stated that *Vuitton v. J. Young (1981)* and *Boston v. Dallas (1975)* were related to the eligibility of the design for protection as trademark, while *Job's daughter (1980), Plasticcolor v. Ford Motor (1991)*, etc were related to "the scope of permissible use of a trademark by another" after the trade dress were considered a valid trademark. This distinction was arguably incoherent because the two series of cases were not different at this point, and all the functionality determinations were the defense after the validity of a trademark (Heald 1996).

2.3.6. Post-1990: *Qualitex*, *TrafFix*, and other leading cases

In 1995, in *Qualitex v. Jacobson*,[79] the US Supreme Court summarized three elements, competitive advantage, substitutability, and non-reputation advantage, in determining the aesthetic functionality. The disputed trade dress was a green-gold colored laundry press pad. Judge Breyer decided that the green-gold color was not functional since it served no function other than as a source identifier. Judge Breyer asserted that a product was functional "if exclusive use of the feature would put competitors at a significant non-reputation-related disadvantage."[80] This quotation indicated that, to be aesthetically functional, first, trade dress protection must impose a competitive disadvantage on competitors. Second, such an advantage should not be caused by the reputation of the source of the goods – the advantage should be non-reputation related. Additionally, *Qualitex* considered the availability of alternatives in determining the aesthetic functionality. Judge Breyer cited the Restatement (Third): "aesthetic value lies in its ability to confer a significant benefit that cannot be duplicated by the use of alternative designs…"[81] After *Qualitex,* many judges considered all three elements in determining aesthetic functionality.

Another illustrative case of the modern treatment of aesthetic functionality is *Publications International, Ltd. v. Landoll (1998)*, where the disputed trade dress was the appearance of cookbooks and children's books. One feature of the trade dress was the gilded edges of the pages.[82] Judge Posner decided the gold color was aesthetically functional, since

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79. *Qualitex*, 514 U.S. at 165.
80. *Qualitex,* 514 U.S. at 164.
81. *Qualitex,* 514 U.S. at 168.
82. Publications Intern., Ltd. v. Landoll, Inc., 164 F.3d 337 (7th Cir. 1998).

gold is used to convey luxury or opulence. Though there were other optional colors, Judge

Posner asserted that monopolizing a basic design element "impoverishes others' palettes."[83]

This meant the alternative colors were limited. Judge Posner also asserted that the competitive

advantage could not be attributed to the source. He concluded, "a seller should not be allowed

to obtain in the name of trade dress a monopoly over the elements of a product's appearance

that…..have value to consumers that is independent of identification."[84]

In *Sabert v. Ullman (1999)*, the disputed trade dresses were gold and silver disposable

serving trays and platters.[85] The court found the trade dress was functional as it imitated "real

silver and gold and providing the product with a luxurious look."[86] Trademark protection

provided the plaintiff a competitive advantage against competitors. The judge claimed

aesthetic functionality required that "trade dress protection would deprive competitors of

alternative designs and thus foreclose competition from the relevant market."[87] It found

imitating real gold and silver "cannot practically be duplicated by the use of alternative

designs."[88] The court also mentioned that "[i]mitation of a more luxurious product is not an

indicator of source, but rather is of functional aesthetic value,"[89] suggesting the advantage was

not reputation related.

Similarly, in *Johnson & Johnson v. Actavis Group* (2008), the disputed trade dress was

the gold/yellow background color of the package of antibiotic ointment and cream. The court

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83. *Publications Intern., Ltd*, 164 F.3d at 341-344.
84. *Publications Intern., Ltd,* 164 F.3d at 339.
85. *Sabert Corp. v. Ullman Co.*, 53 U.S.P.Q.2d 1597 (1999).
86. *Sabert,* 53 U.S.P.Q.2d at 2.
87. *Sabert,* 53 U.S.P.Q.2d at 2.
88. *Sabert,* 53 U.S.P.Q.2d at 3.
89. *Sabert,* 53 U.S.P.Q.2d at 2.

defined an aesthetically functional feature as the exclusive use of which would put competitors at a "significant non-reputation-related disadvantage".[90] The court further stated the ultimate aesthetic functionality test "is whether the recognition of trademark rights would significantly hinder competition."[91] The judge found the color of the background was not functional since gold was not the only color used for first-aid products. Other colors were also prevalent in the packaging.

To summarize, the ultimate test of aesthetic functionality is whether protecting the trade dress would put competitors at a non-reputation-based disadvantage. To diagnose the anti-competitive consequence, courts developed three factors to consider: (1) whether the trade dress conferred a competitive advantage ("commercial success" in early cases) on the plaintiff; (2) whether such advantage could be duplicated by alternative designs; (3) the extent to which the competitive advantage was attributable to the source/reputation.

2.4.   Problems in Determining Aesthetic Functionality

Although courts consistently emphasize the three factors noted above, lack of direct evidence has led them to develop inconsistent, and perhaps inaccurate, proxies for making their determinations.

2.4.1. How courts diagnosed the de-facto advantage of trade dress

Analysis begins by asking a preliminary question about the trade dress: Does it have a special attraction to consumers? We can think of this as the question of "de facto aesthetic

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90. Johnson & Johnson v. Actavis Group hf, 87 U.S.P.Q.2d 1125, 2008 WL 228061, 2 (S.D. N.Y. 2008), as corrected, (Feb. 21, 2008).
91. *Johnson & Johnson*, 87 U.S.P.Q.2d 1125 at 3.

function" or "de-facto advantage".[92] An affirmative answer to this question does not mean

that the trade dress is aesthetically functional, because protecting merely attractive designs

does not necessarily hinder competition if there are other equally good alternative designs.

Courts have applied different proxies to determine the de-facto advantage, such as

commercial success in *Pagliero (1952)*, context-driven aesthetics in *Keene (1981)*, or

disadvantage to the competitors in *Qualitex (1995)*.[93] In using these proxies, judges or juries

try to stand in consumers' shoes and guess whether the disputed trade dress has a special

attraction to consumers. Relying on intuition, judges or juries might mistakenly diagnose the

de-facto aesthetics in some cases.

For example, In *Norwich Pharmaceutical Co. v. Sterling Drug Inc. (1959)*, the Second

Circuit determined that pink on nausea medicine was aesthetically functional because pink

was "pleasing" and therefore more acceptable to the customer and the sufferer. But the

reasoning is relatively intuitive. The court did not know in fact whether pink's attractiveness

evoked a higher consumer acceptance, and thus whether protecting the pink medicine would

have anti-competitive effects. But without empirical studies, we do not know if the judge's

intuition was correct.

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92. I create a new term "de-facto aesthetic function" based on Judge Rich's conception "de-facto (utility) function" in *Morton-Norwich Products (1982).* As mentioned, de-facto (utility) function refers to the usefulness in a lay sense. But a trade dress with the de-facto (utility) function does not mean it is de-jure (utility) function (function in law). In other words, the de-jure functional feature should work better than alternative designs.

93. Someone might argue that the proxy of "disadvantage to the competitors" in fact covers two steps, first checking the de-facto advantage, and second checking the de-jure advantage (checking the alternative designs). We do not deny this argument, but here what we discuss is the first step in this proxy.

In *Louboutin v. YVES (2012)*, the Second Circuit rejected the district court's decision that a red sole on a woman's shoe style was aesthetically functional.[94] The judge reversed the trial court decision that red is aesthetically functional per se in the fashion industry. Neither the trial judge nor the appellate court cited recent relevant empirical research. For example, Elliot and Niesta found that men rated women as more attractive and sexually desirable when the women were viewed within a red picture border or in red clothing (Elliot & Niesta, 2008). This study suggests that the protection of the red color on clothes or shoes creates a non-reputation-based advantage for Louboutin.

Therefore, in identifying a de-facto advantage, court decisions might be biased when they rely only on the judge's or the jury's instincts. Economic and psychological studies might provide better guidance in predicting consumer responses, and the empirical surveys might be helpful to verify such responses in a particular case.

2.4.2. The availability of alternative designs

When trademark protection is claimed for a trade dress, the likelihood of anti-competitive consequences is logically reduced when substitutes remain available to competitors. However, courts frequently lack direct evidence to evaluate the substitutability between one sort of trade dress and its alternatives. In many cases, judges simply assume that the alternatives are substitutable to the disputed feature. In *Ideal Toy Corp. v. Plawner Toy Mfg, Corp. (1982),* the Third Circuit held that the colors of puzzle cube were not aesthetically functional because there were "various manufacturers' puzzle cube versions marked with

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94. Christian Louboutin v. Yves Saint Laurent America, 696 F.3d 206 (2d Cir. 2012).

numbers, domino designs, and pictures of fruit……a wide variety of colors, shapes and markings which could be used to differentiate the faces of a cube puzzle."[95]

The *Restatement (Third)*, suggested courts should do more than merely make assumptions about alternatives: "Because of the difficulties inherent in evaluating the aesthetic superiority of a particular design, a finding of aesthetic functionality will be made only when objective evidence indicates a lack of adequate alternative designs."[96] This reference to "objective evidence" pointed directly to the potential relevance of an empirical approach. For example, consumer surveys might help to evaluate the aesthetic superiority of trade dress alternatives.

Having ascertained some substitutes, judges might still have difficulty deciding the anti-competitive cost of protection, because judges cannot be certain of *how many* comparable alternatives would be enough to overcome possible anti-competitive consequences.

In many cases, courts found no anti-competitive cost where there was an "infinite," "wide variety," "various," or "a great variety." For example, in *Hartford v. Hallmark* (1988), Judge McKay asserted the number of alternative designs for emotional non-occasion greeting cards were infinite, and therefore the disputed design was not functional. In *Ideal v. Plawer* (1982), the court found that the aesthetic functionality did not exist because a "wide variety" of colors and shapes can be used cubic puzzles. In *Application of Mogen David Wine Corporation* (1964), of the court found "a great variety of shapes."

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95. *Ideal Toy Corp,* 685 F.2d 78, note 4.
96. Restatement (Third) of the Law of Unfair Competition §17 (1995)

But how many alternative designs is enough? At least one court was convinced when the plaintiff provided three alternatives. In *Sicilia v. Cox* (1984), the trademark owner prevailed by offering only three other citrus juice products with a lemon/lime shape.[97] However, the *Keene* court was not satisfied when there were 12-15 substitutes.[98] Judge Posner, nonetheless, decided there were economically limited alternatives and denied protection based on anti-competitive grounds. In *Eco v. Honeywell* (2003), however, the trademark owner succeeded in retaining protection when he provided pictures of around 50 other thermostats with different shapes. [99]

2.4.3. Mixed-use cases: When competitive advantage is related to reputation

An example can easily illustrate this problem. Bob sells bright green, alligator-shaped toothbrushes. Eighty percent of consumers buy the toothbrush because it is cute and twenty percent because they know only Bob sells high quality toothbrushes and has a great reputation with dentists. How should a court balance the need for a competitor to attract consumers in this market with the need to protect Bob's reputation? The problem here is not whether to protect trade dress that has both the aesthetic appeal and source-indicating distinctiveness. This issue has been addressed by case law and the two Restatements. If a trade dress is found to be aesthetically functional, it will not be protected even it is distinctive.[100] Here the problem is for a distinctive trade dress, if the competitive advantage is partially attributed to the source (reputation), whether the trade dress is still aesthetically functional.

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97. Sicilia Di R. Biebow & Co. v. Cox, 732 F.2d 417, 429 (5th Cir. 1984).
98. *Keene,* 653 F.2d 822 at 827.
99. Eco Mfg. v. Honeywell Int'l, 357 F. 3d 649,653-654 (7th Cir. 2003).
100. For more information, see *Deere,* 560 F. Supp. 85; Restatement (Third) of Torts §741 (1938); Restatement (Third) of the Law of Unfair Competition §16 (1995)

The determination of aesthetic functionality is straightforward when the competitive advantage is solely attributable to the reputation of the source or solely to the attractiveness of the trade dress. If it is solely attributed to the source, the trade dress is not aesthetically functional, according to the two Restatements and *Qualitex*.[101] If the advantage is solely attributable to the attractiveness of the trade dress, then aesthetic functionality might be found after considering the availability of alternative trade dress.

However, in cases where competitive advantage is partially attributable to the source and partially attributable to the pure attractiveness of the trade dress, the case law and the two Restatements provided no clear guide. In some cases, appellate courts tended to reverse or remand trial courts' conclusions of aesthetic functionality when the trade dress was very distinctive. These cases favored the trademark owner without a robust investigation of whether the anti-competitive consequence existed. For example, in *Vuitton v. J. Young (1981)*, the disputed trade dress was the design of a mustard-color logo arrangement on a dark brown background (see fig. 2). The circuit judge found that Vuitton's design was appealing to consumers, but the court asserted that "a consumer's interest in the prestige afforded by carrying a certain bag may overshadow that person's sense for the purely aesthetic." In other words, the value of the design's function as a source identifier outweighed any worries about anti-competitive effect.

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101. For more information, see *Qualitex,* 514 U.S. at 159; Restatement (Third) of Torts §741 (1938); Restatement (Third) of the Law of Unfair Competition §16 (1995)

Figure 2. Monogram canvas print (Photograph from Louis Vuitton Authentication Guide (2018))

In other cases, courts have decided that trade dress was aesthetically functional when they found that the majority--or the typical consumer--bought the product for the attractiveness of the trade dress. For example, in *J.C. Penny v. H.D. Lee (1941)*, Judge Johnsen decided the four-in-one bib pocket design was aesthetically functional because most of the witnesses purchased the product due to its attractiveness. In *Job's daughter v. Lindeburg (1980),* Judge Fletcher also decided that the Job's Daughters insignia on the jewelry was aesthetically functional because the plaintiff did not prove that typical buyers would think that the jewelry was produced, sponsored, or endorsed by the plaintiff.[102]

However, considering the typical consumers' motivation is problematic. First, without empirical studies, it is difficult to know the proportion of consumer purchasing motivation, namely how many consumers purchase the product due to the aesthetic attractiveness of the trade dress and how many consumers purchase it due to the reputation of the identified source. For example, In *Louboutin v. Yves (2012)*, some consumers bought the red bottom heel

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102. Intern. Order of Job's Daughters v. Lindeburg & Co., 633 F.2d 912 (9th Cir. 1980).

because the color signaled Louboutin, the luxury manufacturer, while others just wanted a sexy heel. The appellate court reversed and remanded the trial court's analysis of aesthetic functionality, which essentially favored the plaintiff.

No court has provided a method for weighing the consumers' interest in maintaining the reliability of a source indication and the consumers' interest in vigorous competition. The mixed motive issue was never satisfactorily addressed in the case law.

To summarize, courts identify the purpose of the aesthetic functionality doctrine as avoiding the anti-competitive consequences of some trade dress protection. In realizing that purpose, judges consider the de-facto advantage conferred by the trade dress, the availability of alternative designs, as well as the advantage attributable to the source. Courts' consideration of all three factors has suffered similar problems of lack of direct evidence and inconsistent use of proxies. I will focus the first and the second issues in the following chapters. The third issue regarding the advantage attributable to the source will not be addressed in this dissertation.

In the next chapter, I will narrow the research scope to the aesthetic functionality of color trademarks. All visual trade dress can be considered as the colors, shapes or the combination of colors and shapes. I choose colors as the research subject because existing research, summarized below, provides strong evidence that consumer's color preferences influence purchase decisions, suggesting that protecting color can have anti-competitive consequences.

CHAPTER 3. PSYCHOLOGICAL STUDIES RELEVANT TO THE AESTHETIC FUNCTIONALITY OF COLOR TRADEMARKS

The aesthetic functionality doctrine assumes that consumers have psychological responses to product colors (Hughes 2015). This chapter will summarize existing studies that explain how colors can influence purchase intention through consumer affect and consumer cognition. Based on these studies, I will discuss two questions relevant to deciding a color's aesthetic functionality: how to identify the advantage a color can confer on a product's marketability, and how to determine a color's substitutability.

3.1. Consumer Responses to Color

3.1.1. Consumer affect

Consumer affect refers to consumers' emotions and appraisals of stimuli (attitudes). Studies of how color influences consumer affect are important because colors can further influence the purchase intention (Wu, Cheng and Yen 2008; Pelet and Papadopoulou 2012). Logically, enhanced purchase intention can confer a competitive advantage on the owner of a color trademark.

3.1.1.1.   Emotion.

The consumer emotion is the set of personal responses evoked during the consumption process (Das 2013). Recent psychological studies use two dimensions, pleasure and arousal (PA model), to describe consumer emotion (Das 2013). The pleasure dimension is an

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emotional continuum ranging from extreme unhappiness to extreme happiness (Mehrabian and Russell 1974). Arousal is the degree of awareness of one's surroundings (Mehrabian and Russell 1974). Pleasure and arousal work together to generate other dimensions, such as excitement/bored (ranging from high arousal and high pleasure to low arousal and low pleasure) and relaxation/tension (ranging from low arousal and high pleasure to high arousal and low pleasure) (Gorn, Chattopadhyay and Yi, et al. 1997). I will elaborate these dimensions as they relate to color one by one.

Arousal. Arousal is the degree of awareness. Some hues evoke higher arousal than other hues. Wilson found that the participants viewing a red screen had a higher arousal level than those viewing a green screen. In the experiment, the consumers viewed a 2-ft screen of plain red or plain green, and the arousal was measured by the electrical skin conductance[103] (Wilson 1966). Valdez and Mehrabian[104] found that the arousal evoked by green-yellow was significantly higher than purple-blue, yellow-red and red-purple. Blue-green was significantly higher than purple-blue. However, the arousal level evoked by red, yellow, blue and green was not different (Valdez and Mehrabian 1994). Arousal in Valdez and Mehrabian's study

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103. This is a method measuring arousal through human physical responses. In the experiment, the physical responses were monitored by a machine with skin electrodes attached to the participants' hands (Wilson 1966).

104. Valdez and Mehrabian did a full study on the effect of the hue (the wavelength), saturation, value of colors and the human mood (arousal, pleasure and dominance) through the self-report scales on color cards. They used 10 colors from long to short wavelength: red, yellow-red, yellow, yellow-green, green, green-blue, blue, blue-purple, purple, purple-red. They found the hues (wavelength) did not have a liner or a quadratic relation with the either arousal or dominance. Regarding the dominance reactions, they found that dominance feeling was highest to green-yellow and yellow while lowest with red-purple. But red, yellow, blue and green were not different in dominance level.

(1994) was measured by the self-report on an 8-item arousal scale such as troubled-dull, frustrated-sad.[105]

This initially seemed inconsistent with Wilson's study in which red increased the arousal more than green. Valdez and Mehrabian attributed the difference to the saturation of the color. Saturation is the purity of the color. The grayer the color, the lower the saturation; the less gray, the higher the saturation (Labrecque and Milne 2012). The red color used in Wilson's study might have been of very high saturation, so it could have been the saturation of the color, not the hue, that enhanced the arousal (Valdez and Mehrabian 1994).

Additionally, Wu and his colleagues found that red online store webpages caused more arousal than the blue ones, measured by the participants' self-report on the 6-item arousal scale.[106] (Wu, Cheng and Yen 2008). Wu's result might be influenced by cultural differences. Wu's study was done in Taiwan, where people prefer red over other colors. (Wu, Cheng and Yen 2008).

Not all the experiments on hues have had significant results. Bellizzi and Hite found that the arousal evoked by a red store background was not different from that evoked by a blue store background (Bellizzi and Hite 1992). Chebat and Morrin found no significant difference in arousal between the red and the green shopping mall décor. (Chebat and Morrin 2007)

Color value and saturation also influence arousal levels. As mentioned, saturation is the purity of a color. Valdez and Mehrabian found that higher saturation evoked higher

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105. The 8-item arousal scale was established by Mehrabian (1978).
106. The 6-item arousal scale was stimulated-relaxed, excited-calm, jittery-dull, aroused-unaroused, frenzied-sluggish, wide awake-sleep (Wu, Cheng and Yen 2008).

arousal level. (Valdez and Mehrabian 1994). Value is the lightness of a color. The closer to white, the higher the value, the closer to black, the lower the value (Labrecque and Milne 2012). Valdez and Mehrabian found that the arousal level went down when the value increased to Munsell Brightness 43[107] and went up for the value higher than Munsell Brightness 43 (Valdez and Mehrabian 1994).

Pleasure. Pleasure is the dimension of emotion ranging from extreme unhappiness to extreme happiness. Guilford and Smith (1959) found that the color region of green to blue evoked the highest pleasure and the region of yellow and yellow-green evoked the lowest pleasure, measured by the participants' self-report a scale from most unpleasant imaginable to most pleasant imaginable. Valdez and Mehrabian (1994) found most pleasant colors were blue, blue-green, green, purple-blue, red-purple, purple. The least pleasant colors were yellow, green-yellow, red-yellow. The measurement was the participants' self-report on the 24-item pleasure scale such as happy-cruel, affectionate-nasty.[108] The two studies revealed that people generally prefer hues from green to blue to purple to red over hues from red to yellow to green (see fig. 3).

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107. Munsell system is a standard to measure the value (brightness), saturation and hue.
108. The 24-item pleasure scale was established by Mehrabian (1978).
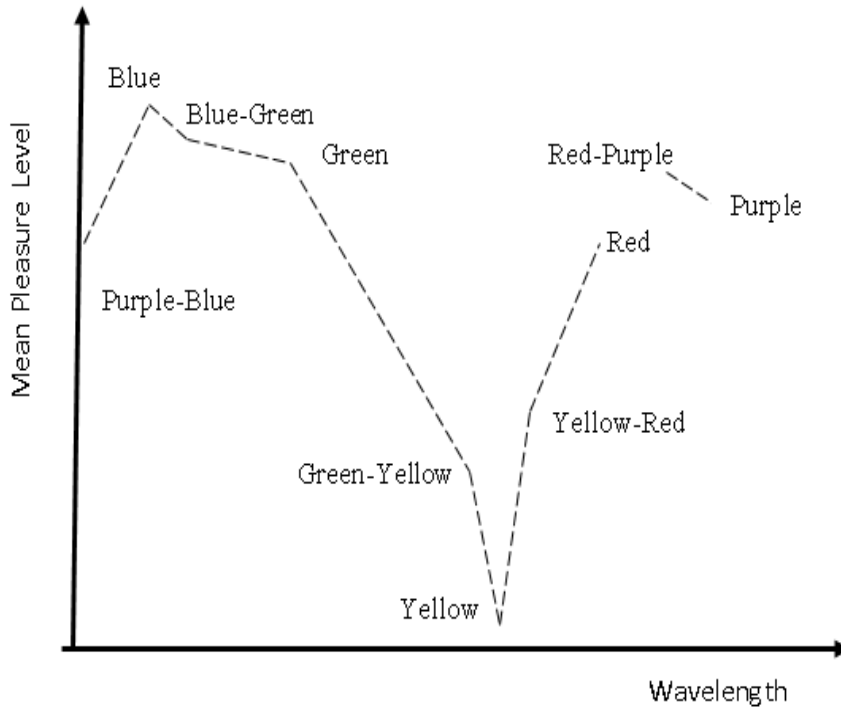
Figure 3. Average pleasure levels as functions of color wavelength (Adapted from Valdez and Mehrabian (1994, fig.3)).

Bellizzi and Hite (1992) found that a blue store background evoked more pleasure than a red store background, measured by an 8-item pleasure scale from contented to depressed and from happy to unhappy.[109] But Wu Cheng and Yen (2008) found that the red store webpages brought more pleasure than blue store webpages, according to participants' self-report on a 6-item pleasure scale measuring: happy-unhappy, pleased-annoyed, satisfied-unsatisfied,

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109. Bellizzi and Hite (1992) used the pleasure scale established by Mehrabian & Russell (1974) and Donovan & Rossiter (1982) but revised them into the 8-item scale: contented-depressed, happy-unhappy, satisfied-unsatisfied, pleased-annoyed, relaxed-bored, important-insignificant, hopeful-despairing, free-restricted clouding. The last one was invalid because it was loaded on the pleasure less than 40%.

contented-melancholic, hopeful-despairing, relaxed-bored. Again, this inconsistency might be

caused by experimental method differences and cultural differences.

Chebat and Morrin (2007) found no difference between red/orange and green store

décors in pleasure. Valdez and Mehrabian (1994) found red was not rated significantly

different from blue or green in evoking the pleasure.

The value and saturation of colors also influence pleasure. Valdez and Mehrabian

(1994) found that the higher saturation evoked higher pleasure. Guilford and Smith (1959)[110],

Valdez and Mehrabian (1994)[111] found that the higher value evoked the higher pleasure.

Excitement. Some studies focus on the color effect on the excitement/boredom

spectrum, which is an affective dimension mixed by the arousal and the pleasure (see fig. 4)

(Gorn et al. 1997). The excitement/boredom dimension ranges from high arousal and high

pleasure to low arousal and low pleasure (Gorn et al. 1997). Gorn and his colleagues

measured excitement/boredom and found that red magazine ads evoked higher excitement

than blue ones. (Gorn et al. 1997). They also found high-saturation magazine ads evoked

higher excitement than low-saturation ones (Gorn et al. 1997).

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110. In Guilford and Smith's study, the consumer gave a score of pleasant degree after
they viewed the color patches (Guilford and Smith 1959).
111. Valdez and Mehrabian also checked the brightness (value) and saturation. They
found that the arousal, dominance and pleasure were all linearly increased with saturation. For
the brightness (value), arousal has a ladle shape relation with brightness, decreasing with the
brightness up to Munsell brightness (lightness) 43 and then reverse and increase a little bit for
the highest brightness. Dominance also has a ladle shape relation with brightness. Pleasure is
linearly increased with brightness. They also found that the influence of brightness on pleasure
was greater than saturation (Valdez and Mehrabian 1994).

Pleasure

Relaxation   Excitement

Boredom   Tension
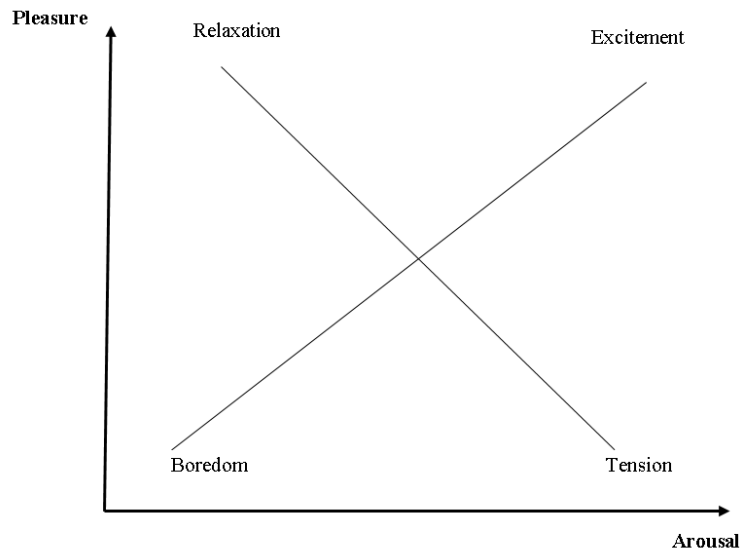
Arousal

Figure 4. Apter's two-dimensional framework of arousal: excitement, relaxation, and hedonic state (Adapted from Gorn et al (1997, fig.1)).

Relaxation. Relaxation/tension is another dimension mixed by arousal and pleasure (see fig. 4). This dimension ranges from the low arousal/high pleasure to the high arousal/low pleasure (Gorn et al. 1997). In a web page experiment, Gorn et al (1997) measured relaxation on a 6-bipolar-item scale of "relaxed", "calm", "peaceful", "uneasy", "tense" and "anxious" as reported by the participants. They found that blue background webpages evoked more relaxation than yellow and red ones. Gorn et al (2004) also found relaxation made participants experience a shorter website downloading time and a greater willingness to recommend the website. In another experiment conducted on magazine ads, Gorn et al. (1997) found that blue and red magazine ads were not rated differently in evoking relaxation.[112] It seems that the

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112. They measured the relaxation by the participants' self-report three-bipolar-item scale, relaxed, soothed, and calm (Gorn et al. 1997).

color stimuli on computers were greater in value than color in magazines, and thus more likely to have significant results.

Additionally, Gorn and colleagues found that higher value caused higher relaxation in the experiment on magazine ads (Gorn et al. 1997) and webpages (Gorn et al. 2004). They also found lower-saturation webpages brought higher relaxation.[113]

3.1.1.2.   Affective appraisal (attitude).

Affective appraisal (attitude) is an intuitive, immediate appraisal of the stimulus (Damasio 1994). Compared with the cognitive evaluation, affective appraisal is more automatic, often unconscious. It is fast and primary, almost without reasoning (Castelfranchi 1999). The affective appraisal is often measured along a spectrum of like/dislike, attractive/unattractive, favorable/unfavorable, good/bad (Castelfranchi 1999), comfortable/uncomfortable, pleasure/unpleasure, depressing/cheerful, etc. (Bellizzi, Crowley and Hasty 1983; Chebat and Morrin 2007). Affective appraisal is important because it might influence the purchase intention. For example, Hall and Hanna (2004) found that webpages of light blue text on dark blue background were rated significantly more beautiful than the webpages of black text on white background. The aesthetic ratings were significantly and positively associated with the purchase intention.

Several studies of color's effect on the affective attitude were focused on warm and cold colors. Bellizzi Crowley and Hasty (1983) found that cold-hues (blue, green) on a store background evoked more positive affective attitudes than warm-hues (red, yellow), measured

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113. The relaxation as a mediator further enhanced the feeling of quickness of the downloading time, the attitudes of the website and the recommending behaviors (Gorn et al. 2004).

by the participants' self-report on the 6-item scale, negative-positive, unattractive-attractive, tense-relaxed, comfortable-uncomfortable, bad-good, and (the shopping environment) pleasant-unpleasant. Using a similar scale, Crowley (1993) further found that the shorter the hue-wavelength, the more positive affective attitude.[114] However, based on the similar measuring scale,[115] Chebat and Morrine (2007) found that cold décor (green) and the warm décor (orange and red) were not different in evoking the affective attitude. The non-significant result might arise from an insufficient color stimulus, because the experiment was done in a real shopping mall and the decorated area (the stimulus) was less than 15% of the overall interior (Chebat and Morrin 2007).

3.1.2. Consumer cognition

Consumer cognition involves "thinking to the stimuli" (Peter and Olson 2008). The cognition process includes attention, interpretation (meaning), memorization, evaluation (attitude), and can include purchase intention (Peter and Olson 2008). We will elaborate on these concepts later. Consumer cognition is important because it heavily influences purchase intention (Peter and Olson 2008). Color(s), by influencing the cognitive process, can influence markets (Labrecque and Milne 2012; Pelet and Papadopoulou 2012). Therefore, granting property rights in some colors, in some contexts, may have an anti-competitive effect.

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114. The red and yellow have the longer wavelength and the green and blue have the shorter wavelength. In their studies they used negative/positive, tense/relax, unpleasant/pleasant as the measure of affective evaluation (Crowley 1993).

115. Chebat and Morrine used 8-item scale: tense-relaxed, uncomfortable-comfortable, depressing-cheerful, drab-colorful, boring-stimulating, unlively-lively, dull-bright, uninteresting-interesting (Chebat and Morrin 2007).

3.1.2.1.   Attention.

Attention is the first stage of the cognitive process. Attention selects information to be attended and comprehended (Peter and Olson 2008).

Dooley and Harkins (1970) found that a colored chart caught more attention than a colorless chart. [116] They put a chart in the classroom and measured attention by monitor-recording the number of times participants looked at the chart and the total amount of time spent looking (Dooley and Harkins 1970). Lohse (1997) found that, in respect to yellow pages ads, color ads attracted the more consumers' attention than non-color ads, measured by the eye-tracking device. [117]

Gelasca, Tomasic and Ebrahimi (2005) found that among 12 colors, red caught the most attention. Red, yellow, green and pink got more attention than light blue, maroon, violet and dark green, measured by self-reporting (Gelasca, Tomasic and Ebrahimi 2005).

Bellizzi, Crowley and Hasty (1983) found that warm colors (red, yellow) in store design earned more consumers' attention than cold colors (blue, green), measured by how close the participant sat to a colored wall. [118]

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116. They put a chart in the class room and measured the attention by the number of times participants looked at the chart and the total amount time spent looking (Dooley and Harkins 1970).

117. In this study, Lohse used the eye tracking machine to track the view order and viewing time. He found that consumers look at the color ads before the non-color ads, notice more color ads than the non-color ads, and view color ads longer than non-color ads (Lohse 1997).

118. The attention was measured by the distances between the participants choose to sit from a colored wall (Bellizzi, Crowley and Hasty 1983).

3.1.2.2.   Interpretation (meaning).

After consumers attend to color stimuli, they interpret the stimuli; therefore, colors can be associated with certain meanings (Peter and Olson 2008) . Color meanings are important, because when color influences product meaning, consumer purchase intention may be affected (Labrecque and Milne 2012).

In studies of color meaning, some measurements overlap with measurements of consumer affect. For example, "happy," "soothing," "sad," or "exciting" are used to measure both consumer affect and color meaning. This is natural, because consumers might interpret the color meanings through their feelings (affect). Of course, color meaning studies also include other measurements which are not used in consumer affect studies, such as feminine, elegant, beautiful, or evil.

Studies reveal that people consistently associate a specific meaning with a specific color. Wexner (1954) found that red was significantly paired with exciting-stimulating, blue with secure-comfortable, orange with distressed-disturbed-upset, blue with tender-smoothing, purple with dignified-stately, yellow with cheerful-jovial-joyful, and black with powerful-strong-masterful.[119] Odbert, Karwoski and Eckerson (1942) found that red was paired with

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119. He studied the relation between colors and mood tones (the specific feelings) through asking the participants to group the color and a specific feeling (Wexner 1954). Besides those feelings listed, in some specific feelings, some colors have no significant difference such as red, brown, blue, black, and purple with protective-defending; black, brown with despondent-dejected-unhappy-melancholy; blue and green with calm-peaceful-serene; red, orange and black with defiant-contrary-hostile (Wexner 1954).

exciting; orange with gaiety; yellow with playful; green with leisurely; blue with tenderness; purple with solemn. Black was heavily concentrated at sad.[120]

Different from the color-word grouping method in previous studies, Clarke and Costall (2007) asked the participants to freely generate any words they thought while viewing the colors. They found that warm colors such as red, yellow and orange were associated with active emotional and warm words such as warmth, sunshine, flames, heat, fire. Green and blue were associated with low anxiety, comfortable, and soothing words; purple with calming; passive nature; black with evil, malice and death; white with the reverse wordings of black; pink with feminine. Brown and grey got few comments or weak emotional words.[121] Labrecque and Milne (2012) found a significantly positive relation between white or pink logos and sincerity; red logos and excitement; blue logos and competence; black or purple logos and sophistication; brown logos with and ruggedness. They also uncovered a significant negative relation between sophistication and orange logos; ruggedness and pink or purple logos. Studies on color meanings are generally consistent with each other.[122]

Elliot and colleagues focused on red's meaning and found that men rated women as more attractive and sexually desirable when the women were viewed within a red picture

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120. The experiment was done by grouping test. The participants first listened 10 orchestral recordings and reported the mood by choosing among 8 groups of adjectives. Then the participants report the colors they associated with music (Odbert, Karwoski and Eckerson 1942).
121. They did a qualitative method. They did not provide the words for the participants to select when they viewed the colors. Instead they asked the participants to generate any words they thought (Clarke and Costall 2007; Lohse 1997).
122. They focused on how logo colors enhance the brand personality (meaning) based on the previous studies on pure color meanings. They checked 10 colors (red, orange, yellow, green, blue, purple, pink, black, brown, white) and 5 personality scales (sincerity, excitement, competence, sophistication, ruggedness) on fictitious logos (Labrecque and Milne 2012).

border or in red clothing (Elliot et al. 2007; Elliot and Niesta 2008). This research might imply why the Louboutin shoe with the red sole is so attractive to consumers despite its very high price.

Labrecque and Milne (2012) revealed that saturation had a significant positive relation with excitement[123] and ruggedness, while color value had a significant negative relation with ruggedness.

3.1.2.3.   Memory.

After consumers interpret the colors, they store meanings in their memory and later retrieve it for evaluation. Here, I discuss how colors enhance the memory of the colored stimuli such as the words, objects (products), and ads. Some colors enhanced memory more than other colors, and this might further relate to purchase intention (Pelet and Papadopoulou 2012).

Many studies reveal that colored objects are better remembered than the same non-colored objects. Borges, Stepnowsky and Holt (1977) found that adults recalled color pictures of objects better than the black/white pictures of objects. Wichmann, Sharpe and Gegenfurtner (2002) found that participants performed better in recognizing colored images than black/white images which were presented to them.

Studies further indicate that some hues enhance the memory of words more than other hues. In a recall test, subjects recalled more correct words on the red background than those on the blue background (Mehta and Zhu 2009). When the background was colorless, and the

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123. This is consistent with the study of consumer affect (Gorn et al. 1997).

color was on the words or the objects, colors might not influence the memory[124] (Kuhbandner, et al. 2015). Studies on memorizing information in a website banner revealed no difference between the warm color banner and the cold color banner[125] (Moore, Stammerjohan and Coulter 2005).

Kuhbandner, et al (2015) found that when different colored objects were in the same picture, red, yellow and blue objects were more easily memorized than green objects.[126]

3.1.2.4.   Cognitive evaluation (attitude).

Cognitive evaluation is a process during which meanings, knowledge, and beliefs are integrated into attitude (Peter and Olson 2008). Compared with affective appraisal, cognitive evaluation is more rational and goal-oriented (Castelfranchi 1999). Many studies have used like/dislike, good/bad, high/low (quality/price) and worthwhile/not worthwhile, to measure

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124. In their study, when the words or objects are paired with colors (red, yellow, blue, green) and presented one by one, colors do not influence the memory of the words or objects (Kuhbandner, et al. 2015).

125. Moore and his colleagues found that, for website banner ads, the blue color and the red color do not attract the attention differently, measured by free recall and recognition. Besides, the color contrast did not significantly influence the attention either (Moore, Stammerjohan and Coulter 2005)

126. This study has four experiments in total. The first experiment is the pairings of word/color. The second is the pairings of object/color. In the first two experiments, the pairings are presented one by one. The results show that colors do not influence memory of the words or the objects. The third experiment is the pairings of object/color, but four pairing are put in one picture to present to the participants. In the third experiment, colors do influence the memory of the objects. It shows that red, yellow and blue objects are more recalled than green objects. In the first three experiments, the participants are instructed in advance that they will recall the words/objects. But in the fourth experiments, the participants are not told to remember the words/objects in advance. The other respects are the same with the third experiment. The result of the fourth experiment is that colors do not influence the memory of the objects. Across the four experiments, given the words or objects, the participants remember the colors differently. Red color is more easily to be remembered than blue and green colors (Kuhbandner, et al. 2015).

cognitive attitude. Many studies reveal that hues do not influence cognitive attitude, but value and saturation might influence cognitive attitude.

Bellizzi, Crowley and Hasty (1983) found that store background colors (blue, green, red, yellow) did not make a difference in cognitive attitude toward the quality and the price of a product measured by participants' self-report on a 1-item scale: low-high (price/quality). Chebat and Morrine (2007) found no difference between the cold décor (green) and the warm décor (orange and red) in attitude toward the product or its environment, measured by 1-item scale: low-high quality.[127] Gorn et al. (1997) found no cognitive attitude difference between blue and red magazine ads, measured by the participants' self-report on the 2-item scale: good-bad, nice-not nice. Moore, Stammerjohan and Coulter (2005) found no difference between the blue banner ads and the red banner ads in influencing the attitude to the ads.

However, Gorn et al. (1997) revealed that value and saturation affect cognitive attitude. They found that both higher-value and higher-saturation magazine ads led subjects to like the ads more, measured by a 2-item scale: good-bad, nice-not nice.

3.1.3. Purchase intention

Through affective and cognitive processes, consumers choose among alternative products and form the intention to buy or not to buy. Several studies reveal that colors

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127. The experiment was down through the interviews of the consumers in the manipulated real shopping mall. The consumers report their attitudes to the interviewers. The color part of the shopping mall only took 10%-15% of the overall interiors of the shopping mall. Besides color effect, they also revealed the culture effect. They found that the French-Canadians rate the higher quality of the environment and product in warm color décor (red and orange) relative to the non-color décor. The Anglo Canadians rate the higher quality of the environment and product in cool color décor (green) relative to the non-color décor (Chebat and Morrin 2007).

influence purchase intention through consumer affect or cognition. For example, Wu, Cheng, and Yen (2008) found that the red background of an online store, as opposed to blue, evoked higher pleasure and higher arousal, which increased the subjects' purchase intention. Pelet and Papadopoulou (2012) found that for some hues (Newsvine green[128] foreground/magnolia yellow background; granny smith apple green foreground/magnolia yellow background), a high value increased negative mood, and the negative mood decreased purchase intention. Hall and Hanna (2004) found that light blue text on dark blue background on webpages generated a marginally significantly higher aesthetic rating than black text on white background, and aesthetic ratings had a significant correlation with purchase intention.[129]

Other studies demonstrate that colors also influence the purchase intention through the consumer cognition. For example, Labrecque and Milne (2012) found that purchase intention was higher if the package hues' meaning matched the product personality (e.g. brand image). Pelet and Papadopoulou (2012, 454, 458-459) found that the lower color contrast on the webpages enhanced memory,[130] which subsequently increased purchase intention.

3.1.4. Relation between purchase intention and purchase behavior/real sales

Many studies have verified the robust correlation between purchase intention and purchase behaviors (Tobin 1959; Juster 1964; Adams 1974; Tauber 1975). This correlation justifies using purchase intention to forecast purchase behaviors and real market sales.

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128. Newsvine green is one shade of green used by Newsvine, Inc.
129. But the text and background colors by themselves did not make difference in purchase intention (Hall and Hanna 2004).
130. It might be that the lower contrast forced participants to attend the webpage more and therefore enhanced the memory (Pelet and Papadopoulou 2012).

Further studies found that three gaps might reduce the purchase intention's accuracy in predicting purchase behaviors (Morrison 1979; Sun & Morwitz 2010). The first gap is between stated intention and true intention (Morrison 1979; Sun & Morwitz 2010). Consumers might overstate or understate their purchase intentions (Sun & Morwitz 2010). For example, if the product is healthy and socially desirable product, consumers might overstate their intention. If the product is unhealthy, non-socially desirable product, the intention might be understated (Morwitz, Stecked, Gupta 2007). The second gap is between true intention (at the survey time) and unadjusted purchase probability (Morrison 1979). This gap is caused by exogenous events such as promotions or financial problems (Morrison 1979; Sun & Morwitz 2010; Ajzen and Fishbein 1973), product being out of stocks (Sun & Morwitz 2010), and whether the consumers are surveyed (Fitzsimons & Morwitz 1996).

Many efforts have been devoted to developing a model to fill the gaps above and to increase purchase intention's predictiveness (Morrsion 1979; Warshaw 1980; Jamieson & Bass 1989; Sun & Morwitz 2010). The common point of these models is adding those variables causing the gaps above into the predictive model. [131]

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131. For example, Warshaw (1980) developed a model that equal the purchase behavior as the function of the probability of antecedent conditions (variables causing gap between true intention and the unadjusted purchase probability) multiplying the purchase probability under such antecedent conditions. Sun & Morwitz (2010) created a model considering the systematic bias and the exogenous variables.

3.2. The Implications of Consumer Psychology Studies for the Aesthetic Functionality

Doctrine

Studies show that, in some circumstances, colors can influence consumer affect, cognition, and purchase intention. The two most difficult questions facing courts concerning a color trademark's aesthetic functionality are: (1) When would protecting color confer a competitive advantage to one litigant over another? (2) When are there enough substitutable colors to allay competition concerns? I will discuss how the psychology studies help to address the two questions in the following sections.

3.2.1. The psychological/competitive advantage of a disputed color

Psychological studies suggest that effect on purchase intention is the closest proxy for "competitive advantage" when evaluating a disputed color. Purchase intention is a robust predictor of purchase behavior and real sales, and a survey can more easily measure purchase intention than it can measure purchase behavior.

How do we know that the disputed color might increase purchase intention? Psychological studies tell us that purchase intention can be influenced by: (1) consumer affect/cognition and (2) context (see fig. 5). Regarding consumer affect, courts may consider expert testimony concerning whether color influenced the consumers' pleasure, arousal, or appraisal. Regarding consumer cognition, experts may testify whether the color influenced consumers' attention, memory, interpretation (meaning), or attitude. If color influences either the consumer affect or consumer cognition, the color might especially influence purchase intention, thus providing evidence of a competitive advantage (Babin, Hardesty and Suter

2003; Bellizzi and Hite 1992; Garber, Burke and Jones 2000; Hall and Hanna 2004;

Labrecque and Milne 2012; Pelet and Papadopoulou 2012; Wu, Cheng and Yen 2008).
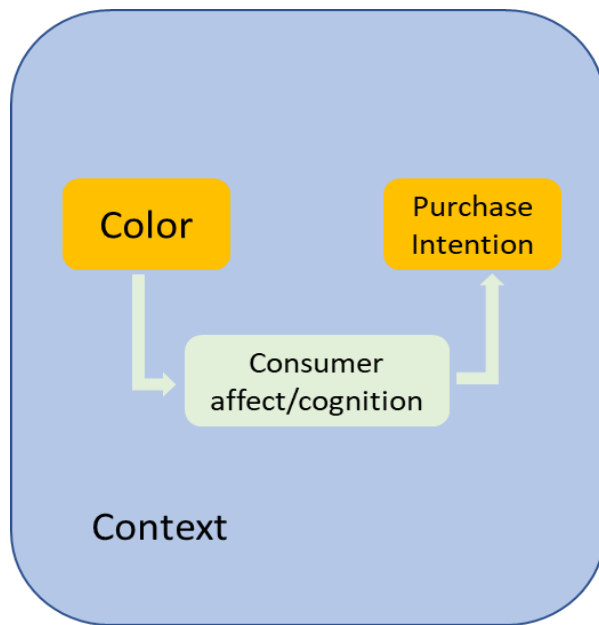
Figure 5. Framework of color and purchase intention, mediated by consumer affect/cognition, moderated by context

Regarding the market context, courts may consider three factors: (1) how the color is used (e.g. in the presence of a strong word mark), (2) the nature of the product/service is, (3) and the cultural context of the product/service. Although consumer psychology studies indicate that color influences purchase intention through consumer affect and cognition, the results of experiments testing these studies have been inconsistent. Some comparisons between hues are significant (Wilson 1966; Wu, Cheng and Yen 2008; Guilford and Smith 1959; Gorn et al. 2004; Mehta and Zhu 2009), while others are not (Chebat and Morrin 2007; Gorn et al. 1997; Moore, Stammerjohan and Coulter 2005). For example, red can score higher than blue in a psychological response, but lower than blue in another experiment (Bellizzi and Hite 1992; Valdez and Mehrabian 1994; Mehta and Zhu 2009; Kuhbandner, et

al. 2015). Contextual differences might explain these inconsistent results. The following three contextual factors help determine whether the disputed color did in fact enhance purchase intention in a specific situation.

   How and where color is used. In the previously mentioned psychological studies, colors can be presented by color patches, projected slides on either a wall or computer screen, or in magazines. Because of the larger size of the color area, the strength of color stimuli generated by projected slides might be greater than color patches, which might explain why Valdez and Mehrabian (1994) found no significant difference in pleasure between red patches and blue patches, while Bellizzi and Hite (1992) found the store where blue was projected onto the walls evoked significantly higher pleasure than the store where red was projected onto the walls. The size of the area also influences memory; the words on the red background were more easily remembered than the words on the blue background (Mehta and Zhu 2009). However, when the words or objects themselves were colored, instead of the background, there was no difference in how easily the words were remembered (Kuhbandner, et al. 2015).

   Additionally, the color presented on a computer screen might have a higher value than both the color patches and the projected slides, because computer screens generate light. Higher value might enhance (distort) the arousal and pleasure level (Valdez and Mehrabian 1994), which may explain, in part, why Wu, Cheng and Yen (2008) found that red webpages evoked higher arousal than blue webpages, while Valdez and Mehrabian (1994) found no arousal difference between red and blue patches, as well as why Bellizzi and Hite (1992) found no different arousal results between the store with red slides projected onto their walls and the store with blue slides projected onto their walls.

These inconsistent results indicate that expert testimony must consider the placement and size of the disputed color used when considering how color(s) might influence purchase intention. Empirical research should seek to replicate as closely as possible the context in which consumers actually encounter a color. For example, the strength of the color stimulus caused by the color used in the store's décor might be stronger than the color stimulus caused by the color on the products or packages. The context of the legal dispute must dictate the experimental method used to gather evidence of functionality. For example, where a color is used on a web page, judges should devalue evidence of the same color when it is presented off-webpage, because the screen light would enlarge the color effect.

The product category. Psychological studies provide robust evidence that colors are significantly associated with particular meanings (Labrecque and Milne 2012; Wexner 1954; Odbert, Karwoski and Eckerson 1942; Clarke and Costall 2007; Elliot and Niesta 2008). When the meaning associated with a color is congruent with the meaning the product intends to deliver, studies suggest that purchase intention increases (Labrecque and Milne 2012). For example, because red is commonly associated with sex appeal, women's red high heeled shoes are more likely to enhance purchase intention, while red coffee mugs are less likely to influence purchase intention (Elliot et al. 2007; Elliot and Niesta 2008). Blue might increase the purchase intention if used in the banking, legal, or accounting settings because blue is associated with competence (Labrecque and Milne 2012). Purple and black might influence the purchase intention in the luxury industry because both hues are associated with sophistication and luxury (Wexner 1954; Labrecque and Milne 2012).

The culture effect. Many psychologists agree that culture moderates the relation between colors and the consumer's psychological response to those colors. Wu, Cheng and

Yen (2008) revealed that Taiwanese participants felt more pleasure and higher arousal when they viewed an online store with a red background than an online store with a blue background. This enhanced pleasure and arousal increased the participants' purchase intention. This result contrasts with Bellizi and Hite's study (1992), in which a store with blue slides projected onto its walls evoked more pleasure than a store with red slides projected onto its walls. In Chebat and Morrin's study (2007), they found that French-Canadians favored warm colored décor (orange and red), while the Anglo-Canadians favored cool colored décor (green). This suggests that any survey accepted into evidence in an aesthetic functionality case must be sensitive to the culture of potential consumers. The universe of subjects should look like the universe of potential consumers of the color trademark.

These contextual factors provide guideposts for litigants to determine whether the disputed color might enhance purchase intention through the consumer affect and cognition in a specific case. In summary, I propose the purchase intention as the proxy to help identify competitive advantage. We can determine whether a color did in fact increases the purchase intention by investigating two factors: (1) the consumer affect and cognition, and (2) the context in which the color was used, the product category, and the culture.

3.2.2. The substitutability of different colors

Even if a particular color evokes strong purchase intention in subjects, protecting the color would not necessarily result in an anti-competitive effect. If many colors can be substituted to create the same effect as the disputed color, the functionality doctrine holds that protection is not a problem.

Psychological studies suggest that substitutability can be measured by empirical surveys.[132] Such surveys are widely used in consumer psychology studies to measure whether two or more colors equally influence psychological responses, including purchase intention (Guilford and Smith 1959; Wilson 1966; Bellizzi, Crowley and Hasty 1983; Chattopadhyay and Yi, et al. 1997; Bellizzi and Hite 1992; Gorn, Chattopadhyay and Sengupta, et al. 2004; Gorn, Moore, Stammerjohan and Coulter 2005; Wu, Cheng and Yen 2008; Elliot and Niesta 2008; Mehta and Zhu 2009; Chebat and Morrin 2007). The basic method uses the same objects, such as words, logos, store backgrounds, products, packages, or magazine ads, and switches the colors on the same objects. After viewing the differently colored objects, the participants are required to answer a series of questions to measure their psychological responses, including purchase intention. A significant statistical result means that the colors influence psychological responses differently; therefore, those colors are not substitutable.

One difficulty, of course, is determining which colors to include in the empirical survey. How should an expert witness decide which colors to include?

Some psychological studies provide specific information on color substitutability in evoking a specific consumer affect or cognition (Wilson 1966; Guilford and Smith 1959; Bellizzi and Hite 1992; Valdez and Mehrabian 1994; Wu, Cheng and Yen 2008; Gorn, Chattopadhyay and Sengupta, et al. 2004; Mehta and Zhu 2009; Labrecque and Milne 2012). These studies provide litigants with recommendations for potential alternative colors to use in

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132. Psychology studies did not directly or explicitly suggest testing the color substitutability by the subject experiments and statistic significance, however many psychology studies on colors revealed color substitutability through subject experiments and statistic calculations. The citations are listed in this paragraph.

the survey. For example, when considering pure color patches, the arousal level of green-yellow tested significantly higher than purple, blue, yellow-red, and red-purple (Valdez and Mehrabian 1994). These studies provide primary evidence that these colors are not substitutable in some contexts. The arousal level of green-yellow was *not* significantly different from the green, yellow, blue-green and red, so these colors might be substitutable for yellow-green. When considering pleasure levels, blue, blue-green, green, red-purple and purple might be considered substitutable for each other; similarly, green-yellow, yellow and yellow-red may be substitutable for each other. Many similar studies shed further light on substitutability (Chebat and Morrin 2007; Gorn, Chattopadhyay and Yi, et al. 1997; Moore, Stammerjohan and Coulter 2005).

We also need to consider the context in which the color is used in order to decide which colors to test in a substitution survey, as context might moderate the color's effect on the observers' psychological responses. In a Western culture, we can propose black as a substitutable color to purple in conveying luxury. However, in China, yellow might also be considered a luxury color, as yellow was only used by the emperors in ancient China. Therefore, we might also include yellow as a substitutable color in the survey if the product or service was promoted in China.

Even after canvassing the literature, a significant question remains: how many substitutable colors are enough to overcome the anti-competitive effect associated with the color trademark protection? Psychological studies do not provide any suggestions on this issue, because it is a fundamentally legal or economic question. In the context of physical embodiments of a product shape, courts have found that 12-15 substitutes are not enough to allay concerns over functionality. The *Keene* court was not satisfied when there were 12-15

substitutes.[133] But in *Sicilia v. Cox* (1984), the trademark owner prevailed by offering only

three other citrus juice products with a lemon/lime shape.[134]

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133. *Keene,* 653 F.2d at 827.
134. Sicilia Di R. Biebow & Co. v. Cox, 732 F.2d 417, 429 (5th Cir. 1984).

CHAPTER 4. ECONOMIC ANALYSIS OF AESTHETIC

FUNCTIONALITY

Economic research explains why trademark protection (including for color

trademarks) can have anti-competitive effects (Chamberlin 1933; Brown 1948; Lunney 1999;

Greer 1979). Some studies have even proposed measures to test monopoly costs (Burgunder

1985, 1986; Cunningham 1995). Based this research, I conclude that measuring distributive

effects (quantity) and monopoly pricing (inelasticity) helps to determine when protecting a

color is anti-competitive. To be clear, in section 4.1, "trademark" refers to traditional

trademarks, such as words, logos. In section 4.2, "trademark" refers to color trademarks.

4.1.   How can Trademark Protection Cause Anti-competitive Effects?

Numerous commentators agree that trademark protection increases market efficiency

by minimizing consumer search costs (Akerlof 1978; Landes and Posner 1987; Katz 2010;

Economides 1988)[135], while potentially imposing monopoly costs by enhancing product

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135. Almost all law and economic scholars agree that the basic purpose of trademarks
is to identify the producer and thereby reduce consumer search costs. This source-identifying
function is realized through two levels of information. One fact transmitted is the identity of
the producer. Katz labels this the "linguistic function" (Katz 2010, 1582). Some trademarks
are simply the names of the producers, such as "Honda," "Christian Louboutin," or "Chanel."
However, simply knowing the producer's identity is insufficient for consumers. They often
need to know a critical further fact--the quality or the features of the product, implied in the
reputation of the producer. Katz calls this the "trust function" (Katz 2010, 1582). Such
information is developed through repeated purchases and by advertising. By the combination
of the linguistic function and the trust function, consumers save time, energy, and resources
spent on finding the desired product and avoiding mistaken purchases. Trademark law
protects both functions and saves consumer search costs.

differentiation (Chamberlin 1933; Brown 1948; Lunney 1999; Lemley 1998; Greer 1979).

Before the passage of federal trademark protection, economist Chamberlin (1949) argued that

trademarks enhanced product differentiation and that "artificial" product differentiation could

cause deadweight losses. According to his theory, when products are fungible, pure

competition should exist between them. If fungible products are artificially differentiated

through advertising, then the artificially differentiated product would have fewer substitutes.

Therefore, the company has the power, to some extent, to restrict the output, increase the

prices, and cause deadweight losses. [136]

By reducing search costs, trademark law promotes market efficiency. The theory of "the market for lemons" explains how trademarks contribute to efficient markets (Akerlof, 1978). Normally, buyers have less information about products than sellers. If no trademarks accurately identified sellers and signaled product quality or features, buyers would be unable to distinguish between high-quality and low-quality sellers and would simply buy the cheapest product. Honest sellers of higher quality products would exit the market, since they could not compete on the price with the low-quality sellers. Such a market might collapse or, more likely be populated with poor quality products (Katz 2010, 1561-1562).

Landes and Posner developed a model to detail how trademark protection promotes market efficiency by saving the search costs. They assume that in a perfectly competitive market with one homogenous product, companies compete on the "full" price, which is the sum of the money price for the physical product and the search cost incurred by consumers. A company who has a stronger trademark would have a higher incentive to keep a constant quality, because a stronger trademark saves more search costs and enables the seller to charge a higher, but still competitive, price. To maintain the advantage earned through the advertising and the effectiveness of its trademark, the company has to maintain consistent quality. Otherwise, consumers might find the quality mismatch with the price and switch suppliers. In this way, trademark protection has the "self-enforcing feature" increasing product differentiation and market efficiency (Landes and Posner 1987).

136. In a perfect competitive market, products from different producers are equal and the competition would force the price to a competitive price level, P_c. Product differentiation would make a product less substitutable with competing products. So, the differentiated product would be shielded from price competition. Therefore, that product could be priced at P_m, which is higher than the competitive price, P_c. Then, consumers who would afford P_c cannot buy the said product and the deadweight loss would be DWL (dead weight loss) = $\frac{(Qc-Qm)*(Pm-MC)}{2}$. The dead weight loss refers to those consumer demands which cannot be satisfied at current price (P_m) (Spaulding, 2019).

Based on Chamberlin's product differentiation theory, other law and economic

scholars have explained how trademark protection would enhance product differentiation and

cause monopoly costs. Brown (1948) asserted that advertisement had a persuasive effect, [137]

and such persuasive effect can convince consumers that the advertised product is substantially

different from other similar products. Brown (1948) saw trademarks as a vehicle containing

all the persuasive effects conveyed by the advertisement.[138] Therefore, trademark protection

could enhance product differentiation, in some cases leading to an anti-competitive cost.

Brown (1948) observed that some trademarks have pre-existing persuasiveness. For

example, trademarked descriptors like "Gold Medal" or "Premier" imply the trademarked

product is superior to other products, and therefore might predispose consumers to buy those

products over other products with lesser descriptors (Brown 1948). Protecting those words

might cause product differentiation and deadweight losses (Brown 1948).

In the same vein, Lunney (1999) argued that information asymmetry was one reason

why trademark protection enhanced product differentiation and could cause the anti-

competitive consequences. Consumers only have good information about brands they have

used and have less information about other brands. Once consumers find a satisfying brand,

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137. Brown asserted that the purpose of advertisement should be providing the
information about the goods offered, most advertising is instead designed to persuade and
influence consumers. According to the study of Waite and Cassady (1949), an analysis of 800
magazine advertisement showed that 15% were informative and 85% were persuasive (Waite
and Cassady 1949).
138. Brown asserted that if the advertisement was successful, it could create demand.
The trademark (symbol) is like a bridge over which all the traffic (demand) created by the
advertisement will be directed to the producer. With time, the trademark itself becomes more
than a bridge but "a 'commercial magnetism' of its own". The symbol with such magnetism
by itself influences purchase decisions (Brown 1948).

they are often unwilling to spend more time and energy to identify alternative products that may be marginally better. This makes alternative products less substitutable. Trademark protection reinforces these purchasing habits and brand loyalty, which might cause deadweight losses and render markets less competitive.

Outside the traditional contours of economics, Greer (1979) proposed that cognitive dissonance can cause consumers to over-trust trademarks, thereby exacerbating product differentiation. After the purchase, consumers might experience the chosen product's negative features, and they should consider the positive features of the alternative product. This natural comparison can cause consumer anxiety. To overcome post-purchase anxiety or cognitive dissonance, consumers irrationally conclude that the product they purchased was satisfactory. The cognitive dissonance theory implies that people might put more faith in trademarks as a guide to quality than is warranted. Human psychology might perpetuate purchasing errors and create pricing inefficiencies.

To summarize, trademarks might reinforce product differentiation created by persuasive advertisements (Brown 1948), asymmetric information (Lunney 1999) and consumer bias (Greer 1979). Moreover, some trademarked descriptors, such as "Gold Medal" or "Premier," may have the "ready-made potency" (Brown 1948, 1188) directly to persuade consumers and create product differentiation. Regardless of whether the product differentiation is reinforced by trademarks (Path 1) or directly created by trademarks (Path 2) or both, product differentiation ultimately may cause the deadweight losses (see fig. 6).
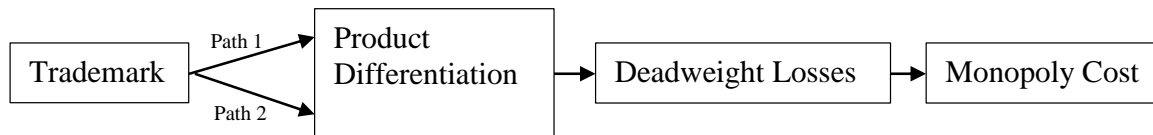
Figure 6. How does trademark protection cause monopoly cost?

To be clear, not all product differentiations are inefficient. For example, some

trademarked products are preferred by consumers due to an earned reputation for good quality

or satisfying features. Product differentiation caused by reputation saves consumers search

cost and does not cause deadweight losses in the long term (Landes and Posner 2003).[139]

When competitors increase quality, or copy unprotected product features, product

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139. Landes and Posner (1987) insisted that the product differentiation enhanced by a trademark is merely an aspect of reduced search cost, not artificially inflated reputation or product differentiation. They argue that the price premium of the strong trademarked product is not due to the perceived non-substitutability of the product, but rather greater search cost savings. They claim trademark protection does not cause or increase the anti-competitive cost through product differentiation. Landes and Posner asserted that the consumers might not care about the claimed formula or the ingredient of the goods. They care about whether the product is actually produced to the specifications of the formula. They are willing to pay the price premium to get greater assurance. Trademark protection enables the consumers to economize on a real cost, search cost. If so, then no deadweight loss is caused by trademark protection (Landes and Posner 1987).

However, Landes and Posner's arguments underestimate the inefficiency in product differentiation. Part of the product differentiation effect indeed works to save searching cost. However, in reality, the product differentiation also increases the non-substitutability between identical products, which causes deadweight losses. Barnes (2006), argues that Landes and Posner ignore the two potential inefficiency effects contained in the price-premium associated with strong trademarks: (1) monopoly profits and inefficient output and (2) the inefficiency of the excessive advertisement. Barnes argues that even if the entire price premium were due to the search cost savings, some consumers would prefer to buy a good at a lower price without paying the information cost (Barnes 2006).

differentiation is reduced; the higher price, as well as the deadweight losses, is then bid away.[140]

The sort of product differentiations that cause deadweight losses exists in two situations. The first situation occurs when the competitors' products have the same quality/features, but the consumers conclude one competitor's products are inferior substitutes for the trademarked product due to the persuasive advertisement, asymmetric information, or consumer bias. This version of product differentiation, advocated by Chamberlin, Brown, Lunney and Greer, is subconsciously embedded in the consumers' minds. Thus, competition regarding physical quality/features cannot easily overcome this differentiation. Therefore, the deadweight losses caused by differentiation are hard to overcome. I call this differentiation "psychological" product differentiation, reinforced or created by trademarks such as words or logos.

In the second situation, product differentiation is caused by physical product features, like color. If consumers prefer a product feature or color apart from its source identifying

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140. Some economists believed that even if product differentiation creates occasional deadweight losses, consumers are nonetheless paying a price premium for the product they want. Product differentiation provides many options to consumers, even if they are artificial (Chamberlin 1950; M. Spence 1976; Chronopoulos 2014).

Other scholars are uncertain about product differentiation. Economides speculates that product differentiation raises the product price in a submarket due to the inferior substitutability. The higher price might induce an overbranded market with the underproduction of each brand and accordingly deadweight losses. But that is not the end of story. Economides asserts that the intertemporal effects of advertising and brand loyalty might threaten and deter the potential entrants. The entry barrier might counterbalance the overbranded market and push the market equilibrium close to the optimal point where there is no product differentiation. If the entry barrier is too large, it might decrease the number of brands below the optimal point. Therefore, the net result is ambiguous and depends on the specific market situation (Economides 1988).

function, then deadweight losses can also occur. Competition cannot easily bid away these losses when trademark protection would prevent competitors from copying the attractive product feature. I call this differentiation "physical" product differentiation.

Interestingly, the same deadweight losses are theoretically tolerable in patent law or copyright law. Patent law and copyright law purposely grant the inventor/creator monopoly power for a limited term to encourage the creation and distribution of better products (new inventions and new artistic works). But trademark law is not aimed to encourage creations or inventions. In *Qualitex*, Justice Breyer states that "It is the province of patent law, not trademark law, to encourage invention by granting inventors a monopoly over new product designs or functions for a limited time, after which competitors are free to use the innovation."[141]

4.2.   When do Anti-competitive Effects Exist in Color Trademarks?

Trademarking a color might cause both psychological and physical product differentiation, with any deadweight losses being costly to overcome. Law and economic studies suggest that color influences product differentiation through three paths (see table 1).

Path 1: Color can function as a traditional trademark, such as words and logos (same as path 1 in fig. 6), reinforcing the differentiation created by persuasive advertisements, asymmetric information, and consumer bias. In other words, like word marks or logos, color as a trademark can be used by a firm to capture gains from production differentiation even when the color itself has no especially attractive qualities to consumers.

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141. *Qualitex,* 514 U.S. at 164.

Path 2: Color can be used as an affirmative marketing tool to produce consumer bias to differentiate products (Brown 1948). This is because color can evoke affective/cognitive responses that enhance purchase intent. For example, if blue is used in a bank's advertisements, the color might evoke higher intent to choose the bank service, since blue is associated with competence (Labrecque and Milne 2012). According to Brown (1948), some appearance elements, such as color, might have a ready-made potency because they are inherently effective in persuading consumers to buy the product.

Path 3: Color might also serve as a product/service feature designed to be consumed by the purchaser, which directly differentiates the colored product from competing products. Trademarking such a color can confer a monopoly on the product with the feature. Lunney (1999, 480) asserted the protection of product features could have anti-competitive effects because consumers have a "distinct preference for particular styles or colors and will often be relatively unwilling to substitute one style or color for another."

Table 1: How traditional trademarks and color trademarks cause the product differentiation

	Traditional trademarks such as words/logos	Color trademarks
Psychological Differentiation	Words/logos capture the differentiation results created by ads, asymmetric info or consumer bias **(Path 1)** Words/logos with ready-made potency create the persuasiveness or consumer bias, and thus the product differentiation **(Path 2)**	Color, as a trademark, can capture the differentiation results created by ads, asymmetric info or consumer bias **(Path 1)** Color, as a tool used in advertisement can affect consumer preferences, and thus create product differentiation. **(Path 2)**
Physical Differentiation	Words/logos cannot directly create physical differentiation	Color, as a consumable product feature, can directly differentiate the products in the sense of physical features. **(Path 3)**

Paths 1 and 2 describe psychological product differentiation, while Path 3 describes physical product differentiation. In this dissertation, I focus on the product differentiation caused by colors through paths 2 and 3 because path 1 is too hard to survey and cannot really be data mined.[142]

4.3.   How to Measure Anti-competitive Effects?

4.3.1. Monopoly pricing (inelasticity)

The law and economic literature sufficiently explain why anti-competitive effects can be caused by trademark protection, including color trademarks. Several studies discuss how to measure anti-competitive effects in trademark law by measuring the monopoly pricing (inelasticity) and the distributive effect (quantity) to uncover anti-competitive effects.

Burgunder (1986) and Cunningham (1995) propose cross-price elasticity of demand as the measurement of product differentiation. Price-elasticity of demand ("PED") is an economic concept measuring the capacity of a product to resist price change (Gillespie 2007).

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142. The model developed by Landes and Posner (1987) suggested that protecting an aesthetic trade dress might either evoke a pro-competitive effect through the source-identifying function or an anti-competitive effect through non-substitutability. Their formal model considers the situation where the competitive advantage is partially due to the source identified by the trade dress and partially due to the pure trade dress attractiveness. The positive effect on the supply curve they graph comes from those consumers who rely on the trade dress to identify the source, thereby lowering consumers' search costs. The negative effect on the supply curve is caused by consumers who buy the product purely due its appealing appearance, so that without higher production costs, other trade dress cannot substitute. However, Landes and Posner (1987) admitted there is no way to know the line where the pro-competitive effect is out-weighted by the anti-competitive effect in a specific case.

It is measured by the percent change in quantity demanded in response to one percent change

in price. The simple function is $(\frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}})$ (43). There are two basic PED: the own-price elasticity

of demand ("own-PED") and the cross-price elasticity of demand ("cross-PED") (Bishop

1952, 782; Ruffin and Gregory 1988, 524). Own-PED is product A's percent change in

quantity demanded caused by one percent change in its price, $(\frac{\frac{\Delta Qa}{Qa}}{\frac{\Delta Pa}{Pa}})$ (Bishop 1952, 782).[143]

Cross-PED is product A's percent change in quantity demanded caused by one percent change

in price of product B, $(\frac{\frac{\Delta Qa}{Qa}}{\frac{\Delta Pb}{Pb}})$ (Bishop 1952, 782). [144] Normally, the greater the absolute value

of the own-PED or the cross-PED, the weaker power in pricing. The smaller the absolute

value of the own-PED or the cross-PED, the stronger power in in pricing.

In economic empirical studies, own-PED and cross-PED have been widely applied to

test the market power of a brand or a product (Farley, Lehmann and Ryan 1982; Ghosh,

Neslin and Shoemaker 1983; Russell and Bolton 1988; Bolton 1989; Huang, Hahn and Jones

2004; Sano et al 2014). But almost no studies suggested a standing value where the monopoly

cost is likely to exist. These studies only measured the market power of different products or

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143. In normal cases, own-PED is a negative value because the price increase naturally reduces the demand (Bishop 1952). However, sometimes consumers would rather pay a higher price because the higher price implies a higher quality product. In this situation, own-PED would be a positive value. Positive own-PED implies the likelihood of monopoly cost.

144. In normal cases, cross-PED is a positive value because one product's demand change is the same direction (increase/decrease) with the price change of the competing products (Bishop 1952).

brands (Bucklin and Srinivasan 1991; Sano et al 2014) or the market power change compared

with previous years (Ward 1995). [145]

Some legal and economic scholars, inspired by these economic empirical studies,

recommended applying PED to test anti-competitive effects associated with a trademark.

Burgunder (1985, 413-416) suggested measuring the monopoly cost by checking whether the

cross-PED of a colored product decreased when the same color was also used on its

competitors' products, compared to when the color was only used on the disputed product. He

further proposed two consumer surveys to test the change of cross-PED. Survey 1 would

present the disputed colored product with its brand name and other colored products with their

brand names to participants. Then, the cross-PED would be calculated by lowering the prices

of other colored products and checking the demand shifts on the disputed colored product.

Survey 2 would follow the same pattern, except the color would be used on both the disputed

product and other products. If the cross-PED value of the disputed colored product increased

significantly in survey 2, the disputed color might be associated with supra-normal profits

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145. For example, Bucklin and Srinivasan (1991) used cross-PED to measure the substitutability between brands. To calculate the cross-PED, they obtained the quantity value at different prices for each brand by consumer surveys. The consumer survey asked the participants their choices between the most preferred brand at a set price and the least preferred brand at a 40% lower price. For those participants who chose the most preferred brand, they further asked how many points (They assigned 10 points for the most preferred brand) it was worth to save 40%. They checked the validity of the consumer survey method by comparing the result with previous studies based on quantity and price panel data (Bucklin & Srinivasan 1991).
Ward (1995) used own-PED to test the market power of some companies in the long-distance telecommunication market. They used the panel data including quantity and price of several companies (Ward 1995, 22-33). Sano and colleagues used own-PED to test the market power among different milk subcategories and milk brand. Since the dataset was not panel data (there is only one set of data), they used the logit regression model to calculate the own-PED (Sano et al 2014).

(Burgunder, Trademark Registration of Product Colors: Issues and Answers 1986). However, Burgunder did not conduct the survey in his study, creating a hole in the literature for this dissertation to fill.

Cunningham (1995, 586) also proposed using cross-PED to test monopoly cost in trademark law, but he did not provide detailed steps how to collect the data or calculate the elasticity in a specific case.

In this dissertation, I suggest using own-PED to measure monopoly cost. I do not choose cross-PED because participants in a survey context would naturally be led to choose the disputed colored product when the price of other colored products is increased, and the cross-PED calculated in the survey would be misleading. Such a quantity-price causation might not necessarily exist in a real market. However, own-PED can measure market power without assuming a substitute relation between the disputed colored product and the competition colored products in the survey.

4.3.2. Distributive effects (quantity)

Along with measuring elasticity of demand, several scholars propose using distributive effects (quantity) changes to measure anti-competitive effects in trademark protection, including color trademarks. A group of economists found that large market shares might cause anti-competitive effects (Thorp and Crowder 1941; Adelman 1951; Edwards and Others 1952). Based on this thoery, Burgunder (1986) asserted that if a trademark attracts a disproportionately large number of consumers compared to its competitors at any price level, this attraction would shift the demand curve to the right and would thus provide the trademark owner with a competitive advantage, even in the absence of pricing effects. Hughes (2015, 1278) also believed trademarking colors that have pre-existing, widely shared psychological

effects on consumers might have a similar effect on market share. In this dissertation, I call the measure of disproportionate market share earned due to a color's attractiveness as the "quantity" measure.

Some economists argue pure quantity measures do not necessarily test monopoly costs in a purely economic sense (Fisher 1997). Nonetheless, quantity measure is still a reasonable proxy to test anti-competitive effects associated with protecting a color trademark. The Supreme Court states the functionality doctrine is meant to prevent "non-reputation related" advantages.[146] Capturing an undeserved share of the market is a prohibited advantage, even if the color trademark owner does not have the ability to charge a higher price. In other words, the Supreme Court does not demand that the defendant prove an actual monopoly cost if a quantity advantage has been showed.

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146. *Qualitex,* 514 U.S. 159.

CHAPTER 5. MEASURING PURCHASE INTENTION, QUANTITY EFFECTS, AND ELASTICITY EFFECTS IN COLOR TRADEMARK CASES

In previous chapters, I explored the aesthetic functionality doctrine's history, economic research, and psychological studies that show how different colors evoke different levels of purchase intention. Purchase intention is robustly correlated with purchase behavior, which affects the distribution of sales ("quantity effects") and pricing ("elasticity effects") in the market. In this chapter, I will use empirical research to explore the anti-competitive effects of trademarking a color. As concluded in Chapter 4, protecting color can be anti-competitive in two ways: by distorting the sales distribution in a market (quantity) and by facilitating monopoly pricing (elasticity). First, granting a trademark right to a color can allow a trademark owner to lock up a certain percentage of a market. This quantity advantage can occur even when consumers find alternative, substitutable colors.[147] Second, in situations where consumers do not find a sufficient number of substitutable colors, granting a trademark

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147. As exemplified in Introduction, let us imagine a market for a product where 10 colors have equally superior attractiveness, and each is owned by a single producer. In this context, protecting colors has no negative pricing effect because, in the absence of collusion, no producer can raise her price without losing sales. Yet, competition is hindered. No producer outside the 10 with an equally good product can effectively enter the market without using one of the 10 superior colors. Protection for color in this instance locks in a percent of the market for each producer and locks out other potential competitors. Supreme Court precedent makes clear that the aesthetic functionality doctrine prevents color from conferring this sort of non-reputation-based advantage on a producer.

right to a color can lead to monopoly pricing. I will present empirical data supporting both

effects in this chapter. Based on these studies, I will propose several approaches to help

determine when trademark protection for a color is anti-competitive.

5.1. Market Data and Distributive Effects (quantity)

Market data can take several forms. First, litigants/judges can search for color

preference data is existing industry reports/investigations. They can also mine data from

sellers on shopping websites such as Amazon.

5.1.1. Industry reports/investigations

Governments' or NGOs' reports rarely reveal sales data based on colors. Most of their

reports are based on price, product type, brand, industry type or regions, some sales data based

on color can be found online. For example, car industries make several reports on sales of

different colored cars. Coating companies, such as PPG industrials, Inc. ("PPG"), Axalta

Coating Systems Ltd. ("AXALTA"), BASF SE ("BASF") and DuPont,[148] provide these

reports. The data is based on the number of cars manufactured in each color (Paula, 2012).

AXALTA reports reflect the market shares of different colored cars from 2013 to 2018

in the North American market (see table 2).

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148. DuPont's annual color reports on cars after 2013 are not available online, so we
do not list DuPont's data in this dissertation.

Table 2. Market share of different colored car in North America (2013-2018)

	White	Black	Grey	Silver	Red	Blue	Brown/Beige	Yellow/Gold	Green	Other
2018	29%	18%	16%	12%	9%	8%	4%	1%	1%	2%
2017	27%	20%	16%	12%	9%	10%	2%	2%	1%	1%
2016	25%	21%	16%	11%	10%	8%	4%	2%	2%	1%
2015	27%	20%	14%	12%	11%	8%	3%	2%	2%	1%
2014	25%	19%	13%	13%	12%	7%	5%	2%	2%	2%
2013	26%	20%	13%	14%	9%	7%	5%	2%	2%	2%

Source: Data from Axalta (2013-2018)

PPG also reports the market shares of different colored cars from 2017 to 2018 in the North American market (see table 3).

Table 3. Market share of different colored car in North America (2013-2018)

	White	Black	Grey	Silver	Red	Blue	Natural	Brown	Green	Orange
2018	26%	19%	18%	13%	11%	9%	3%	N/A	1%	N/A
2017	25%	21%	17%	13%	10%	10%	N/A	N/A	N/A	N/A
2016	25%	19%	12%	19%	10%	10%	4%	N/A	1%	N/A
2015	23%	19%	17%	15%	10%	8%	6%	N/A	2%	N/A
2014	23%	18%	16%	15%	10%	9%	7%	N/A	2%	N/A
2013	21%	19%	17%	15%	11%	9%	6%	N/A	2%	N/A
2012	21%	19%	16%	16%	10%	8%	4%	2%	3%	1%
2011	20%	18%	15%	19%	9%	9%	Gold/Beige 4%	2%	2%	1%

Source: Data from PPG (2012-2018)

BASF data reflects the market shares of different colored cars from 2017 to 2018 in the North American market (see table 4).

Table 4. Market share of different colored car in North America (2017-2018)

	White	Black	Grey	Silver	Red	Blue	Brown	Green	Orange	Gold
2018	28%	19%	17%	13%	12%	9%	2%	N/A	N/A	N/A
2017	28%	20%	15%	12%	11%	9%	2%	1%	1%	1%

Source: Data from BASF (2017-2018)

These reports are extremely consistent regarding color trends for several years. Black, white, grey, silver, red and blue take the top 6 positions for the last 10 years. If car

manufacturers attempt to satisfy consumer demand and have access to proprietary data on

consumer preferences, it is reasonable to assume that this supply data parallels demand data.

I used a chi-square function to check whether the observed color market share

difference is significant. Since the different companies' data is almost identical, I selected the

2018 data from AXALTA reports (see table 2) as a sample to test. The results showed that the

observed difference is significant (X^2 (9, N = 100) =73.200, p < .001). The market share of

white, black and grey was significantly higher than the average share (10%) of all colors

included (white: X^2 (1, N = 100) =40.1111, p < .001; black: X^2 (1, N = 100) =7.111111, p =

0.0077; grey: X^2 (1, N = 100) =4.0000, p = 0.0455). The market share of brown/beige,

yellow/gold, green and other are significantly lower than the average share (10%) of all colors

included (brown/beige: X^2 (1, N = 100) =4.0000, p = 0.0455; yellow/gold: X^2 (1, N = 100)

=9.0000, p = 0.0027; green: X2 (1, N = 100) =9.0000, p = 0.0027; other: X2 (1, N = 100)

=7.1111, p = 0.0077).

Other industries have similar reports on sales data for each color reported by

infopreneur websites. For example, a smartphone infopreneur website, gsmarena.com,

investigated color trends based on 140 branded smartphones in the first half year of 2018 (see

table 5). It found that 92 brands choose black, 64 brands choose blue, gold (49 brands), red

(27), silver (17), grey (15), rose-gold (14), white (12), pink (10), green (4), purple (3) and only

one brand has copper as its color choice.

Table 5. Occurrences of each color in 140 brands (First Half Year of 2018)

Black	Blue	Gold	Red	Silver	Grey	Rose-Gold	White	Pink	Green	Purple	Copper
92	64	49	27	17	15	14	12	10	4	3	1

Source: Data from Paul (2018)

Another phone website, andriodauthority.com, conducted a survey in 2018, asking "What's your favorite smartphone color?" From September 24, 2018 to February 21, 2019, 2949 participants responded. The investigation revealed that black is preferred by 45% of the participants, blue is preferred by 14% of participants, and red is preferred by 10% of participants. The results are shown in table 6:

Table 6. Percent of participants choosing each smartphone colors (industry investigation) - September 2018 - February 2019

	Black	Blue	Red	Twilight	Silver/Grey	White	Others	Gold	Pink
Percent	45%	14%	10%	9%	8%	7%	4%	3%	1%

Source: Data from Westenberg (2018)

The two smartphone reports reflect the popularity of black, blue, red, silver and grey on smartphones. However, one difference exists between the two reports: the report of color occurrences in different brands indicates that gold smartphones are the third popular among 140 brands but the report asking consumer favorite color reveals that gold is almost the least preferred color on smartphones. This difference might be due to the gap between the supply and demand.

Similar data can also be found in the apparel industry. A report conducted by brandwatch.com analyzed 15,308 tweets from August 16, 2015 to September 16, 2015 (Lovejoy 2015). The investigators counted the occurrences of each color in Tweet conversations directed at luxury fashion brands. Tweets about black (26.81%) are the most common, then red (18.39%), white (15.22%) and blue (14.29%) (Lovejoy 2015). Pink, navy,

green, yellow and purple are ranked from fifth to ninth without exact data presented (see table 7).

Table 7. Percent of occurrences of each color in 15,308 Tweet conversations (August 16, 2015 - September 16, 2015)

	Black	Red	White	Blue	Pink	Navy	Green	Yellow	Purple
Percent	26.81%	18.39%	15.22%	14.29%	N/A	N/A	N/A	N/A	N/A

Source: Data from Lovejoy (2015)

The industry reports/investigations can reveal that consumers have strong preferences for certain colors on certain products. Granting a trademark right on these colors might allow trademark owners to lock underserved market shares and therefore cause anti-competitive consequences.

5.1.2. Data mining on Amazon

Amazon is the largest online retailer in the US and its website contains massive amounts of information, including color data, on goods offered for sale. According to eMarketer.com, Amazon took 49.1% of online retail sales in the US in 2018, followed by eBay (6.6%), Apple (3.9%), Walmart (3.7%), and other online retailers (Loeb 2018; eMarketer 2018). Of Amazon's retail business, computer and consumer electronics is the leading product type (+25% of the total Amazon retail sales), followed by apparel and accessories (+15% of the total Amazon retail sales and 38.5% of total US online apparel sales). The third is books and music (no percentage presented in the report), the fourth is health and personal care & beauty (6.2% of the total Amazon retail sales), and the last category is food and beverage (1.8% of the total Amazon retail sales) (eMarketer 2018).

I mined data on Amazon regarding smartphones, home-used electric cords, dresses, sports & outdoors equipment, gloves, winter hats, winter scarves, which belong to the first and second major Amazon product types.

First, in the Amazon.com search bar, I selected the product category "cell phones." Under this category, I used the Amazon filter to restrict the subcategory to "smartphone" and condition to "new." Next, I chose different color filters to calculate the approximate number of items, which actually represents the number of sellers instead of a color's exact sales quantity. Table 8 shows the results: red's popularity drops compared to the cell phone color preference report (see table 6) and color occurrence in brands report (see table 5). One possible explanation is that the Amazon "smartphone" filter mistakenly filters out red smartphones with other features such as dual camera or dual SIM. This might distort the red color data in Amazon data mining. [149]

Table 8. Number of items (sellers) of different colored smartphones sold on Amazon in 2019

	Black	White	Gold	Grey	Silver	Yellow	Blue	Green	Red	Pink	Orange	Brown	Purple
Items	177	68	25	24	19	10	9	5	4	4	1	1	1
Percent	50%	19%	7%	7%	5%	3%	3%	1%	1%	1%	1%	0%	0%

Source: Data mined on Amazon.com. 2019

149. If I remove "smartphone" filter, the number of items for each color increases greatly. Red color increases even more than other colors, which means without "smartphone" filter, the position of red color would be lifted. However, the exact data when mining without "smartphone" filter is not available, because currently, Amazon does not return the exact number of items if the number is too large.

I obtained the data on the other products using a similar method.[150] Tables 9 - 14

reveal that, for those products, black and white products have the largest number of sellers

(12%-30%). Blue and red (8%-16%) are less prevalent than black and white. The other colors,

such as purple, green, orange, yellow, gray, brown, are no more than 11%.

Table 9. Number of items of different colored dresses sold on Amazon in 2015

	Black	White	Blue	Red	Green	Purple	Brown	Yellow	Orange	Gray
Items	356415	236214	204035	167436	98756	87313	76830	65257	46801	25702
Percent	26%	17%	15%	12%	7%	6%	6%	5%	4%	2%

Source: Data mined on Amazon.com, 2015

Table 10. Number of items of different colored sports & outdoors sold on Amazon in 2015

	Black	White	Blue	Red	Green	Brown	Yellow	Purple	Gray	Orange
Items	77249	65426	47070	37484	27719	26965	21377	20211	13454	11170
Percent	22%	19%	14%	11%	8%	8%	6%	6%	4%	2%

Source: Data mined on Amazon.com, 2015

Table 11. Number of items of different colored gloves sold on Amazon in 2015

	Black	White	Red	Blue	Green	Brown	Yellow	Purple	Gray	Orange
Items	29409	17670	16721	15243	9020	7455	6522	5270	3643	3453
Percent	26%	15%	15%	13%	8%	6%	6%	5%	3%	3%

Source: Data mined on Amazon.com, 2015

Table 12. Number of items of different colored winter hats sold on Amazon in 2015

	Black	Blue	Gray	White	Red	Yellow	Green	Brown	Purple	Orange
Items	35596	24537	21799	18176	18166	9277	8200	7748	5694	5248
Percent	23%	16%	14%	12%	12%	6%	5%	5%	4%	3%

Source: Data mined on Amazon.com, 2015

150. For the other products, I use the color plus product name, such as "red dress," as the keywords to search in Amazon searching bar because, for some products, Amazon.com does not have a color filter on the left side.

Table 13. Number of items of different colored winter scarfs sold on Amazon in 2015

	Black	Blue	Red	White	Gray	Yellow	Purple	Green	Orange	Brown
Items	9705	9632	9133	7849	7568	7395	5052	4203	4091	4058
Percent	14%	14%	13%	12%	11%	11%	7%	6%	6%	6%

Source: Data mined on Amazon.com, 2015

Table 14. Number of items of different colored electric cords sold on Amazon in 2015

	Black	White	Red	Yellow	Blue	Green	Orange	Purple	Gray	Brown
Items	68812	51379	24728	19007	17902	17348	11860	7843	4969	2623
Percent	30%	23%	11%	8%	8%	8%	5%	4%	2%	1%

Source: Data mined on Amazon.com, 2015

The chi-square fit quality shows a significant observed difference (dresses: X^2 (9, N = 1364759) =708010, p < .001; sports & outdoors: X^2 (9, N = 348125) =126860, p < .001; gloves: X^2 (9, N = 114406) =53549, p < .001; hats: X^2 (9, N = 154441) =57809, p < .001; scarves: X^2 (9, N = 68686) =7069.3, p < .001; electric cords: X^2 (9, N = 226471) =179890, p < .001).

This data suggests that some colors have more market appeal than others, depending on the product context. Granting sellers exclusive rights to the most popular colors should raise a red flag, prompting scrutiny under the aesthetic functionality doctrine.

5.2. Consumer Surveys and Monopoly Pricing (inelasticity)

As discussed in Chapter 4, consumers who prefer these colors might be willing to pay a higher price. These colors are less vulnerable to a price increase than other colors. In this situation, granting trademark rights to these colors would cause monopoly pricing effect and deadweight losses, even if the seller has a small market share. The existing industry reports/investigations do not offer price information regarding colors. Amazon data mining

cannot provide the demand quantity data at each price point. Therefore, in this section, I use consumer survey to test the inelasticity effects of certain colors.

The survey covered three products: winter hats, winter scarves, and electric home-used cords. I selected hats and scarves because consumers tend to care what color hats and scarves they buy. I chose electric home-used cords as the third product because consumers do not usually care what color chords they buy. I wanted to test products that are both color-related and not color-related.

The survey was conducted on Qualtrics, and I recruited participants through the Amazon Mechanism Turk. Participants recruited by Amazon Mechanism Turk may be biased, since the participants contain many more Democrats and political liberals than random U.S. population samples (Berinsky, Huber and Lenz 2012, 356). Also, the participants are internet users, who may be different from completely random subjects (Gosling et al 2004, 94). However, these issues do not impact this research, which concerns color trademarks and consumer behaviors that have no obvious relation to political ideology. Additionally, marketing and shopping frequently takes place on the internet, which justifies sampling internet-users. Moreover, empirical studies have proved that participants of Amazon Mechanism Turk produce reliable results (Goodman, Cryder and Cheema 2013; Buhrmester, Kwang and Gosling 2011).

5.2.1. Survey design

The experiment presented participants with the same product in different colors and asked them to choose the one they preferred. Each product had six color options: black, red, blue, purple, orange and yellow. Three prices, $8, $10 and $12, were randomly assigned to two colors each (see figs.7 - 9).

Figure 7. Hat with six colors and three prices

Figure 8. Scarf with six colors and three prices

Please choose the one you want to buy and the money will be deducted from your account.

Figure 9. Home-used electric cord with six colors and three prices

I chose the six colors based on an Amazon data mining pre-test (see tables 12 -14). I searched different colored products on Amazon's website and found that for hats, scarves and electric cords, the numbers of items sold (sellers) are different among different colors. Black and white products cover the most items (12%-30%). Blue and red (8%-16%) are comparatively less than black and white. The other colors, like purple, green, orange, yellow, gray, brown, are no more than 11%. To illustrate that colors might have different elasticities, I picked out six colors at different percentage levels to do the experiment.

To simulate the real purchase environment, each participant was given $30 in fake money before seeing the products. They were then asked to shop. They were told to try their best to buy the three products without spending more than $30.

When they saw the first product, a hat, with different colors and prices, they chose one and the money used would be deducted from the account. After they chose the preferred hat, they were brought to the next page, which showed them how much money was left in their

accounts. Then, they were brought to the second product, a scarf, and directed to buy one. The same process was used with the third product, a home-use electrical cord.

5.2.2. Results

360 participants participated in this survey. 4 participants were color-blind, so they were excluded from the data. Therefore, a total of 356 participants were included in the data set.

Table 15 reveals (sales) quantity and market share of each colored product as a purely descriptive matter. Notice that 40% participants choose the black hat, which catches almost half of all the participants. Besides the color black, I observed that the rest of the colors are not equally preferred. Across three products, orange, yellow and purple are preferred by similar percentages of participants, which are less than 12%. Blue and red catch similar percentage of participants to each other, between 14% and 28%. These percentages reveal that hat color preference is like a ladder: black is the top preferred color, blue and red are in the middle, and purple, yellow, and orange are the least preferred.

Table 15. Number and percent of participants choosing each colored product

	black	red	blue	yellow	purple	orange
Hat	161	64	60	13	43	15
	45%	18%	17%	4%	12%	4%
Scarf	149	91	59	15	29	13
	42%	26%	17%	4%	8%	4%
Cord	141	51	52	36	40	36
	40%	14%	15%	10%	11%	10%

I further explored whether the observed differences are statistically significant.[151] The results show that, for any product tested, the observed distribution was significantly different from the expected distribution (Hat: X^2 (5, N = 356) = 248.38, p < .05; Scarf: X^2 (5, N = 356) = 237.22, p < .05; Home-use electrical cord: X^2 (5, N = 356) = 139.13, p < .05). Therefore, the sales quantity/market share of black hats/scarves/cords is significantly larger than other colors.

Further, I applied the own-arc-price elasticity of demand[152] ("arc-PED") to measure the pricing effect. The formula of arc-PED is $\frac{Q2-Q1}{Q2+Q1} * \frac{P2+P1}{P2-P1}$. I calculated each color's arc-PED on each product (see tables 17, 19, 21).

Table 16. Number of participants choosing each colored hat at each price

	Black	Red	Blue	Yellow	Purple	Orange
$8	77	35	36	6	24	10
$10	44	19	13	4	10	4
$12	40	10	11	3	9	1

Table 17. The arc PED of each colored winter hat in the survey

	Black	Red	Blue	Yellow	Purple	Orange
$8-$10	-2.45	-2.67	-4.22	-1.8	-3.71	-3.86
$10-$12	-0.52	-3.41	-0.92	-1.57	-0.58	-6.6

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151. I also used a chi-square check on the data. Chi-square fit test is used to compare the observed distribution to an expected distribution. In our case, we assumed the probability of the preference on any one color is 1/6, because if people prefer each color indifferently, the chance of choosing any color should be equal.

152. The arc price elasticity of demand is used to measure the quantity change between two price points with certain distance on a curve. The own-arc-price elasticity of demand is the arc price elasticity of demand on the product itself, namely, it is the product A's demand change percent in response to product A's price change percent (Wall and Griffiths 2008, 53-54).

Table 18. Number of participants choosing each colored scarf at each price

	Black	Red	Blue	Yellow	Purple	Orange
$8	71	41	32	7	15	7
$10	41	29	17	7	9	4
$12	37	21	10	1	5	2

Table 19. The arc PED of each colored scarf in the survey

	Black	Red	Blue	Yellow	Purple	Orange
$8-$10	-2.41	-1.54	-2.76	0	-2.25	-2.45
$10-$12	-0.56	-1.76	-2.85	-8.25	-3.14	-3.67

Table 20. Number of participants choosing each colored cord at each price

	Black	Red	Blue	Yellow	Purple	Orange
$8	76	39	36	24	25	22
$10	44	8	11	7	11	12
$12	21	4	5	5	4	2

Table 21. The arc PED of each colored home-used electric cord in the survey

	Black	Red	Blue	Yellow	Purple	Orange
$8-$10	-2.4	-5.94	-4.79	-4.94	-3.5	-2.65
$10-$12	-3.89	-3.67	-4.12	-1.83	-5.13	-7.86

For hats, the arc-PEDs over the arc $10 to $12 on black, purple and blue are between -1 to 0, which means the quantity percent reduction is less than the percent increase of price. The arc-PEDs of other colors over the arc $10 to $12 are all below -1, which means the quantity percent reduction is larger than the percent increase of price.

For scarves, the arc-PED over the arc $10 to $12 on black are between -1 to 0. The arc-PED over the arc $8 to $10 on yellow are between -1 to 0. Other colors have the arc-PEDs

below -1. This result shows that black and yellow might be less elastic than other scarf colors over specific price arcs.

For electric cords, the arc-PEDs are all below -1, which means the colors over any price arcs are relatively more elastic than other products. Two facts might explain this high elasticity. First, participants do not care about electric cord color as much as hat or scarf color. Second, electric cords were the last product shown to subjects, and the money left in the participants' accounts might restrict their choices.

Unfortunately, the chi-square of independence results revealed no significant P-value on the interaction between price and color. Appendix A shows these results. I ran a log-linear regression and the results also indicated no significant interaction between price and color (see Appendix B). These results show that the pricing effect does not differ among different colors.

To summarize, in this survey, across three products, black has a significantly higher quantity/market share than other colors, while any inelasticity advantage is relatively weak. However, this survey is only a first attempt at testing the inelasticity affect. In the future, scholars can improve the consumer survey design to make it more sensitive to pricing. Specifically, scholars might improve the survey scenario design to simulate the real purchase experience more closely. For example, with a large budget, participants might develop a website that looks similar to real shopping websites, such as Amazon or eBay. Consumer surveys can be done on this website and the price variable can be naturally manipulated.

5.3. Three Approaches to Aesthetic Functionality Testing in Specific Cases

Based on literature studies and empirical studies, I suggest that researchers, including litigants and judges, adopt psychology guideposts, market data, and consumer surveys to improve color trademark aesthetic functionality determinations.

5.3.1. Psychological guideposts

Psychology studies reveal that under specific contexts, colors evoke purchase intention through affective/cognitive responses. Purchase intention induces purchase behavior, which can directly affect sales distribution and pricing within a market. Therefore, contextual factors and affective/cognitive responses can be used as psychological guideposts for deciding a color's aesthetic functionality. Psychological guideposts help in two ways: first, they show the importance of context and suggest several relevant factors to be considered; second, they suggest when colors might be substitutable for the disputed color. To illustrate how to apply this tool, we will look at an example case: *In re Florists' Transworld Delivery, Inc* (2013) ("*Florists*").

Florists concerns a trade dress registration examined by the Trademark Trial and Appeal Board (TTAB) of United States Patent and Trademark Office (USPTO). The applicant, Florists' Transworld Delivery, Inc., applied to register their black box used for packaging flowers (see fig.10). TTAB refused the registration, claiming the color black was aesthetically functional since "black communicates elegance or luxury . . .Besides, the

evidence reflects that black has significance on somber occasions such as in the context of death."[153]

Figure 10. The applicant's specimen of use (Image from Welch (2013))

A research psychologist would make two inquiries: (1) What is the sales context? (2) Does black evoke a higher level of arousal, pleasure, appraisal, attention, meaning (consistent with the context), memory or attitude, such that it would increase purchase intention in that context?

When looking at context, we must observe how and where the color is used, the product category in question, and the culture in which the sale takes place. In *Florists*, the disputed color was used for a packaging box that contained flowers. Since flowers are frequently bought as a gift, consumers might expect the packaging to convey luxury or high quality. Additionally, flowers come in multiple colors, so consumers might react well to a neutral package color that goes well with differently colored flowers. Lastly, in Western culture, flowers are an important part of specific occasions, such as funerals. For this aspect,

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153. *In re Florists' Transworld Delivery, Inc.*, 106 U.S.P.Q.2d 1784, 1796-1797 (2013).

litigants/judges might check whether a significant part of the box-packaged flowers business is used for funerals.

Regarding the specific context, we want to know if the disputed color evokes higher levels of consumer affect (pleasure, arousal, appraisal, etc.) and consumer cognition (attention, memory, meaning, attitude, etc.) relative to other colors. According to psychological studies, both black and purple convey "luxury" (Wexner 1954; Labrecque and Milne 2012), which is consistent with the meaning consumers expect the gifted flowers to deliver. Additionally, there are several neutral colors – such as black, white, beige and grey – that go well with differently colored flowers (Buff 2016; Little 2014). The visual pleasure created by a color-coordinated presentation may further increase purchase intention (Wu, Cheng and Yen 2008). So, considering the product type is a gift, purple might substitute for black. Additionally, since the package needs to match the flowers, white, beige, grey and other neutral colors might substitute for black to evoke pleasure through visual harmonization.

However, these alternative colors are less substitutable than black if funeral services compose a substantial portion of the box-packaged flower industry. Psychological studies reveal that black is associated with death and mourning, and other colors do not evoke this emotion to the same extent as black (Odbert, Karwoski and Eckerson 1942; Clarke and Costall 2007). Therefore, compared to black, all other colors seem less appropriate in the funeral context. If a significant part of the box-packaged-flowers industry is for funerals, it is

very likely that granting exclusive rights to the color black on the flower box would hinder competition (as the USPTO found).[154]

It is important to note that if the color is used on the product/package itself, consumers might consider the color to be part of the product. Consumers might consciously notice the color stimulus, in which case the color would explicitly influence purchase intention. If the color is used in advertisements or logos, consumers might not consciously consider the color to be part of the product, but the color might unconsciously influence them. However, the product color may not necessarily evoke a higher purchase intention than the advertisement or logo color. It depends on other factors regarding how and where the color is used, such as the size of the color area, whether the color is online or offline, etc. It is also related to other contextual factors, such as product type and local culture. Litigants and judges might consider the specific case situation to decide the color's overall effect on purchase intention.

Psychological guideposts are most helpful when contextual factors command a dominant affective/cognitive path, such as pleasure, arousal or memory, through which the disputed color is significantly stronger than other colors in evoking purchase intention. However, such a method might not be applied in a case where contextual factors command multiple paths, and no path is dominant in evoking purchase intention. For example, in *Florists*, the color's "sadness/death" meaning was likely the dominant path bridging color and purchase intention. Other paths, such as the color harmonization pleasure, or meanings like "luxury" or "high quality," are less important in the funeral scenario. In that case, it would be

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154. The main use of box-packaged flower services should be easy to verify in this case.

easy to infer that purchase intention would be higher for black-boxed flowers than other-color-boxed flowers, since other colors are not as closely associated with death/sadness as black.

However, in many other cases, the contextual factors might command multiple paths, and it might be unclear which path is dominant. For example, in *Qualitex,* the disputed color was gold-green on a laundry press pad. It was unclear which path controls. With press pads, a feeling of "cleanness" might be necessary to evoke high purchase intention. In this path, colors with a gray tone – such as gray, beige, gray-blue, etc. – might be helpful to hide stains, and therefore enhance the "clean" message. However, the memory path might be present in this case. If the laundry press pad's color is eye-catching, it may be noticed and remembered. In this path, shiny colors such as yellow, red, silver, gold and orange might evoke the highest purchase intention. When more than one path exists, and no single path is dominant, it is hard to determine whether purchase intention is higher through the pleasure, arousal, appraisal, attention, memory, meaning or attitude guideposts. Each path might influence purchase intention, and the overall color choice consequences are hard to predict (which may have led Justice Breyer to conclude in *Qualitex* that the colors litigated were not aesthetically functional).

Guideposts are merely helpful reference points that can be further informed by other tools, such as market data and consumer surveys.

5.3.2. Collecting market data

Collecting market data includes searching for color data from existing industry reports/investigations and data mining on shopping websites. Collecting market data is a good approach because it can suggest when a color's market share (quantity advantage) is

significantly larger than other colors. It can also indicate some color preferences' stability. Additionally, when data is consistent across different sources, it provides solid evidence regarding each color's potential market share (quantity advantage).

5.3.2.1.   Existing industry investigations/reports

One obvious advantage of the industry investigations/reports is that it has low litigation costs. Their second advantage is that they can directly reflect a color's potential distributive effect when the report/investigation's specific measurement is sales data. For example, the data on cars' color trends (see tables 5-7) is especially helpful, since the data comes from coating companies and is actual sales data. The data collected from the different coating companies are almost identical. White, black, grey, silver, red and blue took the top 6 spots in these reports, and the quantity of each color was consistent among each company's report. Moreover, the statistical analysis indicates that color preference is significant. These industry reports strongly suggest that granting exclusive rights to top colors, such as black or white for cars and car accessories, would be anti-competitive.

The third advantage is that if the reports/investigations span many years, they can reflect the stability of each color's distributive effect. Determining color preference stability can also be important. One color, such as black or white, might be preferred and have the quantity advantage for a relatively long time. While other colors, such as yellow, green or purple, might be preferred only in some years. So, if we only collect one year's quantity data, it is risky to infer a quantity advantage and find that trademarking such color would impose a monopoly cost. If possible, litigants should explore existing industry reports/investigations over many years. For example, AXALTA reported the top five colors of cars based on their data from 1953 to 2013 (61 years in total) in the North American car market (Axalta 2013).

For 56 out of 61 years, white was in top 5 preferred colors. For 50 of 61 years, blue was ranked in top 5. For 47 of 61 years, red was in top 5. For 33 of 61 years, black and green were in top 5.

Long-term data trends reveal changes in color preference in the North American vehicle market. For example, grey and silver were not as popular from 1953 to 2013 as they were after 2013, but some colors, specifically white, black, red and blue, were consistently preferred in the North American vehicle industry since 1953. In this context, white and black cars may have a quantity advantage over other colors in both the short-term and long-term.

One weakness of searching existing industry reports/investigation is that not all industries have the relevant investigations on colors. Even if there is investigation in an industry, it might be for the industry as a whole, not specifically for the product or service in question. For example, the existing reports in the apparel industry are for the whole industry, not a specific product, such as hats. In this situation, data mining on shopping websites might be conducted as a supplement.

This method's other shortcoming is that some reports/investigations are based on inaccurate measurements, which might not reflect the distributive effect in the real market. For example, gsmarena.com's smartphone report (see table 5) is a less direct measure of the distributive effect (quantity) because the investigation was based on each brand's color supply. Some smartphone companies' choices reflect the companies' color trend; it may not necessarily mean the color is especially in-demand. In a different vein, androidauthority.com's investigation (see table 6) asked for consumers' favorite smartphone color. Gaps might exist between the question "What is your favorite smartphone color" and actual sales statistics. This report is less useful for predicting different colored phones'

distributive effect (quantity). However, researchers comparing the two smartphone color reports would find that black, blue, red, silver, and grey are ranked in the top five of both reports. Judges/litigants might infer from the two reports that protecting these colors would risk anti-competitive consequences.

The apparel industry report conducted by brandwatch.com (see table 4) collected apparel-related tweets. This investigation's relevance to predicting purchase intention is low, because the data is not directly related to sales quantity. It is best to use other approaches, such as data mining shopping websites, to complement these types of data.

Even with these shortcomings, industry reports/investigations, when they are available and based on sales data, is a good resource to improve decision-making.

5.3.2.2.   Data mining on shopping websites

The most obvious advantage to data mining is that it can be applied to a wider scope of cases than psychological guideposts and industry reports/investigations. Today more and more products are bought and sold online. Website mining can reveal market data for many products. Second, shopping website's data can reflect the real market supply, compared to some inaccurate industry reports/investigations (see tables 5 – 7).[155] Third, data mining has a reasonable litigation cost, which is often less than consumer surveys.

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155. However, regarding the data mined on Amazon, it is not the exact sales quantity: it is the number of sellers who are selling a specific colored product on Amazon. But this data might be better in accuracy than the smartphone reports testing the occurrences of each color in 140 brands (see table 5) when predicting the quantity and market share of each color, because the number of retailers would be more sensitive to the market demand to different colors than the number of producers (brands). Amazon data mining is also better than the smartphone industry report created on directly asking "What is your favorite smartphone color?" (see table 6), because, in predicting the (sales) quantity, asking color preference on

One of data mining's weaknesses is that many shopping websites do not have exact sales quantity data available for mining. Therefore, the data collected is not the exact sales quantity – it is usually the number of sellers (suppliers) who are selling a specific colored product. However, even with this weakness, the litigants/judges can get the approximate market share of each color based on the number of sellers of each color. Besides, the number of suppliers or sellers selling one colored product can also tell litigants/judges how the competitive degree would be reduced if they granted that color's trademark protections to one company. If the litigants want to get the sales quantity data, they might further explore some websites where the sales quantity data is available. For example, eBay provides the quantity sold for each colored product. Through Python technology, litigants might get the exact sales quantity data for each colored product.

Another weakness might exist in data mining is that its results might be inconsistent with existing reports/investigations. In this situation, judges need to check each method's specific measurements and decide which one is more accurate.

Additionally, to increase the data mining result's stability, litigants might conduct data mining at the same website for multiple days and get the panel data within a short period of time. The panel data might reveal a short-term stable color preference. Also, litigants might mine for the same product on different relevant websites. If the data collected is consistent with each other, the data evidence's strength is enhanced.

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smartphone is less accurate than the data reflecting the number of items (retailers) in real market.

The last weakness is that collecting market data might work on the products' colors, but not the colors used on logos, advertisements, or store environments. For these other colors, data mining might not reveal the distributive effect (quantity) directly. The relation between the (sales) quantity of the product/services and the color of the logos/ads/environments are not revealed through data mining. Litigants might data mine to get the amount of different colored advertisements/logos/environments, but this data cannot identify the distributive effect (quantity) of the product/service under the ads/logos/environments. In this situation, consumer surveys might work to test the color effect on ads/logos/environments.

5.3.3. Consumer surveys

A properly designed consumer survey can directly measure consumer preference among colors, purchase intention, and forecast the potential market shares (quantity advantage). Most importantly, it can measure the monopoly pricing potential (inelasticity). Also, consumer surveys generally apply to more cases. Researchers might consider a consumer survey to decide the aesthetic functionality of color trademarks.

A consumer survey must be carefully considered and designed in its contextual factors, selection of colors, and presentation setting.

The contextual factors, including product type, how the color is used, and the culture in which it is used, should be simulated in the survey scenario. Using *Florists* as an example, the survey should present the image of the box with flowers. If a substantial portion of the business of box-packaged flowers is used for funeral services, the survey scenario design might imply a funeral setting.

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A selection of potentially substitutable colors that might evoke similar levels of purchase intention should be considered. Three strategies can be used to determine the alternative colors. First, the alternative colors might be proposed by psychology guideposts. For example, in *Brunswick*, the product type was a black outboard boat engine, which commanded significant visual pleasure created by the harmonization between the boat color and the engine color. Color harmonization's importance might suggest that, for boat engines, neutral colors – such as black, white, grey, beige, khaki, nude, etc. – might evoke a high purchase intention. However, considering the boat engine is used in a sea or lake, many consumers might also prefer blue and green. Thus, in the consumer survey, white, grey, beige, khaki, nude, blue and green might be included as alternative colors. The second strategy is to data mine Amazon to find the market share of different colors in this industry. This method is similar to the data mining method described in Section 5.1.2. The survey should include all colors with similar or greater sales quantity/market shares compared to the disputed color. The last strategy is letting participants choose their preferred color from a color spectrum. This method could be applied either as a pre-test or as the survey itself.[156]

Regarding the presentation setting, there are two basic presentation styles. First, one can present each colored product separately to the participants and ask their purchase intentions using a Likert-scale. Second, one can present different colored products together

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156. Having included as many alternative colors as possible, the survey result might reflect that some alternative colors evoke similar or higher purchase intentions relative to the disputed color, while some evoke a lower purchase intention. In this situation, judges might only count those colors with similar or higher purchase intentions and exclude those with lower purchase intentions to decide whether the monopoly cost might exist in trademarking the disputed color.

and ask participants to choose one. The second survey setting is more realistic because, in the real world, consumers are not exposed to different colored products one-by-one. They are more likely to see many products at once, and form purchase intention based on their comparative preference. The second survey setting simulates reality better than the first one.

Additionally, the survey setting might be straightforward when the color is used on the products or logos. However, if the color is used in advertisements or the store environment, it is difficult to simulate the color usage in a survey. Advertisements includes both online and offline ads. For online ads, the survey might simulate the design of the ads and the websites where the ads are posted. After the participants see the ads and the websites, they might be directed to next steps, where their purchase intention will be tested. For offline ads, the experiment might be conducted in a lab and magazine ads might be presented to participants. If the color is used in the store environment, the lab might be used to simulate the store environment. Several lab experiments on how store environment color influences consumer responses might be conducted and used for reference (Bellizzi, Crowley and Hasty 1983; Chebat and Morrin 2007).

Finally, the survey design should simulate the real purchase experience as much as possible.[157] For example, litigants and empiricists might develop a website that looks like a

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157. The other survey design is to directly ask participants about their past purchase experiences. The investigators might ask the participants "Have you ever bought a red winter hat?" or "How many black dresses are in your wardrobe?" There are several elements in the survey to consider. The first element is the way the color is reported. Participants can simply report the name of the color or choose the closest color from a color spectrum. The latter design can reduce the vagueness that comes with naming the color. The second element is how the questionnaire describes the product/service. To reduce the noises of the subcategory and shape of a product, the description should be specific to the product in the case. For example, for a winter hat, the questionnaire might describe it as "cotton knit beanie." The

real shopping website. Based on Burgunder's experiment proposal, cross-PED change might be tested using two surveys. In Survey 1, participants would see the brand A product in one color and other brands' product in alternative colors at the same price. When the participant selects one brand's product, a message might pop out informing that other branded products were just discounted by 5%. The participant could either choose other branded product with discount or stick to the preferred color without a discount. In survey 2, the experiment setting is the same as survey 1, except the colors are same. If cross-PED is significantly decreased in survey 2, it means the disputed color might have monopoly pricing power.

This dissertation's purpose is to explore practical and objective approaches to deciding whether color trademark protection is impermissibly anti-competitive, as defined by US judicial decisions. Potential litigants are the most likely parties to determine whether protecting a particular color on a particular product would have anti-competitive effects. Since the question is inherently empirical, a data-based approach to the question is the best way to improve decision-making. In particular, data mining seems like a promising method for making a prima facie case. If several colors dominate a market, allowing only the owners of those colors to compete may confer a non-reputation-based advantage on those owners. In

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third element is the time limitation of past purchases in the questionnaire. It is difficult for participants to remember their past purchases; providing a time limit might help their reporting. For example, the question might be "Have you bought a cotton knit beanie in recent 3 years? If yes, what is the color of it?" Lastly, to control price noise, a question about price might be added after the first question. For example, we can ask participants to report the approximate price of the cotton knit beanie. In addition to controlling the price, this question can also help to reveal the elasticity of the color. Compared to the shopping scenario, the survey asking about past purchases might reflect the real quantity data. But the survey of past purchases is substantially similar to data mining on Amazon. Considering the litigation cost, I recommend data mining instead of conducting a survey of past purchase experiences.

other cases, where substitutability is low, monopoly pricing may also occur. When

psychology literature suggests this possibility, a direct consumer survey may be the most

effective measuring tool. My own results, which faced significant budgetary constraints, were

quite modest, but I have suggested several ways to improve accuracy.

CHAPTER 6. CONCLUSION: LIMITATIONS AND FUTURE STUDY

This dissertation has tried to fill the gaps in aesthetic functionality doctrine research by:

(1) Making a concrete connection between consumer psychology research and the aesthetic functionality doctrine as applied to color trademarks. The legal doctrine assumes a series of affective/cognitive consumer responses to colors, which affect purchase intention. Consumer psychology research reveals that some colors evoke a higher level of affective/cognitive responses than other colors, and therefore can affect purchase intention, which is relevant to determining when trademark protection inappropriately hinders competition.

(2) Combining economic and psychological research to address practical problems that arise when assessing the aesthetic functionality of disputed color trademarks. In particular, this dissertation proposes that measuring protection's effect on the sales distribution within a market ("quantity"), and on consumer willingness to pay higher prices for certain colors ("inelasticity") are best proxies for predicting whether trademarking a color would hinder competition.

(3) By further exploring empirical methods for measuring the effects noted above, it presents the use of psychology guideposts, market data, and consumer surveys as practical methods to test quantity and elasticity. Although a first-of-its kind consumer survey produced only minor results, the promise for future survey work is clear.

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This study does not try to provide a bar where an effect on the market is "anti-competitive"; that is a job for courts in specific cases. Competitors need not show damage amounting to an anti-trust violation – although the Horizontal Merger Guidelines (2010) suggest some potential bars. In color trademark cases, evidence of actual deadweight losses caused by monopoly pricing (inelasticity) are probably enough to prove anti-competitive consequences, but the distributive effect (quantity) is less than what is clearly contemplated by the Supreme Court's "non-reputational advantage" language.

This dissertation contributes to both academic and practical literature. First, this dissertation rebuts an influential strain of scholarship that suggests the aesthetic functionality doctrine is unmoored, unwieldy and unworkable. Second, this dissertation is the first to import numerous psychological studies into the legal literature of aesthetic functionality, which greatly enriches and extends the understanding of this doctrine. Third, this dissertation suggests three approaches that are more grounded in market realities than the current, highly intuitive, speculative approach taken by trademark offices and judges.

This dissertation's limitations should be noted. First, the survey methods proposed might only apply to hues, not saturations or values of color. Psychological research suggests that color saturation and value influence purchase intention, sales quantity, and elasticity. If both are considered, the case becomes more complicated. Methods that consider color saturation and value must be the subject of future research. I have argued that psychology guideposts provide a map for litigants/judges to decide a color's aesthetic functionality. However, that determination may inevitably be based on the personal experience and psychological knowledge of judges and litigants.

Additionally, the proposed usefulness of data mining would be lessened regarding saturation and value, since website color filters are typically based on hue and not saturations or values. Even if investigators enter the words "dark blue" or "light blue" to describe the different value or saturation in the shopping website's search bar, this description is vague, and the data obtained might include imprecise saturations and values. For consumer surveys, presenting different saturations and values to participants is also problematic. It is uncertain how many levels of saturations and values should be included as alternative colors. If there are too few alternatives, some variations would be missed. If there are too many alternatives, the variations may be non-distinguishable. Also, adding saturations and values increases the number of variables, which requires a far larger sample size and consequently higher research costs.

Future studies might focus on developing or improving methods to test how colors that vary in saturation and value influence quantity and inelasticity. Two options might be worth further exploration: using python technology in data mining and improving the consumer survey design. Python software can recognize colors in website images and return data based on RGB (Red, Green, Blue) dimension, which can be translated to HSV (Hue, Saturation, Value). Additionally, consumer surveys might be improved if they present a product/service without color and ask the participants to choose the preferred color from a color palate with multiple hue, saturation, and value choices.

This study only focuses on individual colors instead of color combinations. In many cases, litigants and judges face a color trademark that includes two or more colors, such as John Deere's green and yellow. Further studies might explore how color combinations

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influence quantity and inelasticity. This dissertation provides a useful framework for this expansion.

Future research might also be devoted to testing and improving the validity of data mining methods. For example, researchers might first search for existing industry reports with high validity and accuracy, such as car color reports from coating companies. Then, researchers might mine similar data from car dealer websites. A comparison of the results between industry reports and independent data mining could be used to confirm the data's validity. To further confirm data validity, researchers might scrape car dealer websites for further data comparisons. One could even develop a model translating the data of items (sellers) to sales quantity. The same method might be used to improve demand elasticity measurements.

Lastly, this study proposes proxies for predicting monopoly costs and how to measure these proxies; it does not investigate all variances between a disputed color and alternative colors as related to purchase intention, sales quantity, and elasticity of demands. Existing economic research does not provide much guidance on this issue.

Despite the limitations inherent in this particular study of color trademarks, the aesthetical functionality doctrine is firmly embedded in the law; judges and litigants will be forced to continue to argue over when protection would confer an unfair advantage to a trademark owner. Hopefully, the methods presented in this dissertation can be used to improve the quality of these determinations, where color protection should be denied because it would confer a non-reputation-based competitive advantage.

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APPENDIX A. CHI-SQUARE TEST OF INDEPENDENCE

RESULTS OF THE CONSUMER SURVEY

Table 22. Crosstabulation of price and color preference for the hat

Color	Price			χ^2	Cramer's
preference	$8	$10	$12		V/phi
Black	77	44	40	6.822	0.099/0.140
	(-1.7)	(.4)	(1.7)		
Blue	36	13	11		
	(1.2)	(-.9)	(-.5)		
Red	35	19	10		
	(.3)	(.7)	(-1.1)		
Purple	24	10	9		
	(.4)	(-.5)	(.0)		
Yellow	6	4	3		
	(-.5)	(.4)	(.2)		
Orange	10	4	1		
	(1.1)	(.0)	(-1.4)		

Note: p > 0.05. Adjusted standardized residuals appear in parentheses below group frequencies. 4 cells (22.2%) have expected count less than 5. The minimum expected count is 2.70. χ^2 is the Fisher's Exact Test correction value.

Table 23. Crosstabulation of price and color preference for the scarf

Color preference	Price			χ^2	Cramer's V/phi
	$8	$10	$12		
Black	71 (-.3)	41 (.9)	37 (1.4)	5.789	0.093/0.131
Blue	32 (.9)	17 (-.2)	10 (-.9)		
Red	41 (-.8)	29 (.4)	21 (-.5)		
Purple	15 (.4)	9 (.1)	5 (-.6)		
Yellow	7 (-.2)	7 (1.4)	1 (-1.4)		
Orange	7 (.4)	4 (.1)	2 (-.5)		

Note: p > 0.05. Adjusted standardized residuals appear in parentheses below group frequencies. 4 cells (22.2%) have expected count less than 5. The minimum expected count is 2.78. χ^2 is the Fisher's Exact Test correction value.

Table 24. Crosstabulation of price and color preference for the cord

Color preference	Price			χ^2	Cramer's V/phi
	$8	$10	$12		
Black	76 (-2.7)	44 (1.8)	21 (1.6)	12.157	0.133/0.189
Blue	36 (1.1)	11 (-.9)	5 (-.5)		
Red	39 (2.2)	8 (-1.8)	4 (-.9)		
Purple	25 (.0)	11 (.2)	4 (-.3)		
Yellow	24 (.6)	7 (-1.0)	5 (.5)		
Orange	22 (-.2)	12 (1.0)	2 (-1.2)		

Note: p > 0.05. Adjusted standardized residuals appear in parentheses below group frequencies. 3 cells (16.7%) have expected count less than 5. The minimum expected count is 4.15. χ^2 is the Fisher's Exact Test correction value.

APPENDIX B. LOGLINEAR REGRESSION RESULTS OF THE

CONSUMER SURVEY

Table 25. Loglinear regression of numbers of participants buying the hat

Predictors	Model 1: Main effects Dependent Variable: numbers of participants	Model 2: Interactions Dependent Variable: numbers of participants
Black	2.373***	3.296***
	(0.270)	(0.831)
Blue	1.386***	2.037*
	(0.289)	(0.868)
Red	1.451***	1.946*
	(0.287)	(0.873)
Purple	1.053***	1.846*
	(0.300)	(0.879)
Yellow	-0.143	0.847
	(0.379)	(0.976)
Orange (redundant)		
$8	0.932***	1.946*
	(0.137)	(0.873)
$10	0.239	1.099
	(0.155)	(0.943)
$12 (redundant)		
Black*$8		-1.297
		(0.894)
Black*$10		-1.004
		(0.967)
Black*$12 (redundant)		

Table 25. (Continued)

Predictors	Model 1: Main effects Dependent Variable: numbers of participants	Model 2: Interactions Dependent Variable: numbers of participants
Blue*$8		-0.791 (0.936)
Blue*$10		-0.938 (1.025)
Blue*$12 (redundant)		
Red*$8		-0.728 (0.941)
Red*$10		-0.480 (1.018)
Red*$12 (redundant)		
Purple*$8		-0.999 (0.953)
Purple*$10		-0.999 (1.044)
Purple*$12 (redundant)		
Yellow*$8		-1.327 (1.096)
Yellow*$10		-0.847 (1.182)
Yellow*$12 (redundant)		
Orange*$8 (redundant)		

Table 25. (Continued)

Predictors	Model 1: Main effects Dependent Variable: numbers of participants	Model 2: Interactions Dependent Variable: numbers of participants
Orange*$10 (redundant)		
Orange*$12 (redundant)		
Constant	1.137*** (0.278)	0.405*** (0.816)
Observations	356	356
df	10	
Likelihood Ratio	7.453	
Pearson Chi-Square	6.936	

Note: *=P < 0.05, **=P <0.01, ***=P< 0.001. Adjusted standardized residuals appear in parentheses below group frequencies.

Table 26. Loglinear regression of numbers of participants buying the scarf

Predictors	Model 1: Main effects Dependent Variable: numbers of participants	Model 2: Interactions Dependent Variable: numbers of participants
Black	2.439*** (0.289)	2.708*** (0.653)
Blue	1.513*** (0.306)	1.435* (0.704)
Red	1.946*** (0.296)	2.152** (0.668)
Purple	0.802* (0.334)	0.788 (0.763)
Yellow	0.143 (0.379)	-0.511 (1.033)
Orange (redundant)		
$8	0.823*** (0.138)	1.099 (0.730)
$10	0.342* (0.150)	0.588 (0.789)
$12 (redundant)		
Black*$8		-0.453 (0.758)
Black*$10		-0.486 (0.820)
Black*$12 (redundant)		

Table 26. (continued)

Predictors	Model 1: Main effects Dependent Variable: numbers of participants	Model 2: Interactions Dependent Variable: numbers of participants
Blue*$8		0.031 (0.812)
Blue*$10		-0.077 (0.880)
Blue*$12 (redundant)		
Red*$8		-0.441 (0.777)
Red*$10		-0.271 (0.838)
Red*$12 (redundant)		
Purple*$8		-0.063 (0.883)
Purple*$10		-0.041 (0.954)
Purple*$12 (redundant)		
Yellow*$8		0.511 (1.154)
Yellow*$10		1.022 (1.192)
Yellow*$12 (redundant)		
Orange*$8 (redundant)		

Table 26. (continued)

Predictors	Model 1: Main effects Dependent Variable: numbers of participants	Model 2: Interactions Dependent Variable: numbers of participants
Orange*$10 (redundant)		
Orange*$12 (redundant)		
Constant	1.021** (0.295)	0.916 (0.632)
Observations	356	356
df	10	
Likelihood Ratio	6.492	
Pearson Chi-Square	6.100	

Note: *=P < 0.05, **=P <0.01, ***=P< 0.001. Adjusted standardized residuals appear in parentheses below group frequencies.

Table 27. Loglinear regression of numbers of participants buying the cord

Predictors	Model 1: Main effects Dependent Variable: numbers of participants	Model 2: Interactions Dependent Variable: numbers of participants
Black	1.365*** (0.187)	2.152** (0.668)
Blue	0.368 (0.217)	0.788 (0.763)
Red	0.348 (0.218)	0.588 (0.789)
Purple	0.105 (0.230)	0.588 (0.789)
Yellow	2.490E-17 (0.236)	0.788 (0.763)
Orange (redundant)		
$8	1.689*** (0.170)	2.197** (0.666)
$10	0.819*** (0.187)	1.609* (0.693)
$12 (redundant)		
Black*$8		-0.928 (0.710)
Black*$10		-0.882 (0.741)
Black*$12 (redundant)		

Table 27. (Continued)

Predictors	Model 1: Main effects Dependent Variable: numbers of participants	Model 2: Interactions Dependent Variable: numbers of participants
Blue*$8		-0.305 (0.808)
Blue*$10		-0.872 (0.865)
Blue*$12 (redundant)		
Red*$8		-0.025 (0.832)
Red*$10		-0.973 (0.905)
Red*$12 (redundant)		
Purple*$8		-0.463 (0.840)
Purple*$10		-0.671 (0.888)
Purple*$12 (redundant)		
Yellow*$8		-0.703 (0.817)
Yellow*$10		-1.299 (0.892)
Yellow*$12 (redundant)		
Orange*$8 (redundant)		

Table 27. (Continued)

Predictors	Model 1: Main effects Dependent Variable: numbers of participants	Model 2: Interactions Dependent Variable: numbers of participants
Orange*$10 (redundant)		
Orange*$12 (redundant)		
Constant	1.422*** (0.222)	0.916 (0.632)
Observations	356	356
df	10	
Likelihood Ratio	13.141	
Pearson Chi-Square	12.652	

Note: *=P < 0.05, **=P <0.01, ***=P< 0.001. Adjusted standardized residuals appear in parentheses below group frequencies.