

# Partiality of Memberships in Categories and Audiences

Michael T. Hannan

Graduate School of Business and Sociology Department, Stanford University, Stanford, California 94305; email: hannan\_michael@gsb.stanford.edu

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## Key Words

grade of membership, contrast, niche width

## Abstract

Recent theory and research have reconceptualized categories in markets and in other settings as part of the languages developed to characterize roles in a producer-audience interface. An important development in this work is the characterization of memberships in producer categories and in audiences as potentially partial. Producers often are regarded as members in a category to varying degrees, and audience members share to varying degrees in consensus about the applicability and meanings of category labels. Such partiality gives rise to fuzziness in boundaries, which has implications for the emergence and persistence of categories. A fast-developing literature has explored these implications empirically.

## INTRODUCTION

Sociological theory and research treat processes applying to categories of agents, relations, and events. Depending on the context, relevant agent categories might include state, ethnic group, social movement, organization, or natural person; categories of relations might include alliance, patronage, or kinship; and event categories might include initiating a war or food riot, claiming an identity, or entering employment. We tend to think about the particular substantive content but lose sight of the fact that the arguments and evidence apply to categories. Why does this matter?

Extensive research reveals that folk categories lack the crisp boundaries expected of scientific concepts (see below). People generally build and use categories with vague boundaries. The vagueness results from judgments that some agents, ties, or events fit only partially in a category.

An obvious objection is that researchers use analytic—not folk—categories. Analytic categories (concepts) are constructed to have clear definitions and to spell out the necessary and sufficient conditions for membership in the category. Even so, two issues remain problematic in sociological research. The first is that much sociological analysis wants to reflect the subjective understandings of the individual agents, which leads analysts to keep their concepts close to folk categories. This is reflected in the choice of labels for the concepts, as in the examples given above. Indeed, the defining properties of relations or events often include claims to membership in the category (claims to statehood, for example) or recognition as a member by other category members (e.g., recognition by other states). The second problem concerns the sometimes widespread existence of entities that bear some but not all of the defining characteristics of the concept. That is, social categories often have partial members. In the case of states, for instance, current problematic cases include Abkhazia, Eritrea, Kosovo, North and South Ossetia, Palestine, Somalia, Sudan, the Turkish Republic of Northern Cyprus, and Western

Sahara (which, to varying degrees, all lack the defining properties of statehood, sovereign control of their territories, and international recognition).

As I describe below, sociological researchers invariably sweep partiality from the picture by design. If the world being analyzed is nearly crisp (has minimal partiality), then this practice makes little difference for substantive conclusions. Sometimes, social worlds crystallize in crisp configurations such as the well-ordered jurisdictions of the system of medieval craft guilds. But such cases are more the exception than the rule. Sociologists usually study worlds in flux, with categories that emerge, transmute, and decay. Category boundaries are anything but crisp under such conditions, and sweeping partiality out of the picture can surely distort analysis.

The social sciences lack developed conceptual and methodological tools for dealing with partiality of category memberships. This review argues for attention to these issues, and it suggests that taking partiality seriously opens exciting lines of inquiry.

For specificity, I concentrate on issues of partiality as they apply to categories in markets. Although existing theories and empirical studies treat producer categories as crisp, some recent empirical studies reveal that many producers (and products) do not fit fully into the categories used by members of relevant audiences. Put differently, social agents often perceive memberships in categories as being partial for at least some category members.

Consider the implications of partiality facing a researcher who wants to compile data on universities and wants to reflect conventional understandings of relevant audiences. Full-fledged members such as the University of Michigan and Harvard University surely must be included. Many other organizations that bear the name university do not fit fully the prevailing conceptions of the category. For instance, the National University of Health Sciences (Lombard, IL) offers chiropractic degrees and “the complementary and alternative medical healing arts,” and Maharishi

University of Management (Iowa) employs a “consciousness-based” system of education featuring transcendental meditation. The National Defense University (which includes the National War College) offers training in national security. Embry-Riddle Aeronautical University claims to be the world’s only accredited aviation-oriented university. The University of South Africa and Britain’s Open University offer only distance learning and do not appear to house any research. Indeed, the Open University’s own Web site asks, “Is the Open University a ‘real’ university? The Open University was the first institution to break the insidious link between exclusivity and excellence. It is a University founded on an ideal and, like all revolutionary ideas, attracted hostility and criticism.”

For-profit entities such as the University of Phoenix and DeVry University strain the category on other dimensions. At the absurd extreme, we have organizations such as McDonald’s Corp.’s Hamburger University, a corporate training center. Trying to decide which entities to include in a study of universities reveals that the category has fuzzy boundaries. I contend that no crisp inclusion rule will be satisfactory.

Another example is the category circus. The definition on Wikipedia on July 6, 2005, nicely captured the fuzzy nature of this category in the contemporary world:

A circus is usually a traveling show that includes acrobats, animal trainers (though this is being phased out with the influence of animal rights groups), clowns and other novelty acts. However, there are circuses today with a permanent venue that do not travel, and some circuses do not have animal acts at all.

This is not, of course, a proper definition. Subsequent revisions of this entry in Wikipedia swept away the fuzziness by dropping reference to the discrepant cases, and such changes seem to be the natural tendency in making definitions. But claiming that a folk concept is crisp does not make it so.

Empirical research on categories has lacked a way to deal with fuzzy boundaries systematically. The best quantitative research compiles data on the membership of a category (a population) or enumerates events by applying specific coding rules to candidate entities or events. For instance, Tilly shaped the work of a generation of social movement scholars by promulgating precise coding rules for collecting data on events of contentious collective action (beginning with Tilly & Rule 1965); Carroll & Hannan (2000) recount the coding rules used in implementing the population approach in the study of organizations. The rules proposed in these cases are crisp—they result in a yes or no answer for each candidate. Such inclusion rules are binary: If the answer is yes, then the researcher regards the entity or event as a full-fledged instance of the concept; if the answer is otherwise, the researcher drops the entity or event from further consideration. Anyone who has done such research realizes that the use of crisp rules often leads to situations in which some included entities, relations, or events are much more similar to excluded ones than to the more prototypical instances of the category.

Confronting the implications of partiality is a major theme in a recent effort to integrate theory fragments in organizational sociology (Hannan et al. 2007). After repeated failed attempts to argue the problem away, my collaborators and I concluded that fuzziness must be addressed head-on. This seemed especially important given the current interest in explaining the emergence of categories and forms (Ruef 2000, McKendrick & Carroll 2001, Rao et al. 2003, Hannan & Hsu 2005, Pontikes 2008, Perretti et al. 2008, Ruef & Patterson 2009).

Treating category boundaries as fuzzy—due to partiality in memberships—is a drastic step. As I describe below, this kind of reformulation complicates theoretical analysis because reasoning about fuzzy objects is awkward at best. My collaborators and I (Hannan et al. 2007) make a sharp distinction between the conceptions and languages used by the members of the worlds that the theories treat (the object language) and the language used for building the

theory (a meta-language). We argue that the former should allow partiality but that the latter should be crisp. This means, as I note above, that we do not adopt a fuzzy logic that would allow propositions to have truth values lying in the  $[0,1]$  interval. In this sense, this line of theory uses fuzziness in a very different way than does sociological methodological work inspired by Ragin (2000).

Colleagues have been especially troubled by the implications of admitting fuzziness for the conduct of empirical research on producers. They wonder whether researchers could devise systematic means of measuring grades of memberships in categories (GoMs, discussed further below), and they point out that a failure on this point would block empirical testing of implications of the new theory.

I argue here that current empirical research ought to allay this worry. After describing the new theory, I review a set of empirical projects that undertake the first steps in dealing systematically with graded membership in producer categories. These studies show not only that partiality can be examined empirically, but also that attention to degrees of fuzziness of categories yields new and unexpected insights. This new perspective appears to be especially well suited for representing legitimation, identity, and authenticity—especially when combined with a modal language for expressing what agents perceive, take for granted, and believe (Hannan et al. 2007, Hsu et al. 2009b, Pólos et al. 2010).

## FOUNDATIONAL ISSUES

The recent upsurge of sociologists' interest in market categories' shapes was stimulated largely by Zuckerman's (1999) powerful demonstration of the force of categories in structuring financial markets. His research (and the considerable body of work that it stimulated) deals with stable situations in which categories have a taken-for-granted character. This research follows a convention in sociological work on such topics as art genres and organizational forms in treating "category" as a

primitive, atomic term. In this respect, it follows a tradition of several thousand years in Western thought (the classic view), which posits that concepts lack internal structure (are atomic).

Frege's (1893, 1903) groundbreaking formalization of predicate logic began with a foundation built on standard set theory. His formulation linked concepts with sets and followed the classic view on concepts. The essence of this approach is the presupposition that meaning is given by extension. The extension of a concept is the set of objects in the universe of discourse that makes true the statement "this object is an instance of the concept." Knowing the membership of this set—the extension of the concept—is tantamount to understanding the concept, according to the Fregean tradition. (For this reason, logics in this tradition—such as the standard predicate logic of mathematics and science—are called extensional logics.)

Frege's (1903, p. 139) dictum "the concept must have a sharp boundary" sought to preserve the logicians' law of the excluded middle (that truth functions can take only two values: true and false). Expressing concepts as classical sets fits this requirement because a set is defined as a collection of objects for which a given property is true. Partial memberships in sets are excluded by definition.

The classical view of concepts came under attack first in philosophy and then in cognitive psychology. The leading figure on the philosophy side was Ludwig Wittgenstein. In the middle of his career, Wittgenstein (1953) repudiated his own influential work in logic and that of Frege and Russell by abandoning the classical view on concepts. His analysis of the social use of natural language concluded that ordinary concepts do not satisfy the classical requirements but instead reflect family resemblances. We can get the flavor of his argument by quoting his famous analysis of the concept "game."

Consider for example the proceedings that we call "games." I mean board-games, card-games, ball-games, Olympic games, and so on. What is common to them all?—Don't say: "There *must* be something common, or

they would not be called ‘games’—but *look and see* whether there is anything common to all.—For if you look at them you will not see something that is common to *all*, but similarities, relationships, and a whole series of them at that. . . . And we can go through the many, many other groups of games in the same way; you can see how similarities crop up and disappear. . . .

And the result of this examination is: we see a complicated network of similarities overlapping and criss-crossing: sometimes overall similarities, sometimes similarities of detail. I can think of no better expression to characterize these similarities than “family resemblances”; for the various resemblances between members of a family: build, features, color of eyes, gait, temperament, etc. etc. overlap and criss-cross in the same way.—And I shall say: “games” form a family. . . .

One might say that the concept “game” is a concept with blurred edges.—“But is a blurred concept a concept at all?”—Is an indistinct photograph a picture of a person at all? Is it even always an advantage to replace an indistinct picture by a sharp one? Isn’t the indistinct one often exactly what we need? (Wittgenstein 1953, Aphorisms 66, 67, and 71)

Subsequent psychological research supported Wittgenstein’s view. Rosch (1973, 1975) examined the relationships of subconcepts to concepts in a series of famous studies. Subjects were asked to tell, for instance, how typical were certain types of fruits (e.g., apples, watermelons, olives) of the category “fruit.” Subjects generally report great differences in typicality among instances such as these, and they generally agree strongly about the degrees of typicality: Apples and oranges are regarded as very typical, watermelons and pineapples as only moderately typical, and olives as very atypical. Rosch & Mervis (1975) claimed that these replicable patterns of graded typicality reveal that concepts involve family resemblances.

Several major lines of work in cognitive psychology and cognitive anthropology have investigated these issues (for useful overviews,

see D’Andrade 1995, Laurence & Margolis 1999, Murphy 2002). Although contemporary researchers still disagree about the cognitive coding of categories, they agree broadly that concepts do not fit the classical picture.

This work caused deep rethinking of the nature of concepts. One way of adapting to these empirical findings is to change the foundational set theory. In the standard theory, a set is characterized fully by its characteristic function, a mapping from elements of a universe of discourse to either zero or one. Therefore, set membership is binary: An element is either (fully) a member of a set or it is not a member at all.

In contrast, fuzzy set theory allows set membership to be partial, a matter of degree. The parallel to the characteristic function of a crisp set in fuzzy set theory is the grade-of-membership (GoM) function, a mapping of the elements of the universe of discourse to the  $[0,1]$  interval. The GoM function for the fuzzy set  $\mathbf{A}$ , typically denoted as  $\mu_{\mathbf{A}}(x):U \rightarrow [0,1]$ , tells to what extent the entity  $x$  possesses the membership-defining property  $\mathbf{A}$ . A fuzzy set is defined as a set of ordered pairs whose first element is an element of the universe of discourse and whose second element is its GoM in the set:  $\mathbf{A} = \{x, \mu_{\mathbf{A}}(x)\}, x \in U$ .

Fuzzy sets can have vague boundaries owing to the presence of entities with small, but positive, GoMs. Thus, it was natural to use graded typicality to represent vagueness of concept boundaries, as Rosch and others did in the 1970s (Rosch et al. 1976).

Powerful and important objections have been directed at this strategy. So at this point I digress from sociological arguments to sketch a controversy in cognitive science and linguistics that bears on strategies for sociological analysis of these issues. The initial enthusiasm for following Rosch in building a theory of concepts on fuzzy set theory was deflated by a series of papers that argued that concepts with fuzzy boundaries do not yield patterns that fit a basic property expected of a language: productivity. This is the idea that competent speakers of a language can understand new

(not-yet-uttered) sentences. Productivity arises from compositionality, the idea (first formalized by Frege) that the meaning of a sentence or phrase ought to depend only on the meanings of its component parts and on the structure of the composition.

Fuzzy representations of concepts can fail to conform to the principle of compositionality, as Osherson & Smith (1981, 1982) demonstrated in an influential pair of papers. Suppose that dogs and cats are typical pets, and trout and salmon are typical fish. What can we assume about “pet fish”? It turns out that the typical pet fish (a guppy or goldfish) is both an atypical pet and an atypical fish, which causes trouble if graded membership is used to represent typicality. The definition of the intersection of a pair of fuzzy sets is a fuzzy set whose GoM function is the smaller of the GoMs in the pair of sets. The guppy and goldfish are problematic because they have high typicality as pet fish (the intersection) and low typicality in each of the component sets.

Perhaps this objection is not as devastating as it seems for the typicality perspective in the case of sociological analysis. Noun-noun combinations, such as pet fish, allow wide scope for creativity in interpretation (Costello & Keane 2000). Some linguists argue that convergence in interpretations depends upon pragmatics, on how the expressions get used. Moreover, members of societies that lack the practice of keeping fish as pets would not be expected to know that a guppy is a prototypical pet fish. In examples closer to those of this review, those unfamiliar with various forms of financial institutions would likely have difficulty coming up with interpretations of such forms of financial organization as building society, credit union, hedge fund, and venture capital or such forms of protest as food riot, hunger strike, or email flood (see Werning et al. 2005a,b for a variety of perspectives on the philosophical and empirical status of compositionality).

Nonetheless, the Osherson-Smith critique has led most cognitive psychologists to distinguish sharply between the existence of an internal structure of graded typicality for a

concept and vagueness of concept boundaries. This theoretical move was motivated largely by a concern with preserving compositionality. I think that this reaction went too far. Social categories constructed by audiences appear to involve both typicality judgments and vagueness (or fuzziness) in category boundaries (Hampton 2007 makes a similar argument). My reading of the evidence suggests that agents often detect shades of difference and decide that some objects fit comfortably in a category, some do not fit at all, and others fit to a greater or lesser degree. This is not to say that arguments should be fuzzy, but rather that sociological analysis should address the implications of the tendency for social actors to recognize partiality of memberships.

## CONCEPTS AND CATEGORIES

Current sociological analysis of categories focuses on a role structure built on the distinction between producers and the audience for what gets produced. My collaborators and I add a specification of the language that the participants use to make sense of the role structure (Hannan et al. 2007). Such languages must contain at least a set of proper names and labels for sets.<sup>1</sup> So the first step in unpacking the category concept is to specify the nature of labeling.

### Labels

The basic idea is that audience members assign a set of labels to objects (producers/products here). More abstractly, a label function associates labels and names with objects (individuals or sets). Because an audience member might apply more than one label to an object (e.g., a proper name and one or more cluster/category labels), a useful approach specifies the label function as mapping to the power set (the set

<sup>1</sup>The characteristic (atomic) sentences of these languages tell that an entity in some subset associated with the label possesses or does not possess a certain feature value at a point in time.



of all subsets of a set) of the set of labels available to that agent.

Frege's notion of the extension of a classical concept can be extended to fuzzy situations. This involves positing that audience members view the application of labels to objects as warranted to varying degrees, depending on the particulars of the case. The formal statement of this idea uses the GoM function  $\mu_{e(t)}(x, y, t)$ , which tells the degree to which the object ( $x$ ) belongs in the extension of a label ( $I$ ) for an audience member ( $y$ ) at a time point ( $t$ ).

GoMs cannot generally be given a probabilistic interpretation because they can fail to satisfy the requirement that a probability measure must sum to one over a set of disjoint and mutually exclusive events. For example, nothing prevents an audience member from deciding that a particular producer has a GoM of 0.6 as a bank and 0.6 as an insurance company. However, a probabilistic interpretation does appear to be warranted in the case of labeling. Consider the set of situations that demand that an audience member apply a label to a particular producer, e.g., a conversation with other audience members. If an agent assigns to a producer a very high GoM in a label, then she will likely include it in a list of the bearers of the label. Hampton (2007) provides motivation for this view:

What people may be estimating when giving a judgment of degree of membership . . . is how comfortable they would feel using the term in a certain way or context, and this sense of easiness will be more or less directly related to the proportion of language users who would agree to the use of the word in that context. . . . It is in this sense that it might be reasonable to treat the probability of categorization as a measure of graded membership.

Fuzziness also matters on the audience side. Use of a label, as with any other aspect of language, is inherently social (as Wittgenstein insisted in arguing against considering private languages). If different audience members apply a label differently, then the lack of extensional

and intensional consensus makes communication difficult and likely thwarts the emergence of a category.

A formal representation of fuzziness in the audience begins by considering audience members' typicality in an extensional consensus about a label. An audience member's fuzzy extension of a label is the set of ordered pairs whose first element is an object in the universe of discourse and whose second element is the audience member's probability of assigning the label to that object (over occasions). An audience member's typicality as a member of the audience for the label is the degree to which her extension of a label agrees with those of other audience members. The basic idea for constructing this function begins by comparing the fuzzy extensions for all pairs of audience members and summing maximum symmetric set differences. Agreement is high when these summed differences are small. In other words, the strength of an extensional consensus in an audience should be proportional to the average typicality of the members.

## Meanings

One reason that agents disagree about label assignments is that they fail to agree about what the label means. Cognitive scientists have usefully represented meanings as schemata: patterns of feature values. A schema for a label is a pattern of the values of relevant features, that is, a subset of the Cartesian product of the ranges of these features. (Schemata for producers in markets can be based on any number of features or on patterns of relations with other agents.) An agent's schema maps a label (and a time point) to a nonempty subset of the ordered  $n$ -tuples of the values of relevant features: the schema-conforming patterns. Defining a schema as a function indirectly imposes the restriction that a schema for a label is unique. This restriction accords well with the view that schemata serve to promote comprehension of a complex reality: that attaching multiple schemata to a label will only create confusion.

The coupling of a label and a schema serves as the basis for concept formation if the audience agrees about meanings or intensions. (The terminology here reflects the conventions in logic and linguistics in referring to meanings as intensions; in technical terms, an intension of a label is a function that gives its extension in each possible world.) So the second step in formalizing fuzziness in an audience addresses intensional agreement. The approach to intensional agreement taken by Hannan et al. (2007) parallels that sketched for the extensional case. Let the GoM  $\mu_{i(l)}(x, y, t)$  tell the degree to which  $x$  fits  $y$ 's intension (meaning) for the label  $l$  at time  $t$ . The key idea for analyzing typicality as an instance of the meaning of a label is to equate  $\mu_{i(l)}(x, y, t)$  with the degree to which the object's (perceived or default) feature values fit the agent's schema for the label.

The key issues for intensional consensus are the same as with labeling: consensus and fuzziness. An agent's typicality in an intensional semantic consensus about a label is the degree to which her schema for the label agrees with those used by the rest of the audience. In parallel with the assumption made about extensional consensus, the strength of the intensional consensus about a label is the average agreement over the producer-audience pairs.

Communication within an audience and over the producer-audience interface runs smoothly when agreement prevails about labeling and meanings. When audience members agree about a concept in the sense that extensional and intensional consensus are high, the label can be said to mark a category for that audience. With this specification, category emergence means that an audience reaches such consensus.

## Contrast

My colleagues and I proposed a theory of emergence that features the causal role of contrast (Hannan et al. 2007, chapters 3–6). The key idea is that a high-contrast set stands out from the background (the domain), which causes enthusiasts in the audience to pay attention to it,

label it, and try to schematize it. We defined the contrast of a (fuzzy) set as the average GoM in the set for those objects with positive GoM. As contrast approaches one, the set becomes crisper (less fuzzy).

## PRODUCER NICHES

The initial theoretical work on the emergence of categories in markets largely considered the case of a single (isolated) category, and it made only modest effort to elaborate the analysis to the case in which producers might have memberships in multiple categories. More progress on this issue has been made recently by recasting the issue of multiple memberships in a niche theoretic perspective. I turn now to that work, beginning with a sketch of how niche theory has been generalized to apply to (fuzzy) category memberships.

The concept of niche has been extremely useful for specifying attraction and competition in sociological analysis (Popielarz & Neal 2007). However, various strands of theory and research define and use the concept in different (occasionally conflicting) ways. Hannan et al. (2003) developed a formulation that unifies the main strands of sociological niche theory. This model was subsequently generalized by introducing fuzziness of the kind considered in analyzing categories (Hannan et al. 2007, chapter 8). This turned out to be a deep change, and it alters some of the central arguments.

The fundamental niche tells what regions of a social space a producer can exploit if it does not face competitors. Fundamental here means that the space reflects only on the degree to which the producer's features fit the local social landscape. (The realized niche is the subset of the fundamental niche that can be sustained in the presence of competition.) The new theory defines the fundamental niche in terms of intrinsic appeal and engagement. Whether a producer's offering is intrinsically appealing to the members of the audience at a social position depends on how well it fits the prototypical taste of that local audience. The conversion of intrinsic appeal into actual appeal depends, according



to this theory, on engagement by producers. Engagement means (a) learning about the tastes of local subaudiences, (b) designing the offering to make it attractive to those tastes, and (c) trying to establish a favorable local identity and reputation. The fundamental niche, in this construction, consists of the subset of the social space in which a producer has positive actual appeal (which requires positive intrinsic appeal and engagement).

## Producer Niches in Blau Space

This theory builds on McPherson's (1983) representation of niches as subsets of Blau space (a space with dimensions such as age, education, sex, and ethnicity). Extensive research reveals that social-demographic position influences tastes. Hannan et al.'s (2007) fuzzy niche theory holds that each social position possesses a prototypical taste but that the tastes of individual audience members at the position match the prototypical taste to varying degrees. Let an audience member's location in the social space be denoted by the function  $pos(y)$ . The relevant position in some contexts might refer to a metric space, e.g., age or wealth; in others, position refers to a qualitative feature such as gender or ethnic group membership. Unlike previous efforts, fuzzy niche theory applies to both cases. The similarity of an audience member's taste to the typical taste for a category at his social position, in formal terms  $\rho(l, y, x, pos(y), t)$ , maps to  $[0,1]$ . A typical member of the audience at a position is one for whom  $\rho(l, y, z, t) = 1$ , where  $pos(y) = z$ .

The argument that actual appeal depends on intrinsic appeal and engagement relies on defaults, generic statements with possible patterned exceptions. In technical terms, this refers to a formula quantified by a generic quantifier that indicates that an expression provides a rule with possible systematic exceptions.<sup>2</sup>

<sup>2</sup>Generic rules are expressed in a nonmonotonic logic for which specificity considerations govern the interactions among conflicting premises (arguments based on more

**Postulate** (Intrinsic appeal and engagement generate actual appeal)

- A. The expected actual appeal of an offering in a category to an audience member at a social position normally equals zero if the offering does not have intrinsic appeal to the characteristic local taste, or the producer does not engage that position.
- B. The expected actual appeal of an offer to an audience member at a position normally increases with its fit to the typical taste at the position and with the producer's engagement at the position.

The signature of niche theory is the presumption of a trade-off between breadth and depth, between the width of the niche and fitness/success at positions within the niche. In particular, sociological theories of the niche impose the constant-sum constraint that increased breadth of a niche comes at the expense of lowered fitness at some positions within it (Hannan & Freeman 1977, Hsu 2006). Analytic leverage in fuzzy niche theory comes from the assumption that both a producer's total engagement and its total intrinsic appeal over positions normally are the same for all typical producers in a high-contrast population. Here, the nonmonotonic logic plays an important role: Lacking any information more specific than that two producers are typical members of a high-contrast population, the default expectation is that they exhibit the same overall capacity for engagement and gaining intrinsic appeal.

**Postulate.** The expected levels of total engagement and total intrinsic local appeal over positions normally are the same for all full-fledged members of a high-contrast category.

## Categorical Niches of Producers

The framework sketched above considered only a single category. Recent research has expanded

specific premises overrule those based on less specific ones). Pólos & Hannan (2002, 2004) provide the technical details.

the framework to apply to sets of categories associated with a market (Hsu et al. 2009a). For instance, one study discussed below considers the supercategory of films and its component genres. The generalized theory focuses on a set of categories for which none is a subtype of another (for the audience).

Targeting a broad set of categories is as a kind of generalism. A category specialist focuses its efforts on fitting one category and, therefore, has a very unequal distribution of GoMs across categories; a category generalist has a more even distribution.

**Definition** (Producer niches in a space of categories)

A. A producer's category-membership niche is a fuzzy set whose GoM function reflects the degree to which the audience member regards it as a member of each category:

$$\mu(x, y, t) = \{l, \mu_{i(l)}(x, y, t)\}, \quad l \in \mathbf{I}(t).$$

B. A producer's category-engagement niche is a fuzzy set whose GoM function tells the proportion of its engagement devoted to each category:

$$\varepsilon(x, t) = \{l, \varepsilon(l, x, t)\}, \quad l \in \mathbf{I}(t),$$

where  $\mathbf{I}(t)$  denotes the set of categories (within some unspecified supercategory) in a market at time  $t$ .

Specialism/generalism pertains to niche width. Because categories generally lack a metric, Hsu et al. (2009a) built on the general (non-metric) niche theory and adapted a standard index of diversity, Simpson's (1949) index, to measure niche width.

**Definition** (Niche width in category space)

A. The width of a producer's category-membership niche (from the perspective of an audience member) is the unevenness of its memberships over categories:

$$W(\mu(x, y, t)) = 1 - \sum_{l \in \mathbf{I}_p(t)} \tilde{\mu}_{i(l)}^2(x, y, t),$$

where  $\tilde{\mu}_{i(l)}(x, y, t)$  is the proportion of the producer's total category memberships that comes from  $l$ .

B. The width of a category-engagement niche is the unevenness of the distribution of the producer's engagement over categories:

$$W(\varepsilon(x, t)) = 1 - \sum_{l \in \mathbf{I}_p(t)} \varepsilon^2(l, x, t).$$

These two measures index generalism on the two key dimensions of the fundamental niche.

Under these assumptions, if a profile of category memberships broadens, then the GoM of at least one must decline<sup>3</sup> because producers that target multiple categories exhibit feature values that are atypical in some or all of the categories. The more a producer fits an agent's schema for one category, the less well it fits another. This is the intuition behind the proposed trade-off between the diversity in categories targeted by a producer and its peak performance across categories.

Likewise, engaging multiple categories limits a producer's ability to devote attention and other resources to engaging the audience for any one category. The principle of allocation in engagement holds that a producer's engagement within at least one category must decline as its category-engagement profile broadens.

It simplifies analysis (without disturbing the key intuitions) to consider the typical members of the audience: those with a high GoM in the intensional consensus for the collection of categories to be analyzed.

**Postulate** (Principles of allocation in a space of categories)

A. The sum of total category memberships to typical audience members is normally the same for all producers in a market.

B. The level of total category engagement is normally the same for all producers in a market.

<sup>3</sup>In general we cannot anticipate which category memberships in a niche will decline with an increase in niche width.

The empirical research discussed below also imposes the auxiliary assumption that the maximal sum of a producer's memberships in the set of categories considered equals one. This assumption simplifies formal development of the trade-offs between patterns of membership and intrinsic appeal by stipulating that a category generalist cannot have a greater level of total category membership than a category specialist.

It also concentrates on categories that have positive valuation to the audience. This means that the expected appeal of an offering in a category by a producer to a normal audience member increases with the degree to which the producer's feature values conform to his/her schema for the category.

## Specialism and Generalism Over Categories

The implications of the model of niches in category space can be seen most clearly by comparing pure specialists with generalists. The argument implies that a category-membership specialist has higher expected actual appeal in its focal category than any membership generalist (who does not also have higher engagement in that category), and an engagement specialist has higher expected actual appeal than any engagement generalist within its focal category.

Generally, we want to know how specialist and generalist producers fare in broader competitive arenas in which they generally face a range of competitors. Hsu and colleagues (2009a) develop their argument for the case of what they call a diverse market, one in which each category normally contains at least one producer with maximal GoM in the category who also fully engages the category. In the case of a diverse market, generalists' offerings are always inferior in expected appeal to the offering of at least one other producer, no matter which categories they pursue.

To this point, I have discussed the relative appeal of producers' offerings to audience members. However, sometimes appeal is not directly observable, but the relative success

of producers in the market can be observed. Therefore, it is useful to extend the formalization to apply to relative success or fitness. Fitness refers generally to a producer's ability to thrive within its environment—to obtain necessary resources, to persist, and to grow. The relevant lines of theory research assume that a producer's expected fitness in a positively valued category normally increases monotonically with the total appeal of its offerings in that category (Hannan et al. 2007, chapter 9).

The main implication of this argument is the following.

### **Theorem** (Niche width, appeal, and success).

In the case of positively valued categories in a diverse market and typical members of the audience, generalists in (1) category membership and (2) category engagement have lower expected appeal and lower expected fitness than at least one producer.

## Empirical Evidence on Producer's Categorical Niche Width

I now sketch the results of six empirical studies that have recently tested implications of the model of generalism in a space of fuzzy categories. Among other things, this overview illustrates a variety of approaches to measuring GoMs in categories and the contrast of categories.

**Feature film projects.** Hsu et al. (2009a) analyzed the effects of the width of category-membership niches on the appeal and success of feature films released in the U.S. industry during 2002–2003. Films, like other art forms, are generally understood in terms of genres. Film studios and distributors usually eschew genre labels (to avoid suggesting that a large portion of the audience might not be interested), leaving the assignments to external agents (especially critics). These public assignments allow memberships to be measured from the perspective of key agents in the audience (assuming that the critics correctly understand and reflect the

conventions of the audience to whom they are addressed).

This research used information about the genres assigned to films by professional critics and firm enthusiasts from three archival sources that classify films into 17 genres, such as action, adventure, animation, comedy, crime, documentary, and drama. A film's GoM in a genre was set to the proportion of the entries in three sources that classify the film under that genre. The width of genre niches was calculated with a Simpson index, as described in the previous section. The appeal of a film to the (typical) audience members was measured using film critics' and consumers' assessments of quality. The fitness of films is measured as (the natural logarithm of) U.S. box office gross.

The statistical analyses control attributes that likely affect the amount of energy that audiences will devote to identifying film projects: star power, director power, the breadth of a film's theatrical exhibition during its opening weekend, size of budget, sequel, backing by a major or independent distributor, crowding within a film's genres, and GoMs in the 17 genres to control for the effects of differences in the popularity or niche volume of individual genres on the film's appeal (a fuzzy membership analog to using dummy variables for genre memberships). Net of these controls, niche width has significant negative effects on (the three measures of) appeal and on the measure of fitness: U.S. box office gross.

**Sellers in eBay auctions.** The paper just discussed also analyzed the effects of the engagement niche width on success of sellers in eBay auctions (success means ending the auction with a sale). This research analyzed a random sample of auctions that ended on August 31, 2001, in a diverse set of 23 categories, including antique furniture, folk art, digital cameras, model trains, and watches. These data allowed for measurement of category engagement (both on the date of observation and over the prior 17 months). Sellers must pick among a predefined set of categories for listing items, and the chosen category corresponded to a defined target audience.

This analysis distinguished sellers who listed items in two or more categories from those who focused on one category (70% of the sellers).

Inclusion of quality indicators and category-specific acronyms in item titles supplied by the sellers provides useful information for buyers but requires sellers to possess some familiarity with the linguistic conventions of the audience. Analysis of the probability that such information gets included in a title (as a measure of engagement) yields results consistent with the reasoning behind the principle of allocation. Sellers who engaged more than one category on the focal day were (significantly) less likely to use acronyms or quality indicators. In turn, the use of quality indicators in titles significantly increased the likelihood that an auction ended with a sale.

Net of these effects (and of the number of items listed and of posted reputations/feedback), the width of the category-engagement niche has a significant negative effect on the probability of completing a sale. The combined results suggest that niche width has both direct and indirect effects (via more effective labeling of items) on fitness. Finally, this research builds on Koçak's (2008) finding that bidders in categories for goods with greater symbolic value are more likely to signal identification with the category in their eBay identifications. She argues that bidders in these categories display more selectivity in choosing sellers. Koçak et al. (2009a) find evidence of such a pattern: Sellers who have generalized in the past are penalized strongly in categories where the bidders themselves display category-focused identities.

**Winemakers.** Negro et al. (2008) analyzed the effect of niche width over wine styles on critical evaluations of Barolo and Barbaresco wines. Style in the making of these elite wines became a source of contention in the late 1980s and 1990s when some producers began to vary traditional techniques to produce initially a French style of Barolo/Barbaresco and later an international or New World style. The type of barrel used for aging became the main focus in the

contention about the authenticity of the styles as expressions of Barolo or Barbaresco.

Traditionally these wines were aged in large casks (*grandi botti*) made from Slovenian oak or chestnut. This tradition was challenged by modernists who began aging wine (partially) in *barriques*, small barrels made from aromatic French oak. Because the traditional *botte* has a much smaller surface-to-volume ratio than a *barrique*, the wood does not have nearly as much influence on taste with the traditional method. The *barrique* became a symbol of modernity, and the French-style wines found favor with the critics and consumers in the 1990s. This stylistic insurgency sparked a traditionalist countermobilization around regional typicality that sought to preserve traditional practice, including sole reliance on *botti* as the essence of authenticity (Negro et al. 2008).

Although traditionalists regard any use of *barriques* as signaling a modern or international style, the predominant view acknowledges the existence of a distinct middle style. With these distinctions, a producer's style niche is a triplet of GoMs in styles:  $\mu(x, t) = \{\mu(\text{trad}, x, t), \mu(\text{mod}, x, t), \mu(\text{mid}, x, t)\}$ , where  $\mu(s, x, t)$  denotes the GoM of the producer  $x$  as an exponent of the style  $s$  at time  $t$ . A winery's GoM in a style was set to the proportion of its portfolio (in a vintage) that comes from the focal style, and the width of each producer's style niche for each vintage was calculated with the Simpson index.

Critical ratings were coded from two influential critical publications that communicate ordered assessments of appeal/quality. (One guide also indicates for each wine whether it was aged solely in *barriques*, solely in *botti*, or in both.) Estimates of ordered logit specifications reveal that the quality ratings of wines made by wineries with broad style niches fell significantly below those of wines made by style specialists.

Negro et al. (2010) argue that partiality has implications for how we should think about experience. According to the spirit of the fuzzy niche theory, a vintner learns more about producing a style in vintages when specializing in

that style. In other words, a principle of allocation applies to learning from experience. This study implemented this imagery by using GoMs in styles to calculate experience in styles. The resulting (fuzzy) measure of experience sums a winery's GoM in each of its current styles over prior vintages. Fuzzy experience with a style has a (significant) positive effect on critical ratings. In addition, the evidence suggests that straddling styles hinders learning about how to produce them. Specifically, the effect of fuzzy experience on quality ratings diminishes with increasing niche width. Taken together, these estimates imply that the effect of experience on appeal is positive for narrow niches and diminishes with increasing niche width. This result is the opposite of what has been found in studies of typecasting. In research on typecasting in labor markets for film actors, Zuckerman et al. (2003) found that inexperienced actors benefit from being typecast because labor market intermediaries interpret narrow experience as signaling skill in the genre. Experienced actors do not enjoy this benefit because market intermediaries are less likely to regard them as unskilled.

Finally, the fuzziness of the styles also matters. As noted above, the contrast of a population is the average GoM in the category among the entities with positive GoM; contrast is therefore inverse to the fuzziness of a category. This research on vintners calculated the contrast of the styles along these lines. It finds that specialists have a big advantage over generalists under high-contrast conditions, but this advantage wanes as contrast falls (styles become fuzzier). Such a loss of contrast seriously damages the critical ratings of the style specialists. Full-fledged membership in a category does not convey much advantage when the category boundary blurs, according to these estimates.

**Actors' careers in film and television.** The general argument has implications for careers, building on the research of Zuckerman et al. (2003) on typecasting of actors (which used a crisp conception of categories). Koçak et al. (2009b) consider the consequences of category

spanning in the case of two separate but related domains: film and television. Using detailed records of actors' participation in productions in each domain and of their degree of specialization over genres within each, this study shows that category spanning within the focal domain significantly reduces the chances that an actor will subsequently gain a starring role in that domain. However, category spanning in one domain does not diminish the chances of success in the other; it has, if anything, a positive effect on the chances of gaining a starring role. This asymmetry suggests that categorical identities can be strongly domain-specific (even for closely related domains) and that the penalty for generalism within a domain reflects mainly a typecasting effect.

**Peer-to-peer lending.** Leung & Sharkey (2009) analyze success of applicants in a peer-to-peer online lending site. In the early years of the site's operation, individual applicants could affiliate with at most one group. The leaders of each group could list a set of categorical affiliations (e.g., occupations, gender, religious affiliations of group members). Groups differed in breadth (number) of affiliations claimed, and funders could click through to pages that described the group members and their loans. Holding constant the applicant's credit score, size of the proposed loan, and other relevant covariates, Leung & Sharkey (2009) find that applicants from groups have much higher probability of receiving funding than those who do not affiliate with groups but that, among the latter, the probability of funding declines significantly with the number of categorical affiliations claimed by the group.

This study concentrates on a natural experiment. Midway through the observation period, the Web site stopped listing the categorical affiliations of the groups. Once the funders could not see whether a group claimed a narrow or diffuse categorical identity, the effect of diffuse identity disappears in an analysis with fixed effects for groups (allowing a comparison of the effect of membership in a group before and after the removal of the categorical information).

## Restaurants and other food services.

Kovács & Hannan (2010) argue that the consequences of spanning categories for appeal to an audience depends on the contrasts of the categories spanned. When categories lack contrast (have very fuzzy boundaries), spanning categories does not cause much additional confusion for the audience; thus, the penalties associated with spanning ought to be slight. But, when the contrasts of the categories spanned are high, audience members will have difficulty interpreting the producer, so spanning categories will be devalued more.

Kovács & Hannan (2010) analyzed reviews of all the San Francisco-based organizations assigned at least one category in the food domain on a Web site.<sup>4</sup> The researchers followed the studies sketched above and set producers' GoMs in categories as inversely proportional to the number of categories assigned.

This study found, as predicted, that producers who get assigned to more than one high-contrast food category get lower evaluations on average than those assigned to one high-contrast category and one or more low-contrast ones.

## THE SOCIAL STRUCTURE OF THE AUDIENCE

### Audience Structure

Another strand of the emerging theory focuses on the audience side (Cattani et al. 2008, Koçak et al. 2009a). This work deals with various facets of the notion that the social structure of the audience affects agreement about the applicability of labels and their meanings. Here the key notion is represented formally by a function that tells the intensity of an agent's engagement as a member of an audience for a label. Engagement

<sup>4</sup>This domain consists of 108 categories, including food genres such as a broad array of ethnic cuisines, e.g., American (traditional), Basque, and soul food. Others refer to the mode of service, e.g., buffet, fast-food, and food stand. Still others pertain the key ingredient(s), e.g., burgers, live/raw food, and seafood. Finally, some refer to particular food codes such as halal, kosher, and vegan.



as a member involves learning about the producers, evaluating producers and products, constructing and enacting labels and schemata, and buying, consuming, discussing, and displaying the products/services of the producers. It also means gaining fluency in the specifics of the audience's language, including proper names and labels for clusters of offerings. So more engaged audiences likely develop more elaborate category languages. In particular they ought to rely more on proper names and category-specific labels.

In this context, it also makes sense to discriminate a vanguard from the mass audience. Highly engaged audience members often develop more subtle and finer-grained distinctions, and they often develop schemata that code these distinctions. They generally share their observations with others and try to reach consensus about how to label objects in the domain and about what the labels mean. Koçak and collaborators (2009a) consider three types of audience members whose presence can strengthen a vanguard: (a) activists: audience members who are highly engaged in the market, who participate more in the activities of the category; (b) enthusiasts: audience members whose personal identities are invested in the collective identity and for whom engagement in the market is both a social and an economic activity; and (c) insiders: producers who have a nonzero GoM as members of the audience for the label. Activists likely lead public discussions of how a market should be organized; they are also more likely to be consulted by authorities. The symbolic capital of enthusiasts and the know-how that insider audiences bring to the mass audience likely give them a privileged position as well, increasing their chances of influencing the agreement among the audience. Hence, increases in the prevalence of activists, enthusiasts, or insiders in the audience segment presumably raise the expected levels of intentional consensus, agreement about valuation, and development of a category language.

This work also proposes that being an active participant in the audience and fully engaging the market makes producers and their

offerings more attractive to other audience members. This argument provides a way to validate indirectly the claim that insiders (producers) help to shape the consensus about the meaning of a category.

It is worth pointing out that the conception of the audience and producer roles that underlies this research assumes that producers generally play both roles because producers are audiences to each other. This conception runs against the common claim that mediated markets involve an interface in which critics mediate between producers and audiences. Surely producers do play this role, but mainly with respect to what is sometimes called the external audience (the fraction of the audience that is composed of nonproducers). This reasoning suggests that critic also be defined as a role. In many cases, occupants of the critic role also play the audience role, as when highly engaged audience members post blogs that review offerings in the category, as with the *Malt Advocate*, the magazine for whisky enthusiasts. However, in other cases the critic adopts a dispassionate posture that distances itself from the audience role, e.g., *Consumer Reports*.

## Empirical Evidence on Audience Structure

Attention has been paid to the empirical implications of the theory on the audience side of the interface of a domain.

**Buyers in eBay auctions.** Koçak et al. (2009b) used the data on eBay auctions discussed above to examine some implications of the foregoing arguments. They measured the overall level of engagement by the audience in each category in two ways: the median number of items bid on by bidders in the category over the previous 17 months and the number of repeat bidders over that period. The degree of activism is indexed by variation in engagement, a Gini index defined over the number of bids per bidder, as well as the proportion of repeat bidders. The prevalence of enthusiasts is the prevalence of category-specific identifications, as discussed

above. Finally, the prevalence of insiders is set to the proportion of those who sold in the category who also bid on offerings in it.

On the outcome side, agreement about valuation is measured by the concentration of demand (over items) on the ground that a high level of agreement about valuation should cause many audience members to seek the same items. The indicator of the elaboration of a category language is the frequency of use of category-specific proper names and acronyms in item titles.

Each of the arguments sketched above receives (partial) empirical support. Concentration of bids is significantly higher in categories with stronger vanguards. Likewise, the use of a category language is significantly more common in categories with more engaged audience members (on average) and stronger vanguards. Finally, items put on auction by sellers who are also buyers (insiders) are significantly more likely to end in a sale, net of the effects of reputation, number of items listed, and niche width.

**Feature-film producers.** Cattani et al. (2008) argue that consensus about labels depends on the network structure of the audience, the density of ties over the producer-audience interface, and the temporal stability of the membership of the audience. They investigate these claims in an analysis of data on film production companies (the producers) and distributors (the audience). Their analysis of the hazard of exit of firms from film production finds that the deleterious effects of adopting a broad niche in the space of genres is weakened when the audience is less densely tied, has fewer repeat ties with producers, and has a higher rate of turnover. In other words, a more fragmented audience agrees less about the category boundaries or is less able to enforce its codes on the producers.

**Accounting.** Bogaert et al.'s (2010) analysis of the emergence and legitimation of the accounting profession in the Netherlands over the period 1884–1939 centers on variations in the degree of consensus among producers (accounts) and the outside audience on the

meaning of “accountant.” The meaning was contested for much of the period, and as many as 15 professional associations promulgated competing codes. On the argument that dissensus in the audience about the meaning of a label impedes cognitive legitimation (Hannan et al. 2007) and the standard ecological argument that legitimation improves life chances of the bearers of a label, this research relates dissensus to the hazard of exit for accounting firms. Dissensus is measured in terms of the evenness of the distribution of memberships over professional associations. As predicted, dissensus increases the exit hazards from accountancy.

**Modernistic music.** The case of the arrival of modernistic music in Brussels during 1919–1939 presents an interesting alternative picture of the relationship between the vanguard and the mass audience (Boone et al. 2009). There were two dominant styles during the 1920s and 1930s: French Neoclassicism (with Stravinsky as the prototype) and German Expressionist (with Schoenberg as the prototype). A Flemish hybrid combined elements of the two musical forms.

Boone et al.'s (2009) analysis finds a divergence in the reception of modernistic compositions at venues favored by music enthusiasts and those favored by the mass (high-status) audience. Stylistic fragmentation among all productions for a year (a Simpson index of diversity over the three styles) depressed the hazard of performance of all forms of modernistic music in the mass venues. But the sign of this effect was the opposite for the enthusiasts' venues, at least initially. This research points to the need to specify the temporal dynamics of these processes more precisely, especially for cases in which enthusiasts lead in adopting a style but switch to another once the style gains acceptance in the mass audience.

**Software categories.** Pontikes (2009) contrasted the reactions of two functionally differentiated audiences to category spanning in the software industry (as described above). She points out that all of the previous research has

concentrated on the buying audience, whose members value producers/products for fit to their category schemata. Other relevant audiences take different perspectives. In particular, venture capitalists generally want to invest in firms that show the potential to gain important shares of large markets. Pontikes (2009) argues that this interest creates a bias in favor of category spanners. She measures appeal in consumer markets by sales of software and appeal to venture capitalists as a high hazard of receiving venture capital funding. As predicted, spanning has opposite effects on the two outcomes: Producers with broad and unconstrained category niches do less well in market competition but have higher hazards of gaining venture capital investments.

### **Restaurants and other food services.**

Kovács & Hannan (2010) argue that enthusiasts in an audience will react strongly to producers who span domains but less strongly than the general audience to spanning categories within a domain. Activism as an audience member is judged in this study by the number of reviews posted. The study finds that activists (those who post many reviews) differ from other reviewers, who are presumably more like the mass audience. Activists impose much weaker (and sometimes no) penalties to restaurants that span categories in the food domain. However, the activists react more negatively to producers who span over the boundary of the food domain.

## **FUZZINESS, APPEAL, AND THE STABILITY OF CATEGORIES**

Recent work has also examined the effect of contrast (lack of fuzziness) on appeal and on the stability of categories. The central argument is that lowered contrast (increased fuzziness) reduces the appeal of all offerings in a category. One line of argument points to a direct effect of contrast. By the definition of a positively valued category, the expected appeal of a producer's offering to typical audience members increases with the degree to which the producer (and the offering) conforms to the audience member's schemata for the category. As a category's

contrast falls, fewer producers conform fully to the relevant schemata; consequently, the offerings in the category generally have lower appeal.

Lowered contrast also limits appeal in an indirect way, through an effect on disagreement about the meaning of the category. When contrast falls, bearers of a label diverge on schema-relevant feature values. This dissimilarity sparks disagreement about the meaning of the label and about which producers belong to the category. Hannan et al.'s (2007, chapters 4 and 5) theory of category emergence posits that increasing contrast (sharper category boundaries) generally increases agreement about the meaning of a category. If key audiences agree about meaning, then some products/producers can become widely accepted exemplars. However, a failure of critics and enthusiasts to reach intensional agreement makes it unlikely that any offering in that category will receive broad acclaim. The process of category erosion can work at the other end of the spectrum of evaluations: Lack of consensus also lowers the likelihood that an offering will be widely judged to be inferior. In this sense, lack of consensus ought to lower the variance of evaluations. Negro et al. (2010) argue that critics and enthusiasts generally make finer and more careful distinctions in the upper range of offerings. If so, then the disagreement about a category spurred by lowered contrast will tend to lower evaluations overall. The social value attached to a category presumably declines when its boundaries blur.

Moving beyond consideration of the effects of the contrast of a focal category, Kovács & Hannan (2010) argue that contrast also affects the audience reaction to spanning. In particular, combining memberships of sharp (high-contrast) categories is likely to cause more confusion and to make identities harder to interpret than when a high-contrast category is combined with a fuzzy one.

### **Empirical Evidence on Fuzziness, Appeal, and the Stability of Categories**

**Winemakers.** As noted above, Negro et al. (2010) found an effect of style straddling at the

level of the winery: A wine's appeal to critics declines with the width of the style niche of its producer. This effect weakens as straddling proliferates (and style niches broaden on average). More important, the appeal of all wines of a style decreases as the style-category contrasts decline. So, as expected, widespread straddling blurs the boundaries of a category and diminishes its social appeal.

**Tape-drive producers.** Similar issues are addressed in a study of the participation of data storage firms in the various technical formats that have characterized tape storage over the history of this industry. Carroll et al. (2010) analyzed complete histories of adoptions and deletions of formats for all firms that have ever offered a tape-drive product. They characterize a firm's GoM as a producer of a format as the inverse of the number of formats that it produces (a firm that produces only one format has a GoM of one in that format and zero in all of the other existing formats at the time).

This research focused on the average level of contrast of a firm's portfolio of formats. Among firms with more than one format, having a high-contrast portfolio makes a firm hard to interpret for potential exchange partners. An analysis (that controls for many details of the technologies involved and for firm characteristics) reveals that the average contrast of a firm's portfolio of formats has a significant positive effect on a firm's hazard of failing or leaving the industry.

**Software producers.** Pontikes (2008) analyzed the effect of fuzziness and constraint on the prevalence of multiple category memberships in the software industry and especially on variations in the degree to which firms claim newly available labels. She coded press releases by software producers to characterize their affiliations with labels and measured a producer's GoM in a label as the number of times it claims that label taken as a ratio to the number of times that it claims any label.

Pontikes (2008) analyzed the effects of contrast and also proposed a measure that takes

account of the degree of focus of the label overlaps (where high focus means that most overlaps are with a small number of other categories). She defines leniency as the product of fuzziness (one minus contrast) and the count of the other labels that a label's members claim.

Through an intricate analysis of overlaps in citations to "prior art" in the sets of all patents in the relevant patent categories, she measured the coherence of labels in knowledge space. A label has a coherent position to the extent that prior-art citations are localized within the set of firms that claim the label. She reasoned that this measure of technical similarity would serve as the basis for producers and other relevant audiences to schematize a label. High similarity will make it more likely that a label would become a category.

An analysis of the probability that a software producer claims a new (to the industry) label found, as predicted, that firms that claim more lenient labels are significantly more likely to claim new ones (that is, broaden membership niches). Moreover, the probability that a producer will adopt a new label increases with the average fuzziness of the labels that it claims. These effects, taken together, reveal that fuzzy and lenient categories tend toward greater fuzziness, because in many cases the new label adopted adds to the set of labels being claimed.

**Feature-film projects.** A similar pattern emerges in an analysis of the factors that encourage genre spanning in Hollywood film productions (Hsu et al. 2008) using data prepared by the American Film Institute (AFI). This data set assigns all American films produced during 1911–1970 to a dominant "stand alone" genre and possibly to subordinate genres as well. In this context, genre spanning means that a film project chose content that led the film to be listed in one or more subordinate genres (which is the case for 15% of the 25,895 films analyzed).

The AFI database also lists the subjects addressed by each film. For instance, films assigned to the horror genre are classified as dealing with murder, physicians, revenge, vampires, monsters, scientists, and so forth.

These researchers conducted a latent semantic analysis to measure the similarities of pairs of films (released during moving five-year windows) and constructed a measure of the average similarity of films in each (stand-alone) genre for each year. They used this information to measure the fuzziness and the leniency of genres, following Pontikes (2008). This analysis reveals, for instance, that mystery and war are especially fuzzy, and western and musical comedy are very crisp. War and mystery are also very lenient; the most constraining genres are satire, musical comedy, and romantic comedy.

Analysis of the likelihood that a film gets assigned a subordinate genre (controlling for characteristics of the individual film project and for the age and recent success of the genres) replicates Pontikes's (2008) key findings: Films with a main classification in more lenient genres have a significantly higher probability of assignment to additional genres, meaning that they (partially) fit the schemata of multiple genres. Net of that effect, the fuzziness of a film's main genre also significantly increases the odds of assignment to subsidiary genres as well.

Another aspect of fuzziness is a lack of similarity of subject matter within a genre. Films assigned to genres with high similarity of subject matter are significantly less likely to stray from the typical subject matter of the genre in a way that gets them assigned to subordinate genres. However, when similarity of subject matter becomes very high, the effect reverses. The authors interpret this latter effect as reflecting a tendency for designers of film projects to move away from highly crowded subjects.

**Passenger airlines.** Researchers who collect full histories of producers that have claimed membership in a category often notice (but do not analyze) that naming patterns tell something about the taken-for-grantedness of a label. Putting a category label in a producer's name (e.g., Bank of New York, Fairchild Semiconductor, Paramount Pictures) signals focus on a category and a bet that the category is durable. Kuilman & Wezel (2008) show that this kind of pattern mattered for the mortality

of firms in the UK airline industry during 1919–2000.

In this case, a moderate naming consensus arose during the 1930s. During this period *The Times* of London began to refer to the industry as the aviation industry (rather than terms used earlier such as aeronautical or aerial navigation) and firms increasingly began to add Aviation (and also Air, Airways, or Airlines) to their names. Kuilman & Wezel (2008) calculated the degree of naming consensus (using the labels just mentioned along with Fly/Flight, Sky, and Jet). Agreement on adjectives that express connection to a label amounts to a kind of extensional consensus among producers. The degree of such consensus has a significant negative effect on the hazard of mortality, which supports the view that consensus reflects taken-for-grantedness. Moreover, a firm's GoM in the consensus (how well its name fits the convention) also has a significant negative effect on the hazard of mortality during the early years of the population's history (when air travel was surely not taken for granted).

## ISSUES OF MEASUREMENT

This survey of recent research reveals that a variety of empirical strategies have been deployed for measuring partiality in category memberships. I now consider these strategies explicitly, discuss their advantages and disadvantages, and consider how they might be improved.

The studies discussed in the previous sections have used various strategies for measuring GoMs in producer categories and in engagement of producers and of audience members. In the case of assessing the GoMs of producers/products in categories, five strategies have been deployed (see **Table 1**):

1. Collect assignments by critics and other audience members of producers/products to a relevant set of categories (e.g., studies of films, restaurants).
2. Use self-claims to memberships over a set of categories, such as the patterns of names and labels claimed (e.g., Pontikes's 2008 analysis of software categories).

**Table 1** Approaches to measuring grades of membership of producers in labels and categories

Category	Audience/critic assignment	Self-claim/label	Similarity	Ties	Inference
Accounting				BBC	
Airlines		KW			
Bank forms					VWL
eBay categories		HHK			
Food service	KH				
Film genres	HHK, HNP		Hsu		
Music genres			BDRV		
Peer lending		LS			
Software categories		Pontikes			
Tape formats					CFLM
Wine styles					NHR
Universities				Kovács	

Abbreviations: BBC: Bogaert et al. (2010); BDRV: Boone et al. (2009); CFLM: Carroll et al. (2010); Hsu: Hsu (2006); HHK: Hsu et al. (2009a); HNP: Hsu et al. (2008); Kovács: Kovács (2009); KH: Kovács & Hannan (2010); KW: Kuilman & Wezel (2008); LS: Leung & Sharkey (2009); NHR: Negro et al. (2010); Pontikes: Pontikes (2008, 2009); VWL: Visentin et al. (2008).

3. Base GoMs in a category on objective similarities among offerings (e.g., elements of formal properties of music compositions as in the study of modernistic music or latent semantic analysis of film themes).
4. Rely on aggregated perceptions of similarities of producers/products from patterns of ties. For instance, Kovács (2009) demonstrated that a structure of graded similarity can be constructed by analyzing in-links to Web pages of universities and colleges. In this construction, two entities are similar if similar entities link to them. The result for contemporary American colleges and universities is a cloud of points in a fairly low dimensional (nonmetric) space, with a dense region at the edge of the cloud that contains the most prestigious organizations. Moreover, the structure of similarity predicts pairwise intensity of competition for students (net of the effects of physical distance and distance on a set of measured characteristics concerning academic and social climates): The more similar the

organizations, the more intensely they compete.

5. Make inferences about likely perceptions of audience members from other observable features of producers/products (e.g., using a winery's methods of aging to judge membership in wine styles).

Each approach to measuring partiality has yielded sensible empirical patterns. Those that rely on assessments of audience members or on claims by producers ought to be most informative. Continued development along these lines holds the most promise.

My research group is exploring how to address in laboratory experiments some of the issues treated here. For instance, we want to set the task of assigning producers to a set of potentially relevant categories in a controlled setting in which we can measure latencies: the time it takes a subject to make an assignment of an object. Low latency would signal a high GoM in the category chosen.

As we have worked on this kind of design, we confront the problem that subjects will only be able to complete this task for prominent exemplars (e.g., Stanford University, but not



perhaps DeVry University). Here the contrast with Rosch's research might be informative. Recall that Rosch (1973) asked subjects to tell how typical were subconcepts of concepts (apples and olives as fruit, for instance). No exemplars were involved. Our task is more difficult and may require a gradual approach, beginning with the Roschian paradigm.

Research along these lines could investigate various concepts and their subconcepts and set the contrast of a category proportional to the average GoM of the subconcepts in the concept. For example, the comedy genre for films is generally thought to include subgenres such as screwball comedy, black comedy, and so forth. How typical are these? Or, consider craft beer. Subjects might be asked to associate with this category (or not) such types as steam beer, coffee stout, fruit ale, and extreme beer. Finally, for the case of university for which I suggested examples above of exemplars that differ in typicality as instances of the this concept, we could instead focus on the subtypes religious university, for-profit university, and so forth.

## DISCUSSION

In a brief time, researchers have devised ways to address implications of partiality in category memberships. Some efforts at measurement

of GoMs in categories have been quite indirect; other studies get much closer to the audience's perspective. Further refinement of these notions in empirical testing requires improvements in the measurement of graded typicality.

This first wave of research has largely supported the notion that the degree of fuzziness (lack of contrast) of a label has consequences for those who affiliate with the label or get assigned it by the audience. In general, the offerings of low-contrast labels lack appeal. Moreover, labels that gain high-contrast and high-intensional consensus tend to thrive; those with low contrast appear to have low survival chances.

An important source of partiality is category straddling by producers: adopting feature values that fit partially to more than one category and/or engaging as a member of more than one category. Both types of partiality (in membership and in engagement) appear to get penalized by audiences.

So we have some evidence that partiality matters on each side of the producer-audience interface. However, these studies consider only one side at a time. The next challenge is to model the two sides simultaneously. This means developing theories of the coevolution of the producer and audience roles and of the language that expresses them.

## DISCLOSURE STATEMENT

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