What is the influence of childhood exposure to cultural norms? The role of segregation and community composition in explaining migrant fertility[1]

Ben Wilson and Jouni Kuha, London School of Economics

Abstract

There are a range of theories predicting that differences between migrant and native fertility are explained by exposure to cultural norms. However, only a handful of studies explore this prediction directly. This study proposes a new approach, which focuses on community composition in childhood. It uses longitudinal census data and registered births in England and Wales to investigate the relationship between completed fertility and multiple measures of community culture, including residential segregation. It does this for both first generation migrants and the second generation, as compared with ancestral natives. The results provide strong evidence in support of childhood socialisation, namely that migrant fertility is closer to native fertility for migrants who grow up in areas with a more dominant native community

[1] ACKNOWLEDGEMENT:

The permission of the Office for National Statistics to use the Longitudinal Study is gratefully acknowledged, as is the help provided by staff of the Centre for Longitudinal Study Information & User Support (CeLSIUS). CeLSIUS is supported by the ESRC Census of Population Programme (Award Ref: ES/K000365/1). The results shown here are released under clearance number is 30135. The authors alone are responsible for the interpretation of the data. Census output is Crown copyright and is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

culture. Furthermore, exposure to ancestral culture may explain some of the variation in completed fertility for second generation women from Pakistan and Bangladesh, the only second generation group to have significantly higher fertility than natives. This suggests one reason why the fertility of some South Asians in England and Wales may remain 'culturally entrenched'. All of these findings are consistent for different measures of community composition. They are also easier to interpret than the results of previous research because exposure is measured before childbearing has commenced, therefore avoiding many issues relating to selection, simultaneity and conditioning on the future.

Introduction

This article considers the links between culture and migrant fertility. More specifically, it considers the extent to which exposure to childhood cultural norms provides an explanation for differences in migrant and native fertility levels. A variety of cultural explanations have been proposed in order to explain these differences, including childhood socialisation, cultural entrenchment, and minority status (e.g. Goldberg, 1959, 1960; Goldscheider & Uhlenberg, 1969; Hervitz, 1985; Zarate & Zarate, 1975). Yet previous research has stated a need for more research that investigates the association between migrant fertility levels and measures of culture (Forste & Tienda, 1996; L. E. Hill & Johnson, 2004; Lichter, Johnson, Turner, & Churilla, 2012).

The concept of culture is an essential component of many theories relating to demographic behaviour. Cultural explanations have been used by demographers from Malthus to the present day, and they are an integral component of many socio-demographic theories including both the first and second demographic transition (Bachrach, 2013). Culture is expected to influence demographic outcomes like fertility or partnership behaviour through the effect of cultural norms and preferences (Cleland & Wilson, 1987; Davis & Blake, 1956; Fernández & Fogli, 2009; Forste & Tienda, 1996; Gjerde & McCants, 1995; Johnson-Hanks, Bachrach, Morgan, & Kohler, 2011; La Ferrara, Chong, &

Duryea, 2012; Lesthaeghe & Surkyn, 1988; Lorimer, 1956). Although these norms and preferences are enacted by the individual, they are also expected to vary over time and space via a continuous process of social interaction (for example with family, friends, and other members of local communities) (Bachrach, 2013; Hammel, 1990; Liefbroer & Billari, 2010). Despite this, it has been argued that demographers have frequently failed to acknowledge the complexity of this process, including the fact that culture is located and generated within a spatial context (Bachrach, 2013; Fricke, 2003; Hammel, 1990; Kertzer, 1997). There may be many reasons for this failure, including practical reasons such as lack of data. Nevertheless, demographic research has often struggled to integrate and evaluate the concept of culture, and in some cases this includes a failure to use measures of cultural variation in empirical analyses, even when studying hypotheses that are underpinned by cultural explanations (for a discussion related to migrant fertility, see: Forste & Tienda, 1996).

In response to these issues, most notably the need for valid empirical research, this article considers the relationship between culture and migrant fertility. As well as its importance for testing cultural explanations, an understanding of this relationship is important for helping to predict the impact of migration on population change and population composition. If migrant fertility has an effect on population size, then this has implications for a variety of policy areas, including health services, education, and pensions. Policy-makers therefore have a vested interest in understanding the differences in completed family size between migrants and natives. This is not only true for first generation immigrants, but also for subsequent (e.g. second) generations, which in turn suggests the need for more research that studies the completed fertility of different generations.

Since the early 1900s, researchers have tried to explain the existence of 'migrant fertility differentials', and provide reasons why migrant fertility is (often) different from native fertility (e.g. J. A. Hill, 1913; Kuczynski, 1901, 1902).

Since then, a variety of theories have been proposed in order to explain migrant fertility, and many of these are founded upon the concept of culture. Tests of the association between cultural measures and migrant fertility are therefore important because they provide evidence for or against particular hypotheses. For example, the childhood socialisation hypothesis predicts that migrant fertility levels will be affected by the fertility norms of the location in which migrants spend their childhood (Goldberg, 1959, 1960; Hervitz, 1985). As such, it can be assumed that research will struggle to evaluate this hypothesis unless it includes an analysis of exposure to childhood cultural norms.

Nevertheless, it is rare that research has used empirical measures of cultural difference to investigate migrant fertility. As Forste and Tienda point out, with reference to ethnic fertility, *"few studies have attempted to discern how cultural influences produce fertility differences"* (Forste & Tienda, 1996, p. 112). Where studies do include measures of culture, beyond indicators of ethnicity or country of birth, they usually focus on one aspect of cultural variation. Typically, this has either been language (Adserà & Ferrer, 2014; Bean & Swicegood, 1985; Marin, Gomez, & Hearst, 1993; Sorenson, 1988; Swicegood, Bean, Stephen, & Opitz, 1988), or an individual's exposure to cultural norms based on the population composition of their community (Abma & Krivo, 1991; Fischer & Marcum, 1984; Gurak, 1980; L. E. Hill & Johnson, 2004; Lopez & Sabagh, 1978). However, even when the relationship between migrant fertility and cultural variation has been analysed, it is hard to interpret the results of this research. In particular, there are inherent difficulties in evaluating associations between culture and fertility when culture is measured after childbearing has commenced (as in these papers). Individuals are usually at risk of having a child over at least a 30-year-long period, which raises questions about how and when to measure culture (including at what age or ages), how to measure fertility, and which method should be used to test the relationship between these various measures. Although some of the papers in the literature have used similar methods, or analysed more than one measure of culture, these same issues of interpretation also mean that it is also difficult to make

comparisons between different cultural measures and their relationship to migrant fertility.

Our research seeks to address a number of these issues. It aims to develop the existing literature by focusing on exposure to cultural norms, and carrying out an analysis using multiple measures of this exposure. Our central research question is whether migrant fertility differentials are associated with the normative environment that migrants are exposed to during childhood. Furthermore, we posit that the magnitude of these differentials may depend on the strength of exposure to a native or non-native normative environment, and that these in turn are related to the population composition of a migrant's childhood community. In other words, we would expect differences between migrant and native fertility to be smaller if migrants spend their childhood residing in a community that has a predominantly native population (which in turn increases their exposure to native fertility norms), and larger when the childhood community has a higher concentration of immigrants.

The analysis extends previous research by combining a number of other methodological developments, most of which are made possible by the use of longitudinal data for England and Wales. These data allow a link to be made between aggregate-level census data (from 1971) and individual-level census data and registered births (from 1971-2009), which in turn allows an investigation of the associations between childhood community and completed fertility. In our analyses, the population composition of a childhood community is measured in several different ways, in terms of absolute numbers, proportions, or levels of segregation, (as explained in later sections). This allows us to explore the reliability of each of these measures and the robustness of our empirical findings. Unlike previous research, culture is measured prior to childbearing, thereby avoiding issues of simultaneity or the possibility of conditioning on the future (which might be the case if culture were measured after childbearing had started). In addition, the use of completed fertility means that the results are not affected by missing data on future childbearing or by

differences between groups in the timing of childbearing. The analysis uses hierarchical (multi-level) models, which allows for some other area-level effects on fertility. Furthermore, results are obtained for both child migrants and the second generation, so that both groups can be compared with each other and benchmarked against a native norm. The inclusion of the second generation is important because they are less likely to have spent as much (if any) of their childhood living outside England and Wales.

The next section provides further theoretical background, including an overview of the hypothesised links between culture, community composition, and migrant fertility. Section 3 then provides a detailed discussion of the method, describing how the analysis builds upon and extends existing research. It also introduces the data set and the statistical models that are used for the analysis. This is followed by the analysis (section 4) and conclusion (section 5).

Background

Our research investigates the relationship between fertility and childhood community for different groups of migrants. This is motivated by an expectation that community composition is related to culture (in particular cultural preferences and norms), and that culture is associated with fertility. In this background section we first consider the literature on these two relationships, and then consider previous research on the specific links between community composition and fertility.

The relationship between culture and fertility

Although hard to define, culture has been conceptualised as a "*nested network of meanings*" (Bachrach, 2013, p. 1), which is continually evaluated by individuals through a process of social interaction (Hammel, 1990). As suggested by Davis and Blake (1956), we might expect that the most important cultural factors (for childbearing) are those that have the greatest influence on the proximate

determinants of fertility (Bongaarts, 1978), such as those that influence sexual behaviour, contraception, or partnership (Marin et al., 1993; Soler et al., 2000; Stephen, Rindfuss, & Bean, 1988). This aligns with the conceptual framework for migrant (and ethnic) fertility proposed by Forste and Tienda (1996). Their framework indicates that cultural factors may influence individual perceptions and goals relating to: (i) early childbearing, (ii) the sequencing of marriage and fertility, and (iii) completed fertility. As such, perceptions and goals can be seen as the factors that mediate the relationship between culture and completed fertility, either directly or through different stages of the childbearing life course. Culture has an influence on individual perceptions and goals through exposure to a normative environment, which in turn has an influence on childbearing, through associations with the proximate determinants of fertility. For many researchers, this process of environmentally-driven norm development is believed to take place largely during childhood. In particular, the *childhood socialisation* hypothesis predicts that migrant fertility levels will be driven by the fertility norms of the location in which migrants spend their childhood (Goldberg, 1959, 1960; Hervitz, 1985).

The relationship between residential community composition and culture

The influence of culture is an inherently spatial process, not least because residential location has an influence on individual interactions with the sources of cultural norms, such as social networks, families, and institutions (Coleman, 1994; Findley, 1980; Forste & Tienda, 1996). In its original formulation, segregation was seen as a barrier to the process by which all ethnic groups (including natives) may come to share a common culture (Burgess, 1928). With the development and revision of assimilation theory, this formulation has become more nuanced, but it remains clear that culture and residential context are intertwined (Alba & Nee, 2005; Portes & Zhou, 1993).

Despite this clarity, it remains uncertain precisely how culture and context are related, and how they interact to influence individual behaviour. As a first step, it may be important to recognise that culture is (at least partially) created through the dynamic relationship between individuals and social/macro environments (Bachrach, 2013). More specifically, it can be argued that individuals select their behaviour from a 'cultural repertoire' based upon the context in which they live (Hammel, 1990). In this sense, neighbourhood can be seen as a source of cultural influence (for some relevant discussions see: Knox & Pinch, 2006; Yancey, Ericksen, & Juliani, 1976; Zhou, 1997), which in turn has an influence on the processes by which individual preferences and norms are developed and expressed.

One of the most prominent assumptions of segregation research is that the population composition of a community, by ethnicity or country of birth, is indicative of the cultural milieu to which its residents are exposed (Forste & Tienda, 1996; Peach, 1996). It is worth noting that this assumption depends on at least two further conjectures: that community composition is a suitable proxy for cultural exposure (Ludi Simpson, 2004), and that actual exposure is the same as potential exposure (Hewstone, 2009; Sturgis, Brunton-Smith, Kuha, & Jackson, 2014). Also, we might note that: *"ethnicity is not a bag of norms producing automatic responses"* (Lopez & Sabagh, 1978, p. 1496), segregation might not lead to a failure to integrate (Vang, 2012), and evenness might not lead to contact (Massey & Denton, 1988). Nevertheless, community composition and cultural exposure are expected to be strongly associated, and this assumption is embedded within many of the theories and conceptual frameworks that have been developed by previous research on assimilation, segregation and ethnicity (e.g. Alba & Nee, 2005; Gordon, 1964; Park & Burgess, 1921).

The relationship between community composition and migrant fertility

The existence of linkages between segregation, culture, and fertility was first proposed at least 60 years ago (Lee & Lee, 1952). Since then, research has outlined in more detail how community composition is expected to influence childbearing because of exposure to different cultural norms (Abma & Krivo, 1991; Forste & Tienda, 1996; L. E. Hill & Johnson, 2004). These include the influence of community environment and community resources, both of which are related to the population composition of the community (e.g. the proportion of migrants, or the level of residential segregation). As such, community composition has an influence on adult supervision, peer groups, and role models, each of which may be particularly important for the development of perceptions and norms during childhood and adolescence (Brewster, 1994; Brewster, Billy, & Grady, 1993; Forste & Tienda, 1996; Hogan, Astone, & Kitagawa, 1985; Hogan & Kitagawa, 1985). In addition to shaping the uptake of cultural norms, the influences of local community factors and social context are likely to affect most stages of the childbearing life course (Findley, 1980). Similarly, previous research has anticipated a relationship between residential segregation and fertility (Coleman, 1994), which might be expected because they both relate to the processes of assimilation and integration (Duncan & Lieberson, 1959; Massey, 1981).

Using this motivation, a small number of studies have explored the links between community culture and migrant fertility, almost all of them in the US context. These studies can be further separated into those that measure fertility indirectly by studying adolescent sexual behaviour and contraceptive use (Brewster, 1994; Brewster et al., 1993; Hogan et al., 1985; Hogan & Kitagawa, 1985), and those that measure fertility directly. Of these, almost all studies have focussed on Mexican Americans (Abma & Krivo, 1991; Fischer & Marcum, 1984; Gurak, 1980; L. E. Hill & Johnson, 2004; Lopez & Sabagh, 1978),

although other contexts have also been studied (B. Nauck, 2007; Bernhard Nauck, 1987).

Studies using direct measures of fertility have focussed on the combination of cultural context and normative context (Abma & Krivo, 1991). In other words, they consider the community cultural norms relating to specific combinations of migrant origin, ancestry, and destination (which themselves explain much of the variation in migrant fertility differentials, e.g. Ford, 1990; Haug, Compton, & Courbage, 2002; Kahn, 1994; Sobotka, 2008; Zarate & Zarate, 1975). One of the first papers to study migrant fertility using measures of community culture was a study of Chicanos (i.e. Mexican Americans) living in Los Angeles. This study concluded that high Chicano fertility was explained, among other things, by community culture (Lopez & Sabagh, 1978). This study explored the fertility of a sample of women who had yet to complete their childbearing, and used a bespoke measure of community culture based on the *"ethnic homogeneity of neighborhood and husbands' fellow workers"* (Lopez & Sabagh, 1978, p. 1493). Similarly, a study of Mexican Americans in Austin (Texas) found a positive correlation between neighbourhood ethnic composition and Mexican American fertility (Fischer & Marcum, 1984). In explaining this result, the authors stated their expectation that: *"pronatalist Mexican American norms are reinforced in rough proportion to the extent of daily interaction with other Mexican Americans"* (Fischer & Marcum, 1984, p. 591).

Further evidence has been provided by research using a nationally representative sample of Mexican Americans, which found that fertility was positively associated with the percentage of Mexican Americans living in a neighbourhood (Gurak, 1980). Moreover, a study using 1980 US Census data showed a significantly higher probability of having of a birth within the last three years for Mexican Americans living in an area with a higher proportion of Mexican Americans (Abma & Krivo, 1991).

A more recent study of Mexican and Central Americans used nationally representative data from the US Current Population Survey in 1995 and 1998 to

explore the relationship between fertility (for different migrant generations), and a series of neighbourhood characteristics based on the US Census in 1990 (L. E. Hill & Johnson, 2004). Somewhat surprisingly, the results suggest that the number of children ever born may be lower in neighbourhoods with a higher percentage of Hispanics (or Asians). However, this result was not consistent across migrant generations.

Method

Taken together, the results of previous research suggest an ambiguous picture of the relationship between community composition, culture and migrant fertility. In part, this may be due to the use of methods and measures that are not the most appropriate for testing this relationship. In this section we discuss five decisions relating to research design and methodology, with regard to previous research, and with regard to the analysis undertaken here.

Building upon previous research

The first decision is how to measure fertility. Here we argue that completed fertility is the most appropriate measure for investigating the direct links between community culture and migrant fertility. Each of the previous studies (of these direct links) has considered populations of women who have yet to complete their childbearing (e.g. women aged 15 to 44), and only one of them attempted to consider completed fertility (by combinin actual births with fertility intentions: Fischer & Marcum, 1984). However, if only part of childbearing life course is considered, and not all women have completed childbearing, then research on migrant fertility is particularly susceptible to variations in birth timing between groups, and this can lead to erroneous conclusions about migrant fertility levels (Parrado, 2011; Parrado & Morgan, 2008; Toulemon & Mazuy, 2004). When comparing migrants and natives, it is likely that there will be differences in the timing of births because first

generation migrant fertility is known to be highly correlated with age at migration (Adserà, Ferrer, Sigle-Rushton, & Wilson, 2012; Andersson, 2004). Research on the distortion of migrant total fertility rates (TFRs) also shows that individual fertility can be elevated shortly after migration (Robards, 2012; Toulemon, 2004, 2006; Toulemon & Mazuy, 2004). These issues can be avoided by studying a sample of women who have completed their fertility.

The second decision to consider is when, during an individual's life course, to measure community composition. In the analysis that follows we use childhood measures, for two reasons. The first is theoretical. It is expected that childhood culture will have a strong influence on migrant fertility across the life course (Adserà et al., 2012), and that childhood is a critical period for the formation of cultural norms and preferences relating to childbearing (Forste & Tienda, 1996). The second is methodological. In previous research, community composition is measured at only one period of time, and this measurement occurs at different stages of the life course for different women in the study. This makes it difficult to interpret any association between community composition and fertility, which will depend upon the composition of the sample at a given moment in time. Although some migrants will remain resident in the same community after arrival, others will experience a variety of community contexts across their childbearing years (both before and after any specific time-point). One way around this might be to use a time varying measure of community context, but this would not resolve the selection problem that a migrant's fertility itself is likely to affect migration between communities (e.g. Hill Kulu, 2005; Zarate & Zarate, 1975). For example, if community context is measured during childbearing, then its relationship with fertility outcomes could be confounded by selective migration from cities to suburbs (H. Kulu & Boyle, 2009; Hill Kulu, Boyle, & Andersson, 2009; Hill Kulu & Washbrook, 2014). This complexity is avoided if we investigate community culture during childhood, measured prior to the commencement of childbearing. Supported by the theoretical relevance of investigating childhood measures, this is the approach taken here.

As a third consideration, it is necessary to decide how to measure community culture in a way that is appropriate for investigating migrant fertility. In the US studies discussed above, the most commonly used measure was the proportion of Mexican Americans living in the community. But a range of alternative measures can be proposed, not least when considering the many other candidates that are discussed in the literature on residential segregation (Massey, 1985; Massey & Denton, 1988). In this research, we use and compare a range of different measures, as explained later in this section.

The fourth methodological consideration is which variables, other than community composition, should be accounted for in the analysis in order to control for other characteristics, of the childhood community and of the individual, which may also be associated with fertility. As explained below, our analyses uses statistical multilevel models to account for community characteristics, with specific community-level and individual-level variables included as control variables. In addition to being constrained by the variables that are available in the LS data, the choice of covariates is informed by the fact that we are investigating area of residence in childhood. This means that mediating variables, which occur between childhood and the completion of fertility, are excluded. The covariates chosen for this analysis are therefore: birth cohort (age in 1971) and parental social class. These are described in more detail below.

The fifth consideration is how to define migrant and native generations, and which generations to consider in the analysis. Here, we focus on child migrants, who are defined as foreign-born women aged under-16 on arrival, and on the second generation, who are born in England and Wales, but have at least one foreign-born parent. In general, it can be argued that a more nuanced understanding of assimilation can be gained by distinguishing between the first and second generation (L. E. Hill & Johnson, 2004). This includes the advantage that the fertility of native-born women can be calculated without the inclusion of the second generation, who may otherwise distort the native norm.

Additionally, in the context of this study, the examination of second generation fertility has a further advantage because they are likely to have lived in native communities for the whole of their lives. This implies that any effect of community composition is less likely to be confounded than the results for child migrants, who will have lived abroad for at least part of their childhood.

Aiming to build upon previous research, this study therefore takes into account these issues in order to incorporate a number of methodological developments, and explores the association between completed fertility and a range of measures of community (cultural) composition. The analysis tests the childhood socialisation hypothesis, which predicts that: *migrant fertility is closer to native fertility for migrants who grow up in areas with a more dominant native community culture.* The results of this test will also provide insight into other cultural explanations, including assimilation and cultural entrenchment. The hypothesis is investigated using longitudinal data for England and Wales for both first generation child migrants and the second generation.

The data set

Our analysis uses individual-level data from the Office for National Statistics (ONS) Longitudinal Study (LS) (CeLSIUS, 2014; Dale, Creeser, Dodgeon, Gleave, & Filakti, 1993; ONS, 2014). The LS data set links decennial census data from the four censuses between 1971 and 2011 for a sample of around 1% of the population of England and Wales, i.e. a little over 500,000 individuals at each census and around one million over the course of the study (as new sample members are added in each decade). In addition, the LS contains register data on vital events, including births registered in England and Wales since 1971.

The accuracy of the LS data has been investigated in general (Blackwell, Lynch, Smith, & Goldblatt, 2003; Hattersley & Creeser, 1995), and with respect to migration and fertility (Hattersley, 1999; Robards, Berrington, & Hinde, 2011, 2013; Wilson, 2011). One problem with the data is that the immigration and emigration of LS members is sometimes not recorded (Robards et al., 2013), so

some immigrants may be missing from the dataset (although many missing immigrants will enter the LS dataset when they are recorded during the census after their migration). This issue is avoided here by restricting the sample to a specific cohort, namely those women who were aged under-16 in 1971 and who were included in the 1971 census. The analysis therefore excludes adult migrants who arrived after 1971. Our sample also excludes women who were not recorded in the 2001 census (due to death or emigration), and a small proportion of those who were recorded in the 2001 census (4%) who had missing values in the focal variables. Appendix table A1 shows the derivation of the final analytical sample, which includes 50,152 women. Of these, 44,168 are ancestral natives (UK-born women whose parents are both UK-born), 4,910 are from the second generation (UK-born women with at least one foreign-born parent, only 4% of whom had parents from different country of birth groups), and 1,074 are first generation child migrants (women born outside the UK who had moved to the UK by the time they were recorded in the 1971 census).

The variables

The dependent variable used throughout the analyses is an individual woman's completed fertility, defined as the total number of children the woman has had by the age of 40. This is calculated using the 'maximum method', which is the maximum number of births identified using either registered births or the own-child method (Wilson, 2011). Building upon previous research, we use several different measures of community composition. Each of them attempts to capture variation in childhood exposure to cultural norms, and is therefore measured using aggregate data from the 1971 Census (when all sample members are under-16) (UK Data Service, 2014). These data are for the entire census population in 1971. They were analysed separately and then linked to the individual-level data in the LS.

Before creating the variables, it was necessary to decide which level of geography should represent a community, and four alternatives were available

in the whole-census data. With approximate average population size in England in brackets, these were: county (1,000,000), local authority (38,000), ward (3,000) or enumeration district (450) (Martin, 2008). Local authorities were chosen, and this choice was guided by the aim of choosing the most appropriate area within which an individual would experience and absorb cultural norms relating to fertility. This included consideration of the likely range of individual mobility, including for travel to work, community activities, social activities, and partnership behaviour (e.g. marriage markets). It was also noted that previous research has cautioned against the use of very small areas *"because of neighborhood selectivity by family type"* (Abma & Krivo, 1991). In addition, we note the 'modifiable areal unit problem', which suggests that the result may be influenced by the choice of areal unit (Flowerdew, 2011; Openshaw, 1984).

Previously, the most common measure of community culture has been the proportion of total community population that share the same ethnicity as the ethnic group being studied. This can either be thought of as a measure of 'exposure to the same group', or as its inverse, a lack of exposure to other groups (L. Simpson, 2007, p. 407). We also use this approach, with some slight modifications. It has been argued that studies of minority fertility should consider the size of the minority population (Kennedy, 1973), and that there may be an effect of community population size on fertility (Findley, 1980), so we consider both the absolute size and relative proportion of the minority group. Also, we use country of birth instead of ethnicity as the variable on which the calculations are based, in order to focus on the influence of non-native or origin culture irrespective of self-identification. Ethnic groups include different generations of migrants, many of whom may have 'assimilated'. This implies that, had we used ethnic community composition instead, the results might be confounded by selection out of (and into) ethnic groups. Furthermore, in this analysis it was decided to use two different definitions of place of birth. The first is a crude measure which defines individuals as UK-born or not, thus placing the whole foreign-born population in one group. The second defines place of birth as the country of birth of each individual, and uses the most

detailed country of birth groups that were available in the data (which are shown later in table 1 and figure 2).

In addition to these measures of population size, we also considered residential segregation. This can be loosely defined as the geographical evenness of groups in an area (L. Simpson, 2007, p. 407), in other words, how the population of a group is distributed across smaller areas within the larger area of interest. To the best of our knowledge, this has not been considered before in research on migrant fertility. Here the smaller areas were taken to be wards within local authorities (LAs). The measure of residential segregation that we use is the index of dissimilarity (ID; see e.g. Simpson 2007), which is defined as follows. Let N_{igk} denote the total population size of group g in Ward k in LA i and $N_{ig} = \sum_k N_{igk}$ the size of the group in the LA overall, and let $N_{i\bar{g}k}$ and $N_{i\bar{g}} = \sum_k N_{i\bar{g}k}$ be the population sizes similarly of those who are not members of group g. The index of dissimilarity of group g in LA i is defined as $ID_{ig} = 0.5 \sum_k \left| N_{igk}/ N_{ig} - N_{i\bar{g}k}/ N_{i\bar{g}}) \right|$, where g depends upon the statistical model being estimated, and is either the entire foreign-born population (model A5), or the foreign-born population in the same country of birth (or parental country of birth) group as each migrant woman in the model (models A6, B3 and C3). The index of dissimilarity can take on values between 0 and 1.

The measures of community composition used here are therefore:

1. *The population of each Local Authority that is foreign-born, measured according to: (a) size, and (b) proportion*
2. *The population of each Local Authority that is in the same country of birth (or parental country of birth) group, by: (a) size, and (b) proportion*
3. *The index of dissimilarity at Local Authority level using Ward-level data, for (a) the foreign-born population, and (b) the population in the same country of birth (or parental country of birth) group*

It may be useful to note that in all of the models that are estimated, community composition is only measured for migrant women. In other words, non-migrant women are placed in a single group, and are not distinguished

according to levels of community composition. This is because we are focussed on the effect of community composition on migrant fertility.

One further consideration is the fact that regression results using the size or proportion of area-level populations are affected by the distribution of these measures over the areas themselves. This may be less of an issue if only one area-level measure is used, but it could create problems for studies such as this which seek to compare measures. It would also create problems here for the measures that match people to their country of birth groups. For example, the proportion of the population that is Irish in 1971 is on average far larger than the proportion that is Pakistani. As such, the magnitude of a variable that matches individuals to the proportion of their country of birth group will be far greater for the Irish-born, irrespective of whether the area has relatively high or relatively low levels of Irish culture (compared to the England and Wales average).

Given this issue, and the desire to compare results across measures, each measure was standardised by: (a) ranking the local authorities, (b) placing each local authority in one of three percentile groups to represent high, medium, and low levels of immigrant culture, and (c) assigning the percentile group as the measure of the composition of an individual's local authority. In most cases, the percentile groups that are used are: top 5%, 5-25%, and bottom 75%. These 'top-heavy' groupings are chosen because migrants are, on average, more likely to be resident in areas that have a higher number or proportion of migrants (or higher levels of residential segregation). In some analyses, for example when focusing on South Asian migrants only, different groupings were used because almost all individuals would have otherwise been classified into a single category.

The other variables used in the analysis are: birth cohort (age in 1971) and parental social class. These are measured for all sample members. Age is included as an indicator of birth cohort, and in particular because sample members have different ages in 1971 (when the childhood indicators are

measured). Parental social class is included in order to represent the socio-economic background in which children are raised, which may in turn affect their completed fertility.

The statistical models

Let Y_{igj} denote the completed fertility of individual j in area (local authority) i, where the individual belongs to ethnic group g. Conditional on the explanatory variables introduced below, Y_{igj} is taken to follow a Poisson distribution. To define explanatory variables for Y_{igj}, let Z_{1igj} be an indicator variable for whether or not the individual is a foreign-born child migrant, Z_{2igj} a similar indicator for the second generation (so both of these are 0 for ancestral natives), and $\boldsymbol{X}_{ig}$ a vector of indicator variables for the percentile groups, as defined above, for a particular measure of community composition of area i with respect to group g. The models may also include other individual-level explanatory variables $\boldsymbol{W}_{igj}$ and other area-level variables $\boldsymbol{V}_i$. Letting μ_{igj}denote the expected value of Y_{igj}, this is modelled as:

$$\log(\mu_{igj}) = \alpha_0 + \boldsymbol{\beta}_1[Z_{1igj}\boldsymbol{X}_{ig}] + \boldsymbol{\beta}_2[Z_{2igj}\boldsymbol{X}_{ig}] + \boldsymbol{\alpha}_1\boldsymbol{W}_{igj} + \boldsymbol{\alpha}_2\boldsymbol{V}_i + u_i \qquad (1)$$

, where u_i is a normally distributed random variable with mean 0 and variance σ_u^2, independent of the explanatory variables. The model is thus a Poisson log-linear model with a random intercept, a multilevel model (Goldstein, 1999; Jones, 1991) where the purpose of the random intercept u_i is to account for the remaining area-level variation after controlling for $\boldsymbol{V}_i$. All the models were estimated using Stata version 11.

In model (1), the elements of $\boldsymbol{\beta}_1$ are the regression coefficients associated with being a child migrant rather than ancestral native, for individuals in areas with different community compositions (as defined by $\boldsymbol{X}_{ig}$) and $\boldsymbol{\beta}_2$ are the coefficients for being a member of the second generation. The exponentiated value of an element $\boldsymbol{\beta}_1$ or $\boldsymbol{\beta}_2$ is the ratio of the expected completed fertility of a child migrant or a member of the second generation in an area of a particular

composition, relative to an ancestral native woman with the same characteristics $\boldsymbol{W}_{igj}$ in the same area. These ratios, labelled `IRR' in the tables below, are the quantities of foremost interest in our analyses.

Analysis

Summary statistics and completed fertility

Table 1 shows the number of ancestral natives in the sample, as well as the distribution of first generation child migrants and the second generation by ancestral group. The analysis is limited to the country groups shown in table 1 because these are the most detailed groups available in the aggregate data for the 1971 Census which were used to calculate the community composition variables. The groupings reflect international geography in 1971. For example, present-day Pakistan and Bangladesh are grouped together because Bangladesh was still in the process of being recognised as independent (including by some Census respondents).

[Table 1 about here]

Table 1 shows that there are more members of the second generation than first generation child migrants, both overall and for most ancestral groups. On average, child migrants have a higher completed fertility (2.06 children per woman) than ancestral natives (1.85), whereas second generation women have a lower completed fertility (1.77). This is shown in appendix table A2, which also indicates the distribution of other explanatory variables for these generations.

[Figure 2 about here]

Although these average levels of completed fertility are indicative of the childbearing of each generation, there is considerable variation by ancestry. Figure 2 shows the completed fertility of different ancestry and generation groups relative to ancestral natives. The most distinct ancestral group is

Pakistanis and Bangladeshis, who have around 50% higher completed fertility than natives for the first generation, and around 30% higher for the second. This is in contrast to New Commonwealth migrants from Asia/Oceania (including Hong Kong, Malaysia, and Singapore), as well as the residual category 'Rest of the world', where the first and second generation both have lower completed fertility than natives.

Models of completed fertility and exposure to community culture

Based on the childhood socialisation hypothesis that is tested here, the central question is whether completed fertility is closer to the native norm for migrants who grow up in areas with a more dominant native community culture. Table 3 shows the results of six different models, specified as explained in the previous section. The models use different measures of exposure to community cultural norms, and each model allows the association between exposure and completed fertility to be different for the first and second generation.

For example, the results of the first model (A1) show that there is no significant difference between the completed fertility of natives and those first generation migrants who live in (the 75% of) local authorities that had the smallest number of foreign-born residents (IRR=0.94). For this, and all other area rank results, the completed fertility of natives is the reference category (IRR=1.0).

[Table 3 about here]

Using a significance level of 5% (which is used throughout unless otherwise stated), there is also no significant difference between the completed fertility of natives and first generation migrants living in local authorities that were ranked in between the top 5% and the top 25% in terms of foreign-born population size (IRR=1.05). This is in contrast to those who are ranked in the top 5%, who do have significantly higher completed fertility (IRR=1.14). As such, we can conclude that a higher completed fertility than the native norm is

more likely for first generation migrants who arrived in England and Wales as children, and spent (some of) their childhood in the local authorities that had the largest numbers of foreign-born residents.

As with the rest of the models in table 3, this first model includes controls for age and parental social class. The effects of each of these are fairly constant across models. Women who are older (i.e. from an earlier birth cohort) have a slightly higher completed fertility, whereas women have fewer children if either of their parents were in a professional or intermediate social class in 1971.

Results for the first generation

The results of model A1 in table 3 suggest that first generation migrant women are less likely to have the same level of fertility as natives if they spend their childhood living in an area where they are less likely to be exposed to native culture. This interpretation depends upon the extent to which foreign-born population size is a valid indicator of exposure to native culture, and this issue of 'construct validity' (Shadish, Cook, & Campbell, 2002) is one motivation for testing a series of different measures, each of which is intended to represent exposure to cultural norms.

Considering the first generation alone, each of the six models in table 3 provides some evidence in support of the hypothesis that migrant fertility is closer to native fertility for migrants who grow up in areas with a more dominant native community culture. In the first five models, there is no significant difference between the completed fertility of natives and migrants who spent some of their childhood in local authorities where they were more likely to be exposed to native norms (in model A6 the result is just significant at 5% for migrants in the least segregated areas). This is in contrast to the significantly higher completed fertility for migrants who were least likely to be exposed to native norms (i.e. ranked in the top 5% of exposure to non-native norms). This is irrespective of the variable that is used to measure exposure to

native norms, (although there is some variation in point estimates and standard errors).

For example, migrants who spent their childhood in one of the 5% most segregated local authorities gave birth to 25% more children (on average) than natives, which was significantly more than both natives and migrants who spent their childhood in one of the 75% least segregated local authorities. This is substantively similar to the results using a measure of the proportion of population that is in same country of birth group as the respondent. With this measure, migrants who spent their childhood in a local authority that was ranked in the top 5% gave birth to 15% more children than natives, and they were not significantly different from those who spent their childhood in a local authority ranked in the lowest 75%. The results that use matched country of birth (shown in models A3 and A4) are important because they take some account of migrant heterogeneity.

Results for the second generation

Following the same logic as the results for the first generation, second generation completed fertility should be closer to the native norm for migrants who spent their childhood in areas where they were most likely to be exposed to this native norm (e.g. the least segregated areas). However, the results of all six models are inconsistent with this expectation. For example, second generation women who lived in the least segregated areas have significantly lower fertility than natives, whereas those who lived in the most segregated areas are not significantly different from the native norm (model A5).

An alternative way to interpret these results is to hypothesise that exposure to non-native norms has the effect of raising fertility (on average). When combined with the recognition that second generation fertility is on average lower than that of natives, this leads to the expectation that, similar to the first generation, second generation fertility will be higher for women who lived in areas that had a greater number or proportion of (similar) migrants, or

in areas that were more segregated. This explanation accords with the results to a greater extent, but the results still show considerable uncertainty. In particular, it is difficult to interpret the results because migrants are not separately identified by ancestral origin in these models.

South Asian ancestral groups

In order to take better account of cultural differences between migrant groups in a test of childhood socialisation, it is desirable to focus on singular ancestral origin groups. This analysis therefore focuses on South Asians, who are of particular interest in England and Wales because their fertility has typically been found to be higher than that of natives (Coleman, 1994; Coleman & Dubuc, 2010; Dubuc, 2012; Dubuc & Haskey, 2010; Sigle-Rushton, 2008). As shown in figure 2, the two first generation groups with the highest completed fertility are Pakistanis/Bangladeshis (who are combined throughout in this analysis) and Indians. For these two groups, as well as second generation Pakistanis/ Bangladeshis, their completed fertility is much higher than that of ancestral natives.

[Table 4 about here]

[Table 5 about here]

Considering these ancestral groups separately, the results for Pakistani/Bangladeshi ancestry provide further evidence in support of the childhood socialisation hypothesis (table 4). Using area level variables that are matched to the same ancestral group – i.e. the size or proportion of population from Pakistan/Bangladesh – there is a significant and substantial difference in completed fertility between natives and first generation migrants who lived in the highest 2% of local authorities (i.e. those most likely to be exposed to the cultural norms of Pakistan/Bangladesh). This compares with those Pakistanis/Bangladeshis who lived in local authorities which had the lowest number or proportion of Pakistanis/Bangladeshis, whose completed fertility is

not significantly higher than the native norm (in the case of population size) and is comparatively smaller (in the case of both size and proportion).

Importantly, the results for second generation Pakistani/Bangladeshi women follow a similar and more striking pattern, such that growing up in an area with a high likelihood of exposure to Pakistani/Bangladeshi cultural norms is associated with having significantly higher completed fertility than natives. Those who grew up in the highest 2% of local authorities (by size and proportion) had 50% more children than natives (a result which is significant), whereas the completed fertility of those in the lowest 95% was not significantly different from the native norm. This pattern is similar when the analysis is repeated using the ranked index of dissimilarity for Pakistanis/Bangladeshis. Based on these results, it would appear that the higher fertility of both first and second generation women from Pakistan/Bangladesh may be partially explained by childhood socialisation.

Similar results for women of Indian ancestry are shown in table 5. On average, first generation Indians have higher fertility than natives, and as with the results for women from Pakistan/Bangladesh, at least some of this difference can be explained by the different community composition in which Indian women spend their childhood. At the 5% level, completed fertility was significantly higher than that of natives for those who lived in local authorities with the largest number and highest proportion of Indians. Completed fertility was not significantly higher for those who lived in local authorities with the smallest number and lowest proportions. The same result is evident when the analysis was repeated using the index of dissimilarity, calculated for the Indian population. Although the results the second generation Indians showed similar patterns to the results for second generation Pakistanis/Bangladeshis, none of the area level variables were significant at the 5% level, except for those in the areas which had the highest index of dissimilarity.

Conclusion

Despite the fact that culture is implicit in the majority of theories about migrant fertility, very few studies of migrant fertility have explored measures of cultural difference, beyond indicators of ethnicity and country of birth. Spatial dimensions of cultural difference have rarely been considered, and when they have, studies have derived conflicting conclusions about the existence, and the direction, of an association between migrant fertility and exposure to normative cultural environments.

This research set out to address this issue, and to test the childhood socialisation hypothesis, which predicts that migrant fertility is closer to native fertility for migrants who grow up in areas with a more dominant native community culture. This research used a range of measures for childhood cultural exposure, and applied several other methodological developments. This included strategies to take account of migrant heterogeneity by ancestry: differentiating between the first and second generation, using a measure of community composition that matches each individual's country of birth group, and carrying out separate analyses of two South Asian groups, Indians and Pakistanis/Bangladeshis. Although the findings here are certainly not unanimous, they provide consistent evidence for the childhood socialisation hypothesis.

In general, first generation migrants who were more likely to be exposed to native cultural norms as children did not have significantly different completed fertility than the native norm. The results were less conclusive for the second generation, although they suggest that exposure to ancestral culture may explain some of the variation in completed fertility for Pakistani/ Bangladeshis, the only second generation group to have significantly higher completed fertility than natives. These results suggest one reason why the fertility of some South Asian immigrants and their descendants might remain culturally entrenched, namely they show that an increased exposure to South

Asian cultural norms may promote or reinforce preferences for a higher completed fertility than is the norm in England and Wales. For Pakistanis/ Bangladeshis, this also holds for the second generation. Given the novelty of this finding, it is recommended that further work be carried out to explore the links between community culture and fertility for second (and subsequent) migrant generations. Residential segregation is expected to reduce over time for the children of immigrants (Massey & Denton, 1985; Waters & Jiménez, 2005), so it would also be useful to incorporate a changing measure of community culture in this analysis.

The existence of 'exposure to cultural norms' as a mechanism for influencing migrant fertility has implications for assimilation theory. As well as suggesting more research is needed to identify other mechanisms of fertility assimilation, it also suggests a fruitful avenue for further research, namely to investigate the connection between different assimilation outcomes. Our analysis highlights the value of considering the association between two dimensions of assimilation, namely residential segregation and fertility, and offers some support for the fact that assimilation outcomes are interconnected. The results are also important for understanding one reason why migrant fertility might vary from that of natives. This requires further investigation, but provides some valuable insight that can be used by policy-makers and those who are preparing population projections.

As discussed prior to the analysis however, there are several potential challenges to the conclusions that are given above. Chief among these is the extent to which community composition represents exposure to cultural norms. It is true to say that exposure does not necessarily imply either contact or changing fertility preferences. This inference is provided by theory, and further evidence is required in order to test the assumption that community composition is an appropriate proxy measure of cultural influences on fertility behaviour. Further research is also required to determine the extent to which these results might be susceptible to their reliance upon the measurement of

childhood community culture in a single year (which cannot be tested using the LS data because it only allows this to be measured for 1971). It may be that the results are affected, to a greater extent than is assumed here, by changing population composition, area social contiguity, and migration. It could be argued that some communities are more established than others, and better able to transmit cultural norms, irrespective of population composition.

It is interesting to note that more recent incarnations of assimilation theory have argued for a notion of composite culture, which moves beyond the consideration of static cultural groups delineated by ethnic boundaries (Alba & Nee, 2005). As mentioned, the ancestry groups that are used here were restricted in detail by data availability, and it would certainly be desirable to have more detailed groups. Also, future research would benefit from including measures of attitudes, preferences and norms relating to ancestral culture, as well as perceptions of the destination (the country or the area). It would also be useful to include measures that show whether the first and second generation have links to their ancestral origin country (e.g. relatives left behind, return visits, remittances), as this may be another source of cultural norms. Finally, despite the methodological challenges, it is recommended that research be carried out to investigate how changes in community composition over the childbearing life course are related to the level and timing of migrant fertility. As shown here, the analysis of community composition and its relationship to later life outcomes has the potential to provide a better understanding of the links between spatial variation and demographic events. More research on the changing nature of links between community and fertility can only serve to develop this further.

References

Abma, J. C., & Krivo, L. J. (1991). The Ethnic Context of Mexican American Fertility. *Sociological Perspectives*, *34*(2), 145–164.

Adserà, A., & Ferrer, A. (2014). Factors influencing the fertility choices of child immigrants in Canada. *Population Studies*, *68*(1), 65–79. http://doi.org/10.1080/00324728.2013.802007

Adserà, A., Ferrer, A. M., Sigle-Rushton, W., & Wilson, B. (2012). Fertility Patterns of Child Migrants Age at Migration and Ancestry in Comparative Perspective. *The ANNALS of the American Academy of Political and Social Science*, *643*(1), 160–189. http://doi.org/10.1177/0002716212444706

Alba, R., & Nee, V. (2005). *Remaking the American mainstream: Assimilation and contemporary immigration*. Harvard University Press.

Andersson, G. (2004). Childbearing after Migration: Fertility Patterns of Foreign-born Women in Sweden. *International Migration Review*, *38*(2), 747–774.

Bachrach, C. A. (2013). Culture and Demography: From Reluctant Bedfellows to Committed Partners. *Demography*. http://doi.org/10.1007/s13524-013-0257-6

Bean, F. D., & Swicegood, G. (1985). *Mexican American fertility patterns*. University of Texas Press Austin.

Blackwell, L., Lynch, K., Smith, J., & Goldblatt, P. (2003). *Longitudinal study 1971-2001: completeness of census linkage*. London: Office for National Statistics. Retrieved from http://www.census2001.gov.uk/downloads/theme-population/LS-no.10.pdf

Bongaarts, J. (1978). A Framework for Analyzing the Proximate Determinants of Fertility. *Population and Development Review*, *4*(1), 105–132. http://doi.org/10.2307/1972149

Brewster, K. L. (1994). Neighborhood context and the transition to sexual activity among young black women. *Demography*, *31*(4), 603–614. http://doi.org/10.2307/2061794

Brewster, K. L., Billy, J. O. G., & Grady, W. R. (1993). Social Context and Adolescent Behavior: The Impact of Community on the Transition to Sexual Activity. *Social Forces*, *71*(3), 713–740. http://doi.org/10.2307/2579892

Burgess, E. W. (1928). Residential Segregation in American Cities. *Annals of the American Academy of Political and Social Science*, *140*, 105–115.

CeLSIUS. (2014). Centre for Longitudinal Study Information and User Support. Retrieved January 2, 2014, from http://www.ucl.ac.uk/celsius

Cleland, J., & Wilson, C. (1987). Demand Theories of the Fertility Transition: An Iconoclastic View. *Population Studies*, *41*(1), 5–30. http://doi.org/10.1080/0032472031000142516

Coleman, D. A. (1994). Trends in fertility and intermarriage among immigrant populations in Western Europe as measures of integration. *Journal of Biosocial Science*, *26*(01), 107–136.

Coleman, D. A., & Dubuc, S. (2010). The fertility of ethnic minorities in the UK, 1960s–2006. *Population Studies*, *64*, 19–41. http://doi.org/10.1080/00324720903391201

Dale, A., Creeser, R., Dodgeon, B., Gleave, S., & Filakti, H. (1993). An introduction to the OPCS Longitudinal Study. *Environment and Planning A*, *25*(10), 1387 – 1398. http://doi.org/10.1068/a251387

Davis, K., & Blake, J. (1956). Social Structure and Fertility: An Analytic Framework. *Economic Development and Cultural Change*, *4*(3), 211–235.

Dubuc, S. (2012). Immigration to the UK from High-Fertility Countries: Intergenerational Adaptation and Fertility Convergence. *Population and Development Review*, *38*(2), 353–368. http://doi.org/10.1111/j.1728-4457.2012.00496.x

Dubuc, S., & Haskey, J. (2010). Ethnicity and Fertility in the United Kingdom. In J. Stillwell & M. Ham (Eds.), *Ethnicity and Integration* (pp. 63–81). Dordrecht: Springer Netherlands. Retrieved from http://www.springerlink.com.gate2.library.lse.ac.uk/content/x75262030127783t/

Duncan, O. D., & Lieberson, S. (1959). Ethnic segregation and assimilation. *American Journal of Sociology*, *64*(4), 364–374.

Fernández, R., & Fogli, A. (2009). Culture: An Empirical Investigation of Beliefs, Work, and Fertility. *American Economic Journal: Macroeconomics*, *1*(1), 146–177. http://doi.org/10.1257/mac.1.1.146

Findley, S. E. (1980). A suggested framework for analysis of urban-rural fertility differentials with an illustration of the Tanzanian case. *Population and Environment*, *3*(3-4), 237–261. http://doi.org/10.1007/BF01255341

Fischer, N. A., & Marcum, J. P. (1984). Ethnic Integration, Socioeconomic Status, and Fertility Among Mexican Americans. *Social Science Quarterly (University of Texas Press)*, *65*(2), 583–593.

Flowerdew, R. (2011). How serious is the Modifiable Areal Unit Problem for analysis of English census data? *Population Trends*, (145), 102–14.

Ford, K. (1990). Duration of Residence in the United States and the Fertility of US Immigrants. *International Migration Review*, *24*(1), 34–68.

Forste, R., & Tienda, M. (1996). What's Behind Racial and Ethnic Fertility Differentials? *Population and Development Review*, *22*, 109–133. http://doi.org/10.2307/2808008

Fricke, T. (2003). Culture and Causality: An Anthropological Comment. *Population and Development Review*, *29*(3), 470–479. http://doi.org/10.1111/j.1728-4457.2003.00470.x

Gjerde, J., & McCants, A. (1995). Fertility, marriage, and culture: Demographic processes among Norwegian immigrants to the rural middle west. *The Journal of Economic History*, *55*(04), 860–888.

Goldberg, D. (1959). The Fertility of Two-Generation Urbanites. *Population Studies*, *12*(3), 214–222. http://doi.org/10.2307/2171971

Goldberg, D. (1960). Another Look at the Indianapolis Fertility Data. *The Milbank Memorial Fund Quarterly*, *38*(1), 23–36. http://doi.org/10.2307/3348618

Goldscheider, C., & Uhlenberg, P. R. (1969). Minority Group Status and Fertility. *American Journal of Sociology*, *74*(4), 361–372.

Goldstein, H. (1999). *Multilevel statistical models*. Retrieved from http://www.ats.ucla.edu/stat/examples/msm_goldstein/goldstein.pdf

Gordon, M. M. (1964). *Assimilation in American life: The role of race, religion, and national origins*. Oxford University Press, USA.

Gurak, D. T. (1980). Assimilation and fertility: A comparison of Mexican American and Japanese American women. *Hispanic Journal of Behavioral Sciences*.

Hammel, E. A. (1990). A Theory of Culture for Demography. *Population and Development Review*, *16*(3), 455–485. http://doi.org/10.2307/1972832

Hattersley, L. (1999). *LS User Guide 18: International migration data in the Longitudinal Study*.

Hattersley, L., & Creeser, R. (1995). *Longitudinal study 1971-1991: history, organisation and quality of data*. London: Office of Population Censuses and Surveys, H.M.S.O.

Haug, W., Compton, P., & Courbage, Y. (2002). *The demographic characteristics of immigrant populations*. Council of Europe.

Hervitz, H. M. (1985). Selectivity, adaptation, or disruption? A comparison of alternative hypotheses on the effects of migration on fertility: The case of Brazil. *International Migration Review*, *19*(2), 293–317.

Hewstone, M. (2009). *Living Apart, Living Together?: The Role of Intergroup Contact in Social Integration*. Max Planck Institute for the Study of Religious and Ethnic Diversity.

Hill, J. A. (1913). Comparative Fecundity of Women of Native and Foreign Parentage in the United States. *Publications of the American Statistical Association*, *13*(104), 583–604. http://doi.org/10.2307/2965013

Hill, L. E., & Johnson, H. P. (2004). Fertility Changes Among Immigrants: Generations, Neighborhoods, and Personal Characteristics. *Social Science Quarterly*, *85*(3), 811–827. http://doi.org/10.1111/j.0038-4941.2004.00246.x

Hogan, D. P., Astone, N. M., & Kitagawa, E. M. (1985). Social and Environmental Factors Influencing Contraceptive Use Among Black Adolescents. *Family Planning Perspectives*, *17*(4), 165–169. http://doi.org/10.2307/2135241

Hogan, D. P., & Kitagawa, E. M. (1985). The Impact of Social Status, Family Structure, and Neighborhood on the Fertility of Black Adolescents. *American Journal of Sociology*, *90*(4), 825–855.

Johnson-Hanks, J., Bachrach, C. A., Morgan, S. P., & Kohler, H.-P. (2011). *Understanding family change and variation : toward a theory of conjunctural action*. Dordrecht; New York: Springer.

Jones, K. (1991). Specifying and Estimating Multi-Level Models for Geographical Research. *Transactions of the Institute of British Geographers*, *16*(2), 148–159. http://doi.org/10.2307/622610

Kahn, J. R. (1994). Immigrant and native fertility during the 1980s: adaptation and expectations for the future. *International Migration Review*, *28*(3), 501–519.

Kennedy, R. E. (1973). Minority Group Status and Fertility: The Irish. *American Sociological Review*, *38*(1), 85–96. http://doi.org/10.2307/2094333

Kertzer, D. I. (1997). The proper role of culture in demographic explanation. In G. W. Jones, R. M. Douglas, J. C. Caldwell, & R. M. D'Souza (Eds.), *The Continuing Demographic Transition* (pp. 137–157). Oxford: Oxford University Press.

Knox, P. L., & Pinch, S. (2006). *Urban social geography: an introduction*. Pearson Education.

Kuczynski, R. R. (1901). The Fecundity of the Native and Foreign born Population in Massachusetts (I.). *The Quarterly Journal of Economics*, *16*(1), 1–36. http://doi.org/10.2307/1882901

Kuczynski, R. R. (1902). The Fecundity of the Native and Foreign born Population in Massachusetts (II.). *The Quarterly Journal of Economics*, *16*(2), 141.

Kulu, H. (2005). Migration and Fertility: Competing Hypotheses Re-examined. *European Journal of Population / Revue Européenne de Démographie*, *21*(1), 51–87. http://doi.org/10.1007/s10680-005-3581-8

Kulu, H., & Boyle, P. J. (2009). High Fertility in City Suburbs: Compositional or Contextual Effects? *European Journal of Population / Revue Européenne de Démographie*, *25*(2), 157–174. http://doi.org/10.1007/s10680-008-9163-9

Kulu, H., Boyle, P. J., & Andersson, G. (2009). High Suburban Fertility: Evidence from Four Northern European Countries. *Demographic Research*, *21*, 915–944. http://doi.org/10.4054/DemRes.2009.21.31

Kulu, H., & Washbrook, E. (2014). Residential context, migration and fertility in a modern urban society. *Advances in Life Course Research*, *21*, 168–182. http://doi.org/10.1016/j.alcr.2014.01.001

La Ferrara, E., Chong, A., & Duryea, S. (2012). Soap Operas and Fertility: Evidence from Brazil. *American Economic Journal: Applied Economics*, *4*(4), 1–31. http://doi.org/10.1257/app.4.4.1

Lee, E. S., & Lee, A. S. (1952). The Differential Fertility of the American Negro. *American Sociological Review*, *17*(4), 437–447. http://doi.org/10.2307/2087999

Lesthaeghe, R., & Surkyn, J. (1988). Cultural Dynamics and Economic Theories of Fertility Change. *Population and Development Review*, *14*(1), 1–45. http://doi.org/10.2307/1972499

Lichter, D. T., Johnson, K. M., Turner, R. N., & Churilla, A. (2012). Hispanic Assimilation and Fertility in New U.S. Destinations. *International Migration Review*, *46*(4), 767–791. http://doi.org/10.1111/imre.12000

Liefbroer, A. C., & Billari, F. C. (2010). Bringing norms back in: a theoretical and empirical discussion of their importance for understanding demographic behaviour. *Population, Space and Place*, *16*(4), 287–305. http://doi.org/10.1002/psp.552

Lopez, D. E., & Sabagh, G. (1978). Untangling structural and normative aspects of the minority status-fertility hypothesis. *American Journal of Sociology*, *83*(6), 1491–1497.

Lorimer, F. (1956). Culture and Human Fertility. *Journal of School Health*, *26*(4), 136–136. http://doi.org/10.1111/j.1746-1561.1956.tb00823.x

Marin, B. V. O., Gomez, C. A., & Hearst, N. (1993). Multiple Heterosexual Partners and Condom Use among Hispanics and Non-Hispanic Whites. *Family Planning Perspectives*, *25*(4), 170–174. http://doi.org/10.2307/2135925

Martin, D. (2008, February 29). Census geography: England 1971 [Text]. Retrieved January 2, 2014, from http://www.restore.ac.uk/geo-refer/31425dengs00y19711980.php

Massey, D. S. (1981). Dimensions of the New Immigration to the United States and the Prospects for Assimilation. *Annual Review of Sociology*, *7*, 57–85. http://doi.org/10.1146/annurev.so.07.080181.000421

Massey, D. S. (1985). Ethnic residential segregation: A theoretical synthesis and empirical review. *Sociology and Social Research*, *69*(3), 315–350.

Massey, D. S., & Denton, N. A. (1985). Spatial Assimilation as a Socioeconomic Outcome. *American Sociological Review*, *50*(1), 94–106. http://doi.org/10.2307/2095343

Massey, D. S., & Denton, N. A. (1988). The Dimensions of Residential Segregation. *Social Forces*, *67*(2), 281–315. http://doi.org/10.1093/sf/67.2.281

Nauck, B. (1987). Individuelle und kontextuelle Faktoren der Kinderzahl in türkischen Migrantenfamilien. Ein Replikationsversuch bevölkerungsstatistischer Befunde durch Individualdaten. *Zeitschrift Für Bevölkerungswissenschaft*, *13*(3), 319–344.

Nauck, B. (2007). Immigrant families in Germany. Family change between situational adaptation, acculturation, segregation and remigration. *Zeitschrift Für Familienforschung*, *19*(1), 34–54.

ONS. (2014). The ONS Longitudinal Study. Retrieved January 2, 2014, from http://www.ons.gov.uk/ons/guide-method/user-guidance/longitudinal-study/index.html

Openshaw, S. (1984). Ecological fallacies and the analysis of areal census data. *Environment and Planning A*, *16*(1), 17 – 31. http://doi.org/10.1068/a160017

Park, R. E., & Burgess, E. W. (1921). *Introduction to the Science of Sociology*. Chicago: University of Chicago Press.

Parrado, E. A. (2011). How High is Hispanic/Mexican Fertility in the United States? Immigration and Tempo Considerations. *Demography*, *48*(3), 1059–1080. http://doi.org/10.1007/s13524-011-0045-0

Parrado, E. A., & Morgan, S. P. (2008). Intergenerational Fertility Among Hispanic Women: New Evidence of Immigrant Assimilation. *Demography*, *45*(3), 651–671.

Peach, C. (1996). Good segregation, bad segregation. *Planning Perspectives*, *11*(4), 379–398. http://doi.org/10.1080/026654396364817

Portes, A., & Zhou, M. (1993). The new second generation: Segmented assimilation and its variants. *The Annals of the American Academy of Political and Social Science*, *530*(1), 74–96.

Robards, J. (2012, June). *Estimating the fertility of recent migrants to England and Wales (1991-2001) – is there an elevated level of fertility after migration?* Presented at the European Population Conference, Stockholm University.

Robards, J., Berrington, A., & Hinde, A. (2011). Estimating fertility rates using the ONS Longitudinal Study-what difference does the inclusion of non-continually resident members make? *Population Trends*, *144*.

Robards, J., Berrington, A., & Hinde, A. (2013). Identifying biases arising from combining census and administrative data – the fertility of migrants in the Office for National Statistics Longitudinal Study. *Longitudinal and Life Course Studies*, *4*(3), 258–267.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin.

Sigle-Rushton, W. (2008). England and Wales: Stable fertility and pronounced social status differences. *Demographic Research*, *19*(15), 455–502.

Simpson, L. (2004). Statistics of racial segregation: measures, evidence and policy. *Urban Studies*, *41*(3), 661–681. http://doi.org/10.1080/0042098042000178735

Simpson, L. (2007). Ghettos of the mind: the empirical behaviour of indices of segregation and diversity. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *170*(2), 405–424.

Sobotka, T. (2008). Overview Chapter 7: The rising importance of migrants for childbearing in Europe. *Demographic Research*, *19*, 225–248. http://doi.org/10.4054/DemRes.2008.19.9

Soler, H., Quadagno, D., Sly, D. F., Riehman, K. S., Eberstein, I. W., & Harrison, D. F. (2000). Relationship Dynamics, Ethnicity and Condom Use among Low-Income Women. *Family Planning Perspectives*, *32*(2), 82–101. http://doi.org/10.2307/2648216

Sorenson, A. M. (1988). The Fertility and Language Characteristics of Mexican-American and Non-Hispanic Husbands and Wives. *The Sociological Quarterly*, *29*(1), 111–130. http://doi.org/10.2307/4121576

Stephen, E. H., Rindfuss, R. R., & Bean, F. D. (1988). Racial differences in contraceptive choice: Complexity and implications. *Demography*, *25*(1), 53–70. http://doi.org/10.2307/2061477

Sturgis, P., Brunton-Smith, I., Kuha, J., & Jackson, J. (2014). Ethnic diversity, segregation and the social cohesion of neighbourhoods in London. *Ethnic and Racial Studies*, *37*(8), 1–21. http://doi.org/10.1080/01419870.2013.831932

Swicegood, G., Bean, F. D., Stephen, E. H., & Opitz, W. (1988). Language usage and Fertility in the Mexican-Origin Population of the United States. *Demography*, *25*(1), 17–33. http://doi.org/10.2307/2061475

Toulemon, L. (2004). Fertility among immigrant women: new data, a new approach. *Population & Societies*, *400*. Retrieved from http://www.ined.fr/en/publications/pop_soc/bdd/publication/540/

Toulemon, L. (2006). *Fertility Among Immigrant Women in France: New Data, a New Approach*. Prepared for Population Association of American 2006 Annual Meeting, Los Angeles, California, March 30-April 1, 2006.

Toulemon, L., & Mazuy, M. (2004). *Comment prendre en compte l'âge à l'arrivée et la durée de séjour en France dans la mesure de la fécondité des immigrants?* INED. Retrieved from http://www.ined.fr/fichier/t_publication/1053/publi_pdf1_120.pdf

UK Data Service. (2014). Casweb | UK Data Service Census Support. Retrieved January 2, 2014, from http://casweb.mimas.ac.uk/

Vang, Z. M. (2012). The Limits of Spatial Assimilation for Immigrants' Full Integration Emerging Evidence from African Immigrants in Boston and Dublin. *The ANNALS of the American Academy of Political and Social Science*, *641*(1), 220–246. http://doi.org/10.1177/0002716211432280

Waters, M. C., & Jiménez, T. R. (2005). Assessing Immigrant Assimilation: New Empirical and Theoretical Challenges. *Annual Review of Sociology*, *31*(1), 105–125. http://doi.org/10.1146/annurev.soc.29.010202.100026

Wilson, B. (2011, August 19). *Migrant fertility in England and Wales: Measuring fertility convergence* (Masters dissertation). London School of Economics and Political Science, London.

Yancey, W. L., Ericksen, E. P., & Juliani, R. N. (1976). Emergent Ethnicity: A Review and Reformulation. *American Sociological Review*, *41*(3), 391–403. http://doi.org/10.2307/2094249

Zarate, A., & Zarate, A. U. de. (1975). On the reconciliation of research findings of migrant-nonmigrant fertility differentials in urban areas. *International Migration Review*, *9*(2), 115–156.

Zhou, M. (1997). Segmented Assimilation: Issues, Controversies, and Recent Research on the New Second Generation. *International Migration Review*, *31*(4), 975–1008. http://doi.org/10.2307/2547421

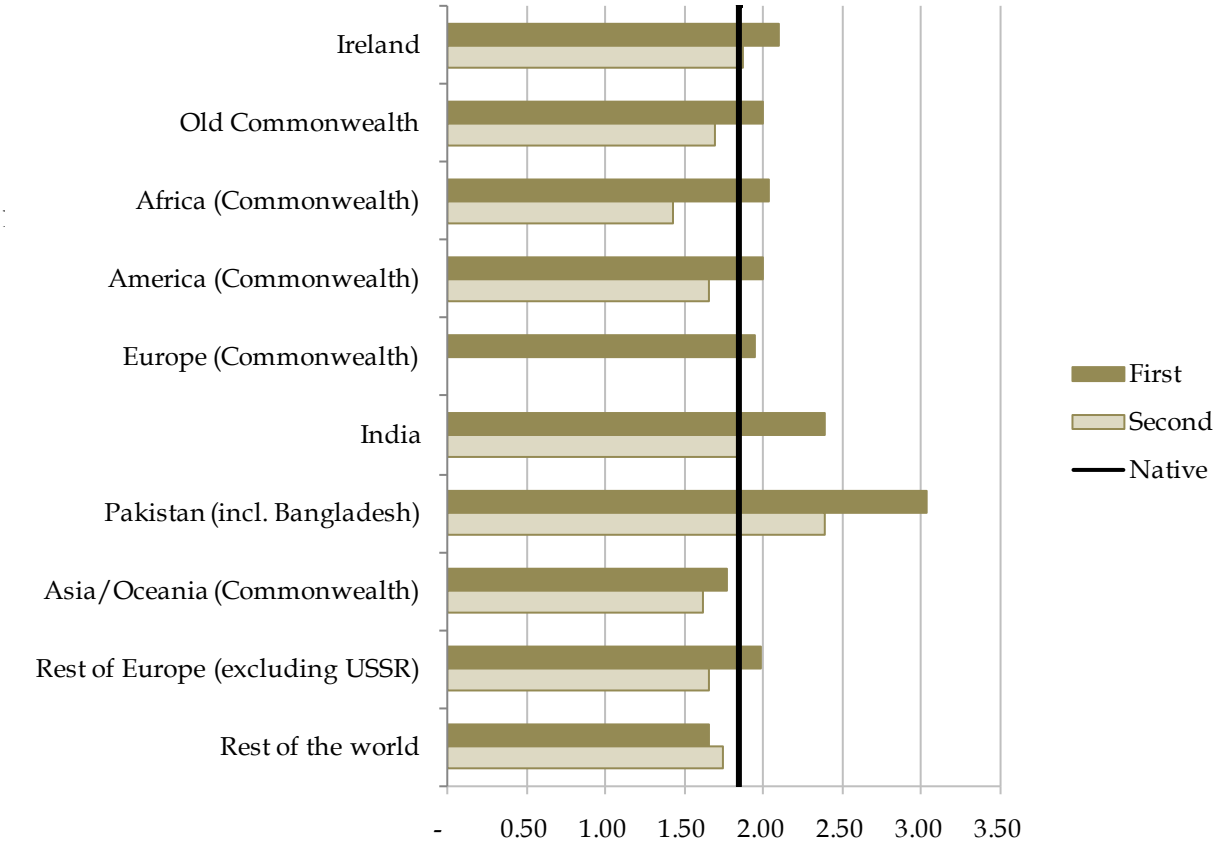
Tables and figures

Table 1: Frequencies by generation and (ancestral) country of birth

Ancestral country of birth: using 1971 codes	Second generation	% of total	Child migrants	% of total
England & Wales [1]				
Ireland	1,776	36	58	5
Old Commonwealth	145	3	76	7
Africa (Commonwealth)	126	3	185	17
America (Commonwealth)	746	15	84	8
Europe (Commonwealth)	0	-	96	9
India	433	9	145	14
Pakistan (incl. Bangladesh)	115	2	72	7
Asia/Oceania (Commonwealth)	69	1	97	9
Rest of Europe (excluding USSR)	953	19	194	18
Rest of the world	334	7	67	6
Parents from different COB groups	213	4		
Total	**4,910**		**1,074**	

1: The total number of ancestral natives is 44,168; Source: Author's analysis using Office for National Statistics Longitudinal Study data.

Figure 2: The completed fertility of different ancestry and generation groups relative to ancestral natives



Note: The figure shows the mean completed fertility for migrants (by generation and ancestry) relative to the average cumulative number of births for natives (which is equal to 1.85); There are no second generation women from the European Commonwealth; Source: Author's analysis using Office for National Statistics Longitudinal Study data.

Table 3: Exposure to community culture and its association with migrant fertility (models for all migrants)

	model A1		model A2		model A3		model A4		model A5		model A6	
	Ranked size of foreign-born population		Ranked proportion of population that is foreign-born		Ranked size of individual's COB group population		Ranked proportion of population that is same COB group		Ranked index of dissimilarity		Ranked index of dissimilarity of individual's COB group population	
Variable	**IRR**	**SE**	**IRR**	**SE**	**IRR**	**SE**	**IRR**	**SE**	**IRR**	**SE**	**IRR**	**SE**
Factors measured for migrants only												
Area rank: foreign-born child migrants												
Top 5%	1.14	0.03	1.09	0.04	1.15	0.03	1.13	0.03	1.25	0.06		
5-25%	1.05	0.04	1.12	0.04	1.00	0.04	1.07	0.05	1.14	0.04	1.16	0.05
Lower 75%	0.94	0.05	1.02	0.04	0.96	0.05	1.00	0.04	0.97	0.03	1.05	0.03
Area rank: second generation												
Top 5%	0.95	0.01	0.96	0.02	0.96	0.01	0.97	0.02	0.95	0.03		
5-25%	0.97	0.02	0.94	0.02	0.96	0.02	0.92	0.02	0.97	0.02	0.96	0.02
Lower 75%	0.90	0.02	0.94	0.02	0.90	0.02	0.93	0.02	0.93	0.01	0.94	0.01
Covariates (for all sample members)												
Parental social class (in 1971)												
Either parent has high SEC	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Neither parent has high SEC	1.12	0.01	1.12	0.01	1.12	0.01	1.12	0.01	1.12	0.01	1.12	0.01
SEC unknown for both parents	1.20	0.02	1.20	0.02	1.20	0.02	1.20	0.02	1.20	0.02	1.20	0.02
Age (in 1971)	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00

Note: COB = Country of birth; The outcome for all models is completed fertility (the number of children born to each woman up to 2009); All results are obtained from hierarchical multilevel Poisson models where women are nested in Local Authorities; Source: Author's analysis using Office for National Statistics Longitudinal Study data.

Table 4: Community culture and fertility - models for Pakistanis/Bangladeshis

	model B1		model B2		model B3	
	Ranked size of Pakistani population		Ranked proportion of population that is Pakistani		Ranked index of dissimilarity	
Variable	**IRR**	**SE**	**IRR**	**SE**	**IRR**	**SE**
Factors measured for Pakistanis/Bangladeshis only						
Area rank: child migrants						
Top 2%	1.61	0.16	1.74	0.24		
3-5%	1.71	0.17	1.63	0.15		
Bottom 95%	1.31	0.26	1.46	0.20		
Top 40%					1.75	0.15
Bottom 60%					1.40	0.16
Area rank: second generation						
Top 2%	1.57	0.13	1.56	0.20		
3-5%	1.29	0.14	1.49	0.13		
Bottom 95%	0.95	0.14	1.04	0.11		
Top 40%					1.41	0.10
Bottom 60%					1.18	0.13
Covariates (for all sample members)						
Age (in 1971)	1.01	0.00	1.01	0.00	1.01	0.00

Note: The outcome for all models is completed fertility (the number of children born to each woman up to 2009); All results are obtained from hierarchical multilevel Poisson models where women are nested in Local Authorities; Source: Author's analysis using Office for National Statistics Longitudinal Study data

Table 5: Community culture and fertility - models for Indians

	model C1		model C2		model C3	
	Ranked size of Indian population		Ranked proportion of population that is Indian		Ranked index of dissimilarity for Indian-born population	
Variable	**IRR**	**SE**	**IRR**	**SE**	**IRR**	**SE**
Factors measured for Indians only						
Area rank: child migrants						
Top 2%	1.28	0.10	1.30	0.11		
3-5%	1.31	0.11	1.29	0.11		
Bottom 95%	0.91	0.17	1.06	0.14		
Top 40%					1.34	0.08
Bottom 60%					0.94	0.12
Area rank: second generation						
Top 2%	1.06	0.07	1.05	0.08		
3-5%	1.04	0.07	1.06	0.06		
Bottom 95%	0.94	0.06	0.94	0.05		
Top 40%					1.11	0.05
Bottom 60%					0.87	0.05
Covariates (for all sample members)						
Age (in 1971)	1.01	0.00	1.01	0.00	1.01	0.00

Note: The outcome for all models is completed fertility (the number of children born to each woman up to 2009); All results are obtained from hierarchical multilevel Poisson models where women are nested in Local Authorities; Source: Author's analysis using Office for National Statistics Longitudinal Study data

Appendix tables

TABLE A1: THE ANALYTICAL SAMPLE

	N	% of all	% of sample with missing
All women under 16 in 1971	64,370		
drop scotland and n.ireland	531	0.8	
drop communals	622	1.0	
not enumerated at 2001 Census [1]	10,903	16.9	
Sample with missing values	52,314	81.3	
missing COB	128		0.2
missing age at migration	37		0.1
missing parental COB	1,440		2.8
missing address one year ago	460		0.9
foreign-born migrants who lived in a different LA one year ago	97		0.0
Total missing	2,162		4.0
Analytical sample	50,152		96.0

1: Assumed to have emigrated or died; Source: Author's analysis using Office for National Statistics Longitudinal Study data.

TABLE A2: DESCRIPTIVE STATISTICS BY GENERATION

	Ancestral natives	Second generation	Foreign-born child migrants
mean number of children			
maximum (own child + registered)	1.85	1.77	2.06
registered births in 2009	1.79	1.70	1.90
difference	0.06	0.07	0.15
mean age (years)			
age in 1971	7.4	7.0	9.4
parental social class in 1971 (n)			
Either parent has high SEC	17,571	1,629	355
Neither parent has high SEC	23,744	2,777	455
SEC unknown for both parents	2,853	504	264
parental social class in 1971 (%)			
Either parent has high SEC	40	33	33
Neither parent has high SEC	54	57	42
SEC unknown for both parents	6	10	25
observations (n)	**44,168**	**4,910**	**1,074**

Source: Author's analysis using Office for National Statistics Longitudinal Study data.