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Trade Dress Protection and Its Impact on Competition: An Attempt at an Empirical Approach
Dr. Xiaoren Wang

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Barton Beebe, Roy Germano, Christopher Jon Sprigman, and Joel H. Steckel

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TRADE DRESS PROTECTION AND ITS IMPACT ON COMPETITION: AN ATTEMPT AT AN EMPIRICAL APPROACH

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I. INTRODUCTION

According to U.S. trademark law, firms can claim an exclusive trademark right not only in respect of words or logos, but also in relation to features of the product, such as shape, color, packaging, product design, and the overall feel or appearance of a product or service. These other types of trademarks are called trade dress.[1] However, trademark protection for some types of trade dress might hinder competition to a greater extent than traditional trademarks, as it affects the product itself rather than only its branding.[2] Trademark protection for trade dress can reduce market competition, generate a higher price for some products, and accordingly make the market less efficient for consumers. The functionality doctrine in trademark law addresses this concern. This article does not deal with utilitarian functionality, i.e., functionality in the technical or mechanical sense, which refers to a feature "essential to the use or purpose of the article or if it affects the cost or quality of the article."[3] The relevant facts for this are objective. The focus here is rather on aesthetic functionality and the problems raised by the assessment thereof, which is often heavily subjective. Aesthetic functionality refers to a situation where the appearance of the product is the primary attraction for consumers to purchase.[4] Considering every attractive design aesthetically

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1 The Lanham Act defines trademarks 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 this definition does not mention color(s), U.S. courts protect a single color as a trademark. *In re* Owens-Corning Fiberglas Corp., 774 F.2d 1116 (Fed. Cir. 1985) (recognizing the color pink on fibrous glass residential insulations as a trademark); Qualitex Co. v. Jacobson Products Co., 514 U.S. 159 (1995) (holding that the green-gold color on dry cleaning press pads was capable of functioning as a trademark). Courts protected color combinations and color confined to a specific design as trademarks even earlier. Brunswick-Balke-Collender Co. v. American Bowling & Billiard Corp., 150 F.2d 69 (2d Cir. 1945) (protecting the plaintiff's trademark on bowling pins, a crown device in red paint or impressed around the neck of the pin); Chevron Chem. Co. v. Voluntary Purchasing Grps., Inc., 659 F.2d 695 (5th Cir. 1981) (granting trademark protection to a combination of yellow and red bands on the plaintiff's agricultural chemical packages); SK&F, Co. v. Premo Pharm. Labs., Inc., 625 F.2d 1055 (3d Cir. 1980) (protecting an oral diuretic capsule colored by half maroon and half white as a trademark.); Transportation, Inc. v. Mayflower Servs., Inc., 769 F.2d 952 (4th Cir. 1985) (protecting the plaintiff's trademark right on a red/black color scheme of its taxi cabs).

2 Ralph S. Brown Jr., *Advertising and the Public Interest: Legal Protection of Trade Symbols*, 57 Yale L.J. 1165 (1947); Glynn S. Lunney Jr., *Trademark Monopolies*, 48 Emory L.J. 367 (1999); Mark A. Lemley, The Modern Lanham Act and the Death of Common Sense, 108 Yale L.J. 1687 (1998); Christopher Buccafusco & Jeanne C. Fromer, *Fashion's Function in Intellectual Property Law*, 93 Notre Dame L. Rev. 51 (2017); Lee Burgunder, *Trademark Registration of Product Colors: Issues and Answers*, 26 Santa Clara L. Rev. 581 (1986).

3 Inwood Labs., Inc. v. Ives Labs., Inc., 456 U.S. 844 (1982).

4 The Restatement of the Law of Torts (First) ("Restatement (First)") defines aesthetic functionality as a situation "When goods are bought largely for their aesthetic value, their features may be [aesthetic] functional because they definitely contribute to that

functional would avoid the subjectivity to a large extent but over-penalize such design. Short of that, judges generally have to rely on their personal expectations and experiences to assess the potential impact of a design or design feature for which trade dress protection is claimed on competition. This article suggests an empirical approach to the question with the aim to provide a better, more reliable, and more predictable factual basis for the assessment of possible anti-competitiveness of trade dress protection. It is meant to kick off further investigation and development of the proposed methodology.

II. AESTHETIC FUNCTIONALITY— A THEORETICAL CONUNDRUM

In the United States, the Court of Appeals for the Ninth Circuit originally developed an overbroad scope of aesthetic functionality asserting that a feature was aesthetically functional as long as it was an important ingredient in commercial success.[5] The Court of Appeals for the Third Circuit realized that this definition might over-punish attractive trade dress because not all attractive trade dress with commercial success will hinder competition if protected.[6] Later, many circuit courts of appeal moved their attention from the aesthetic aspect of trade dress to the consequences for competition and agreed that the final test of aesthetic functionality was whether granting trademark protection on trade dress would hinder competition.[7] The U.S. Supreme Court further affirmed this

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value and thus aid the performance of an object for which the goods are intended." Restatement (First) of Torts § 742 cmt. a (1938) (second emphasis added). The Restatement (Third) of the Law of Unfair Competition ("Restatement (Third)") explains that aesthetic functionality is 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.'" Restatement (Third) of the Law of Unfair Competition § 17 cmt. c (1995) (second emphasis added).

5 Pagliero v. Wallace China Co., 198 F.2d 339 (9th Cir. 1952).

6 Keene Corp. v. Paraflex Indus., Inc., 653 F.2d 822, 825 (3d Cir. 1981).

7 Stormy Clime Ltd. v. ProGroup, Inc., 809 F.2d 971, 977 (2d Cir. 1987); Villeroy & Boch Keramische Werke v. Thc Systems, 999 F.2d 619 (2d Cir. 1993); Christian Louboutin S.A. v. Yves Saint Laurent America Holding, Inc., 696 F.3d 206 (2d Cir. 2012); W.T. Rogers Co., Inc. v. Keene, 778 F.2d 334 (7th Cir. 1985); Hartford House, Ltd. v. Hallmark Cards, Inc., 846 F.2d 1268, 1272 (10th Cir. 1988); Brunswick Corp. v. British Seagull Ltd., 35 F.3d 1527 (Fed. Cir. 1994); Sno-Wizard Mfg., Inc. v. Eisemann Products Co., 791 F.2d 423 (5th Cir. 1986); Johnson & Johnson v. Actavis Group HF, No. 1:06-cv-08209, 2008 WL 228061, at *3 (S.D.N.Y. Feb. 21, 2008); Restatement (First) of Torts § 742 cmt. a (Am. Law Inst., 1938); Mitchell M. Wong, *Aesthetic Functionality Doctrine and the Law of Trade-Dress Protection*, 83 Cornell L. Rev. 1116, 1142 (1997); Mark P. McKenna, *(Dys)Functionality*, 48 Hous. L. Rev. 823, 851 (2011); Graeme B. Dinwoodie, *The Death of Ontology: A Teleological Approach to Trademark Law*, 84 Iowa L. Rev. 611, 696 (1999).

competition test in *Qualitex*[8] and *TrafFix*.[9] Justice Breyer asserted in *Qualitex* that a product was functional "if exclusive use of the feature would put competitors at a significant non-reputation-related disadvantage."[10] *TrafFix* confirmed the applicability of this competition test to aesthetic functionality: "[i]t is proper to inquire into a 'significant non-reputation-related disadvantage' in cases of [a]esthetic functionality, the question involved in *Qualitex*."[11] The two quotations together indicated that, to be aesthetically functional, first, trade dress protection would impose a competitive disadvantage on competitors. Second, such an advantage should not be caused by the reputation of the source of the goods.

However, it is usually difficult for courts to discern which trade dress if protected would impose a competitive disadvantage on competitors, namely, in what situation trade dress protection is likely to hinder competition. Judges often rely on their personal experiences and intuitions to assess whether competition is hindered if granting trademark protection to the disputed trade dress.[12] For example, in *Christian Louboutin S.A. v. Yves Saint Laurent America Holding, Inc.*,[13] the Court of Appeals for the Second Circuit rejected the district court's decision that a red outsole on a woman's shoe style was aesthetically functional. Neither the trial court nor the appellate court cited potentially relevant empirical research[14]—for example, neither cited Elliot and Niesta's research revealing that men rated women as more attractive when the women were viewed within a red picture border or in red clothing.[15] This article does not argue that the Second Circuit was wrong in rejecting aesthetic functionality of the red outsole. But the problem is that the decision on competition hindrance and aesthetic functionality is difficult and depends merely on judges' intuition.

To minimize the difficulties, scholars such as Bone and Wong suggest a per se rule approach.[16] With this approach, judges do not

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8 Qualitex Co. v. Jacobson Prods. Co., 514 U.S. 159, 164 (1995).

9 TrafFix Devices, Inc. v. Marketing Displays, Inc., 532 U.S. 23 (2001).

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

11 *TrafFix*, 532 U.S. at 33.

12 Norwich Pharmacal Co. v. Sterling Drug, Inc., 271 F.2d 569 (2d Cir. 1959); Christian Louboutin S.A. v. Yves Saint Laurent America Holding, Inc., 696 F.3d 206 (2d Cir. 2012); Xiaoren Wang, *Aesthetic Functionality at a Crossroads: What a Troublesome Doctrine Can Learn from Its Past,* 19 Chi.-Kent J. Intell. Prop. 357 (2020).

13 696 F.3d 206 (2d Cir. 2012).

14 *Id.*; Christian Louboutin S.A. v. Yves Saint Laurent America, Inc., 778 F. Supp. 2d 445 (S.D.N.Y. 2011).

15 Andrew J. Elliot & Daniela Niesta, *Romantic Red: Red Enhances Men's Attraction to Women*, 95 J. Personality & Soc. Psych. 1150 (2008).

16 Wong, *supra* note 7; Robert G. Bone, *Trademark Functionality Reexamined*, 7 J. Legal Analysis 183, 239 (2015).

need to evaluate the competition consequence, but only have to determine whether the disputed feature falls within a previously determined category of per se aesthetic functionality.[17] Particularly, Bone suggests that an aesthetic feature should be recognized as aesthetically functional per se if it is central to the consumption value of the product regardless of the competition necessity, except for cases where the consumption value derives mainly from the source-identifying function.[18] The assumption here is that, if the aesthetic value is central to the product consumption, the feature should be deemed anticompetitive per se and nothing more is required. Wong suggests that if the aesthetic feature has functions beyond a source of identification, for instance, the function of making the product more beautiful, the feature is aesthetically functional.[19] Both Bone and Wong define a pre-determined category of aesthetically functional trade dress and save judges from predicting competitive consequences that are more difficult. However, this per se rule approach is problematic because it goes back to an overbroad definition of aesthetic functionality over-penalizing attractive trade dress. Even an aesthetic feature is central to the consumption or has functions beyond the source-identification, it does not mean competitors cannot use other aesthetic features to compete.

Disagreeing with the per se rule, Hughes observes that the aesthetic functionality cases are, in fact, about consumers' psychological responses.[20] Hughes suggests that courts should recognize aesthetic functionality only when the product feature triggers "widely shared," "preexisting" psychological responses from consumers.[21] These psychological responses include aesthetic preference and other responses caused by our neurological system and social culture.[22] Part III will further elaborate on this. Similarly, Lunney explains aesthetic functionality from the perspective of consumer psychology.[23] He points out that a product feature is aesthetically functional when it cannot be substituted by alternative features in consumers' minds.[24] The approach suggested by Hughes and Lunney narrow the scope of aesthetic functionality and therefore avoid over-penalizing attractive trade dress.

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17 Bone, *supra* note 16, at 190.

18 *Id.* at 241.

19 Wong, *supra* note 7, at 1132-34.

20 Justin Hughes, *Cognitive and Aesthetic Functionality in Trademark Law,* 36 Cardozo L. Rev. 1227, 1230 (2014).

21 *Id.*

22 *Id.* at 1251-1255.

23 Lunney, *supra* note 2, at 481.

24 *Id.*

However, courts applying the approach still need to predict these psychological responses, which calls for empirical evidence.

Neither approach has addressed the question "whether the competition is likely to be hindered" because it is a hybrid question including not only legal doctrinal issues but also factual aspects such as actual consumer responses. However, existing approaches only provide the doctrinal or normative answers to the question. To improve the decision-making by courts, an empirical approach is needed to address the factual aspects of the question. This article therefore explores an empirical approach to make decision-making less subjective. It takes a new direction—an empirical approach—for courts to identify anticompetitive consequences with more data evidence in trade dress cases. Part III will further elaborate on the empirical gap in existing studies and the necessity of an empirical approach to address aesthetic functionality.

Part IV reviews the economic literature on market power and suggests two proxies to test the market power of a disputed trade dress. One measures "inelasticity," a proxy of a trade dress's power to maintain sales at a higher price.[25] The other is designated simply as "market share."[26] A larger market share associated with a product feature, compared with smaller market shares of alternative trade dress, implies the market power enjoyed by this feature. Granting trademark protection on trade dress with a large market share or inelasticity is likely to hinder competition, unless the large market share or inelasticity is primarily caused by characteristics unrelated to the product appearance, or by brand reputation.

To provide concrete examples, this study conducts two empirical exercises in Part V. One is an Amazon data mining exercise on color trademarks, a subcategory of trade dress, to reveal market shares associated with some colors. The other is a human-subject experiment to illustrate the inelasticity of some colors.

Combining the two methods, Part VI will try to propose an empirical approach for litigants to assess market power in color trademark cases.

This article does not aim to develop a perfect empirical method that addresses all issues in deciding aesthetic functionality. Instead, it attempts to explore the potentials of an empirical approach to make the assessment of aesthetic functionality more fact-based. The proposed empirical approach, of course, has shortcomings, which will be discussed in Part VI. For example, it cannot distinguish whether the market power measured is caused

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25 Andrew Gillespie, Foundations of Economics, 43 (2007).

26 Joe S. Bain, *Economies of Scale, Concentration, and the Condition of Entry in Twenty Manufacturing Industries*, 44 Am. Econ. Rev. 15, 15-16 (1954); Bradley T. Gale, Market Share and Rate of Return, 54 Rev. Econ. & Stat. 412 (1972).

by *the brand reputation*, which is protected by trademark law, or *the aesthetic value of the feature*, which should not be protected. Taking *Christian Louboutin S.A.* again as the example, it is possible that many consumers like red outsole shoes primarily because this characteristic identifies a famous brand—Christian Louboutin—instead of the aesthetic value of the red outsole.[27] The Second Circuit emphasizes that aesthetic function and branding success can be hard to distinguish, and courts should not conclude aesthetic functionality merely because the feature denotes the product's desirable source.[28] Also the Advocate General Opinion in the EU case *Louboutin v. Van Haren* concluded that the "substantial value of the goods" (the EU version of "functionality") in Article 3(1)(e) of Directive 2008/98 should not include the reputation of the mark or its proprietor.[29] Following these rulings, even if the empirical method proves that the red outsole shoes have a big market share or high inelasticity, one cannot necessarily conclude that the design is aesthetically functional. The empirical approach proposed in this article cannot isolate the aesthetic attraction from the reputation effect. Future research might further develop new empirical methods to address this issue.

There are two further issues that are important but not addressed in this article. First, in addition to the brand reputation, a feature like the Louboutin red outsole might also contain an expressive value,[30] through which consumers show their social status, personality, or beliefs to others. It is debatable whether trademark law should protect this value.[31] Therefore, there is no uniform normative answer whether this expressive value is actually aesthetic functionality, or whether it belongs to the realm (and merit) of brand reputation, and consequently deserves trademark protection.

Second, fashion changes market power associated with trade dress. Green handbags might be popular and have a big market share this year but lose their attraction next year. Empirical evidence can only (dis)prove the market power at the present moment. Shall we grant trademark protection to a trade dress with temporary market power? How should we deal with product features that have a potential to develop a popularity that results

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27 696 F.3d 206 (2d Cir. 2012).

28 *Id.* at 222.

29 Christian Louboutin v. Van Haren Schoenen, [2018] C-163/16, Additional Opinion of AG Szpunar, para. 67.

30 Rochelle Cooper Dreyfuss, *Reconciling Trademark Rights and Expressive Values: How to Stop Worrying and Learn to Love Ambiguity*, *in* Trademark Law and Theory: A Handbook of Contemporary Research (Graeme B. Dinwoodie and Mark D. Janis eds., 2007).

31 Barton Beebe, *Intellectual Property Law and the Sumptuary Code*, 123 Harv. L. Rev. 809 (2010); Dreyfuss, *supra* note 30; Hughes, s*upra* note 20, at 1275-1279.

in aesthetic functionality in the medium or long term? These are important normative questions related to aesthetic functionality. But due to the empirical focus of this article, it will set these issues aside for future studies.

III. THE AESTHETIC FUNCTIONALITY DOCTRINE—A CLOSER LOOK

As discussed in Part II, aesthetic functionality refers to a situation where a product feature lacks utilitarian functions, but its ornamental appearance attracts consumers to purchase.[32] The recognition of aesthetic functionality varies in history. *Pagliero v. Wallace China Co.*[33] in 1952 created the widest scope of aesthetic functionality, while later cases narrowed it down. In *Pagliero*, the Ninth Circuit asserted that a feature was aesthetically functional if it was an important ingredient in commercial success.[34] This case established a per se bar by which any attractive designs were likely to lose trademark protection.

The Third Circuit in *Keene v. Paraflex* was critical of *Pagliero*'s "commercial success" standard; it led to an overbroad scope of aesthetic functionality, by which attractive designs were punished.[35] The Third Circuit and other courts pointed out that merely attracting consumers was not adequate to establish aesthetic functionality. For example, in *W.T. Rogers v. Keene*, the judge stated: "[T]he fact that a design feature is attractive does not . . . preclude its being trademarked."[36] In *Kohler v. Moen*, the judge pointed out "not all designs that enhance a product's appeal have been found to be 'functional.' "[37] The disputed trade dress was regarded as aesthetically functional only when trademark protection for the trade dress would hinder competition in respect of the product itself.[38] In *Hartford v. Hallmark*, Judge McKay, quoting *Brunswick*[39] and *Sno-Wizard,*[40] held that "[w]hether the feature is functional should turn on 'whether the protection of the [feature] would hinder competition or impinge upon the rights of others to

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32 Restatement (First) of Torts § 742 cmt. a (1938); Restatement (Third) of the Law of Unfair Competition § 17 cmt. c (1995). The explanation here emphasizes how aesthetic functionality is different from utilitarian functionality. But it does not mean the two functionalities are mutually exclusive. A product feature can have both utilitarian functionality and aesthetic functionality simultaneously.

33 Pagliero v. Wallace China Co., 198 F.2d 339 (9th Cir. 1952).

34 *Id.*

35 Keene Corp. v. Paraflex Indus., Inc., 653 F.2d 822, 825 (3d Cir. 1981).

36 W.T. Rogers Co. v. Keene, 778 F.2d 334, 343 (7th Cir. 1985).

37 Kohler Co. v. Moen Inc., 12 F.3d 632, 649 (7th Cir. 1993).

38 *Id.*

39 Brunswick Corp. v. British Seagull Ltd., 35 F.3d 1527 (Fed. Cir. 1994).

40 Sno-Wizard Mfg., Inc. v. Eisemann Prods. Co., 791 F.2d 423 (5th Cir. 1986).

compete effectively in the sale of goods.' "[41] In *Johnson & Johnson v. Actavis Group*, the court stated the ultimate aesthetic functionality test "is whether the recognition of trademark rights would significantly hinder competition."[42] Restatement (Third) of Unfair Competition also summarized these cases and concluded, "[t]he ultimate test of aesthetic functionality . . . is whether the recognition of trademark rights would significantly hinder competition."[43] In 1995, the Supreme Court affirmed this competition test in *Qualitex*.[44] Justice Breyer defined that a product was functional "if exclusive use of the feature would put competitors at a significant non-reputation-related disadvantage."[45] Although the definition here refers to functionality, one can find that Justice Breyer intended to apply the competition test to aesthetic functionality.[46] In a later paragraph, he cited the Restatement (Third) and explicitly affirmed that the "ultimate test of aesthetic functionality" is whether the trademark protection would significantly hinder competition.[47] In addition, the Supreme Court in *TrafFix* confirmed again the competition test in *Qualitex* should apply to aesthetic functionality.[48]

Despite the competition test, a factual question remains: How does a court know when competition is likely to be hindered? Existing scholarship splits on how to address this problem.[49] Wong and Bone propose a return to the per se rule so that courts are not forced to "guess" competitive consequences.[50] Bone suggested a per se rule to regard any product feature as aesthetically functional so long as the feature is central to a product's consumption value.[51] Wong recommended courts adopt the identification theory.[52] This theory recognizes trade dress as aesthetically functional if it has functions beyond identifying source.[53] For example, the design of the Trésor perfume bottle does not only identify the source but also has

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41 Hartford House, Ltd. v. Hallmark Cards, Inc., 846 F.2d 1268, 1272 (10th Cir. 1988)

42 Johnson & Johnson v. Actavis Group HF, No. 1:06-cv-08209, 2008 WL 228061, at *3 (S.D.N.Y. Feb. 21, 2008).

43 Restatement (Third) of the Law of Unfair Competition § 17 cmt. c (1995).

44 *Qualitex*, 514 U.S. at 165.

45 *Id*.

46 *Id.*, 514 U.S. at 170.

47 *Id*.

48 *TrafFix*, 532 U.S. at 33.

49 Bone, *supra* note 16; Wong, *supra* note 7; Hughes, *supra* note 20; Lunney, *supra* note 2; McKenna, *supra* note 7; Dinwoodie, *supra* note 7.

50 Bone, *supra* note 16; Wong, *supra* note 7.

51 Bone, *supra* note 16 at 239.

52 Wong, *supra* note 7, at 1132-34.

53 *Id*.

aesthetic or decorative value.[54] According to Wong's identification theory, the Trésor perfume bottle should be regarded as aesthetically functional because it has function beyond identifying source.[55] The theory is also a per se rule, as it does not analyze the competitive consequence but only checks whether a feature falls into a previously determined category of aesthetic functionality (any functions beyond identifying source).[56] The per se rule might be easy for courts to apply, compared with evaluating competition hindrance. However, as criticized by many judges,[57] the per se rule might over-punish attractive trade dress: the features, with the aesthetic value central to consumption or with other functions beyond source-identifying, are not necessarily anticompetitive if protected, if there are many alternative comparable designs available.

Other scholars reject the per se rule.[58] Hughes observes that aesthetic functionality cases actually involve a spectrum of psychological responses from consumers.[59] He suggested that judges analyze consumer responses and proposed that trade dress that evokes "widely shared," "preexisting" psychological responses among consumers might hinder competition if protected.[60] Hughes included not only aesthetic preferences but also other psychological responses resulting from our sensory and neurological systems as well as social culture (Hughes used the word "acculturation").[61] For example, bright orange on safety jackets captures our attention more than darker colors do.[62] This is a psychological response built on our sensory and neurological system less relevant to aesthetic

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54 L'Oréal SA v. Bellure NV, [2009] C-487/07.

55 In Case C-487/07, the EU court decided that trademark law should not only protect trademarks' essential function, the source-identification, but also protect other functions such as communication, advertisement, and investment. Wong's advice obviously disagrees with the EU court's extensive protection approach. According to Wong's identification theory, other functions beyond the essential trademark function should not be protected.

56 Wong, in fact, suggests a larger scope of aesthetic functionality than Bone: according to Bone's proposal, aesthetic features must contribute substantially to consumption to be aesthetically functional, while Wong's theory does not require substantial contribution. Despite this difference, neither Bone nor Wong requests courts to evaluate competitive consequences such as how many comparable alternative designs are available if granting a trademark right on the disputed trade dress. Therefore, they both belong to the per se rule approach.

57 *Keene Corp.*, 653 F.2d at 825; Wallace Int'l Silversmith v. Godinger Silver Art, 916 F.2d 76, 80 (2d Cir. 1990); *Christian Louboutin S.A.*, 696 F.3d at 221.

58 Dinwoodie, *supra* note 7; Hughes, *supra* note 20; Lunney, *supra* note 2.

59 Hughes, *supra* note 20, at 1230.

60 *Id.* at 1251-55.

61 *Id.* at 1254-1255, 1278.

62 *Id.* at 1253.

values.[63] The association between the color black[64] and grief in certain contexts is built by social culture.[65] In reality, aesthetic preference and other psychological responses often co-exist and are mixed on a product feature or a color. No matter what kind of response, Hughes emphasizes that it must be widely shared among consumers to be regarded as aesthetically functional.[66] For example, several empirical studies prove that, regardless of specific products, blue is preferred by most people.[67] while yellow and yellow-green[68] are the least preferred.[69] According to Hughes' suggestion, the blue color might have a widely shared preference among consumers. But yellow is liked by only a small group of people, so courts may not worry about this color except for special cases such as yellow on safety jackets, where eye-catching is important.

Partially disagreeing with Hughes, Lunney points out the determination of aesthetic functionality might be underinclusive if only focusing on trade dress with a widely shared preference.[70] For example, Baroque-style dishes might not be widely preferred, but for a small subset of consumers who like them, other designs cannot be substituted for this design. Due to this non-substitutability, the producer who trademarks Baroque-style dishes can set prices higher than for other designs. Lunney suggests that courts also

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63 Although Hughes regards eye-catching function as aesthetic functionality, it may also fall into utilitarian functionality because it is essential to the use or purpose of the product.

64 Strictly speaking, black and white are not colors. But the United States Patent and Trademark Office (USPTO) allows parties to register color trademarks on black, white, gray, and translucent. Therefore, the article counts black, white, and gray as colors. *See* USPTO Design Search Code Manual, Table of Categories, Miscellaneous, 29.02-29.07, http://tess2.uspto.gov/tmdb/dscm/dsc_29.htm#29 [https://perma.cc/E4F5-M5CE].

65 Hughes, *supra* note 20, at 1253. The association between black and grief is established in Western culture. In other cultures, such as in China, white is also linked with funerals and sadness.

66 *Id*. at 1254. Hughes further clarifies that the widespread psychological response does not have to be 100% of the relevant consumers: "a response common to a quarter of them (relevant consumers) might be enough." *Id.* at 1255.

67 Joy Paul Guilford, *The Affective Value of Color as a Function of Hue, Tint and Chroma*, 17 J. Experimental Psych. 342 (1934); Hans J. Eysenck, *A Critical and Experimental Study of Color Preferences*, 54 Am. J. Psych. 385 (1941). GW Granger, *An Experimental Study of Color Preferences*, 52 J. Gen. Psych. 3 (1955); Joy Paul Guilford and Patricia C. Smith, *A System of Color-preferences*, 72 Am. J. Psych. 72, 487 (1959). Nilgün Camgöz, Cengiz Yener and Dilek Güvenç, *Effects of Hue, Saturation, and Brightness on Preference*, 3 Color Rsch. & Application 199 (2002).

68 A hue (hue degree: 90) between yellow and green. Different psychological studies might have reasonable deviations. Camgöz, Yener & Güvenç, *supra* note 67.

69 Patricia Valdez & Albert Mehrabian, *Effects of Color on Emotions*, 123 J. Experimental Psych. 394 (1994); Camgöz, Yener & Güvenç, *supra* note 67.

70 Lunney, *supra* note 2, at 481.

regard such trade dress as aesthetically functional if it is non-substitutable.[71]

Both Hughes and Lunney are correct that aesthetic functionality is in essence about consumers' psychological responses. But, following this suggestion, judges need to guess consumer responses, which might be equally as difficult as assessing competitive consequences. Courts will need to predict whether the disputed trade dress evokes widely shared consumer responses or whether the trade dress is non-substitutable in consumer minds. Unfortunately, existing studies have not provided tools for courts to make these predictions.

Since consumer response is an inevitable part of answering whether the competition is likely to be hindered, the question calls for an empirical approach. Therefore, this article attempts to present an empirical approach for courts to measure the potential market power of a disputed trade dress and help litigants and judges evaluate competition hindrance less subjectively. This empirical approach includes a data mining exercise on shopping websites and a human-subject experiment. The data mining aims at revealing the market share of a disputed trade dress and the experiment at showing the inelasticity of a disputed trade dress (the two methods will be outlined in Part V.A and B).

Before presenting the details of the empirical approach, the next section will first explore two economic proxies of market power, which the data mining and experiment will utilize.

IV. ECONOMIC PROXIES TO MEASURE MARKET POWER

Market power is a company's ability to set a price above a level that would exist in a highly competitive market.[72] Economists have explored a variety of proxies to measure market power. The two most important in the trade dress context are: inelasticity and market share.[73]

A. Inelasticity

Some trade dress might have an inherent, preexisting attraction for consumers. Making use of this attraction, companies can develop

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71 *Id*.

72 William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 Harv. L. Rev. 937 (1981).

73 There are other proxies such as profit rate that can represent market power. However, in litigation, it is hard to prove that a high profit rate is mainly caused by trade dress. A high profit rate might largely be created by good product quality, low costs, or extensive marketing. Besides, it is difficult to design an empirical method to measure the profit rate. Therefore, this study chooses only those proxies available and testable to predict the market power of trade dress protection.

or enhance product differentiation to gain market power. For example, some trade dress comes as a physical aspect of a product, such as a Baroque design for dishes. Consumers who prefer the Baroque style might be willing to pay a higher price for a Baroque dish than a dish without this design. Product differentiation through certain trade dress can give a company the power to retain consumers at a higher price. Such market power to retain consumers against price increase is called "inelasticity."[74] The more consumers maintained when the price increases, the more inelastic and the greater market power the product.

Inelasticity can be measured by price-elasticity of demand ("PED"). PED is the decrease in quantity demanded for a product in response to the increase in price.[75] In general, PED $=|(\%\ Change\ in\ Quantity\ Demanded)/(\%\ Change\ in\ Price)|$.[76] Overall, the smaller the PED, the higher the inelasticity and stronger market power (see Table 1).[77]

Table 1. The PED value, inelasticity, and market power

PED	Inelasticity		Market power
0	Perfectly inelastic	Largest	Largest
0-1	Inelastic	↕	↕
1	Unit elastic		
>1	Elastic		
infinite	Perfectly elastic	Smallest	Smallest

When the PED is 0, the product is "perfectly inelastic," and the market power is the largest.[78] At this level, all consumers stay with the product when the price increases (the numerator is zero). It indicates that the product has the largest market power to resist potential consumer loss caused by price increase.

When the PED is between 0 and 1, the product is "inelastic," and the market power is less than the level above.[79] In this situation, a

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74 Michael Parkin, Microeconomics, 125-126 (2019).

75 *Id.*

76 The specific formula is PED = $|[\frac{Q2-Q1}{\frac{(Q2+Q1)}{2}}]/[\frac{P2-P1}{\frac{(P2+P1)}{2}}]|$. *See* Gillespie, *supra* note 25, at 43. In this formula, P1 is the original price. P2 is the new price, which is often higher than P1. Q1 denotes the number of buyers (or the quantity demanded) at P1, while Q2 denotes the number of buyers (or the quantity demanded) at P2.

77 Parkin, *supra* note 74, at 125-126; Gillespie, *supra* note 25, at 43.

78 Parkin, *supra* note 74, at 125-126.

79 *Id.*

few but not many consumers leave the product when the price increases. The percentage decrease of consumers is less than the percentage increase in the price, and consequently the total revenue still increases compared with the total revenue at the initial lower price.[80] The market power is less than the level above but still relatively strong.

When the PED equals 1, the product is "unit elastic," and the market power further decreases.[81] At this level, more consumers leave, and the percentage decrease of consumers equals the percentage increase in price. In this situation, the total revenue is the same as that of the initial lower price, i.e., the product does not earn more money from the price increase.

When the PED is greater than 1, the product is "elastic," and the market power continues to decline.[82] Compared with when the product is "unit elastic," more consumers leave at this level. The percentage decrease of consumers is greater than the percentage increase in the price. Therefore, the total revenue is even less than that of the initial lower price. That is to say, instead of earning more money as a result of the price increase, the product loses profits.

When the PED is infinite, the product is "perfectly elastic," and the market power is the smallest.[83] At this level, a huge number of consumers leave when the price increases only a little bit. Using the mathematic language, the consumer number decreases by an infinite percentage in response to the percentage increase in the price.

In reality, the decrease in consumer numbers might be severe if the price increases from one price point while gentle from another price point even though in absolute terms the increase is the same. For example, the reduction in consumer numbers would be different where a handbag's price increases *from $80 to $100* from where it is *from $100 to $120*. That is to say, in testing the inelasticity of the same trade dress, the PED value and the market power measured by PED may vary depending on starting prices. Therefore, a PED value is meaningful and applicable only at a specific price point.

In economic empirical studies, PED has been widely applied to test the market power of a brand or a product.[84] Law scholars such

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80 Regarding the mathematic relation between the quantity-price percentage change and the total revenue, readers can refer to Gregory N. Mankiw, Principles of Microeconomics, 95-96 (1998); Roger A. Arnold, Economics, 385-86 (9th ed. 2009); Parkin, *supra* note 74, at 125-126; Gillespie, *supra* note 25, at 43.

81 Parkin, *supra* note 74, at 125-126.

82 Parkin, *supra* note 74, at 125-126.

83 *Id.*

84 John U. Farley, Donald R. Lehmann & Michael J. Ryan, *Patterns in Parameters of Buyer Behavior Models: Generalizing from Sparse Replication,* 1 Mktg. Sci. 181 (1982); Avijit Ghosh, Scott A. Neslin & Robert W. Shoemaker, *Are there associations between price elasticity and brand characteristics?*, American Marketers Association (AMA) Educators' Conference, American Marketers Association 226 (1983); Gary J. Russell & Ruth N.

as Cunningham and Burgunder also recommended PED to test the market power associated with a trade dress or trademark.[85] This article will follow these suggestions and use PED to test market power.

B. Market Share

In traditional microeconomic theory, market share is not a direct measure of market power.[86] This is because theoretically, market power is defined as a firm's ability of pricing above the competitive level.[87] However, a large market share does not necessarily enable a company to price above the competitive level. If competitors or new entrants can offer substitutive products, they can force the price of a big firm down to the competitive level. Imagine that two dairy farms, A and B, supply milk to a town at the same price, $3.97 per gallon. A has 80% of the market share, while B has 20%. Although A has a dominant market share, it does not have the power to lift the price to get extra benefits because once A increases the price, B will capture market share from A by offering milk at the old price. Besides, seeing the rises in price, another new dairy farm, C, might enter into this market, which reduces A's market share even further. Facing the threat from B and C, A is unable to lift the price above the competitive level to get extra profits. Therefore, traditional economic studies argued that a big market share was not worrisome.

However, market practice deviates from this traditional theory. Economists of industrial organizations[88] have pointed out that, in the real world, a big market share frequently indicates market power because a big market share creates entry barriers and non-

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Bolton, *Implications of Market Structure for Elasticity Structure,* 25 J. Mktg. Rsch. 229 (1988); Ruth N. Bolton, *The Relationship between Market Characteristics and Promotional Price Elasticities,* 8 Mktg. Sci. 153 (1989); Min-Hsin Huang, David E. Hahn & Eugene Jones, *Determinants of Price Elasticities for Store Brands and National Brands of Cheese*, 39 Applied Econs. 553 (2004).

85 Mark A. Cunningham, Utilitarian Design Features and Antitrust Parallels: An Economic Approach to Understanding the Functionality Defense in Trademark Litigation, 18 Hastings Comm. & Ent. L.J. 569, 586 (1995); Burgunder, *supra* note 2.

86 Franklin M. Fisher, *Diagnosing Monopoly*, 27 J. Reprints Antitrust, L. & Econ., 669-698 (1997).

87 William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases,* Harv. L. Rev. 937 (1981).

88 Bain, *supra* note 26, at 15-16; Tibor Scitovsky, *Ignorance as a Source of Oligopoly Power*, 40 Am. Econ. Rev. 48, 51 (1950); Steve Salop, *Information and Monopolistic Competition*, 66 Am. Econ. Rev. 241 (1976); Dennis E., Smallwood & John Conlisk, *Product Quality in Markets Where Consumers are Imperfectly Informed*, 93 Q. J. Econ. 1 (1979); Stephen A. Rhoades, *Market Share as a Source of Market Power: Implications and Some Evidence*, 37 J. Econ. & Bus. 343, 349-350 (1985).

substitutability, which eventually provides the power to price high.[89]

Moreover, empirical evidence has proven that large market shares are associated with market power. Bain found that in 16 of 20 industrial sectors in the United States, large factories erected moderate or strong entry barriers.[90] Rhoades investigated 6,492 banks and found that when market shares rise, the rate of return increases significantly with other factors constant.[91] Gales also proved that a high market share is associated with high rates of return.[92]

Drawing on economic studies, Burgunder, a law scholar, proposed that a disproportionately large market share can be a proxy of market power.[93] He pointed out that if a trade dress attracts a disproportionately large number of consumers compared with its competitors, this attraction would provide the trade dress owner with a competitive advantage.[94]

In legal practice, market share is the basis for measuring a firm's market power in antitrust merger cases.[95] Therefore, market share should also be a reasonable proxy to test the market power associated with a trade dress. The Supreme Court states that the functionality doctrine is meant to prevent "non-reputation-related" advantages.[96] Capturing an undeserved share of the market is a prohibited advantage. In other words, the Supreme Court does not demand that the defendant prove a direct power to price above the competitive level if a large market share has been shown. Therefore, this study will also use market share to measure the market power associated with trade dress. If a disproportionately large number of consumers prefer a trade dress, this trade dress might have market power leading to concerns.

Of course, it is possible that consumers prefer the trade dress due to the brand reputation signaled by the trade dress. In other words, the market share or inelasticity advantage might be reputation related, which is allowed by trademark law. This issue is not addressed in this article. Future empirical studies should further develop on it.

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89 *Id*.

90 Bain, *supra* note 26, at 38.

91 Rhoades, *supra* note 88, at 351-59.

92 Gale, *supra* note 26.

93 Burgunder, *supra* note 2.

94 *Id*.

95 Horizontal Merger Guidelines, § 5 (2010).

96 *Qualitex*, 514 U.S. 159 (1995).

V. TESTING MARKET POWER OF COLOR TRADEMARKS

Color trademarks are colors used for the whole or a specific part of a product's appearance, product packaging, store decorations, and advertisements, etc., to identify the product or service provider.[97] Prominent examples of color trademarks are T-Mobile's magenta, Tiffany's blue, and Louboutin's red.[98] These are used prominently in commercial communications, including advertisements, retail outlets, and, where applicable, product packaging.

This study chooses color trademarks, a subcategory of trade dress, to test market power. Many color trademark cases are litigated not only in the United States but also in other places in the world.[99] Exploring empirical methods to test market power resulting from trademark rights granted to colors can help law practitioners decide the aesthetic functionality of color trademarks and may also inspire future studies to develop empirical methods to address the aesthetic functionality of other categories of trade dress, such as shapes or the combination of colors and shapes.

In the following sections, this study conducts data mining on Amazon to measure market share and uses a human-subject experiment to test the inelasticity of colors. Both the data mining and the experiment are conducted on three products—winter hats, winter scarves, and electric cords for home use.

A. Market Share Tested by Amazon Data Mining

1. Method

This study chooses Amazon as the platform to mine data because Amazon is the largest online retailer in the United States and its website contains massive amounts of information, including color data on goods offered for sale. According to eMarketer.com, Amazon generated 49.1% of online retail sales in the United States in 2018, followed by eBay (6.6%), Apple (3.9%), Walmart (3.7%), and other

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97 § 1202.05 Trademark Manual of Examining Procedure, July 2021, United States Patent and Trademark Office; Burgunder, *supra* note 2, at 608-609.

98 The European Court of Justice deemed Louboutin's red sole mark as a position mark. *See* Christian Louboutin v. Van Haren Schoenen, [2018] C-163/16. The Second Circuit considered Louboutin's red sole mark as a color trademark. *See* Christian Louboutin S.A. v. Yves Saint Laurent America Holding, Inc., 696 F.3d 206 (2d Cir. 2012). This article adopts the Second Circuit's view on this issue. It is, of course, conceded that the Louboutin red is claimed for only a specific part of the products, while T-Mobile's magenta and Tiffany's blue are applied across the entire range of the commercial communication including the products or their packaging themselves.

99 Two prominent cases from the EU are *Libertel Groep BV v. Benelux Merkenbureau*, [2003] C-104/01; and *Oberbank AG v. Deutscher Sparkassen- und Giroverband eV, Banco Santander SA and another v. Same* [2014] C-217/13 and C-218/13; and from Japan, see, by way of example, *Sanyo Electric v. Twinbird*, Osaka High Court judgment of Mar. 27, 1997 (29 Chisai 368).

online retailers.[100] In litigation, Amazon is not always the best platform to collect data, particularly for those products or services not sold on Amazon such as vehicles, raw materials, and financial services. Litigants should choose the platform according to the context in the case—for example, primary distribution channels and consumer shopping habits. Part VI will discuss this issue with details.

The study selects three products—winter hats, winter scarves, and electric cords—to purposely test two kinds of products, namely, color-sensitive and color-neutral products. Regarding winter hats and scarves, consumers may strongly care about the colors (color-sensitive products). This will be less so for electrical cords (color-neutral products). Choosing the two kinds of products is to offer an example for litigation. In a color trademark case, litigants should include two products in data mining. The disputed product is the tested product, the counterpart of hats and scarves. Litigants should also select a product that is color neutral as the baseline product, the counterpart of electrical cords here. That allows litigants to assess the market power of the disputed product by comparing it with the baseline product.

This data mining chooses colors according to color categories of the United States Patent and Trademark Office ("USPTO"). The USPTO allows parties to register color trademarks under eleven categories: blue, red/pink, yellow/gold, green, brown, purple, orange, black, white, gray/silver, translucent.[101] The data mining includes all USPTO color categories except "translucent," as translucent winter hats or scarves are not relevant in the market.

One difficulty in this data mining is that the sale quantity of each color is not available on Amazon. An alternative proxy has to be found. The study decides to use the number of sellers as the alternative proxy because if a color has a high demand, namely a large market share, it will naturally attract many sellers. Therefore, when the sale quantity data is not available, the number of sellers can be a non-ideal but reasonable proxy to tell the market share enjoyed by a color.

The method is simply to enter the color and the product (e.g., "red coffee maker") as keywords in Amazon's search bar and obtain the number of "results" of each colored product returned by the Amazon search engine. The number of results is the number of sellers. Market share is usually held by a company or a brand. For the data mining, we suppose market share is held by a color.

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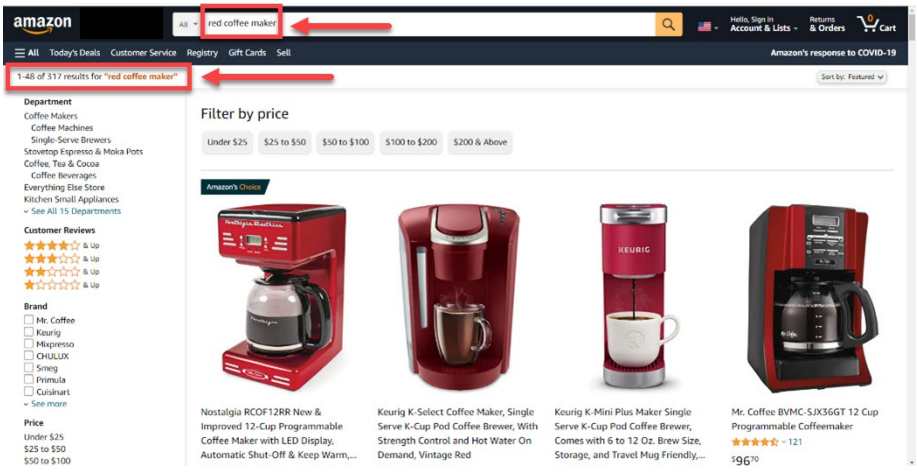
100 EMarketer Editors, *Amazon Now Has Nearly 50% of US Ecommerce Market*, eMarketer (July 16, 2018), https://www.emarketer.com/content/amazon-now-has-nearly-50-of-us-ecommerce-market [https://perma.cc/H6MU-3983].

101 *See* USPTO Trademark Design Search Code Manual, Table of Categories, Miscellaneous, 29.02-29.07, http://tess2.uspto.gov/tmdb/dscm/dsc_29.htm#29 [https://perma.cc/E4F5-M5CE]. In the EU, in turn, precise indications of color codes (e.g., Pantone) are required.

Figure 1. Illustration of the Amazon data mining method.



By way of example, the term "red coffee maker" is first entered in Amazon's search bar (see Figure 1), with the search engine returning 317 results for "red coffee maker." Then, other colors are introduced by entering "blue coffee maker," "yellow coffee maker," "green coffee maker," etc. Then, the number of "results" for each color is returned by the search engine.

2. Results and Analysis

As stated, the data mining was carried out for three products: winter hats, winter scarves, and electric cords for home use. The results indicate that market shares of different colors are at different levels across these products. Tables 2–4 reveal three levels of market share. Level 1 is black. For all three products, black is the most popular in the market (14%–30%). Level 2 includes mainly white, gray/silver, blue, red/pink, which take market shares from 8% to 15%—less prevalent than black (the exceptions are yellow/gold and green electrical cords that also take 8%).[102] Level 3 covers the remaining colors—purple, green, orange, yellow, brown, and occasionally gray/silver—which are the least popular. These colors each take lower than 8% of the market share and most of them have only around 5%.[103]

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[102] Level 2 colors of electrical cords are slightly different from colors of winter hats and scarves. For electric cords, the second level also includes yellow/gold and green. Besides, the white electrical cords have a relatively higher market share of 24%, which is closer to black. A reason could be that white is a traditional color for electrical cords and therefore the market share of white is closer to that of black in level 1. Similar considerations may apply to yellow/gold, which increase visibility of electrical cords.

[103] The gaps between levels 1, 2, and 3 are obvious on hats and electrical cords but might shrink relatively on scarves.

Table 2. Number of Items of Different Colored Winter Hats for Sale on Amazon

	Black	Blue	Gray/Silver	White	Red/Pink	Yellow/Gold	Green	Brown	Purple	Orange
Items	35,596	24,537	21,799	18,176	18,166	9,277	8,200	7,748	5,694	5,248
Percent	23%	16%	14%	12%	12%	6%	5%	5%	4%	3%

Source: Data collected from Amazon.com, 2015[104]

Table 3. Number of Items of Different Colored Winter Scarves for Sale on Amazon

	Black	Blue	Red/Pink	White	Gray/Silv	Yellow/Gold	Purple	Green	Orange	Brown
Items	9,705	9,632	9,133	7,849	7,568	7,395	5,052	4,203	4,091	4,058
Percent	14%	14%	13%	12%	11%	11%	7%	6%	6%	6%

Source: Data collected from Amazon.com, 2015

Table 4. Number of Items of Different Colored Electrical Cords for Sale on Amazon

	Black	White	Red/Pink	Yellow/Gold	Blue	Green	Orange	Purple	Gray/Silver	Brown
Items	68,812	51,379	24,728	19,007	17,90	17,348	11,860	7,843	4,969	2,623
Percent	30%	23%	11%	8%	8%	8%	5%	4%	2%	1%

Source: Data collected from Amazon.com, 2015

This study further checks the results by Chi-square analysis, a statistical tool to verify whether the difference among groups (here color categories) is significant.[105] The outcomes of this analysis do indicate that market share varies with color across the three products.[106]

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104 The data was collected in 2015, and it might not reflect the current color preference on the three products. The author only uses the data to exemplify how to conduct data mining, estimate the market share of each color, and predict the potential anti-competitive effect. Litigants can follow the proposed method to mine data and generate evidence to support their cases of color trademarks. But they should not directly take the data results of this study as the evidence in their cases.

105 The purpose of Chi-square analysis is to verify that the differences of market share are associated with colors. Put simply, if the P-value in the Chi-square analysis is less than 0.05, it means there are differences associated with colors. For a full overview of Chi-square analysis refer to Robert M. Lawless, Jennifer K. Robbennolt, and Thomas Ulen, Empirical methods in law, 247-264 (2010).

106 The results of Chi-square calculation are: winter hats: X2 (9, N = 154,441) = 57,809, p-value < .001; winter scarves: X2 (9, N = 68,686) = 7,069.3, p-value < .001; electrical cords: X2 (9, N = 226,471) = 179,890, p-value < .001. The p-value of all three products is smaller than 0.05, which means that the market share does vary with color across three products.

As discussed in Part IV.B, market share is one proxy of market power. Different market shares associated with colors imply that protecting some colors through trademarks such as black on these products may grant market power to the trademark owner and prevent competitors from competing efficiently with these products. This data method, therefore, can reveal the market power of a disputed color. If litigants offer such evidence in litigation, courts can build their decisions of aesthetic functionality on a less subjective basis, compared with relying only on intuitions of consumer responses or competition consequences. The method suffers in accuracy by using the number of sellers on Amazon to represent market share. Part VI will further discuss how to improve the measurement accuracy.

An extra finding is that product type influences color market shares significantly. Figure 2 uses a line chart to illustrate the distribution of color market shares on winter hats and winter scarves. The horizontal axis is for ten colors and the vertical axis is the market share in percentage. One might notice that the lines of winter hats and winter scarves have similar shapes, which means the distribution of color market shares on the two products are similar.[107] However, in Figure 3, the line of electrical cords is significantly different from lines of winter hats and winter scarves.[108] For electrical cords, the market share of the color white is relatively higher, while the color gray is relatively lower (see Figure 3), compared with winter hats and scarves. Therefore color market share trends on one product cannot be generalized to other products, so litigants cannot generalize the data on one product to all cases. They must analyze the data for disputed products on a case-by-case basis. In addition, the results also show that electrical cords are not a good baseline product in litigation because it is not color neutral (Figure 3). Black and white have substantial larger market shares (black: 30% and white: 23%) than other colors.

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[107] The chi-square analysis also indicates that the distribution of color market shares on winter hats and winter scarves have no significant difference: winter hats vs. winter scarves: X2 (9, N = 200) = 5.69787, p-value = .7697.

[108] The chi-square analysis re-affirms that the distribution of color market shares of electric cords are significantly different from that of winter hats and winter scarves: winter hats vs. electric cords: X2 (9, N = 200) = 105.410, p-value < .0001; winter scarves vs. electrical cords: X2 (9, N = 200) = 88.233, p-value < .0001.

Figure 2. Color preference trends on winter hats and winter scarves.

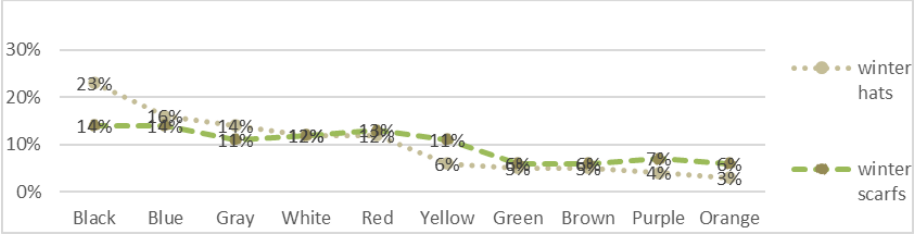
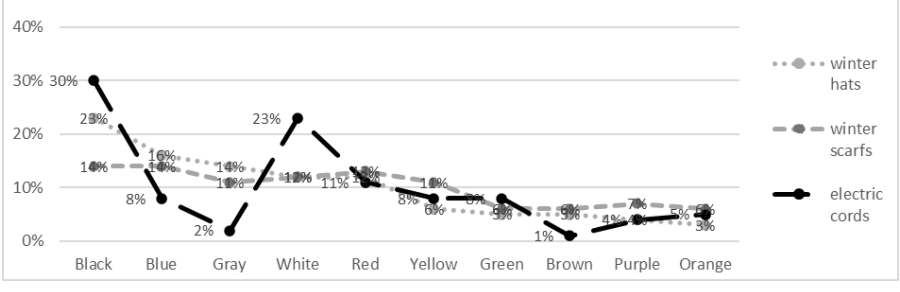


Figure 3. Color preference trends on winter hats, winter scarves, and electrical cords.



B. Inelasticity Tested by an Experiment

1. Method

To test the inelasticity of colors, the study designs an online experiment on the Qualtrics platform and recruits participants throughout the United States using Amazon Mechanical Turk ("MTurk"). Qualtrics is a platform for users to design surveys.[109] MTurk is a crowdsourcing platform that can recruit a large number of participants, according to the requirements of researchers, to complete online experiments or surveys.[110] This platform is criticized due to participants with political bias and problems caused by the "online" nature.[111] However, these issues do not impact the experiment in this study, which concerns color trademarks and consumer behaviors that have no obvious relation

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109 Qualtrics Survey Basic Overview, https://www.qualtrics.com/support/survey-platform/survey-module/survey-module-overview/?parent=p002 (last visited June 26, 2022).

110 Amazon Mechanical Turk, https://www.mturk.com/ (last visited June 24, 2022).

111 Adam J. Berinsky, Gregory A. Huber & Gabriel S. Lenz, *Evaluating Online Labor Markets for Experimental Research: Amazon.com's Mechanical Turk*, 20 Pol. Analysis 351, 356 (2012); Samuel D. Gosling, Simine Vazire, Sanjay Srivastava & Oliver P. John, *Should We Trust Web-based Studies? A Comparative Analysis of Six Preconceptions about Internet Questionnaires*, 59 Am. Psych. 93, 94 (2001).

to political ideology. Additionally, marketing and shopping frequently takes place on the Internet, which justifies sampling Internet users. In addition, some empirical studies have proved that participants of the MTurk platform produce similarly reliable results compared with offline participants.[112]

The experiment presents participants with three products—winter hats, winter scarves, and electrical cords—in different colors and asks them to choose the one they prefer. Each product has six color options: black, red, blue, purple, orange, and yellow. Three prices—$8, $10, and $12—are randomly assigned to two colors each (see Figures 4–6). In normal experiments testing inelasticity, the choice of price is important because the PED value varies at different price points. However, litigants are concerned little about this choice, as the specific case has already decided the price. Litigants should choose the market price of the disputed product in the case. Therefore, this experiment here mainly considers how to make the price change more obvious in choosing the price. It chooses $10 as the middle price because people tend to quickly sense the degree of increase or decrease from $10. The choice of the lower price of $8 and the higher price of $12 is also for participants to feel the price change easily. Part VI will further discuss how to choose the price and set the price change in litigation.

Figure 4. Hat with six colors and three prices presented in the experiment.

112 J.K. Goodman, C. E. Cryder & A. Cheema, *Data Collection in a Flat World: The Strengths and Weaknesses of Mechanical Turk Samples*, 26 J. Behav. Decision Making 213 (2013); Michael D. Buhrmester, Tracy Kwang & Samuel D. Gosling, *Amazon's Mechanical Turk: A New Source of Inexpensive, Yet High-Quality, Data,* 6 Persp. on Psych. Sci. 3 (2011).

Figure 5. Scarf with six colors and three prices presented in the experiment.

Figure 6. Home-use electrical cord with six colors and three prices presented in the experiment.

It is not practical to cover all ten colors in this experiment because of the sample size and budget limitation. Six colors have been chosen for the experiment: black, blue, red, purple, orange, and yellow. These colors have been picked from each level of market share based on Amazon data from Part V.A: Black in level 1, the most preferred color; blue and red in level 2, which attract fewer consumers; and yellow, purple, and orange from level 3, which capture the fewest consumers in the market.

The participants will first answer several demographic questions, including whether the participant is color-blind.[113] Each participant is then given $30 in fake money before viewing the products.[114] They would try their best to buy the three products without spending more than $30. Participants will see the first product, a hat, with different colors and prices. Above the product image is an instruction: "Please choose the one you want to buy and the money will be deducted from your account" (see Figure 4). They will choose one. The system will deduct the money used and show participants the money left in their accounts. Then, participants will see the second product, a scarf (see Figure 5) with different colors and prices with the same instruction and choose one they prefer. The system will show them the amount of money left in their accounts again. Lastly, participants will go to the third product, a home-use electrical cord (see Figure 6), with the same process.

Due to the limited sample size of this experiment, the study does not allow participants to choose "none of the colors above" or skip the question if they do not like any of the six colors. In a specific case, litigants should offer a choice of "none of the above" for participants.

The measurement used in this experiment is PED (price elasticity of demand), the specific formula of which is as follows:

$$\left|\left[\frac{Q2-Q1}{\frac{(Q2+Q1)}{2}}\right]/\left[\frac{P2-P1}{\frac{(P2+P1)}{2}}\right]\right|.$$[115]

2. Results and Analysis

Three hundred sixty participants participated in this experiment. Four participants were color-blind according to their answers to demographic questions and were not counted. Therefore, this study analyzed the data of 356 participants.

Table 5 illustrates how many participants chose each color regardless of price. For all three products, over 40% of the participants chose black, which captures almost half the participants; followed by blue and red, with percentages of participants of 14% and 28%, respectively. Orange, yellow, and purple are preferred by the lowest percentage of participants, less than 12%. The chi-square analysis verifies that different

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113 The experiment promised to treat personal information as confidential and got the consent of each participant.

114 $30 in total is to impose a pressure on participants. Participants face a limited budget and sense that the money might not be enough for all three products if they do not take the price seriously in each round.

115 Gillespie, *supra* note 25, at 43.

percentages are associated with colors.[116] This means consumers consider certain colors significantly differently.

Table 5. 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%

The experiment's main purpose is to test the inelasticity of each color by calculating the PED values. Table 6 records the number of participants who chose each color at each price for each product. One can observe that, overall, the number of participants (buyers) decreases in response to the price increase from $8 to $10 to $12. The author calculated the PED values by passing the data in Table 6 through the following PED formula:

$$\left(\left|\left[\frac{Q2-Q1}{\frac{(Q2+Q1)}{2}}\right]/\left[\frac{P2-P1}{\frac{(P2+P1)}{2}}\right]\right|\right)$$

For example, when the price of black hats increases from $8 to $10, the number of participants choosing black hats decreases from 77 to 44. Therefore, the PED value of black hats on the price change from $8 to $10 is as follows:

$$\left|\left[\frac{44-77}{\frac{(44+77)}{2}}\right]/\left[\frac{10-8}{\frac{(10+8)}{2}}\right]\right| = 2.45$$

Following the same calculation, Table 7 shows the PED values in response to the price increase from $8 to $10 and from $10 to $12 on each product with each color. Litigants can do the calculation with free online PED calculators instead of manually.[117]

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[116] Hat: X2 (5, N = 356) = 248.38, p-value < .05; Scarf: X2 (5, N = 356) = 237.22, p-value < .05; home use electrical cord: X2 (5, N = 356) = 139.13, p-value < .05. If participants are indifferent to color, the percentage of participants choosing any color should be 16.67% or 1/6 (the expected value). The chi-square analysis shows that the observed values (the actual percentage of participants choosing each color in this experiment) are significantly different from the expected value (16.67%). Therefore, the expected value (the null hypothesis) is rejected and the assumption that people are indifferent to color is *not* true.

[117] *Price Elasticity of Demand (PED) Calculator*, https://goodcalculators.com/price-elasticity-of-demand-calculator/ (last visited June 24, 2022).

Table 6. Participant Numbers Choosing Each Color at Each Price

		Black	Red	Blue	Yellow	Purple	Orange
Hat	$8	77	35	36	6	24	10
	$10	44	19	13	4	10	4
	$12	40	10	11	3	9	1
Scarf	$8	71	41	32	7	15	7
	$10	41	29	17	7	9	4
	$12	37	21	10	1	5	2
Cord	$8	76	39	36	24	25	22
	$10	44	8	11	7	11	12
	$12	21	4	5	5	4	2

Table 7. PED Values Over $8–$10 and $10–$12

		Black	Red	Blue	Yellow	Purple	Orange
Hat	$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
Scarf	$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
Cord	$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

Note: PED values between 0 and 1 in bold.

As pointed out in Part IV.A, if the PED value is between 0 and 1, it means the color is inelastic and has relatively strong market power. When the PED value is greater than 1, the color is elastic and has relatively weak market power. When PED is 0, the color is perfectly inelastic and has the largest market power.

Let us examine the results in Table 7 based on this standard.

For hats, when the price increases from $10 to $12, the PED values of the colors black, blue, and purple are 0.52, 0.92, and 0.58, which are between 0 and 1. It means that black, blue, and purple are inelastic when the price increases from $10 to $12. The data implies that granting trademark protection on black, purple, or blue on hats is likely to give market power to the trademark owner in this price range.

For scarves, the PED value of black is between 0 and 1 from $10 to $12, which means black scarves are inelastic at this price range and have relatively strong market power. The PED value of yellow from $8 to $10 is 0, which means yellow scarves are perfectly inelastic and likely to have the largest market power when the price

goes from $8 to $10. These results imply that trademarking black or yellow may confer market power on the trademark owner.

The interesting examples are blue hats, purple hats, and yellow scarves. These colors do not attract the most participants in the experiment. Their market shares (17% for blue hats, 12% for purple hats, 4% for yellow scarves, see Table 5) are smaller than black (40% +, see Table 5). However, these colors can be inelastic at a certain price range. This phenomenon shows the possibility that colors without big market shares might also have the market power to retain consumers against the price increase.

As discussed in Part IV, PED value varies with the choice of prices. Therefore, the PED values and the market power revealed in this experiment are only for the prices from $8 to $10 to $12 and are not applicable to any other price points.

For electrical cords, no PED value is less than 1, which means participants are not willing to pay a higher price on any colored electrical cords but simply choose the cheapest. Two facts might explain this result. First, consumers might not care about the electrical cord's color as much as the hat's or the scarf's color. Second, the experiment order might distort the results. Electrical cords are the last product shown to subjects. The less money remaining in the participants' accounts might force them to choose the cheapest electrical cords regardless of color. A future study should randomly assign product order to control this noise.

The purpose of the data mining and experiment is not to prove that granting trademark protection on black, blue, purple, and yellow will hinder competition, but rather, that available data resources and empirical methodologies have the potential to measure the market power of a color accused of being aesthetically functional on the facts of a particular case. The approach is refined below.

VI. A NEW EMPIRICAL APPROACH FOR LITIGANTS AND COURTS

This section will discuss an empirical approach combining data mining and an experiment to test the market power of color trademarks, in order to make the courts' decisions on aesthetic functionality less intuitive.

Litigants should start with data mining. If data mining shows that the disputed color has market power in the sense of market share, the data could make a prima facie case for competition hindrance, unless the market share is due to the brand reputation. If not, litigants might consider whether the disputed color is inelastic. Litigants might conduct an experiment to test for inelasticity. This section will elaborate on how to conduct the data mining and experiment in real cases.

A. Data Mining for Color Trademark Litigation

The data mining method has been described in Part V.A. This section will discuss other key respects of conducting data mining to test market power: the selection of the baseline product, the selection of and alternative colors and the determination of market power.

1. Selection of a Baseline Product

As mentioned in Part V, the litigants should include two products in data mining: the disputed product and the baseline product. The purpose is to assess market power of the disputed product by comparing it with the baseline product. The baseline product should be color neutral or close to color neutral. The data mining results in Part V indicate that electrical cords are not color neutral and therefore should not be the baseline product. Litigants can consider other products, for instance, batteries, disposable cleaning gloves, cleaning sponges, etc. as the baseline product.

2. Selection of Alternative Colors

Litigants should include as many alternative colors as possible. If the data mining includes insufficient alternative colors, the disputed color's market share would appear mistakenly larger than its real market share. Judges might decline this data mining evidence because of its weak validity.

When selecting alternative colors, litigants can consider purchase intention evoked by colors. They might start with identifying the disputed color's advantage that leads to high purchase intention and find other colors with the same advantage. They can decide the color's advantage according to the nature of the disputed color, the context where the color is used, the function of the disputed product, consumer habits, and other contextual factors in specific cases. For example, in *Brunswick*, the disputed color was black on outboard engines.[118] Black might attract purchases, as it goes well with any other color.[119] So, litigants might include those colors having the same matching advantage. In fact, a variety of neutral colors—such as white, gray, beige, khaki, nude, etc.—do go well with other colors. Therefore, these neutral colors should be included in the data mining as alternative colors. In addition, some colors might evoke high purchase intention by advantages distinct from the disputed color. These colors should also be included. For example, in the *Brunswick* situation, consumers might prefer blue- and green-colored outboard engines because the two colors are

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118 Brunswick Corp. v. British Seagull Ltd., 35 F.3d 1527 (Fed. Cir. 1994).

119 *Id.*

associated with lakes and the sea. Thus, litigants should consider including blue and green as alternative colors. The purpose of this step is to include as many potentially relevant alternative colors as possible, therefore litigants need not be 100% sure that the colors selected have advantages and definitely evoke purchase intention. Litigants can choose the colors based on their intuitions and knowledge or advice from their clients in this step. The data mining in the next step will measure the market share of each color.

Sometimes, it is difficult for litigants to decide which colors evoke purchase intention because the psychological effects can be implicit and complicated. An optional method of selecting alternative colors is to include all main colors based on USPTO color categories. As mentioned, the USPTO makes it possible to register single colors in eleven categories. Seven categories are chromatic (red/pink, blue, green, orange, yellow, purple, brown) and four are achromatic (black, white, gray, translucent). In each chromatic category, colors vary in brightness and saturation. Brightness measures how black/white a color is (range: 0%–100%), and saturation means how gray/colorful a color is (range: 0%–100%). In each of the seven chromatic categories, litigants should pick four colors with low or high saturation and brightness. The idea is to reasonably exhaust the main shades (colors varying on saturation and brightness) from each chromatic category. For example, in the blue category (Figure 8), litigants may choose blue with high saturation / high brightness (A), blue with high saturation / low brightness (B), blue with low saturation / high brightness (C) and blue with low saturation / low brightness (D). By this method, litigants will include 28 chromatic colors (7 chromatic categories * 4 specific colors) as alternative colors. Picking four specific colors in each chromatic category reasonably exhausts the main distinguishable shades within the chromatic category, because, in general, the USPTO only allows two or three specific colors to coexist in one chromatic category.[120]

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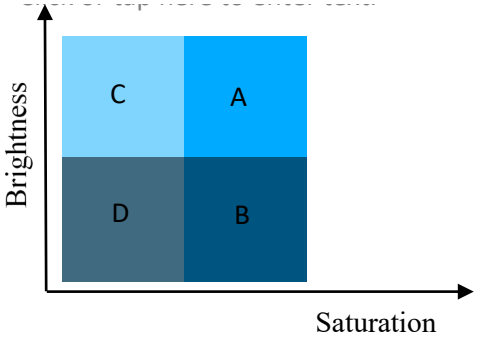
[120] Through USPTO Trademark Electronic Search System (TESS), https://tmsearch.uspto.gov/bin/gate.exe?f=login&p_lang=english&p_d=trmk (last visited June 26, 2022), one can find that only two or three single colors coexist in one chromatic category in the USPTO. For example, through the link provided above, one can search all single-color trademarks used on the outsole of shoes. The steps are as follows: (1) click the link provided above, and in the next page, click "Word and/or Design Mark Search (Free Form)," (2) in the Search Terms, enter the code "290301[DC] AND SHOE [DD]" (the code means "the single color red/pink used on a portion of shoes" according to USPTO Trademark Design Search Code Manual, Table of Categories, Miscellaneous, 29.03, http://tess2.uspto.gov/tmdb/dscm/dsc_29.htm#29, last visited June 26, 2022), (3) click the button "Image List." The search result indicated that up to June 26, 2022, only two colors on the outsole of shoes coexist: one is a dark pink color (Serial No. 88491643) and another one is a red color (Serial No. 77141789). The third color trademark, a light pink color (Serial No. 85149118), is dead due to a conflict with the prior red color trademark (Serial No. 77141789/Reg. No. 3361597). *See* USPTO Office Action against U.S. Application Serial No. 85149118, https://tsdr.uspto.gov/documentviewer?caseId=sn85149118&docId=OOA20110126135031#docIndex=8&page=1 [https://perma.cc/QL7N-EVF4]

Figure 8. Four colors in the blue chromatic category.[121]



Then litigants should also add four achromatic colors: black, white, gray, and translucent into alternative colors. Litigants do not need to distinguish brightness and saturation in this step because consumers might not distinguish variations of brightness and saturation on black, white, gray, and translucent. After this, litigants might also add two colors: gold and silver as alternative colors.[122] Therefore, by this strategy, litigants include 34 different colors (28 chromatic colors + 4 chromatic colors + gold + silver) in the data mining.

(last visited June 26, 2022). By the same search method (only changing the search code to "290303[DC] AND SHOE [DD]"), one can find that in the blue category, only one blue color exists on the outsole of shoes (Serial No. 90038072). USPTO rejected a cyan color application (Serial. No. 87284931) by a prior blue trademark (Reg. No. 4736873). *See* USPTO Office Action against U.S. Application Serial No. 87284931, https://tsdr.uspto.gov/documentviewer?caseId=sn87284931&docId=OOA20170131214826#docIndex=2&page=1 [https://perma.cc/QLY2-DJCG] (last visited June 26, 2022). USPTO rejected another blue trademark (Serial No. 85288621) for other reasons. *See* USPTO Office Action against U.S. Application Serial No. 85288621, https://tsdr.uspto.gov/documentviewer?caseId=sn85288621&docId=OOA20110428112255#docIndex=2&page=1 [https://perma.cc/QA5L-YPJP] (last visited June 26, 2022). By the same search method (only changing the search code to "290306[DC] AND SHOE [DD]"), one can find that in the green category, only one green-color trademark on the outsole of shoes (Serial No. 86691919) exists. USPTO rejected a lime color (Serial No. 85335704) and a green color (Serial No. 88288570) by a prior dark green color (Reg. No. 3659582). *See* USPTO Office Action against U.S. Application Serial No. 85335704, https://tsdr.uspto.gov/documentviewer?caseId=sn85335704&docId=OOA20110711211256#docIndex=16&page=1 [https://perma.cc/A89Q-4VJD] (last visited June 26, 2022); USPTO Office Action against U.S. Application Serial No. 88288570, https://tsdr.uspto.gov/documentviewer?caseId=sn88288570&docId=OOA20190430113047#docIndex=1&page=1 [https://perma.cc/9TNS- 65P7] (last visited June 26, 2022).

121 The author picks colors in Figure 8 by the HSV system of Google color picker. *Google Color Picker*, https://htmlcolors.com/google-color-picker (last visited June 24, 2022). The hue degree is 200. A: brightness 100%/saturation 100%, B: brightness 50%/saturation 100%, C: brightness 100%/saturation 50%; D: brightness 50%/saturation 50%.

122 Although USPTO puts gold under the yellow category and silver under the gray category, in color registration examination, USPTO considers gold distinguishable from yellow, and silver distinguishable from gray. So, litigants might also include gold and silver as two distinct colors from yellow and gray in the data mining.

Last, litigants might further exclude impractical colors from alternative colors. For example, some colors may have significantly higher production costs than the disputed color. Litigants can get this knowledge from their clients. Some colors are obviously not suitable as alternative colors on some products or services. For example, shining colors such as red or orange may not be appropriate for products or services for funerals. These colors should not be chosen as alternative colors. Further, litigants might also exclude those colors that have been already claimed as color trademarks.

3. Judgment on Market Power

Analyzing the data, litigants would obtain the market share in percentage for the disputed color. However, is the disputed color's market share large enough to hinder the competition? There is no uniform answer. Litigants and judges should evaluate two factors: the number of alternative colors and the disputed color's market share (see Table 8).

Table 8. Two Factors and Conclusions on Market Power and Aesthetic Functionality

<table>
<tr><th></th><th>Factor 1: The number of alternative colors</th><th>Factor 2: Market share of the disputed color</th><th>Market Power</th><th>Aesthetic functionality</th></tr>
<tr><td>Situation 1</td><td>Limited</td><td>---</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Situation 2</td><td rowspan="3">Many</td><td>High</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Situation 3</td><td>Middle</td><td rowspan="2">Depending on the experiment</td><td rowspan="2">Depending on the experiment</td></tr>
<tr><td>Situation 4</td><td>Low</td></tr>
</table>

Having decided alternative colors by the methods in Part VI.A.2, litigants may first check the total number of alternative colors. If the alternative colors are limited (Situation 1), there is no need to further conduct data mining because the competition hindrance in this situation is obvious, no matter the market share of the disputed color—large or small. When the entire number of available colors is limited, claiming a trademark right on any one color restricts the choices for new entrants and therefore curtails competition. The question is how many alternative colors would count as "limited"? It is impossible to establish a magic number because of the contextual

difference of various cases. One suggestion to litigants and judges is to look at the number of existing competitors who produce the same products (litigants might obtain the approximate number of existing competitors from their clients). The number of alternative colors should not be fewer than the number of primary competitors. For example, with more than 100 players in an industry, such as the luminaire industry in *Keene*, twelve to fifteen alternative designs might be limited because this number is far lower than that of competitors.[123] But in an industry with four or five main players, such as the air industry, fifteen alternative designs or colors may not be deemed "limited."[124] Therefore, when the alternative colors are far fewer than primary competitors, litigants should decide the alternative colors are limited and fall into Situation 1. In this situation, litigants can prove the competition without the data mining process.

If the number of alternative colors is far higher than that of main competitors, litigants should consider the number as "many." Litigants can conduct the data mining and check the market share of the disputed color. If the disputed color has a relatively high market share (Situation 2), then the disputed color might have market power. Trademarking the disputed color may allow the trademark owner to exclusively and permanently control a big segment of the market, granting an advantage over the quantity of goods sold in relation to rivals.

If the disputed color has a market share in the middle level (Situation 3), or the low level (Situation 4), the disputed color may not have market power unless it is inelastic. In Situations 3 and 4, litigants could take an experiment to further check whether the disputed color is inelastic. Part VI.B will explain how to proceed with Situations 3 and 4.

To decide when the market share of the disputed color falls into the high, middle, or low level, litigants and judges should observe the distribution of market shares of all colors and check if there are clear clusters (levels). For example, the Amazon data on winter hats indicated three levels (clusters) of color market shares (see Table 2). Black hats are at the first level (23%), white, gray/silver, blue, red/pink are at the second level (12%–16%), other colors are at the third level (3%–6%). Therefore, black hats have a large market share (Situation 2), white, gray/silver, blue, red/pink hats have a middle market share (Situation 3), while the remaining colors have a low market share (Situation 4). However, if the distribution of market shares is relatively even and therefore no clear clusters (levels) are indicted, it means that all colors have similar market

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123 Keene Corp. v. Paraflex Indus., Inc., 653 F.2d 822, 827 (3d Cir. 1981); Wang, *supra* note 12.

124 Wang, *supra* note 12.

share. Then, litigants might deem the disputed color to have a middle market share (Situation 3).

To summarize, if the number of alternative colors is lower than that of main competitors, litigants might consider it as "limited" (Situation 1). In this situation, litigants may conclude that the disputed color has market power, and granting a trademark right is likely to hinder competition. Therefore, the disputed color is aesthetically functional, without conducting data research. Otherwise, litigants need to conduct the data mining and look at the market share of the disputed color. With clear clusters of market shares in the data, litigants can conclude that the disputed color has the market power and is aesthetically functional, if the market share of the disputed color is large (Situation 2). If the market share is of middle (Situation 3) or low level (Situation 4), litigants may consider an experiment to check whether the disputed color is inelastic. If the distribution of color market shares is relatively even, the disputed color should be deemed as having a middle level of market share and falls into Situation 3, where an experiment is also needed.

4. The Unaddressed Issues

The current data mining design cannot distinguish whether the market share is due to the brand reputation or the color itself, particularly in a case where the disputed color signals a famous brand. Future studies might develop better empirical methods to isolate the market power brought by the trade dress itself from the reputation associated with the trade dress.

In addition, data from Amazon is convincing only for products for which Amazon is a substantial sale channel. For other products or for services that are not mainly distributed on Amazon, litigants have to look at other websites to conduct data mining. There are various online shopping websites, such as eBay.com, Etsy.com, InspireUplift.com, Overstock.com, Wish.com, Alibaba.com, Aliexpress.com, etc. Litigants can choose proper websites according to the sale channels of the disputed product. For example, although eBay is the second shopping website following Amazon, it might be improper for products sold at fixed prices because eBay sells products by auctions. Etsy.com can be a good place to source data of homemade products instead of factory-built ones. Besides, not all products are sold online. The data mining method cannot apply to those products/services purchased primarily off-line, such as vehicles or raw materials, etc. One alternative data method for off-line products/services is to check the availability of industrial reports on color preference. For example, coating companies—including PPG, Axalta, BASF, and DuPont—publish color

popularity reports on cars annually.[125] If the disputed color is included in such reports, litigants can use these reports as evidence to (dis)prove the color market power in the relevant industry.

Another limitation of data from Amazon is that it can apply only to product or package colors rather than to colors used on advertisements, websites, or store decorations. In addition, the current data mining method is straightforward for single-color trademarks, but it might not fit other categories of trade dress, such as product designs combining multiple design elements (colors, shapes, materials, structures, etc.), for example, the design of Longchamp's tote bag. Therefore, future studies might improve the data mining method to test other categories of trade dress. For example, machine learning methods have trained programs to recognize designated objects, faces, animals, etc. It is possible to train a program to identify a specific trade dress with multiple design elements and to use this program to mine the data on trade dress. However, these empirical methods could bring high litigation costs. This will be discussed in Part VII.

Future studies might further improve the construct validity (the validity of the measures)[126] of the data mining. Amazon does not provide sales quantity data. The data collected in this study is the number of sellers ("results") who are selling or offering to sell a color-specific product. Future studies can explore other websites where the sales quantity data is available and use Python programming or an application programming interface ("API") to extract the data. Python is a user-friendly programming language, by which users can draft a program and retrieve bulk data from websites. API is an interface that enables users to extract the data they want from a website. Many websites provide APIs for users to collect and analyze data on their websites.[127] For example, some

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125 *Colour Popularity Reports*, https://www.axalta.com/au/en_GB/newsroom/ColourPopularityReports.html (last visited June 24, 2022); *Global Color Report*, https://www.basf-coatings.com/global/en/shaping-the-future/driving_color_design/global_color_report.html (last visited June 24, 2022); *Blue Automobiles to Lift COVID Blues? PPG 2020 Automotive Color Report Shows Blue Hues Maintaining Pre-Pandemic Growth*, news.ppg.com (Feb. 9, 2021), https://news.ppg.com/press-releases/press-release-details/2021/Blue-Automobiles-to-Lift-COVID-Blues-PPG-2020-Automotive-Color-Report-Shows-Blue-Hues-Maintaining-Pre-Pandemic-Growth/default.aspx; Brake and Front End Staff, *DuPont Announces World's Most Popular Car Colors*, Brakeandfrontend.com (Dec. 3, 2009), https://www.brakeandfrontend.com/dupont-announces-world-s-most-popular-car-colors/.

126 L. J. Cronbach & P.E. Meehl, *Construct Validity in Psychological Tests*, 52 Psych. Bull. 281 (1955).

127 Google APIs Explorer, https://developers.google.com/apis-explorer/ (last visited June 24, 2022); Twitter API, https://developer.twitter.com/en/docs/twitter-api (last visited June 24, 2022); Graph API, https://developers.facebook.com/docs/graph-api/ (last visited June 24, 2022); Amazon Marketplace—Sell more, easier, and faster, https://www.productsup.com/ppc/amazon-marketplace-platform/?utm_campaign=UKI-EN-Search-Import-Export-Channels&utm_medium=cpc&utm_source=bing&utm_term=amazon%2

eBay sellers list each deal on their web pages and litigants may get the quantity sold for each colored product on this website through Python programing or the eBay API.[128]

B. Consumer Experiment in Color Trademark Litigation

If the Amazon data mining shows there are many alternative colors and the disputed color has a market share of a middle or low level (Situations 3 and 4 in Table 8), litigants may consider an experiment to further check whether the color is inelastic. Part V.B has demonstrated how to conduct the experiment on three products. This section will further elaborate on some issues when applying this method in real cases.

1. Colors and Prices

In such an experiment, litigants may include all alternative colors from previous data mining if the budget provided by their clients allows. This is because if there are insufficient alternative colors in the experiment, the participants are, in fact, forced to choose the disputed color due to limited alternatives. Therefore, the PED value of the disputed color might be mistakenly analyzed as smaller than it really is in the marketplace, and accordingly, the market power measured by PED could be mistakenly larger. Relying on such a result, courts might unduly recognize the trade dress as aesthetically functional. To avoid this mistake, judges could deny the experiment as evidence if they find it does not include enough alternative colors.

Regarding prices, litigants should use the real price of the disputed product as the baseline price. And they could increase or decrease the price by 5% to test the inelasticity of the disputed color. In antitrust law, the Federal Trade Commission ("FTC") often considered a 5% price change as a small but significant change in merger cases.[129] So it is reasonable to use this price change rate to test the inelasticity of colors. Besides, litigants should also consider whether a 5% price change will be sensed by participants in the experiment and make proper adjustments. In Part V.B, the experiment increases the price by 25% (from $8 to $10) and 20% (from $10 to $12). This is because the prices of hats, scarves, and

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0marketplace%20api&utm_matchtype=p&msclkid=a79c65aafa5212261c3907309df017 66&utm_content=Amazon%20marketplace (last visited June 24, 2022).

[128] eBay Developers Program, https://developer.ebay.com/develop/apis#:~:text=eBay%20 offers%20developers%20a%20wide,use%20of%20our%20RESTful%20APIs (last visited June 24, 2022).

[129] In horizontal merger cases, FTC applies a small but significant and non-transitory increase in price ("SSNIP"), usually around 5%, to test whether other products can substitute the disputed product and thus whether the two products constitute a one-product market. Horizontal Merger Guidelines, § 4.1.2 (2010).

electric cords are very low. A 5% price change would make a difference of only 50 cents, so participants would be very likely to stay with a color even when the price increases. By choosing a 20% and 25% price change, participants can easily and quickly sense the changes and make their choice. In real cases, litigants might set the price change at 5% or above, based on the price of the disputed product and the consumer sense of price changes.

2. Participants

The experiment in this article tested on daily-use products so that it did not ask participants whether they were purchasers of hats, scarves, or electrical cords. Litigants should require participants to be purchasers or users of the disputed product when recruiting participants. In addition, the experiment's participants should match the consumer profile—gender, age, income, job, etc.—of the disputed product. For example, the disputed product in *Louboutin* is women's high-heeled shoes.[130] Supposing the litigants want to test whether Louboutin's red sole design is inelastic for this case, female participants should make up a majority among the total participants. If the case is about whether John Deere tractors' green and yellow colors are aesthetically functional, litigants would need to recruit farmers as the majority of the experiment participants.

3. Experiment Strategy

The settings of the experiment are straightforward when a color is used for products or logos. However, if the color is being used for advertisements, websites, or the store environment, it is difficult to simulate color usage in the experiment. Litigants could present the images of the advertisements or websites to the participants. After the participants see the images, they may be directed to the next step, where their purchase intention will be tested. If the color is used in the physical store environment, litigants can refer to some of the methods psychologists have used in studying the effects of environmental colors. For example, a psychological study developed an online store to mimic a real store environment.[131] Litigants might learn from the method conducted online. They could develop a three-dimensional online store to mimic a real store and manipulate the colors of the three-dimensional store to test participants' reactions.

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130 Christian Louboutin S.A. v. Yves Saint Laurent America Holding, Inc., 696 F.3d 206 (2d Cir. 2012).

131 Lawrence L. Garber, Jr., Raymond R. Burke & J. Morgan Jones. *The Role of Package Color in Consumer Purchase Consideration and Choice* (Marketing Science Institute Working Paper No. 00-104, 2000), *available at* https://www.researchgate.net/publication/299552540_The_Role_of_Package_Color_in_Consumer_Purchase_Consideration_and_Choice [https://perma.cc/5EXD-WJVP].

4. The Unaddressed Issues

Like the data mining exercise, the current experiment design cannot address cases where the trade dress might attract consumers due to its reputation. Future studies might explore new experiment designs to isolate the brand reputation from the aesthetic value of the product feature.

Another weakness of the experiment is its high expense. In general, experiments would cost more than data mining. So, this study has suggested not conducting the experiment if the data mining exercise can prove the market share advantage of the disputed color. Future research might explore some data mining methods to test for inelasticity, as a way to replace the experiment. For example, future research might obtain the data on the quantity of prices and sales of the disputed trade dress and its alternatives, and therefore calculate the PED. Using data mining to replace experiments might not only save litigation costs but also improve the validity of the evidence, because data mining collects real market data.

VII. CONCLUSION

Granting a trademark right to a trade dress might prevent competitors from using the same or a similar trade dress to compete efficiently in the market. U.S. courts label such trade dress as aesthetically functional and deny the trademark protection. However, it is difficult for courts to diagnose when a trade dress is likely to hinder competition if protected.

Some scholars believe that courts have no capacity to discern the competition hindrance. They suggest courts return to the per se rule.[132] However, this approach is likely to over-penalize the attractive trade dress. Other scholars suggest that courts check psychological responses of consumers to determine whether a trade dress is aesthetically functional.[133] While not over-penalizing attractive trade dress, this approach may lead courts to guess or predict consumer responses.

Neither approach addresses the problem because they have not explored the empirical methods to improve courts' ability in deciding the competition hindrance. This study attempts to propose an empirical approach to make the decision of competition hindrance less subjective.

This article has identified the gap between normative research and judicial practice in determining aesthetic functionality. It enriches inter-disciplinary research by combining economic and empirical studies to address this practical problem on color

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[132] Bone, *supra* note 16; Wong, *supra* note 7.

[133] Hughes, *supra* note 20; Lunney, *supra* note 2.

trademarks. By exploring empirical methods for measuring the market power of colors, it presents the use of data mining and experiments as practical methods to address the aesthetic functionality of trade dress.

The article does not aim to offer a perfect empirical approach to solve the aesthetic functionality issue entirely. Instead, it opens a door for empirical methods to address this issue. The methods proposed here have several limitations, on which future studies can be further developed. In addition, litigation cost is a big concern when using empirical methods in judicial practice. Scholars such as Robert Bone proposed the per se bar against trade dress protection also due to the consideration of litigation costs.[134] While not denying high costs of empirical methods, the author believes that, in the long term, empirical methods are a promising path to improve judicial practice for issues like aesthetic functionality. First, the determination of aesthetic functionality includes factual/empirical aspects, which calls for empirical methods to interfere. Second, the digital age brings us big data and rich information available on social media and the public Internet. Some data contains important information to help judges improve their decision-making, particularly on issues consisting of factual aspects. It is a pity if legal practitioners do not make use of the data resources. Last, new data collection and processing methods are emerging every day. With the development of technologies, some data or information that is hard to get today might be collected later, and the imperfect empirical methods can be improved in the future. Looking at this trend, legal scholars and practitioners should keep track of the latest data technologies and research how to apply them to develop low-cost empirical methods to address judicial issues.

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[134] Robert G. Bone, *Enforcement Costs and Trademark Puzzles*, 90 Va. L. Rev., 2099 (2004).