Who moves to the methodological edge? Factors that encourage scientists to use unconventional methods

Sharon Koppman[a,*], Erin Leahey[b]

[a] Merage School of Business, University of California, Irvine, 4291 Pereira Drive, Irvine, CA 92697, United States
[b] School of Sociology, University of Arizona, 1145 E. South Campus Drive, Tucson, AZ 85721, United States

ABSTRACT

Breaking from tradition is necessary for scientific advancement, yet we know little about the factors that encourage scientists to break from tradition in their research, particularly by using methods that are unconventional in their fields. To address this gap, we integrate the sociology of science with insights from organization theory, which delineates the evaluative advantages bestowed on those with elite status and a consistent professional identity. We use a mixed methods design. Bibliometric data on articles using three unconventional methods in sociology—Correspondence Analysis, Qualitative Comparative Analysis, and Sequence Analysis—allow us to identify which types of scholars have a greater hazard of using unconventional methods and the conditions under which these associations hold. Interviews with published, unpublished, and likely users reveal how scholars manage the career risks associated with unconventional method use. We find that scholars who are male and affiliated with top-tier universities, as well as those already committed to an identity consistent with the use of unconventional methods, have a greater hazard of using them in published work, though these associations depend on the extent to which the method diverges epistemologically from conventional methodology and the visibility of its lineage. In addition, we identify five successful (and two unsuccessful) strategies scholars use to manage their use of unconventional methods. Taken together, results from this mixed methods study advance knowledge on scientific practice, extend organization theory, and provides guidance to policymakers and administrators who aim to foster risky, path-breaking research.

1. Introduction

Breaking from tradition is necessary for the advancement of scientific knowledge; Copernicus, Newton, Lavoisier, and Einstein are all known for shattering the scientific tradition of their age (Kuhn, [1962] 1970). Funding agencies recognize this, and aim to support risky, path-breaking projects: National Institute of Health through the High-Risk, High-Reward Research Program, National Science Foundation through the Early-concept Grants for Exploratory Research (EAGER), and the European Research Council through Horizon 2020′s support for "unconventional and innovative approaches." Yet relatively few studies have examined the factors underlying the tendency for scientists to engage in research that is *unconventional*, i.e., that breaks from the way research is usually conducted, and those that do tend to focus on choices to use ideas (i.e., topics or theories) that depart from conventional thought (e.g., Foster et al., 2015; Schilling and Green, 2011; Trapido, 2015; Uzzi et al., 2013). We focus on a neglected way in which scientists break from scientific tradition in their research: by using

methods that are uncommon and unconventional in their fields. Correspondence Analysis (CA), Sequence Analysis (SEQ), and Qualitative Comparative Analysis (QCA) are examples of unconventional methods within our field, sociology.

Though there are robust literatures on the development and diffusion of innovative techniques, the use of uncommon and unconventional methods does not fit neatly within them. Scholarship on innovation typically focuses on the development of new products or ideas, and while the development of new methods certainly falls under this umbrella, the application of such methods by other scholars – especially decades after their development – does not. Scholarship on diffusion typically examines the adoption of techniques that eventually diffuse widely throughout the population of interest. From the spread of hybrid corn seeds in Iowa farms (Ryan and Gross, 1943) to the spread of Christianity in the Roman Empire (Stark, 1996), the tacit assumption is that almost everyone eventually becomes an adopter (Abrahamson and Rosenkopf, 1997; Etzion, 2014; Jonsson, 2009). The techniques of interest here have not, and most likely never will, diffuse fully. Diffusion

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* Corresponding author.
E-mail addresses: skoppman@uci.edu (S. Koppman), leahey@arizona.edu (E. Leahey).

scholars have largely ignored the adoption of techniques that remain uncommon despite their maturity, perhaps due to the assumption that they will eventually disappear, even though some techniques do manage to stick around without ever becoming prevalent (Colyvas and Jonsson, 2011).

Instead, to understand the use of unconventional methods, we integrate the sociology of science and ideas with insights from organization theory. The sociology of science and ideas encourages us to consider how social factors and career expectations inform scholars' choice of method. Insights from organizational theory, particularly on valuation risk, encourage us to move beyond cumulative advantage to sources of status that spill over from associations with organizations and groups. From these theoretical insights, we develop hypotheses about whether and how traits like status (especially gender and institutional prestige) and a prior commitment to particular a professional identity may inform the decision to use an unconventional method. Specifically, we think that high status offers a buffer to valuation risk, so that male scholars and those affiliated with high-status institutions will be more likely to use unconventional methods. We also expect that scholars who have already demonstrated a commitment to an identity consistent with the use of unconventional methods (e.g., interdisciplinary research) will also gravitate toward unconventional methods.

To test these ideas, we design a mixed methods study. We collect and analyze quantitative, bibliometric data to understand which types of scholars are more likely to use unconventional methods and the conditions under which these associations hold. We also conduct and transcribe 25 interviews with those who have used (or were well-suited to use) one of the three unconventional techniques we study; analyses of these qualitative data give us a sense of how scholars manage career penalties associated with unconventional research choices. Our qualitative data allow us to identify five successful (and two unsuccessful) strategies scholars use to manage valuation risk. The three most common successful strategies involve demonstrating competence in conventional methods, while the fourth and fifth, respectively, involve demonstrating commitment to an established identity and distancing oneself from the method. By contrast, strategies to gain status or a positive identity through the use of an unconventional method are described as largely unsuccessful.

Understanding which scholars are more likely to use unconventional methods is important for policy efforts to encourage their use and, by extension, path-breaking research because science policy can readily influence the content and conduct of science through individual scientists and their selection of methods and approaches (Laudel and Gläser, 2014). Our empirical, mixed methods study not only advances knowledge on scientific practice and theory of valuation risk and scientific norms, it also has practical implications for policymakers and institutions seeking to encourage risky, path-breaking scholarship.

2. The sociology of science and ideas

To understand why scholars might choose to use an unconventional method, we turn to the sociology of science, and specifically, to the sociology of ideas, a body of literature devoted to understanding the social processes by which ideas emerge, develop, and change (Camic and Gross, 2001). One of its key concerns is *intellectual choice*—why scientists and intellectuals choose to use different theories (Mulkay, 1991), methods (Camic, 1995; Camic and Xie, 1994), and ways of interpreting data (Gieryn, 1999). A large portion of this literature posits that these choices[1] are the product of scholars' efforts to garner

recognition from other people in their field (Bourdieu, 1988; Collins, 1998; Merton, 1957). For instance, Collins (1998:38) argues that intellectuals formulate ideas to "win" peer attention—i.e., to get peers to engage with their arguments. Similarly, Bourdieu (1988) argues that intellectuals are drawn to approaches that align with positions to which they aspire. Latour and Woolgar (1979) argue that scientific work involves a quest for "credibility" that permeates the scientific process, including the selection of methodological techniques. Together, this literature suggests that scholarly decisions to use particular research methods are intertwined with individual concerns about career attainment.

Choosing to use a methodological tool that is uncommon and unconventional may be especially intertwined with concerns about career attainment. Scholars may choose to use a method that diverges from convention in order to stand out from their peers. Indeed, eminence is hard to achieve without defying convention. Using a method not typically used in one's field is one way to make an original contribution to knowledge (Guetzkow et al., 2004), and such contributions garner peer recognition, the main currency within science (Merton, 1957).

But such quests for recognition are challenging because many evaluative practices in academia put unconventional work at a disadvantage. Scientists are trained in a tradition, which leads them to ignore anomalies churned up by daily scientific work (Kuhn, [1962] 1970). Scientists tend to evaluate work falling outside that tradition less favorably, as a result of said training (Teplitskiy et al., 2018), leading unconventional work to be disadvantaged during peer review (Siler et al., 2015; Wang et al., 2017). Moreover, because university systems of evaluation, like hiring and promotion procedures, emphasize reliable and visible productivity, scholars feel pressure to pursue conservative publication strategies; a scientist who embarks on untraditional research is more likely to have long periods in which they appear unproductive, such as the seven years Andrew Wiles spent working on Fermat's Last Theorem (Foster et al., 2015). As Kuhn (1977:227) put it, "the successful scientist must simultaneously display the characteristics of a traditionalist and of the iconoclast." This, according to Kuhn, is the essential tension of scientific research, elaborated later in Bourdieu's (1975) distinction between "succession" and "subversion," and Whitley's (2000) distinction between "relevance" versus "originality."

Because choosing to use an unconventional method is a high-risk, high-reward career strategy, not all scholars are equally likely to participate. Yet relatively few studies have examined the factors underlying participation, and those that do tend to focus on choices to use unconventional ideas (i.e., topics or theories) rather than methods.[2] Studies examining unconventional ideas have shown that scholars who are already productive, visible, and recognized for highly unconventional work are more likely to choose to recombine substantive knowledge in new and different ways (Trapido, 2015), engage in untraditional research strategies (Foster et al., 2015), and enter emerging substantive fields (Sabatier and Chollet, 2017). Yet we know little else about the factors underlying scholarly engagement in these high-risk, high-reward strategies.

We build on this literature in two main ways. First, we break from the general focus on unconventional knowledge combinations and instead emphasize the choice to use unconventional methodological techniques. Methods are a critical part of the fabric that provides a foundation for future scientific discovery (Leahey, 2008; Shi et al., 2015). As a mode of discovery, methods are adaptable to varied

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[1] The use of the word "choice" in this literature is generally used to describe a extended process of following one intellectual path rather than another, not an exact moment in which scholars decide between alternatives (e.g., Foster et al., 2015; Gross, 2002).

[2] This gap is not surprising given that the sociological study of scientific norms was initially focused on moral norms, i.e., shared expectations about how scholars should feel and act (Merton, [1942] 1973; Mitroff, 1974), as opposed to technical/cognitive norms, i.e., shared expectations about scientific practice and the nature of scientific inquiry (Zuckerman, 1988), though this has been changing (e.g., see Leahey, 2008 for a review of research on methodological norms in social science).

contexts; evidence for this comes from the citation bonus that methodological contributions receive in the scholarly community (Peritz, 1983). Furthermore, especially in the field we study – sociology – innovation is often viewed in terms of methods, which "hold the promise of informing theories and contributing to progress in answering specific conceptual questions or 'resolving old debates.'" (Guetzkow et al., 2004: 202). Yet methods are often overlooked in studies of unconventional scientific work, perhaps because these decisions are assumed to be more rational and objective than decisions about unconventional topics and theories, and thus less susceptible to status concerns. Certainly, what diffusion researchers call 'rationality' – which is akin to the "technical fit" or "suitability" of a method – matters (Leahey, 2005). But our study affirms that status concerns are also relevant to the choice to use an unconventional method.

Second, we expand on the status effects documented by previous studies, which have focused on cumulative advantage—i.e., the benefits bestowed on those who have already earned status through productivity and visibility—to sources of status that spill over from associations with organizations and groups. These advantages are also important, as they are often at the root of the previously-studied processes of cumulative advantage (Correll et al., 2017). We do so by integrating insights from organization theory on valuation risk into the literature on the sociology of science.

3. Theory of valuation risk

The aforementioned tension between the iconoclast and the traditionalist, evident in many fields, has been described by organization theorists as a choice between conformity and differentiation grounded in competition for audience favor (here, a scholar's peers). Differentiating oneself through unconventionality has high potential returns (e.g., being seen as "cutting-edge" or "original") but it also poses *valuation risk*: the danger that differentiating will make one appear incompetent or scattered (Leung, 2014; Zuckerman, 2017, 1999). In science, valuation risk emerges in the peer review process and university hiring and promotion procedures, during which one's record of scientific achievement is evaluated. Thus, choosing to differentiate through one's research may increase the risk that a scholar is evaluated by gatekeepers—peer reviewers, journal editors, recruitment and hiring committee members—as incompetent and/or scattered. To build hypotheses as to which scholars are more likely to bear this risk by using an unconventional method in their published research, we draw on the literature on valuation risk, which delineates the evaluative advantages bestowed on those with elite status and those who affirm consistent professional identities.

3.1. The evaluative advantages of status

Although all scholars may be motivated to differentiate themselves in order to reap high returns, only those less sensitive to valuation risk – particularly, able to bear the risk of being seen as incompetent – may actually do so. Actors associated with high-status groups, i.e., those who are ranked highly and garner deference (Goode, 1978; Weber, [1922] 1978), are comparatively able to bear this risk (see Sauder et al., 2012 for a review). We extend past research showing that scholars who have earned status directly (e.g., through productivity) are more likely to engage in unconventional research (e.g., Sabatier and Chollet, 2017; Trapido, 2015) by arguing that scholars who garner status through affiliation with high-status groups and organizations are similarly inclined, as these ties decrease their sensitivity to valuation risk. Indeed, Leahey (2005) found that scholars affiliated with high-status institutions were more likely to buck the trend toward statistical significance testing. Because they are more secure in their positions, we suspect that scholars affiliated with higher-status groups are more likely to embrace

the high-risk, high-rewards differentiation strategy of using unconventional methods.[3]

Two prominent affiliations that bestow status are membership in high-status social groups and highly-ranked organizations (Correll et al., 2017). Membership in a high-status social group, such as being a member of the male gender or white race, provides an advantage because these social categories serve as "diffuse" status characteristics, in that people tend to rely on beliefs about members of these groups to estimate the competence of others (Ridgeway and Correll, 2006). For instance, the widespread belief that men are typically more competent than women leads evaluators to infer that male job candidates are generally "better" than female ones (Ridgeway and Correll, 2004). Membership in highly-ranked organizations also bestows status, as these affiliations are often used by evaluators as signals of quality or competence (Podolny, 1993). For instance, employers at elite professional service firms evaluated job candidates who attended top-tier Ivy League schools as more competent than those who attended lower-tier Ivy League schools, regardless of their academic performance (Rivera, 2011). These status advantages not only shape evaluations of competence by others but are also internalized by individuals. For instance, being a member of the lower-status gender tends to negatively affect women's assessments of their own competence, expectations about how others will evaluate them, and willingness to engage in high-risk, high-reward behavior, such as starting a business (Correll, 2001, 2004; Thébaud, 2010).

We expect that scholars affiliated with high-status social groups and highly-ranked organizations will be more likely to use unconventional methods because these affiliations decrease their sensitivity to valuation risk. Because male scholars and those affiliated with highly-ranked universities are widely viewed as more competent (Crane, 1970; Ridgeway and Correll, 2004), they should feel more secure than their female and lower-ranked peers and expect (and receive) the benefit of the doubt from gatekeepers (Phillips et al., 2013)—such as journal editors, personnel committees, and funding agencies—even when they experiment with less conventional techniques. By contrast, scholars affiliated with mid- and lower-status groups with upwardly mobile aspirations occupy a more insecure position and feel more pressure to conform to audience expectations (Phillips and Zuckerman, 2001). Given the protection and evaluative advantages that their high-status group membership affords them, we expect men and scholars employed at elite universities to gravitate toward unconventional methods and to be successful publishing with them. Therefore, we hypothesize:

H1a. Male scholars have a greater hazard of using an unconventional method than female scholars

H1b. Scholars affiliated with top-tier institutions have a greater hazard of using an unconventional method than those affiliated with lower-tier institutions

3.2. The evaluative advantages of a consistent professional identity

Valuation risk is not only about being seen as incompetent—it is also about the risk of being seen as uncommitted or inconsistent (Correll et al., 2007; Leung, 2014). Actors who have already committed to a professional identity that is consistent with the use of unconventional methods are more likely to use such a method, as they are better able to bear this risk. Research suggests that professionals who demonstrate an ongoing commitment (to a role, a genre, a subfield, or any

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[3] Though Phillips and Zuckerman's restatement of status conformity theory argues that low-status actors who are permanent outsiders, like their elite peers, are more likely to deviate, in cases where low-status actors are not permanently excluded, such as our study population (active scientists), status is expected to have a positive, linear effect on unconventional behavior (Phillips and Zuckerman, 2001:420).

given approach to work) are more likely to be evaluated positively by gatekeepers because they are more easily understandable (Zuckerman et al., 2003). Indeed, film actors (Zuckerman et al., 2003) and freelancers (Leung, 2014) with consistent professional identities have less trouble finding work. Trapido (2015) found that engineers with an established identity for research recombining prior knowledge in unusual ways were disproportionately rewarded for subsequent research aligned with this identity. And within academia, scholars with consistent academic identities tend to be more productive (Leahey, 2006; Leahey et al., 2017) and more highly paid (Leahey, 2007). Academics carve out identities for themselves through sustained commitment to topics (racial segregation), theories (middle-range theory, Marxism, Pragmatism), methods (computational social science), and what interests us here: broader approaches to knowledge production like interdisciplinarity.

We expect that scholars with prior commitments to an interdisciplinary identity are more likely to use unconventional methods because this commitment decreases sensitivity to valuation risk. Largely due to the influx of federal funding and university-level support, interdisciplinary research is increasingly popular (Leahey et al., 2017). Interdisciplinarity is typically defined as the recombination of substantive knowledge from multiple disciplines. Openness to ideas and theories from other disciplines is likely associated with using unconventional methods, given that many social science methods are imported, wholesale or in their key machinery, from other disciplines; for instance, correlational analysis, multiple regression, experimental design, and hypothesis testing were developed to study crops, fields, fertilizers, and genetics (Abbott, 2004). Scholars who demonstrate a penchant for exploring and integrating different discipline to produce interdisciplinary scholarship should be more likely to try out unconventional methods, as using an unconventional method is often a way to display commitment to an interdisciplinary academic identity, and a consistent academic identity is professionally rewarded.

H2. Scholars with a greater commitment to an interdisciplinary identity have a greater hazard of using an unconventional method

3.3. When and how do status and consistent identity matter?

Even among unconventional methods, departures from convention vary. Unusual or atypical scientific products are usually defined as those that integrate substantive knowledge from rarely paired subfields (e.g., Schilling and Green, 2011; Trapido, 2015; Uzzi et al., 2013). This may be extended to unconventional methods because all disciplines have, in addition to a theoretical tradition, a consensual epistemological approach to data that methods may depart from to different degrees: what we refer to as *epistemological divergence*. Methods with low levels of *epistemological divergence* are not *that* different epistemologically from conventional methods. For instance, methodological traditions in political science and sociology tend to be variable-oriented, quantitative, time-insensitive, frequentist, and positivist. As such, in these disciplines, unconventional methods include those that are case-oriented, qualitative, time-sensitive, Bayesian, or interpretive. Yet a method that is, for instance, time-sensitive but still variable-oriented, quantitative, frequentist, and positivist strays less from convention than a method that is case-oriented, qualitative, set-theoretic, and interpretive but still time-insensitive.

High-status scholars are more likely to use methods with low levels of epistemological divergence because such methods are less threatening to the status quo in which high-status scholars are invested. Diffusion research on early-stage adoption argues that elite actors adopt methods that threaten the status quo to maintain their status—elites worry that if they do not adopt, they will become irrelevant (Compagni et al., 2015). Because unconventional methods that never fully diffuse are unlikely to ever inspire similar social pressures, we expect a different pattern of results. In the literature on the role of status in

conformity, Blau (1955) argues that high-status actors tend to use practices that mesh with prevailing group norms but not those that are counter-normative. Similarly, Phillips and Zuckerman (2001) posit that elites often buttress their unconventional choices with disclaimers to temper any effects unconventionality may have on the status quo in which they are deeply invested. Because unconventional methods that are more different content-wise from conventional methodology pose a greater potential threat to a field's convention-based status order in which elites acquired their status, we expect that the aforementioned status advantages will not hold.

H3. The positive relationship between status and the use of unconventional methods holds only for those with low epistemological divergence

Though most research on unconventional science has focused on atypical combinations of substantive topics, another dimension has recently gained attention: the extent to which it reveals *some* connection to a tradition somewhere, i.e., its lineage. Some scientific work sustains streams of knowledge on a substantive topic, whereas other work disrupts knowledge streams (Funk and Owen-Smith, 2016). We extend this to methods because, much like a substantive topic, methods differ in the extent to which they reveal connections to previous streams of knowledge from other fields, a tendency we refer to as *lineage visibility*. More than streams of knowledge on a substantive topic, streams of knowledge on methods tend to be interdisciplinary, particularly in social science, where almost all methods are imported from other disciplines (Abbott, 2004). Yet this lineage is not always visible and as a result, some methods appear more disconnected from methodological tradition. Though unconventional methods, by definition, are a departure from the methodological tradition of their own field, a visible lineage from another field likely tempers perceptions of unconventionality because it shows the method has connections to a tradition somewhere.

We expect that an unconventional method with a visible lineage in another field is more attractive to scholars seeking to affirm commitment to an interdisciplinary identity. Diffusion research on early-stage adoption argues that actors adopt novel techniques to acquire a positive identity as a market leader (Kennedy and Fiss, 2009). Because methods that do not diffuse generally do not offer this opportunity—it is hard to be seen as a "leader" when few follow—the effects of identity likely differ. We suspect that actors adopt methods that are unconventional to demonstrate commitment to an established identity, and as a result, this strategy is contingent on the specific established identity. In the case of the academic identity of interest here—interdisciplinarity—the use of an unconventional method only functions as a way to demonstrate commitment if the unconventional method has a visible connection to tradition in another discipline. As such, we expect that the aforementioned identity advantage is contingent on the method's lineage visibility.

H4. The positive relationship between an established interdisciplinary identity and the use of unconventional methods only holds for methods whose (extra-disciplinary) lineage is visible.

Finally, we are also interested in *how* scholars incorporate unconventional methods into their research programs to minimize valuation risk. We expect that using an unconventional method is a high-risk, high-reward career strategy, yet we know little about how scholars manage the risk that their unconventionality will be evaluated as incompetent or scattered in practice. For instance, previous studies speculate that elite actors use disclaimers to shift default negative interpretations of unconventionality to neutral or positive ones (Phillips et al., 2013; Phillips and Zuckerman, 2001). This is one possible strategy, however, there are likely many other ways scholars manage peer and gatekeeper impressions of their use of unconventional methods. A second aim of this article, thus, is to identify such strategies through interviews.
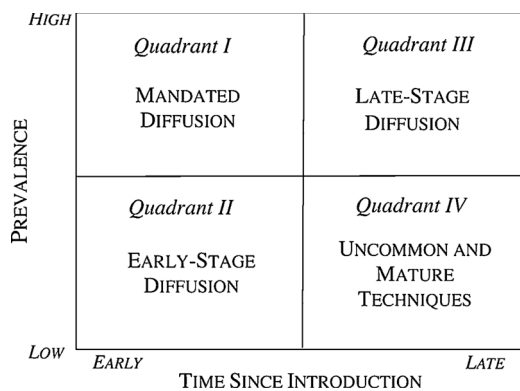
Fig. 1. How the Methods of Interest (Quadrant IV) Differ from Practices that Diffuse.

4. Empirical context: unconventional methods in sociology

Like many previous studies of scientific practice (Gerber et al., 2001; Leahey, 2005), we study a single discipline. We do this because disciplines differ in terms of their degree of receptivity to crossing disciplinary boundaries, and the degree to which their work is read and cited by researchers in other disciplines (Pierce, 1999). We study sociology because sociology is more methodologically diverse than other social sciences like anthropology (with its qualitative field research tradition) and psychology (with its experimental tradition), making an investigation of how unconventional methods are used particularly informative. Our analysis is restricted to English-speaking sociologists in North America and Europe.

Our interest in the adoption of methods that remain uncommon despite their maturity is distinct from most practices studied in the diffusion of innovation literature. As depicted in Fig. 1, methods can be characterized by their prevalence as well as their newness (i.e., time since the method was developed or introduced to the discipline). Studies of diffusion focus predominantly on Quadrants II and III: when techniques are introduced into a population, they are used by a smaller portion of the population (i.e., early-stage diffusion in Quadrant II), and as time passes, they are used by an increasingly larger portion (i.e., late-stage diffusion in Quadrant III). When multiple regression was introduced to sociology, for instance, it was in Quadrant II; today, however, it falls in Quadrant III (Camic and Xie, 1994). If a legal change requires a population to adopt a technique very quickly—or, in the case of methods, a policy change at a prominent journal—it may appear in Quadrant I. For instance, the three-star significance convention was quickly adopted due to a policy change at the flagship sociology journal (Leahey, 2005).

By contrast, the methods of interest to us fall predominantly in Quadrant IV: even though a long time has passed since their introduction, they have not been adopted widely (i.e., they are uncommon and mature). Quadrant IV has been largely neglected in the literature, perhaps because rarely-used innovations are expected to disappear once their novelty wears off. Yet some techniques stick around (and therefore, can be assumed to have some legitimacy) despite never becoming prevalent (Colyvas and Jonsson, 2011). When they are first introduced, uncommon methods fall briefly in Quadrant II, but we do not know whether the processes that shape the adoption of innovations that eventually diffuse are the same as those that shape the use of innovations that do not. For these reasons, we single out uncommon and mature methods for empirical study, and modify expectations from the diffusion literature accordingly.

Within sociology, we study three uncommon and mature methods: Correspondence Analysis (CA), Sequence Analysis (SEQ), and Qualitative Comparative Analysis (QCA). CA was introduced to Anglophone sociology by Pierre Bourdieu in his 1984 tome, *Distinction*.

SEQ was introduced into Anglophone sociology by Andrew Abbott in his 1990 *American Journal of Sociology* article. The third method, QCA, was developed in Anglophone sociology by Charles Ragin. None of these methods has become common in Anglophone sociology, despite being introduced to sociology decades ago.[4] Only a small fraction of active Anglophone sociologists has ever used one of these methods in published research. In Figs. 2 and 3, we track the use of each method and show that only a small fraction of published research has ever used these methods. For example, from introduction until 2012, we identified 59 publications using correspondence analysis, 61 studies using sequence analysis, and 80 using QCA. In comparison, a conservative estimate[5] of publications using logistic regression during the same period is 2,116. Indeed, not one of the methods we study appears in the *Thesaurus of Sociological Indexing Terms*, which Sociological Abstracts uses to indicate the content of articles indexed therein.

These three uncommon and mature methods are also unconventional. They depart in epistemology and lineage from conventional quantitative approaches to data analysis, which are largely variable-oriented, quantitative, time-insensitive, frequentist, and positivist, and have been part of the methodological tradition in American sociology since the early 20th century (Camic and Xie, 1994). In contrast to regression-based methods that require "independent observations," Bourdieu et al. (1991):254 introduced CA as "a relational technique whose philosophy entirely corresponds to what social reality is.....it is a technique that 'thinks' in relationships." Developed by French statistician Jean-Paul Benzécri, CA is grounded in the tradition of French data analysis, which distinguishes itself from the Anglo-Saxon tradition through its grounding in description and geometric representation of data (Rouanet and Le Roux, 1993). The importer of sequence analysis, Andrew Abbott (1988):169, lamented the "general linear reality" that describes most sociological methods, and said sequence analysis, developed by mathematicians in genetics and computer science, was more appropriate for assessing process-oriented nature of most social theories. Finally, Ragin (2007):18-19 argued that "variable-centered analysis," with its emphasis on net effects, was not the only way to derive general knowledge, and that a "case-based approach"—in particular, QCA, which relies on the Quine–McCluskey algorithm from electrical engineering—could be just as if not more illuminating.

In spite of these similarities, it is the distinctions among these methods that interest us, and serve as the basis for the moderating role we expect the method to play (see Hypotheses 3 and 4). As delineated in Table 1, there are clear distinctions between CA and SEQ, on the one hand, and QCA, on the other. QCA, we argue, is a more unconventional than the other two in its degree of epistemological divergence and lineage visibility.

First, CA and SEQ are more closely aligned with sociology's methodological traditions compared to QCA. CA is a frequentist statistical approach that identifies relationships between variables, which is the *sine qua non* of the dominant quantitative tradition in sociological analysis and indeed, a number of scholars have challenged Bourdieu's claims that CA is distinctive in the way he described. For instance, Chan and Goldthorpe (2007):321 said they questioned any effort to "represent CA and MCA [multiple correspondence analysis] as techniques that are in some way set apart from the Anglo-Saxon mainstream of multivariate data analysis in the social sciences." Similarly, SEQ analysis is part of a tradition of algorithmic modeling, increasingly employed by sociologists associated with computational social science and "big data" (Aisenbrey and Fasang, 2010; Veltri, 2017). Both CA and SEQ, in short, are related to

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[4] We define Anglo-phone sociology as articles published in English that appear in the Web of Science as of December 2012 classified under the following Subject Categories: "Sociology," "Social Science Methods," and "Social Science Interdisciplinary."

[5] This was estimated based on number of articles in Anglophone sociology that included "logistic regression" or "logit" in the title, abstract, or keywords.

a

Correspondence Analysis

b

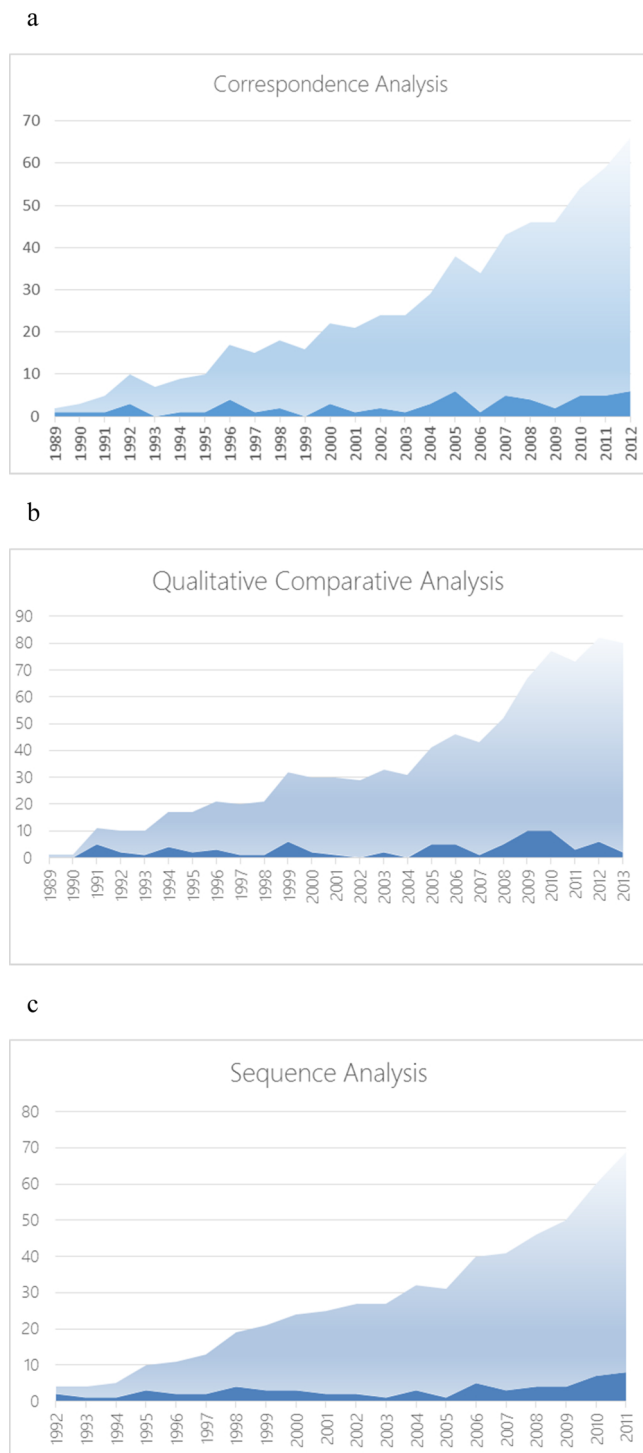Qualitative Comparative Analysis

c

Sequence Analysis

Fig. 2. Number of Articles Using Three Unconventional Methods in Sociology: Annual and Cumulative. (a) CA (b) QCA (c) SEQ.

other techniques quantitative sociologists use and are descriptive rather than causal. In contrast, QCA presents a distinct approach to causality (which focuses on necessity and sufficiency) and aims to apply causal analysis to small-n, case-based, largely qualitative studies. This differs from the aforementioned techniques in its stronger claim (of causality), which – although valued more than descriptive approaches – is also more difficult to achieve. It also tries to span a larger and more polarized epistemological divide. Although the descriptive-causal split has been described as a divide between "modeling cultures" (Veltri, 2017), the quantitative-qualitative split is a larger and historically more contentious

divide (Lamont and Swidler, 2014).

Second, while all three depart from tradition in sociology, CA and SEQ have highly visible connections to tradition in other disciplines, whereas QCA does not. This is evident from the extent to which the interdisciplinary predecessors of CA and SEQ are more typically acknowledged by subsequent users (Funk and Owen-Smith, 2016). Users of CA are often inspired by the importer (Bourdieu), yet continue to cite founder Benzécri: 32 percent of CA articles in Anglophone sociology mentioning correspondence analysis also cite Benzécri. Similarly, the importer of sequence analysis to Anglophone sociology, Andrew Abbott, described Sankoff and Kruskal's 1983 book *Time Warps, String Edits, and Macromolecules* as the method's "standard reference" (Abbott and Hrycak, 1990: 152) and subsequent users followed suit: 21 percent of articles in Anglophone sociology using sequence analysis also cite *Time Warps*. In contrast, although QCA relies on the Quine–McCluskey algorithm from electrical engineering and the developer of QCA, Charles Ragin, cites McCluskey's 1965 *Introduction to the Theory of Switching Circuits,* this foundational work is rarely referenced by QCA users. Within Anglophone sociology, only 3 percent of articles mentioning QCA also cite this or any other work by McCluskey. Additionally, CA and SEQ are prevalent techniques in Ecology and Genetics, but QCA is not prevalent in any discipline.

5. Quantitative data & methods

To test our hypotheses, we collect original, archival data on sociologists and their publications, and conduct person-year level analyses using case-control sampling methods for studying rare events.

5.1. Sample selection

Because using an unconventional method in one's published research is a rare event, random sampling is not ideal because it will likely produce a sample with no events. Instead we collected archival publication data using case-control methods (Gross, 2002; Lacy, 1997) for studying rare events. Our sample includes "published users" of each method in the twenty years following its introduction to the field, plus an equal number of randomly sampled "potential users."

5.1.1. Selection of users

Published users of each method were identified through sole or coauthorship of a methodological or empirical article that used the method in question. Published users were identified through a search in Clarivate Analytics' Web of Science (WoS). Consistent with our decision to focus on sociology, we only included articles under WoS subject categories 'Sociology,' 'Social Science, Mathematical Methods,' and 'Social Science, Interdisciplinary.' To qualify as an article that uses sequence analysis or qualitative comparative analysis, articles had to 1) contain the name of the method in their title, abstract, or key words and 2) cite the method's importer (i.e., Abbott for SEQ) or developer (i.e., Ragin for QCA). To qualify as an article that uses correspondence analysis, articles only had to contain the name of the method in the title, abstract, or key words. Because the development and spread of CA is more diffuse, we did not require these articles to also reference the work of Pierre Bourdieu or others who helped bring this method to the attention of sociologists. We manually verified that each article identified in this way was an application or extension of the method in question. As an additional check, we compared our sample of QCA uses to the Comparative Methods for Systemic Cross-Case Analysis (COMPASSS) bibliographic database of QCA articles, and articles included in COMPASSS but not in our initial sample were added.

5.1.2. Selection of potential users

Potential users of each method were identified using the American Sociological Association (ASA) Member Directory for 2012. Given that not all methodological techniques are suitable for all types of data
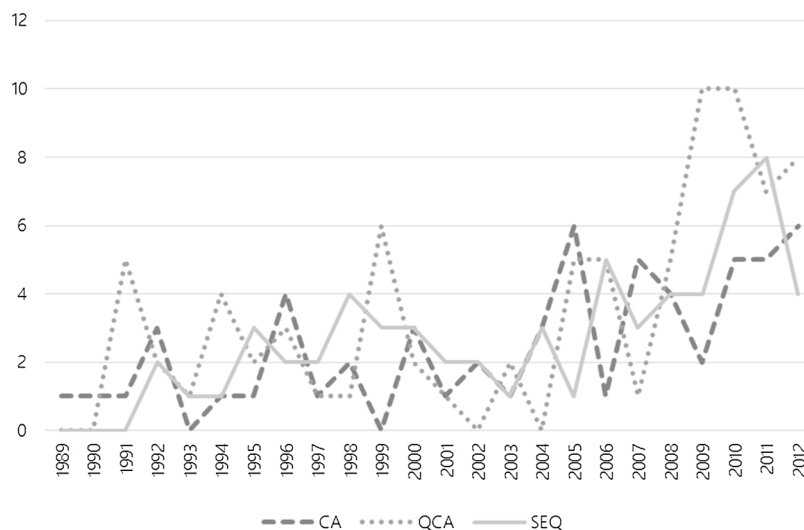
Fig. 3. Number of Articles Using Three Unconventional Methods in Sociology: Annual counts compared.
Note: Limited to English publications listed in the Web of Science classified by the subject categories "Sociology," "Social Science Interdisciplinary," and "Social Science Methods."

Table 1
Three Unconventional Methods in Sociology.

	Correspondence Analysis	Sequence Analysis	Qualitative Comparative Analysis
Description	Examines patterns of relationships between categorical variables	Identifies similarities and differences in the pattern and ordering of events	Inductively identifies conditions that foster outcomes in small-n studies
Foundational Field	Statistics	Genetics	Electrical Engineering
Foundational Work	*L'analyse des données: L'analyse des correspondances*	*Time Warps, String Edits, and Macromolecules*	*Introduction to the Theory of Switching Circuits*
Author of Foundational Work	Jean-Paul Benzécri	David Sankoff & Joseph B. Kruskal	Edward J. McCluskey
Citations to Foundational Work (Google Scholar 2018)	1,088	2124	430
Importer	Pierre Bourdieu	Andrew Abbott	Charles Ragin
Importation work	*Distinction*	"A Primer on Sequence Methods"	*The Comparative Method*
Importation Date	1984	1990	1987
Percent Citations to Importation Work that also Cite Foundational Work	32%	21%	3%
Sociological Subfield Imported to	Culture	Occupations & Professions	Comparative Historical

(Leahey, 2005) and research questions, we limit our sample of potential users to ASA members who identified with the sociological subfield into which each method was introduced, and likely conduct the kind of research and work with the kind of data suited for each technique. To construct a sampling frame of potential users of sequence analysis, we identified ASA members who said they were interested in Occupations and Professions; for potential users of QCA, we identified ASA members interested in Comparative Historical Sociology; and for potential users of correspondence analysis, we identified ASA members who said they were interested in Cultural Sociology. A research assistant selected a systematic random sample of potential users for each method. Graduate students and other ASA members who did not have a PhD were excluded.

5.2. Data sources

For each scholar in our sample, we obtained information from multiple sources. We retrieved information about their research record from the Web of Science, including university affiliation, number of coauthors, number of publications, and keywords associated with their referenced works, which we use to measure interdisciplinarity. We examined scholars' websites, CVs, and their ASA biography to identify methodologists, glean professional age, and to confirm gender. We collected individual-level data from Proquest Dissertation Abstracts to obtain PhD-granting university and year of PhD receipt. Details of each measure are provided below.

5.3. Analytic strategy and operationalization of variables

We take advantage of our longitudinal data and estimate a discrete-time event history model for each method of interest (CA, QCA, SEQ). This allows us to assess whether the independent variables of interest affect not only whether a method is used, but whether it is used more

quickly. Modeling the hazard aligns well with our hypotheses about engaging in a high risk activity: using an unconventional method. It also allows us to account for the tendency of individuals to use the number of prior uses (i.e., prevalence of the method) as an indicator of quality (Banerjee, 1992; Salganik et al., 2006). For the event history models, the data are structured in long, person-year format, and the outcome – the hazard of use – captures both whether and when use occurred. Because the hazard varies quite a bit from year to year, we specify the most general and flexible model (which includes a binary indicator for all but one year), and also control for the hazard of use in the previous year, to explicitly account for path dependencies. We rely on multiple imputation to deal with a limited amount of missing data on one control variable: productivity.

5.3.1. Explanatory variables

Two explanatory variables help us test Hypothesis 1: whether scholars affiliated with high-status social groups (e.g., men) and top-tier universities are more likely to use unconventional methods.

5.3.1.1. Male.
Gender was measured based on analysis of first names. In ambiguous situations, we relied on pronoun usage and photographs from faculty webpages. For ease of interpretation, we use the variable "male" in analysis (= 1 for men, and = 0 for women).

5.3.1.2. Top-tier university (current).
To determine whether the scholar was affiliated with a top-tier institution, we determined their current institutional affiliation at the time of publication for published users, and in 2013 for potential users. Published users' institutional affiliations were gleaned from Web of Science record for their article in which they first used the method of interest. Potential users' institutional affiliations were gleaned from CVs and faculty lists available from department webpages. Once universities were identified by name, we identified their ranking in 2013 from the *QS World University Rankings by Subject– Sociology*,[6] a ranking of the top 200 sociology departments worldwide. The QS sociology ranking is largely a reputational measure, much like the *U.S. News and World Report*, based on subjective assessments of departmental reputation by academics (70%) and employers (10%). It also includes faculty citations per paper (5%) and faculty h-index (15%). Rankings based on such assessments tend to be very highly correlated with one another (e.g., $r > .95$) (Evans et al., 2011). From this, we constructed a binary variable, which equals 1 if the university was listed among the top 50 sociology departments, and 0 otherwise.

We rely on a sophisticated measure of interdisciplinarity to help us test Hypothesis 2: scholars already committed to an interdisciplinary identity are more likely to use unconventional methods. Because professional identities are composed of an individual's accumulation of past experiences (Leung, 2014), we gauge scholars' commitment to interdisciplinary scholarship by examining their research record.

5.3.1.3. Interdisciplinary identity.
We rely on Porter et al.'s (2008) article-level measure of "integration," which assesses the extent to which an article integrates knowledge from diverse disciplines, which we then aggregate to the person level by taking the mean of each individual's set of papers.[7] Uniquely, it incorporates not only the

variety of categories and their balance (i.e., the evenness of the distribution), but also their dissimilarity (i.e., their cognitive distance) into one index (Rafols and Meyer, 2010). The categories of interest are the Web of Science's (WoS) 244 subject categories (SCs); curator Clarivate Analytics assigns 1–6 SCs to each indexed journal, which we then extend to each article. To gauge how well a given paper integrates knowledge from diverse disciplines, we examine the SCs that appear in its bibliography (Porter et al., 2007:127). While the variety of SCs and their balance is specific to each focal paper's set of references, their similarity is derived from a SCxSC co-citation matrix of the population of all WoS articles and thus shared by all focal papers. Intuitively, a paper's score increases as it references more, relatively unrelated SCs (Porter et al., 2007:277). The interdisciplinarity score ranges from 0 to 1, with scores closer to 1 indicating greater interdisciplinarity. For published users, we measured interdisciplinarity *prior* to the publication of their article that used the method in question; for potential users, we measured it until the beginning of data collection (Fall 2013).

Though Porter's measure has been widely used (Cassi et al., 2014; Garner et al., 2013; Koppman, 2016; Leahey et al., 2017; Schoolman et al., 2012), large-scale validity assessments are lacking. Indeed, there is "no simple answer to the question of the validity of several bibliometric indicators in use today" (Roessner et al., 2013:464). However, previous small- and mid-scale assessments confirm that the measure indeed captures disciplinary diversity. Porter and Rafols (2009) find that the measure correlates highly with two other measures of diversity (Herfindal Index 0.91, and Shannon 0.88). Rafols and Meyer (2009) conduct case studies of individual articles and find that the measure captures disciplinary diversity (and breadth of the knowledge base) more than novelty of knowledge integration, which is best captured with a measures of network coherence. Roessner et al. (2013), in their chronological analysis of one researcher's published output over 40 years, find that change in his integration scores over time accurately captures his shift in research foci and the diversification of his disciplinary interests. And more recently, Abramo et al. (2018) find that the measure correlates highly with the disciplinary diversity represented in coauthors' affiliations.

We examined the validity of the interdisciplinarity measure using our data as well. Two human coders (two sociology PhDs) independently rated the interdisciplinarity of a small subset of articles whose interdisciplinarity scores were near the minimum, mean, and maximum values. Coders were asked to review the article title, abstract, full text, and works cited, and to assess whether the article seemed to be "low," "medium" or "high" in terms of interdisciplinarity, which was defined as integrating knowledge from diverse disciplines. To measure agreement between the raters, we used Weighted Cohen's Kappa. The average of the two raters' combined scores was 0.708, above the 0.61 threshold of "substantial agreement" (Landis and Koch, 1977), suggesting that our measure of interdisciplinarity is consistent with raters' understandings of interdisciplinarity.

5.3.2. Moderating/conditioning variables

Hypotheses 3 and 4 specify possible interaction effects: specifically, associations noted in earlier hypotheses are expected to hold only for unconventional methods that are not too unconventional—i.e., compared to the most unconventional methods, they have lower epistemological divergence from conventional methods and more visible extra-disciplinary lineage. To test these hypotheses, we specify separate

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[6] We chose this source because it was international and ranks sociology departments rather than universities. The ranking only goes back until 2011, which limits our ability to identity the rank of the department at the time of use. This is not problematic because reputational rankings such as these, in sociology departments in particular (Burris, 2004) and universities in general (Askin and Bothner, 2016), tend to be quite stable.

[7] This aggregation to the person level helps alleviate concerns that the research article is an inappropriate unit of analysis. Other researchers have found that "the single article as a unit of analysis is to small" (Roessner et al., 2013:464), and the article is "too small for the course grained description of

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(footnote continued)

science" provided by Web of Science SCs (Rafols and Meyer, 2010:283), and that a correlation with the diversity of author affiliations doesn't hold as well at the paper level (Abramo et al., 2018). Because these concerns are based largely on articles with minimal ($< =3$) references, we remove such papers (n=17) from the calculation.

models for each of the three methods and make comparisons across them. Relative to CA and SEQ, we contend that QCA has greater epistemological divergence (as it is less connected to conventional sociological methods) and lower lineage visibility (as its intellectual predecessors are obscured).

5.3.3. Control variables

We control for variables that potentially influence both the explanatory variables of interest and the outcome of interest: use of an unconventional method.

5.3.3.1. Professional age. Scholars with more seniority may be more likely to use unconventional methods, as their job security makes them less vulnerable to the evaluations of gatekeepers – such as journal editors, reviewers, and funders – who tend to be less enthusiastic about unconventional work (Siler et al., 2015; Wang et al., 2017). In the United States, this is evident in the clear division between faculty positions that are secure (like tenured associate and full professorships) and those that are not. Although many countries do not have a tenure system, seniority is still strongly associated with career security and often with some other form of permanent employment (Cruz-Castro and Sanz-Menéndez, 2010; Lutter and Schröder, 2016). Our measure of professional age captures how long a scholar has been active in the discipline. For published users, professional age is the difference between year of publication and year of PhD receipt. For potential users, professional age is the difference between study year (2013) and year of PhD receipt. We used professional age as a measure of seniority rather than academic rank (e.g., assistant, associate, full) because we have an international sample and academic ranks vary by country. Controlling for the *actual* job security afforded by seniority allows us to look more cleanly at the sense of security afforded by status, our theoretical interest.

5.3.3.2. Intra-organizational immobility. Being hired by one's PhD granting institution – ungenerously referred to as "academic inbreeding" – has long been argued to stifle risky, innovative behavior (Horta et al., 2010; Smolentseva, 2003). We measured intra-organizational immobility by identifying whether scholars were, at the time of use for published users and at the time of data collection for potential users, employed at the same university where they received their PhD[8] . Such scholars were are coded 1 if this condition was met, and 0 otherwise.

5.3.3.3. Productivity. We measured each scholar's productivity by summing their peer-reviewed research articles indexed in the Web of Science. For published users, this was the total number of publications *prior* to their published use of the unconventional method, and for potential users, this was the total number of publication as of data collection (Fall 2013). This measure is standard in the sociology of science literature, and is highly correlated with book productivity (Leahey, 2007). Moreover, books are a common outlet for scholars who use all three of the methods we examine, so we do not expect bias to result from this omission.

5.3.3.4. Sociology department. As sociologists employed in interdisciplinary departments (e.g., in schools of business, public policy, education and public health) tend to have more exposure to methods from other fields, we include a measure of affiliation with a

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[8] Some studies have distinguished between "inbred" scholars whose entire career is within their PhD-granting university and "silver-corded scholars" who work at the same organization where they received their doctoral degree but previously worked at another university (Horta, 2013). However, the inbred scholars in our sample have mean professional ages 5-9 years below the overall mean, suggesting the presence of silver-corded scholars is very limited.

disciplinary department. Data culled from CVs and department websites allowed us to indicate whether each individual was employed in a sociology department (= 1) or not (= 0).

5.3.3.5. Methodologist affiliation. We consider sociologists to be methodologists if they indicate membership in the ASA methods section or list methods as a research or teaching interest on their CV. Methodologists are coded 1, others are coded 0.

5.3.3.6. European. National and continental differences in social science research practice have been documented extensively (Abend, 2006; Platt, 1998). To control for this, we determined from CVs and websites whether each individual was employed in a European country (= 1) or in North America (= 0).

5.3.3.7. Share organization with importer. Because techniques often spread through direct face-to-face interaction (Rogers, 1967; Ryan and Gross, 1943), especially in the time period under study here, we control for whether the sociologists shared an organizational home with the importer (Bourdieu for CA, Abbott for SEQ) or developer (Ragin for QCA) at any time during their career up until the time of use for published users and the year of data collection for potential users.

5.3.3.8. Network size. Given that a larger network increases access to new and different ideas (Burt, 2004), we include a control for network size. This is measured as the number of unique co-authors apparent in the scholar's research record as indexed in the Web of Science. For published users, we measured the number of unique collaborators *prior* to their adoption article; for potential users, we measured until the beginning of data collection (Fall 2013).

5.3.3.9. Top-tier university (PhD). To proxy scholarly quality and ability, we control for the prestige of scholars' PhD-granting universities, which was measured at the time of use for published users and in 2013 for potential users. PhD universities were gleaned from Proquest Dissertation Abstracts, CVs, and faculty lists available from department webpages. Once organizations were identified by name, we identified their ranking in the *QS World University Rankings by Subject–Sociology* published in 2013. From this, we constructed a binary variable, which equals 1 if the organization was listed among the top 50 sociology departments, and 0 otherwise.

5.3.3.10. Lagged hazard. To account for path dependencies, we also control for prevalence of use in the previous year.

5.4. Descriptive statistics

Descriptive statistics are presented in Table 2. As a check for multicollinearity, we estimated variance inflation factors (VIF) for each variable used in the modeling. All were below 1.87, indicating no excessive multicollinearity.

6. Quantitative results

6.1. Main analyses

The results presented in Table 3 reveal that, as expected (H1), status is positively associated with a scholar's use of unconventional methods but this typically varies by the method in question, providing partial support for H3. Affiliation with a top-tier university quadruples a scholar's hazard of using correspondence analysis ($\beta = 1.43^{**}$, 95% CI, .72, 2.15, hazard ratio (HR) is $e^\beta = 4.18$) and doubles the hazard of using sequence analysis ($\beta = 0.69+$, 95% CI, -.04, 1.42, HR = 1.99). But for QCA, the coefficient is negative ($\beta = -.70^*$, 95% CI, -1.28, -.11, HR = .50), so scholars in top-tier universities have a hazard of use that

Table 2
Descriptive Statistics.

Variable	CA		SEQ		QCA	
	Mean	SD	Mean	SD	Mean	SD
Male	0.63	–	0.60	–	0.68	–
Top-tier university (current)	0.26	–	0.27	–	0.25	–
Interdisciplinary identity	0.44	0.14	0.44	0.15	0.41	0.15
Professional age	15.69	13.26	17.02	14.88	14.49	13.42
Intra-organizational immobility	0.22	–	0.20	–	0.11	–
Productivity	6.51	7.41	7.98	11.00	8.32	10.21
Sociology department	0.69	–	0.65	–	0.76	–
Methodologist affliation	0.18	–	0.14	–	0.09	–
European	0.33	–	0.32	–	0.24	–
Share organization with importer	0.04	–	0.05	–	0.15	–
Network Size	1.90	1.07	1.94	1.12	1.93	1.24
Top-tier university (PhD)	0.39	–	0.48	–	0.45	–

Table 3
Event History Model Results: Coefficients and Standard Errors.

	Model 1 CA	Model 2 SEQ	Model 3 QCA
Male	0.97**	1.05**	− 0.23
	0.37	0.36	0.23
Top-tier university (current)	1.43**	0.69 +	− 0.70*
	0.37	0.37	0.30
Interdisciplinary identity	2.22*	2.81*	− 2.48**
	0.89	1.13	0.60
Controls			
Professional age	0.05**	0.02 +	0.04**
	0.01	0.01	0.01
Intra-organizational immobility	0.78*	− 0.07	0.18
	0.35	0.35	0.32
Productivity	− 0.03	− 0.03	− 0.04*
	0.03	0.03	0.02
Sociology department	− 0.71*	0.27	− 0.85**
	0.31	0.30	0.26
Methodologist affliation	0.567 +	0.337	0.69 +
	0.30	0.35	0.35
European	1.19**	0.76*	− 0.62*
	0.46	0.32	0.30
Share organization with importer	− 0.29	− 0.19	1.28**
	0.59	0.62	0.28
Network Size	− 0.04	− 0.05	− 0.01
	0.03	0.04	0.02
Top-tier university (PhD)	0.34	− 0.34	0.17
	0.46	0.33	0.25
Contagion (lagged hazard)	− 71.65**	− 1.90	− 16.71**
	11.05	6.29	5.00
Year Indicators[a]	yes	yes	yes
N	2,289	1,931	2,950
AIC	524.4	487.1	792.7
BIC	713.6	609.6	948.5

** p < 0.01, * p < 0.05, + p < 0.1; two-tailed tests.
[a]The most general discrete-time event history model specification, using a binary variable to capture each year, is used.

is 50% lower than other scholars.[9] We find a similar pattern for gender. Men have over 2.5 times greater hazard of using correspondence analysis (β = 0.97**, 95% CI .24, 1.70, HR = 2.63) and sequence analysis (β = 1.05**, 95% CI .36, 1.75, HR = 2.86) in published work, relative to women, but have a lower hazard (though not significant) of using

QCA.[10] We expect that these differences stem from the particularly unconventional nature of QCA.

As hypothesized (H2), an interdisciplinary identity is positively associated with a scholar's use of unconventional methods but this also varies by the method in question, providing support for H4. The extent to which scholars' research is interdisciplinary has a large and positive association with use of the two methods with visible connections to methodological traditions in other disciplines: Correspondence Analysis (β = 2.81*, 95% CI 0.47, 3.97) and Sequence Analysis (β = 2.22*, 95% CI .60, 5.01). Moving from a mono-disciplinary research program to one that is maximally interdisciplinary is associated with a 16-fold increase in the hazard of using correspondence analysis ($e^{2.81}$ = 16.60) and a nine-fold increase in the hazard of using sequence analysis ($e^{2.22}$ = 9.21). But as expected, maximal interdisciplinarity decreases the hazard of using QCA by more than 90 percent (β=-2.48**, 95% CI -3.65, -1.30, HR 1- $e^{-2.48}$ = .92). More realistically, increasing one standard deviation in interdisciplinarity (∼.15 for all three methods) more than doubles the hazard of using correspondence analysis, increases the hazard of using sequence analysis by 38%, and decreases the hazard of using QCA by 14%. This variation is, again, likely explained by the more unconventional nature of QCA, especially its less visible connection to a methodological tradition in another discipline.

The models we present and interpret here fit the data well. In comparison with models that include only controls and omit the five hypothesized variables (not shown), the models presented here are favorable. Their AIC values decline from 561.1 to 524.4 for CA, from 515 to 487.1 for SEQ, and from 831.5 to 792.7 for QCA. The BIC values decline from 728 to 713.7 for CA, from 616 to 609.6 for QES, and from 964 to 948.5 for QCA.

The results for several control variables are worth mentioning. The coefficient for professional age is significant and positive in all three models.[11] We suspect this is because seniority provides *actual* security and legal employment protection and therefore its positive effect does not vary based on the unconventionality of the method. (Article) productivity has a mild negative association only with QCA. Identifying as a methodologist has a marginally significant, positive association with the use of two unconventional methods. Perhaps not surprisingly, sharing an organizational affiliation with Ragin greatly increased the hazard of using QCA. Because our sample of potential users was taken from the American Sociological Association member directory (and thereby under-representing non-U.S. sociologists), we cannot place too much weight on the coefficient for European, but we note that the main effect is significant and positive for sequence analysis. Perhaps not surprisingly for mature yet uncommon and unconventional methods, the prevalence of the practice in the previous year is not positively associated with use in the current year.

6.2. Sensitivity tests

We ran a number of sensitivity tests to gauge the robustness of our results. Though we argue that scholars employed by top-tier universities are more likely to use unconventional methods in published research, it may be the case that using unconventional methods prompts a move to a more highly-ranked organization. This is unlikely because we measure rank of current organization and examine its

Table 4
Event History Model Results for Sensitivity Tests: Coefficients and Standard Errors.

	Top Journals			Friendly Journals			Removing Unpublished Users		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	CA	SEQ	QCA	CA	SEQ	QCA	CA	SEQ	QCA
Male	1.10*	1.08**	−0.21	0.91*	1.05*	−0.19	0.99*	1.14**	−0.32
	0.38	0.35	0.24	0.37	0.36	0.23	0.38	0.36	0.25
Top-tier university (current)	1.3**	0.71+	−0.78**	1.47**	7.82+	−0.70*	1.35**	0.65	−1.02**
	0.37	0.39	0.32	0.37	0.39	0.30	0.37	0.42	0.34
Interdisciplinary identity	1.53**	3.26**	−1.92**	2.12*	3.01**	−2.43**	2.11*	2.86*	−2.28**
	0.92	1.15	0.60	0.90	1.14	0.59	1.07	1.17	0.64
Publication quality	0.43**	0.30**	0.36**	–	–	–	–	–	–
	0.14	0.07	0.08	–	–	–	–	–	–
Journal friendliness	–	–	–	0.13	0.46**	0.16	–	–	–
	–	–	–	0.10	0.12	0.10	–	–	–
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	2,289	1,931	2,950	2,289	1,931	2,950	2,110	1,819	2,738

$p < 0.01$, * $p < 0.05$, + $p < 0.1$; two-tailed tests.

association with scholars' *subsequent* use of a new method.[12] To ensure that we have identified the correct order, we also constructed a measure of publication quality. We measured publication quality by the number of times the scholar had published in one of the two top sociology journals, the *American Sociological Review* and the *American Journal of Sociology,* at the time of publication (for users) or by 2013 (for non-users). As shown in Table 4, Models 1–3, when we control for quality of prior publishing experience, the association between being employed at a top-tier university and the use of an unconventional method did not change. Publication quality has a significant and positive association with the use of both QCA and SEQ.

Perhaps users are just publishing in journals that are friendlier to these methods, making their attempts to use these methods more likely to be published (and thus counted as "use" in our analysis). To test this possibility, we constructed a measure of journal "friendliness" to the methods in equation, based on the percent of uses published in each journal. We determined that *Poetics* was "friendly" to correspondence analysis (27 percent of all CA uses); the *American Journal of Sociology, Sociological Methods and Research* and the *International Journal of Comparative Sociology* were "friendly" to QCA (11 percent, 9 percent and 7.5 percent of all QCA uses, respectively); and the *American Journal of Sociology* and *Sociological Methods and Research* were "friendly" to sequence analysis (10 percent and 15 percent of all SEQ uses, respectively). We then constructed a measure of the number of times each scholar had ever published in the "friendly" journal(s) for each method. We found that this variable was only significantly associated with sequence analysis and our results remained unchanged, as shown in Table 4, Models 4-6.

A final concern is that we may mistakenly categorize as potential users scholars who have in fact used the method but failed to publish with it or were asked by editors or reviewers to use a different method. To address this concern, we conducted a short survey of the potential users in our sample to check whether they had ever used the method under study in an unpublished work. Response rates were 44 percent for CA, 48 percent for QCA and 34 percent for SEQ. Our survey identified five users who had unpublished papers using CA, eight for QCA, and five for SEQ. We found no significant differences on any key variables between published and unpublished users, although unpublished users were generally younger and published fewer articles than published users. We then removed unpublished users who had used the method before 2014 from our sample and an equivalent number of randomly selected users, as our case control design requires

equal numbers of users and potential users. Rerunning our analyses, our results, shown in Table 4, Models 7–9, remain largely unchanged.

7. Qualitative data & methods

7.1. Method and participants

Beyond identifying which scholars are more likely to use unconventional methods, we are also interested how scholars manage valuation risk associated with using unconventional methods. To understand these strategies, we conducted semi-structured interviews with the inventor of QCA, Charles Ragin, the importer of sequence analysis to sociology, Andrew Abbott, as well as 23 interviews with sociologists from our quantitative sample.[13] We purposively selected sociologists who 1) had used the method and published it, 2) had used the method but not published it, and 3) had a high predicted probability of using the method but had yet to do so. We report the interviewees by category in Table 5. Semi-structured interviews, one to two hours in length, were conducted in-person or by Skype between March and November 2017, recorded, and transcribed by professional transcribers. We modified the interview protocol slightly for each type of sociologist interviewed.

7.2. Data analysis

We analyzed our data sources using an inductive, iterative process, in line with the grounded theory tradition (Corbin and Strauss, 1990) and with qualitative analysis software QDA Miner. We began with a broad interest in how scientists select, evaluate, and characterize the methods of interest. We then followed a three-stage coding process. The process began with generating first-order descriptive codes through open-coding, a process that derives codes from respondents' terminology. For instance, we coded "I incorporated a statistical test that showed that the findings I was getting were not by chance" (QCA user) and "Because it's Goodman's version, it has significance tests" (CA user) with the descriptive code "significance tests." Second, we looked for relationships among first-order codes, grouping them together into second-order themes. For instance, we grouped the aforementioned "significance test" code with respondents descriptions of their efforts to minimize researcher discretion—for instance, using the median to "calibrate" in QCA and using previous empirical research to "determine costs" in SEQ—which we labeled "minimize choice." We gave these

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[12] Though it is possible that the use of other unconventional methods, earlier in time, prompted their move to a top university.

[13] We were unable to interview the importer of correspondence analysis, Pierre Bourdieu, because he passed away in 2002.

Table 5
Interviewee Selection.

	Developer/ Importer	User (published)	User (unpublished)	High predicted probability	Total
CA	0	2	1	2	5
SEQ	1	3	3	0	7
QCA	1	5	4	3	13
Total	2	10	8	5	25

merged codes the second-order label "incorporate convention," as they are both efforts to incorporate the logic of conventional statistics into the use of unconventional methods. Third, we identified aggregate analytical dimensions. For instance, we classified "incorporate convention" into the aggregate category "valuation risk strategy," as it appeared to be one of several ways our interviewees described managing the career risks associated with using an unconventional method. We verified our interpretations by soliciting feedback from the key informants on a preliminary draft of the analysis (Miles and Huberman, 1994).

8. Qualitative findings

In this section, we begin by showing that scholars describe the use of the unconventional methods we study as pathways to career attainment, yet these efforts are shaped by valuation risk assessments. We then describe the various ways scholars say they manage valuation risk, finding that successful strategies typically cut across methods. We also identify two strategies that appeared to be less successful: one, which was no longer viable ("being first"), and the other, which we refer to as "status by association," which was described as unsuccessful when evoked by users of the most unconventional method, QCA.

8.1. Career attainment and valuation risk

The scholars we interviewed frequently described the use of unconventional methods as beneficial for career attainment. For instance, a recent PhD and unpublished user of SEQ explained: "I think more interesting sociology happens when you're using unconventional or new methods or data." PhD students on the job market who did not do so, she explained, were "almost always dinged for *being a carbon copy* of another student or their advisor." As such, she said, "I would tell graduate students, try to take risks in certain places because you want to be able to say something unique about what you've done, you want to take ownership of something." A published user of QCA similarly described how his use of QCA improved his visibility: "QCA is where I'm more cited. Ninety percent of the cases where people ask me to join juries, provide them with recommendations, or review in journals is because of QCA." "To be honest," he said, "it's helped me move up quite quickly. I'm now a senior professor, 'cause very few people have so many citations in my field."

Scholars, however, were also quick to point out the associated risks. For instance, when we asked a non-user with a high predicted probability of use if she encouraged her students to use unconventional methods, her response was immediate: "No. No, I want them to get jobs [laughs]." Similarly, a published user of QCA recounted his tenure experience: "It wasn't really something that my institutional environment in any way encouraged. I remember when I came up for tenure, the dean at the time was basically saying, 'Look, uh, this looks interesting but frankly I've [got] no idea whether it's just you doing this fuzzy stuff, or whether other people think that it is also valuable.' I've always thought of it as a very high risk, high payoff kind of situation." As a full professor summarized, "You have to have the time and the luxury and sort of self-understanding that it's okay to take that risk in your career to do so."

Many interviewees attributed the high risk level to perceptions that

users of unconventional techniques may be incompetent or uncommitted. For instance, an unpublished user said she decided *not* to use sequence analysis in her dissertation because she was worried about being, and being seen as, less competent. "There were graduate students in my program that were less risk adverse, who also had the time, the energy, to explore so many different methods at one time," she explained. "I felt like I would start to lose expertise if I became a 'jack of all trades' [and master of none], so I made very conscious decisions to narrow down…And I don't know if that was an institutional message or just my own risk aversion, of like, is this a project that's going to yield a paper that will get published?" When we asked her to clarify why she thought that using SEQ would diminish her publication chances, she said: "I think papers with unconventional methods are probably viewed less favorably [in the review process], but that's an assumption… the review process is so random that the chance for methodological bias to play a role is high."

Similarly, the importer of sequence analysis described how faculty members initially evaluated his choices to use many different and unconventional methods, theories, and topics as a lack of commitment. "In graduate school, I was viewed as somebody who should've done a lot better than I did," he explained. "A faculty member at the time later told me, 'We all considered you were a flake.'" The faculty, he said, had wondered "Why was I unable to start doing regular sociology?" Eventually, he managed to turn these negative perceptions of "flakiness" into positive evaluations of "creativity." "The fact that I tend to be interested in a lot of different things, and I'm always looking for new stuff, *eventually I got that defined as creative rather than as an idiot* who can't make up his mind on what he wants to do," he recounted. "Obviously it's much better to be defined as creative rather than as scatterbrained. But in many ways, it's the same set of behaviors. It's partly how you train other people to receive it." As he noted, his unconventional research choices were risky because they could be interpreted as "scatterbrained." In the following section, we examine the processes underlying how scholars "train other people to receive it"—that is, manage the valuation risk.

8.2. What works: managing valuation risk by demonstrating competence and commitment

Through our analysis of interviews, we identified seven strategies scholars use to manage valuation risk. In addition to using disclaimers, the strategy suggested by Phillips and Zuckerman (2001), we identified six new strategies. All of the observed strategies, with one notable exception, were observed across all methods, although the successful strategies were more frequently expressed by users of correspondence analysis and sequence analysis. In Table 6, we provide illustrative examples from each method and the proportion of interviewees who used each strategy.

The most common strategies scholars used to manage valuation risk involved demonstrating competence in conventional methods, which likely served to decrease the chance that their use of an unconventional method was evaluated as incompetence. This was accomplished in three main ways: demonstrating conventional expertise in one's research program, incorporating conventional expertise into the application of the unconventional method (even when doing so ran counter to the logic of the method), and emphasizing the technique's similarity to conventional methods.

All three of these strategies worked by casting the user of the method as competent in conventional methods. For instance, scholars used the most common strategy, "establish conventional expertise," when they "diversified," "hedged" and "primed the pump" with research using conventional methods while (or prior to) using the unconventional method. Similarly, the second most common strategy involved incorporating the logic of conventional methods, for instance, by incorporating tests of significance and attempting to minimize researcher discretion or "degrees of freedom"—even when the method in

Table 6
Strategies to Manage Valuation Risk.

Strategy	Definition	Frequency	Examples
Establish conventional expertise	Demonstrate proficiency in conventional methods	64%	I have tended to see publications [of CA] and most of these people that are not junior like me, which is, to be honest, one of the reason I'm only just starting now to publish now with it. I was trying to *prime the pump* and get a number of things out.
			I was doing a PhD looking at longitudinal data. And I'd looked at a whole bunch of different methods that I picked up. And just around about the time that I finished, a colleague of mine came across sequence analysis and we applied it to round things out.
			I wasn't putting all my eggs in one basket. My dissertation did not use QCA, at all. It used standard econometrics for that matter. The majority of my publications at the early stage, sort of on the three streams of research and one was QCA related. I was certainly *hedging,* and I wasn't focusing only on that. That seemed like not a very good career strategy at the time.
Incorporate convention	Apply conventional logic	56%	There's something that's very prominent called Goodman's RC model for association. Well, that is Goodman's version of correspondence analysis. But because it's Goodman's version, it has significance tests. And it fits into this whole framework of thinking that way… Sometimes I will do Goodman's stuff instead just because you don't have to justify the Goodman stuff.
			You have built in into your [sequence] analysis some choice like how big is the substitution cost?…In my dissertation, in the papers that I published, we were looking at class mobility and we were able to refer to previous work that looks at distance between different social classes. So we use those as basis for some of our decisions…Otherwise you can always choose a set of costs to get the result that you want, right?
			I did OLS regression and I did QCA…and I incorporated a statistical test that showed that the findings I was getting were not by chance based on just the marginal distributions of the sets. And I had to standardize everything sort of by the median. So I did some like, very conventional things to make it, I think, more appealing to conventional people.
Conventional by association	Borrow conventionality from similar techniques	40%	Correspondence analysis is not really new. Some version of it exists for a long, long time. And the other thing to say is that it has sort of a very deep similarity or relationship with other methods that other people are more familiar with, with principal component analysis and so on.
			It's not that unconventional. You do sequence analysis and then you make some sort of optimal matching algorithm, then you cluster people together and then you throw it into regression. That's actually one of the papers that I'm working on at the moment.
			I had done all this work with databases so I already knew set theory and so it [QCA] makes sense.
Be first	Be the first application	40%	The first successful application is it's usually received with enthusiasm, right?…But you need someone to build on the method that you propose, and that's when I think things can kind of get a little more complicated because, so for instance I review papers that are the third or fourth application of a methodology and it becomes very hard to figure out why you need a third or fourth application.
			If I were to adopt any unconventional method, I think adopting it at an earlier stage would be better than later. Just because you sort of stamp your name on it.
			The field that I was operating in at the time was a much more mature field of research, and I figured, I've already committed to this configurational approach…so a couple of years after my PhD, I made this conscious decision to shift a lot of my time and resources over to configurational theory and methodology and using QCA, because it seems like a much more open space where you can have bigger impact and you could sort of really do something new and fresh and interesting.
Be committed	Affirm epistemological identity	32%	I see myself as proselytizing for the last ten years is something like networks and culture and a relational approach. So the keyword would be relational approach…If you look at my early papers, we reject the view that Euclidean distance is the proper metric for social life. It's networks…And correspondence analysis is definitely part of that.
			I'm interested in the analytic techniques. And I'm especially interested in basically broadly descriptive techniques, and I think they've become all the rage in big data. They've been unfashionable through my whole career until now.
			You have to make it [QCA] a part of your identity. You have to make a commitment. It becomes part of your identity if you are going to adopt something like this and try to promote it. Because you become associated with it.
Status by association	Borrow status from importer, importing discipline, or method	23%	

Table 6 (*continued*)

Strategy	Definition	Frequency	Examples
			This [CA] is something that is associated with a single person who is probably the most cited sociologist in the American literature. And that makes a big difference. Bourdieu has an enormous reputation.
			Given that it [sequence analysis] comes kind of from the hard sciences, it feels, I don't know, more legitimate or more kind of, you know, "sciencey." (laughs)
			As a basic qualitative project, it doesn't seem very interesting to me. To add this different methodological approach [QCA] made it, I guess, a little but more interesting or maybe, I can't think of a better word, but *harder,* something that may be a little more credible in the field.
Disclaimers	Distance self from method	16%	It [CA] absolutely wasn't critical to the paper…So definitely doesn't fit into my identity as a scholar because I don't think I've ever used it since, and I just probably wouldn't.
			Algorithmic modelling (including OM) has a place but, in my view, a relatively minor one as compared to standard methods grounded in probability theory.
			QCA did not fit into my previous identity as a scholar. To the extent it was tied into identity, it was about methods. I think later on people would say, 'Oh, he's a methodologist,' or something like that because he published in SMR [Sociological Methods & Research].

question required discretion. For instance, according to the developer of QCA, users should "calibrate" their "sets" (i.e., transform data into variables with numeric values) based on theoretical and substantive knowledge, yet users of this strategy described calibrating by the median and mean. The third most common strategy was to associate the unconventional technique with one that was more conventional and/or use it in conjunction with conventional methods (e.g., "you throw it into a regression"). This was used less frequently with QCA than the other two, which we suspect this is because QCA is seen as more unconventional due to its relatively higher epistemological divergence and relatively less visible lineage. Altogether, 84% of our informants used at least one of these three strategies.

Interestingly, the fourth most common strategy used to manage valuation risk across methods involved demonstrating commitment to an established identity. For SEQ and CA, this commitment was often justified through the association with tradition in another discipline. For instance, a user of correspondence analysis who identified himself in the example in Table 6 as committed to a "networks and culture and a relational approach" explained,

> For cultural sociologists or network people, it's [correspondence analysis] seen as a somewhat exotic or kinky thing to do. But for a lot of other social science, it's just part of the multivariate armory… I'm kind of working with [a computer scientist] on a grant and he just uses correspondence analysis. He doesn't think it's a big deal. If the main question is data mining, if what you're really about is finding patterns and interestingly enough, that's a question that *hard scientists take as a very obvious question*. And sociologists have almost always rejected it.

In his words, while using correspondence analysis in sociology was a way to affirm his commitment to an unconventional ("funky or kinky") identity, it was connected to tradition in other disciplines. Though similar descriptions emerged for users of sequence analysis, for QCA users, the identity that formed the basis of the commitment was typically to QCA itself (see Table 6 for an example).

8.3. What does not work: using unconventional methods to acquire status and identity

The two strategies described by informants as unsuccessful were fundamentally different from the successful ones. Instead of acknowledging and trying to manage valuation risk, they were attempts to gain

status or a positive identity through the use of an unconventional method.

The first unsuccessful strategy involved using the unconventional method as a means to "borrow prestige" (Mills, 1956), what we term "status by association." This strategy appeared particularly problematic for some users of QCA. While published and unpublished users of correspondence analysis and sequence analysis said they drew status from the importer, the journal in which the method first appeared, and its connections to convention in other scientific disciplines (see examples in Table 6), unpublished users of QCA tended to describe efforts to draw status from what (they perceived as) the method's formality and rigor – traits they associate with higher-status, conventional methods in sociology. For instance, in Table 6, the unpublished user described QCA as appealing because, in contrast to qualitative methods, it was "harder" and "more credible in the field." Similarly, another unpublished user of QCA explained, "Under the pressure of the rigor of quantitative analysis and kind of the methodological, epistemological rigor that some of those methods demand, I think QCA has provided a way to push back by arguing that qualitative methods can be just a rigorous." QCA users also noted this tendency among unpublished users. As one user explained, "[QCA is] more likely to attract those who are more on the qualitative end of things and would like to add some 'rigor' to their work." Another QCA user agreed: "I see a number of qualitative researchers using the method, sometimes doing it okay and often not doing it very well, but they seem to like it because it provides *greater rigor*, because it's more formalized and especially if they're trying to present to a more quantitative audience, having the trappings of the formal model is useful." It is notable that this strategy was used with QCA, the method whose epistemological divergence is the greatest.

Scholars who used this strategy with QCA were described as unsuccessful largely because they tended to activate evaluations of incompetence. This was evident from the publishing experiences of unpublished users and the reviewing experiences of published users. For instance, an unpublished user who described QCA as a way for qualitative researchers to show "rigor" described his frustration with reviewers "trying to judge or assess the method based on the assumptions of quantitative analysis, which don't really operate under QCA." As an example, he said, "I have seven cases and four variables. And obviously from a statistical point of view, that's not enough [cases]." The wording of this sentence itself betrays this tension: By using the term "variables," he activates exactly the assumptions he is seeking to avoid. This tendency was also described by QCA users in their experiences as

reviewers. For instance, one user described how he often reviewed QCA papers that were "fatally flawed" such that "you could not infer anything from the analysis." He attributed this to QCA's appeal to researchers not proficient in conventional statistics. "It's almost always necessary, if a person is into QCA, they actually aren't very good at stats," he explained. Given that QCA was designed to formalize the logic of qualitative analysis, this observation, if accurate, is unsurprising. Yet it appears that efforts to use formalization to demonstrate "rigor" and conformity to conventional methods were likely to inspire evaluations of incompetence, as they opened the door for evaluations of "rigor" based on the standards and epistemology of mainstream research; standards which QCA was not designed to meet and with which many of its users, if they were trained as qualitative scholars, were unfamiliar.

The second strategy, which we term "being first," was trying to acquire a positive identity as an innovator by being the first application in a particular discipline, subfield, or topic. Describing methods as "state-of-the-art" or "cutting-edge" was perceived to give papers an extra boost (deserved or not) in the review process. Some said that their use of the methods under study had benefitted from this during an earlier time period, yet as the method became less novel, the benefits dwindled: e.g., "it becomes very hard to figure out why you need a third or fourth application." Given that all of the methods under study were decades old at the time of the interviews, most mentions of this strategy said that it was no longer a viable approach. As one user of sequence analysis put it, "Sequence analysis is not novel enough to be a selling point anymore…it is not cutting-edge anymore."

As a result, scholars who used this strategy were unsuccessful because they were difficult to classify and thus confusing to evaluators. As an unpublished QCA adopter explained, "I did a presentation at [elite sociology department] on QCA and it was met with complete bewilderment, I remember, from the faculty." As a published user QCA explained how this played out in the review process, "If it an unknown novel thing, people will give them [the scholar] points for importing a method or ignore it if they don't quite understand it but understand like, 'Oh there's some network thing going on here. I don't do networks but it's probably fine.' *Rather than ding them for, 'Well, I didn't understand this thing.'* But, after 30 years of QCA, you don't get the points for the novelty of it." As he put it, deviating from convention was rewarded when it was novel and less likely to be penalized when it was classifiable within a well-established category ("some network thing"), but the former, at least, was no longer viable for QCA.

Altogether, this suggests that using unconventional methods to garner status or a positive identity are likely not effective strategies, particularly for the more unconventional method, QCA. Notably, all of the successful users of QCA reported using at least one of the strategies that demonstrate competence in conventional techniques. These findings suggest that while using QCA may not require competence in conventional methods, demonstrating such competence may be necessary to successfully navigate a review process dominated by reviewers who "think" in terms of conventional statistical techniques and probability theory. At the same time, while published users described using unconventional method to demonstrate commitment to an identity, using it to acquire an identity as an innovator was no longer appropriate; rather than being classified as cutting-edge, it was simply confusing.

9. Discussion and conclusions

By enlisting both quantitative and qualitative evidence, we identified the status and identity advantages that shape the use of unconventional methods, the conditions under which these associations hold, and strategies scholars use to manage the risks associated with doing so. We find that scholars who are affiliated with prestigious universities and male, as well as those already committed to a relevant identity (interdisciplinarity), are more likely to use unconventional techniques, though these effects only hold for the methods (CA and

SEQ) that are not *too* unconventional. In addition, we identify five successful strategies (and two unsuccessful strategies) scholars use to positively frame their unconventional method use. Taken together, these findings make empirical, theoretical, and policy contributions.

9.1. Empirical contribution to the science of science

To our knowledge, this is the first study to empirically examine the temporal antecedents of the use of unconventional methods and the conditions under which it occurs. Numerous articles across scientific disciplines and academic institutions extol the importance of tradition-breaking research, yet little is known about which scholars tend to participate and the conditions under which they tend to do so. We find that higher-status scholars and those with established, relevant identities are more likely to use unconventional methods and these tendencies are contingent on characteristics of the method in question.

Our findings extend recent work on science in three key ways. First, we break from the focus on unconventional ideas (generally) by instead emphasizing the choice to use unconventional methodological tools. In particular, we built on recent work examining the factors underlying scientists' decisions to produce unconventional substantive knowledge (Foster et al., 2015; Sabatier and Chollet, 2017; Trapido, 2015) by emphasizing the factors underlying scientists' decisions to use unconventional methodological tools. Through these decisions, we show how career concerns of individual scientists shape the conventionality of their work. Second, we reorient status effects away from cumulative advantages and toward sources of status that spill over from associations with organizations and groups. Status concerns guide the literature on the sociology of science (e.g., Bourdieu, 1988; Whitley, 2000) and recent work on which scholars engage in unconventional (substantive) research (Foster et al., 2015; Sabatier and Chollet, 2017; Trapido, 2015). Yet the focus has been on advantages that accrue to scholars who are already productive, visible, and recognized for original research. We complement this body of work by demonstrating the importance of status advantages that spill over from associations with groups and organizations, sources that often underlie the cumulative processes previously studied (Correll et al., 2017).

Finally, we extend research showing that highly influential science tends to be highly unconventional and highly conventional—it reaches "toward both frontiers" (Uzzi et al., 2013:471) and bridges "deep pools of knowledge with an atypical connection" (Schilling and Green, 2011:1322)—by revealing how this paradox is navigated in everyday practice. By studying how scholars navigate this tension, we show that those who successfully publish with unconventional methods take strategic actions to mitigate perceptions of incompetence or lack of commitment and of those, the three most common involve demonstrating competence in conventional methods. Though previous scholars have provided famous examples to suggest how these highly unconventional and conventional combinations come about—for instance, how Darwin spent much of the *Origin of Species* discussing conventional knowledge of his day—our study elaborates *how* scholars strategically include convention into unconventional work in the practice of science.

9.2. Theoretical contribution to valuation risk and scientific norms

By drawing on insights from organization theory about the evaluative advantages of status and identity, we confirm their operation in a new setting (academic sociology), and elaborate such theories by inductively identifying strategies that are (and are not) successful in tempering such risk. Though there is a body of work devoted to documenting the penalties associated with differentiation, we know little about how these are managed in practice beyond speculation that elite actors use disclaimers (Phillips et al., 2013; Phillips and Zuckerman, 2001). In addition to finding empirical support for the use of disclaimers, we identify six new strategies, four of which appear largely successful. We also extend theory on valuation risk by showing that the

well-documented effects of status and consistent identities are contingent on characteristics of the unconventional practice in question. Specifically, they only hold for methods, like CA and SEQ that are not *too* unconventional: those that diverge less, epistemologically, from conventional methods and those whose extra-disciplinary lineage is visible.

By focusing on methodological techniques, our paper also moves the sociological study of scientific norms from its initial focus on how scientists should act and feel explored by Mitroff (1974) to norms about the nature of scientific inquiry and scientific practice, in line with the growing body of work on social science research practice (Leahey, 2008). Our results also confirm what Merton and Barber (1976) called "sociological ambivalence:" incompatible normative expectations (e.g., both norms and counter-norms) for scientists. Because established scholars in top-tier institutions are the ones more likely to take the risk of using an unconventional method (at least the ones that are not too unconventional), we corroborate that the Mertonian norm of organized skepticism ("detached scrutiny of beliefs in terms of empirical and logical criteria") is faced by the counter-norm of organized dogmatism (Mitroff, 1974), though we see these as shaping scientific practice by acting more as "evaluative repertoires" (Mulkay, 1976) than as norms.

9.3. Policy contribution

This study has policy implications for governments and organizations seeking to promote unconventional, "high risk, high reward" research. Our quantitative results suggest that, to the extent research policymakers aim to encourage scientists to break from tradition in their research, it would behoove them to support scholars who are not members of high-status groups and organizations. Efforts towards this end are underway. The NSF ADVANCE program aims to make science more inclusive for people of all gender and racial groups. Foundations like Howard Hughes, and agencies like NIH and NSF continue to fund important (if highly selective) grants for young individuals – substantially and for multiple years – through K and CAREER awards. Additionally, research policymakers could consider programs that cement commitments to unconventional-friendly professional affiliations early in scientists' careers. Though there are some programs devoted to interdisciplinary work, like the Andrew W. Mellon Foundation's New Directions Fellowships (McBee and Leahey, 2016), programs could more explicitly focus on methodological importation and train scholars in methods from other disciplines. Recent Data Science boot camps are exemplary in this regard.

Our qualitative results, however, provide an important caveat. Encouraging risky methodological application among scientists who are unlikely to engage in it on their own will only further science if the scientists in question are able to eventually gain some minimum level of acceptance for their efforts from the elites in that discipline. To contribute to disciplinary knowledge, they must be able to make it through the review process into the literature from which subsequent scholars draw. We find that scholars who use unconventional methods successfully (i.e., publish it in a sociology journal) also tend to demonstrate competence in conventional methods in a variety of ways. These individual-level strategies are largely absent from current discussions about how to best promote "high risk, high reward" research. In fact, some programs promoted by research institutions, particularly those that target younger scholars for interdisciplinary training, may limit the extent to which these scholars develop competence with the tools of their home discipline (Hackett and Rhoten, 2009). Though many important scientific problems require cross-disciplinary solutions, scientific careers remain structured largely by disciplines and a scholar who is not a proficient user of her disciplinary toolkit is unlikely to significantly contribute to that discipline.

This study sheds light on which scientists choose to break with tradition by trying out unconventional methods, the conditions under which these associations hold, and how scholars manage the career risks associated with doing so. Future research could test the status and identity advantages we document in other disciplines, particularly those that differ from sociology in status, degree of interdisciplinarity, and the extent to which unconventional method use is acceptable. Future research could also illuminate other factors that contribute to unconventional method use. For instance, the connectedness of co-authors within a given field may reveal the contribution of network ties. Altogether, we hope this study will inspire other scholars to study unconventional methods as an overlooked pathway to path-breaking research.

Acknowledgements

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