Essentially Quantified? Towards a More Feminist Modelling Strategy

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Abstract
Just over three decades ago, feminist theorists began developing a clear and convincing case against the use of gender as a single analytic category. The treatment of gender as a single category has been robustly criticised for erroneously homogenising the experiences of women and for ignoring other important sources of variation that cut across gender in important and complex ways. Moreover, where multiple social divisions have been considered, researchers have been criticised for implicitly (and sometimes explicitly) treating multiple dimensions as additive and separable. Notwithstanding some notable exceptions, feminist demographers and quantitative social scientists continue to employ, often uncritically, methods that fail to address these concerns. This paper argues that feminist researchers need to pay greater attention to the assumptions that underlie their choice of method and the models they estimate. Additionally, the paper suggests the ways in which estimating models that incorporate notions of "intersectionality" (with all of their added complexity) might be better accommodated in gender-sensitive empirical work.

Introduction

In research extending back more than three decades, feminist theorists have raised questions about the usefulness of social categories such as gender and ethnicity, and the way in which those categories are used by researchers. Taken together, this work makes a clear and convincing case against examining gender, class, or ethnicity as single and separate categories. The treatment of gender as a single category has arguably been afforded the greatest attention, and theorists have robustly criticised the unreflective and uncritical deployment of the category "woman". Feminists have been criticised, often (but not only) by other feminists, for assuming that women's experiences can be easily generalised and for erroneously homogenising the experiences of women. As a consequence, feminist research has highlighted the importance of taking into consideration other important sources of variation – like ethnicity, age, and social class – that interact with gender in important and potentially complex ways to shape diverse social positions.

Moreover, where multiple dimensions have been considered, researchers have been criticised for implicitly (and sometimes explicitly) treating multiple dimensions as additive and separable. In Spelman's (1988) seminal work, she refers to this as the "ampersand problem" – the problem that arises when researchers assume that the experiences of black women, for example, can be deduced by understanding separately the effects racial discrimination and the effects of gender discrimination. Multiracial feminist theory has played a crucial role in the development of these critiques, which formed the foundation of what is today called "intersectionality", arguing that their experience of race and gender could not be separated and instead needed to be considered as interrelated and inseparable social divisions. As Brown and Misra (2003) succinctly put it "Race is 'gendered' and gender is racialized', so that race and gender fuse to create unique experiences and opportunities for all groups" (pg. 488). Instead of operating as two distinct and unitary hierarchies, race and gender intersect to create, in specific historical situations, a "matrix of domination" in which each of the cells represents a unique positioning (Collins 1990).

These ideas can, of course, be extended to incorporate other socially constructed hierarchies, including for example class, disability, age, and sexuality. Taking into the account the way in which different axes of disadvantage intersect, the notion of what is meant by the term "woman" (or "man") becomes increasingly problematic. Indeed talking about gender without taking into account other socially structured axes of differentiation becomes meaningless and obscures the experiences of marginalised groups. Some women have high levels of academic achievement and manage to obtain good jobs. Other women are less advantaged and are becoming increasingly vulnerable to poverty, especially older women. Importantly, we see similar differentiations among men. Clearly, gender is an important axis of difference but "only one among many divisions in a truly uneven and heterogeneous society." (Coward, 1999, pg. 211). If we believe that social structures are "mutually constitutive", we cannot speak of gender independently of other social structures. An intersectional perspective – one that

examines how various systems of oppression "mutually construct one another" (Collins, 1998, pg. 63) -- is required.

Notwithstanding some notable exceptions (most of which fall within the sociological literature where these issues have gained more prominence than in the demographic literature) quantitative researchers have been extremely slow to adapt their methods and models to accommodate the concerns raised in the literature that (eventually) led to the development of the intersectionality paradigm. For the most part, demographers and quantitative social scientists continue to employ, often uncritically, methods that fail to acknowledge or address feminist concerns. In this paper, we explore the ongoing disconnect between the ideas raised in this literature and the assumptions that underlie much of the empirical analyses that we, as quantitative researchers, carry out. In addition, we discuss the ways in which demographers and other quantitative social scientists can incorporate more of an intersectional perspective in their work. Although data constraints limit the extent to which empirical work can reflect interlinking hierarchies in all of their complexity, researchers can and should take greater care in their choice of methods and model specifications and reflect to a greater extent on the assumptions that underlie their choice of method and the models they estimate.

Intersectionality – Background and Basic Tenets

Theoretical development of intersectionality

Although there are various understandings of intersectionality, key tenets of the paradigm which are particularly relevant for quantitative researchers include the following: (1) Analytical categories are socially defined and constructed with meanings that are historically and contextually contingent (Zinn and Dill, 1996); (2) Intersecting hierarchies which occur at all levels of social life, work to create unique social positions and result in positions of both oppression and domination (as well as opportunity and disadvantage) in the same individual; (3) Specific social locations create a unique social positioning which cannot be either represented or understood as additive and separable (Collins, 1990). These ideas were largely (but not entirely) generated from feminist critiques of early feminist work – more specifically "via an internal critique and self-reflection of the imagined community of feminism" (Knapp, 2005, pg 260). The term "intersectionality" was first introduced by Kimberle Crenshaw (1989) in the late 1980s in the context of a discussion of Black women's employment experiences in the United States, but the relevant concepts and issues were raised and explored in many earlier academic texts (see, for example, Davis, 1981; hooks, 1984; Spelman, 1988, Mohanty, 1988). In this sub-section, we provide a brief (and incomplete) sketch of the critiques that led to the development of the idea and theory of intersectionality.[1]

An important early contribution of feminist scholarship was its critique of mainstream research for not acknowledging or incorporating the experiences of women. Feminists developed tools to uncover

[1] Our intention in this section is to familiarise readers with the key criticisms that, in recent decades, led to the development of intersectional thinking and not to carry out a detailed intellectual history of feminist thought. For an impressive and far more comprehensive history of the development of intersectionality tracing many of the ideas as far back as the nineteenth century, see Brah and Phoenix (2004).

strategies of power and exclusion that were hidden in mainstream, male dominated and male centred research. In an attempt to understand what it means to be oppressed "as a woman", some feminist scholars attempted to isolate gender oppression from other forms of oppression, and as a direct consequence, their worked tended to be either pre-occupied with the experiences of white middle class women or to ignore completely the experiences of other women. It is from critiques of this (largely feminist) work, that the theory of intersectionality began to take shape. Some scholars, Black feminist scholars in particular, began to argue that the experiences of a certain, privileged group of women had become conflated with the experiences of all women in much the same way that the experiences of (some privileged groups of) men have been conflated with the experiences of all humanity (hooks, 1981).

In addition to taking issue with the use and meaning of the term "woman", feminist scholarship also scrutinised the way in which multiple social divisions, when they were considered at all, were dealt with analytically. Feminist texts were criticised for making the implicit assumption that various axes of difference could be understood as additive and separable. Such approaches implicitly assume, for example, that (i) experiences of sexism and racism can be examined in isolation and (ii) added together to understand the experiences of Black women. In this way, additive analyses assume away the possibility that Black women experience different kinds of gender oppression than White women or different kinds of racial oppression than Black men.[2] The implications of choosing to apply this approach are important because as Spelman (1988) reminds us, "How one starts, in thinking as well as in acting, has everything to do with where one might go" (pg. xi). Assumptions which underlie our methodologies affect the way we think about and conceptualise issues and can, in turn, affect our interpretation of the results. This means that our definition and use of categories, our underlying assumptions, and our modes of analysis all work to focus attention to some areas and divert it from others. The models we employ determine not just what we ask but also what we are able to find. Some reflection on these matters is warranted because certain simplifying assumptions may cause us to inadvertently assume away important information. In so doing, we may be inadvertently recreating or naturalising hierarchies that need to be problematised and challenged.

Engaging with and critiquing a selection of (predominantly) feminist texts, researchers brought together these various criticisms to develop the theory of intersectionality. In so doing, they constructed a solid argument for a re-conceptualisation of gender – one that moves beyond a simple male-female binary and that can better reflect the complexity of social structuring and social life. The development of intersectionality has influenced feminist thought enormously. Researchers now acknowledge the necessity of examining men and women from varying social groups and at the interstices of multiple axes. Researchers are increasingly sensitive to multicultural perspectives and

[2] Recent empirical research provides additional evidence against this simplifying assumption. Results from in-depth interviews demonstrate the ways in which employers stereotypically and differentially characterise Black men, Black women and white women (Kennelly, 1999). Moreover, recent work by Steinbugler, Press, and Dias (2006) demonstrates that racial stereotyping by whites differs significantly across groups who were asked to consider "Blacks", "Black Men", and "Black Women" when they formulated their assessments.

aware of the consequences of imposing Western perspectives and interpretations (Lober, 2006). According to McCall (2005) "… feminists are perhaps alone in the academy in the extent to which they have embraced intersectionality….One could even say that intersectionality is the most important theoretical contribution of women's studies, along with racial and ethnic studies, so far."(pg. 1771). While the contribution that intersectionality has made to the way in which researchers think about social structures and oppression is apparent, the movement from critique to methodological innovation has gone in various directions and is far from complete. Indeed, the extent to which feminist methodologies have incorporated these ideas and aims, at least in some disciplines, has been questioned. Knapp (2005) wonders if it has become a concept that is mentioned more than used, and suggests that "By just mentioning other 'differences' besides 'gender', the work continues to be delegated to the respective 'others'." (pg. 255). Others have pointed out that "The enormous body of theory and research feminists sociologists have produced is used at the gender-as-variable level or as adding women to the sampling mix, just as it was twenty years ago." (Lober, 2006, pg. 449). But these criticisms should not divert attention away from the developments that have occurred. The next section provides a sketch of the different ways intersectionality has been incorporated in methods of research. Drawing heavily on the work of McCall (2005), we summarise the different approaches to intersectionality that exist in the literature to date, highlighting those developments that have the most to offer empirical researchers.

Methodologies for Applying Intersectionality

Intersectionality has come forth as a new and important paradigm, particularly in women's studies, but methods of studying it and the ways in which it should be operationalised remain underdeveloped and, in some ways, contested. [3] It is generally agreed that intersectional analyses should aim to treat different social dimensions as mutually modifying or reinforcing (Glenn 1999) rather than as concepts that can be understood as unitary and separable. But that is difficult, if not impossible, to accomplish in its entirety. When multiple aspects of difference are examined simultaneously, the result is an often intractable amount of complex information. Indeed, taken to its limit, intersectionality could lead researchers to continue splitting their samples into increasingly detailed social groups until there is nothing left but a population of individuals (or handful[s] of individuals) which cannot be meaningfully studied (Young, 1994). At present, there is no clear or straightforward solution for how that complexity can effectively be managed. Focusing in particular on the ways in which they manage complexity, McCall (2005) proposes a typology of existing methodological approaches to intersectionality: the anti-categorical approach which she connects with poststructuralist theories; the intra-categorical approach which focuses on differences that cut across one particular category of interest; and the inter-categorical approaches which focus on differences across (multidimensional) categories.

[3] McCall (2005) makes an excellent case for why empirical approaches to intersectionality should be accepted as valid by feminist researchers and indeed developed further. This paper takes on a far more modest challenge and speaks to the "other side" – those quantitative researchers who are interested in making their work more gender sensitive. We want to convey some of the basic ideas that quantitative researchers might want to consider when conducting their research.

The anti-categorical approach is based on what Weldon (2005) calls the strong version of intersectionality. Proponents of this approach would argue that analytical categories are over-simplistic, fictional devices. Because categories erroneously convey a sense of unity and distinctiveness, they are exclusionary and invalid. This approach aims not to redefine (or better define) analytical categories, but to deconstruct them and in so doing take away their power. Proponents of this approach to intersectionality would argue empirical analyses of gender, race, and class as invalid because the categories themselves are meaningless. But some have argued that this approach to intersectionality has moved too far away from its foundations, developing into a method that bears little resemblance to what the originators would have envisioned (Weldon, 2005). According to this argument, intersectionality grew out of the recognition that social structures generate social groups and determine social positions; the key issue is how those structures are conceptualised and interpreted. Examining and challenging structures of disadvantage becomes impossible if those same structures are treated as meaningless. Consequently, one is left asking how to generate categories for comparison while at the same time exerting efforts to critically deconstruct those same categories? (Lober, 2006). As Weldon (2005) cautions, "If we think there is anything to the observations about class, race or gender … then this version of intersectionality obstructs analysis of the similar or at least related effects that social structures have on many people's lives." (pg. 5). Because this approach is most predominant, at least amongst feminist scholars, and has come to represent for many what it means to conduct intersectional analyses, it is perhaps not surprising that the central tenets of intersectionality have not yet influenced the thinking and methodologies of quantitative researchers to any great extent.

Compared to the anti-categorical approach both the intra-categorical approach and the inter-categorical appear to be more consistent with the approach advocated by Collins (1999) who suggests that researchers should focus on "a concrete topic that is already the subject of investigation and … find the combined effects of race, class, gender, sexuality, and nation, where before only one or two interpretive categories were used." (pg, 278). Both approaches make use of analytical categories and both approaches attempt to address the ampersand problem, though in slightly different ways and with slightly different aims and objectives. The methods employed predominantly in each approach can differ substantially, but Knapp (2005) sees the two as complementary and interdependent: "their respective potentials unfold best by holding onto both poles of this interdependency" (pg. 262). Both begin with the use of analytic categories and both draw attention to the importance of heterogeneity within broadly defined analytic categories but the former tends to lend itself to more qualitative approaches whilst the latter is more amenable to quantitative descriptive analyses.

The intra-categorical approach examines marginalised or neglected groups located at the interstices of several social dimensions in order to explore the complexity and heterogeneity of differentially located individuals. A key way that complexity is dealt with in this approach is to focus intensively on a single group or case study that is compared with the hegemonic representation of a more broadly defined social category to which that group also belongs. Examples of literature on intersectionality that employ an intra-categorical approach include case studies which take the form of in-depth

qualitative analyses of, for example, young South Asian women (Ahmad et al 2003) or Black victims of domestic violence (Crenshaw, 1991).

In contrast to the intra-categorical approach which is pre-occupied with differences that cut across a single social group, the inter-categorical approach makes the measurement and description of inequality (and changes in patterns of inequality) both within and across categories the focus of its analysis. "The concern is with the nature of the relationship between social groups and, importantly, how they are changing, rather than with the definition and representation of such groups per se…." (McCall, 2005, pg. 1785) This approach attempts to uncover how analytically defined categorical difference – gender, ethnicity, social class, and age -- intersect in practice and in relation to particular economic and geographical contexts (see, for example, McCall, 2000 ; 2001). It also seeks to verify whether broad analytical categories are sufficient for the purposes of description and to test whether the use of more detailed social groupings is required. It is important to emphasise that whether there are differences between groups is not simply imposed but instead treated as a hypothesis. This approach most obviously has implications for large scale quantitative analyses, suggesting that the researchers should be more sensitive to the way in which categories are constructed and analysed.

Intersectionality in Quantitative Research – What Can Researchers Do?

The idea of intersectionality has played an instrumental role in highlighting the limitations of existing approaches to gender analysis, and in emphasising the political effects of ignoring within group diversity. Although the central tenets were developed largely in the context of a critique of feminist theoretical texts, and not as a result of engagement with empirical work, as the inter-categorical approach makes clear, many of the core ideas can be applied to empirical research and, moreover, raise salient issues for demographers and other quantitative social scientists who make use of analytic categories. All too often, researchers who want to carry out gender sensitive empirical analyses resort to standard parametric (often some variant of least squares) modelling techniques. In order to examine gender wage gaps, for instance, the researcher will estimate linear models that include, in addition to age or experience, separate controls for gender, race/ethnicity, and education level. In regression analyses, this modelling strategy effectively imposes the strong assumption that the effects of gender, race/ethnicity, and education are additive and separable. The gender parameter reflects differences in average earnings by gender regardless of the person's race and ethnicity and the race/ethnicity parameter reflects differences in the average earnings of other groups (both men and women) usually relative to Whites. In effect, model specifications often ignore the concerns about complex inequality raised by feminist theory and impose the additive logic of the ampersand problem.

Staying with this example, the Oaxaca decomposition offers a somewhat more intersectional approach to the issue of gender wage gaps.[4] Here separate (fully interacted) models are estimated for women and men, explicitly acknowledging that the effect of gender is not additive and separable. The returns to

[4] See http://www.econ.ubc.ca/nfortin/econ351/Oaxaca1.PDF for an excellent explanation of the decomposition is carried out.

education (and other analytically defined characteristics) are likely to differ between men and women. To include race/ethnicity controls in each of the sex specific equations would be to assume that within each gender group, the "ethnicity effect" could be added on. It would not, for example, allow for returns to women's education to vary by her ethnic group. If the researcher also takes into account differences by race and ethnicity, an intersectional perspective would require separate models for each sex and ethnic group combination, however. This is where data constraints begin to bite. Taking into account only two social dimensions, we suddenly have several models and an extremely high number of parameters to be estimated. Given that there are so many social divisions that are likely to intersect, it is nearly impossible to operationalise intersectionality in all of the richness and detail that its current understanding implies. But that does not mean that we should not try to incorporate intersectional thinking as much as we can. So what can researchers do in practice?

Prioritise the Number of Observations

For quantitative research, the sample sizes that are available in "large scale" survey samples can seriously limit the extent to which inter-categorical approaches to intersectionality can be applied. Sample sizes are often limited, especially for some population sub-groups, and as discussed above, data requirements increase substantially with each additional dimension. Although data limitations – both in terms of information and sample size -- mean that it is not possible to account for all sources of difference and diversity using an inter-categorical (or intra-categorical) perspective, it is nonetheless true that intersectionality could be far better accommodated than it currently is in much of the extant literature. When it comes to data sources, part of the answer may be found by looking back to the history and development of demographic work.

When, in the early 1990s, Eileen Crimmens (1993) looked back on the previous three decades of *Demography*, she made an important observation about the way in which developments in social demography (or population studies) differed from those that had taken place in formal demography. She noted that the data used in formal demography – the bulk of work that published in the early years of *Demography* -- tended to come from vital registration systems and from the census, and most analyses focused on groups. Over time, the increased availability of large scale sample surveys, the computer power to analyse them, and concurrent methodological developments created an environment in which researchers were increasingly encouraged to not just describe but to explain demographic dynamics and processes. Speaking of social demography, she asserts, "We have moved from descriptive methods and data to analysis that is based largely on the application of causal models. The availability of certain types of data and the power to easily apply complex statistical techniques have encouraged the development of methods appropriate to this emphasis on causal models" (pg. 585).

Appropriately she cites the strong influence of economists and economic modelling, and the enthusiastic adoption of OLS (or OLS-like) parametric models. In their enthusiasm for more complex and causal models, few considered the costs that came with this kind of modelling, however. Whereas formal demography dealt with heterogeneity by subdividing the population into sub-population groups and examining each group separately, one of the costs of adopting new methods of analysis and

including an increasingly large number of explanatory variables was the simplifying assumptions that such methods entailed. The treatment of categories as additive and separable was one of those costs that allowed more complex models to be estimated even when confronted with some small sub-group populations (Xie, 2000). Because the aim of the inter-categorical approach is more akin to earlier demographic pursuits -- the description and documentation of differences – more traditional data sources with many observations (but perhaps fewer variables and less complex longitudinal designs) are likely to be a good option.

Fortunately changes in computing and database technology have made the return to traditional demographic data sources easier and far more flexible. In contrast to researchers who were responsible for the many early articles in *Demography* that relied on "unpublished two- or three-variable cross tabulations compiled by the census bureaus, statistical offices or the United Nations at the request of, or made available to, individual researchers." (Crimmins, 1993, pg. 581), we now have incredibly valuable resources like IPUMS (http://www.ipums.umn.edu/) which provide free access to individual census records for several countries and for multiple census years. Population registers from several (predominantly but not exclusively from Scandinavian) countries also offer researchers unprecedented opportunities to explore large samples with extremely accurate data. The availability of these kinds of data allows researchers to examine and measure differences across detailed social groups and even to assess change over time. McCall's (2000; 2001) work on wage inequality provides excellent examples of what can be accomplished with large census samples. Her applications of the inter-categorical approach uncover important differences that would masked by more simplistic, additive approaches. For example, looking across cities in the United States, McCall (2000) finds that class and racial inequalities among men, racial inequalities among women and gender inequalities among the highly educated are likely to be higher in post-industrial rather than older industrial regions. The class inequalities between women show the reverse pattern, as does gender inequality among the lower educated. These patterns could not have been identified with the simple inclusion of dummy variable controls or by using smaller data sets.

Maximise the Number of Observations

When data with the largest number of observations is inappropriate for the question at hand, there are still ways to make the most of the data that is available. Researchers interested in the inter-categorical approach might also want to consider using data sources like the UK Labour Force Survey or the US Current Population Survey which contain relatively large samples (particularly of minority populations) and extend back for several years. Combining samples from more than one year can boost the number of observations and enhance the sample appreciably. For some outcomes of interest, it might be possible to construct pseudo-cohorts (immigrants with a specific set of characteristics who came to the country one year ago in survey year t and combined with those who report coming to the country in survey year t+1) which would allow the researcher to assess change over time not for the same person but at least for the same groups.

We have taken this route in some of our own work (Sigle-Rushton and Perrons, 2006). To examine the longer-term relationship between motherhood and employment, we use a sample of repeated cross-sections drawn from UK Labour Force Survey. With several quarters of data, sample sizes are sufficiently large for us to control for ethnic group in our models and specify models that allow for a relatively large number of interactions. We allow key parameters of interest - educational qualifications, partnership, and fertility variables[5] - to differ for those who are classified as Indian, Pakistani, Bangladeshi, Black Caribbean, and Black African. This selective interaction strategy allowed us to estimate models that apply an inter-categorical approach with a smaller number of parameters than would be required in a fully interacted specification. The findings reveal significant differences between ethnic groups in terms of life course events. First, confirming earlier findings, motherhood is significantly associated with a reduced probability of employment (Sigle-Rushton and Waldfogel, 2007). But there are important variations by level of qualifications and ethnicity. Mothers with no qualifications are much less likely to be in employment than those with a degree. Furthermore, the variation across different ethnic groups is far wider amongst mothers with no qualifications than those with a degree. Consistent with previous research, Bangladeshi and Pakistani mothers with low qualifications have very low participation rates, but there is nonetheless a steep educational gradient (Holdsworth and Dale, 1997; Modood, Berthoud, Lakey, Nazroo, Smith, Virdee and Beishon, 1997; Dale Fieldhouse, Shaheen, and Kalra 2002).

By making the most of our data, we are also able to identify important differences between Pakistani and Bangladeshi women living in the UK. In quantitative research, it has often been the case that data on Pakistani and Bangladeshi women are combined, usually because of limited sample sizes, to form one group. There are several reasons why this may be an unfortunate, albeit necessary, estimation strategy. For instance, we know that compared to Pakistani women, Bangladeshi women are less likely to speak English fluently. They also have higher rates of inactivity and lower rates of employment (Modood et al, 1997). Bangladeshi women also tend to come from communities that are more economically disadvantaged than those of Pakistani women (Blackburn, Dale, and Jarman, 1997). We also find differences in the employment patterns of Black Caribbean and Black African women which similarly suggests that a unified 'Black' category in statistical analyses may mask important variations in the experiences of different women in the labour market.

Adapt Existing Methods Wherever Possible

Although with any data source, it will not be possible to account for all sources of difference in all of their complexity, it is nonetheless true that feminist concerns regarding complex inequalities and intersectionality could be far better accommodated than they currently are in much of the existing literature. Even with more limited sample sizes, when estimating standard regression models,

[5] Following Sigle-Rushton and Waldfogel (forthcoming), we control for fertility with indicator variables for having one child, two children, three children and four or more children. In addition, we control for the number of years since the last two children (if any) were born. Because time effects may be nonlinear, we control for the square of the time since each of the last two births as well.

researchers should, at a minimum and wherever possible, explore the extent to which they can interact different analytic categories of interest and examine critically the size and significance of their parameters. Additionally, depending on the research question, testing for interactions with other key variables may warranted, again wherever sample size permits. That said, it is especially important, when there is so much (potential) complexity, to be clear from the outset (before creating the variables), which groups are being compared, why they are being compared, and what can be found out by comparing them (Lober, 2006).

The next thing that researchers can and should do to incorporate an inter-sectional perspective is make sure that their results are not more complex than they need to be. Recall that the inter-categorical approach should not impose complexity but should instead seeks to verify whether broad analytical categories are sufficient for describing the outcome of interest. Although there may be evidence that social structures sometimes interact, do not assume that they always do. "Even to find that these structures intersect to position certain social groups against others in some contexts doesn't mean they are so positioned in all contexts. Which divisions are more salient will depend on the context (Weldon, 2005, pg. 13)." As a matter of good practice, all interactions that are included in the models should be tested for significance (with careful attention to sample size problems and how they can affect measures of significance) and the model fit should be compared to that of the more restrictive model. The use of step-wise methods provides one way of assessing whether and which interactions are required (see, for example, Hobcraft, 2003; Hobcraft and Mensah, 2006; and Hobcraft and Sigle-Rushton, 2006 for examples of to apply this approach). Obviously where more simplistic models fit the data well, simplicity is a virtue. But that simplicity should be confirmed rather than assumed.

Adopt New Ways of Presenting Results

Although it can be extremely informative to estimate models with several interactions, it is important to emphasise that doing so can result in extremely large tables with pages of parameter estimates that are difficult to digest and interpret. With many parameter estimates and complex interactions, tabular results of this form will be difficult to present and interpret with ease. This may be one reason behind McCall's (2005) warning that

> "…it is nearly impossible to publish grandly intersectional studies in top peer-reviewed journals, using the categorical approach because the size and complexity of such a project is too great to contain in a single article. Indeed there is much hostility to such complexity; most journals are devoted to additive linear models and incremental improvements in already well-developed bodies of research." (pg 1787).

It would behove authors who want to apply an inter-sectional approach to think carefully about how best to present their results so that they are linked as clearly as possible to the research question at hand and the issues s/he is trying to examine. In many cases, this will not be a table of parameter estimates (these may be best placed in an Appendix or made available on request). For example, in McCall's (2000) work in inequality across U.S. labour markets, she chooses to present the percentage of variance explained by different sets of explanatory variables and so presents important information on a range of

different models without weighing the reader down with hundreds of parameter estimates that are of less substantive interest anyhow.

When we tried to present our work on the employment rates of different groups of mothers (discussed above), we encountered similar problems of presentation. The final models contained well over 100 parameters, many of which were interacted with race and ethnicity making the tables cumbersome and difficult to interpret. For this reason we decided to summarise the findings in a way that readers would find more accessible and which would focus on our aims and objectives, one of which was to document differences by ethnic group. We used the parameters from the model to estimate the likelihood of employment for a hypothetical individual who follows a particular life course. We estimated the probability of employment separately for women of different ethnic groups with no qualifications and then for those with at least a degree level qualification. These predicted probabilities were presented graphically and the findings were discussed with reference to different aspects of the graphical representation instead of referring to a large table and multiple combinations of parameter estimates.

It goes without saying that inter-categorical models will remain complex and difficult for readers to understand. This will create an unfortunate obstacle to publication that can only partially be overcome. But the point of this discussion is to stress the importance of not making the problem any harder than it needs to be and of thinking about creative ways to ameliorate this problem. Standard methods of presenting model results are generally inappropriate when the models being estimated are so complex. It is a mistake to try to present results using methods and practices that were designed for other types of (single parameter of interest) analyses.

Consider Alternative Methodologies.

In addition to making the most of existing data sources and adapting standard methods (wherever possible), researchers who are interested in applying the inter-categorical approach should ask themselves whether the regression approach is always the best option. Parametric regression techniques, while traditionally the statistical method of choice in the social sciences, often impose strong linearity assumptions and, as already mentioned above, can meet with data-based constraints on the extent and order of interaction terms. When the assumptions underlying parametric regression methods are not met, the model is unlikely to describe the data well. In addition, as discussed in the previous section, when many and high-order interactions are included in an attempt to allow for non-linear relationships, the model is often difficult to interpret.

Non-parametric techniques allow researchers to relax or eliminate many of the restrictive assumptions underlying parametric modelling. Classification and regression trees (CART) provide an example one such technique that can aid in the identification of non-linear relationships and in the choice of parsimonious models that are more consistent with the aims of an inter-categorical approach. Regression trees are a person centred statistical technique that stratifies the data into higher and lower risk groups by sequentially splitting the data into more homogeneous groups based on a specific outcome. Researchers interested in identifying multiple, complex pathways, that contain a series of

inter-related events can use this method to identify the structure of pathways without making the strong assumptions necessary in regression techniques (Zhang and Singer, 1999; Zhang and Bracker, 1995). In some cases, person centred analyses can be used as a preliminary step that can be employed to identify inform and complement the other statistical techniques like regression analysis. Importantly person centred approaches like CART (but also better known techniques like cluster analysis) can help researchers identify differences across more complex groups and may be better suited in some instances to inter-categorical approaches. In addition, the CART method appears to be well suited for identifying complex relationships in smaller samples. Because the model is not well known in the demographic literature, we provide a brief introductory description of the method in Appendix A, but interested readers are directed to Zhang and Singer (1999) for a more thorough introduction, and to Zhang and Bracken (1995) or Hobcraft and Sigle-Rushton (2005) for applications of this method.

Discussion and Conclusion

The idea of intersectionality has been described as "a fast a flexible traveller in the English speaking world of western feminism" (Knapp, 2005, pg. 254). But the idea has travelled and left its mark in a partial and selective way. Its epistemic and methodological influence has been strongest in areas linked to post-modernism and post-structuralism to such an extent that the idea of intersectionality is sometimes understood as synonymous with the anti-categorical, deconstructionist approach. This latter approach rejects the use the analytic categories and would argue that their definition and use is invalid. Because this approach has come to predominate, some of the core, generative ideas, many of which have important implications for quantitative methodologies, have had less influence on the methodological approaches in demography and other quantitative social sciences than they otherwise might have had.

This paper has sought to highlight some of the fundamental concerns raised by the early literature on intersectionality, and it has sought to show that these concerns raise important questions about the way we, as demographers, carry out quantitative analyses. The original writings and arguments which generated and shaped the conceptualisation of intersectionality can be traced back to writings of black feminists. The central arguments they put forth were not anti-categorical in the sense that we understand it today. They were not arguing that the category "woman" is entirely meaningless, nor were they arguing that other aspects of social divisions are so important that heterogeneity among women invalidates any attempt to understand similarities in their positions. Moreover, the central argument of that literature does not imply that nothing is to be learned from the examination of broad analytical categories, such as women, or Latinos, or immigrant people. Instead, the idea of intersectionality was generated from the fundamental argument that the social positions that result from various social structures cannot be conceptualised or understood as additive and separable (Weldon, 2005). Important substantive information on the effects of social structures is assumed away and therefore will not be identified by this way of thinking.

Allowing these core ideas to travel in a different direction opens up the possibility for other methodological developments and innovations, those which "…avoid the fully deconstructive rejection

of all categorization, yet … remain deeply sceptical of the homogenizing generalizations that go with the territory of classification and categorization." (McCall, 2005, pg. 1783). But taking on these ideas requires extremely large samples and results in an enormous amount of complexity. Consequently, this paper has also sought to offer suggestions for how researchers who want to develop more gender sensitive methods can most productively take these ideas forward.

While the intra-categorical and inter-categorical approaches offer empirical researchers a way of dealing with intersectionality, it is important to stress that analyses that apply the notion of intersectionality (including it must be said, the anti-categorical approach) are always likely to be partial because the analysis becomes increasingly complex as additional social structures are considered. Nonetheless, as in the examples we presented above, a partial solution may uncover new information that was previously obscured by simplifying additive assumptions. Although some analysts make an effort to examine women and men separately wherever possible, or to examine broad racial groups separately wherever possible, the idea of intersectionality provides a theoretical motivation for this practice and stresses the importance of incorporating multiple axes of differentiation. Although the findings will never be comprehensive or definitive in the sense that we can conclude there are no other social structures that need to be incorporated in order to document and understand the outcome of interest, the value in adopting this way of thinking and linking it to how we carry out our work will help elucidate areas that need further attention in our own or future work. This is one the most important contributions intersectionality has to make to demographic work.

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Appendix A

A CART analysis begins with the unique root node of the tree which is represented by a circle at the top of the tree diagram. This root node contains all observations in the sample from which the tree is derived. At each subsequent layer of the tree, a node can be internal, meaning that additional nodes lie below it, or, the node can be terminal, meaning no additional nodes lie below it. Internal nodes are represented with circles and terminal nodes with boxes. Both the root and the internal nodes are partitioned, into two nodes in the next layer of the tree. These are called left and right daughter nodes, each of which is a sub-set of the internal node above it and, in the diagram, connected to it with straight lines. The goal, for each partition, is to locate a binary split that results in two homogeneous, or pure, daughter nodes. Because no split is likely to achieve total purity, we base our choice on a goodness of a split measure that weighs the impurities of the resulting daughter nodes. Impurity can be measured using any concave function, ϕ, that satisfies these three conditions:

(i) $\phi \geq 0$;

(ii) for any $p \in (0,1)$, $\phi(p) = \phi(1-p)$, and

(iii) $\phi(0) = \phi(1) < \phi(p)$.

The partition of the sample becomes progressively more detailed as the layers get deeper, but each subject is eventually assigned to one of the terminal nodes – ideally a node in which all subjects are homogenous with respect to the outcome variable. In practice, the complete homogeneity of terminal nodes is rarely achieved, however.

The method continues splitting each layer of nodes until no offspring nodes can be split any further. When this happens, the tree is said to be saturated. Because the total number of possible splits for a node falls from one layer to the next, the number of permissible splits gradually approaches zero, at which point the tree cannot grow any further. Saturated trees of are limited statistical use because the terminal nodes are usually very small, and the trees are often so large that interpreting them can be difficult. For this reason, some researchers make the trees more workable by applying a second step called "pruning". To prune to the tree, a Studentized log relative risk is calculated for each internal node from the bottom up.[6] Next, the Studentized log relative risk for each internal node, is compared with those calculated for all of its offspring nodes. If any offspring node has a higher statistic than its ancestor, the statistic of the ancestor is replaced with that higher value. Finally, any node whose statistic falls below some threshold (say 1.96 the researcher is interested in pruning to a 0.05 significance level) is changed to a terminal node. The terminal nodes, both before and after pruning represent mutually exclusive groups of real people each of which have different risks with respect to the outcome of interest.

[6] In practice, this statistic is biased upward to some extent because the relative risk is calculated as a resubstitution estimate – i.e. using a similar measure to the one from which the tree was grown.