Balancing Categorical Conventionality in Music[1]

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Research on the relationship between categorical unconventionality and popularity has produced mixed results. While many accounts suggest that unconventionality is penalized, much sociological theorizing indicates that success comes from a delicate balancing act between conventional and unconventional offerings. Using data on the genre self-classifications of over 2 million musicians and bands across the United States, the authors find broad support for this balancing act. Yet the shape it takes is also conditioned on local contexts, across both high-order complexes of musical genres and geographic space. The authors highlight the local metropolitan area characteristics that shift the relationship between unconventionality and popularity. They also create a typology of cities based on how their unconventional offerings are rewarded and punished. An online visualization tool enables further investigation of these relationships. The authors close by proposing an agenda for how to study local heterogeneity in the relationship between unconventionality and popularity.

In 2007, before being nominated for six Grammy Awards and rising to international stardom, Janelle Monáe was a weirdo. In fact, in our data on over

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2 million musicians and bands working at that time, when measured by the techniques described below, the combination of genres Monáe used to describe herself were in the 99th percentile for unconventionality. While Monáe's unconventionality was already on full display—at the time she was in the middle of releasing a three-part concept album about a messianic android—less well known was her history as a weirdo coming up in the Kansas City scene and the room for experimentation that it gave her. As Monáe later explained of her band in Kansas City, The Weirdos, "being a part of [The Weirdos] and touring with them around Kansas City helped me to discover my inner weirdo, if you will" (Gross and Hart 2013). Monáe here draws a close connection between categorical conventionality, success, and the local context. This article develops concepts and methods for examining these interrelationships more generally.

Research on the relationship between categorical unconventionality and popularity often—although not always—finds that individuals, organizations, and products are penalized, punished, and discounted for breaking from the norm (Zuckerman 1999; Negro, Koçak, and Hsu 2010; Durand, Granqvist, and Tyllström 2017). Yet an emergent and ongoing question in the categories literature that is also exemplified by Monáe's rise to stardom is how—given a strong categorical imperative—innovation actually occurs (Romanelli 1991; Clemens and Cook 1999; Pontikes 2012; Pontikes and Hannan 2014; Sgourev and Althuizen 2014). As noted by Zuckerman (2017, p. 61), an emphasis on penalization for categorical norm violation "may have diverted the literature from appreciating the factors that provide relief from the categorical imperative, making innovation possible."

Relying on a data set of over 2 million musicians and bands, we investigate how the relationship between categorical unconventionality and popularity shifts, depending on the geographic and relational context in which a band operates. To do so, we first discuss the categories literature, highlighting contrasting findings on the return in popularity for categorical unconventionality. We then assemble a wide swath of social theorizing that suggests an inverted U shape in the relationship between unconventionality and popularity. This proposed relationship between conventionality and popularity has been theorized in the sociological literature for well over a century and dates back even farther in Western philosophy. For example, Nietzsche attributes the success of artists, poets, and writers to their ability to balance conventionality and unconventionality, a creative process that he refers to as "dancing in chains" (1986, p. 343). In this view, unconventional category blending tends to be rewarded up to a point, beyond which increasing unconventionality becomes a liability.

Testing this hypothesis is the first goal of this article, and we find strong evidence for it across multiple musical domains and hundreds of metropolitan areas. Yet beyond the generally inverted "U-ness" of this shape, potential

heterogeneity in its form has not drawn as much theoretical attention. As a second major goal of the article, rather than controlling away this potential heterogeneity in form in search of a singular average effect, we investigate it. First, we generate a theoretical graph illustrating different shapes the relationship between unconventionality and popularity may take. Exploiting the potential of big data, we then take a "forensic social science" approach (Goldberg 2015; McFarland, Lewis, and Goldberg 2016; see also Vaughn 2014) to learn from our data in a structured yet open-ended way. After establishing that the universe of bands in our data is structured into multiple musical "worlds" that we term "rock," "hip-hop," and "niche," we show that while the basic inverted U shape occurs within those worlds, the relationship between unconventionality and popularity differs between them. Whereas bands in the niche world are more harshly penalized for being conventional than are bands in other worlds, bands in the hip-hop world operate along a wider range of conventionality, not only with less penalty but also, unlike bands in the other worlds, even seeing a second uptick in popularity for being more unconventional. Scaling down to the geographic level, we then generate a typology of cities ("normalists," "traditionalists," "experimentalists," and "specialists") based on the relationship between unconventionality and popularity for bands from them. More generally, we find that bands from metropolitan areas with features like higher population density, record industry concentration, and younger residents are more rewarded for more unconventional musical offerings. We also provide open-access, interactive visualization tools by which others can extend our observations in potentially novel directions, more fully investigating the micro- and mesolevel mechanisms at work in rewarding and penalizing unconventionality. In this spirit, the discussion proposes an agenda for how to study the relationship between unconventionality and popularity while still allowing for heterogeneity in local contexts, highlighting Nashville and Honolulu as representative of what may be more general phenomena. We close the article with two examples of how our approach can be readily imported into other research domains beyond music, before discussing the contributions of our work to research on categories, cultural sociology, urban studies, big data, and forensic social science more generally.

IS IT BETTER TO FIT IN, STAND OUT, OR BOTH?

> Conventions are the artistic means *acquired* for the understanding of the hearer; the common speech, learnt with much toil, whereby the artist can really communicate his ideas. . . . What the artist devises beyond convention he offers of his own free will and takes a risk, his success at best resulting in the setting-up of a new convention. As a rule originality is marveled at, sometimes even

> worshipped, but seldom understood. (Friedrich Nietzsche, *Human All Too Human*, aphorism 122)

As summarized by Pontikes (2012, pp. 81–82), a "consensus is building that organizations with multiple market identities are . . . less likely to be successful . . . than more focused competitors." Often—although not always—referred to as the "categorical imperative" (Zuckerman 1999), empirical evidence of a penalty for unconventionality has been found across a wide swath of markets, including those for securities (Zuckerman 1999), online lending (Leung and Sharkey 2013), Hollywood films (Hsu 2006), technology (Carroll et al. 2010), and wines (Negro, Hannan, and Rao 2010). As this line of research has been summarized by Kovács and Hannan (2010, p. 176), for producers "the threat of external punishment . . . presents a significant barrier to participation in multiple categories."

Although most scholarship has focused on the disciplinary mechanism of clear categorization, the literature is much less settled on this question than it may initially appear (Schneiberg and Berk 2010; Zuckerman 2017). As Keuschnigg and Wimmer (2017, p. 449) put it, the "negative effects [from category spanning] are far from universal." Indeed, under the right conditions there is no penalty for category mixing for law firms (Phillips, Turco, and Zuckerman 2013) or diversification across industries (Baker 1992; Campa and Kedia 2002; Ruef and Patterson 2009), and category blending can be rewarded in venture capital markets (Navis and Glynn 2011; Pontikes 2012; Wry and Lounsbury 2013), for law and technology firms (Fleming 2001; Paolella and Durand 2016), and for elite artists (Sgourev and Althuizen 2014) and established actors and musicians (Zuckerman et al. 2003; Lena and Pachucki 2013; Johnson 2017; van Venrooij and Schmutz 2018). Considering these mixed findings, Pontikes and Hannan (2014, p. 312) summarize the "underlying tension" in the literature as one in which "social structures are simultaneously rigid enough to induce widespread conformity and malleable enough to change as a result of nonconformist behavior."

Yet rather than viewing producers and products as facing a single categorical imperative of varying directions and strengths, for over a century, scholars across different theoretical paradigms have argued for the need to balance between conventionality and unconventionality in market presentation. Notably, while this suggestion can be observed at an industry level (Peterson and Berger 1975; Lopes 1992; Dowd 2004), organizational level (e.g., Mears 2011; Childress 2017; Zhao et al. 2017), the level of individuals (e.g., Becker 1982; Accominotti 2009; Goldberg et al. 2016; Wohl 2019), or the level of discrete cultural objects such as songs (de Laat 2014; Askin and Mauskapf 2017), if there is an imperative, the imperative is in understanding trade-offs and finding the right mix of conventionality and unconventionality in any given

context. As Simmel (1957, p. 542) wrote more generally of fashion, a "compromise" must be struck between "adaptation to society [i.e., conventionality] and individual departure from its demands [i.e., unconventionality]." This general idea has also been referred to as a "balance between innovation and conformity" (Alston 1989, p. 153), a "trade-off between the emancipating aspects of entrepreneuring and the accommodation of constraints" (Rindova, Barry, and Ketchen 2009, p. 483), and an offsetting between "universal isomorphism and distinctive enumeration" (Negro et al. 2010, p. 18). As Zuckerman (2017, p. 35) summarizes it, "differentiation imperatives stand in fundamental tension with the categorical imperative," as "candidates must distinguish their offerings from others but not have their offerings screened out for being outside the conventional differentiation."

For Bourdieu (1993, p. 123), this balancing act is expressed as a combination of "tradition and tempered innovation," whereas for White and White (1993, p. 10) entrants are assessed "both in terms of known standards and in terms of originality," and for Roy and Dowd (2010, p. 192) producers must find space somewhere in between in "a shifting mixture of precedence and uniqueness." In social psychology—and work on categories and markets inspired by it—the same basic principle is referred to as "optimal distinctiveness," which is expressed through an inverted U-shaped relationship between unconventionality and market success: unconventionality is rewarded up to a point, but when offerings become too unusual their popularity fades (Brewer 1991; Askin and Mauskapf 2017; see Zhao et al. [2017] for review). As such, in this type of "strategic balance" (Deephouse 1999), products must be "legitimately distinctive" (Navis and Glynn 2011) without being too distinctive, such as Uzzi et al. (2013, p. 468) find for highly conventional articles containing "intrusion[s] of unusual combinations" and Lena and Pachucki (2013) find for sampling choices in rap songs. Taken together, this disparate theorizing leads to our central hypothesis, which, following Nietzsche, we call the dancing in chains (DIC) hypothesis:

Hypothesis 1.—*Unconventional category blending will be rewarded up to a point, beyond which increasing unconventionality will become a liability. This process produces an inverted U-shaped curve describing the relationship between unconventionality in category blending and popularity.*

Nietzsche's evocative phrase offers a useful label to capture an implicit empirical hypothesis embedded in the diverse theorizing reviewed above. Nietzsche himself developed the notion of "dancing in chains" in rich philosophical reflection on the creative artistic process, emphasizing the temporal process of balancing freedom and constraints, the weight of old conventions and the search for new ones, and the seeming paradox of freely choosing to bind oneself to conventions. We extend the general insight of a dynamic and shifting relationship between "dancing" and "chains" by examining how the relationship between unconventionality, conventionality, and popularity varies

depending on a band's context. What it means for a band to be unconventional depends on where it sits within the broader musical landscape. To examine how context operates to define the meaning of "balancing," we feature two key contexts that plausibly (but not fully) shape the expectations bands meet: the larger genre complexes and the geographic location with which they are associated.

BALANCING ACTS AND CONTEXTS

Unlike a clear and consistent categorical imperative, a balancing act between two competing imperatives better allows for the possibility of nonlinear relationships between conventionality and popularity. While a wealth of sociological theorizing across a range of subfields suggests some form of the DIC hypothesis, beyond a widespread theoretical support for this insight, variation in its form has remained uninvestigated and untested. This means that with regard to variation on an inverted U we cannot appeal to a well-articulated theoretical tradition to generate clear sets of ex ante hypotheses to be tested. Moreover, empirical investigation of such variations has been hampered by the fact that modeling them requires complex techniques such as nonlinear interactions, which can be difficult to interpret and sometimes unreliable outside of a big data context.

To meet these challenges, now operating outside of a hypothetico-deductive framework, we first develop intuitions about some of the possible forms the relationship between unconventionality and popularity might take. We do so in the form of a theoretical figure (Swedberg 2016; Silver 2020), supported with illustrative examples of the types of settings and contexts in which these different relationships between unconventionality and popularity could possibly occur. We then consider the potential role of two types of contexts in shifting the relationship between unconventionality and popularity—relational, supralevel complexes of three different musical "worlds" (Silver, Lee, and Childress 2016) and metropolitan-level local scenes (Silver and Clark 2016). These contexts may provide some, but not all, of the plausible sources of variation that we find. We use these insights to help us better interpret the patterns we inductively discover in our data via various techniques geared toward revealing how nonlinear relationships between unconventional category pairings and popularity may vary across contexts.

Figure 1 shows nine theoretical relationships between conventionality and popularity. The *X*-axis runs from highly conventional combinations of categories on the left to highly unconventional combinations on the right; the *Y*-axis goes from low popularity to high popularity. Our goal in figure 1 is to be illustrative, not exhaustive, and to illuminate the ways the relationship between unconventionality and popularity can vary, the point along the spectrum of conventionality at which unconventionality becomes a strong liability

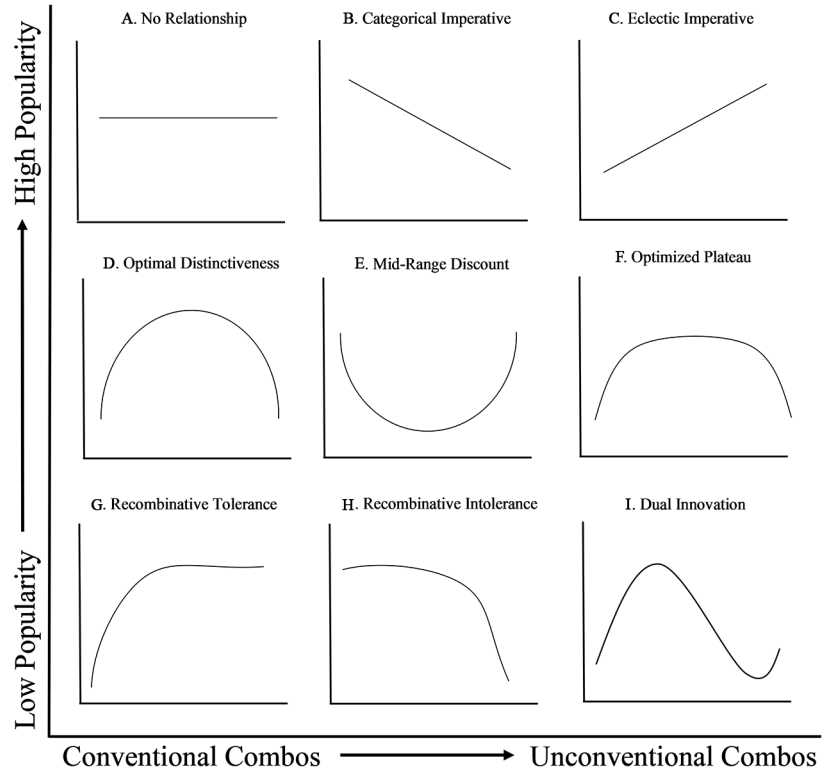

FIG. 1.—Nine forms of the relationship between conventionality and popularity. Each subgraph has the same *Y*- and *X*-axes, with low to high popularity on the *Y* and conventional to unconventional genre combinations on the *X*. Variations on themes in the subgraphs can be read across the rows.

could differ, the strength of the penalty could vary, the linearity of the relationship could vary, and more. The first row shows three simple versions of this relationship: no relationship, linearly increasing punishments for unconventionality, and linearly increasing rewards for unconventionality. Whereas scholarship operating in the categories literature has produced findings in support of figures 1*A*–1*C* or something like them (e.g., Hsu 2006; Pontikes 2012; Phillips et al. 2013), figure 1*D*, or something roughly like it in its nonmonotonic form, is supported by various literatures on balancing between conventionality and unconventionality (e.g., Simmel 1957; Nietzsche 1986; Brewer 1991). The inverted U shape in figure 1*D* describes contexts in which optimal distinctiveness predominates: the most and least conventional offerings are penalized,

and an inflection point exists at the midpoint, in which the "conventionally unconventional" receive the most market attention.

The heterogeneous findings discussed above suggest considering possible contextual variations on the basic form of a nonlinear relationship between conventionality and popularity. For this reason, figures 1*E*–1*I* present different variants on the basic principle of a balancing act and the rewards or penalties for where one falls within it. Figure 1*E*—the inverse of figure 1*D*—is a scenario in which extreme conventionality and unconventionality are strongly rewarded, while offerings that balance the two are penalized. Something like a U shape has been observed in the industry for video game platforms (Cennamo and Santalo 2013) and may also be found in the bifurcated market for fashion models in New York as described by Mears (2011), in which one side of the market rewards conventional attractiveness (i.e., conventionality), whereas the other rewards "edginess" (i.e., unconventionality), with perhaps a discounting for falling in between. Figure 1*F*, which we term an "optimized plateau" model, is a variation on the theme of optimal distinctiveness: a wider range of unconventionality is rewarded equally, without a perfect balance that creates a clear peak. For example, think of the world of big budget blockbuster movies, which since their emergence in the 1970s and 1980s have so regularly genre blended across action, drama, comedy, romance, thriller, and so on, that it is more noteworthy when they do not do so. Even among the more limited subset of big budget superhero movies, unconventionality of genre combinations can widely range, extending without penalty from the perhaps more conventional blending of war film and political thriller in *Captain America: Winter Soldier* to the perhaps less conventional blending of space opera and comedy in *Guardians of the Galaxy*. Yet an openness to genre blending in the world of blockbuster films is less common in the world of Oscar-bait movies—which are almost exclusively intimate dramas and tend to be highly conventional biopics and period pieces (Rossman and Schilke 2014)—as well as more niche worlds of film, like low-budget genre films such as horror movies in which, as with romance novels (Radway 1984), breaking from convention at all may be sharply penalized. As these examples suggest, even within a single cultural domain (i.e., movies), norms about what is and is not conventional may differ depending on what part of the domain one is examining.

Finally, the third row presents three more nonsymmetrical forms of nonlinear relationships between popularity and conventionality. In figure 1*G*, which we title "recombinative tolerance," extremely conventional offerings are penalized, whereas moderately and extremely unconventional combinations are equally privileged. Focusing on geographic differences, this type of curve might be found in the 2010s stand-up comedy scene in Brooklyn, which is celebrated for category blending across different types of stage performance. As

New York Magazine cultural critic E. Alex Jung (2018) explains, Brooklyn-style comedy "isn't just influenced by stand-up, but also drag, cabaret, burlesque, experimental theater, viral videos, and variety shows. . . . [It is] an amalgam of performance art, skit, musical, and storytelling." In this example, place identity in part comes to inflect the shape of the relationship between conventionality and success such that the scene in Brooklyn is generally a better home for, generates more, and is more widely known for unconventional stand-up comedy than is, for example, Dallas. A further extension of this idea would be an "eclectic imperative" (fig. 1*C*) in which increasing unconventionality is increasingly rewarded. This type of relationship could perhaps be found in Zurich, Switzerland, in the 1920s during the early formation of the anti-art artistic movement. Figure 1*H*, "recombinative intolerance," is the inverse of figure 1*G* and represents a context in which conventional and relatively typical recombinations are privileged, whereas more abstruse recombinations are harshly penalized; it is a variant on the categorical imperative that is sensitive to some degree of a balancing act. This could be found in the focus on authenticity and not breaking too far from the norm in blues performance expected of Chicago bands (Grazian 2005). Finally, we term figure 1*I* a "dual innovation" model. In this framework, extreme conventionality and most unconventional combinations are punished, whereas less unusual recombinations are privileged. Yet the most atypical offerings also attract increased popularity compared to their slightly less atypical brethren. This would be a world or scene that follows an optimal distinctiveness model but also contains experimental trailblazers who receive their own, if lesser, rewards; think of a market for fine art in which the most rewarded artists balance conventionality and unconventionality but that also contains an avant-garde at the fringes of what is acceptably art who are rewarded more than other unconventional artists (Rawlings 2001). This can be considered one variation on markets that contain what Zhao et al. (2017) call multiple convergence points in which, rather than a single inverted U shape, there may be multiple peaks and valleys for popularity across the full range of conventional and unconventional offerings.

Rather than being exhaustive, the examples from figure 1 are intended to be illustrative of the types of relationships between unconventionality and popularity that could exist in any given context. Our goal in illustrating these possibilities is not to delimit the consideration set of relationships that may exist but rather to expand it, given that extant theories can sometimes "act as blinders" that "do not allow for serendipitous findings or unexpected discoveries" (McFarland et al. 2016, p. 30). In that vein, we imagine that the forms of the relationships we outline in figure 1 may vary, just as the examples we use to illustrate those forms may vary, such that one can imagine different relationships based on different audiences (e.g., Pontikes 2012), creators in

different relational positions within the same overall domain (Bourdieu 1993), and creators from different geographic locales with their own reputations for what typically comes from different places and what is locally typically done there (e.g., Bennett 2000; Leschziner 2007; Phillips 2011; Hoppe 2020). The central task implied by figure 1, then, is to uncover how the balancing act between unconventionality and conventionality varies given specific contexts.

Guided by Griswold (2014, p. 142), we think of bands as existing in communities that may be defined both relationally (i.e., through similarity and dissimilarity in relational "webs of association") and spatially (i.e., geographically, or "something we can locate on a map"). Notably, Zhao et al. (2017) similarly observe that variation on inverted U shapes may be found both (1) based on psychographic market contexts and (2) geographically. Following this logic, first, balancing between conventionality and unconventionality may take different forms within different relationally defined supralevel musical worlds. Given that from a sociological perspective (unlike a musicological perspective) genres are community based rather than purely sonically based (Lena 2012), we would expect these different communities to have different established conventions (Becker 1982; Crossley and Bottero 2015), particularly as it relates to what is and is not conventional. Put another way, just as producers' frames of reference are relationally defined from the position of their niches (White 2002), we might expect that bands working in the world of hip-hop genres may have an orientation to both unconventionality and popularity different from bands in the rock world (and related genres), who may have their own norms and definitions.

Similarly, we expect that bands from different urban contexts could, at the margins, be held to different standards depending on the meanings connected to the type of cultural scenes (Silver and Clark 2016) associated with their cities. In various contexts, place-based cultural identities have been shown to shape how both locals and nonlocals evaluate people and events associated with a given place (Molotch, Freudenburg, and Paulsen 2000), from potential tourists applying different stereotypes to Vermont and New Hampshire based on their local reputations (Kaufman and Kaliner 2011) to tech workers considering a move to San Francisco rather than Los Angeles partly on the basis of the former's bohemian countercultural reputation (Storper et al. 2015). These general place associations extend to music as well, and scholars of popular music have closely examined the degree to which musicians are stamped by the expectations and conventions of the local scenes with which they are associated (Bennett 2017). Different metropolitan-level scenes have different reputations not only for different styles of music (e.g., grunge from Seattle or hyphy from Oakland) but also for being more traditional or avant-garde in their orientations (e.g., Athens, Georgia, as a hotbed of musical

innovation in the rock world in the early 1980s). A rock band from Cleveland that experiments with unusual genre combinations runs the risk not only of being penalized for pushing the boundaries of conventionality for a generic placeless rock band but also for being too unusual for a Cleveland band—by contrast, an Athens, Georgia, band may be positively expected to combine more unusual genres.

Beyond specific cities and their unique identities, types of local contexts may generate different expectations for bands associated with them. This is in line with a rich tradition in popular music research and the geography of music (e.g., Ellis and Beresford 1994; Bennett 2000; Hudson 2006; Phillips 2011; Wynn 2015; Johnson 2017; Mellander et al. 2018). This literature also points us toward variables to include and explore in the analysis, even if it does not give clear predictions. For example, dense cities with critical masses of racially diverse, young, and cosmopolitan residents and subcultures (Fischer 1995) tend to be associated with experimentation and personal self-expression (Silver and Clark 2016), whereas smaller more homogenous locations tend to generate relatively stronger expectations of conventionality for their cultural offerings. Likewise, being from highly educated college towns (such as Ann Arbor or Madison) may raise expectations for unconventional musical offerings (Kruse 2010) for some musical styles, while hailing from marginalized communities and "crossroad" cities such as New Orleans, Memphis, Detroit, Chicago, and Kansas City (where Janelle Monáe is from) might do so for others (Florida and Jackson 2010, p. 311). New musical forms have often emerged in poor and African-American communities, and location in such settings may be a signal to reward certain forms of experimentation that might be discouraged elsewhere (Chang 2005; Phillips 2011). Moreover, while being located in commercial industry cores might encourage conformity (Peterson and Berger (1975), cities with major record industry concentrations can also attract large numbers of talented and highly professionally competent musicians across many genres, leading to increased opportunity for novel creations, much like the creation and rise of Funk music as described in Lena (2012). This is also the case with Nashville, where the country music industry attracts talented musicians, some of whom then go on to be celebrated for unconventionally combining the local "house style" of country music with other genres.

Taken together, this literature suggests that the rates of return on unconventionality should differ across cities on the basis of factors such as record industry concentration, median household income, racial composition, and the percentage of college graduates and students (Fischer 1995; Florida and Jackson 2010; Kruse 2010; Phillips 2011; Silver and Clark 2016). This also implies that we should be able to classify cities by the form of the unconventionality-popularity relationship their bands experience, whether at the extremes of experimentalism or traditionalism across genre worlds, closer

to the norm, or specializing in experimentation in one genre world while remaining traditionalist across the others. In terms of the types of curves illustrated in figure 1, for bands from experimentalist cities, the punishment for unconventionality should occur further to the right of the graph, and the fall from most to least popular should be shorter; by contrast, hailing from traditionalist cities should generate the opposite pattern (an earlier penalty and a steeper drop).

Combining the above review and synthesis of multiple literatures, our analysis pursues two major questions:

Question 1.—What is the typical shape of the relationship between conventionality and popularity among musicians and bands? In brief, in accordance with the DIC hypothesis, we would expect to find variants on the second and third rows of figure 1, rather than the linear relationships between unconventionality and popularity represented in the first row of figure 1. We would expect this to be the case both across musical worlds and across metropolitan-level musical scenes.

Question 2.—How does this shape vary across metropolitan areas? The literature on the role of place in forming the identity and reputation of cultural producers suggests that where bands are from should alter expectations around how unconventional they can be. This may be based on features of locales that might be associated with different rates of return on unconventionality, such as their racial and educational composition and their record industry concentration. And even beyond these types of geographic resources for bands, it may be based on the presence of different metropolitan-level musical "scenes," such that bands from cities with more experimentalist scenes are afforded more space for unconventionality before being penalized, whereas bands from cities with more traditionalist scenes are expected to conform more strictly to conventional genre combinations.

DATA

We investigate these questions by uncovering patterns in a large data set of musicians and bands. More specifically, our data consist of 2.88 million musical artists and groups with profiles on MySpace.com in January 2007. These data were originally collected by the University of Chicago Cultural Policy Center (see Rothfield et al. 2007). At the time of data collection, MySpace had existed for 4.5 years and was not only the most visited social network in the United States, but it had also surpassed Google Search and Yahoo Mail as the most visited website in the United States (Cashmore 2006). In 2007, industry analysts worried that MySpace had become a natural monopoly (Keegan 2007), and through an analysis of users' online behavior before and after visiting the site, the takeaway was that "people are really using

[MySpace] to discover artists and bands" (Wray 2007). At the time of data collection, MySpace was thought of as "the de facto home page for the music industry" (Kirkpatrick 2007). Also key to our analysis is that when these data were collected MySpace was still over a year away from incorporating an algorithmic recommendation engine into its platform and had not yet debuted a "newsfeed" onto the site, meaning that music listeners on MySpace were not algorithmically directed toward listening to some bands and not others, nor was their listenership influenced through native advertising on the site (Vincent 2007).

For terminological simplicity we refer to both solo artists and groups on MySpace as "bands." All bands in our data set self-classified their musical offerings by selecting up to, but not more than, three genre designations from a standardized list of 121 genres (see table A1 for a full list). Regarding those genres, as outlined by DiMaggio (1987, p. 441), "Literally, a genre is a 'kind' or 'type' of art . . . [and the] notion of genre presumes that some aggregation principle enables observers to sort cultural products into categories." The creation and assignation of genres can be accomplished by communities of creators (Lena 2012), influenced through industry interests or conventions (Negus 2013; Skaggs 2019), or defined by critics (van Venrooij and Schmutz 2018) or audiences (DiMaggio 1987). While cultural sociologists rightly note heterogeneity in genre assignments (both in where they come from and potential mismatches in assignment across those assigning), those working in the categories literature have also relied on category (i.e., genre) assignments across a wide range of sources, all of which, of course, have their own strengths and weaknesses. Here we briefly touch on three strengths and a potential weakness of our data on genre assignments.

A strength of our data is that on MySpace the same genres were available for self-identifying to all bands. Hence, their self-classifications occur within the same categorical system, consisting of the same availabilities and constraints, while still allowing for high levels of granularity in self-definition (Hsu, Hannan, and Koçak 2009). As a result, unconventionality in categorical self-presentation was available to them but not forced on them. With 121 genres afforded and three available slots in which to apply genres to represent themselves, bands had around 300,000 unique categorical identities available to them. While additional genres to pick from might provide bands some greater leeway to express a wider range of genre combinations, the MySpace platform offered significant opportunities to both affirm their strong identification with conventional styles and display themselves in unusual ways.[2]

[2] While for our question it is only important that bands have a range of conventional and unconventional genre combinations available to them (and in our case they have a wide range with around 300,000 possible combinations available to them), using critic's classifications for

In fact, as discussed below, all bands did not use all available genre slots, nor were combinations across these genres equally distributed.

A second strength of our data is their size and scope. If we think of bands in 2007 as an iceberg, the vast majority of bands in our data set would be in the (vast majority of the) iceberg that is below the surface. This submerged portion of the iceberg is for the most part entirely ignored by those who would otherwise be engaging in category assignments (e.g., critics, industry observers, record labels, or communities of superfans). Simply put, producer self-classification allows us to investigate millions of the otherwise unclassified bands that are therefore unobserved in most research. Third, while we do not know whether audiences agree with our bands' self-definitions, we know, as we discuss below, that they were exposed to them as a feature of bands' self-presentations. While there will always be heterogeneity in audience classification systems (e.g., Pontikes 2012), we know both how bands use labels to self-present to potential audiences and that those audiences were exposed to those self-presentations.

The major potential limitation of self-designation is that it can be aspirational (Granqvist, Grodal, and Woolley 2013; Pontikes and Kim 2017) and possibly not reflect true category membership or competency. While still a concern, this is less of a worry in our data than is often the case. The vast majority of bands in our database are "paid" not in monetary compensation from consumers but through the "psychic goods" of identity as an artist (Menger 1999, p. 556; see also Bourdieu 1993). This remuneration through artistic identity means that misrepresenting one's artistic identity for perceived strategic gain is perhaps less common in our data than in data on more humdrum goods and products; regardless, there is no reason to believe it is a systematic problem in our data.

On MySpace, self-selected genre designations appeared directly below the band's name on the top left of the page (the most prime real estate for left-to-right languages such as English). These genre designations, should there be more than one selected, were separated by slashes (e.g., "rap/hip-hop/R&B"). Likewise, beneath and to the right of genre designations, the next text presented to potential listeners is the city and state in which the band is located. While we cannot be assured that every visitor to every page treated these category and city designations as meaningful information, because they were clearly displayed directly beneath the name of the band on the top left of the page guarantees that this information was observable, readily available, and treated as meaningful on the platform. In brief, our analysis of relational

147,000 albums on allmusic.com and without a constraint on the number of genres assigned, Hannan et al. (2019, p. 122) find that assigning three genres is modal (58% of all cases) with only one genre being applied to about 20% of all cases.

musical worlds and geographic musical space mirrors the information that we know was available to potential listeners of these bands.

Our database also includes for each band its total number of plays, views, and fans. Unfortunately, additional band-level information is not available, although future research would benefit from incorporating such information. After several transformations from these raw data, which we discuss below, we merge the data set with data from the U.S. census and County Business Patterns (CBP). These metropolitan-level variables allow us to investigate how the relationship between unconventionality and popularity shifts across urban contexts.

ANALYTIC STRATEGY

The various subgraphs in figure 1 illustrate scenarios in which the relationship between (un)conventionality and popularity takes on different shapes, which in turn indicate diverse modes of rewarding categorical conventions in the form of popularity. Our analytic strategy exploits opportunities within our data set to observe this relationship within and across different contexts. We examine two major spaces in which bands operate: (1) the relational structural space of musical worlds and (2) the physical geographic space of metropolitan areas. Our analysis inductively traces the relationship between bands' popularity and the conventionality of their genre choices across these contexts, with an eye to ways in which the resultant curves approximate the theoretical constructs in figure 1, as well as other relationships that emerge in the data. After describing how we measure popularity, we discuss our procedures for investigating these two contexts in order.

Defining Popularity

During the time of data collection, MySpace did not have a mechanism for the purchase or sale of music. Instead, our outcome variable is a construct of three indicators of popularity: total number of views, total number of fans, and total number of plays in the embedded music player on each band's page. These measures are highly correlated, with a Cronbach's alpha of .91, well above the standard .7 threshold for construct validity. To combine these three variables into a single construct, we take natural logarithms of each component variable (views, plays, and fans) to normalize their distributions (which are highly skewed), calculate a Z-score for each, and then add them. This helps ensure that components are given equal weight in the popularity score despite their differences in numerical magnitude (i.e., bands will get many more page views than people signing on as fans).

Table 1 shows the mean, median, and standard deviation for plays, views, and fans. Figure 2 shows plays, views, and fans across the three worlds (derived

TABLE 1
MEAN, MEDIAN, AND STANDARD DEVIATION FOR PLAYS, VIEWS, AND FANS

	Plays	Views	Fans
Mean	3,788	2,137	222
Median	120	125	3
SD	147,595	67,886	3,582

NOTE.—Data are across all MySpace bands. Large SDs indicate that while the preponderance of bands have relatively few plays, views, and fans, popularity is spread across a great range of values including smaller numbers of very popular bands.

according to methods described below). On average bands in the rock world are more popular than bands in the hip-hop world, which are slightly more popular than bands in the niche world. The large disparity between the means and medians indicates that, as is generally true in markets for cultural goods, a relatively small number of bands are extremely popular, while most are not. For example, the median band has three fans and 120 plays.[3]

As music in 2007 was not available for sale on or through MySpace, like Salganik, Dodds, and Watts (2006) we are able to measure a relatively pure form of popularity that is not conditioned on factors like pricing, variation in disposable entertainment income, or the possible prevalence of piracy over purchasing in some worlds more than others. Likewise, in 2007 MySpace was an unmediated market (Hirsch 1972), allowing for direct interaction between bands and potential fans of their music without any sorting, segregating, evaluations, or "coverage mismatch" (Zuckerman 1999) from third-party intermediaries or some third-party intermediaries over others (Dowd et al. 2021).[4]

Deriving Three Musical Worlds: Rock, Hip-Hop, and Niche

We create a large and complex genre network by mapping the band-provided (self-identified) colistings of (up to three) genres. Genres are considered "related" when a band lists them together. For the full population of bands that listed more than one genre designation, greedy modularity optimization is employed to identify genre communities. These procedures resulted in three higher-order genre complexes, which we term "worlds": rock, hip-hop, and niche, which are made up of 16 lower-order genre communities. These genre worlds are

[3] As a robustness check, we ran our regression models with a dummy variable for bands with the lowest popularity score, which did not alter our findings.

[4] While we believe ours is a "purer" measure of popularity than sales for the above-stated reasons, in a supplementary analysis of the top 150 bands on MySpace (available on request) popularity does track well with sales.

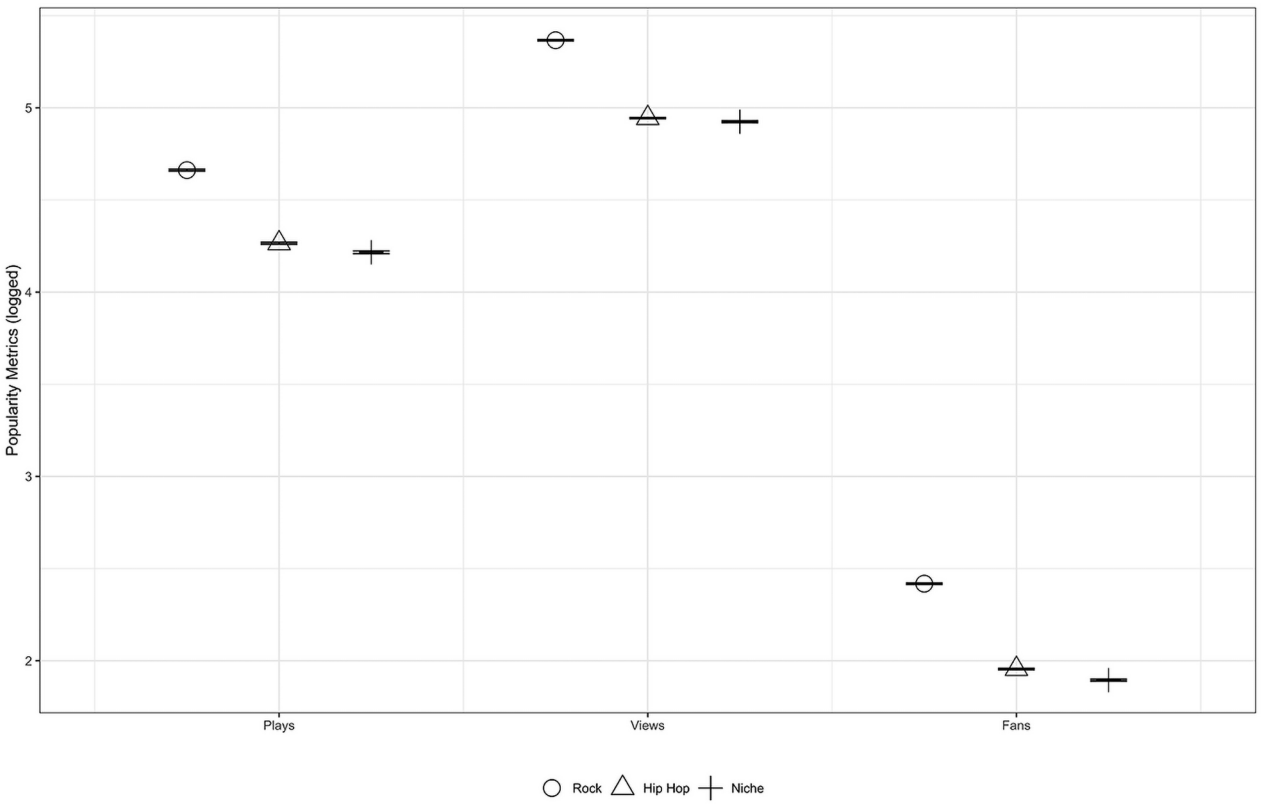

FIG. 2.—Popularity varies by musical world. Mean values and 95% confidence intervals for three popularity metrics (plays, views, fans) within three musical worlds (rock, hip-hop, and niche). Given the size of the data set, confidence intervals are extremely narrow. Rock musicians are consistently more popular, on average.

robust across multiple network-based community detection algorithms.[5] They result from the fact that musicians are more likely to pair some genres together than others. Genres are not isolated units combined haphazardly but are anchored in higher-order musical groupings—islands of musical inbreeding, each of which is structurally distinct from the next, mixing more within their boundaries than between. The hip-hop world includes genres such as rap, R&B, and crunk; rock includes genres like metal, alternative, and punk; and niche includes genres like electronica, experimental, and Hawaiian. More details regarding these procedures and the rationales for them are available in appendix D and Silver et al. (2016).

To be clear, the construction of these worlds does not drive the overall inverted U shapes we document below. Rather it allows us to investigate whether within the basic framework of an inverted U shape we see different patterns across worlds in the relationship between popularity and unconventionality, just as we subsequently investigate whether our results differ by geographic place. The conceptualization of multiple musical worlds as defined by genres within the broader universe of music making is not foreign to sociologists of music, who emphasize that in music there are multiple "genre worlds" (Frith 1998), musical "worlds" (Crossley and Bottero 2015), and "music cultures" (Negus 2013) that are simultaneously operating according to different conventions, evaluations, norms, or standard practices. Yet our interest in whether the worlds of rock, hip-hop, and niche genres may substantively differ from one another when it comes to the relationship between unconventionality and popularity is not solely derived from a broader acknowledgment that music is organized by genres or that those families of genres come with different communities and conventions (which is true across genres and supralevel families of genres across all creative goods). Rather, in addition to being relationally derived through webs of association (Griswold 2014, p. 142), our three worlds empirically differ in ways that would reasonably play a role in our central question on the relationship between popularity and unconventionality.

Most importantly for the question of the relationship between popularity and conventionality, the baseline level of popularity in the rock, hip-hop,

[5] Our analysis showed that the clustering produced by greedy modularity optimization was robust across algorithms. In comparing clusterings from the greedy modularity optimization algorithm to alternatives, similarities are in the range of 93% (walktrap community detection) to 96% (multilevel modularity optimization). The (small) differences tended to revolve around the relative size of clusters, with alternatives producing less balance. For instance, alternatives might place a few genres into the larger niche cluster that greedy optimization placed into the hip-hop cluster. Despite the fact that multiple algorithms would generate similar clusters, we chose greedy modularity optimization in part because it is the most computationally efficient and also because its logic reflects in a straightforward way our intention to find densely interconnected areas of the genre network (discussed further in Silver et al. 2016).

and niche worlds empirically differs, as do each world's baseline characteristics of genre blending. Overall, as figure 2 shows, bands in the rock world are on average the most popular, whereas bands in niche world are the least. Likewise, these worlds have different degrees of internal differentiation: our community detection algorithm found no subcommunities in the hip-hop world and no musical core around which other genres operate in the niche world (see app. D). The worlds also have different levels of permeability at their boundaries: while bands in the niche world still inbreed with other niche world genres more than they crossbreed into genres in other worlds, they do extend out to other worlds in their genre combinations more than do bands in the rock and hip-hop worlds (Silver et al. 2016). Given that these worlds differ both for overall popularity and for genre blending within and between them, we would, in fact, be somewhat surprised if there was not variation in how the relationship between popularity and conventionality operates across these worlds.

A reasonable question concerns the substantive meaningfulness of the niche world, which contains genres that are more sonically heterogeneous than those in the rock or hip-hop worlds, as well as including more regional specialty genres such as "Spanish pop," "regional Mexican" and "J-pop." Despite this internal heterogeneity, these niche genres in our view still constitute a world in our sense of the term (1) because bands more frequently blend genres within the niche world than into either of the other worlds and (2) because the genres in the niche world occupy the same structural position in relation to the two dominant worlds of popular music: rock and hip-hop. In fact, the logic of structural equivalence (Burt 1976; White, Boorman, and Breiger 1976) is central to the types of relational measures we employ in constructing these worlds and is particularly important if the structural equivalence of entities may be capturing some of the variation in one's research question.[6] In our case, bands in the niche world are structurally equivalent not only in how they combine genres in relation to the rock and hip-hop worlds but also with regard to their relationship to popularity. Simply put, because in 2007 rock and hip-hop were the two major worlds around which popular music orbited, by working in niche genres, bands were creating ceilings on how popular they could become (e.g., regional Mexican bands are reasonably doing something that is not oriented around trying to make it onto the Billboard Top 100). This is to say that if one is interested in the relationship between genre combinations and popularity, a world of bands that are

[6] It is worth noting that the point of structural equivalence is to see beyond the types of categorical groupings that are more readily apparent. Recalling Mohr (1994) on 19th-century welfare relief, unwed mothers and returning soldiers were the structurally equivalent "deserving poor" in relation to tramps, despite unwed mothers never also being returning soldiers and vice versa.

structurally equivalent in their relationship to unconventionality in genre combinations and who also have opted to work in comparatively less popular genres is substantively meaningful for our research question on both counts. Nevertheless, we reiterate that we do not enforce meaningfulness in our measures on the niche world in relation to the other two worlds but rather allow for meaningfulness to be observable should it exist.

Defining Genre Conventionality

In the categories literature, categorical typicality is most often treated linearly through count data, in which each additional category assigned correlates with a one-unit increase in categorical complexity (Hsu et al. 2009; Kovács and Hannan 2010; Pontikes 2012). While this measure is elegant in its simplicity, it elides research on classification systems in which conceptual distances between categories are not equal. For instance, a count data approach would treat the blending of "black metal" and "death metal" as equivalent to the blending of "death metal" and "opera." Following recent developments in this stream of research (e.g. Kovács and Hannan 2015; Wry and Castor 2017; van Venrooij and Schmutz 2018), we therefore treat musical genres as relationally positioned to one another: those genres that regularly co-occur are closer and more conventional (e.g., black metal and death metal), whereas those that do not (e.g., death metal and opera) are more distant and unconventional (Church and Hanks 1990; Mohr 1998; Gärdenfors 2004; Pachucki and Breiger 2010). While a relational approach to classificatory systems is far from novel (Bourdieu 1993; Mark 1998; Ruef 2000; Ruef and Patterson 2009), it is, we believe, too irregularly applied to work on category blending.

To this end we adapt Lizardo's (2014) measure to our case and data. In this measure, genres that are routinely connected to one another are considered more conventional, while more unusual combinations count as more unconventional. Technical details about how we construct the measure are in appendix B.[7] The resulting unconventionality measure ranges from 0 to 1, with values closer to 1 indicating a band with a more unconventional set of genre

[7] Lizardo's (2014) measure was developed to quantify unconventional genre preferences in consumers. However, the measure itself is neutral with respect to its object, as are other plausible metrics such as species of the broader family of Jaccard-style distance metrics, variants of which have also appeared in the categories literature (e.g., Kovács and Hannan 2015). Accordingly we compared results based on our min-clustering approach with a standard Jaccard measure and Kovács and Hannan's (2015). In all cases the inverted U appears, and the results of the multilevel regression models are nearly identical. However, for both the standard Jaccard and Kovács and Hannan's (2015) variation, unconventionality is compressed toward the right side of the distribution due to Jaccard-based measures' collapsing disparity in size between genres with the unconventionality of the pairing of those genres. Our approach allows us a direct path to our research interest about the combining of genres in atypical ways.

combinations. The most categorically conventional bands in our data, which have an unconventionality score of 0, self-present as fully committed to a single genre by either listing it multiple times across each available genre slot (e.g., death metal/death metal/death metal) or only listing one genre (e.g., jazz/[blank]/[blank])—these are indications of conforming to clear categorical conventions.[8] Scores in the middle range from .3 to .7 tend to include fairly familiar genre combinations, such as metal/thrash/death metal (rock world), pop/R&B/hip-hop (hip-hop world), techno/trance/turntablism (niche world). These are the types of conventionally unconventional genre pairings we would expect toward the middle of the distribution: they are not the entirely conventional genre purists who set the baseline (e.g., punk/punk/punk), nor are they the highly unconventional weirdos who appear at the high values. Those very unconventional genre combinations become extremely unusual above around .9, including self-presentations such as electro/surf/powerpop and crunk/indie/techno (rock world), ambient/death metal/hyphy and club/afrobeat/ska (hip-hop world), and Christian rap/jungle/thrash and dub/house/thrash (niche world). To return to our opening example, in our data Janelle Monáe's genre combinations placed her in the 99th percentile of rock world unconventionality.

Linking Bands to Cities

Given the linkages suggested by the literature between various place character and musical conventions, we locate bands in metropolitan areas and examine the extent to which the general relationship between conventionality and popularity shifts, depending on the city a band is associated with. To assign bands to geographic areas, we exploit the fact that bands could list their city and state on their MySpace profile. While in most cases this was straightforward, in some cases bands did not enter a city or state or entered terms that could not be interpreted as a city or state except on a case-by-case basis. Of the approximately 2.5 million band pages that were identified as being in the United States, we were able to match about 2.2 million to a census-designated primary metropolitan statistical area (PMSA; for convenience we use the generic terms MSA, metro, or metro area throughout this text), and thus they could be included in the geographic analysis.[9]

[8] Because the number of genres chosen may itself be associated with bands' popularity (e.g., in that completing all three genre slots is a sign of being more committed to public self-presentation), we control for this in our regression models.

[9] Matching bands to PMSAs required a few different approaches. While the vast majority of bands could be matched to PMSAs after correcting for common errors, typos, and stylized spellings in their provided city/state information, about 150,000 were matched by SAS's soundex routine based on pronunciation. In addition, city names that had an identified state and were used 10 or more times were manually investigated and matched to a metro area when possible.

Although bands are embedded in or have emerged from local metropolitan scenes, especially since the advent of virtual spaces like MySpace, they also operate in translocal and virtual scenes (Peterson and Bennett 2004).[10] Likewise, the advent of virtual distribution channels like MySpace allowed bands to reach widespread audiences outside of traditional industry distribution networks. Accordingly, our measure of popularity is not strictly local—a San Francisco–based band can and will have plays, views, and fans from elsewhere. Nevertheless, wherever they are located, we know that, compared to today, audiences were much more likely to have at least some knowledge of the bands they were listening to online. This is because our data exist in a brief window in which MySpace was the most popular music destination on the Internet, but before the advent of newsfeeds, algorithmically generated taste suggestions, promotional advertising on the site to attract more attention, or even multiartist playlists. Likewise, we know that audiences are exposed to a band's location information on their MySpace page, which can potentially shift expectations for how much unconventionality is appropriate for, for example, a rap artist from New York or Los Angeles or a rock musician from Cleveland or Athens. Analytically, this straightforwardly suggests considering the impact on popularity of the interaction between the place label associated with a band and its unconventionality.

While our data cannot account for fan location or the degree to which a given band tours and participates actively in virtual spaces, we note that research suggests that even in a digital setting most bands' online audiences come from the local milieu out of which they operate (Allington 2014). Given that the vast majority of MySpace bands have very small followings, we expect this to be especially the case in our data set. Moreover, to the extent that the typical MySpace band does reach extralocal audiences, those audiences would accordingly tend to be highly knowledgeable about the band and the local scene in which it operates. Overall, the low median popularity indicates most bands in the MySpace universe are "garage bands" operating within relatively local scenes with little translocal reach.[11] Still, we cannot differentiate

[10] In a supplementary analysis for the top 150 bands on MySpace, we investigated their relationship to the cities they listed on their profiles: 74% listed places that they were either born or raised in and launched their careers from (e.g., Ice Cube and Los Angeles or Regina Spektor, whose family moved to New York when she was eight and who came up through the antifolk scene in New York); 22% listed cities they moved to in young adulthood (usually after high school or college) and developed their sound in for a significant amount of time before their first release (e.g., Blake Shelton, who moved to Nashville at 17 and worked and performed in Nashville for nine years before his first release); and 4% listed cities they had moved to after their first release, with this type of infrequent residential mobility being inversely related to popularity even in the top 150 bands ranked for popularity (i.e., the top .005% of bands in our data ranked for popularity).

[11] Very popular bands by contrast likely have much broader reaches, suggesting that their location may be less important, although not entirely unimportant: regardless of their location,

between our metropolitan-level effects being somewhat "noisy" because of the existence of some nonlocal fandom or nonlocal fans holding unconventional bands from places with characteristics that might signal or produce openness to experimentation (or the opposite) to different standards. Nevertheless, as we return to in the discussion, pursuing with suitable data a more robust analysis of how these multiple spaces operate separately and in interaction is an exciting avenue for extending our research.

Metropolitan Variables

Our metro area variables come from three data sources: the U.S. census, CBP (aggregated to the PMSA level), and our MySpace data (also aggregated). Because metro boundary definitions changed in 2010 and our PMSA definitions are from 2000, we use data from the 2000 census. The CBP data are from 2001. Given the highly aggregated character of these data, it is extremely unlikely that relative differences among metro areas would change substantially between 2000 and 2007.

The census provides population data that the literature has identified as defining urban contexts in which various musical styles may be differentially favored. These population variables include population density, median household income, education (the percentage of the population with a college degree), youth concentrations (the percentage of the population ages 25–34), the percentage of the population that are college students, and the nonwhite percentage of the population. To capture local music industry concentration, CBP contains information about recording industry establishments and music exhibition and consumption spaces. Specifically, we include two indexes. One is a metro per capita record industry index, which sums four six-digit North American Industrial Classification System (NAICS) categories: "Record Production," "Music Publishers," "Sound Recording Studios," and "Other Sound Recording Industries." The other is a per capita index measuring concentrations of music consumption and exhibition opportunities: "Musical Instrument and Supplies Stores," "Prerecorded Tape, CD, and Record Stores," "Promoters of Entertainment Events with Facility," and "Promoters of Entertainment Events, without Facility."[12]

Finally, we construct a metro-level variable from our MySpace data. This variable measures the degree to which each metro specializes in a particular

audiences may implicitly or explicitly treat rap bands, e.g., from Los Angeles, Atlanta, or New York, differently. In line with this insight, we found that restricting our regression analysis to the top 5% of bands in terms of popularity reduced the explanatory power of metropolitan variables to some degree.

[12] Details about organizations included in NAICS categories may be found at https://www.census.gov/naics/.

musical world (as defined above). To construct this variable, we calculate an entropy index (specifically, Shannon's entropy H) based on the number of bands in each of the three worlds. Lower values indicate greater specialization.

We use several different techniques to examine how the relationship between unconventionality and popularity varies by musical world and metropolitan area. Specific details about these methods are provided in the course of the analyses.

RESULTS

Testing the Dancing in Chains Hypothesis

We first examine the relationship between bands' conventionality in genre recombination and their popularity across musical worlds. Figure 3 visualizes generalized additive models (GAMs) showing the relationships between unconventionality and popularity for all bands across all three musical worlds.[13] The DIC hypothesis holds. Across all three musical worlds we find an inverted U shape. Two-line tests (Simonsohn 2018) confirmed the nonmonotonic, inverted U-shaped function in each musical world.

The inverted U is the predominant shape taken by the relationship between unconventionality and popularity, strongly confirming our central hypothesis. Yet figure 3 also suggests minor variations on this dominant motif. Rock and niche worlds largely approximate an optimal distinctiveness model (fig. 1*D*), with rock somewhat resembling the optimized plateau model in which the range of acceptable unusual combinations is relatively wider, and the peak is somewhat flatter. More specifically, rock and niche both exhibit curves that are slightly skewed to the right. The niche curve starts lower (i.e., a stronger penalty for no genre blending at all) than the rock and hip-hop worlds. In these musical worlds, bands reach an inflection point at an unconventionality score of around .65 or so, and then they experience sharper

[13] As Beck and Jackman (1998) describe, GAMs are especially well suited for cases like ours in which the shape of the relationship between the independent and dependent variable is an open question. While standard forms of regression allow for the possibility of nonlinearity, in our case existing research provides little theoretical guidance when it comes to specifying the appropriate parameterization a priori, as required when using more conventional techniques. A GAM gets around this problem by allowing the relationship between the independent and dependent variable to vary locally across the range of the predictor. The smoothness of the resulting curves depends on the value of the user-defined smoothing parameter λ, which can be selected using generalized cross-validation (Wood 2017). As a robustness check, we experimented with alternative values of λ and found consistent support for the claim that the relationship between unconventionality and popularity is characterized by an inverted U shape, with the returns on unconventionality tending to fall off at either extreme. The visual evidence produced by the GAMs was subsequently corroborated using more conventional parametric procedures including two-line tests and quadratic multilevel regression, as discussed below.

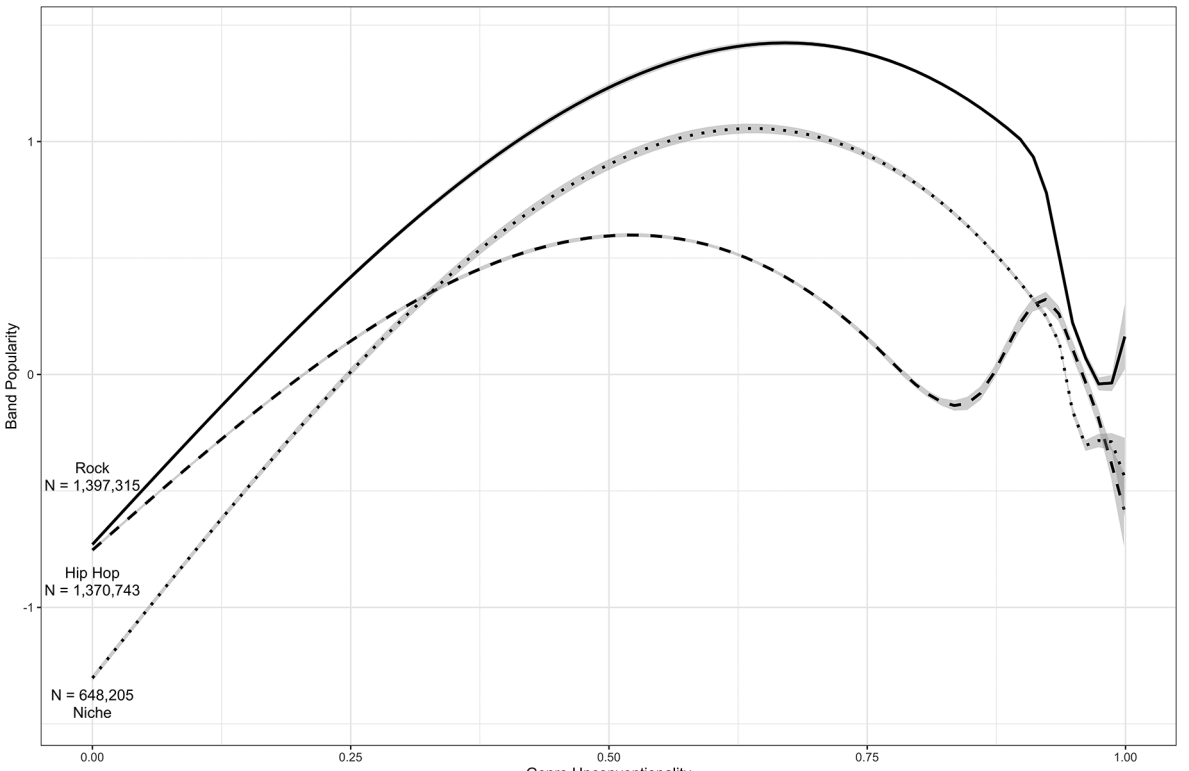

FIG. 3.—Genre conventionality and popularity across three musical worlds: rock, hip-hop, and niche. All three exhibit an inverted U-shaped characteristic of optimal matching. However, the shapes vary, indicating different ways of balancing these imperatives. Curves are estimated using a GAM in which the relationship between popularity and unconventionality in a given world is expressed in terms of a penalized cubic regression spline. Penalized cubic regression splines were implemented using the shrinkage smoother included as part of the mgcv library in R (Wood 2017). The visual evidence produced by the GAMs is corroborated using more conventional parametric procedures including two-line tests and quadratic multilevel regression.

declines in popularity as they get more unconventional from there. The types of genre combinations chosen by relatively popular bands at these inflection points are in general not extremely conventional, nor are they extremely innovative. For example, techno/trance and punk/glam combinations are near the inflection point in the niche world, as are rock/alternative/grunge and thrash/metal/hardcore in the rock world. These are semifamiliar genre combinations that stand in between categorical purity on the one hand and more unconventional recombinations on the other. In these worlds they are the conventionally unconventional genre pairings that attract fans.

The hip-hop world also is well described by an inverted U shape, although it takes a slightly different form. It follows the same pattern as rock and niche through the first three-quarters of the range, with the inflection point occurring around a .5 unconventionality score—earlier than the other worlds. The imperative to convention is somewhat stronger in the hip-hop world, although the curve is somewhat flatter, suggesting that the range of unconventionality that is rewarded is relatively wider. Bands' popularity peaks at a relatively higher level of conventionality (e.g., hip-hop/pop/R&B) and diminishes when they stray into more unconventional territory, such as neo-soul/techno or hyphy/jazz. At the same time, the "punishment" for such unconventionality is not as steep as it is in rock and niche, in that the distance between peak and trough popularity is substantially smaller in the hip-hop world.

The relationship between unconventionality and popularity in the hip-hop world further complicates at the tail of unconventionality, where it resembles the dual innovation model envisioned in figure 1*I*. After the first major uptick, a second one appears, where even more unconventional combinations result in relatively heightened popularity, before, in this case, trailing off again when their unconventionality becomes too extreme.[14] Examples of genre combinations chosen by relatively popular bands at this second inflection point in the hip-hop world include hyphy/rock/punk and indie/crunk. Popular artists at this second peak in the hip-hop world in 2007 included Cody ChestnuTT (perhaps most well known for his collaboration with The Roots on "The Seed (2.0)," which was described as a "hybrid of distorted rock, hip-hop and psychedelic soul" [Petridis 2002]) and Zilla Rocca (an unconventional rapper who would go on to later self-identify as making what he called "noir-hop").

Popularity and Conventionality Vary by Urban Context

So far, we have demonstrated a strong and consistent inverted U shape across three musical worlds, which describes a nonlinear process whereby bands' popularity increases as they incorporate more unconventional genre combinations,

[14] The right tail of the rock world exhibits an uptick, where extremely unconventional genre combinations (e.g., psychedelic/death metal/southern rock) tend to increase in popularity.

before hitting an inflection point where additional unconventionality reduces their popularity. We also pointed toward some evidence that this general pattern comes in somewhat different forms across musical worlds and that the ways genre recombination is rewarded and punished correspond to scenarios envisioned by our theoretical figure. We now move to the metropolitan context. We examine the extent to which conventionality is rewarded differentially depending on where bands are in geographic space. To do so we pursue a two-step strategy. In the first step, we compare metros by the shapes of their conventionality-popularity curves across musical worlds. In a second step, for each genre world we fit a multilevel regression model that accounts for both within and between metro variation in the conventionality-popularity relationship. These models are designed to highlight variables that shift the relationship between conventionality and popularity across metros. More details about both methods are provided below.

Turning to the first step, we again use GAMs to generate separate curves for each musical world, this time for each metro separately. This produces three curves for each metro, with one curve for each musical world. This is illustrated in figure 4 using the case of San Francisco. We construct similar sets of curves for all metro areas.

Comparing figure 4 to figure 3, it is striking that the macropattern of the inverted U recurs in this local context, again confirming the generality of the DIC hypothesis. Yet figure 4 also indicates that across all three musical worlds the rate of return on unconventionality for bands located in San Francisco differs from the typical pattern. Nationally, the inflection point for popularity occurs between about .5 and .65. For San Francisco bands, however, the inflection point occurs between .875 and .925. To be sure, even for bands from San Francisco extreme unconventionality is eventually penalized, but this discounting is less extreme than it is on average. Compared to other metropolitan locales, across all three musical worlds it pays to be an unconventional band connected to San Francisco's reputation for experimentation and innovation.

To facilitate comparison and exploration of these types of curves across metros and musical worlds more generally, we built an online interactive visualization tool, which also provides more methodological details (see https://unconventionality.github.io/). Figures 5 and 6 are stylized snapshots of this tool, but we encourage readers to view the interactive visualization and its corresponding appendix to better understand how to use the interface and the methods by which we produced it.

Points are positioned in the central panel to reveal similarities and differences in the shapes of their corresponding curves. Figure 5 illustrates the overall results, which again can be explored in more detail at https://unconventionality.github.io/. In both figure 5 and the online tool, the left panel shows the three basic patterns describing the conventionality-popularity relationship across

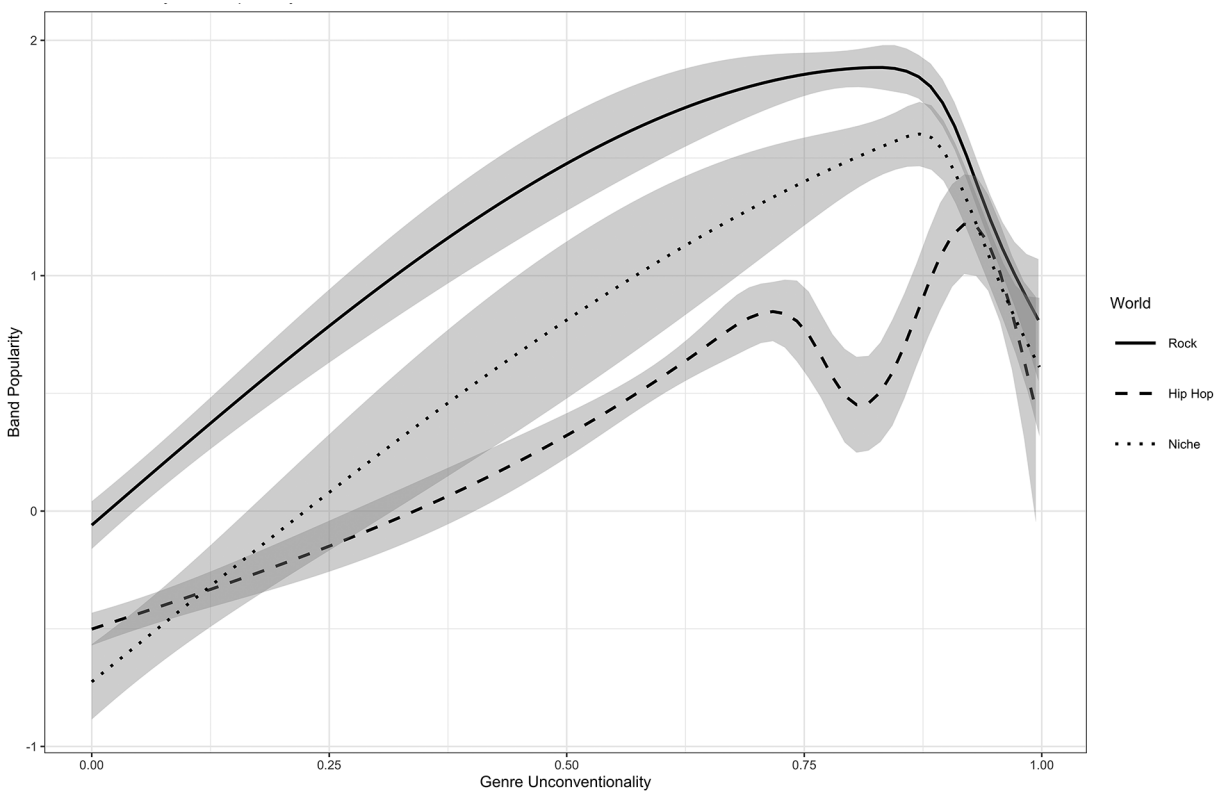

FIG. 4.—Atypical receptivity to unconventional genre combinations across rock, hip-hop, and niche musical worlds, for the San Francisco PMSA. Curves are derived from GAMs with cubic splines, with R's mgcv package. We construct similar curves for all metro areas and compare them.

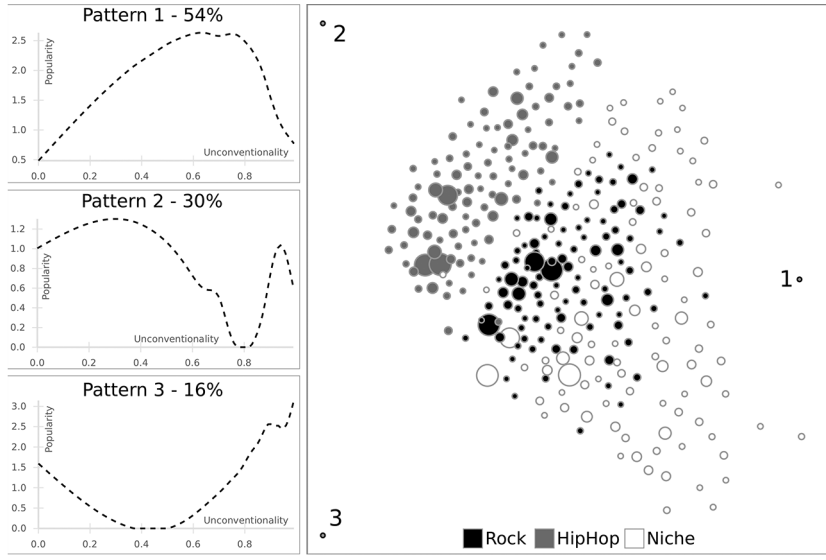

FIG. 5.—Comparing the conventionality-popularity relationship across metro areas and musical worlds. All metro-musical world combinations are placed into a three-dimensional space derived from a nonnegative matrix factorization of their local unconventionality-popularity curves. Metro-world combinations are positioned by how closely they approximate the three patterns on the left. Bubble sizes are proportional to metro population size. There are three bubbles for each metro and one bubble for each musical world. These relationships can be explored in more depth through an online interactive tool accessible at https://unconventionality.github.io/.

all metros. Each pattern is present within each metro to varying degrees. Percentages that accompany each pattern indicate the contribution of that pattern to the total shape of all curves across all metros.

Pattern 1 is accordingly the most common factor, contributing about 54% of the total shape of the curves and representing the basic inverted U of optimal distinctiveness in figure 1. Pattern 2 contributes about 30% and approximates the dual innovation model of figure 1. The distribution of points on the graph indicates that, independent of metro characteristics, the niche world tends to resemble pattern 1, the hip-hop world tends to resemble pattern 2, and rock is in the middle, with a somewhat greater tilt toward pattern 1 than pattern 2. This aspect of the decomposition thus corroborates the results of figure 3, showing that musical worlds constitute the major axes around which our universe of over 2 million bands turn.

Pattern 3, however, reveals an additional, metropolitan axis of comparison that cuts across musical worlds. Accounting for about 16% of the popularity-conventionality curves within metros, this pattern describes the degree to which unconventionality or conventionality is rewarded for bands from a

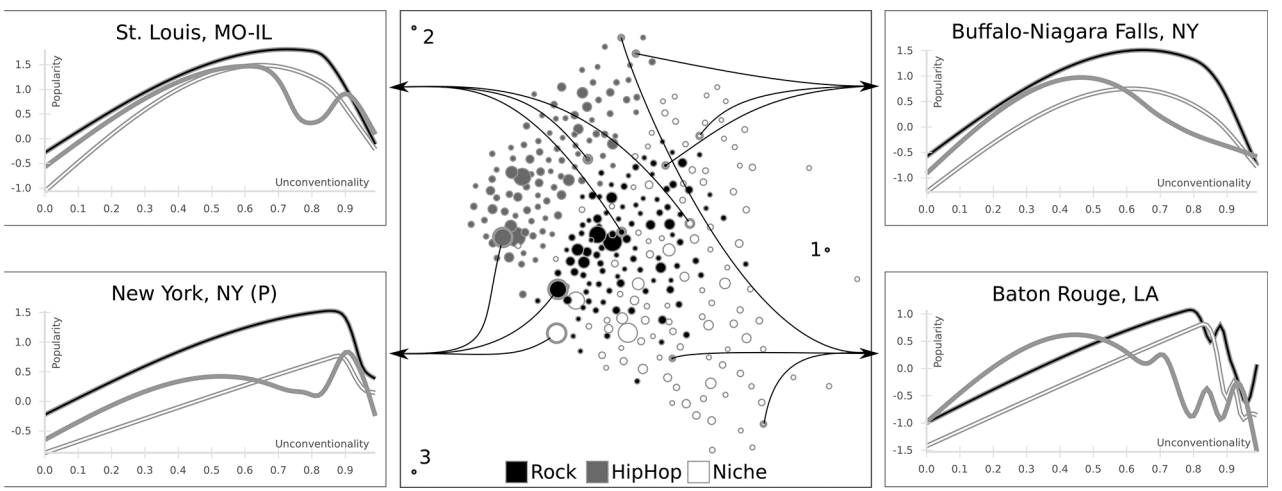

FIG. 6.—Illustrating normalists, traditionalists, experimentalists, and specialists. Four metro areas highlighted as examples of general types of metropolitan formations of the conventionality-popularity relationship. These relationships can be explored in more depth through an online interactive tool accessible at https://unconventionality.github.io/.

given metro. Looking at the right panel of figure 5, within each world, there is a clear distribution of metros ranging from the bottom left of the panel (more receptive to unconventional genre blending) to the top right (less receptive). Taken as a whole, figure 5 empirically illustrates the core theoretical intuitions behind this study: that, within the basic framework of a balancing act between conventionality and unconventionality, the relationship between conventionality and popularity comes in many forms and that the shape and distribution of those forms track (to varying degrees) the (musical) categorical context (i.e., genre worlds) and geographical context (i.e., metros).

These methods also allow us to identify metros that occupy distinctive positions within the space of conventionality-popularity relationships, such as San Francisco. In the online visualization, hovering over or clicking on a point in the central panel changes the left panel. The three patterns are ranked according to their prominence for that metro and musical world. For example, clicking on New York City's niche curve shows that pattern 3 contributes about 32% of its shape, more than pattern 2 does (18%). These relative contributions account for the position of each point in the central panel.

Based on an examination of the positions of metros via the interactive tool and the relative shares contributed by pattern 3 to their shapes, table 2 presents a typology of four different types of metropolitan areas. Figure 6 adds graphical illustration, while also providing further examples of similarly positioned metropolitan areas in table 2. Bands from normalist metros, illustrated by St. Louis, Missouri, in the top left of figure 6, have all three of their points in the middle of the distribution, generally exhibiting a typical relationship between conventionality and popularity across all genre worlds. Bands from conventionalist metros, illustrated by Buffalo, New York, in the top right of figure 6, are rewarded for conventional genre combinations and punished for unconventional pairings with greater force than are bands from other cities, across all worlds; for these metros, all three of their points tend to cluster in the upper right of the diagram. Bands from experimentalist cities, such as New York in the bottom left of figure 6, are more rewarded for unconventional combinations across all worlds: all three of their points tend to cluster in the bottom left of the diagram. Last, bands from specialist cities experience a sharp contrast across musical worlds, for example, by being less or more

TABLE 2
Typology of Cities

Normalists	Traditionalists	Experimentalists	Specialists
St. Louis, Mo.	Buffalo, N.Y.	New York, N.Y.	Baton Rouge, La.
Dallas, Tex.	Gary, Ind.	Ann Arbor, Mich.	Birmingham, Ala.
Sacramento, Calif.	Norfolk, Va.	Nashville, Tenn.	Miami, Fla.
Dayton, Ohio	Vallejo, Calif.	San Francisco, Calif.	Greenville, N.C.

receptive to eclectic offerings in one world versus the others. For these types of metros, there are great distances between their three points. In the bottom-right corner of figure 6, this is exemplified by Baton Rouge, Louisiana. Hip-hop bands from here find unconventional hip-hop music more rewarded, whereas for rock and niche bands unconventionality is more rewarded.

Together, figures 5 and 6 show that the shape of the relationship between conventionality and popularity varies in important ways from one metropolitan area to the next. We now turn to multilevel regression to investigate how the shapes of these metro-specific relationships vary as a function of the characteristics of the metropolitan areas in which a band is located. For each musical world, we estimate a varying intercept, varying slope model in which the effects of unconventionality and unconventionality squared are allowed to vary by a band's metro area, thus producing a unique quadratic curve for each. In addition to controlling for the number of genres selected—represented here as an ordered factor—and the characteristics of the metropolitan area, we include a series of cross-level interaction terms representing the interaction between the unconventionality terms on the one hand and the metro-level characteristics on the other. Following Gelman (2008), continuous predictors are standardized to have a mean of 0 and a standard deviation of 0.5, while dichotomous predictors are centered around the mean.

The results of the analysis are shown in table 3. For context, we first note main effects beyond our focal variable, bands' relational unconventionality. We find that for the otherwise average band in any given world, popularity is generally associated with lower population density, higher numbers of college graduates and young people, lower incomes, and greater specialization in distinct musical worlds, all else being equal. The rock world stands out in the extent to which popularity is associated with concentration of the local record industry. Similarly, we find that whereas popularity in the rock and niche worlds is negatively associated with the size of the nonwhite population, the hip-hop world is unique in the sense that, on average, the racial composition of the surrounding area has almost no effect on the band's overall popularity. Across all three worlds, we find that bands that choose two or three genres tend to be more popular than those who choose only one. This last finding is significant in that it is a variant of the typical count data approach that has been used in the categories literature, where choosing more total genres would indicate greater unconventionality. On this score, we find that across over 2 million American bands there is more of an eclectic imperative (fig. 1*C*) than a categorical imperative (fig. 1*B*; see also Pontikes 2012; Johnson 2017).

Keeping this background in mind, we turn to the relationship between unconventionality and popularity. As expected, characteristics of a band's city such as population density, racial composition, median household income,

TABLE 3
VARYING INTERCEPT, VARYING SLOPE MODELS OF UNCONVENTIONALITY BY MUSICAL WORLD

Predictor	Rock Popularity	Hip-Hop Popularity	Niche Popularity
Unconventionality	−1.37***	.35***	−1.94***
	(.03)	(.02)	(.05)
Unconventionality^2	−3.57***	−1.20***	−4.09***
	(.07)	(.06)	(.08)
Population density	−.21*	−.38**	−.34***
	(.10)	(.13)	(.10)
Percentage nonwhite	−.37***	.00	−.27***
	(.07)	(.07)	(.07)
Median household income	−.28***	−.25**	−.32***
	(.08)	(.09)	(.08)
Percentage ages 25–34	.27***	.15*	.21**
	(.07)	(.07)	(.07)
Percentage college graduates	.23**	.21*	.16
	(.09)	(.09)	(.09)
Percentage college students	.04	−.02	.04
	(.04)	(.03)	(.04)
Metro musical world specialization	−.17***	−.27***	−.16***
	(.05)	(.04)	(.05)
Record industry concentration	.25**	.00	.07
	(.09)	(.07)	(.07)
Music consumption and exhibition concentration	.02	.04	.04
	(.05)	(.05)	(.05)
Two genres	.83***	.39***	.20***
	(.02)	(.02)	(.04)
Three genres	1.03***	.53***	.58***
	(.02)	(.02)	(.04)
Unconventionality × population density	−.04	−.23***	.17
	(.09)	(.05)	(.13)
Unconventionality^2 × population density	.20	.40*	.62**
	(.19)	(.17)	(.21)
Unconventionality × percentage nonwhite	.21**	−.13***	.26*
	(.07)	(.03)	(.11)
Unconventionality^2 × percentage nonwhite	.53***	.26*	.66***
	(.15)	(.11)	(.17)
Unconventionality × median household income	−.10	−.29***	.05
	(.09)	(.04)	(.13)
Unconventionality^2 × median household income	.05	.38**	.44*
	(.18)	(.14)	(.21)
Unconventionality × percentage ages 25–34	.01	.16***	.04
	(.07)	(.03)	(.10)
Unconventionality^2 × percentage ages 25–34	−.21	−.15	−.18
	(.15)	(.11)	(.17)
Unconventionality × percentage college graduates	.16	.22***	.39**
	(.10)	(.04)	(.15)
Unconventionality^2 × percentage college graduates	.14	.02	.33
	(.19)	(.15)	(.23)
Unconventionality × percentage college students	.04	.03	.03
	(.04)	(.02)	(.06)
Unconventionality^2 × percentage college students	.07	.11*	.05
	(.08)	(.05)	(.10)

TABLE 3 (*Continued*)

Predictor	Rock Popularity	Hip-Hop Popularity	Niche Popularity
Unconventionality × metro musical world specialization	−.08	−.10***	−.13
	(.06)	(.02)	(.08)
Unconventionality² × metro musical world specialization	−.13	.22**	−.11
	(.11)	(.07)	(.12)
Unconventionality × record industry concentration	.14	.19***	.16
	(.08)	(.03)	(.11)
Unconventionality² × record industry concentration	−.00	.29**	.12
	(.17)	(.11)	(.17)
Unconventionality × music consumption and exhibition concentration	.01	−.00	.04
	(.06)	(.03)	(.09)
Unconventionality² × music consumption and exhibition concentration	−.03	−.02	−.01
	(.12)	(.09)	(.15)
Observations (bands)	1,014,966	1,002,941	468,872

NOTE.—Results of three separate varying intercept, varying slope models—one for each musical world. Intercepts are allowed to vary by metro area, as are the slopes for unconventionality and unconventionality², thus producing a metro-specific polynomial for each. Observations (metros) = 332.

* $P < .05$.

** $P < .01$.

*** $P < .001$.

and record industry composition play an important role in shaping the relationship between unconventionality and popularity. For any given world, the instantaneous returns on unconventionality u for a band from the typical MSA can be expressed in terms of the estimated marginal effect:

$$\hat{M} = \left(\hat{\gamma}_{10} + \sum \hat{\gamma}_{1k} w_k\right) + 2\left(\hat{\gamma}_{20} + \sum \hat{\gamma}_{2k} w_k\right) u, \tag{1}$$

where $\hat{\gamma}_{10}$ refers to the main effect of unconventionality and $\hat{\gamma}_{1k}$ refers to the cross-level interaction between unconventionality and the kth metro-level covariate w_k, with $\hat{\gamma}_{20}$ and $\hat{\gamma}_{2k}$ similarly defined for unconventionality squared. To help fix ideas, we begin by focusing on the payoff function for an otherwise average band, as given by $\hat{\gamma}_{10} + 2\hat{\gamma}_{20} u$. While the value of $\hat{\gamma}_{10}$ represents the estimated marginal effect of unconventionality for an otherwise average band that is equally average in its combination of genres, the value of $\hat{\gamma}_{20}$ estimates the degree to which the rate of return changes as this combination of genres gets further from the world-specific mean. Whether the average band in a given world benefits from unconventionality is reflected in the direction of $\hat{\gamma}_{10}$. In this case, positive effects denote popularity rewards,

while negative effects denote popularity penalties, with the magnitude of each given by the magnitude of the corresponding parameter estimate.

Looking at table 3, we find that whereas unconventionality tends to pay off for the average band in the hip-hop world, this is not the case in the rock and niche worlds, where increased unconventionality comes at a price, as evidenced by the direction of the corresponding main effect. This is not to say that unconventionality is without its costs in the hip-hop world or that unconventionality goes totally unrewarded among rock or niche bands. Indeed, in all three worlds the relationship between unconventionality and popularity for an otherwise average band is characterized by an inverted U shape, as evidenced by the direction of $\hat{\gamma}_{20}$, which is consistently negative from one world to the next. This is in line with results of the GAMs described above, lending further support to the idea that regardless of the musical world in which an otherwise average band resides, the DIC hypothesis holds.

What differs based on the musical world in which a band is located is the point at which these payoffs become penalties, and these models allow us to be more precise about that threshold. The notion of a world-specific balancing point is more than just a loose analogy. For any given world, the estimated balancing point is given by $-\hat{\gamma}_{10}/2\hat{\gamma}_{20}$. Using this formula, we estimate that for an otherwise average hip-hop band, unconventionality does not become a liability until the unconventionality score is 0.30 standard deviations or more above the world-specific mean, as compared to 0.38 standard deviations below the world-specific mean for the otherwise average rock band or 0.47 standard deviations below the world-specific mean for the otherwise average niche band. As the formula for the estimated balancing point $-\hat{\gamma}_{10}/2\hat{\gamma}_{20}$ suggests, these differences are driven not only by differences in $\hat{\gamma}_{10}$ (i.e., the estimated rate of return for the average band) but by differences in $\hat{\gamma}_{20}$. The lower the absolute value of $\hat{\gamma}_{20}$, the more slowly the estimated rate of return changes, which is precisely what we observe when comparing the hip-hop world to its counterparts. We find that the absolute value of $\hat{\gamma}_{20}$ in the hip-hop world is noticeably smaller than it is in the other two, producing a flatter popularity curve in a world where the base rate of return on unconventionality already tends to be higher, with the balancing point pushed up accordingly.

As equation (1) shows, these relationships are affected by characteristics of a band's geographic location in a straightforward way: all else being equal, a 2 standard deviation increase in the value of the kth metro-level covariate w_k increases the estimated rate of return at the mean by a value of $\hat{\gamma}_{1k}$ and the effect of u on $\hat{M}$ by a value of $2\hat{\gamma}_{2k}$. The latter quantity is significant insofar as it governs the flatness of the popularity curve. Consider, for example, the case of the rock world, where a 2 standard deviation increase in the size of the nonwhite population in a band's metro area increases the base return on unconventionality by a value of 0.21, while simultaneously reducing the effect of unconventionality on the estimated returns in popularity by

a value of $2 \times 0.53 = 1.06$. In other words, as the size of the nonwhite population goes up, the payoff for unconventionality tends to increase, while the popularity curve tends to get flatter, suggesting a context in which the value of the predicted payoff is less sensitive to differences in the level of unconventionality, as in the optimized plateau (fig. 1*F*). While we observe a similar pattern in the niche world, things work somewhat differently in the hip-hop world, where an increase in the size of the nonwhite population tends to reduce the payoff for unconventionality at the mean. As is the case in the other two worlds, the popularity curve for the hip-hop world tends to get flatter as the size of the nonwhite population grows, although the degree of flattening is less pronounced, keeping in mind that the popularity curve in the hip-hop world is generally much flatter to begin with.

To be clear, it is possible for the base rate of return to vary as a function of metro-level characteristics without inducing comparable changes in the steepness of the underlying popularity curve and vice versa. This is most apparent in the hip-hop world, where, for example, returns on unconventionality tended to increase when bands are located in areas with a larger college-educated population, with the steepness of the popularity curve varying only slightly. Nonetheless, the cumulative effect of metro-level characteristics tends to be more pronounced in cases in which both unconventionality and unconventionality squared are subject to interactions, as can be seen in figure 7, which depicts the changing pattern of marginal effects that results from the inclusion of the cross-level interactions described above. For each metro-level variable, we examine what happens to the marginal effect of unconventionality for an otherwise average band as we shift the value of the variable in question or the level of unconventionality, keeping in mind that payoff for increasingly unfamiliar pairings depends on the level of unconventionality from which a band starts. In both cases, the shift from low to high is defined by a shift from the 10th percentile to the 90th. Looking at the results for the rock world, for example, we observe a significant difference in the estimated marginal effect of unconventionality as the size of the nonwhite population shifts from low to high, as evidenced by the lack of overlap between the corresponding confidence intervals (CIs).[15] This is true for both conventional rock bands as well as their less conventional counterparts.

Four key features stand out here. First, while changes in the metro-level characteristics may shift the payoff a band receives for unconventional genre blendings, it is universally true that the estimated returns on unconventionality are positive at low levels of unconventionality and negative at high levels of

[15] While an absence of overlap between two intervals implies a significant difference in the estimated marginal, the presence of overlap does not imply insignificance. To account for this, we constructed a 95% confidence band based on the difference in estimated marginal effects observed across the central 80% of conventionality scores (see fig. C1).

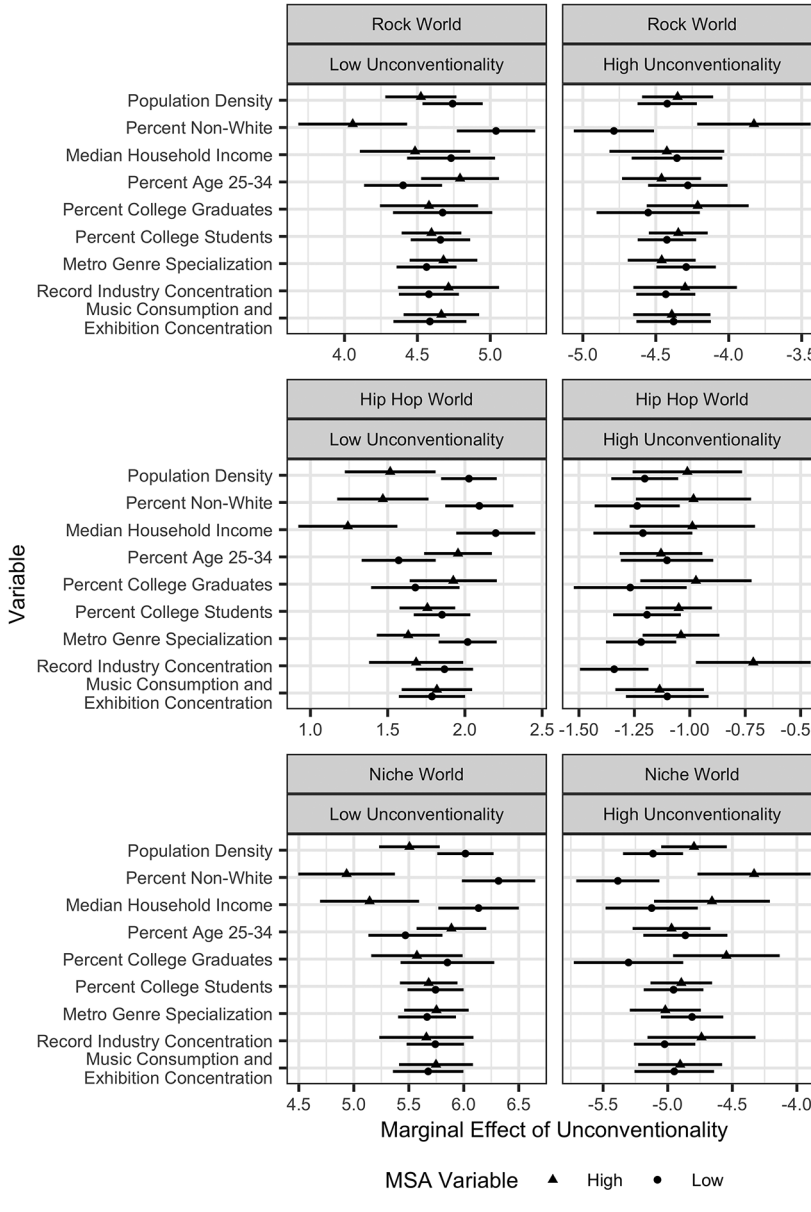

FIG. 7.—Estimated marginal effects by unconventionality and metro-level variable status. Point estimates refer to the instantaneous marginal effect of unconventionality, with the corresponding 95% confidence interval, constructed using the delta method as implemented in the margins package in R (Leeper 2018). For any given variable, low and high values refer to the 10th and 90th percentile, respectively. Scales are unique to each panel in order to increase legibility.

unconventionality. This change in direction is consistent with the idea that the curve depicting the relationship between unconventionality and popularity is characterized by an inverted U shape, providing further support for the idea that unconventionality is neither universally positive nor negative. Second, while the relationship between metro-level characteristics and the payoff for unconventionality differs across worlds in noticeable ways, it is generally the case that the rewards and penalties associated with unconventionality are less pronounced in the hip-hop world. Third, the payoffs for unconventionality are strongly affected by racial composition, regardless of world. Finally, apart from racial composition, the payoffs for unconventionality in the rock world appear to be less affected by observable metro-level characteristics than they are in the other two worlds. This is perhaps most apparent when comparing rock to hip-hop, where the returns on unconventionality are clearly affected by not only racial composition but population density, median household income, and record industry concentration. More specifically, we find that for conventional hip-hop bands, the returns on unconventionality tend to be higher in metro areas that are less densely populated, have lower levels of median household income, and have less record industry concentration, all else being equal. The opposite pattern holds, however, for less conventional hip-hop bands that tend to be penalized more heavily in these types of areas than they are in areas that are either more densely populated or more affluent or feature a more prominent local record industry.

DISCUSSION AND CONCLUSION

Back when she was the lead singer of The Weirdos, Janelle Monáe credited openness to experimentation in her local Kansas City music scene with giving her the freedom to "discover" her "inner weirdo." Using data on the genre combinations of and fandom for over 2 million bands, we show that, within the genres in which she was working, Monáe was right. As can be seen in the online visualization tool, Kansas City bands were atypically tolerated for being weirdos, a finding also predicted by work on music and urban contexts in which Kansas City is a "crossroad" city in which new genre recombinations in music have emerged and been distinctively rewarded (Florida and Jackson 2010, p. 311). Across the landscape of popular music, Monáe and the Weirdos were not only exceptionally weird in their genre pairings; they were also exceptionally rewarded (or at any rate, less penalized) for their unconventionality in part because of their embeddedness in a particular local context. While Monáe's eventual superstardom was not predictable, starting out she was at least the right kind of weird in the right kind of place for her weirdness to be tolerated or even encouraged.

Our analysis generalizes this insight to over 2 million bands. Bands from some cities (such as New York or San Francisco) are rewarded for unusual

genre combinations at relatively high rates, whereas those from others (such as Buffalo) are less rewarded for unconventionality; others (such as St. Louis) broadly mirror national patterns, while bands from still others (like Baton Rouge) are rewarded or punished for unconventionality differently depending on the musical world in question. Further, we examined a range of metropolitan characteristics that associate with a band's likelihood of being rewarded or penalized for eclectic musical offerings. Extending a literature on the geography of popular music, we found that returns on unconventional musical offerings also vary by the metropolitan characteristics and musical worlds in which bands are embedded. Very unconventional rock and niche bands enjoy more tolerance for experimentation when located in racially diverse metros, while hip-hop bands in cities with a strong record industry concentration are more rewarded for unconventional genre mixing than hip-hop bands in cities without. When located in metros with highly educated populations, unconventional hip-hop and niche bands are more likely to find an audience relatively open to unusual genre combinations.

Our analysis reveals large-scale patterns in the relationship between unconventionality and popularity, highlighting the fact that the average or typical pattern is a complex combination of diverse local processes. The "average effect" is a special case that may in fact be rare. Social reality is indelibly marked by contingency and context, but this does not make it unknowable. While we have in this article been able to document some sources of local variation from cities and genre worlds that produce distinctive forms of relation between unconventionality and popularity, articulating and identifying the mechanisms by which these forms arise remains an open challenge. We conclude with reflections on what a forward-looking agenda in search of such mechanisms might look like.

Central to such an agenda is to incorporate a more sociological perspective into how we conceptualize the social psychological processes identified by past research of the balancing act between conventionality and unconventionality. From Simmel (1957) to Brewer (1991) and beyond, authors point at a "desire to fit in and stand out" resulting in a "sweet spot." We add the sociological proposition that there is no single sweet spot but rather multiple spots that are contingent on what it means to fit in or stand out in different contexts. Figure 1 shows some shapes this contextualization may generate, but additional work is necessary to identify how and why precisely one or the other arises.

We suggest as an "accounting device" (Griswold 2014, p. 16) four sites that we believe any prospector should be looking for when digging for explanations as to why various sweet spots emerge: (1) categories, (2) producers, (3) consumers, and (4) places. Regarding categories, in advancing explanations of the types of patterns shown in figure 1, the researcher may want to know such things as how old the category is and whether it has differentiated into

avant-garde and commercial poles. Or how popular is the category, what level of generality does it operate on, and how important is authenticity within the category? For producers, how generally oriented are they to other producers versus consumers (e.g., a "musician's musician" or "comic's comic"); do they work full time in the domain or category, or is participation in it part of a portfolio career; and are they generally compensated through psychic, status-based, or monetary rewards? The workhorse variables through which we study cultural tastes such as age, education, childhood arts exposure, diversity, and connoisseurship may be the same types of measures that drive audience's attraction or repulsion to unconventional combinations. And finally, places may vary in how much they are defined by a particular category, if they are stepping-stone places, industry centers, crossroads, immigrant communities, or reputational magnets that draw producers and consumers while also defining reputations for knowledgeable nonresidents.

We expect that the shapes of the unconventionality-conventionality balancing acts that we observe will emerge from how features of these four sites combine. For example, one might consider the degree to which the rock world tended to allow for a greater range of unconventionality with less steep penalties across the middle range of the distribution, while still at this time (as would later be noted) being less ambitious in innovating new sounds through recombinant experimentation (Baker 2013; Baroni 2015). This may be because of a maturity of genres that the rock world contained and a greater range of conventionally unconventional combinations that are generally accepted as being legitimately rock-like in their sounds. Likewise, one could advance conjectures about the sharper penalty for extreme conventionality in the niche world. This could occur because to locate oneself outside of the two major worlds around which popular music orbited in 2007 (rock and hip-hop) is to already present oneself as catering to an unusual audience; to be firmly dedicated to just one niche genre in the niche world could moreover imply a hyperniche self-presentation not in the market for more popularity beyond the already inclined (Mark 1998). In turn, the second uptick in popularity in the hip-hop world fits with future recollective accounts of how music was being transformed through genre blending with hip-hop (Richmond 2015; Guan 2017). While anecdotal and based on public perceptions, it is in fact the outcome that would be predicted by our data from 2007. With the right longitudinal data, scholars could also look at the trajectories of particular genres, perhaps with unconventional genre blending being more penalized as scenes form (Wry, Lounsbury, and Glynn 2011) and again as they mature into traditionalist domains in which preservation takes primacy over experimentation (Lena 2012)—this would be a genre-specific temporal version of the more spatial inverted U we have documented in this article.

These genre category processes we expect would produce different outcomes depending on how they interact with mechanisms rooted in audiences,

producers, and places. Thus, part of the decreasing rewards for unusual genre blending in the rock world could be explained by aging audiences and a more "traditionalist" orientation to the genre and its communities (Lena 2012). Similarly, part of the trend toward cross-world genre blending in hip-hop likely arises in part from hip-hop artists' increasing commercial success creating opportunities for collaboration with other commercially successful artists from diverse genre communities. And all of these interactions among genre, producer, and audience can be influenced by the place in which they occur. To illustrate, we discuss how two places shift the orientation of audiences and producers toward blending genres in music that emerges there.

First, Nashville provides an intriguing case for building explanations about shifting rewards for genre classifications around the distinctive local characteristics of a place. Returning to our data, for bands in the hip-hop world from Nashville, the online visualization tool shows that returns to unconventionality generally rise, peaking around .9, before dropping. Bands at this range of conventionality in Nashville often combine country and related Americana genres with genres such as soul and R&B—for example, country/soul/rock, alternative/southern rock/soul, and Christian/rock/soul. Jason Eskridge is a case in point—a musician in our data set who lists soul/acoustic/folk and was featured in 2014 by a local music blogger as an example of top soul artists in Nashville (Jay 2014). This specific example exemplifies a broader point about the underlying mechanisms at work: with Nashville's growing country music industry concentration, it has become home to large numbers of talented highly professionally competent musicians, attracting musicians from other genres as well (Florida and Jackson 2010). Even so, country and related genres still dominate. This combination—a genre specialist city with a large recording industry base and professional talent pool—probably makes it more likely that country + X combinations (which might be unusual nationally) would occur here and be less penalized for such combinations. For example, while there was certainly an "Alternative Country" virtual scene that positioned itself against "the corporate way of producing country music centered in Nashville" (Lee and Peterson 2004, p. 202), bands located in Nashville that make alternative/country are still on average substantially more popular (mean popularity = 2.86, 95% CI [2.13, 3.52]) than alternative/country bands from elsewhere (mean popularity = −.1, 95% CI [−.26, .05]). This is one example of how local production and consumption dynamics can encourage specific forms of genre combinations and, more generally, of how place characteristics such as industry concentration and local genre predominance can help explain why particular sweet spots between conventionality and unconventionality may be more likely to arise in some places than others .

Honolulu provides another illustration of how to incorporate place into explanations of the origins of patterns in U-shaped curves. Like Nashville,

Honolulu is strongly associated with a specific music genre (Hawaiian). But Honolulu is less of an industry center and more of a meeting point of diverse ethnocultural traditions along with a local cultural economy strongly shaped by tourism. The result is a comparatively flat and elongated relationship between unconventionality and popularity across the middle of the distribution for the niche world. This may be because in Honolulu there is a long history of the types of genre blending with Hawaiian music that are unconventional on the national stage. For instance, the genre blending of reggae and Hawaiian music (e.g., replacing the guitar with a ukulele) is a robust phenomenon in Hawaii (Kale 2017), and the blending of Hawaiian music with country music dates to the 1920s with Sol Hoopii and his lap steel slide guitar (Silva 2017). In fact, Honolulu, a relatively small metro area, accounts for roughly one-quarter of all bands who chose combinations of Hawaiian, reggae, and country genres, and Honolulu bands with these combinations are on average substantially more popular (mean popularity = .31, 95% CI [.09, .52]) than bands with these combinations elsewhere (mean popularity = −.68, 95% CI [−.83, −.53]). The prevalence of Hawaiian music there likely means that genres that diffused to Hawaii from other places (like reggae and country) have been adapted to blend with the "home" sound of the local scene (Bennett 2000) and that audiences—some of whom are tourists looking for local sounds—give Hawaiian bands from Honolulu more room for unusual combinations with Hawaiian music than from elsewhere. Overall, scaling down in this way into smaller genre communities or smaller metropolitan scenes could better allow for teasing out the relationship between psychological explanations and mesolevel sociological mechanisms. Even so, the typology we formulated in table 2 could be used to make relatively general hypotheses about how local cultural scenes make particular curves more or less likely in experimentalist or traditionalist places.

To be clear, while our observations about places like Nashville and Honolulu are to some degree speculative, they show how for scholars of urban studies, culture, and creativity our findings and the accompanying online visualization tool can serve as a first step "thin description" (Spillman 2014) that precedes the thick description of qualitatively investigating meaning making, mechanisms, and processes within local contexts or within specific genres and the family of genres they are most combined with. Such may also be true for online spaces (Peterson and Bennett 2004), which may be more shaped by categories, producers, and consumers than they are by geographic places, or as places themselves they may have their own features that drive the local relationship to rewarding unconventionality. This suggests that in the long-run, qualitative, historical, and networks-based studies (e.g., Grazian 2005; Lena 2012; Cornfield 2015; Crossley 2015; Skaggs 2019) may be more equipped than our more macrolevel approach to tease out local dynamics.

We believe the approach developed in this article is highly portable to other domains. For example, using data from Artprice and ArtFacts, global artists could be identified as operating within worlds through the media and movements in which they work and then indexed for conventionality within those worlds while also being geographically located in cities or countries. As in Buchholz (2018), with the use of these data sources, popularity could then be measured two ways: through both auction sales and gallery exhibitions. Some cities or countries may produce more popular unconventional artists than others, just as unconventionality may be rewarded differently in the auction market and gallery market (relatedly, see van Venrooij and Schmutz 2018) or in some artistic worlds over others.

As another example, using American Sociological Association section membership data the researcher could index the conventionality of multiple section memberships across each member (e.g., Culture and Theory section membership may be highly conventional, whereas Culture and Rationality and Society may not) and then nest members in their departments. From this, as in our typology of cities, one could then create a typology of departments, potentially with conventionalists, normalists, traditionalists, and experimentalists classified by the conventionality of their members' section memberships. Going a step further, one could then index the conventionality of section memberships for participants in the employment fair, modeling over time whether unconventional job market candidates are more likely to be employed by experimentalist departments than normalist or traditionalist departments. Like the example of the global art market, while porting the basic contours of our approach to this setting may introduce a new set of challenges, it may also have substantial payoffs.

Overall, we see this work as contributing to multiple literatures. For the categories literature we hope our work serves as another vote in several recently emergent trends. First, we hope this work serves as another call to study the effects of categories on popularity beyond the scope of the categorical imperative (Zuckerman 2017). Second, we believe this article signals a direction in which research can head, as work on categories can be brought back into conversation with a wider swath of sociological literature extending back to Simmel, which treats market actors as balancing between two competing imperatives. With limited exceptions, work in the categories literature mostly operates along the first row of proposed relationships in figure 1. We additionally hope this work serves as a call for the further investigation of both nonlinear and nonmonotonic functions in the relationship between categorical unconventionality and popularity. To do so would require treating categories as positioned in relational space, which along with others (Kovács and Hannan 2015; Wry and Castor 2017; van Venrooij and Schmutz 2018) we feel is a fruitful way to move forward in this line of research. With regard to category assignments, given the varied purposes that

genre designations serve (DiMaggio 1987; Lena 2012; Negus 2013), while our data are on producer's self-claims, future research could home in on cases in which there are classificatory mismatches across different classifying groups (e.g., producers and consumers).

For the sociology of culture, this work brings further evidence to the endurance of regionalism in cultural American life (Griswold and Wright 2004; Leschziner 2007; Griswold and Wohl 2015) and even in virtual communities (Peterson and Bennett 2004; Allington 2014). For work on urban culture and the geography of music, this article makes several contributions. While most quantitative research in this area relies on industry and official government statistics (Florida, Mellander, and Stolarick 2010), we show the potential in using other data sources to capture the full spectrum from local grassroots garage bands and solo mix-tape artists to superstars. With so many bands invisible to official sources, we are able to capture distinctive local musical contexts such as those in Buffalo, Baton Rouge, and St. Louis, which are too often overlooked for industry-based studies of New York, Los Angeles, and Nashville. Moreover, we create a new measure of local musical conventionality and unconventionality, which can be added to more typical measures such as industry concentration. While in this work we focus on the level of musician's and band's self-presentation, we hope that future work merges our approach with exciting work happening at the level of discrete objects such as songs (e.g., de Laat 2014; Askin and Mauskapf 2017). Likewise, while we focus on the relationship between conventionality and popularity as it relates to spatial and relational communities, we believe that other axes of variation such as artist sociodemographics (e.g., de Laat 2019), location in a genre's trajectory (Lena 2012), or industry conditions embedded in different historical time periods (e.g., Peterson and Berger 1975; Lopes 1992; Dowd 2004) might provide additional sites of meaningful variation. In the same vein, future researchers could investigate the degree to which a genre or particular combinations of genres (or fandom for genres) is embedded within a particular locale versus being diffuse without a geographic "home base," perhaps documenting the degree to which different musics and their fandoms live locally, translocally, or virtually across geographic divides (Peterson and Bennett 2004). Measurement techniques from economic geography such as location quotients might be usefully adapted to this end.

Finally, we show how big data sources can be used to advance older theoretical ideas, such as the Chicago school's (both new and old) sensitivity to local context and variation amid more general patterns (Sampson 2012), while also illustrating what a forensic approach to big data can look like (McFarland et al. 2016). By using a suite of quantitative techniques for contextualizing and visualizing local distinctiveness, we hope to bring sensibilities traditionally associated with qualitative research to larger-scale studies,

while at the same time encouraging qualitative and local researchers to situate their findings and cases comparatively, against other U.S. metropolitan locations. Facilitating this kind of comparative dialogue between local and general is one of the true advantages of big data. Our study shows the potential it holds.

APPENDIX A

TABLE A1
GENRES BY WORLD

Hip-Hop		Rock		Niche				
Club	Acoustic	Folk Rock	Powerpop	A'Cappella	Dub	Hawaiian	Progressive House	Visual
Crunk	Alternative	Funk	Progressive	Acousmatic	Dutch Pop	Healing & Easy Listening	Psychobilly	Western Swing
Freestyle	Ambient	Fusion	Psychedelic	Afro-beat	Electro	House	Regional Mexican	Zouk
Hip-Hop	Americana	Garage	Post-punk	Big beat	Electronica	IDM	Samba	
Hyphy	Bluegrass	Gospel	Punk	Black Metal	Emotronic	Idol	Spanish Pop	
Latin	Blues	Grunge	Religious	Bossa Nova	Flamenco	Industrial	Shoegaze	
Salsa	Christian	Hardcore	Rock	Breakbeat	French Pop	Italian Pop	Showtunes	
Lyrical	Classic Rock	Indie	Rockabilly	Breakcore	German Pop	Japanese Classic	Tango	
Neo-soul	Classical & Opera	Jam Band	Roots Music	Celtic	Ghettotech	J-Pop	Tape Music	
R&B	Comedy	Jazz	Screamo	Christian Rap	Glam	Jungle	Techno	
Rap	Country	Lounge	Ska	Concrete	Gothic	K-Pop	Thrash	
Reggae	Electroacoustic	Metal	Southern Rock	Death Metal	Grime	Live Electronics	Trance	
Reggaeton	Emo	New Wave	Surf	Disco House	Grindcore	Melodramatic Popular	Trip Hop	
Soul	Experimental	Pop	Swing	Downtempo	Happy Hardcore	Minimalist	Tropical	
	Folk	Pop Punk		Drum & Bass	Hard House	Nu-Jazz	Turntablism	

APPENDIX B

Defining Genre Unconventionality

Extending Lizardo's (2014) measure of "effective omnivorousness," we measure genre unconventionality as follows. Given an $n \times p$ adjacency matrix $\mathbf{A}$ depicting the relationship between bands and genres, the degree of numerical overlap between any given pair of genres j and k is given by $\mathbf{C} = \mathbf{A}'\mathbf{A}$. We use this information to construct a matrix of similarity scores $\mathbf{O}$, where

$$o_{jk} = \frac{c_{jk}}{\min(c_{jj}, c_{kk})}. \tag{B1}$$

The resulting scores range from 0 to 1, with higher scores indicating a more conventional pairing, much like a Jaccard coefficient. The chief difference is that whereas Jaccard-based measures standardize the value of c_{jk} by dividing by the total number of unique entities to which j and k are collectively tied (i.e., $c_{jj} + c_{kk} - c_{jk}$), our measure standardizes the value c_{jk} by dividing by the minimum value of c_{jj} and c_{kk}. This captures the degree of overlap from the perspective of the smaller of the two genres.[16] The advantage of this approach over the conventional Jaccard measure is that it avoids the tendency to conflate inequity in the magnitude of c_{jj} and c_{kk} (i.e., the number of entities tied to j and k, respectively) with a lack of overlap or clustering (Latapy, Magnien, and Del Vecchio 2008).

Our approach diverges from Lizardo (2014) in two important ways. First, instead of working with o_{jk}, which measures the degree of similarity between a given pair of genres, we focus instead on the dissimilarity given by $d_{jk} = 1 - o_{jk}$. The resulting scores still range from 0 to 1, but higher scores indicate more unconventional pairings. Second, instead of making a band's unconventionality score cumulative, adding to its score when more genre choices are made, we take the mean of each band's genre-pair unconventionality. In effect each genre pairing receives an unconventionality score, and a band's overall unconventionality score is the mean of each genre pair it chooses. We take means instead of sums because bands can self-select the number of genres (up to three total), so the very number of genres listed (regardless of how unusual any pairing is) can affect the score. As a result, if we summed across all pairs, a band would get a higher score for describing itself as "pop/rock/alternative" than as "grindcore/ghettotech/[blank]."

[16] As a robustness check, we compared our results to the results produced using a number of Jaccard-based measures. We found that, as expected, unconventionally scores tended to cluster near 1 when using a Jaccard coefficient to measure the degree of overlap between genres. Nonetheless, our results do not depend on the choice of measure. More specifically, we find that the relationship between popularity and conventionality is characterized by an inverted U shape, regardless of which measure we use. The results of our multilevel regression are similarly unaffected.

Taking the mean of genre pair unconventionality scores avoids this problem. Accordingly, the unconventionality score u associated with band i is given by

$$u_i = \frac{\sum_{j \in N(i)} \sum_{k \in N(i)} d_{jk}}{m_i(m_i - 1)}, \tag{B2}$$

where $N(i)$ refers to the set of all genres chosen by band i (which Lizardo refers to as the "cultural neighborhood"), and $m_i = \Sigma_j a_{ij}$ refers to the total number of genres selected by band i. In our regression models, we also separately control for the number of genres selected, in an effort to account for the effect of adopting multiple genre labels, thus allowing the effects associated with the number of genres to differ from the effects associated with the particular combination of genres adopted.

Unconventionality scores are calculated using a band's complete set of genres. A band counts as part of a musical world so long as at least one of its genres is in that world. If a band lists one genre in the rock world and two in the hip-hop world, all three MySpace genres are considered in the calculation for the score for both worlds. For bands whose genres span across multiple worlds, we calculate separate scores for them for each world. The fact that a band can belong to more than one world means that a band can also have more than one unconventionality score, with the level of unconventionality depending on the world in which it is being viewed. By way of example for the value of this approach, a band like Rage against the Machine lists its genres as rock/rap/punk. This mirrors the on-the-ground reality of Rage against the Machine self-identifying with and actively participating in both the rock and hip-hop worlds: both its stated musical influences (Black Sabbath, the Sex Pistols, Public Enemy, Cypress Hill) and its concert touring (U2, Wu-Tang Clan) traverse these worlds (Everley 2017). In the hip-hop world, it is a band with rap influences that also participates in rock and punk genres, whereas in the rock world it is the opposite. Our measure leaves open the real world possibility that the unconventionality of Rage against the Machine is interpreted differently when performing with U2 and when performing with Wu-Tang Clan, while also not enforcing that difference (e.g., the rock and rap worlds are allowed to be associated with genre spanning combinations differently, but they are not forced to). Our measure reflects these differences: in the rock world, Rage against the Machine's genre combination is conventionally unconventional, lying around the 50th percentile of rock world unconventionality. However, the same combination was near the 83% of unconventionality in the hip-hop world. This, we believe, better captures both the theoretical underpinnings of our approach and how the real world operates.[17]

[17] As an alternative procedure and robustness check we reran our procedures with bands assigned exclusively to the world of their first self-reported genre designation, which did

APPENDIX C

Significance Tests for Nonlinear Interactions

Depicting the results of a nonlinear interaction is notoriously difficult because the effect of interest differs as a function of both the value of the corresponding variable as well as the value of the variables that it is allowed to interact (see Mize [2019] for a recent review). To address this problem, we examined how the estimated marginal effect of unconventionality changed when we changed the level of unconventionality or the level of a given metro-level variable, focusing on the contrast between the 10th and the 90th percentile of each. As can be seen in figure 7, there is little doubt that if we hold the value of the metro-level variable constant, the marginal effect of unconventionality at the 10th percentile of unconventionality is significantly different from what it is at the 90th percentile. What is less clear is whether the estimated marginal effect of unconventionality differs significantly across levels of each metro-level variable, holding unconventionality constant.

As a first approximation, we focused on the presence of nonoverlapping intervals. The difficulty with this approach is that while a lack of overlap between two intervals implies a significant difference, the presence of overlap does not imply insignificance. Rather than comparing intervals, a more appropriate approach is to construct an interval around the estimated difference. Toward this end, we used the delta method to construct a 95% confidence band based on the difference in estimated marginal effects that results when we shift the level of a given metro-level variable from the 10th percentile to the 90th. The results are shown in figure C1, which depicts the estimated difference observed across the central 80% of conventionality scores for each metro-level variable. A positive difference indicates that the estimated marginal effect of unconventionality at the 90th percentile of the metro-level variable in question is larger than it is at the 10th percentile of that same metro-level variable. A negative difference, however, indicates that the marginal effect of unconventionality at the 10th percentile is larger than it is at the 90th percentile, with no difference denoted by the dashed line. When the dashed line falls within the bounds of the confidence band, it means that the estimated difference in the marginal effects is significant at that point.

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not meaningfully change our results. By way of further exploration, we created a variable for bands who are "purists," where purists only select MySpace genres within a given world. Overall, rock purists are more popular than world-crossing rock world bands, whereas niche and hip-hop purists are less popular. This is likely because rock world musicians are more popular in general. Controlling for purists in our regression models does not substantively alter our results.

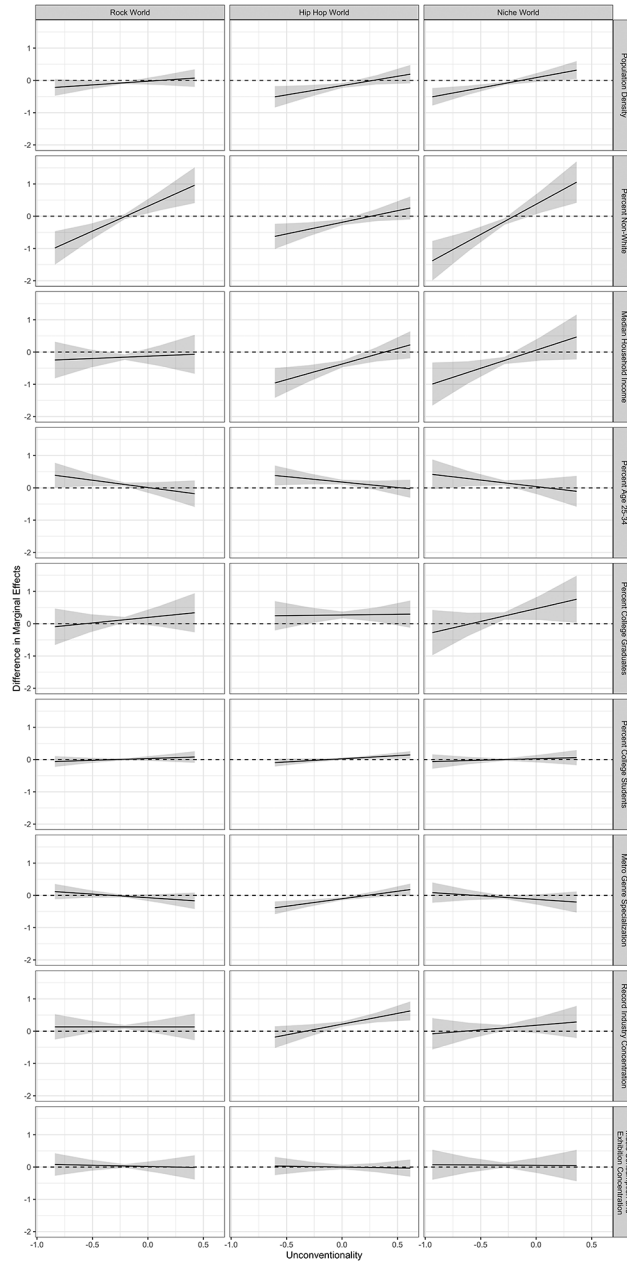

FIG. C1.—Differences in estimated marginal effects

APPENDIX D

Constructing Musical Worlds

We follow a two-stage strategy to partition MySpace data into musical worlds, as discussed in more detail in Silver et al. (2016), some of the text from which we reproduce here. A first step is to reject the null hypothesis that there is a completely random relationship among a band's genre choices. Whatever a band chooses for genre 1 would be arbitrarily related to its choice for genres 2 and 3 and vice versa. This is admittedly an unlikely scenario, but it does provide a useful baseline. Using a community detection (modularity optimization) algorithm, we find that genre choices are far from random. Certain genres are paired with one another with great consistency. To determine this, we catalog all band-supplied genre combinations as a network defined by the frequency with which bands coselect them. For instance, if one band chooses rap and metal, there would be one edge between the rap and metal nodes, and so on, with numerical frequency for rap and metal and all other activated genre-by-genre ties.

Given that bands' genre choices do evince latent structural patterns, the second step is to examine the nature of these patterns. By applying modularity clustering to the MySpace genre hierarchically—that is, repeatedly subdividing genre communities until it is impossible to do so again with statistical significance—we are able to characterize in greater detail the MySpace universe's organization of musical genres. We find a fundamental first division among rock, hip-hop, and niche musical worlds that breaks down further into 16 distinct genre communities. The current study focuses on the highest-order division (rock, hip-hop, niche) for the sake of simplicity and clarity—we are examining variations between three worlds and hundreds of metropolitan areas. Nevertheless, examination of the 16 lower-order communities is an important further area of research and a useful way to understand the meaning of the higher-order worlds.

To find the latent structure of MySpace bands' genre selections, we create a large and complex network by mapping the band-provided colistings of (up to three) genres. Genres are considered "related" once when a band lists them together. In the event that a musician chooses only one genre—thereby providing no information about how genres are associated with one another—the musician's choices are not included in the analysis. To make sure this did not bias our results, we compared the distribution of genre nominations for genres that are listed alone versus genres that are listed in some sort of combination. We found that the distributions do not differ substantially. Thus, eliminating single genre selections from our analysis does not bias the resulting genre clusters in any significant way, nor would providing some kind of unique score for single genres change the combinatory patterns that we currently see.

For the full population of bands in the data that did list more than one genre designation, greedy modularity optimization is employed to identify genre communities. Greedy modularity optimization was developed by Clauset, Newman, and Moore (2004). This algorithm partitions a network by maximizing its modularity, a measure that quantifies a network's community structure by providing a value for every clustering within a given graph. The general idea is to employ a random graph on the same vertex set that does not have any community structure and compare the edge density of the clusters in the original graph with the edge density of the clusters in the random graph. The greater the difference between the two edge densities, the more community structure the given clustering describes. We use the version operationalized in R's IGraph package, which outputs the best community structure (structure with the highest modularity score) possible.

But modularity algorithms, like most clustering algorithms, have no universally accepted significance tests. In other words, there is no consensus as to whether a modularity score of .1, .3, or any value indicates a "real" versus an arbitrary community structure. In certain situations, however, it can be relatively easy to apply statistical techniques that approximate a significance test. While it is unclear how we would define, let alone test, the significance of the entire community structure discovered in this study, it is relatively straightforward to test whether a single identified community is significantly structurally "separate" from the rest of the large network. This can be done with a Wilcoxon rank-sum test, which, applied to this context, assesses whether there is a statistically significant difference between the number of in-edges and out-edges adjacent to members of a given community. If a community has significantly more in-edges than out-edges, the community is considered statistically significant—a relatively unified group of genres with relatively strong boundaries. And if all its constituent communities are significant, it is reasonable to consider an entire community structure statistically significant.

In this study, running the modularity optimization algorithm and significance testing was procedurally united. In order to identify the most specific genre complexes possible, we do not simply run the modularity optimization once. Instead, we run the modularity optimization and the rank-sum test in direct succession and progressively until further dividing a community into smaller, more specific groupings no longer yields statistically significant communities. Our results therefore present a community structure in which all identified communities are indivisible into smaller significant communities and are themselves significant at the $P < .01$ level.

We used a modularity-based approach to community detection because our primary interest is to identify areas of density in a graph composed of weighted and undirected edges. Our data are simple: musicians select genres, and genres are considered related when they are coselected by many musicians. Areas of

density therefore represent in a clear and straightforward way groups of genres that are commonly associated with one another across the millions of musicians in our sample. Given the nature of our data, structure comes from edge weights, so the community detection algorithm chosen must be able to work with edge weights. Since our edges are undirected, the community detection algorithm must be chosen accordingly. Modularity-based approaches are a primary example of internal density approaches that operate on weighted, undirected edges (Coscia, Giannotti, and Pedreschi 2011); here we use Igraph's implementation of greedy modularity optimization.

Figure D1 is a dendrogram that details how a first-order clustering into rock, hip-hop, and niche music worlds is broken down into 16 genre communities, with provisional names to capture their main tendencies. For every division, the community's in-edges outnumber its out-edges at a statistically significant level ($P < .01$). Table D1 summarizes the MySpace genres within each community.

We performed a placebo test to ensure that the modularity observed in the MySpace network is not due simply to network density, randomly rewiring the network 1,000 times. While the modularity coefficient for the

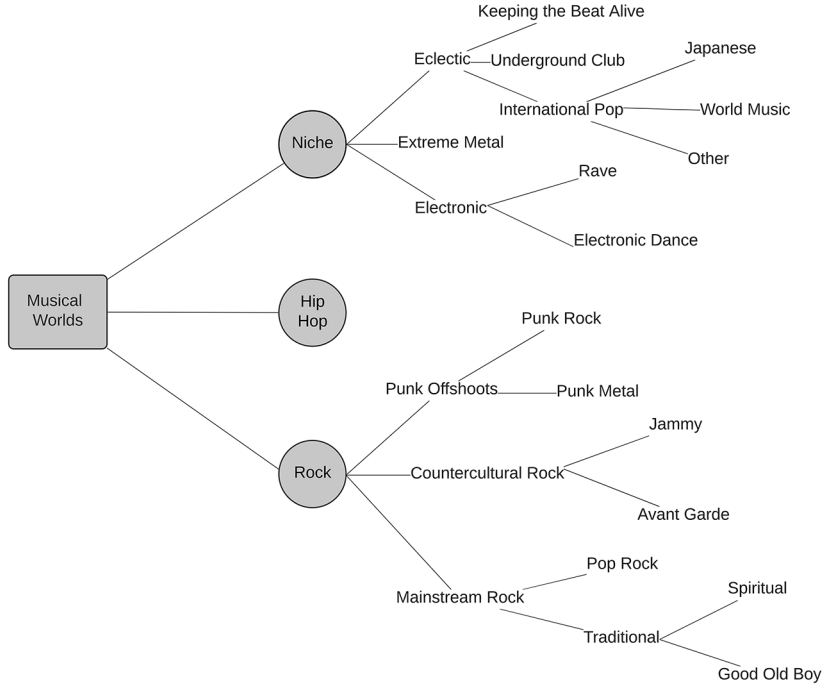

FIG. D1.—Summary of a dendrogram of MySpace genres with 16 genre communities at its leaves.

TABLE D1
GENRES WITHIN COMMUNITIES

Genre Community	MySpace Genre
Hip-hop	Club, Crunk, Freestyle, Hip Hop, Hyphy, Latin, Lyrical, Neo-soul, R&B
Avant-garde	Ambient, Classical & Opera, Comedy, Experimental, Electroacoustic, New Wave, Progressive, Psychedelic
Electronic/dance	Breakbeat, Downtempo, Drum & Bass, Dub, Electro, IDM, Tropical
Extreme metal	Black Metal, Death Metal, Gothic, Grindcore, Thrash
Good old boy	Americana, Bluegrass, Country, Rockabilly, Roots Music, Southern Rock
Jammy	Blues, Classic Rock, Funk, Fusion, Jam Band, Jazz, Lounge, Swing
Japanese	Healing & Easy Listening, Idol, Japanese Classic, Melodramatic Popular
Keeping the beat alive	A'Cappella, Afro-beat, Big beat, Christian Rap, Disco House, Nu-Jazz
Other	Ghettotech, Grime, Hawaiian, Regional Mexican, Showtunes, Western Swing, Zouk
Pop/rock	Pop, Powerpop, Rock, Alternative, Indie
Punk metal	Emo, Screamo, Hardcore, Metal
Punk rock	Garage, Grunge, Pop Punk, Punk, Ska, Surf
Rave	Acousmatic, Electronica, Hard House, House, Industrial, Techno, Progressive, House, Trance, Trip Hop
Spiritual	Acoustic, Folk, Folk Rock, Christian, Gospel, Religious
Underground club	Glam, Happy Hardcore, Jungle, Psychobilly, Shoegaze, Turntablism, Visual
World music	Bossa Nova, Breakcore, Celtic, Concrete, Dutch Pop, Emotronic, Flamenco, French Pop, German Pop, Italian Pop, J-Pop, K-Pop, Live Electronics, Minimalist, Samba, Spanish Pop, Tango, Tape Music

actual MySpace network is 0.31, the average modularity for our 1,000 random simulations is only .04. This very dense network exhibits almost no modularity at all when its edges are randomly allocated. Thus, the clustering patterns we observe in the MySpace network are highly unlikely to be due to random chance.

Progressive modularity clustering moves from the left to right of the dendrogram in figure D1. Furthest on the left, the first-order breakdown separates out three main worlds of popular music—rock, hip-hop, and niche worlds. As we move to the right, the rock world breaks down to its "subcultural" varieties, which we call countercultural rock, mainstream rock, and punk offshoots, and then finer categories therein. The hip-hop world, dominated by rap, hip-hop, and R&B, breaks down no further into statistically significant communities. They comprise both a major musical world and an "end" community. The niche world represents a variety of less popular (as defined by the frequency with which they are selected by musicians) genres and communities. It is essentially a category encompassing music not strongly

tied to the two dominant poles of American music in the 2000s: rock and hip-hop. These include most notably electronic music genres, dark or extreme metal, and various underground and world music genres, which emerge and further subdivide as we move to the right of the chart.

As an alternative procedure and robustness check, we reran our analysis using these 16 communities and treating them as the "genres," using the same unconventionality formula as described in appendix B. In other words, we examined degree of conventionality across these 16 "umbrella" categories that operate at the same level and then plotted the resulting variable against band popularity in figure D2. This approach accounts for the possibility that the "balancing act" we observe is an artifact of differences in the number of genres within worlds by treating lower-order genre communities themselves as the relevant musical units.

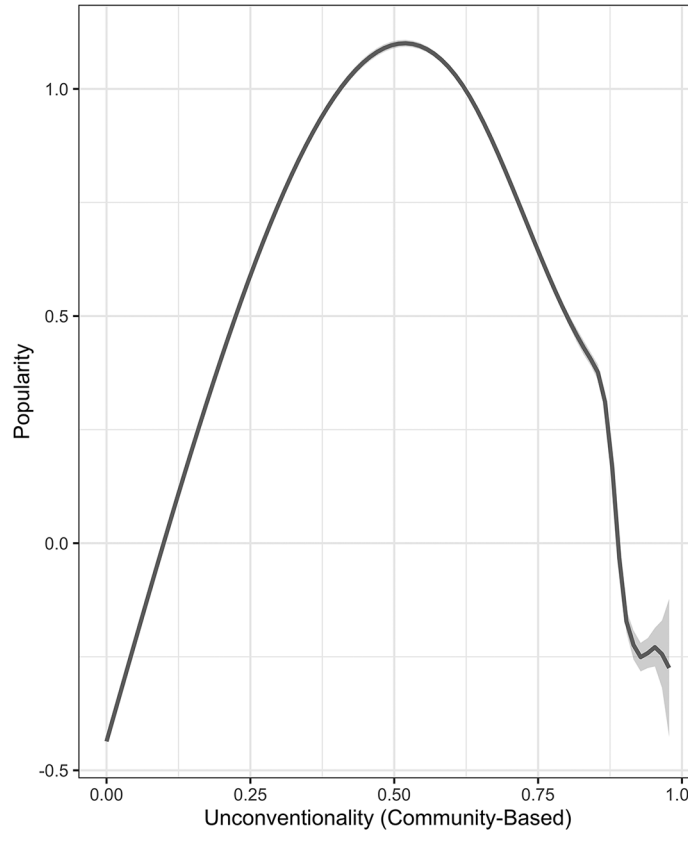

FIG. D2.— Relationship between unconventionality and popularity, where unconventionality is calculated with each of the 16 genre communities being treated as "genres."

As can be seen, this does not meaningfully change our results for the basic inverted U between unconventionality and popularity, which we also confirmed with two-line tests. Similarly, we examined how the relationship between this measure of unconventionality and popularity shifts across metro areas. As figure D3 shows, we find substantially similar basic patterns of association, with race, income, and record industry concentration showing significant effects.

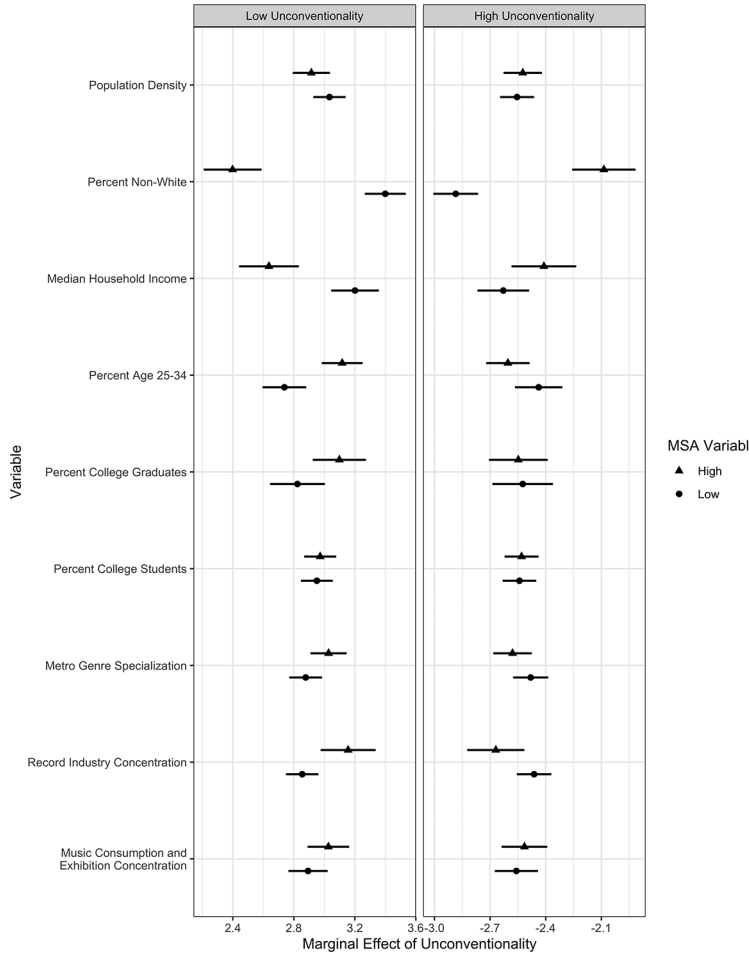

FIG. D3.—Variation in returns on unconventionality by metro-level characteristics, for unconventionality calculated using 16 genre communities as "genres."

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