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Guest editorial

Critical quantitative geographies

Epistemological premises of quantitative geography have been seriously challenged through several rounds of stringent critiques by critical geographers in the past three decades or so. While critical perspectives and qualitative approaches are now widely adopted in contemporary geography, quantitative approaches are often questioned or considered with suspicion by many in the current intellectual milieu of the discipline. Despite recent attempts to reassert the critical potential and positive role of quantitative geography (eg Kwan, 2004; McLafferty, 1995; Plummer and Sheppard, 2001; Sheppard, 2001), bridging the critical/quantitative divide in geography has been much more arduous than many have thought.

The difficulty in reconnecting the critical and the quantitative has been in part due to the real or imagined existence of the kind of quantitative geography developed and practiced in the 1950s and 1960s in contemporary geographic research. Certain geography subfields, such as transport geography, are historically more quantitative than others due to the influence of allied fields such as civil engineering and neoclassical economics (Goetz et al, 2009). While many quantitative geographers are critically inspired, with primary research interests on significant social issues such as racial segregation, income inequalities, and health disparities, some critics tend to understand quantitative geography in terms of the most abstract kind of mathematical formalism and theorization. Another reason for the difficulty in reconciling the critical and the quantitative apparently stemmed from the identity politics in geography, in which contentions between critical-qualitative and spatial-analytical perspectives over several decades have reinforced and rigidified the critical/quantitative antagonism in geography (Kwan, 2004). Consequently, many in the discipline tend to perceive or represent the two approaches as irreconcilable spheres of geographical research in spite of recent attempts to bring critical and quantitative geographies together.

Further, despite considerable progress in quantitative geography that has helped to bring the two closer, the image of naive number crunching seems to linger on in the minds of many critics (Ellis, 2009). Recent developments in quantitative geography, however, have addressed certain limitations of conventional quantitative approaches, whose primary objective was often taken to be the establishment of law-like generalizations (Fotheringham, 2006). The application of local forms of spatial analysis (eg local statistics) and multilevel modeling, for instance, has facilitated the analysis of the relationship between local context and people's everyday life (Lloyd, 2007; Zolnik, 2009). Instead of making sweeping generalizations of an entire study area or population, these methods were developed to reveal the effect of local context on social processes and their spatial outcomes. Recent developments in complexity theory, agent-based modeling, geocomputation, and geovisualization also suggest that complexities of urban/social systems and people's everyday life can be taken into account to a certain extent. While these recent developments have moved quantitative geography away from positivist tenets and therefore seem helpful in bridging the critical/quantitative divide in geography, recent attempts to delink positivism and quantitative methodologies do not seem to be very successful; many critical geographers continue to see quantitative geography as a largely positivist and empiricist endeavor.

In order to shed light on the possibilities for bridging the critical/quantitative divide in geography, we organized a series of five sessions—entitled "Critical Quantitative Geographies: Beyond the Critical/Analytical Binarism"—at the 2007 annual meeting of the Association of American Geographers in San Francisco. The purpose of these sessions was to explore the possibilities for crossing the boundary of and forging creative connections between critical/qualitative and analytical/quantitative geographies. We sought contributions that attempt to develop new vocabularies or alternative rationalizations that help reconnect critical/qualitative and analytical/quantitative geographies. We also solicited papers that explore how critical/qualitative and analytical/quantitative approaches may enrich each other and how quantitative methods may be used to address issues informed by critical geographies. Several questions were emphasized in our call for papers: (1) To what extent is a 'new quantitative geography' that is based on critical social/cultural theory possible? (2) In what ways may quantitative methods be used in research inspired by critical social theory? (3) How can quantitative geographies take people's lived experiences into account? (4) How can social, cultural, and political contexts be foregrounded in quantitative analysis? (5) How can quantitative geographies take situated knowledges and positionality of the researcher and researched into account? and (6) How can reflexivity be practiced when conducting quantitative analysis? How to articulate this in research reports or publications?

A total of twenty-nine geographers participated in these sessions, with twenty-four papers or panel presentations. Participants spanned a wide spectrum of specialties and theoretical perspectives, including economic geography, feminist geography, population geography, transport geography, and spatial analysis. A subset of the papers will be published in two special issues of *The Professional Geographer*, one of which concentrates on conceptual or theoretical issues pertinent to the themes of the AAG sessions (Kwan and Schwanen, 2009). The other brings together various practical examples of how numbers can be enacted for critical purposes (Schwanen and Kwan, 2009). The papers included in this theme issue of *Environment and Planning A* address the six questions in the original call for papers through an economic geographical lens. This lens is more than apposite, given that economic geography is one of the fields where bridging the critical and the quantitative is both very arduous and strongly needed. We write this not only with the debate between geographical economics and cultural economic geography in mind (eg Barnes, 2001; Plummer and Sheppard, 2006), but also with the exchanges between analytically and culturally inclined economic geographers and regional scientists in mind (eg James, 2006; Markusen, 1999; 2003; Martin, 2001; Peck, 2003).

Each in their own way, the papers in this issue take these debates and exchanges over ontology, epistemology, and methodology one step further. They all ask in what ways theoretical and conceptual reasoning grounded in numbers can contribute to critical economic geography (and vice versa). All offer a postcultural turn perspective on quantitative approaches. Differences in substance, theory, and methods notwithstanding, the three papers concentrate on how various aspects of context—variably understood as contingencies, path dependencies, and/or relationships between people, places, institutions, and discourses—mediate and refract the outcomes of the processes under investigation. The authors also seek to integrate the open-ended, nondeterministic, and nonclosed nature of the real world into quantitative approaches. In so doing, they seek to counter the reductionist and structuralist tendencies characteristic of most varieties of scientific reasoning premised on quantification and carve out more room for different forms of agency. Finally, all contributions seek to transcend the quantitative/qualitative binary by advancing mixed-method approaches and/or stressing the need to integrate statistical or mathematical with qualitative languages.

Bergmann et al (2009) propose a mathematical model inspired by complexity theory to explore the spatial dynamics of capitalism. Their model in the tradition of classical political economy makes the partiality of quantitative narratives a virtue rather than a vice. It takes home the ontological lessons of the likes of Gilles Deleuze about relationality, open-endedness, causality, and nonreductionism. They use computational techniques to show that equilibrium states are but one of the possibilities to which trajectories of capital accumulation tend in the long run. Bergmann et al emphasize the importance of theorizing both short and medium and long run dynamics, if we want to theorize a world in flux.

Hamilton (2009) in her paper proposes the framework of analytical generosity to evaluate corporate campaigns as a means of regulating the social and environmental effects of multinational corporations. Building on feminist epistemology and methodology, this framework entails a self-reflexive, quantitative assessment of corporate campaigns that makes room for individual agency, relationality, and indeterminacy. Hamilton uses descriptive statistics and discriminant analysis to question her own preconceptions and as a means for building robust theory. This allows her, among other things, to foreground the role of dialogue rather than warfare tactics and market transactions as a source of stakeholder power in attempts to influence multinational corporations' strategies.

Finally, Strauss (2009) explores how insights from the field of behavioral economics, which has gained increased attention from politicians and policy makers, can inform geographers' work on economic decision making, and how the former can be extended by drawing on the latter. She argues that critical economic geographers can make important contributions to the elaboration of a fine-grained, multiscalar, and nondeterministic notion of context, which behavioral economics currently lacks. This, she contends, needs to be supported by rigorous and imaginative empirical research based on methodological triangulation—the use of multiple methods to address the same research question. And statistical and experimental research is an indispensable part of the methodological tool bag of critical geographers in conversations with and attempts to convince mainstream economists.

Further to the points already noted, the following lessons can be inferred from these three contributions. We fully agree with Bergmann et al (2009) that quantification and mathematization are not problematic per se but rather how results are interpreted. Modesty is key here. Outcomes should not be fetishized as definitive and final answers. Researchers should be very careful in generalizing results to cases in spaces and times whose actions are not directly investigated (cf Lawson, 1995). They should also be very explicit about the limits of the models employed, acknowledging and exploring the differences internal to the categories being used in the model and the interactions between modeled and nonmodeled factors (Bergmann et al, 2009).

In fact, we believe that the use of quantitative methods can have various advantages. Apart from generating results commensurate with mainstream social science and policy evaluation studies and contextualizing case-study research, they can generate surprises and make analysts aware of how their own background assumptions have informed expectations and interpretations. Like any method, they can function as a thinking technology (Gane and Haraway, 2006) that generates alternative understandings and hypotheses. Moreover, as Bergmann et al (2009) argue, the relatively strict constraints of statistical and mathematical models not only force researchers to clarify the nature of their assumptions; they also allow the consequences of those assumptions to be explored in analytically rigorous ways.

Obviously, then, there is an important place for quantitative methods in contemporary (economic) geography. We hope that the papers in this issue illustrate some of the manifold potentialities that enumeration, statistics, and mathematics and associated ontologies and epistemologies hold for a vibrant critical geography.

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