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Borders and Boundaries in Markets: A Sociocognitive Approach for Market Definition and Implications for Antitrust

Elizabeth G. Pontikes[†]

ABSTRACT

Categorical distinctions are foundational to firm competition and regulation. Yet, market categories are notoriously difficult to define. The question of how to delineate markets is well-worn in the antitrust literature but is now the focus of a growing sociocognitive literature in strategy and organizational sociology.[1] *Historically, there has been little cross-pollination between these research areas. More integration, however, may be increasingly important in modern markets, where change is rapid, new technologies are key differentiators in many traditional industries, and platform competition is on the rise. In this paper, I introduce recent theoretical and empirical advances in sociocognitive research on categories in markets. I describe a theoretical model that incorporates the probabilistic nature of how people categorize, ambiguity in category boundaries, and that multiple audiences are relevant in most markets. Empirically, researchers employ a range of approaches to represent these aspects of market definition, from qualitative studies, to surveys, to computational approaches that leverage recent advances in machine learning applied to large corpora of text. I discuss key implications from this theoretical model and how they might inform market definition in antitrust.*

I. INTRODUCTION

Antitrust law restricts firms from having excessive market power to engage in business conduct that has anticompetitive effects.[2] Delineating market boundaries is at the heart of many antitrust cases.[3] For

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[1] The sociocognitive literature draws on cognitive science and sociology to model markets as systems of categories. *See* Part II for a detailed description.

[2] Market power is an economic term that describes a firm's ability to raise its prices above a competitive level without losing enough customers to make it unprofitable. For a discussion of antitrust law and market power, *see* William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 HARV. L. REV. 937 (1981); Frank Easterbrook, *The Limits of Antitrust*, 63 TEX. L. REV. 1 (1984).

[3] Gregory J. Werden, *The History of Antitrust Market Delineation*, 76 MARQ. L. REV. 123, 123

example, evaluating whether a prospective merger will result in enough market power for monopoly pricing, or whether bundling a set of products is anticompetitive, turns, in part, on whether the products in question are in the same market. Despite the importance of market delineation to antitrust, it is notoriously difficult. As Gregory Werden states in his 1992 history:

> A fitting summary of the lower court decisions on market delineation between 1962 and 1982 was provided by one district court: "Reported cases have largely been limited to governmental concerns for [the] protection of competition where courts have narrowed and broadened the product market without real criteria or consistency."[4]

David Glasner and Sean Sullivan suggest there has been little subsequent progress on this issue. They claim that Robert Pitofsky's decades-old remark that "no aspect of antitrust enforcement has been handled nearly as badly as market definition" still applies today.[5] In fact, the picture may be even more bleak in the modern era with industry boundaries increasingly blurred. Technology companies now compete in traditional markets like automobiles and media, and the rise of platform competition complicates the distinction between product complements and substitutes.[6]

As an example of market delineation in antitrust, consider the 1998 United States Department of Justice (DOJ) antitrust case against Microsoft. Much of the dispute hinged on whether operating systems and Web browsers constituted separate product markets.[7] If the products

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(1992) ("Market delineation is a critical stage in the structural analysis employed in many antitrust cases to help assess actual or potential market power."); Jonathan B. Baker, *Market Definition: An Analytical Overview*, 74 ANTITRUST L.J. 129, 129 (2007) ("Market definition is often the most critical step in evaluating market power and determining whether business conduct has or likely will have anticompetitive effects.").

[4] *See* Werden *supra* note 3, at 181 (quoting Calnetics Corp. v. Volkswagen of Am., Inc., 348 F.Supp. 606, 617 (C.D. Cal. 1972), remanded, 532 F.2d 674, 691 (9th Cir.), cert. denied, 429 U.S. 940 (1976)).

[5] David Glasner & Sean P. Sullivan, *The Logic of Market Definition*, 83 ANTITRUST L.J. 293, 293 (2020) (quoting Robert Pitofsky, *New Definitions of Relevant Market and the Assault on Antitrust*, 90 COLUM. L. REV. 1805, 1807 (1990)).

[6] Multi-sided platforms coordinate interactions among two or more sets of agents, which presents difficulties defining one relevant market. These were apparent in Ohio v. Am. Express Co. (*Amex*), 138 S. Ct. 2274 (2018), where the dissent called the majority's approach to grouping complements and substitutes into the same market "economic nonsense" (Breyer, J., dissenting) (quoting PHILLIP E. AREEDA & HERBERT HOVENKAMP, FUNDAMENTALS OF ANTITRUST LAW ¶ 565a, at 431 (4th ed. 2017)). For a detailed explanation of challenges in market definition under platform competition, *see* David Evans, *The Antitrust Economics of Multi-Sided Platform Markets*, 20 YALE J. ON REGUL. 325, 356–8 (2003).

[7] United States v. Microsoft Corp., No. CIV. A. 98-1232, 1998 WL 614485, at *1 (D.D.C. Sept. 14, 1998).

were considered separate, then the government's case was strengthened: it would be anticompetitive for Microsoft to provide their Internet Explorer browser free with their Windows operating system.[8] In Bill Gates' deposition, DOJ attorneys repeatedly asked if Gates marketed Microsoft's Internet Explorer browser and the Windows operating system as discrete products, or whether he presented the browser as part of the Windows operating system. This line of questioning aimed to demonstrate it was anticompetitive for Microsoft to promote browsers and operating systems in the same product market. At one point, a seemingly exasperated Gates responded: "I know [that Internet Explorer is part of Windows is] a true statement, but [we didn't do] anything to try to get anyone else to endorse the statement."[9] This exchange illustrates the challenge the court faced. There were at least two credible ways to define the market(s) for browsers and operating systems. First, the court could find that an operating system was a platform on which browsers run and that these were distinct products. Alternatively, a court could determine that a browser was a feature of an operating system in one product market. To determine whether it was anticompetitive for Microsoft to bundle their browser and operating system products, the court had to choose one market definition in the face of considerable uncertainty and conflicting views.

The antitrust literature has long recognized that the courts do not have a consistent approach to market delineation,[10] but courts have not coalesced around an answer. In 2010, Louis Kaplow put forth a provocative solution: courts should stop defining markets. Professor Kaplow argued market definition is tautological and market power can be assessed without delineating market boundaries.[11] This suggestion spurred antitrust scholars to reconsider the purpose of market delineation, but many questioned Professor Kaplow's solution of avoiding market definition entirely. Werden points out that market delineation is necessary to study entry and the durability of market power.[12] Glasner

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[8] The United States Department of Justice (DOJ) alleged Microsoft engaged in anticompetitive practices by bundling its Internet Explorer Web browser free with its Windows Operating System. This case posed several issues around regulating technology markets that are detailed in John E. Lopatka & William H. Page, *Antitrust on Internet Time: Microsoft and the Law and Economics of Exclusion*, 7 S. CT. ECON. REV. 157 (1999). What is relevant to the present topic is that much of the dispute hinged on whether browsers and operating systems were separate product markets (*see id.* at 173–176; *see also* Gates Deposition at 438, U.S. v. Microsoft Corp., 87 F. Supp. 2d 30, 35 (D.D.C. 2000), *aff'd in part, rev'd in part and remanded*, 253 F.3d 34 (D.C. Cir. 2001) (Nos 98-1232, 98-1233) ("Q. You are aware . . . that one of the issues in this case is the extent to which operating systems and browsers are or are not separate products?").

[9] Gates Deposition, *Microsoft*, 253 F.3d 34 (Nos 98-1232, 98-1233), at 439.

[10] *See* Werden, *supra* note 3; Glasner & Sullivan *supra* note 5, at 293.

[11] Louis Kaplow, *Why (Ever) Define Markets?* 124 HARV. L. REV. 438, 438 (2010).

[12] Gregory Werden, *Why Ever Define Markets? An Answer to Professor Kaplow*, 78 ANTITRUST L.J. 729, 729 (2013).

and Sullivan demonstrate that the courts have historically relied on market definition and do not show an inclination to abandon this practice any time soon.[13] In a realist sense, it seems likely that market definition will continue to factor in antitrust decisions, suggesting that it is important to develop a more reliable approach to delineate markets.

Further, some scholars propose that the function of market definition is not limited to simply determining market shares: it is critical to crafting a theory of anticompetitive behavior and articulating a theory of harm. Glasner and Sullivan emphasize that a relevant market is required to identify the group in which competitive injury can occur, although they concede that market definition is sometimes unnecessary.[14] Thomas Nachbar goes further and contends that market definition is necessary in virtually every antitrust case to determine the relevant market, even if market definition is not required to establish market power. Professor Nachbar also points out that firms can have market power through legitimate means, like product differentiation. He concludes that market definition provides necessary context for courts to determine if market power is anticompetitive.[15]

I aim to complement this recent turn in antitrust literature by introducing a sociocognitive approach to market definition that, in the past thirty years, emerged in strategy and sociology literatures. The sociocognitive approach provides theoretical and empirical tools for researchers to realistically represent markets.[16] It accounts for aspects of market delineation that have historically challenged researchers: market boundaries are not crisp and may substantially overlap; market definitions vary depending on the audience and context; different product attributes can be a credible basis for market definition; and markets often rapidly change. Applied to the Microsoft case, a sociocognitive approach would have represented the browser and operating system markets as fuzzy and overlapping sets. Further, the sociocognitive approach would have defined the markets depending on the audience (e.g., firms, partners, end-users, analysts), to reflect the inherent uncertainty and ambiguity in the markets' definition.

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[13] Glasner & Sullivan, *supra* note 5, at 296 ("On the contrary, the Court has recently reaffirmed its view that 'courts usually cannot properly apply the rule of reason without an accurate definition of the relevant market.'") (quoting Ohio v. American Express, 138 S. Ct. 2274, 2285 (2018)); s*ee also* Baker *supra* note 3, at 129 ("Throughout the history of U.S. antitrust litigation, the outcome of more cases has surely turned on market definition than on any other substantive issue.").

[14] Glasner & Sullivan, *supra* note 5, at 325.

[15] Thomas Nachbar, *Qualitative Market Definition*, 109 VA. L. REV. 373, 419 (2023).

[16] *See* Gino Cattani et al., *Categories and Competition*, 38 STRATEGIC MGMT. J. 64, 64–65 (2017); Joseph Porac & Howard Thomas, *Taxonomic Mental Models in Competitor Definition*, 15 ACAD. MGMT. REV. 224 (1990); MICHAEL T. HANNAN, LÁSZLÓ PÓLOS & GLENN R. CARROLL, LOGICS OF ORGANIZATION THEORY: AUDIENCES, CODES, AND ECOLOGIES, xi–xii (2007) [hereinafter *HPC*].

Sociocognitive research draws on cognitive science and sociology to model individual perceptions of market categories and how these individual concepts become social categories with a shared meaning. For example, in their recent book, Michael Hannan and colleagues put forth a formal model of markets as a probability distribution over a semantic feature space, where concepts and categories are defined dyadically with respect to an audience.[17] Empirically, studies leverage qualitative historical and comparative methodologies, as well as quantitative computational machine learning algorithms applied to large corpora of text.[18] In the sociocognitive literature, these theoretical and empirical representations of market categories are used as the basis for interpreting research hypotheses of competitive economic outcomes.

In this paper, I suggest sociocognitive market representations can be used in antitrust to provide the relevant market context required for anchoring a legal theory of anticompetitive behavior and harm. The sociocognitive approach does not solve the problem of determining what is anticompetitive. Rather, it provides a realistic and generalizable representation of the market context that may help move the legal discussion from a debate over what is the "right" market definition—a question that cannot be answered definitively—to a conversation around how legal theories apply within the market context. This approach is consistent with the recent turn in antitrust that treats market definition as necessary context for interpreting theories of harm. Integrating these literatures is promising, but historically there has been little conversation between them.[19]

This Article bridges the gap between these literatures by describing theoretical and empirical approaches to how borders and boundaries in markets are understood from the sociocognitive perspective. Part I provides a summary of market delineation in antitrust, focusing on recent treatments and the modern economy. Part II introduces the sociocognitive approach, providing background and discussing the unique contributions of the strategy and organizations literatures. Part III outlines four ramifications of the sociocognitive approach for market definition: (A) boundaries are not crisp and markets often have substantial overlap; (B) markets need to be defined with respect to a relevant audience; (C) markets are defined based on multiple relevant dimensions depending on audience and context, and this affects how similarities

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[17] MICHAEL T. HANNAN, GAËL LE MENS, GRETA HSU, BALÁZS KOVÁCS, GIACOMO NEGRO, LÁSZLÓ PÓLOS, ELIZABETH PONTIKES & AMANDA J. SHARKEY, CONCEPTS AND CATEGORIES: FOUNDATIONS FOR CULTURAL AND SOCIOLOGICAL ANALYSIS, 4 (2019) [hereinafter *C&C*].

[18] *See infra* Part IV.

[19] For an overview of historical links between the strategy and antitrust literatures, *see* Hillary Greene & Dennis Yao, *The Influences of Strategic Management on Antitrust Discourse*, 59 THE ANTITRUST BULL. 789 (2014).

between markets are assessed; and (D) market categories are dynamic. Part IV presents empirical strategies to represent markets in the sociocognitive tradition, including qualitative studies, comparative historical analyses, and computational approaches. I conclude with suggestions as to how the sociocognitive approach may inform market definition for antitrust purposes.

II. PART I: MARKET DEFINITION IN ANTITRUST

In antitrust litigation, courts use market definition to assess market power. Since the mid-twentieth century, courts, when considering whether there is impermissible monopoly power, have relied on reasoning that delineates a market and then determines whether a firm controls enough market share to give it monopoly power. In their reasoning, courts draw from the industrial-organization (IO) economics literature, which defines markets as the set of close substitutes for a product based on cross-elasticity of demand.[20] In practice, courts have difficulty implementing this framework in a consistent manner, resulting in numerous critiques over the decades.[21]

Market definition is especially challenging when products are differentiated, as this creates ambiguity around boundary drawing and whether substitute products should be included in the market. This

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[20] In industrial organization economics, George Stigler defined a commodity market as having homogenous goods and uniform prices. *See* Werden, *supra* note 3, at 125–7. Antitrust case law relies on this definition, and then determines a firm's share of the market. *See* Werden, *supra* note 3 at 128 ("The case law has not hesitated to delineate markets and rely, to a significant extent, on market shares."); *see also* Kaplow, *supra* note 11, at 439 ("Market power, in turn, is most often assessed under the market definition / market share paradigm, making market definition the most litigated issue in the field."). Eastman Kodak Co. v. Image Tech. Servs., Inc., 504 U.S. 451, 469 n.15 (1992) articulates, "Because market power is often inferred from market share, market definition generally determines the result of the case."

[21] Werden, *supra* note 3, documents the history of antitrust cases and critiques the fact that many decisions turned on the courts deciding a relevant market was narrow or broad without setting out a consistent principle being applied. For example, he writes regarding the United States v. E. I. du Pont de Nemours & Co., 353 U.S. 586 (1985) case, "The relevant market found by the Court was considered 'exceedingly narrow' by one prominent commentator, who was not alone in questioning the basis for limiting the market . . . ." *Id.* at 140 (quoting Jesse W. Markham, *The Du Pont-General Motors Decision*, 43 VA. L. REV. 881, 887–88 (1957), and later, "the Court certainly did not provide a cogent rationale [in *du Pont*] for the narrow markets of automotive finishes and fabrics. Given the broad market found in *Cellophane* almost exactly a year before, more explanation was very much needed." *Id.* at 141. *See also* the critique of market definition from Easterbrook, *supra* note 2, at 22 ("An inquiry into power does *not* entail the definition of a 'market,' a subject that has bedeviled the law of mergers. Usually the search for the 'right' market is a fool's errand.") (emphasis in original); Kaplow, *supra* note 11, at 477 n.79; Glasner & Sullivan, *supra* note 5, at 293 ("Despite its long tenure in antitrust analysis, and despite the crucial role it has played in many a case and investigation, the process of defining relevant markets remains both confused and uncertain."). Nachbar, *supra* note 15, at 373 points out that "[t]he case that introduced modern market definition to antitrust, United States v. E.I. du Pont de Nemours & Co. (*Cellophane*), is widely known in antitrust circles for giving birth to its own brand of error: the '*Cellophane* fallacy.'"

process also calls into question whether a highly differentiated product is its own market.[22] In addition, there is an ongoing debate whether supply substitution should be considered in addition to demand substitution.[23] Professor Kaplow's article details the major problems with the established practice of determining market power. In what he calls the "market definition / market share" paradigm, Professor Kaplow discusses how courts first define the relevant market and then assess if market share is too high.[24] He argues there is not a coherent way to define a market without first assessing market power and concludes the courts should assess market power without delineating the relevant market.[25]

The long-running conflicts regarding market definition were exacerbated when they were applied to platform competition, and they came to the fore in 2018 with *Ohio v. American Express* (*Amex*).[26] At issue in *Amex* was an "anti-steering" provision that American Express used to contractually preclude merchants from steering customers toward competing credit cards that charged lower fees.[27] The *Amex* decision revealed a contentious debate on market definition for platforms. Credit cards are platform goods that provide value by facilitating financial transactions between two sides of a market: customers and merchants. In *Amex*, the majority included both producers and consumers in the same market, reasoning that this was necessary because prices are determined by both parties.[28] Justice Breyer, in dissent, strenuously disagreed that customers and merchants could be included in the same market because they are not substitutes. Justice Breyer further argued

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[22] *See* Baker, *supra* note 3, at 131 ("Market definition may make little contribution to antitrust analysis, for example, when market boundaries are difficult to draw, making the resulting market concentration statistics close to arbitrary. This may occur in industries in which firms are differentiated in product or geographic space, particularly when those spaces are densely packed with . . . large numbers of sellers differentiated by small degrees."); Nachbar, *supra* note 15, at 378 ("Although price increases might reflect anticompetitive market power, they are equally indicative of competition through product differentiation.").

[23] *See* Baker, *supra* note 3.

[24] Kaplow, *supra* note 11, at 439.

[25] *Id.* at 440 ("A market definition conclusion can never contain more or better information about market power than that used to define the market in the first place.").

[26] 138 S. Ct. 2274 (2018).

[27] *See* Glasner & Sullivan, *supra* note 5, at 340–343; Nachbar, *supra* note 15, at 389–90.

[28] *See* Glasner & Sullivan, *supra* note 5, at 341 ("courts must include both sides of the platform—merchants and cardholders—when defining the credit-card market") (quoting *American Express*, 138 S. Ct. at 2286); Nachbar, *supra* note 15, at 390 ("[T]he Supreme Court affirmed, holding that, in cases in which a platform provides a 'single, simultaneous transaction,' the antitrust market definition must include not only the merchants on one side of the transaction but the cardmembers on the other side, since the total price of the transaction is actually paid by the two parties in combination rather than just by the merchants.") (quoting *American Express*, 138 S. Ct. at 2286–87).

that market definition was unnecessary because the price increase was evidence of anticompetitive effects.[29]

Subsequent commentary was not satisfied with either approach. While the economics of platform competition necessitated consideration of both sides of the market,[30] doing so by commingling them into a single market, as the majority advocated, struck many as misguided. Commentators noted that the majority's approach was flawed because it violated the principle that markets are defined by a set of substitutes.[31] At the same time, scholars questioned Justice Breyer's argument that market definition was unnecessary because the price increase indicated anticompetitive effects. Nachbar noted that firms can raise prices for many reasons that are not under the purview of anti-trust law. This can occur, for example, if firms have a differentiated product that provides additional value to a customer segment[32]

In 2016, Hemant Bhargava, David Evans, and Deepa Mani foreshadowed how platform competition could confound antitrust analysis in a study of the smart mobile market. They summarized four aspects of platforms they expected to be especially challenging. First, changes in consumer behavior that result in overlap between previously separate markets can shift market power. Next, rapid changes in consumer behavior and market entry increases the likelihood of mistakes when defining markets and conducting market power analysis as it is increasingly difficult to predict future behavior. Third, rapid and unpredictable shifts in competitive dynamics and technologies make it difficult to

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[29] For a detailed explanation *see* Nachbar, *supra* note 15, at 387–95.

[30] *See* Evans, *supra* note 6, at 325 ("[In platform competition] market definition and market power analyses that focus on a single side will lead to analytical errors; since pricing and production decisions are based on coordinating demand among interdependent customer groups . . . .").

[31] Glasner & Sullivan, *supra* note 5, at 342 ("While the majority is certainly correct that network effects must be accounted for in the antitrust analysis of this case, this does not require both the merchant and cardholder sides of the platform to be included in the relevant market . . . ."); PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION ¶ 565d2 (4th and 5th eds., 2023 Cum. Supp.) ("Putting production complements into the same market simply because making a deal requires both introduces economic nonsense into the law and economics of market power. There are much better techniques for evaluating the pricing relationship among substitutes and complements and their effects on market power.").

[32] Nachbar, *supra* note 15, at 394 argues that anticompetitive effects were not already established because the observed effects of American Express' price increase is not enough to infer anticompetitive harm. ("Given the nature of platforms, premising a finding of market power on the presence of high prices on one side of a platform will cause courts to systematically mistake economically efficient (and potentially procompetitive) platform pricing for anticompetitive effects."). He further makes the case that market definition was necessary at 390. ("Instead, the market definition question in *American Express* went to identifying what the total product (and hence the total price to be charged) was."). Hovenkamp critiques both analyses: "The two sides were clearly complements, but they were complements in production rather than use." PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION § 5.02 (4th ed., 2024).

design restrictions to address the harm. Finally, there is a greater likelihood that restrictions will have negative unintended consequences, which can occur, for example, by hamstringing incumbents in favor of fast-moving entrants who emerge as powerhouses.[33] While the analysis was specific to the smart mobile market, these descriptors characterize many modern markets and are not limited to platform competition. In the modern economy, markets are increasingly porous and fluid due to rapid changes in technologies and customer tastes. This portends growing difficulties for antitrust analyses that use the classical approach for market definition.

Spurred by concerns over challenges posed by platform competition in *Amex*, coupled with theory of abandoning market definition altogether,[34] recent scholarship recasts the discussion. Researchers argue that market definition is necessary, but for reasons beyond the abstract value of determining market shares articulated in the "market definition / market share" paradigm.[35] Glasner and Sullivan contend that market definition is important to provide necessary context for understanding competitive effects. They highlight that the purpose of antitrust law is to determine whether a firm's actions have caused, or could cause, anticompetitive injury, and the market defines where to apply scrutiny about potential anticompetitive injury.[36] They further argue that market definition facilitates further analysis by defining the outer bound of where injury could occur.[37]

Professor Nachbar also maintains that market definition provides necessary context for analyzing anticompetitive behavior, as there is not a meaningful way to discern if a business practice is anticompetitive

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[33] Hemant Bhargava et al., *The Move to Smart Mobile Platforms: Implications for Antitrust Analysis of Online Markets in Developed and Developing Countries*, 16 U.C. DAVIS BUS. L.J. 157, 161–62 (2016).

[34] Nachbar, *supra* note 15, at 375–6 ("The current debate over market definition is universal, with scholars like Kaplow being joined by jurists, legislators, and regulators arguing not only over how to conduct market definition but whether it needs to be conducted at all."). Nachbar notes that Justice Breyer's dissent in *Amex* argued that market definition was unnecessary, and "[l]egislation proposed in the last Congress by Senator Amy Klobuchar would have removed market definition as a requirement in many antitrust cases . . . " *Id.*

[35] Werden's response argues market definition is necessary to evaluate entry and further that it "identifies the competitive process at issue" and "bring[s] clarity and power to the narrative." Werden, *supra* note 12, at 730. Nachbar suggests that the ubiquity of identifying market definition for the purpose of determining market share has undermined other, more foundational purposes for market definition in antitrust. *See* Nachbar, *supra* note 15, at 382–83; *id.* at 383 ("A more nuanced understanding of market definition—one that takes it outside of its traditional use in the market definition / market share paradigm—provides new justification for market definition, justification that is informed less by economic concepts and more by the content of the antitrust law."); *see also* Glasner & Sullivan, *supra* note 5, at 297 ("We do not challenge the consensus that market definition serves broad purposes, but we suspect that this breadth of use may actually be a source of some confusion.").

[36] Glasner & Sullivan, *supra* note 5, at 297.

[37] *Id.* at 314.

without understanding its legal and social meaning. For example, market power gained through product differentiation may be economically efficient and thus procompetitive.[38] Professor Nachbar concludes that, for courts to determine if the firm's market power is relevant to the antitrust issue, market power must be considered in context to how the market is defined.[39] Market definition should therefore be informed by qualitative criteria that can capture the nature of observed economic effects.

These recent treatments suggest the future role for market delineation in antitrust may be more contextual and nuanced than it previously has been. Rather than using market definition to identify an economic entity in which a firm takes up share to gain power, market definition would provide context for theories of harm and determining the entities at risk for anticompetitive injury. To employ this approach, it is important to establish criteria that should be used to map the market definitions. Criteria should be broad enough to apply across contexts, but specific enough to allow comparisons across situations.[40] For this purpose, sociocognitive literature may lend itself to the project of representing markets.

III. PART II: THE SOCIOCOGNITIVE STUDY OF MARKET CATEGORIES IN STRATEGY AND ORGANIZATION THEORY

The sociocognitive approach recognized that markets were not objective entities, but instead, analytical abstractions, and that market definitions depended on social context and individual cognition. This approach emerged in two related literatures: strategy and organizational theory.[41] Sociocognitive scholars sought to define markets for the

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[38] Nachbar, *supra* note 15, at 415 ("First, there is no meaningful way to determine whether a particular practice is truly anticompetitive without acknowledging its full legal and social meaning. Are celebrity endorsements a legitimate source of rents? How about anti-steering provisions? The answers to those questions cannot be determined merely by observing whether a particular product's prices went up or down.").

[39] *Id.* at 419 ("Whether market power . . . is relevant to antitrust law . . . has to be considered in context. That context is not only dependent on market definition: it affects the market definition itself. . . . Recognizing the legally contingent nature of market definition opens the door to a broader understanding of how to define relevant markets beyond the economic tools of measurement . . . .").

[40] Nachbar cautions a downside of using qualitative criteria is that they may be cherry-picked to favor a particular outcome. Nachbar, *supra* note 15, at 423 ("The peril lies in the potential for any number of policy justifications to inform market definition, even those having little to do with competition."). The sociocognitive approach provides generalized theoretical and empirical frameworks for which qualitative elements are relevant to include in market definition. This may alleviate problems arising from markets being defined idiosyncratically for the purpose of generating a preferred outcome.

[41] Strategy is a multidisciplinary field in business schools that draws from economics, sociology, and to a lesser extent psychology. The focus in strategy research is the individual firm and how it can sustain profits (for an overview, *see* Michael E. Porter, *What is Strategy*, HARV. BUS.

purpose of studying competitive processes and outcomes. Their research showed that market boundaries were not determined by objective technical attributes; rather, they were based on social agreement around cognitive understanding of relevant attributes. The strategy and organization theory research streams emerged independently, but their paths converged. In this section, I will summarize the histories and major contributions of each. In the following section, I will expand on four key implications and their potential applicability to antitrust, drawing from both research streams.

A. Strategy: The Sociocognitive Turn

Identifying the relevant competitive group, or the boundary of a firm's market, is critical for managers to make informed decisions, and in turn, for researchers to analyze outcomes. As Gino Cattani, Joseph Porac, and Howard Thomas write, "[c]ategorical distinctions form the core of competitive markets."[42] Historically, strategy researchers faced similar challenges as antitrust scholars in delineating markets.[43] As Cattani et al. note, "[a]lthough conceptually reasonable, similarity and substitutability have proven in practice to be slippery and contentious competitive criteria."[44] They identify two overarching issues with the traditional criteria. First, competitive intensity is graded, making any boundary somewhat arbitrary. Second, there are many more potential criteria for what could count as a relevant attribute as compared to the feasible set that a person could or would actually use,[45] called the infinite dimensionality problem.[46]

In a seminal article, Joseph Porac, Howard Thomas, and Charles Baden-Fuller posited that competitive groups were partly determined by managerial cognition, or how managers conceive of who their competitors are, which they demonstrated in the empirical case of Scottish

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REV., Nov.–Dec. 1996). This contrasts with the focus of IO economics, which is predominantly at the industry level of analysis. *See* Greene & Yao, *supra* note 19. Organization theory is a sociology-based approach to studying organizational behavior, and this stream emerged from the sub-field organizational ecology. *See* Michael T. Hannan, *Rethinking Organizational Ecology in Light of Developments in Cognitive Science and Natural-Language Processing*, OSF (Sept. 11, 2022) [hereinafter *Rethinking*].

[42] Cattani et al., *supra* note 16, at 64.

[43] In fact, Cattani et al., *supra* note 16, at 68 include a discussion of the challenges in antitrust research of using cross-elasticities of demand to delineate markets.

[44] *Id.* at 66.

[45] *Id.* at 66–67.

[46] This problem is discussed in psychology categorization research, in Gregory L. Murphy & Douglas L. Medin, *The Role of Theories in Conceptual Coherence*, 92 PSYCH. REV. 289, 292 (1985), which argues that there are potentially infinite similarities and differences between any two entities. ("[A]ny two entities can be arbitrarily similar or dissimilar by changing the criterion of what counts as a relevant attribute.").

knitwear manufacturers based on detailed interviews.[47] Their findings implied market definition was endogenous, with competitive groups partly emerging from a manager's cognitive perceptions, rather than a manager's perception of competition being determined by external market forces. This conclusion reversed causality from the mainstream view, which assumed that sets of rivals were based on exogenous and objective characteristics.[48] Another implication of their findings was that competition was asymmetric, meaning the competitive group can be different for every firm, and larger and more categorically representative firms were more likely to be named as competitors.[49] This feature of competition makes it impossible to set universal market boundaries.

A subsequent study on the emergence of the minivan product market established the social element of the sociocognitive approach. A close analysis of the text of articles from automotive industry and consumer publications demonstrated that the market definition of the minivan fluctuated between its introduction in 1982 and 1988, when it stabilized around attributes including "front-wheel drive," "low step-in height," and "seven passenger." The stabilization of the market definition around these features emerged from a dialog between producer and consumer audiences as "[n]either consumers nor producers had total control over the category's final realization, and both sides of the market were instrumental in shaping the category's evolutionary trajectory."[50] Studies also established that managerial cognition around new

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[47] Joseph F. Porac, Howard Thomas & Charles Baden-Fuller, *Competitive Groups as Cognitive Communities: The Case of Scottish Knitwear Manufacturers*, 26 J. OF MGMT. STUD. 397 (1989) [hereinafter *Competitive Groups*]; Joseph F. Porac, Howard Thomas, Fiona Wilson, Douglas Paton & Alaina Kanfer, *Rivalry and the Industry Model of Scottish Knitwear Producers*, 40 ADMIN. SCI. Q. 203 (1995) [hereinafter *Rivalry*].

[48] *See* Sarah Kaplan, *Research in Cognition and Strategy: Reflections on Two Decades of Progress and a Look to the Future*, 48 J. OF MGMT. STUD. 665, 669 (2011) ("What is powerful about this argument is that it reverses the causality proposed by economists, suggesting that 'interfirm monitoring and co-ordination *create* rather than result from oligopolistic situations.'") (quoting *Competitive Groups*, *supra* note 47, at 413) (emphasis in original). She also notes that the focus on managerial cognition departed from prevailing economic and sociological explanations of macro-level structural effects determining economic outcomes (e.g., transaction cost economics, resource dependence theory, and organizational ecology). *Id.* at 667.

[49] *See Rivalry*, *supra* note 47, at 208–09; *see also* Theresa K. Lant & Joel A. C. Baum, *Cognitive Sources of Socially Constructed Competitive Groups: Examples from the Manhattan Hotel Industry*, *in* THE INSTITUTIONAL CONSTRUCTION OF ORGANIZATIONS: INTERNATIONAL AND LONGITUDINAL STUDIES 20–22, 35–38 (W. Richard Scott & Søren Christensen eds., 1995), who showed similar asymmetries in competitive groups in the Manhattan hotel industry.

[50] José Antonio Rosa et al., *Sociocognitive Dynamics in a Product Market*, 63 J. MKTG. 64, 67, 74 (1999). This paper investigates the emergence of the "minivan" category label first introduced by Chrysler in 1982. The market definition for minivan was in flux the next six years and by 1988, had stabilized around attributes like front-wheel drive, low step-in height, and seven passenger. Though specific models were initially rated similarly, as the market congealed around a definition, models that had the characteristics that became characteristic of the market realized increased evaluations, those with different characteristics decreased, suggesting people's evaluations of a

technologies drove firm investment in research areas,[51] and even affected market entry.[52] A study of IBM found the company's reputation was constructed through stakeholder interpretation as much as their material resources.[53]

Altogether, sociocognitive research in strategy indicates that attributes underlying market definition are rooted in cognitive understandings and social interactions, such that market boundaries are not universal and are often ambiguous. This contrasts with classical treatments of markets as crisp sets and with definitions that do not widely differ by person or context.[54] Sociocognitive research calls into question whether the classical approach to market definition can apply in most settings. Additionally, research provides examples of how surveys, interviews, and text can be coded and analyzed to empirically represent market definitions from different perspectives that change over time, as compared to traditional empirical analyses that use coarse external groupings like SIC codes to proxy the market. [55]

B. Organization Theory: Concepts and Categories

The strategy arm of sociocognitive research highlights how different perspectives of individual managers affect market definitions. This contrasts with sociocognitive research that emerged from organization

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product are not made in isolation but in reference to expectations anchored by the market definition.

[51] *See* Mary Tripsas & Giovanni Gavetti, *Capabilities, Cognition, and Inertia: Evidence from Digital Imaging,* 21 STRATEGIC MGMT. J. 1147, 1148 (2000) (in a study of the Polaroid Corporation's shift from analogy to digital imaging, "find[ing] that by restricting and directing search activities related to technology development, managerial cognition influences the development of new capability."); Callen Anthony et al., *"Who Are You? . . . I Really Wanna Know": Product Meaning and Competitive Positioning in the Nascent Synthesizer Industry,* 1 STRATEGY SCI. 163, 163 (2016) ("We discover that conventional dimensions of competitive positioning, such as features and price, do not capture important distinctions in how firms framed their products. Rather, firms projected two distinct meanings for the synthesizer . . . ."); *see also* Giovanni Gavetti & Daniel Levinthal, *Looking Forward and Looking Backward: Cognitive and Experiential Search*, 45 ADMIN. SCI. Q. 113, 113 (2000) (showing through simulations that changing a cognitive representation of an objective landscape affects paths explored and therefore affects outcomes).

[52] J. P. Eggers & Sarah Kaplan, *Cognition and Renewal: Comparing CEO and Organizational Effects on Incumbent Adaption to Technical Change*, 20 ORG. SCI. 461, 461 (2007) ("We find that attention toward the emerging technology and the affected industry is associated with faster entry . . . .").

[53] Violina P. Rindova & Charles J. Fombrun, *Constructing Competitive Advantage: The Role of Firm-Constituent Interactions*, 20 STRATEGIC MGMT. J. 691, 692 (1999).

[54] Joan Robinson described classic commodity markets as sets of homogenous goods separated from each other by a "marked gap." JOAN ROBINSON, THE ECONOMICS OF IMPERFECT COMPETITION 5 (1933).

[55] *See* Gerard Hoberg & Gordon Phillips, *Product Market Synergies and Competition in Mergers and Acquisitions: A Text-Based Analysis*, 23 REV. OF FIN. STUD. 3773 (2010) for an example of how text-mining documents is more predictive of financial outcomes as compared to SIC or NAICS groupings.

theory, which conceives of market definitions based on external audience expectations. Research in organization theory also shows that market definitions are not universal and that market boundaries are fuzzy. However, these conclusions rely on sociology principles demonstrating that audience expectations constrain firm actions. This differs from strategy research, which focuses on the agency and individual beliefs of managers within firms.

In the 2000s, scholars in organization theory became interested in how cognitive understandings and social categories affect market exchange. Market categories are interesting from a sociological perspective because market boundaries are socially constructed. As Hannan et al. write, "we identify and give meaning to the individuals, objects, and situations we encounter by categorizing them—assessing them in terms of their concepts, or abstract mental representations of the world."[56]

This research stream emerged from organizational ecology, a subfield of organization theory that studied organizations of the same form, referred to as organizational populations. Ecology research demonstrated that external selection pressures changed the makeup of populations in predictable ways. Empirically, scholars compiled complete histories of populations to conduct longitudinal studies. This required researchers to establish rules for including organizations, which made salient the difficulty in creating a crisp and universal definition for a market in line with how markets are understood in the classical view.[57]

In addition, a series of empirical studies in organizational ecology established that market category definitions are socially constructed and that these constructions transform people's understanding and value of products. In a study of the microbrewery market, Glenn Carroll and Anand Swaminathan documented how activists made salient the attribute of small-scale production. In response to shifting customer demand, large "industrial" beer manufacturers were able to produce beer that rivaled microbrews in taste. Nevertheless, microbrewers and enthusiastic customers were able to socially construct a definition of the microbrewery market that included the brewer's identity as a small-scale artisanal producer. This attribute appealed to a growing audience strongly enough to stymie large brewers' attempts to gain market share in the microbrewery market, despite their cost advantages.[58]

Subsequent research suggests how people value a product is not just about its inherent features. Instead, people assess products relative to their *expectations* of what are the most important features, which are

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[56] *C&C*, *supra* note 17, at 1.

[57] For an intellectual history of this approach, *see Rethinking, supra* note 41.

[58] Glenn R. Carroll & Anand Swaminathan, *Why the Microbrewery Movement? Organizational Dynamics of Resource Partitioning in the U.S. Brewing Industry*, 106 AM. J. SOCIO. 715 (2000).

anchored to the subset of attributes that form the market definition. Because of this, studies find that people value organizations that are specialists in one market and devalue organizations that span multiple market categories.[59] Further, firms in markets with crisp boundaries have better outcomes than those in markets with ambiguous boundaries,[60] and the category spanning discount depends on the crispness of boundaries.[61] Later work shows that category effects differ depending on the evaluating audience, providing more evidence that category-based evaluations are partly based on individual perception and social construction. A study of the software industry finds firms in ambiguous categories generate lower revenue from customers but are more likely to be funded by venture capitalists, a "market maker" audience interested in path breaking products.[62] Corporate law firms that straddled multiple market categories are more appealing to customers looking for highly sophisticated services.[63]

These results demonstrate that how people evaluate a product or organization partly depends on how they make sense of it *relative* to the market it is in. In other words, people make sense of products partly based on the market category schemas they access. Therefore, accurately representing categories is critical to understanding behavior and outcomes in markets. Further, an accurate representation requires engaging with the sociocognitive underpinnings of market definition, linking effects observed at the social level with individual cognitive perceptions.

Researchers developed a theoretical model to represent market categorization. Two key aspects of this model diverged from classical treatments. First, concepts and categories are not crisp; they have fuzzy

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[59] Value is typically captured by product ratings, sales, or firms' financial outcomes. *See* Greta Hsu, *Jacks of All Trades and Masters of None: Audiences' Reactions to Spanning Genres in Feature Film Production*, 51 ADMIN. SCI. Q. 420, 444 (2006) (seminal study showing films in one genre received higher critical reviews compared to films in multiple genres); Greta Hsu et al., *Multiple Category Memberships in Markets, An Integrative Theory and Two Empirical Tests*, 74 AM. SOCIO. REV. 150, 166 (2009) (showing eBay sellers sold fewer goods if they participated in multiple market categories); Ming D. Leung & Amanda J. Sharkey, *Out of Sight, Out of Mind? Evidence of Perceptual Factors in the Multiple-Category Discount*, 25 ORG. SCI. 171, 180–182 (2014) (taking advantage of a natural experiment on a peer lending site and finding a multiple-category discount when category assignments were displayed on the site, which reduced when buyers were unaware of categorizations, suggesting that the effect arises from category assignments, not just unobserved differences among products).

[60] *See* Giacomo Negro et. al, *Categorical Contrast and Audience Appeal: Niche Width and Critical Success in Winemaking*, 19 INDUS. & CORP. CHANGE 1397, 1397 (2011).

[61] Balázs Kovács & Michael T. Hannan, *Conceptual Spaces and the Consequences of Category Spanning*, 2 SOCIO. SCI. 252, 252 (2015).

[62] Elizabeth G. Pontikes, *Two Sides of the Same Coin: How Ambiguous Classification Affects Multiple Audiences' Evaluations*, 57 ADMIN. SCI. Q. 81, 81 (2012).

[63] Lionel Paolella & Rodolphe Durand, *Category Spanning, Evaluation, and Performance: Revised Theory and Test on the Corporate Law Market*, 59 ACAD. MGMT. J. 330, 346–47 (2016).

boundaries and graded membership. Second, category definitions are not universal, but must be defined with respect to a particular audience or individual.[64] An audience approach means the researcher or analyst does not aim to determine one correct market. Rather, the role of the analyst is to understand how all relevant actors might differently define a market. As Michael Hannan wrote, "[a] key step toward a modern view on [market] memberships was shifting the burden of deciding what is and is not an instance of a form [market category] . . . from the analyst to the agents in the system being studied."[65]

The shift to fuzzy boundaries means market membership is not binary, but instead, that objects have graded membership. So, a truck-like vehicle might be considered a *partial* member of the minivan category. Fuzziness arises at both the individual and collective level. For the individual, cognitive science research describes how people consider objects as having graded membership in categories. For example, many people think of an apple as a typical fruit and an olive as atypical, or a "sort of" fruit.[66] For the collective level, market boundaries can also be fuzzy due to disagreement within an audience. If there is a fifty-percent overlap in the rivals who comprise a competitive set for each firm in a market, any overall boundary drawn around the market will necessarily be fuzzy.

Michael Hannan and colleagues develop a formal market categorization model to realistically represent market categories as probability distributions in a multidimensional semantic space. The semantic space comprises the relevant features or attributes, and a point in the space is the value assigned for the respective combination of features. The category is a probability distribution based on how similar a point in the space is to the prototype of the category.[67] For example, the semantic space for beer might have six dimensions: price, taste (light to full bodied), alcohol content, color, fermentation process, and scale of production. The probability distribution for *industrial beer* would skew to lighter taste and color, lower price, and large-scale production, while *microbrews* (or *craft beer*) would skew in the other directions.

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[64] *See* Michael T. Hannan, *Measuring Memberships in Collectives in Light of Developments in Cognitive Science and Natural Language Processing*, 9 SOCIO. SCI. 473, 480–81 (2022) [hereinafter *Measuring Memberships*]; *Rethinking*, *supra* note 41, 17–18.

[65] *Measuring Memberships, supra* note 64, at 474.

[66] Eleanor Rosch & Carolyn B. Mervis, *Family Resemblance: Studies in the Internal Structure of Categories*, 7 COGNITIVE PSYCH. 573, 578–580 (1975). An established body of research in cognitive psychology pioneered by Eleanor Rosch in the 1970s showed concepts were graded and people assign objects partial membership. *See* Eleanor H. Rosch, *On the Internal Structure of Perceptual and Semantic Categories*, *in* COGNITIVE DEVELOPMENT AND THE ACQUISITION OF LANGUAGE, 111–144 (T.E. Moore ed., 1973).

[67] *C&C*, *supra* note 17, at 6–11. For an earlier treatment that uses fuzzy set theory, *see HPC*, *supra* note 16.

Distributions are defined at the level of an individual or audience; for example, an enthusiast connoisseur would likely have a more piqued distribution (a crisper boundary) distinguishing *microbrews* from *industrial beer*, while a casual beer drinker might see little difference. An investor might more heavily weight the price and scale dimensions. With this approach, an analyst can assess consensus around the market definition by measuring distances between distributions. This can be done for individual agents, to capture the consensus among members of an audience (e.g. how much do two analysts agree?), and distances between audiences (e.g. do investors and customers have markedly different definitions?).

This model provides a platform to represent market categories in their context, encompassing multiple viewpoints. This framework is a crucial first step for incorporating ambiguities inherent in categorization. In antitrust, these ambiguities have been long acknowledged but not fully considered in analytical treatments. Despite widespread understanding that the classical model of market definition deviates from reality, the classical model's ongoing appeal may be that it provides a consistent methodological framework. The probabilistic, audience-based model is not as simple as the classical model, but it is tractable, generalizable, and most importantly, properly represents how categories in markets operate.

IV. PART III: IMPLICATIONS

Findings in organizational theory and strategy establish that market definitions are based on both individual conceptions of what the market is, as well as the social consensus that develops around these individual concepts. As a result, there is usually not one objective and universal definition of a market. These findings are also in line with antitrust research that demonstrates the difficulty of defining a relevant antitrust market in a manner that is consistent and generalizable. Together, these three literatures suggest that accurately representing market definitions requires consideration of cognitive and social processes. In this section, I highlight four implications of the sociocognitive approach for antitrust law.

A. Ambiguity, Fuzzy Boundaries, and Overlap

A persistent critique of the classical approach, which treats categories as a crisp set, is that realistic markets do not have sharp boundaries. This is a central point in the strategy and organization theory

research streams,[68] and it is also prominent in antitrust analysis.[69] These challenges are likely to become more pressing in the future, as markets in the modern economy are increasingly fluid, ambiguous, and fast-moving.[70]

Jonathan Baker echoes the core premise of the sociocognitive view when he writes that market definition entails making judgements as to matters of degree, which is extremely difficult.[71] Sociocognitive research provides theoretical models and examples for how such graded judgements can be theoretically conceived and empirically measured, which may make the process less difficult. Rather than requiring the analyst to make decisions that force a sharp boundary onto a fuzzy market for analytical purposes, the sociocognitive approach treats markets as networks, fuzzy sets, or probability distributions where products are assigned grades of membership or probabilities of being in a category. This provides a full representation of all potential substitutes without sacrificing the analyst's ability to distinguish between strong and weak competitors. It also can represent multiple markets with varying degrees of overlap.

B. Market Definitions Vary Across Audiences

Another challenge is that markets are not universally defined. Instead, definitions vary for different people and when deployed in different roles. At the same time, markets are not solely cognitive constructs at the individual level. There needs to be some level of social consensus around a market definition in order to effectively coordinate market

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[68] *See* Cattani et al., *supra* note 16, at 66 ("One well-known difficulty in using similarity and substitutability to categorize firms into competitive groups is the fact that both imply a continuous and graded structure of competitive relationships."); *Measuring Memberships, supra* note 64, at 475 ("A key idea holds that audience judgements do not produce the kind of crisp boundaries that analysts assume.").

[69] Herbert Hovenkamp, *Markets in Merger Analysis*, 57 ANTITRUST BULL. 887, 901 (2012) ("It is well known that the relevant market estimates . . . are never 'correct' in product differentiated markets . . . ."); Baker, *supra* note 3, at 131; Glasner & Sullivan, *supra* note 5, at 306 ("[T]he expectation that substitutability standards should reveal natural markets is revealed in the failure of this ideal. Perfect gaps in competition are rare; a given product usually faces competition from products of varying degrees of substitutability at different price points.").

[70] *See* Elizabeth Pontikes & Bill Barnett, *The Persistence of Lenient Market Categories*, 26 ORG. SCI. 1415, 1415 (2015) (showing that lenient market categories—with ambiguous meanings and porous boundaries—were the most likely to persist and grow in the software industry); Nina Granqvist et al., *Hedging Your Bets: Explaining Executives' Market Labeling Strategies in Nanotechnology*, 24 ORG. SCI. 395, 395 (2013) (showing a similar trajectory for the nanotechnology market category); *see also* Bhargava et al., *supra* note 33, at 157 (documenting these trends for platform competition). The modern economy seems to be moving toward more ambiguity in market definition, especially for largest and best performing firms (e.g., Meta, Amazon, Apple, Google, Microsoft).

[71] Baker *supra* note 3, at 143 ("The process of market definition involves judgements as to 'matters of degree' that can at times be 'extremely difficult to measure.'").

exchange. This duality is at the of the sociocognitive approach, where market definitions arise from interplay between individuals' cognitive representation and social agreement around the market definition.[72] As people interact, they update their cognitive representations, and often converge around a presumed market definition, which may be codified through industry associations or government regulations.[73]

An audience is a group of individuals or stakeholders that have a common interest in or interaction with a market. Examples include customers, producers, analysts, and investors. Typically, members of an audience have a shared understanding of a market, and, for purposes of a macro analysis, markets can therefore be defined with respect to various audiences. The minivan market study exemplifies this approach as researchers compiled industry publications that reflected producer and consumer views of the minivan, and then coded the text to typify each audience's evolving definition.[74] As the study shows, there is communication between audiences, and sometimes there is convergence around a common definition. Separately modeling each audience allows analysts to represent potential differences between audiences, consider whether audiences are converging, and illustrate how audiences influence each other. Analysts can also investigate the level of consensus within an audience by measuring distances between individual definitions.[75]

This approach could be useful in antitrust to adjudicate interests of multiple stakeholders, like suppliers and customers,[76] or multiple sides of platform exchange.[77] Often the debate in the antitrust literature revolves around determining *a priori* who is the most relevant audience and constructing a market definition from their perspective.[78] In contrast, this approach models the category definition for all relevant audiences, which enables analysts to then study audience differences and interactions.

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[72] *See HPC*, *supra* note 16.

[73] *See id.*

[74] *See* Rosa et al., *supra* note 50; *see also* Hsu, *supra* note 59 (example of critics versus mainstream customers in film); Elizabeth G. Pontikes & Ruben Kim, *Strategic Categorization*, *in* FROM CATEGORIES TO CATEGORIZATION: STUDIES IN SOCIOLOGY, ORGANIZATION, AND STRATEGY AT THE CROSSROADS 71–111 (Rodolphe Durand, Nina Granqvist & Anna Tyllström eds., 2017) (example of analysts versus producers in software).

[75] *See C&C*, *supra* note 17. Part IV below describes empirical approaches.

[76] *See* Baker, *supra* note 3.

[77] *See* Evans, *supra* note 6.

[78] *See* Baker, *supra* note 3.

C. There are Multiple Valid Ways to Define Markets

One challenge in determining a market definition is that there are many potential dimensions of difference or similarity that could be relevant.[79] Cattani and colleagues refer to this "infinite dimensionality" problem as one of the most significant challenges in defining market boundaries.[80] For example, common-sense approaches to defining markets are either as sets of competitors or based on descriptive characteristics, which researchers often assume are roughly equivalent. However, in a study of information technology markets, Professors Elizabeth Pontikes and Amanda Sharkey find substantial variance in the similarity between two markets depending on whether similarity is computed based on sets of competitors or descriptions.[81]

This issue of dimensionality may underlie some of the inconsistencies identified in the antitrust literature,[82] as there are many potential dimensions of difference from which a court can select as the relevant basis for a market. If the court's decision is made absent an overarching framework, then the court's reasoning can appear idiosyncratic. Some may contend that market definition based on context will exacerbate this problem as each context is different, and standardized high-level metrics should be used instead. Quantitative metrics like cross-elasticity of demand, however, do not resolve the issue of dimensionality. This is because prior to the calculation of a metric such as cross-elasticity, the researcher must select the set of products to compare. Further, these metrics are continuous, and crisp markets are discrete. As such, the researcher must determine the threshold above which the product should be included in the market. Thus, there is still the question of choosing which substitutes are close enough to be considered in the comparison set.

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[79] In the microbrewery example, the scale of production is a characteristic that historically varied across manufacturers but only became salient in the 1980s as a relevant characteristic that divided the market. *See* Carroll & Swaminathan, *supra* note 58.

[80] Cattani et al., *supra* note 16, at 67. This has roots in a discussion in the psychology literature in that two objects have potentially infinite differences and similarities. *See* Murphy & Medin, *supra* note 46, at 292. Douglas Medin, Robert Goldstone, and Dedre Gentner conclude that similarity is a coherent construct as long as it is defined in terms of the ways, or respects, in which two objects are similar. Douglas Medin et al., *Respects for Similarity*, 100 PSYCH. REV. 254 (1993). Applying these ideas to the question at hand, these respects comprise the relevant dimensions along which a market is defined.

[81] Elizabeth Pontikes & Amanda Sharkey, *Competitive and Descriptive Market Definitions: Effects on Firm Value* (U.C. Davis, Working Paper, 2022). An example can be seen in comparing the laptop and tablet market, which are similar when compared based on technical features, but, as of 2022 only two of the top five firms in terms of market share are in both markets (Apple and Lenovo).

[82] *See* Evans, *supra* note 6.

In the sociocognitive approach, analysts engage closely with the context, but not with the goal of drawing a crisp boundary around the relevant definition for the market. Rather, this approach provides consistent tools to map any market context, incorporating all potentially relevant dimensions, for multiple audiences and adjacent markets. It provides a theoretical and empirical basis for strategy and organizations researchers to evaluate a range of theories of competition. For antitrust scholars, the sociocognitive approach also provides a theoretical and empirical basis for evaluating anticompetitive behavior.[83]

D. Dynamics

A final implication for the sociocognitive approach is that markets are increasingly dynamic. Fast-paced change is cited by Bhargava and colleagues as one of the most challenging issues for antitrust in platform competition as "antitrust analysis that focuses on static markets is highly prone to error when it comes to dynamic online industries . . . ."[84] This dovetails with a critique offered by Daniel Sands and colleagues of using cross-elasticity of demand to define markets: "cross-elasticity of demand is inherently a backward-looking measure. Hence, much depends on stable competitive relationships and product attributes to estimate future competitive positions."[85] They argue that when delineating a market in complex and fast-moving areas, it is important to consider multiple sources of information. The sociocognitive approach provides a framework to integrate many sources of information in a generalizable and coherent manner. This includes modeling the fluidity and ambiguity of a market's boundaries, the extent to which it overlaps with other markets, the relevant dimensions of value, and different definitions for various audiences. These elements can be modeled at a point in time and updated, so that the analyst can capture the pace of change.

V. EMPIRICAL APPROACHES

In conjunction with their conceptual ideas, sociocognitive researchers also advance empirical approaches that can capture fuzzy boundaries, relevant dimensions, and audience perspectives. Many researchers leverage rich bodies of text, like analyst reports, industry publications, and online reviews to uncover how different audiences conceive of a

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[83] This is in line with Glasner and Sullivan's suggestion that antitrust analysis should include the process of defining different potentially relevant markets for the purpose of analyzing theories of harm. Glasner & Sullivan, *supra* note 5, at 344.

[84] Bhargava et al., *supra* note 33, at 157.

[85] Daniel Sands et al., *Competition as Sensemaking*, *in* COMPETITION: WHAT IT IS AND WHY IT HAPPENS 28 (Stefan Arora-Jonsson et al., eds, 2021).

market. These methods are in line with Professor Nachbar's appeal for market definition to be informed by qualitative as well as quantitative criteria, to capture the nature of how a firm is exercising market power.[86] With recent computational advances however, this exercise need not be strictly qualitative: machine learning algorithms can identify common themes or dimensions quantitatively from large corpora of text.[87]

Early studies used interviews, surveys, and qualitative analyses of text to capture market definition. For example, Professor Joe Porac and colleagues conducted field interviews and a survey that they coded to determine relevant dimensions of market competition and competitors from the perspective of each firm in Scottish knitwear.[88] Professors Mary Tripsas and Giovanni Gavetti engaged in an inductive, in-depth case study of Polaroid using analyst reports and business press articles.[89] Professor Greta Hsu used category assignments of films from the Internet Movie Database (IMDB).[90]

To study multiple audiences, it is important to determine sources of data that reflect each perspective. For example, Professor Rosa and colleagues identified consumer and industry publications that covered the minivan and used independent coding to uncover themes.[91] More recently, Professors Daniel Engler, Gino Cattani, and Joseph Porac used history-friendly simulations that generated counterfactual histories and compared them to the realized history to test theories of a market's evolution.[92]

Scholars have increasingly leveraged advances in computational methods and the availability of electronic records and online discussions to advance their research. For example, Professor Elizabeth Pontikes studied market categorization in the software industry using automated methods to capture sentences from press releases where firms wrote the market they were in, and then she used a combination of automated methods and by-hand inspection of results to compile self-claims to market categories.[93] Professors Greta Hsu, Balázs Kovács,

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[86] *See* Nachbar, *supra* note 15.

[87] It is important to note that machine learning approaches still require interpretation from an analyst who understands the context in order to be socially meaningful. What they do allow is the researcher to leverage large amounts of data for generalized inference.

[88] *See Rivalry*, *supra* note 47.

[89] *See* Tripsas & Gavetti, *supra* note 51.

[90] *See* Hsu, *supra* note 59.

[91] *See* Rosa et al, *supra* note 50.

[92] *See* Daniel Engler et. al, *Studying the Incubation of a New Product Market through Realized and Alternative Histories*, 5 STRATEGY SCI. 160, 160 (2020).

[93] *See* Pontikes, *supra* note 62. For research that maps markets in press releases to patent activity, *see* Elizabeth G. Pontikes & Michael T. Hannan, *An Ecology of Social Categories*, 1 SOCIO. SCI. 311 (2014); Elizabeth George Pontikes, *Category Innovation in the Software Industry: 1990–*

and Özgecan Koçak studied cannabis dispensaries' abilities to compete on changing demand landscapes using a combination of hand-coding and automated methods to infer themes from firms' "about us" statements compared to themes from online reviews.[94] Professors Elizabeth Pontikes and Amanda Sharkey applied topic modeling[95] to the descriptive text of market segment reports from industry analyst Gartner, and used automated methods to identify competitors listed in these reports, to compare market definitions based on characteristics versus competitors.[96] Professors Gaël Le Mens, Balázs Kovács, Michael Hannan, and Guillem Pros applied a Bidirectional Encoder Representations from Transformers (BERT) Natural Language Processing (NLP) classifier to descriptions of books to uncover bases for genre categorization.[97]

In sum, the availability of text, electronic archives, online reviews, and descriptive Web sites, provides potential data on multiple audience perspectives for many market categories. Computational advances provide tools to extract general themes from these large text corpora, making it increasingly tractable to empirically represent markets in a consistent, realistic, and generalizable manner.

VI. CONCLUSION

Market definition is central to antitrust, but the practice of delineating markets is challenging for scholars and courts. Antitrust research draws from industrial organization economics, primarily scholars from the mid-twentieth century who closely engage with questions of market definition.[98] However, antitrust scholars suspect that "mainstream economics has little to say about market definition."[99] This silence may be a feature of microeconomic theory, where "markets are typically taken as a primitive concept, leaving it to the applied microeconomist to define

2002, 43 STRATEGIC MGMT. J. 1697 (2022).

[94] Greta Hsu et al., *Experientially Diverse Customers and Organizational Adaptation in Changing Demand Landscapes: A Study of US Cannabis Markets, 2014-2016*, 40 Strategic MGMT. J. 2214 (2019).

[95] *See* Paul DiMaggio et al., *Exploiting Affinities between Topic Modeling and the Sociological Perspective on Culture: Application to Newspaper Coverage of U.S. Government Arts Funding*, 41 POETICS 570 (2013).

[96] *See* Pontikes & Sharkey, *supra* note 81.

[97] *See* Gaël Le Mens et al., *Using Machine Learning to Uncover the Semantics of Concepts: How Well Do Typicality Measures Extracted from a BERT Text Classifier Match Human Judgments of Genre Typicality?* 10 SOCIO. SCI. 82 (2023).

[98] George Stigler set out the classical notion of a commodity market with homogenous goods and uniform prices; Joan Robinson noted that many markets frequently deviate from this classical notion; and Edward Chamberlin went further, with the insight that markets are not an economic entity but an abstraction or analytical tool, and that the boundaries of markets are to some extent arbitrary. *See* Werden *supra* note 3, at 125–27; Glasner & Sullivan, *supra* note 5, at 307–308.

[99] *See* Glasner & Sullivan, *supra* note 5, at 313.

a market appropriate to a given empirical study."[100] Overlooked in antitrust research is the sociocognitive literature in strategy and organization theory, which, over the last thirty years, developed theoretical and empirical approaches to represent categories in markets. This Article connects these research streams, with the hope that more integration will be fruitful for both.

The sociocognitive literature complements a recent turn in the antitrust discipline which suggests that market definition serves a more expansive purpose than simply determining market share. Namely, market definition provides necessary context to interpret anticompetitive theories of harm.[101] To this end, although sociocognitive literature cannot discern anticompetitive behavior, the sociocognitive approach provides a generalized model for market definition that speaks to aspects of market definition that have challenged researchers: fuzzy boundaries; definitions that vary across audiences and contexts; different attributes that could be the relevant dimensions for market definition; rapidly changing markets. Returning to the Microsoft case that introduced this Article, a sociocognitive approach to mapping the browser and operating system markets that represented these inherent ambiguities may have provided a more suitable foundation to evaluate theories of anticompetitive behavior. More generally, the sociocognitive framework can perhaps help shift the debate from what is the correct market—a question that is difficult to answer conclusively—to an analysis of how theories of anticompetitive harm develop within a realistic representation of the market context.

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[100] *See id.*

[101] *See supra* notes 33–36 and accompanying text.