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The Global Urban: Difference and Complexity in Urban Studies and the Science of Cities

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Introduction

The study of the city is in a phase of theoretical reflection and experimentation. There is concern to build analyses of the urban that are informed by trends and experiences of urbanization across the world, accounting for the pace, scale and form of demographic and social change as well as the overall social, economic and ecological significance of the city in global or planetary change. For example, the desire in international policy circles to 'leave no city behind' and to generate useful guidance for development in what are now some of the world's most vulnerable places is a powerful motive for ramping up urban research and for identifying key interventions that could shift cities onto a more sustainable path. There is a widespread consensus that to make sense of massive urban expansion, especially in Asia, and to illuminate lesser understood urban realities, such as those of Africa, the generation of some new concepts and approaches is necessary.

Regardless of their philosophical points of origin or methodological commitments, initiatives to understand the significance of an urban world bring to the fore the tension between specificity (or difference) and universality in conceptualizing the urban and in drawing together empirical evidence, at the global scale, for innovation in policy and

theory. In the field of urban studies, theory is now strongly shaped by the search for effective ways to understand the nature of the urban across a great diversity of outcomes (Parnell, Pieterse and Watson, 2009; Roy, 2009; Simone, 2011b; Robinson, 2016a; b). We argue that this concern needs to be further prioritised as policy makers seek to illuminate the drivers and outcomes of the global settlement transition.

Acknowledgement that the composite trajectory of cities will influence the pathways of global change has hastened recognition of the importance of taking account of the cumulative ways in which varied sectors, actors, scales and temporalities shape cities and affect flows within and between cities. Interest in the urban applications of complexity and systems thinking is strengthening a developing 'science of cities' (Batty, 2013). Drawing on this emerging body of work, as well as on trends in urban studies more broadly, we suggest that the focus on cities as pathways of *global* change should also highlight the fact that much more needs to be understood about the specificity of urban experiences in differential and varied geographical contexts to inform both how generalizations about the urban are produced and how they are taken up by global policy makers.

Of ongoing concern is that conceptual refinement of the urban condition takes place in a context where the resources for theorisation and interdisciplinary alignment remain highly skewed towards privileged centres and institutions whose national and regional geographical orientation and range tend to exclude urban realities (typically of poorer and more remote cities) that may (or may not) rupture existing generalizations and theoretical integration. In this chapter, then, we raise concerns that the welcome boom in global urban research runs the risk of compounding an existing geographical bias in theory-making towards well-resourced centres. Furthermore, while in the discussion

that follows we seek to open up conversations between urban studies and the emerging science of cities, as well as to promote interdisciplinary research which is potentially able to integrate insights across an array of processes and divergent urban contexts, we suggest that this should not gloss over significant conceptual and methodological disagreements and geographical complexities.

We start from the premise that there is wider value, even an urgent necessity, in forging a bolder, legible and united, if critical, scholarly community of urbanists that is global in its composition and geographically embracing in outlook. There are significant disjunctures and difficulties, though, entailed in any efforts at merging, harmonizing or synthesizing urban studies and a science of cities, as well as navigating significant differences within each of these fields. Nonetheless, stepping back from what have often been divisive theoretical debates between 'critical theory' and 'science' in order to expand academic capacities to engage urbanisation as a fundamental transition of our time is, we argue, a political as well as an intellectual project for which there is clearly an urgent need. In this chapter we make a first effort at opening up this conversation across the widening field of urban studies, highlighting some shared conundrums involved in developing a more global approach to urbanisation, and considering emerging formulations in both fields as to how knowledge production across urban diversity and complexity might proceed.

Global urban policy making and imperatives for urban research

Especially on our minds as we write this chapter is the potential for scholarly engagement in global urban policy through processes such as those that surround the Sustainable Development Agenda, the New Urban Agenda or the Paris Agreement on

Climate Change. The multilateral political focus on cities and the values and indicators that are given prominence through position statements and targets seem to imply that developmental claims such as 'the right to the city', or indicators such as maximum air pollution levels, might hold as easily for Lilongwe as they do for Oslo. The issue of how and why cities differ from each other and how much this matters in generating universal arguments and knowledge about the urban condition is, we argue, a shared challenge for all scholars concerned with a global framing of the urban, both in the science of cities and in urban studies. In policy terms, while expert knowledge may need to be consolidated and synthesised to generate a picture of global urban trends, it is important that this is done in ways that deal effectively with differentiation across the world of cities, as well as with uncertainties and contradictions, rather than brushing them aside. The broad field of urban studies necessarily confronts difference and divergence in urban experiences, and must grapple with the limited reach of conceptual insights at the same time as fostering broader conversations about the nature of the urban. We feel that the rich theoretical debates about how to manage these tensions might provide useful vocabularies for reflection in global policy debates. And for urban theorists, responding to the urgent needs of global policy challenges might be considered to be more pressing than it currently seems to be (see Mitlin and Satterthwaite (2013) for an important overview of these challenges in relation to urban poverty).

However, while there is undoubted value in drawing out shared predicaments in generating knowledge about the nature, form and processes of global urbanization, and in stimulating cross-fertilization of academic and policy ideas, the potential lines of academic disagreement should not be trivialized. Nor should the desire to speak with one voice to ensure impact in global policy discussions detract from tough intellectual

debates. The task of getting the academy to speak coherently to policy and practice cannot be done without regard for real intellectual and ideological differences that have long existed between data-driven 'science of cities' and critical urban theory (see e.g. Brenner and Schmid, 2014). In this chapter we propose to review the incipient potential for thinking across this divide in building global urban knowledge and theory, but also to chart lines of divergence.

In particular, we are keen to flag that there is a shared concern with the relationship between wider theorizations or analyses of the urban and the specificity of cities (distinctive or differentiated urban outcomes). Both urban theory and 'science of cities' traditions confront this conundrum – theorizing across difference. Curiously, this has often been precisely the grounds on which divisive and critical debate has emerged between these two traditions, counterposing the universalizing tendencies of science with the more interpretive traditions of social science, alert to specificity and difference. We suggest that, in the light of the global and sustainable development agendas' overt urban policy directive, there is now a renewed incentive for conversations to be had across what has conventionally been a chasm of disagreement.

In the quest for more integrative analyses of urbanization at a global scale to respond to global policy developments, commensurability across different disciplinary views of cities of the world emerges as a significant challenge. Here there are multiple imperatives: first to harness and synthesize knowledge; second to acknowledge the limits of commensurability in assembling data on different processes; and third to protect against geographical exclusion in the event of data gaps, and to avoid gross generalizations that erase urban specificities. To date, the major cleavages and contradictions of competing domains of urban knowledge, found in the normative base,

the methods of research and the metrics of evaluation of urban progress, have been largely eluded through the alignment of disciplinary and operational specializations; thus economists advise on city growth strategies, sociologists on urban race and youth issues, and engineers on how to build bridges. Fragmented urbanism is then reconnected through design, intuition or budgeting and political processes. But the rise of global policy and scholarly discourses now demand high levels of generalization (ICSU, 2011). Synthesis is required for national and global policy formulation and so a more holistic thinking about 'the urban' has come into play.

The contemporary urban debate that purports to feed policy is therefore an inherently complex and interdisciplinary act, stimulated by opportunities for integration-based innovation, but bound also to confront competing rationalities and exclusions. At the point when synthetic conceptualizations of the urban are required, the intractable problem of specificity (or not) must thus be confronted. Nowhere is this more obvious than in the selection of indicators for the sustainable development goals that will work across all contexts (Simon et al., 2015).

As we proceed to review below how both urban studies and the science of cities treat urban differentiation and urban complexity in the challenge of building global urban knowledge, our concern is to make clear that there is currently no theoretical consensus on how to do this. In urban studies these debates are more fully developed, and there are some emerging practical ways forward to support new kinds of knowledge production, notably in a reconfiguration of comparative urban methods. In relation to a science of cities we draw attention to silences, ambiguities and confusion about how to treat the question of urban specificity when data gaps hide or preclude inclusion of significant urban formations.

Crucially we argue that in response to the imperative of greater global policy relevance for both urban studies and the emerging science of cities, knowledge about the urban condition needs to be made useful both within and across places – global analyses of the urban need to resonate with and be able to respond to specific local experiences. It is in this spirit, then, that we press for an expanded debate on conceptions of the 21st-century city that are synthetic in that they are globally relevant and transdisciplinary, but also responsive to the diversity and complexity of the urban experience. Nuanced analyses are needed that account for specificity and incommensurability and that confront directly the terms of theoretical differences and conceptual conflict.

In seeking to take forward this conversation as a contribution to growing calls for a more tractable and unified scholarship on cities, the rest of the chapter is structured in two main parts. The first deals with the challenges of navigating the search for data and knowledge on urbanization at a global scale while data is both uneven and differentiated across diverse urban situations; it also considers the complexity and commensurability issues which arise in the strongly interdisciplinary bodies of work that are being drawn together as the 'science of cities'. The second approaches in more detail how specificity, or difference, and wider conceptualizations, or issues of universality, are being treated in typically social science debates in what might be termed 'urban studies'. The opportunities for debates and developments in each field to inform the other in initiatives to generate more global urban analyses are, we hope, opened up through this encounter.

The science of cities – commensurable urban abstractions beyond specificity?

There is no doubt that over the last decade or so there has been a massive increase in urban scholarship from across the hard natural, engineering and medical sciences. New enquiry has included comparing and generalizing the workings of physical and natural processes within cities, such as flooding, nitrogen flows or air pollution (cf. Aerts et al., 2013), as well as detailing the composite impact of cities on global environmental change, largely through the study of demographic shifts, the changing burden of disease, global energy consumption and biodiversity loss (cf. Seto et al., 2012; Elmquist et al., 2013). The focus on cities in the climate change debate is possibly the most important example of the interface of science and policy at the global scale (Rosenzweig et al., 2010). An underlying narrative of a 'great urban acceleration' (Figure 2.1), and not just urbanization and the growth of cities, underpins the surge in the urban sensibility of core scientific disciplines, many of which had hitherto not concerned themselves much with cities or what went on in them. Viewed from the perspective of those policy makers who might wish to apply the knowledge of these scholars, what is startling is how little this work of scientists and that of social scientists, in the rubric of urban studies, connect to each other. More startling still is that closer inspection suggests that there may be contradictory policy implications emerging from within the scientific urban renaissance.

[Insert Figure 2.1 here]

The fact is that the world is now predominantly urban – and many scientists have noticed this. Growing recognition of the wider consequences of the urban transition have had a catalytic, and largely positive, impact on the use of scientific evidence to shift global and national policy on cities over the last decade, with the transition to renewable energy as a strategy to reduce carbon emissions produced by cities as possibly the best example of evidence-based urban transformation (Rosenzweig et al.,

2010). Bolstered by composite (though not necessarily commensurable or spatially representative) evidence about the urban transition and the urban future, academics have been among the leaders in bringing the city, the built environment and a concern with spatial relationships into debates about Earth's future sustainability (McPhearson et al., 2016). In practical terms, what this means is that scientists, rather than social scientists or even the design professions, have managed to alter the normative base of global policy makers by urbanizing the 2030 sustainable development agenda – ensuring that national policy formation and reporting includes an emphasis on cities and that local as well as national governments are identified as critical global urban actors (Barnett and Parnell, 2016).

This dedicated urban policy attention, as witnessed by the Sustainable Development Goals, Habitat 3 and the Paris or Sendai Agreements, should be good for cities in general, although the precise terms of the urban vision are heavily debated within and beyond the sciences and the policy priorities of the multilateral urban agenda remain opaque (Cohen, 2015). There is, however, a real danger that despite the greater prominence of cities in general, some cities may in fact now slip further behind in the framing of urban opportunities and dilemmas – not least because of the influence of scientific modes of research that do not do enough to make visible unconventional, unrecorded and under-measured cities (Simon et al., 2015). There are two aspects to sharpening the urban gaze of science in this regard. The first is to make the science of cities spatially and analytically representative of the whole city and the whole world of cities. The second is to acknowledge the ontological limits of science in the study of the urban.

A fundamental flaw in the contribution of science to a global understanding of cities is that data-poor regions are simply left out of graphic and statistical accounts of global development progress. Take West Africa, for example, where, excluding Nigeria, there are over 150 million people for whom there are almost no robust metrics at the national let alone urban scale. The data lacuna that is the reality of impoverished nations like Angola, Chad, Cameroon, Central African Republic, Equatorial Guinea, Gabon, Republic of Congo and San Tome and Principe (http://qz.com/602406/why-is-central-africa-missing-from-so-many-maps) relates, as one might expect, to fundamental socio-economic data but it extends also to the global metrics that define city density, connectivity or urban well-being. Here, then, the problem is not just missing data but distorted categorization. Stronger awareness of the urban blind spots of science, including what is measured and whether it is measured effectively, is thus imperative – not only for the intellectual integrity of how cities are represented, but also to ensure that the urban poor of the world feature appropriately in the emerging science of cities. Failure to attend to these technical and conceptual deficiencies means that fundamental global challenges, like urban food security or climate mitigation, will remain illegible within this mode of analysis.

Unlike traditional social science work on the city that has very diverse roots, there is relative epistemological cohesion in science, although it is not true that there is full theoretical interoperability across disciplines concerned with the city. The centrality of urban problems and opportunities that have been fostered by science, engineering and even economics are, however, typically framed either in terms of conventional modelling or, more recently, by complexity or systems thinking. Because the theoretical assumptions made by these largely quantitative and positivist scholars lend themselves to generalization and macro-scale analysis, working at the scale of the city or the

settlement system is often seen as unproblematic, even desirable. The ability to provide comparative information that has (notwithstanding the points about missing data above) global coverage is also attractive for multilateral agencies seeking high-level abstractions and guidance on a general or global urban policy direction. One marker of the willingness of scientists to engage urban policy at this scale is the focus on cities in both *Science* and *Nature* in the lead-up to the UN's major conference on Human Settlements (Habitat 3) that was held in Quito in 2016. The more general awareness of scholars in supporting the implementation of an urban Sustainable Development Goal is underscored by the emphasis on cities in new funding calls and the science programmes of international structures like Future Earth (Bai et al., 2016). Cities are clearly no longer *terrae incognitae* for hard scientists who, in taking an integrative and global approach to the urban, may be closer to finding the ear of global policy makers on how to transform cities than urban studies scholars, whose work is more often concerned with less tangible social processes in specific cities. Indeed, it is in navigating the search for global knowledge on cities and the specificity of local urban processes that the tensions between social and scientific urban research may be most apparent – and where a productive conversation between these two traditions may be most useful.

Putting aside the well-established critiques of positivism, there are unintended pitfalls of the scientific turn for marginalized places, related to the way in which this kind of research is authenticated. There are well-established protocols (largely statistical but also geospatial) that are used to account for the robustness of the results presented in scientific papers by urban economists, engineers, ecologists and other powerful groups of urban researchers including epidemiologists (Newell and Siri, 2016). As is well known, undertaking large-scale sophisticated mapping and modelling

is, if not impossible, then very difficult and time consuming in small, poor and data-deprived areas. The importance of the global urban data gap alone might discredit this mode of positivist research as a legitimate platform for robust global urban policy reflection. However, this difficulty has been at least partially addressed by the rise of big data and complex systems approaches, largely displacing linear modelling (Kitchin, 2014a).

To deal with issues of scale and complexity most urban scientific research now engages systems thinking for the study of sustainable cities and is no longer only concerned with linear modelling. Complexity thinking highlights bimodal interactions, feedback loops in and across cities, urban resilience, tipping points of change and the interaction of different actors and systems within city governance (Bai et al., 2016). Assumptions about causality that inform the more sophisticated new complex systems work is, however, often drawn from patterns derived from peer-reviewed studies (often systematic reviews) of cities and city systems, which are geographically biased to northern examples. For cities off the global data or publication map the danger of oversight because they are not reflected in comparative data platforms or in the secondary literature is heightened by intense systems thinking research and especially by the shift to big data.

Big data and smart data lie at the heart of the urban scientific renaissance, as this is not only where most new, raw urban data is located, but where there are optimal opportunities to make better information work (and pay for itself). The research of big data scientists entails more than just the pulling together of exceptionally large and complex information that can be analysed in new ways using powerful computations (Kitchin, 2014b). The analytical and operational power lies in the formulation of

algorithms that sort and reveal patterns of flows in and through cities, based on assumptions about how cities work. The incorporation and adaptation of these patterns into packages, such as traffic systems or billing systems, is undertaken on the assumption that other cities will purchase them because the algorithms apply across many urban contexts.

However, of key concern here is the extent to which poor African cities might be excluded from the conceptualizations of big data science, as revealed by an audit of Batty's (2013) articulation of the practical value of an emergent 'science of cities'. He describes how scientists pursue the manipulation and modelling of new varieties of data – particularly big data – generated by the monitoring of devices and people across the city based on the assumption of widespread, even universal, ownership of data-generating devices. While the use of cellular technology in African cities has been much publicized, the fact that consumers limit its use because of cost; have restricted coverage; and may share phones across a family or business means that the assumptions about information need to be heavily contextualized. Second, Batty points to ways big data can make urban environments sites of ever greater competition through modelling prediction and projection, but this presupposes that all economic activity is legal and legible on the Web – which is rarely the case in urban 'slums' where informal and/or illegal networks thrive on hidden information. Batty optimistically points to the potential to integrate diverse services and add value to how citizens participate in generating knowledge about their cities and use the same collectively collated information to reduce the price they pay for goods and services, but the chances of applying this web-based rationality to African cities needs dramatically improved connectivity to take hold. The rationalities of everyday African urban life may not ultimately prove more difficult to model than those of other urban places, but the danger

is that big data science does not currently assume the need to engage with questions of geographical specificity; assumes that there is sufficient information about all cities to illuminate urban patterns in general; and assumes that the patterns that it does identify will enable action that necessarily enhances the quality of life of residents.

It would be disingenuous to suggest that the global community is oblivious to the distortions of generalizing from over-researched regions of the world (Seto et al., 2012; Simon et al., 2015). To address the missing cities in science huge new programmes, such as those sponsored by Future Earth or the international science councils, have been put in place (cf. www.icsu.org/news-centre/news/top-news/icsu-signs-a-five-year-agreement-with-sida-to-support-integrated-science-in-africa). Notwithstanding major new investments, the scale of research and resources directed at urban Africa are insignificant in comparison with ongoing investments into what are already well-understood cities in Europe or North America. Thus, while urban research on and in Africa is advancing, the spatial knowledge gap on cities is growing. Thus, at the very moment that African cities' expansion provides the critical entry point for a more engaged and holistic science, there is more than ever inequality in the distribution of research output (cf. Jeenah and Pouris, 2008). Ironically, because of the dominance of social science in the region, the overall gap in the outputs of African urban research relative to those of other world regions may be getting worse as cities elsewhere are no longer the object of only social research, but become the beneficiaries of the better funded science research grants that are reliant on data availability.

We noted earlier that despite efforts to promote the apparent theoretical coherence of urban science, it is dangerous to assume that the results of the varied cohorts of science will generate congruent recommendations for urban management. Despite the

common use of modelling, systems theory and big data by urban scientists there are important discrepancies and incommensurabilities across the different approaches and objects of urban scientists that make it hard for interdisciplinary teams to agree, even before they have begun to grapple with how and why the urban specificity of, say, African cities might be accommodated in generalizable urban research findings. For example, the focus on climate change and material flow typically point to the imperative of densification and high-rise construction, while a concern with biodiversity might place lower emphasis on absolute density. For biologists, although land use cover expansion is a concern, the hardening of surfaces and imperatives of keeping open corridors or vectors within a city for plants and animals would outweigh the rigid reduction in density levels. For urban health specialists the framing of the urban problem, although investigated in a similar quantitative scientific mode, will vary hugely according to how the concerns of infectious or non-communicable diseases were weighted.

The significance of disciplinary divergence within the sciences is understood and there are efforts to reduce the way incommensurable findings are taken up and amplified by professional urban practice. In the well-organized and affluent centres of the north, scientific disciplines enjoy specialized access to professionals who work in cities and there are well-established sectorally specific science policy interconnections. But these professional communities then operate in specialist silos. The challenge of how to bring the different, often competing, elements of expert knowledge together has spawned calls for a more integrated science of cities and, especially at the global scale, better portals to ensure that scientists engage policy makers in distilling and prioritizing knowledge about cities in ways that cross disciplinary boundaries. The problem remains that in taking up this important issue of knowledge integration or transdisciplinarity,

questions of the genesis, representivity and commensurability of the different forms of city information through which a science of cities might be constructed have not, hitherto, been a central concern.

While on balance there is little doubt that the scientific expansion of the global community of urban scholars is a necessary and important step, there are nevertheless possible pitfalls that must be acknowledged. Looking to science, from our positions in the social sciences and from our empirical and conceptual reference points of African cities, we see three immediate difficulties locked into the rise of a scientific paradigm of cities. The first is that although part of the appeal of science is that as a method it delivers generalizable, verifiable and transferable knowledge, in the realm of urban knowledge this is not in fact the case: from a policy-making perspective the contradictory insights drawn from different areas of science are difficult to manage. The second problem is that the emergent science of cities consciously and unconsciously assumes a uniformity that derives from the selection of apparently comparable quantifiable base information. Through the algorithms and models that scale up and assess complex global processes of urban change, core assumptions are amplified. The end result is that political nuance, local context and bias in data selection can distort and delegitimize outputs at the local scale, making the results and insights of scientific analysis difficult to implement or promote, especially in places that are arguably in greatest need.

In dealing with urban specificity, then, in relation to an emerging global science of cities, the critical issues are to do with *complexity* – ways to grapple with the interrelation of processes (of water, air, governance) – and *difference* – accommodating diversity and grappling with the legitimacy and relevance of information for local

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decision makers. These map directly onto the more theoretically articulated challenges being worked through in urban studies, suggesting some important openings for cross-fertilization which we explore below. Practically, the tasks of synthesizing, attending to difference and building more qualitatively integrative and institutionally sensitive interpretations of specific urban areas, surely the strengths of social-science-inflected urban studies more generally, strongly indicate the value of and potential for engagements across these two fields.

For all of its inherent and operational shortcomings, complex systems thinking has done the most (if not enough) to advance a transdisciplinary and global dialogue on cities. One reason for this, Bai et al. (2016) argue, is that systems thinking allows for specificity, requiring a relational approach to urbanization. In their terminology, this recognizes, first, that cities are located, embedded in surrounding environments and ecologies, and can be specified in geophysical space. And, second, that cities themselves have physical (i.e. built), social (i.e. interpersonal, institutional and cultural) and ecological architectures. Third, these architectures encompass related architectures at smaller scales (e.g. neighbourhood, family) and are embedded in related architectures at larger scales (e.g. state, nation, world). In sum, then, in this view, the systemic nature of cities is a consequence of the relationships between location and physical and social architectures across scales, including within and between cities and with smaller and larger physical and social architectures. Keeping in view this complexity of the urban, and its differentiation across space and scale, then holds potential for the kinds of nuanced interpretations which can combine appreciation of the specificity and limits of both data and concepts while nonetheless seeking to strengthen wider analyses of urbanization. In this case, the instincts of systems theory and the science of cities join

urban studies in searching for ways to understand the expanding complexity and reach of urbanization.

Urban studies: revisable conceptualizations and difference

As with data-driven analyses of cities, then, scholars from a range of different traditions in urban studies agree that there is a need for a more global approach. Certainly there are different positions on this, and some stringent debate, but at the same time a number of initiatives have brought to light productive and interesting lines of analysis with potential for learning across theoretical divides (McFarlane, 2011; Brenner and Schmid, 2015; Robinson and Roy, 2016). Across these overlapping initiatives, the call for conceptual innovation and the desire to treat the geographical differentiation of the urban effectively add up to a new mode of urban theorizing. In this emerging theoretical landscape, concepts which travel are valued, but generally only insofar as they are treated as provisional and revisable, subject to interrogation based on different urban outcomes and different urban experiences. We suggest that the most innovative and suggestive insights might emerge from contexts which have not yet played a strong role in shaping urban concepts, or which have been seen as beyond conceptualization in some way, often treated as empirical fodder for pre-given theorizations, or as exceptions to wider theoretical analyses. To some extent, the cutting edge of urban theory is emerging on its former margins – the informalities which once marked the non-urban now define core urban qualities of association and emergence (Simone, 2001; Le Galès, 2011); the once exceptionalism of places like China are now central to conceptualizing the future of urbanisation (Wu, 2015.

We explore these emergent theorizations here under the rubrics of: searches for theoretical integration (e.g. planetary urbanization); differentiations of knowledge (e.g.

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strategic regional and feminist/identity perspectives); and methodological revisions (e.g. 'assemblage theory' and comparative urbanism).

Theoretical integration: A growing interest in the idea of 'planetary urbanization', drawing on Henri Lefebvre's (2003 [1974]) suggestive hypothesis of the 'complete urbanization of society', has been inspired by the sprawling extension of many cities, generating enormous urban regions, or even urban galaxies, as Soja and Kanai (2007) would have it. In addition, the globalization of many urban processes has meant that flows and connections among cities are shaping the planet far beyond the physical extent of even these large urban settlements. Furthermore, in the dynamic processes of financialized globalization, it seems as if the urban form itself has become a key contributing element of global economic growth; certainly the social experience of the urban has become increasingly commodifiable for business and property developers (Schmid, 2011; Harvey, 2013). Core questions for urban theory no longer admit a reasonable answer: discerning where and what is the city becomes an impossibility (Brenner and Schmid, 2014; Brenner, 2013) and we are invited to seek to re-specify the theoretical content of the 'urban' and to develop new vocabularies of urbanization (Brenner and Schmid, 2015) in the face of the sense that the territorial term 'city' has become inadequate (Merrifield, 2013).

In the global dialogue between disciplines concerned with the urban, and even more so in the interactions between the academy and global practice, these theoretical propositions concerning planetary urbanization are seen by some as hard to operationalise (Parnell, Crankshaw and Acuto, 2017), or requiring stronger attention to different contexts and different experiences of the urban (Parnell and Pieterse, 2016; Peake, 2016). As commentators on this approach, as well as its protagonists, have

noted, the project of theorising the urban at a planetary scale confronts the challenge of thinking across a great diversity of urban processes and urban outcomes. In their seven theses on urbanization, for example, Brenner and Schmid include the suggestion that:

> urbanization under capitalism is always a historically and geographically variegated process: … [it] must be understood as a polymorphic, multiscalar and emergent dynamic of sociospatial transformation: it hinges upon and continuously produces differentiated, unevenly developed sociospatial configurations at all scales. (2015: 175)

What needs to be theorised as urban must therefore start with a multiplicity of forms, trends and interpretations of the urban condition around the world. Schmid, for example, concludes his discussion of specificity and urbanization with the suggestion that "the urban is not a universal category; it is a specific category that is always dependent on concrete conditions and historical developments" (2016: 305). Lefebvre himself, as Goonewardena et al. (2008: 297) observe, was sceptical of any 'premature intellectual totalisation', insisting on the necessary incompleteness of theoretical specifications and the importance of different contexts in building understandings of the urban. It is this sensibility which has most provoked critics of this approach, who express concerns that in their ambition to recast urban theory, planetary urbanization theorists have a tendency to resort to a universalizing language about the urban, imply that there is no outside to urbanization processes, and depend on pre-given theorizations of capitalism, most familiar to writers in the global north, for example, to characterize these processes (Leitner and Shephard, 2016; Peake, 2016).

Differentiations of knowledge: An important starting point for considering such criticism might be to agree that, in building analyses of different, specific experiences of urbanization, a contribution to theory and its transformation is being made. At times

there is a tardiness or plain refusal to acknowledge this, which can make for awkward lines of engagement across different traditions. Scott and Storper (2015), for example, insist that an adequate theorization of the urban already exists, but would benefit from enhancement through attending to empirical variability; or, in the case of assemblage theory, there is the suggestion that this approach brings a purely methodological refinement rather than analytical innovation – see McFarlane, 2011; Brenner, Madden and Wachsmuth, 2011). The difficulty here is two-fold: on the one hand a classically reductionist manoeuvre might privilege only certain processes as objects of global urban theorization - cultural differentiation or institutional development could be seen to matter less than more spatially extensive economic processes, for example. Or it could be that different outcomes become only so much empirical variation on privileged, pre-existing analyses or models (*pace* Scott and Storper, 2015); in this case the limits to theoretical innovation are drawn quite tightly around existing knowledge.

As Roy (2016) persuasively points out, to refute the conceptual or *theoretical* import of difference is to suggest that certain universal or abstract concepts which are concerned to characterize phenomena are inevitably generalizable (i.e. appear and apply everywhere). By contrast, we can insist that conceptualisations are always historically and geographically grounded; and that effective and useful concepts, wrenched from the multiplicity of historical processes in a specific context, can never encompass the whole of a given situation or phenomenon, and are unlikely to be relevant in all places. Roy rightly cites Chakrabarty's seminal (2001) text, *Provincialising Europe* in support, but his manoeuvre is very complex analytically and has been subject to profound misinterpretations by some of the critical commentators we consider here. He asks us to see all conceptualisations of capitalism as necessarily bound to historical specificity – in his view there is no pure or original capitalism,

broadcast from the "west", for example, across the rest of the world. His characterisation of History '1' and History '2' does not counterpose universal (Marxist) theorizations of capitalism as a putative History 'I', in opposition to History 2 as pure difference. Rather, History 2 refers to the specific historical processes which are always shaping History 1, but also interrupting it (p. 64); they are dialectically intertwined: "any historically available form of capital is a provisional compromise made up of History 1 modified by somebody's History 2" (p. 70. Does this constitute a rather 'defanged' approach to empirical difference, as Chaudhury (2012) argues, unable actually to challenge and lead to revisions in established theorizations? Perhaps, if the specificities and differences do not themselves become starting points for theorizing something other than capitalism, for example (Parnell and Robinson, 2011), or the historically divergent forms of capitalism are not attended to in conceptual debates. On this score, Lefebvre's commitment to the fullness – inexhaustibility – of concrete totalities and the necessary incompleteness of all theorization in the face of empirical diversity resonates (Lefebvre, 2009; Robinson, 2016a).

This points to the conundrums of urban theory-building in a world of many different cities (and indeed to this chapter's central concerns): the necessary limitations of any concepts in the face of (a) difference and (b) complexity. Certainly, there will be numerous instances where a Scott and Storper (2015) ambition of enhancing existing theory through case studies will be sensible – valuable concepts can then be stretched and refined. But it is essential for global urban studies to be open to a much more thorough-going revision and expansion of inherited concepts based on the diversity of urban situations, many of which have yet to be considered in developing wider theorizations, as well as the wide range of urbanization processes at play in shaping any outcome. To take issue with Scott and Storper, who insist on being able to know (more

or less) where the edge of the city arrives based on the functioning of the urban land market, already theorized based on the US case, we can observe that this risks fundamentally misconstruing the processes behind many major urban forms of the contemporary era where, as in Africa, the peri-urban rather than the city core is the frontier of everyday urban investment and value (Mercer, 2016). And Chinese urban processes, for example, driven by state decision making and territorialized administrative politics mean that urban extensions frequently leapfrog contiguous urban areas, producing highly discontinuous land markets, for example the rural collectives and urban villages which have transformed the Chinese urban landscape (Hsing, 2010; Wu, 2015). To understand the urban land market as an outcome of a direct governmental developmental logic might well require some new explanatory starting points.

It is, however, in relation to attending to the necessary complexity of urban experiences that we find the repertoire of concept formation stretched even more significantly by scholars concerned with questions of social difference. Linda Peake (2016), for example, proposes that feminist analyses, starting with women's often brutalising experiences of urbanization, identify new starting points, as well as political motivations, for theorization; and Maliq Simone (2011a; 2016), in his provocative distillation of 'black urbanism', outlines what is an as-yet barely discernible voice within urban studies, black urban life, carved out in the hard-won constitution of associations, communal life and making a living, a rich reality of urbanism occluded by the conventional surface of racial analytics and practices.

Relatedly, some feminist and black scholars insist that the labour of knowledge production can be critically associated with positionality – to write as a white (northern)

scholar, for example, is to produce knowledge which is inevitably marked and situated (Derickson, 2016). Collaborative opening to different subjects of urban theory (Roy, 2011; Ferenčuhová, 2016; Parnell and Pieterse, 2016), and the broad insistence on writing the urban differently from different place and subject positions, have been emphasized by a number of writers (Watson, 2009; Myers, 2011; Parnell and Oldfield, 2014). This does resonate with the intentions of Brenner and Schmid's Thesis 7, in which the 'urban as a collective project' is an open determination, shaped by a multiplicity of struggles, across different contexts and political subjects (2015: 176–177). But this political instinct, their critics rightly argue, needs to stretch to the production of knowledge too, in which authorial reach and authority could be curtailed by acknowledging the veracity of claims, often disjunctive in relation to wider theories, made by the multiplicity of theorists and scholars of different urban processes and situations. As Robinson articulates, then:

> A vital and urgent consequence of any new geography of theorizing—comparative or otherwise—should be that the mode and style of urban theorization itself is transformed from an authoritative voice emanating from some putative centre of urban scholarship to a celebration of the conversations opened up amongst the many subjects of urban theoretical endeavour in cities around the world, valorizing more provisional, modest and revisable claims about the nature of the urban. (2016: 196)

Methodological revisions: How might such a spatially sensitive theorization of the urban proceed? Institutional development is imperative – new centres of urban theorizing, such as the Indian Institute of Human Settlements (Revi et al., 2015) or the African Centre for Cities (Parnell and Pieterse, 2016), and other networking and partner initiatives provide crucial resourcing for new subjects of theorizing. Fostering urban hubs in the regions undergoing rapid urban transformation is one way to presence new

ideas and thinkers, to create new starting points for theorization and to decentre the excessively resourced northern voices in urban studies. Much pragmatic work is needed here, as despite strong intellectual interventions in this direction to date, the geographical basis of English-language scholarship remains narrow and the number of southern scholars whose work is known beyond their region in no way feeds the multiple reference points required for global generalization and theorization. In addition, a methodological divergence is required – where very different kinds of knowledge are valorized, possibly even finding ways to peer-review empirical and evidence-driven reports in core international urban studies publications. Innovation in the traditional metrics of scholarly assessment is vital to address the extreme deficiencies of insight and information relevant to many of the poorest urban areas. This is a point explored by Parnell and Pieterse, who insist that:

> it is inordinately difficult, using only established research methods, to research the African city and use the findings of research from Africa to destabilize urban theory formation. Either Africa must be ignored or the theory, method and data of urban studies must change. The former is not possible and so we need to better understand the barriers to finding appropriate new methods of (African) urban research. (2016: 241)

The challenge of getting reliable and insightful intelligence on cities, where there is no formal intellectual community which publishes and shares information publically, is a problem for policy specialists as well as social scientists and even the better resourced scientists working on cities. Thus along with 'data gaps' discussed in the previous section, gaps in conceptualization of the urban are pressing. Collaborative working from under-researched locations to foster a global reflection on 'the urban', drawing on potentially new lines of partnership and resources across the global urban scholarly

community – social, scientific and policy oriented – would also significantly strengthen the transdisciplinary urban project.

At the same time as an openness to new subjects and thematics of urban studies are called for, some different approaches to the analytical sticking points associated with theorizing the urban are also needed. An imagination in which weighty political economy abstractions jostle uncomfortably with difficult 'empirical' differences or insistently embodied knowledge, consigned to only represent variety or empirical observation, can set the tone for intractability in current theoretical debates. But as we have discussed in this section, this can be disassembled into a series of methodological and epistemological dilemmas facing all urbanists and requiring creative and new responses across disciplines. How can concepts be renovated, overthrown or invented across diverse urban outcomes? How can urban theory work effectively with different cases, with elsewhere? And how can the complexity of the urban be addressed through necessarily reductionist conceptualizations, confined to begin through an engagement with specific places and data sources, and yet called upon to grapple with the inexhaustibility of social and material worlds? Methodological innovations are in progress in the field, including reformatting comparison with a looser and more agile task of 'thinking cities through elsewhere' (Robinson, 2014; Robinson, 2016a); ethnographic research practices which provide a mode of operation attuned to inventing concepts and launching them into a wider world of analysis (Simone, 2011; Simone and Pieterse, 2017); and an insistence that concepts might run aground, finding their limits in their inability to encompass distinctive urban worlds (Jazeel, 2014).

The three initiatives in urban theorization reviewed here (a search for theoretical integration; the differentiation of knowledge; and methodological innovations) share a

common instinct with the systems theorizations with which we ended our discussion of the science of cities: to place the urban as a conceptualization (more or less) open to reformulation in response to both *differentiated* emergent forms of urbanization and the *complexity*, or opacity, as Simone (2016) would have it, of the urban. Here, perhaps the conceptual dilemmas shaping contemporary urban studies debates might have some resonance with the more empirical conundrums of the search for globally relevant urban policy insights through a 'science of cities'.

As the instincts of Bai et al. (2016) confirm as 'science of cities' scholars reach for a vocabulary to characterize a multi-scalar and interconnected urban world, there is scope for grounding a project of strongly revisable urban theory or knowledge in the spatiality of the urban itself – in its profound multiplicity as elements of the urban are repeated, differently, across multiple locations (Jacobs, 2006); in its complex fullness as multi-dimensional urban worlds (Pieterse and Simone, 2017); and in its divergent but intimately interdependent forms, variously considered as identifiable territorializations articulated through the multiplicity of flows and interconnections across and within urban settlements (McCann and Ward, 2010; Bunnell, 2013); or, as planetary-scale urbanization processes formed through both concentration (agglomeration) and extension (spread; explosion; operational landscapes) (Lefebvre, 1994; Brenner and Schmid, 2015). In all these formulations of urban spatiality, any sense that we can easily identify 'cities' is dispersed.

Thus, as we approach the urban in its necessary multiplicity, from specific places and observations, a range of wider conceptualizations, emergent or inherited, are available to reflect on urban experiences or outcomes. On the one hand, the reach of concepts beyond their initial locations is entirely an empirical matter – the urban is

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constituted through multiple circulations, trajectories and interconnections which stretch beyond any specific territorial outcome of urbanization processes, and thus needs to be conceptualized across multiple locations. But, on the other hand, it is also a matter of the potential reach of concepts themselves: as we approach different urban realities where numerous features are shared with other contexts, we can search for interesting and useful ideas from elsewhere to make sense of them. Thus, the interconnected but differentiated global urban condition invites us to think across distinctive territorializations of urbanization processes. The search for effective conceptualizations draws us across the world of cities, grounding a comparative imperative, alert to opportunities for inventing and revising conceptualizations of the urban. This reflects the potential of renewed comparative practices, able to meet the challenges of conceptualizing the global urban (Robinson, 2011; 2016a).

Furthermore, as we confront the emergent complexity and 'problems' of this 'urban manifold' as it makes itself known to us in any particular situation (Simone, 2011a), new conceptualizations are demanded of us. Here the invitation is to invent new concepts, to generate understandings relevant to distinctive urban situations, which would be available to launch into a wider world of urban conceptualization, possibly to be put to work in new situations. In this vein, for example, the concepts of informality, so characteristic of many poorer cities, have generated a hugely productive approach to emergent urban social formations in many contexts (Simone, 2001; Le Galès, 2011; Schindler, 2013; Hentschel, 2015; Tuvikene, Neves Alves and Hilbrandt, 2016). There are quite some openings, then, for urban social theory to recraft itself in the face of the differentiated, changing and globalizing urban world.

Conclusions

Our review of the current urban studies debates on conceptualizing global urbanization has indicated a range of resources for how urban knowledge might be considered both possible and revisable in the face of a highly differentiated, but also profoundly interconnected, globalizing urban world. Relatively isolated work in the emerging field of urban science research is facing challenges which resonate strongly with these more conceptual enquiries. The pragmatic demands of global urban development might, then, benefit from being integrated into, or entering into conversation with, a more spatially sensitive global urbanism. Our concern in bringing together these two areas of scholarship for reflection has been to demonstrate that as scholars concerned with a common urban world, there are shared dilemmas in finding ways to work with and think across a diversity of urban experiences. One conclusion is that for both fields of endeavour the characteristics of global urbanization set the terms for theorization and integration of understanding: any search for integrating and universalizing insights must rest provisionally on differentiated and specific experiences of the urban, and must grapple with the multiplicity and complexity of any urban context.

We conclude that working with the specificity of cities (territories), and the diverse flows and interconnections which frame urbanization across the planet, requires a modest approach to universalizing ambitions and a willingness to hold such analytical achievements as provisional, and revisable. Especially significant for both urban theory and a science of cities is our observation that, in addressing 21st-century urbanization, attention to the specificity (or not) of places within and across the putative 'global south' (notably Asia and Africa), weakly presenced in both theorization and data analysis, should be at the forefront of the revisionist project of urban research. However, we also insist that the planetary-scale challenges of urbanization, embraced unevenly in global policy-making forums, demand a more effective response from

urban studies scholars, including interacting with multilateral policy makers as well as local-level institutions and actors. As the call is made from various international policy-making bodies to inform understandings of global urbanization processes, urban studies scholars could pay closer attention to the energies and achievements, as well as the limitations, of the emerging science of cities.

Notes

[Note to typesetter: Take in footnote 1 (below) here]

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