# The convergence of completed fertility for migrant generations

**This is a draft. All feedback will be gratefully received.**

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## Abstract

Previous research has attempted to test migrant fertility convergence, but has failed to define this concept in detail, or develop an agreed methodology. This may explain why the literature on convergence remains fragmented, with a confusing array of competing hypotheses and explanations. After reviewing alternative definitions of convergence, this paper compares convergence (towards native fertility levels) within, between, and across migrant generations. Unlike much previous research, completed fertility is used, which allows particular hypotheses to be isolated, and avoids the results being confounded due to birth timing differentials. Completed fertility is estimated using recently released data for the UK, and the analysis makes use of negative binomial regression models. In aggregate, the results show evidence of convergence between, within, and across generations, thereby supporting the adaptation hypothesis. However, analysis by ancestral origin shows that evidence of convergence is highly dependent the definition of convergence that is used. For the cohorts of UK women analysed here, this is most notable for women from Bangladesh, New Zealand, Canada, Australia and the USA. However, there is fairly strong evidence of adaptation for women from Ireland and Jamaica, and of cultural entrenchment for South Asian migrants. These conclusions remain unchanged after considering social characteristics (i.e. comparing to a more similar the native benchmark), but the results for men show noticeably differences, particularly for first generation adult migrants.

## Introduction

A key challenge for demographers is to understand the links between migration and population change (Salt and Clarke, 2002), and this includes the influence of immigrants on future levels of fertility. Knowledge of this topic is valuable for creating and assessing population projections, and can help to inform the decision-making of policy-makers working on population issues, (including ageing, pensions, and the future demand for services). From a demographer's perspective, one of the most enduring impacts that a migrant may have on any destination is their number of children (Coale, 1972), an impact that persists through the fertility of their children.

Considering both internal and international migration, researchers have been investigating the differences in fertility between *native-* and *foreign-born* women for more than 100 years (Kuczynski, 1902). Despite much research effort however, including improvements in data collection and methodology, the relationship between migration and fertility remains unclear. In particular, it is uncertain whether immigrant fertility inevitably *converges* with that of natives. It would appear that *"a case of a complete convergence has not thus far been recorded"* (Sobotka, 2008, p.231), but it is difficult to say whether this is due to an absence of convergence, a lack of data, or a lack of research. Furthermore, a large number of migrant fertility hypotheses have been proposed, but their predictions are often ambiguous, and research has largely failed to isolate individual hypotheses. The consequence is a fragmented literature, from which it very hard to derive useful generalisations.

At the heart of the relationship between fertility and migration is *fertility convergence*, a concept that this article seeks to review and assess. The article first considers how to define and measure migrant fertility convergence. A crucial issue is that many fertility measures suffer from *tempo-distortion* (Ní Bhrolcháin, 2011), and research usually studies samples of women who might not have completed their childbearing (Haug et al., 2002; Sobotka, 2008). This is especially problematic when assessing the fertility of migrants, not least because birth timing is often highly correlated with the timing of migration (Parrado, 2011; Toulemon, 2004, 2006). This article therefore focuses on *quantum convergence* or *completed fertility convergence*, highlighting the importance of migrant generations, and making a distinction between convergence *within*, *between*, and *across* generations. After established a conceptual framework, this paper then considers relevant theories and hypotheses, and proposes a research design that is able to distinguish between the hypotheses that make specific predictions. The spirit of this research is that, before trying to explain convergence, priority should be given to establishing whether it does or does not occur.

After establishing a framework for convergence research, the second half of the article considers the case of the UK,[1] and investigates whether the fertility of migrant generations converges with that of ancestral natives. As a case study, the UK beneficial because it has an established foreign-born population, which allows the estimation of completed fertility for both first and second generation migrants. The investigation makes use of recently released data from *Understanding Society* (also called the UK Household Longitudinal Study, or UKHLS), which constitutes a representative sample of approximately 40,000 household in the UK (Buck and McFall, 2011). This source is particularly useful because it allows the identification of different migrant generations (using individual and parental country of birth), and the estimation of completed fertility for both women and men.

An introduction to the UK context is presented later (see: *Migrant fertility in the UK*), and it is important to recognise the contribution of previous researchers to the question of migrant fertility (Adserà et al., 2012; Coleman, 1994; Coleman and Dubuc, 2010; Dubuc, 2009, 2012; Dubuc and Haskey, 2010; Iliffe, 1978; Murphy, 1995; Robards, 2012; Robards et al., 2011; Sigle-Rushton, 2008; Tromans et al., 2007; Wilson, 2011; Zumpe et al., 2012). In common with many other countries, the UK has experienced a vigorous debate about migration, which continues to influence political debates (BBC, 2012a, 2012b, 2012c), as well as debates more directly related to migrant fertility (BBC, 2008, 2012d, 2012e). In addition to their academic contribution, the results of this research therefore have implications for social policy, integration, and attitudes to migration, in particular for the UK.

[1] The UK (United Kingdom) consists of England, Wales, Scotland, and Northern Ireland. Unless otherwise specified, statistics are for the UK.

## A framework for migrant fertility convergence

### Defining convergence

Although it is discussed and appraised in much previous research, the concept of migrant fertility convergence is rarely made explicit. In fertility research, the terms adaptation and assimilation are often used synonymously with convergence,[2] and general usage implies that convergence represents a movement towards equality between migrants and natives (e.g. Haug et al., 2002; Kulu and Milewski, 2007; Massey, 1981). However, where definitions are given, they use varying degrees of specificity. In their recent study of immigrant fertility assimilation, Parrado and Morgan investigate *"whether Hispanic fertility levels increasingly approximate those of non-Hispanic whites (hereafter simply "whites") over time and across immigrant generations."* (2008, p.652). While Dubuc uses *"intergenerational adaptation and assimilation interchangeably, defined as the observable convergence of behavior across generations toward the national average."* (2012, p.367). As a final example, Sobotka's recent review of immigrant fertility in Europe states that: *"Trends over time differ between countries, but typically indicate a gradual diminishing of differences between the fertility levels of immigrants and foreigners on one side and natives on the other…"* (2008, p. 231).

Although none of these statements are deficient for their researcher's purposes, they serve as examples to indicate three ambiguities that are associated with definitions of fertility convergence. These are: (1) how to measure fertility, (2) how to define the population groups (i.e. migrants and natives), and (3) how to make comparisons between these groups. Arguably, any definition of convergence must address these three issues.

### Measuring fertility

The previous discussion highlights the obvious importance of measuring *"fertility levels"* for tests of convergence. However, the choice of measure will dictate the questions that can be investigated (Ní Bhrolcháin, 2011), and consequently the type of convergence that can be assessed. Research that exclusively considers convergence in birth timing (*tempo*) should therefore use different measures from research that focuses on convergence of the number of

[2] The term convergence is preferred here because it is more theoretically neutral. For some research, adaptation is a specific hypothesis (juxtaposed against others), and assimilation is a sociological theory. Both are discussed later in the article.

children born (*quantum*). Although previous research has tried to test quantum convergence, it has almost exclusively used fertility measures that are distorted by birth timing. Research has used samples of women who have not completed childbearing (Haug et al., 2002; Sobotka, 2008), or measures of fertility that make it impossible to distinguish quantum and tempo differences (Andersson, 2004; e.g. Coleman, 1994; Fernandez and Fogli, 2006; Jensen and Ahlburg, 2004; Kulu, 2005; Lindstrom and Giorguli Saucedo, 2002, 2007; Milewski, 2010). These issues are particularly problematic for studies of migrant fertility because the timing of migrant births is known to relate to the timing of migration (Adserà et al., 2012; Andersson, 2004; Robards, 2012). Frequently used measures, such as the Total Fertility Rate, may overestimate birth rates for migrant women (Parrado, 2011; Toulemon, 2004, 2006), and any measure may distort comparisons if childbearing is incomplete for the sample being considered. For example, differences in the Total Fertility Rate (TFR) of migrants and natives may simply reflect the postponement of births among one group relative to the other.

As an alternative, quantum comparisons can be made using measures of completed fertility (Frejka, 2008; Frejka and Sardon, 2007). Unfortunately, this has rarely been attempted in previous research on migrant fertility (although, see: Parrado and Morgan, 2008; Rosenwaike, 1973), and the majority of exceptions have focussed on only first generation migrants (e.g. Goldberg, 1959; Mayer and Riphahn, 2000; Young, 1991). A discussion of quantum convergence implies that we are interested in the number of children born to a woman over her reproductive lifetime (Bongaarts and Feeney, 1998). For migrant fertility convergence, this lifetime total appears to be the most relevant measure for policy-makers (Demeny, 2011), as well as those working on demographic projections (ONS, 2007; Sobotka, 2008). This is not to say that tempo concerns are unimportant, but merely that quantum differences between migrants and natives are of greater interest. For example, this is clearly true when considering the effect of (migrant) fertility on future population ageing (Coale, 1972).

### Identifying migrant generations

In order to investigate migrant fertility convergence, it is crucial to define migrants and natives, and this requires the disaggregation of migrant generations (Compton and Courbage, 2002). Although alternative definitions of *migrants* are sometimes used elsewhere (e.g. those based on citizenship, nationality, ethnicity, or intention-to-stay), this research focuses on country of birth definitions (as shown in Table 1). Much of the literature has used these definitions to some extent (Andersson, 2004; Bélanger and Gilbert, 2006; Frank and Heuveline, 2005), but very few studies have incorporated information on parental country of birth alongside country of birth and age at migration.

**Table 1: Generational groups**

| Detailed Generation | Aggregate generation | Place of birth | Age at migration | Parent's place of birth |
|---|---|---|---|---|
| Ancestral natives | Third | Native-born | | Both native-born |
| Generation 2.5 | Second | Native-born | | One foreign-born |
| Generation 2.0 | Second | Native-born | | Both foreign-born |
| Child migrants | First | Foreign-born | Under 16 | |
| Adult migrants | First | Foreign-born | 16 and over | |

Note: Ancestral natives are sometimes called the 'third-or-more' generation. Child migrants are often referred to as generation 1.5.

## Different methods of comparison

In addition to using the most appropriate fertility measure and disaggregating generations, any test of convergence must include a dimension over which migrant (and native) groups are compared. For example, different dimensions of culture may be used (Forste and Tienda, 1996), such as residential concentration (Abma and Krivo, 1991; Fischer and Marcum, 1984; Hill and Johnson, 2004) or language use (Adsera and Ferrer, 2011; Sorenson, 1988; Swicegood et al., 1988). Another cultural measure is *exposure to destination*. This can be measured using duration of residence (i.e. years since arrival) (Ford, 1990). Furthermore, the generations in Table 1 can be ranked according to their exposure to destination culture, or from the opposite perspective, according to their exposure to migrant origins (where the origin may be that of their ancestor). A test of this ranking is implicit in much previous research (Andersson, 2004; Bean et al., 1984; Bélanger and Gilbert, 2006; Østby, 2002), and will be referred to here as a comparison ***between*** generations.

More typically, use of the term convergence implies a comparison over time (e.g. Coleman, 1994), and this interpretation accords with other notions of demographic convergence (Billari and Wilson, 2001; Wilson, 2001). For example, research on tempo convergence has investigated trends in first birth rates (Milewski, 2007; Scott and Stanfors, 2011). However, as discussed previously, comparisons over time are problematic when research aims to assess quantum convergence using measures of fertility that can be distorted by birth timing. All results have the potential to be confounded by the postponement of births to migrants (Andersson, 2004; Toulemon, 2004, 2006), or natives (for discussions of postponement in Europe see: Frejka and Sobotka, 2008; Goldstein et al., 2009; Lesthaeghe and Willems, 1999; Sobotka, 2004). This is one of the main advantages of using completed fertility to study quantum convergence, as is the case here. For completed fertility, number of births does not vary by age (since childbearing is complete), so a comparison across birth cohorts is suitable to assess convergence over time.

As opposed to a static comparison between generations, convergence over time suggests either a comparison ***within*** generations, or a comparison ***across***. A comparison within generations implies a comparison between one generation (e.g. first generation adult migrants) and the ancestral native *benchmark*, such that quantum convergence is where differences in completed fertility are smaller for more recent cohorts. An alternative to comparing within generations is to use an approach which Parrado and Morgan refer to as comparison ***across*** generations (2008). This approach compares migrant/native differentials for two (or more) generations, but with a time-lag between cohorts, thereby simulating a comparison between migrants and their children. For example, the fertility of first generation Mexicans born between 1900 and 1904 can be compared with the fertility of second generation Mexicans born between 1925 and 1929 (assuming a 25 year gap between the reproduction of parents and their children).

Clearly there are several choices of method for assessing convergence, and preference for one or the other may vary for theoretical reasons (e.g. to isolate hypotheses relating to migration timing), or practical reasons (e.g. data limitations). A legitimate question is whether conclusions differ depending upon how the comparison is made. There are issues associated with each of these comparisons, and the extent to which they are comparable, or valid for testing specific hypotheses, is unclear. This research therefore sets out to contrast the results of quantum convergence tests that compare between, within, and across generations. This comparison forms part of the central empirical question, which asks whether completed fertility converges for migrant generations in the UK.

## Theories, hypotheses, and predictions

The lack of explicit definitions of convergence may explain the existence of numerous migrant fertility hypotheses that compete to explain the results of previous research (Coleman, 1994; Goldscheider and Uhlenberg, 1969; Goldstein and Goldstein, 1981; Hervitz, 1985; Kulu, 2005; Ritchey, 1975; Zarate and de Zarate, 1975). As noted elsewhere, theoretical models of immigrant fertility tend to be *"incomplete and self-contradictory"* (Coleman, 1994, p.111), and hypotheses are often poorly specified and/or indistinguishable (Forste and Tienda, 1996). This situation is not helped by the fact that no single study has considered all hypotheses, their precise predictions, or how they overlap. Furthermore, despite continual reference in the literature to sociological theories of assimilation, it remains uncertain what these theories predict for the process of fertility convergence.

This article does not have space for a full review of hypotheses, but a review of the literature suggests that they can be divided into three categories:

(i) hypotheses that focus on first generation migrants and the timing of migration

(ii) hypotheses that consider the fertility of later generations

(iii) more general hypotheses and explanations

Given that this research is focussed on quantum convergence, the first group of hypotheses are not considered. These include the hypotheses of *disruption, anticipation, elevated fertility, legitimacy, family formation,* and *the inter-relation of events* (Bledsoe, 2004; Goldstein and Goldstein, 1983; Milewski, 2007; Sobotka, 2008). Each of these is concerned with the direct relationship between a migration event and fertility, and they make no predictions for the second and later generations. In order to test them robustly, it seems clear that research must investigate the relationship between birth timing and the timing of migration.

More relevant to this research are the hypotheses of ***adaptation***, ***socialisation***, ***cultural entrenchment***, and ***minority group status*** (Forste and Tienda, 1996; Goldscheider and Uhlenberg, 1969; Hervitz, 1985; Milewski, 2007). These consider the fertility of later generations, and are summarised in Table 2. This table is based on the most explicit predictions in the literature, but despite their imprecision, some similarities and differences are immediately clear. For example, while adaptation predicts (at least some) convergence for the first generation, socialisation does not. On the other hand, both adaptation and socialisation predict convergence for the second generation, whereas cultural maintenance predicts that convergence will not occur for some migrant groups. Presumably, one reason why very few hypotheses have been dismissed by previous research, or upheld with confidence, is the existence of overlapping predictions, which make hypotheses impossible to distinguish. The goal of hypothesis testing is made even more elusive by a lack of precision. For example, minority group status can predict increases or decreases in fertility, depending on its theoretical formulation (Coleman, 1994). This research therefore focuses on testing adaptation, socialisation and cultural entrenchment.

**Table 2: Hypotheses with predictions for later generations**

| Hypothesis | Adult migrants | Child migrants | Later generations |
|---|---|---|---|
| **Adaptation** | Fertility converges quickly (within 10 years?) | Fertility converges quickly (within 10 years?) | Convergence is complete |
| **Socialisation** | Fertility level of origin is maintained | Fertility level converges with natives | Convergence is complete |
| **Cultural entrenchment** | Fertility level of origin is (largely) maintained | Depends on origin subculture | Depends on origin subculture |
| **Minority group status** | Depends on minority status | Depends on minority status | Depends on minority status |

The most common theoretical framework for migrant fertility research is assimilation theory, whereby fertility is seen as an outcome of assimilation (Massey, 1981; Sobotka, 2008). As illustrated by Forste and Tiende, there is a complicated web of origin and destination factors influencing the completed fertility of immigrants (1996, p.129), and many of these may be affected by assimilation. Yet it is unclear how this occurs, which mechanisms are involved, and how the assimilation and fertility processes inter-relate. Importantly, it is highly unlikely that fertility assimilation follows the same set of processes as other forms of assimilation, for example wages or employment. A further complication is the fact that assimilation theory itself is contested and multidimensional (Alba and Nee, 1997, 2005; Glazer, 1993; Portes and Zhou, 1993; Yinger, 1981), and incorporates multiple processes (Massey, 1981; Waters and Jiménez, 2005; Yinger, 1981). This paper therefore makes no claim to test assimilation theory, although its results may inform future assimilation research.

## Counterfactuals and competing explanations

The third and final group of hypotheses include *reverse causality, selection,* and *social characteristics* (Forste and Tienda, 1996; Goldscheider and Uhlenberg, 1969; Sobotka, 2008; Toulemon, 2004, 2006). To the extent that these are frequently discussed in other social science contexts (e.g. in other research topics or disciplines), they can be described as common (quantitative) social science concerns. This statement is not meant to demean their value, since they are critical for designing and interpreting research on migrant fertility. Instead, it suggests that the assessment of these explanations can be supported by drawing upon the methodological literature (Freedman, 2005; Gelman and Hill, 2006; Keyfitz and Caswell, 2005; Rosenbaum, 2010).

As discussed in the introduction, this article places a priority on establishing whether convergence does or does not occur, with the additional goal of isolating and testing the three hypotheses that make predictions for the convergence of completed fertility for migrant generations (i.e. adaptation, socialisation, and cultural entrenchment). Explanations for convergence are therefore of less priority here, but it is nevertheless important (here and elsewhere) to contrast competing explanations, at least to the extent that this is realistically possible.

Related to this discussion is the topic of causal inference (e.g. Ní Bhrolcháin, 2001; Ní Bhrolcháin and Dyson, 2007). While most research on migrant fertility has not explicitly mentioned causality, there are exceptions (Bleakley and Chin, 2010; Kulu, 2005). To be clear, this paper does not seek to estimate the causal effect of migration, and this decision is motivated by a consideration of counterfactuals (and potential outcomes) for fertility convergence (Rosenbaum, 2010; Rubin, 1974). As defined previously, tests of convergence make a comparison between migrants and natives, but there is no manipulation or assignment mechanism that allows individuals to move between these two groups (to use the language of Holland, migrant generation is an attribute: Holland, 1986). Alternatively, if the counterfactual was '*stayers*' (i.e. non-migrants left behind in a given destination), causal inference might be a plausible approach, but presumably this would represent a study of divergence from origin fertility. This also highlights why trends in origin country fertility are of less concern here than the fertility of the destination.

Nonetheless, the influence of migrant origin is still important for tests of convergence. For example, origin (or origin culture) is mentioned by both the socialisation and cultural entrenchment hypotheses (see Table 2). If these hypotheses are to be differentiated, it is necessary to account for variations by country of origin (or ancestry), and this also allows a more nuanced interpretation of results. However, as mentioned, the priority here is to describe convergence, rather than explaining it or exploring its mechanisms. Any variations by origin may be explained in a number of ways, including cultural differences, migrant selection, and the inheritance of ancestral fertility norms. Related to this is global demographic convergence. The concept of convergence between national levels of fertility has been discussed explicitly in studies relating to demographic transition theory (Billari and Wilson, 2001; Wilson, 2001), and this may form part of an explanation for migrant fertility convergence.

## Migrant fertility convergence: the UK case

The first half of this study has proposed a framework for testing the completed fertility convergence of migrant generations. The second half applies this framework to the UK, in order to show the clarity that it provides, to lay a platform for future research, and to contribute to the growing body of research on immigrant fertility in the UK.

### Immigrant fertility in the UK

In addition to the availability of large sample data, the UK has a number of characteristics that make it a valuable and informative case-study. As a consequence of historical immigration, the UK has a relatively large and well-established foreign-born population (Rendall and Salt, 2005; Walvin, 1984). The history of immigration to the UK is both nuanced and extensive (Coleman et al., 2002; Daley, 1998; Foner, 2009; Hornsby-Smith and Dale, 1988; Horsfield, 2005; Murphy, 1995; Peach, 2006; Rendall and Ball, 2004; Rendall and Salt, 2005; Walvin, 1984), and for reasons of space only a few pertinent facts can be highlighted here. Historically, the largest group of immigrants to the UK came from Ireland, although in the 21st Century they have been replaced by Indians as the largest foreign-born group (ONS, 2012c). Indian migration began in earnest in the early 1970s, whereas migration from Bangladesh began in earnest toward the end of the decade (with Pakistan somewhere in between) (Coleman et al., 2002). As with the commencement of most migration flows, men were the first to settle in the UK, which meant that family reunification for South Asians chiefly began in the 1980s.

Compared with South Asia, immigration from the Caribbean began earlier, and was at its peak in the 1950s and 1960s, falling significantly after the Commonwealth Immigrants Act introduced restrictions on inflows in 1962 (Foner, 2009). Nevertheless, much family reunification occurred after the Act, leading to a continual immigration of Caribbean women throughout much of the 1960s.

Two other historical groups are worth highlighting. The first is the 'Old Commonwealth' countries (New Zealand, Australia & Canada), who have a considerable history of settlement in the UK, and have experienced far fewer restrictions than other (New) Commonwealth countries. The other is Africans, who represent a very diverse range of origins (Daley, 1998), and include one notably large group of South Asians (largely Indians) who were expelled from Uganda by Idi Amin in 1972.

Similar to many European countries, the UK has experienced recent increases in net international migration, in particularly since the A8 countries joined the European Union in 2004 (ONS, 2012a). Results from the 2011 Census of England and Wales show a 62% growth in the foreign-born population since 2001 (ONS, 2012b), with estimates for the whole UK indicating that 12% of the 2011 population was born abroad (ONS, 2012c). Alongside this change in population numbers, the proportion of UK births to a foreign-born mother rose from 15% in 2001 to 24% in 2011 (Zumpe et al., 2012). However, this trend has been partially attributed to the changing age structure of the UK-born and foreign-born female populations. Although the UK TFR rose from 1.78 in 2004 to 1.97 in 2011, the foreign-born TFR fell from 2.48 to 2.28 (Tromans et al., 2007; Zumpe et al., 2012).

This falling foreign-born 'immigrant' TFR may be reflective of a longer-run trend. Previous research shows that the UK TFR has fallen for many ethnic minority groups since the 1970s, in particular Pakistani and Bangladeshi women (Coleman, 1994; Coleman and Dubuc, 2010; Dubuc, 2009, 2012; Dubuc and Haskey, 2010; Iliffe, 1978; Sigle-Rushton, 2008). Furthermore, Dubuc has shown that, when making a cross-sectional comparison between generations for South-Asian ethnicities, the TFR of the second generation is closer to the UK average that the TFR of the first (Dubuc, 2012). As highlighted for other contexts (Parrado, 2011; Toulemon, 2004, 2006), much of the UK research does not consider (or control for) the timing of migration. However, it is know that age-specific migrant fertility rates are highest for migrants who have recently arrived in England and Wales (Robards, 2012), and the fertility of child migrants to England and Wales increases with age at migration (Adserà et al., 2012).

## Data

This research uses data from the first wave of *Understanding Society* (UKHLS), which includes around 60,000 adults who were surveyed in 2009/10. Importantly, approximately 10% of this sample is part of an ethnic minority boost, which means that first and second generation migrants are overrepresented. There are two analytical samples used here, one for men and one for women. The female sample is restricted to women aged 40 and above, but born after 1922 (since cohorts older than this are materially affected by mortality). In order to make the results easier to interpret, the sample also excludes child migrants and foreign-born women with UK-born parents. Cases are then dropped if they are surveyed by proxy (3.2% of cases), or if they are missing information on parental country of birth (0.8%), fertility history (3.1%), or the covariates used in the analysis (1.2%). This results in a sample size of 14,252 women (who may be assumed to have completed their fertility), including 1,401 foreign-born women, and 1,166 native-born women who have at least one foreign-born parent.

The male sample is restricted in the same way, except it is restricted to men aged 50 and above (because analysis showed many births to men aged between 40 and 50, but very few after age 50). Cases are then dropped if they are surveyed by proxy (7% of cases), or if they are missing information on parental country of birth (0.8%), fertility history (4.7%), or the covariates used in the analysis (0.8%). This results in a sample of 7,762 men, including 732 foreign-born men, and 414 native-born men who have at least one foreign-born parent.

Previous research has considered the accuracy of UK data sources, and shown the importance of accurate fertility measurement for research on migrant fertility (Dubuc, 2009; Robards et al., 2011; Wilson, 2011). Furthermore, it is known that birth histories can contain reporting errors (Ní Bhrolcháin et al., 2011), with male fertility histories being particularly susceptible to error (Rendall et al., 1999). Importantly, it is not known whether we should expect these errors in birth histories to be systematically different for migrants and natives, although this assumption is made here.

## Method

Completed fertility is measured using information from direct questions in the survey, and there are two focal variables. The first is birth cohort, which is established from date of survey and age at survey. The second is migrant generation, which is established as shown in Table 1. The analysis reflects the descriptive nature of the central question: does completed fertility converge (between, within or across) for migrant generations in the UK? As discussed, the benchmark for all comparisons is ancestral natives (for brevity, I will refer to them as natives in much of the analysis that follows). In other words, the comparison is made against the native fertility norm - the average for all natives - although as discussed later, this comparison group changes when control variables are added to the analysis.

Initially, aggregate estimates of mean completed fertility are calculated, and disaggregated by generation and cohort. Then count regression models are used to investigate the effects of origin and ancestry. These models are chosen for similar reasons to previous work on migrant fertility (Adserà et al., 2012; Mayer and Riphahn, 2000), and negative binomial models are preferred to avoid problems of over-dispersion. All estimates consider the complex survey design and the fact that migrants are oversampled (using Stata's *svy* command). For the negative binomial regressions, estimated equations all have the same functional form, although the majority of models do not include covariates (X):

$$E(Y_i) = \mu_i = \exp(\hat{\alpha} + \hat{\beta} X_i + \hat{\gamma}_j Z_j + \hat{\theta}_k C_k + \hat{\rho}_{jk}(Z_j * C_k))$$

Where Y is the number of children ever born (at age 40 for women and age 50 for men), X is a matrix of individual-level covariates (years of education, highest qualification, and partnership history), Z is a matrix of dummies for generation and ancestry groups (i.e. two dummies for each ancestry group, one for adult migrants and one for the second generation), C represents birth cohort group, and Z*C is an interaction between generation/ancestry and birth cohort. It follows that for each generation/ancestry group, risk ratios for completed fertility relative to ancestral natives are calculated as follows:

$$IRR\left(Z_j\right) = \frac{E\left(Y_i \mid Z_j = 1\right) = \mu_i = exp(\hat{\alpha} + \hat{\beta} X_i + \hat{\gamma}_j(1) + \hat{\theta}_k C_k + \hat{\rho}_{jk}((1) * C_k))}{E\left(Y_i \mid Z_j = 0\right) = \mu_i = exp(\hat{\alpha} + \hat{\beta} X_i + \hat{\gamma}_j(0) + \hat{\theta}_k C_k + \hat{\rho}_{jk}((0) * C_k))}$$

## Results

The starting point for much work on migrant fertility is a comparison of foreign- and native-born fertility. For women in the UK, Table 3a shows estimates of the mean completed fertility for these two groups. The difference has become smaller for more recent cohorts (to less than 0.1 for women born between 1962 and 1971). Importantly, this difference is far less than the difference indicated by past and present TFRs. Table 3b shows that the equivalent TFR difference was 0.4 in 2011, (and equivalent figures for England and Wales in 2011 are identical to one decimal place (ONS, 2012d)). Almost all TFR differences are larger than the maximum difference in completed fertility, which are for the oldest birth cohorts. This suggests, as shown for France, that there are tempo distortions in the UK TFR (Toulemon, 2004, 2006).

**Table 3a: Mean number of children (completed fertility), by birth cohort (1922-71)**

| Birth cohort: | 1922-31 | 1932-41 | 1942-51 | 1952-61 | 1962-71 |
|---|---|---|---|---|---|
| UK-born | 2.3 | 2.3 | 2.1 | 2.0 | 2.0 |
| Foreign-born | 2.9 | 2.7 | 2.1 | 2.2 | 2.1 |
| **Difference** | **0.6** | **0.4** | **0.0** | **0.2** | **0.1** |
| p-value | 0.07 | 0.02 | 0.92 | 0.46 | 0.12 |

Note: Means are weighted accounting for survey design so that results are representative of the UK population

Source: UKHLS Wave 1 (author's analysis)

**Table 3b: Total fertility rates for England and Wales (1981-2001) and the UK (2004-2011)**

| Year: | 1981 | 1991 | 2001 | 2004 | 2007 | 2011 |
|---|---|---|---|---|---|---|
| UK-born | 1.7 | 1.8 | 1.6 | 1.7 | 1.8 | 1.9 |
| Foreign-born | 2.5 | 2.3 | 2.2 | 2.5 | 2.5 | 2.3 |
| **Difference** | **0.8** | **0.5** | **0.6** | **0.8** | **0.7** | **0.4** |

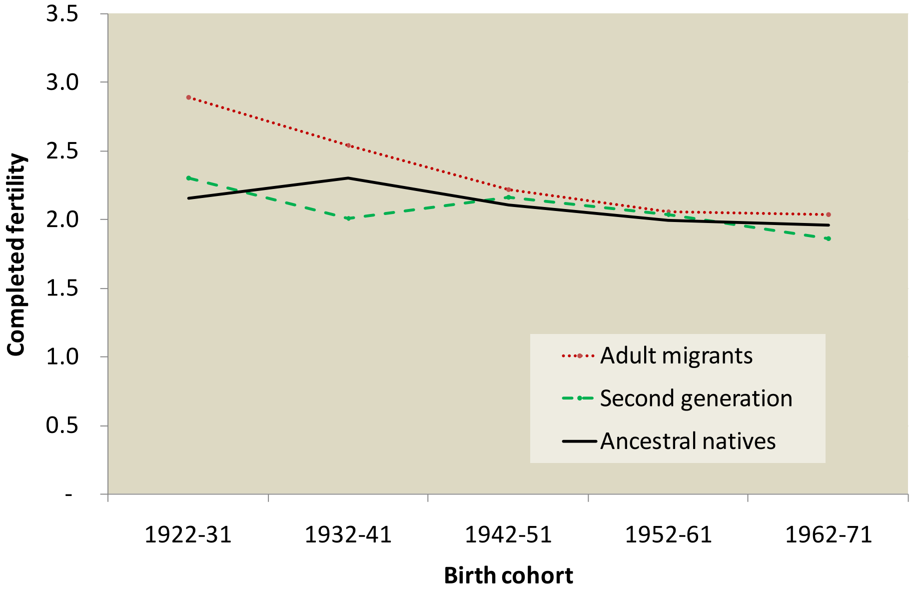
Data: Birth registration & population data from either Census (1981-2001) or Annual Population Survey (2004-11)

Source: (Sigle-Rushton, 2008; Tromans et al., 2007; Zumpe et al., 2012)

## Aggregate generational convergence

In order to test for generational fertility convergence in aggregate, the UK-born population (as shown in Table 3a), is separated into ancestral natives and second generation migrants, and the results are shown in Figure 1. These results provide some evidence for all three types of completed fertility convergence. Convergence between generations is assessed by comparing the ranking of generations, and for three out of the five cohorts, the rankings are as expected (adult migrant then second generation then ancestral native). For both of the others, the average fertility of the second generation is below the average for ancestral natives (and only by 0.1 children for 1962-71). Convergence within the first generation (for adult migrants) is demonstrated by the fact that the completed fertility of this group has become closer to natives for more recent cohorts. By the same standard, the second generation looks to have already converged (within) in 1922-31, (although there are minor deviations for the later cohorts). Finally, convergence across generation can be assessed by comparing the difference between adult migrants and ancestral natives for the oldest cohorts (where there is a notable difference in completed fertility), with the difference between the second generation and ancestral natives for the cohorts born 20-30 years later (where there is almost no difference). These data therefore provide some evidence for convergence across generations (in aggregate).

**Figure 1: Mean number of children (completed fertility), by birth cohort and generation**




Source: UKHLS Wave 1 (author's analysis)

## Analysis by origin and ancestry

Despite the evidence of aggregate convergence shown in Figure 1, there is evidence to suggest that convergence patterns in the UK will differ by country of ancestry (Adserà et al., 2012; Dubuc, 2012). The rest of the analysis therefore focuses on ancestry, defined as country of birth the first generation, and parental country of birth (of the foreign-born parent or parents) for the second generation.[3] As discussed, the consideration of ancestry is also necessary to disentangle the hypotheses. Table 4 shows the country groups that are used here. In addition to trying to maintain groups with a similar migration history and a reasonable sample size, certain countries have been deliberately separated. This is chiefly because they have known fertility differentials (Coleman, 1994; Iliffe, 1978), and can be more usefully compared with other research when analysed in isolation. Unfortunately, sample size limits this strategy to consideration of the largest ancestral populations.

Using this survey design (including weights), the proportion of the population in each group can be estimated by ancestry (see Table 4). This shows the relative changes in migration patterns (for women who have remained in the UK until 2009/10), including a fall

[3] For a very small number of cases, who have two foreign-born parents with different ancestries, the ancestry of the mother is used.

in the proportion of adult migrants from Ireland and the Caribbean, and a corresponding rise for adult migrants from Asia and Africa. It is worth noting here, and for interpretation elsewhere, that the sample size for each cell in Table 4 is larger than 15, except for Bangladesh in columns A and C (where there are between 5 and 10 cases).

**Table 4: Percentage of generation & cohort group in the population: by ancestry**

| | A | B | C |
|---|---|---|---|
| | 1922-1951 | 1952-1971 | 1952-1971 |
| **Ancestry** | **1st generation** | **1st generation** | **2nd generation** |
| Ireland | 16 | 7 | 37 |
| India | 12 | 10 | 10 |
| Pakistan | 3 | 6 | 3 |
| Bangladesh | 1 | 2 | 0 |
| Jamaica | 5 | 3 | 7 |
| Other Caribbean | 4 | 3 | 4 |
| NZ, Australia, US & Canada | 6 | 9 | 5 |
| North & West Europe | 14 | 9 | 9 |
| South & East Europe | 12 | 10 | 13 |
| North Africa & Middle East | 5 | 7 | 3 |
| West & Central Africa | 3 | 7 | 2 |
| East & Southern Africa | 8 | 13 | 2 |
| East Asia | 4 | 9 | 2 |
| Other | 7 | 6 | 2 |
| total (%) | 100 | 100 | 100 |

Note: Percentages are weighted accounting for survey design so that results are representative of the UK population. Results as shown may not sum correctly due to rounding; Source: UKHLS Wave 1 (author's analysis)

In order to compare between, within and across generations, the analysis focuses on three groups (A, B, & C in Table 4). Two of these are first generation adult migrants: an older cohort (A) born between 1922 and 1951, and a more recent cohort (B) born between 1952 and 1971. The third group (C) are second-generation migrants in the recent cohort (born between 1952 and 1971). The comparisons are discussed in detail later, but in essence they may be summarised as follows:

- **convergence between** compares columns B and C, essentially a ranking of different migrant generations from the same birth cohort group
- **convergence within** compares columns A and B, so that the same migrant generation (the first generation) is compared across successive birth cohorts

- **convergence across** compares columns A and C, equivalent to indirectly comparing first generation migrants with their children, i.e. second generations born more recently

### Comparisons with ancestral natives

An overview of comparative fertility patterns is provided by looking at the estimated IRRs for the three generation/cohort groups (Table 5). For example, adult migrant women from Ireland born between 1922 and 1951 had completed fertility 30% higher than ancestral natives (IRR=1.3, p=0.03). Appendix Tables A1-A3 show the p-values associated with each of the IRR estimates. In summary, all IRRs of 1.3 and above, or 0.7 and below, are at least significant at the 10% level (significance is discussed in more detail in the next section).

Without any formal comparison, it is apparent that there completed fertility is persistently higher for women with Pakistani and Bangladeshi ancestry. This is suggestive of cultural entrenchment. Also notable, is the higher fertility (relative to natives) for the older cohort of first generation Jamaicans, and lower fertility for the more recent cohort of first generation migrants from wealthier countries like the US and the 'Old Commonwealth' (New Zealand, Australia, and Canada).

**Table 5: Completed fertility relative to ancestral natives**

| | A | B | C |
|---|---|---|---|
| | 1922-1951 cohorts | 1952-1971 cohorts | 1952-1971 cohorts |
| **Ancestry** | **1st gen IRR (vs natives)** | **1st gen IRR (vs natives)** | **2nd gen IRR (vs natives)** |
| Ireland | 1.3 | 0.9 | 1.0 |
| India | 1.2 | 1.1 | 1.1 |
| Pakistan | 1.7 | 1.6 | 1.5 |
| Bangladesh | 1.5 | 2.0 | 1.4 |
| Jamaica | 1.6 | 0.9 | 0.9 |
| Other Caribbean | 1.1 | 1.0 | 0.9 |
| NZ, Aus, US & Canada | 0.9 | 0.6 | 1.0 |
| N. & W. Europe | 1.0 | 0.7 | 0.9 |
| S. & E. Europe | 1.0 | 0.8 | 0.9 |
| N. Africa & Middle East | 0.9 | 1.2 | 0.7 |
| W. & C. Africa | 1.0 | 1.3 | 1.1 |
| E. & S. Africa | 1.0 | 1.2 | 1.0 |
| East Asia | 0.8 | 0.9 | 0.9 |
| Other | 0.9 | 1.0 | 1.0 |

Notes: Models are estimated accounting for survey design. Each IRR shows the risk of birth relative to ancestral natives in that birth cohort, where an IRR of 1.0 means that women had the same completed fertility as ancestral natives; Source: UKHLS Wave 1 (author's analysis)

## Assessing convergence

As discussed previously, different types of convergence require different comparisons. Here, convergence between generations compares first and second-generation migrants from the same birth cohort group (columns B & C in Table 5). For example, the estimated IRR for Bangladeshi ancestry is 2.0 for first generation adult migrants and 1.4 for the second generation. The ratio between these two IRRs, second divided by first, is 0.7, which is below 1.0 and therefore indicates lower fertility, relative to natives, for the second generation compared with the first.[4] On its own, this ratio only describes the direction of 'movement' (i.e. a 'rise' or 'fall', although as the speech marks suggest, this is not a change over time when comparing between generations). However, given that the second generation IRR is closer to 1.0 than the first, the ratio of 0.7 suggests convergence between generations for women with Bangladeshi ancestry. Details of this comparison are shown in Appendix Table

[4] Although this value of 0.7 can also be considered an IRR, it is described here as a ratio to avoid confusion.

A1, which includes the p-values associated with each of the IRR estimates and their ratio comparison. In this example, the ratio of 0.7 and has an associated p-value of 0.04, so in addition to suggesting convergence, it is also somewhat significant.

In order to summarise the results for every ancestry group, comparisons are categorised as follows:

- **'Yes'** describes a statistically significant 'movement' toward native completed fertility (at the 10% level, $p<0.1$), such that the second generation has an IRR closer to 1.0 than the first generation.
- **'Slight'** is the same as 'yes', except the change is not significant at the 10% level.
- **'No'** describes any movement away from native completed fertility or where there is no change (i.e. neither the first nor the second generation is closer to natives).

For ease of generalisation 'yes' is considered to represent groups where there is evidence of convergence. However, despite these strictly defined categories, this research does not seek to over-interpret the accuracy of estimates. The 10% benchmark is somewhat arbitrary, and represents a fairly high type-one error. Along similar lines, it is important to note that results categorised as 'slight' or 'no' may be inaccurate due to uncertainty. As the names suggests, it is believed that 'slight' results offer slight evidence of convergence, and 'no' results offer no evidence of convergence. The strongest evidence against convergence is therefore a 'no' with a statistically significant ratio, which therefore describes a significant 'movement' away from the native fertility norm.

### A summary of results

The yes/no/slight classification scheme is used for all three types of convergence (between, within and across), and a summary of results is shown in table 6 (detailed results are shown in Appendix Tables A1-A3). The first inference made from these results is that evidence for or against convergence is highly susceptible to the definition of convergence that is used. This is most notable for Bangladesh and New Zealand, Australia, the US & Canada. There is also greater similarity between the results for *within* and *across*, compared with the results for *between.* This may be related to the fact that convergence *between* generations is cross-sectional, whereas the other two types compare different birth cohorts.

**Table 6: A comparison of evidence for convergence**

| | Convergence? | | |
|---|---|---|---|
| **Ancestry** | between | Within | across |
| Ireland | slight | yes | yes |
| India | slight | slight | slight |
| Pakistan | slight | slight | slight |
| Bangladesh | yes | no | slight |
| Jamaica | no | yes | yes |
| Other Caribbean | no | slight | slight |
| NZ, Aus, US & Canada | yes | no | slight |
| N. & W. Europe | yes | no | no |
| S. & E. Europe | slight | no | no |
| N. Africa & Middle East | no | no | no |
| W. & C. Africa | slight | no | no |
| E. & S. Africa | slight | no | slight |
| East Asia | slight | slight | slight |
| Other | slight | slight | Slight |

Notes: Models are estimated accounting for survey design. Convergence is assessed consistently using the following rules: 'yes' describes a movement toward native completed fertility (i.e. toward an IRR of 1.0) which is statistically significant at the 10% level (p<0.1); 'slight' describes a movement toward native completed fertility which is not statistically significant at the 10% level; 'no' describes any movement away from native completed fertility or where there is no change (i.e. neither group is closer to natives); Source: UKHLS Wave 1 (author's analysis)

Statistically significant evidence for convergence (i.e. yes) is less common than slight or no evidence, and this may be partly driven by a lack of sample power. Nevertheless, there is significant evidence of convergence *within* and *across* for Ireland and Jamaica, and convergence *between* for Bangladesh, North & West Europe, and New Zealand, Australia, the US & Canada. Except for Bangladesh, this significant convergence between represents a rise in fertility – i.e. adult migrants from these high income countries have a lower fertility than natives, (but the second generation in the same cohort do not). It may be that migrants from these countries have multiple delays in their childbearing due to migration, employment, interrupted partnership or delayed education.

## Accounting for covariates

There is not space here to investigate these possible delays, or account for all the factors that may explain convergence. However, as described in the method, it is possible to control for some covariates. Importantly, this is not in order to isolate the true effect of ancestry net of other variables. Instead, the principal aim here is to investigate what happens to the results when we change the comparison group from all UK natives, to natives with similar demographic characteristics. For example, the addition of education and partnership controls means that Irish adult migrants are compared with natives who have the same education and partnership history.

**Table 7: A comparison of evidence for convergence**

| % change in IRRs after adding controls | 1922-1951 cohorts | 1952-1971 cohorts | 1952-1971 cohorts |
|---|---|---|---|
| **Ancestry** | **1st gen IRR (vs natives)** | **1st gen IRR (vs natives)** | **2nd gen IRR (vs natives)** |
| Ireland | 0 | 5 | 3 |
| India | 4 | -7 | 3 |
| Pakistan | -1 | -12 | -5 |
| Bangladesh | -4 | -15 | 2 |
| Jamaica | 5 | 8 | 27 |
| Other Caribbean | 7 | 5 | 29 |
| NZ, Aus, US & Canada | 13 | 7 | 2 |
| N. & W. Europe | 4 | 18 | 7 |
| S. & E. Europe | -5 | 2 | 11 |
| N. Africa & Middle East | 4 | -4 | 4 |
| W. & C. Africa | 25 | 11 | 17 |
| E. & S. Africa | 3 | 1 | 4 |
| East Asia | 8 | -1 | 9 |
| Other | 13 | 2 | 7 |

Notes: Positive values indicate that the IRR increased after adding controls to the models;
Source: UKHLS Wave 1 (author's analysis)

Table 7 displays the percentage change in IRRs after adding controls to the models shown earlier. For the most part, there is no material change in the results,[5] and this is true even for the larger percentage changes. For example, the IRR for second generation Jamaican women is 29% higher after adding controls to the model, but this only represents an increase from an IRR of 0.9 to 1.1. Furthermore, this does not change the qualitative inferences made about convergence for this group. In fact, only one quarter of the inferences shown in Table 6 are changed by the addition of controls (see: Appendix Table A4), and most of these are relatively small shifts between 'slight' and 'no'. The majority of changes are for convergence *between* generations, and this includes the most material shifts. For women from Bangladesh and North & West Europe, although fertility change is still in the direction of convergence, it

[5] 43% of the cells shown in Table 5 remain unchanged to one decimal place

is no longer significant. On the other hand, slight evidence of convergence (between) for women from South & East Europe is significant after the inclusion of controls.

This analysis shows that the addition of (some) demographic controls has a minimal impact on the results for most migrant groups. Groups with higher percentage changes (in Table 7) are indicative of the migrants for whom education and partnership history may be important explanations for fertility change, either due to population composition, fertility variation, or both. Nevertheless, it appears that ancestry is a more important determinant of convergence patterns than the social characteristics considered here.

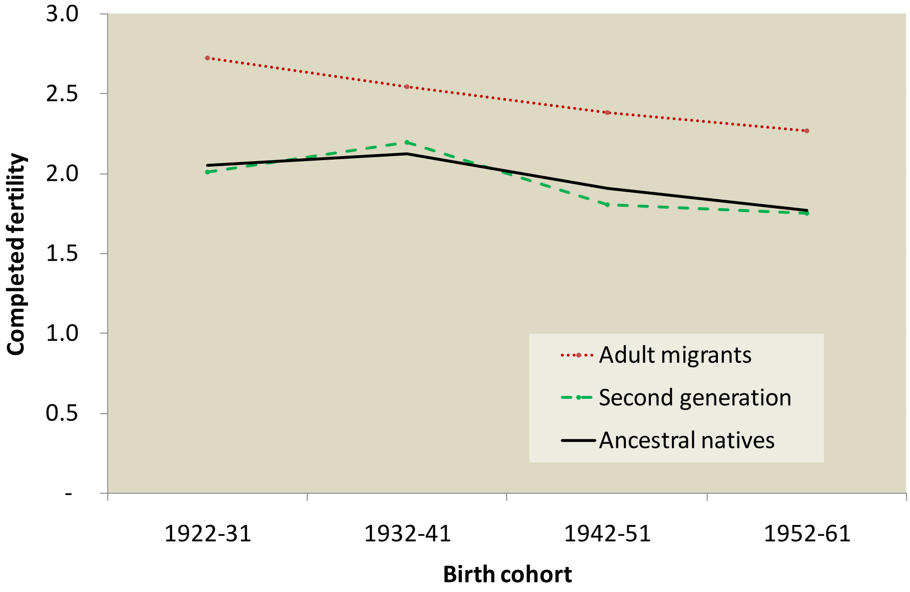
## Results for men

Despite the descriptive priority of this research, one important factor that is not considered here is partner's country of birth. The fertility of foreign-born women may be more likely to converge with the native norm if they are partnered with a UK-born man, and the same may be true for the second generation (who may also be partnered with someone from any other generation). Unfortunately, partner's country of birth is only available in the UKHLS dataset for partners who are currently resident in the same household, so there are a very large number of missing values. Where women do have resident partners, these may not be the same as the father(s) of their children.

Nevertheless, it is still possible to carry out an analysis of convergence separately for men. This represents one way of testing the validity of the female results, (and a chance to further demonstrate the value of the convergence framework). Also, the majority of adult migrants have either a UK-born partner or a foreign-born partner from the same ancestral group, so it is possible to gain some insight into the latter by comparing the results for men and women from the same origin.

Before considering the results for men by ancestry, it is worth comparing the aggregate results. Second generation women have a very similar completed fertility trend to natives (Figure 1), and this is also true for men (Figure 2). However, although the gap between the completed fertility of adult migrants and natives became much smaller for recent cohorts of women (and is only 0.1 for the three more recent cohorts shown in Figure 1), the equivalent gap for men has not become smaller, instead ranging between 0.4 and 0.7 (and equal to 0.5 for the two most recent cohorts shown in Figure 2).

**Figure 2: Mean number of children (completed fertility): men**




Source: UKHLS Wave 1 (author's analysis)

**Table 8: Convergence within first generation adults by ancestry: men**

| | comparison: within (the 1st) generation | | | |
|---|---|---|---|---|
| **Ancestry** | Which is closer to native norm? | ratio: recent / older cohort | p-value | **convergence?** |
| Ireland | older | 0.6 | 0.11 | no |
| India | older | 1.1 | 0.37 | no |
| Pakistan | recent | 0.9 | 0.61 | slight |
| Bangladesh | older | 1.1 | 0.73 | no |
| Jamaica | recent | 0.8 | 0.31 | slight |
| Other Caribbean | recent | 0.5 | 0.05 | yes |
| NZ ,Aus, US & Canada | older | 1.0 | 0.95 | no |
| N. & W. Europe | older | 1.1 | 0.84 | no |
| S. & E. Europe | older | 0.9 | 0.54 | no |
| N. Africa & Middle East | older | 1.3 | 0.15 | no |
| W. & C. Africa | older | 1.5 | 0.02 | no |
| E. & S. Africa | older | 1.3 | 0.08 | no |
| East Asia | recent | 0.8 | 0.46 | slight |
| Other | older | 1.1 | 0.78 | no |

Notes: See Appendix Table A2 for detailed notes; Source: UKHLS Wave 1 (author's analysis)

In terms of convergence, this persistent gap between adult migrants and natives implies a lack of convergence *within* first generation adults. Furthermore, analysis by ancestry shows the origins that are driving this trend (Table 8). Despite the evidence that some origins are converging (Other Caribbean) or have falling fertility relative to native (Ireland), there are several origin groups with ratios larger than 1.0, most notably those from Africa (and the Middle East). In addition to compositional changes in the population, the lack of aggregate convergence *within* is therefore partly driven by increasing fertility (relative to natives) for African males.

Given the smaller sample of men who are 50 plus (compared with women 40 plus), it is not possible to estimate second generation fertility for all ancestral groups (and sadly, this includes Africans). However, for groups with a large enough sample, results show that although there is some agreement between the results for men and women from the same origin, there are enough differences to suggest that patterns of male fertility convergence are distinct (see: Appendix Table A5). For example, while Irish women exhibit convergence across and within, this is not true for men. Despite the fact that fertility has fallen for both male and female adult migrants from Ireland, the most recent cohort of men has fallen considerably below the native norm. For second generation Jamaicans, male completed fertility remains higher (relative to natives) than for women, and the same is true for the most recent cohort of adult migrant from New Zealand, Australia, the US & Canada.

In the absence of further evidence, it is seems speculative to propose reasons for these differences between men and women. Beyond gender itself, explanations may include (but are not limited to) differences in selection, characteristics, family formation, and partnership. One important explanation may be the extent to which male migrants (from a given ancestry group) are more or less likely to partner with women from the UK. In any case, these results suggest that patterns of fertility convergence for men are not identical to those for women.

## Discussion

This article sets out a framework for researching the convergence of completed fertility for migrant generations. The framework builds upon a large body of previous research, but seeks to make concepts, definitions and predictions more explicit. The framework is applied to the UK in order to test three types of convergence: *between*, *within*, and *across* generations. In addition, three hypotheses are chosen to be tested because they make specific predictions for the completed fertility of migrant generations: *adaptation*, *socialisation*, and *cultural entrenchment*.

The results indicate the importance of defining convergence. Analysis of the UK shows that evidence for (or against) convergence depends upon the type of convergence being investigated. Aggregate results for women show evidence of all three types of convergence, but this is most definitely not the case when the analysis considers ancestral groups (or when repeated for men). For women, the greatest overlap in results by ancestral group is for convergence *within* and *across* generations, but the analysis *between* generations gives opposing results for some ancestries, including some (like Bangladesh) where there are no similarities in results by convergence type. This variation by convergence type has important implications for future research, and for those seeking to interpret the existing literature.

Related to this is the potential caution required when interpreting migrant TFRs, in particular when trying to make inferences about future fertility. Aggregate results show a smaller difference between UK-born and foreign-born women for completed fertility than for the TFR. As shown elsewhere, this may reflect an overstatement of the TFR due to immigrant's years spent in origin (prior to migration) being effectively excluded from the TFR denominator (Toulemon, 2006).

Of the three hypotheses that make specific predictions for the fertility convergence of migrant generations, there is strong evidence for the cultural entrenchment of South Asian fertility (for women), in particular for Pakistan and Bangladesh. In agreement with Dubuc (2012), there is some evidence of convergence between generations for South Asians (here, significant results are found for Bangladeshi women and Indian men). There is also 'slight' evidence of convergence within and across generations. However, the completed fertility of South Asians remains significantly higher than that of natives for the most recent birth cohort group (for both first and second generations), except for second generation Indian women.

The socialisation hypothesis predicts that there will be convergence for second generation, but not for adult migrants. For the framework proposed here, this means there will be convergence between and/or across, but not within (the first generation).[6] For women, this is certainly not true in aggregate, and the only ancestral groups that come close to this pattern are (i) Bangladesh, (ii) New Zealand, Australia, the US & Canada, and (iii) East & Southern Africa – although none of these three groups provide convincing evidence (see: Table 6).

This lack of evidence for socialisation does not necessarily match results found elsewhere. Evidence has been found for child migrants in England and Wales who have incomplete fertility, such that those who arrive when younger have more similar fertility to natives (Adserà et al., 2012). However, the difference between Adserà et al. and the results shown here may be due to differences in the timing of fertility for child migrants arriving at different ages, or differences between child and adult migrants, (within or between origin groups). Of interest, and worthy of future research, is that there is some evidence to support the socialisation hypothesis for men, particularly in aggregate.

The third hypothesis, adaptation, predicts convergence for all generations, which implies that there will be convergence between and/or across, as well as within (the first generation).[6] For women, as well as being true in aggregate, there is significant evidence for the adaptation of women from Ireland and Jamaica, and slight evidence for a number of other ancestry groups (Table 6). However, there is no evidence of adaptation for men.

The clarity of these results shows the benefit of the convergence framework outlined here. Three generational hypotheses have been disentangled, and the results can be used to inform future work on UK population projections, in particular for assumption-setting. When contemplating differential fertility, certain ancestries appear more worthy of attention, in particular South Asians and African men. The latter suggest that it may be important for population projections to consider patterns of male fertility, or at least the extent to which women are partnered with UK-born men or the same ancestry groups.

Having focussed on the descriptive contribution, and established convergence patterns in the UK for some ancestry groups, further analysis is required to explore and explain these results. One important avenue for research will be to consider other assimilation processes, and their relationship to completed fertility convergence. As discussed, convergence trends may also be explained by global fertility convergence, reverse causality, selection, and other changes in the population composition of migrants (where the latter is particularly important for aggregate convergence).

[6] If information were available, it might be argued that convergence within the second generation (not calculated here) could replace the assessment between and/or across.

Finally, it is worth adding a note about external validity. There are several reasons why the results shown here should be treated with caution, each of which could be investigated with further research. The sample includes only those women who were resident in households in 2009/10, which means that some women will be missing due to mortality and migration. Perhaps most importantly, this means that immigrants who have returned to their origin country are not included here. Related to this is the fact that this research does not consider children born abroad or children left behind, (instead merely considering children ever born). Nevertheless, unlike much previous research, the use of completed fertility means that these results are not affected by birth timing differences between migrant and native groups. Having established this framework for completed fertility, it is recommended that future research explores the links between quantum and tempo, and how a more rigorous framework can be applied to study cohorts of women who have yet to complete their childbearing.

## References

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

Adsera, A., and Ferrer, A.M. (2011). Age at Migration, Language and Fertility Patterns Among Migrants to Canada. IZA Discussion Paper No. 5552.

Adserà, A., Ferrer, A.M., Sigle-Rushton, W., and 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*, 160–189.

Alba, R., and Nee, V. (1997). Rethinking Assimilation Theory for a New Era of Immigration. International Migration Review *31*, 826–874.

Alba, R.D., and Nee, V. (2005). Remaking the American mainstream: Assimilation and contemporary immigration (Harvard Univ Pr).

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

BBC (2008). More long-term migrants to UK. BBC.

BBC (2012a). Net migration target "too blunt". BBC.

BBC (2012b). Cameron considers EU migrant curb. BBC.

BBC (2012c). Miliband shifts immigration policy, saying Labour "got it wrong". BBC.

BBC (2012d). What is the UK's optimum population? BBC.

BBC (2012e). The truth behind UK migration figures. BBC.

Bean, F.D., Cullen, R.M., Stephen, E.H., and Swicegood, C.G. (1984). Generational Differences in Fertility Among Mexican Americans: Implications for Assessing the Effects of Immigration. Social Science Quarterly (University of Texas Press) *65*, 573–582.

Bélanger, A., and Gilbert, S. (2006). The fertility of immigrant women and their Canadian-born daughters. In Report on the Demographic Situation in Canada, 2002, (Statistics Canada), pp. 127–151.

Billari, F.C., and Wilson, C. (2001). Convergence towards diversity? Cohort dynamics in the transition to adulthood in contemporary Western Europe. Max Planck Institute for Demographic Research, Working Paper [WP2001-039].

Bleakley, H., and Chin, A. (2010). Age at arrival, English proficiency, and social assimilation among US immigrants. American Economic Journal. Applied Economics *2*, 165.

Bledsoe, C.H. (2004). Reproduction at the Margins: Migration and Legitimacy in the New Europe. Demographic Research *Special 3*, 87–116.

Bongaarts, J., and Feeney, G. (1998). On the quantum and tempo of fertility. Population and Development Review 271–291.

Buck, N., and McFall, S. (2011). Understanding Society: design overview. Longitudinal and Life Course Studies *3*, 5 – 17.

Coale, A.J. (1972). How a population ages or grows younger. In Readings In Population, W. Peterson, ed. (New York: The Macmillian Company), pp. 115–121.

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

Coleman, D., and Dubuc, S. (2010). The fertility of ethnic minorities in the UK, 1960s–2006. Population Studies *64*, 19–41.

Coleman, D., Compton, P., and Salt, J. (2002). Demography of migrant populations: the case of the United Kingdom. In The Demographic Characteristics of Immigrant Populations, W. Haug, P. Compton, and Y. Courbage, eds. (Council of Europe Publishing), p. 497.

Compton, P., and Courbage, Y. (2002). Synthesis report. In The Demographic Characteristics of Immigrant Populations, W. Haug, P. Compton, and Y. Courbage, eds. (Council of Europe),.

Daley, P.O. (1998). Black Africans in Great Britain: Spatial concentration and segregation. Urban Studies *35*, 1703–1724.

Demeny, P. (2011). Population Policy and the Demographic Transition: Performance, Prospects, and Options. Population and Development Review *37*, 249–274.

Dubuc, S. (2009). Application of the Own-Children Method for estimating fertility by ethnic and religious groups in the UK. Journal of Population Research *26*, 207–225.

Dubuc, S. (2012). Immigration to the UK from High-Fertility Countries: Intergenerational Adaptation and Fertility Convergence. Population and Development Review *38*, 353–368.

Dubuc, S., and Haskey, J. (2010). Ethnicity and Fertility in the United Kingdom. In Ethnicity and Integration, J. Stillwell, and M. Ham, eds. (Dordrecht: Springer Netherlands), pp. 63–81.

Fernandez, R., and Fogli, A. (2006). Fertility: The role of culture and family experience. Journal of the European Economic Association *4*, 552–561.

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

Foner, N. (2009). Gender and Migration: West Indians in Comparative Perspective. International Migration *47*, 3–29.

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

Forste, R., and Tienda, M. (1996). What's Behind Racial and Ethnic Fertility Differentials? Population and Development Review *22*, 109–133.

Frank, R., and Heuveline, P. (2005). A cross-over in Mexican and Mexican-American fertility rates. Demographic Research *12*, 77–104.

Freedman, D.A. (2005). Statistical Models: Theory And Practice (Cambridge University Press).

Frejka, T. (2008). Overview Chapter 2: Parity distribution and completed family size in Europe. Demographic Research *19*, 47–72.

Frejka, T., and Sardon, J.-P. (2007). Cohort birth order, parity progression ratio and parity distribution trends in developed countries. Demographic Research *16*, 315–374.

Frejka, T., and Sobotka, T. (2008). Overview Chapter 1: Fertility in Europe. Demographic Research *19*, 15–46.

Gelman, A., and Hill, J. (2006). Data analysis using regression and multilevel/hierarchical models (Cambridge University Press).

Glazer, N. (1993). Is assimilation dead? The Annals of the American Academy of Political and Social Science *530*, 122–136.

Goldberg, D. (1959). The Fertility of Two-Generation Urbanites. Population Studies *12*, 214–222.

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

Goldstein, S., and Goldstein, A. (1981). The Impact of Migration on Fertility: an `Own Children' Analysis for Thailand. Population Studies *35*, 265–284.

Goldstein, S., and Goldstein, A. (1983). Migration and Fertility in Peninsular Malaysia. A Rand Note, Prepared for The Agency for International Development *[N-1860-AID]*.

Goldstein, J.R., Sobotka, T., and Jasilioniene, A. (2009). The End of "Lowest-Low" Fertility? Population and Development Review *35*, 663–699.

Haug, W., Compton, P., and 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 293–317.

Hill, L.E., and Johnson, H.P. (2004). Fertility Changes Among Immigrants: Generations, Neighborhoods, and Personal Characteristics*. Social Science Quarterly *85*, 811–827.

Holland, P.W. (1986). Statistics and Causal Inference. Journal of the American Statistical Association *81*, 945–960.

Hornsby-Smith, M.P., and Dale, A. (1988). The Assimilation of Irish Immigrants in England. The British Journal of Sociology *39*, 519–544.

Horsfield, G. (2005). International Migration. In Focus on People and Migration, (London: Palgrave Macmillan), pp. 115–119.

Iliffe, L. (1978). Estimated fertility rates of Asian and West Indian immigrant women in Britain, 1969-74. Journal of Biosocial Science *10*, 189–197.

Jensen, E., and Ahlburg, D. (2004). Why does migration decrease fertility? Evidence from the Philippines. Population Studies *58*, 219–231.

Keyfitz, N., and Caswell, H. (2005). Applied Mathematical Demography (Springer).

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

Kulu, H. (2005). Migration and Fertility: Competing Hypotheses Re-examined. European Journal of Population / Revue européenne de Démographie *21*, 51–87.

Kulu, H., and Milewski, N. (2007). Family change and migration in the life course. DemRes *17*, 567–590.

Lesthaeghe, R., and Willems, P. (1999). Is Low Fertility a Temporary Phenomenon in the European Union? Population and Development Review *25*, 211–228.

Lindstrom, D.P., and Giorguli Saucedo, S. (2002). The Short- and Long-Term Effects of U.S. Migration Experience on Mexican Women's Fertility. Social Forces *80*, 1341 –1368.

Lindstrom, D.P., and Giorguli Saucedo, S. (2007). The interrelationship of fertility, family maintenance and Mexico-U.S. Migration. Demographic Research *17*, 821–858.

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.

Mayer, J., and Riphahn, R.T. (2000). Fertility assimilation of immigrants: Evidence from count data models. Journal of Population Economics *13*, 241–261.

Milewski, N. (2007). First child of immigrant workers and their descendants in West Germany: Interrelation of events, disruption, or adaptation? Demographic Research *17*, 859–896.

Milewski, N. (2010). Immigrant fertility in West Germany: Is there a socialization effect in transitions to second and third births? European Journal of Population / Revue Européenne De Démographie *26*, 297–323.

Murphy, M. (1995). The Impact of migration on population composition: The British Case. In The Demographic Consequences of International Migration, S. Voets, J. Schoorl, and B. de Bruijn, eds. (The Hague: Netherlands Interdisciplinary Demographic Institute), pp. 207–224.

Ní Bhrolcháin, M. (2001). "Divorce Effects" and Causality in the Social Sciences. European Sociological Review *17*, 33 –57.

Ní Bhrolcháin, M. (2011). Tempo and the TFR. Demography *48*, 841–861.

Ní Bhrolcháin, M., and Dyson, T. (2007). On Causation in Demography: Issues and Illustrations. Population and Development Review *33*, 1–36.

Ní Bhrolcháin, M., Beaujouan, É., and Murphy, M. (2011). Sources of error in reported childlessness in a continuous British household survey. Population Studies *65*, 305–318.

ONS (2012c). Population by Country of Birth and Nationality Report.

ONS (2012a). Migration Statistics Quarterly Report - February 2012 (ONS (online)).

ONS (2012b). International migrants in England and Wales, 2011.

ONS (2012d). Births in England and Wales by Parents' Country of Birth, 2011.

Østby, L. (2002). The demographic characteristics of immigrant population in Norway (Oslo: Statistics Norway).

Parrado, E.A. (2011). How High is Hispanic/Mexican Fertility in the United States? Immigration and Tempo Considerations. Demography *48*, 1059–1080.

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

Peach, C. (2006). South Asian migration and settlement in Great Britain, 1951–2001. Contemporary South Asia *15*, 133–146.

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

Rendall, M., and Salt, J. (2005). The foreign-born population. Focus on People and Migration, London: Palgrave Macmillan 131–152.

Rendall, M.S., and Ball, D.J. (2004). Immigration, emigration and the ageing of the overseas-born population in the United Kingdom. Population Trends *116*, 18–27.

Rendall, M.S., Clarke, L., Peters, H.E., Ranjit, N., and Verropoulou, G. (1999). Incomplete reporting of men's fertility in the united states and britain: A research note. Demography *36*, 135–144.

Ritchey, P.N. (1975). The Effect of Minority Group Status on Fertility: A Re-examination of Concepts. Population Studies *29*, 249–257.

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

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

Rosenbaum, P.R. (2010). Design of observational studies (Springer).

Rosenwaike, I. (1973). Two generations of Italians in America: their fertility experience. International Migration Review 271–280.

Rubin, D.B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. Journal of Educational Psychology *66*, 688.

Salt, J., and Clarke, J. (2002). Europe's migrant groups. In The Demographic Characteristics of Immigrant Populations, W. Haug, P. Compton, and Y. Courbage, eds. (Council of Europe), pp. 17–55.

Scott, K., and Stanfors, M. (2011). Can Immigrant Fertility Rejuvenate the European Population? Evidence from Sweden (Center for Economic Demography and Department of Economic History, Lund University, Sweden).

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

Sobotka, T. (2004). Is Lowest-Low Fertility in Europe Explained by the Postponement of Childbearing? Population and Development Review *30*, 195–220.

Sobotka, T. (2008). Overview Chapter 7: The rising importance of migrants for childbearing in Europe. Demographic Research *19*, 225–248.

Sorenson, A.M. (1988). The Fertility and Language Characteristics of Mexican-American and Non-Hispanic Husbands and Wives. The Sociological Quarterly *29*, 111–130.

Swicegood, G., Bean, F.D., Stephen, E.H., and Opitz, W. (1988). Language usage and Fertility in the Mexican-Origin Population of the United States. Demography *25*, 17–33.

Toulemon, L. (2004). Fertility among immigrant women: new data, a new approach. Population & Societies *400*.

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).

Tromans, N., Natamba, E., and Jefferies, J. (2007). Have women born outside the UK driven the rise in UK births since 2001? Population Trends *136*, 28–42.

Walvin, J. (1984). Passage to Britain: immigration in British history and politics (Penguin in association with Belitha Press).

Waters, M.C., and Jiménez, T.R. (2005). Assessing Immigrant Assimilation: New Empirical and Theoretical Challenges. Annual Review of Sociology *31*, 105–125.

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

Wilson, C. (2001). On the Scale of Global Demographic Convergence 1950–2000. Population and Development Review *27*, 155–171.

Yinger, J.M. (1981). Toward a theory of assimilation and dissimilation. Ethnic and Racial Studies *4*, 249–264.

Young, C.M. (1991). Changes in the Demographic Behaviour of Migrants in Australia and the Transition between Generations. Population Studies *45*, 67–89.

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

Zumpe, J., Dormon, O., and Jefferies, J. (2012). Childbearing among UK born and non-UK born women living in the UK (ONS).

## Appendix

**Table A1: Convergence between generations: by ancestry**

| | 1952-1971 cohorts | | 1952-1971 cohorts | | comparison: between generations | | | |
|---|---|---|---|---|---|---|---|---|
| **Ancestry** | **1st gen IRR (vs natives)** | p-value | **2nd gen IRR (vs natives)** | p-value | Which is closer to native norm? | ratio: 2nd / 1st | p-value | **convergence?** |
| Ireland | 0.9 | 0.55 | 1.0 | 0.81 | 2nd | 1.1 | 0.52 | slight |
| India | 1.1 | 0.01 | 1.1 | 0.50 | 2nd | 0.9 | 0.40 | slight |
| Pakistan | 1.6 | 0.00 | 1.5 | 0.00 | 2nd | 0.9 | 0.66 | slight |
| Bangladesh | 2.0 | 0.00 | 1.4 | 0.07 | 2nd | 0.7 | 0.04 | yes |
| Jamaica | 0.9 | 0.51 | 0.9 | 0.14 | 1st | 1.0 | 0.89 | no |
| Other Caribbean | 1.0 | 0.88 | 0.9 | 0.36 | 1st | 0.9 | 0.72 | no |
| NZ, Aus, US & Canada | 0.6 | 0.03 | 1.0 | 0.91 | 2nd | 1.5 | 0.06 | yes |
| N. & W. Europe | 0.7 | 0.01 | 0.9 | 0.51 | 2nd | 1.4 | 0.10 | yes |
| S. & E. Europe | 0.8 | 0.00 | 0.9 | 0.21 | 2nd | 1.1 | 0.36 | slight |
| N. Africa & Middle East | 1.2 | 0.11 | 0.7 | 0.03 | 1st | 0.6 | 0.01 | no |
| W. & C. Africa | 1.3 | 0.00 | 1.1 | 0.29 | 2nd | 0.9 | 0.37 | slight |
| E. & S. Africa | 1.2 | 0.03 | 1.0 | 0.92 | 2nd | 0.8 | 0.22 | slight |
| East Asia | 0.9 | 0.30 | 0.9 | 0.67 | 2nd | 1.1 | 0.68 | slight |
| Other | 1.0 | 0.52 | 1.0 | 0.81 | 2nd | 1.1 | 0.62 | slight |

Notes: Models are estimated accounting for survey design. Each IRR shows the risk of birth relative to ancestral natives in that birth cohort, where an IRR of 1.0 means that women had the same completed fertility as ancestral natives. The ratio shows second generation IRRs divided by first generation IRRs. Hence, a value larger than 1.0 suggests higher fertility, relative to natives, for the second generation compared with the first. Convergence is assessed consistently using the following rules: 'yes' describes a movement toward native completed fertility (i.e. toward an IRR of 1.0) which is statistically significant at the 10% level ($p<0.1$); 'slight' describes a movement toward native completed fertility which is not statistically significant at the 10% level; 'no' describes any movement away from native completed fertility or where there is no change (i.e. neither group is closer to natives); Source: UKHLS Wave 1 (author's analysis)

**Table A2: Convergence within the first generation: by ancestry**

| | 1922-1951 cohorts | | 1952-1971 cohorts | | comparison: within (the 1st) generation | | | |
|---|---|---|---|---|---|---|---|---|
| **Ancestry** | **1st gen IRR (vs natives)** | p-value | **1st gen IRR (vs natives)** | p-value | Which is closer to native norm? | ratio: recent / older cohort | p-value | **convergence?** |
| Ireland | 1.3 | 0.03 | 0.9 | 0.55 | recent | 0.7 | 0.05 | yes |
| India | 1.2 | 0.13 | 1.1 | 0.01 | recent | 1.0 | 0.96 | slight |
| Pakistan | 1.7 | 0.00 | 1.6 | 0.00 | recent | 1.0 | 0.78 | slight |
| Bangladesh | 1.5 | 0.07 | 2.0 | 0.00 | older | 1.3 | 0.18 | no |
| Jamaica | 1.6 | 0.00 | 0.9 | 0.51 | recent | 0.6 | 0.00 | yes |
| Other Caribbean | 1.1 | 0.43 | 1.0 | 0.88 | recent | 0.9 | 0.54 | slight |
| NZ, Aus, US & Canada | 0.9 | 0.27 | 0.6 | 0.03 | older | 0.8 | 0.26 | no |
| N. & W. Europe | 1.0 | 0.74 | 0.7 | 0.01 | older | 0.7 | 0.03 | no |
| S. & E. Europe | 1.0 | 0.97 | 0.8 | 0.00 | older | 0.8 | 0.16 | no |
| N. Africa & Middle East | 0.9 | 0.41 | 1.2 | 0.11 | older | 1.3 | 0.14 | no |
| W. & C. Africa | 1.0 | 0.97 | 1.3 | 0.00 | older | 1.3 | 0.12 | no |
| E. & S. Africa | 1.0 | 0.61 | 1.2 | 0.03 | older | 1.1 | 0.34 | no |
| East Asia | 0.8 | 0.41 | 0.9 | 0.30 | recent | 1.1 | 0.84 | slight |
| Other | 0.9 | 0.76 | 1.0 | 0.52 | recent | 1.0 | 0.96 | slight |

Notes: Models are estimated accounting for survey design. Each IRR shows the risk of birth relative to ancestral natives in that birth cohort, where an IRR of 1.0 means that women had the same completed fertility as ancestral natives. The ratio shows first generation IRRs for the more recent birth cohort (1922-51) divided by first generation IRRs for the older cohort (1952-71). Hence, a value larger than 1.0 suggests higher fertility, relative to natives, for the more recent cohort. Convergence is assessed consistently using the following rules: 'yes' describes a movement toward native completed fertility (i.e. toward an IRR of 1.0) which is statistically significant at the 10% level ($p<0.1$); 'slight' describes a movement toward native completed fertility which is not statistically significant at the 10% level; 'no' describes any movement away from native completed fertility or where there is no change (i.e. neither group is closer to natives); Source: UKHLS Wave 1 (author's analysis)

**Table A3: Convergence across generations: by ancestry**

| | 1922-1951 cohorts | | 1952-1971 cohorts | | comparison: across generations | | | |
|---|---|---|---|---|---|---|---|---|
| **Ancestry** | **1st gen IRR (vs natives)** | p-value | **2nd gen IRR (vs natives)** | p-value | Which is closer to native norm? | ratio: 2nd / 1st | p-value | **convergence?** |
| Ireland | 1.3 | 0.03 | 1.0 | 0.81 | 2nd | 0.8 | 0.04 | yes |
| India | 1.2 | 0.13 | 1.1 | 0.50 | 2nd | 0.9 | 0.49 | slight |
| Pakistan | 1.7 | 0.00 | 1.5 | 0.00 | 2nd | 0.9 | 0.58 | slight |
| Bangladesh | 1.5 | 0.07 | 1.4 | 0.07 | 2nd | 0.9 | 0.77 | slight |
| Jamaica | 1.6 | 0.00 | 0.9 | 0.14 | 2nd | 0.5 | 0.00 | yes |
| Other Caribbean | 1.1 | 0.43 | 0.9 | 0.36 | 2nd | 0.8 | 0.25 | slight |
| NZ,Aus,US,Canada | 0.9 | 0.27 | 1.0 | 0.91 | 2nd | 1.2 | 0.42 | slight |
| N. & W. Europe | 1.0 | 0.74 | 0.9 | 0.51 | 1st | 0.9 | 0.50 | no |
| S. & E. Europe | 1.0 | 0.97 | 0.9 | 0.21 | 1st | 0.9 | 0.49 | no |
| N. Africa & Mid East | 0.9 | 0.41 | 0.7 | 0.03 | 1st | 0.8 | 0.34 | no |
| W. & C. Africa | 1.0 | 0.97 | 1.1 | 0.29 | 1st | 1.1 | 0.50 | no |
| E. & S. Africa | 1.0 | 0.61 | 1.0 | 0.92 | 2nd | 0.9 | 0.70 | slight |
| East Asia | 0.8 | 0.41 | 0.9 | 0.67 | 2nd | 1.1 | 0.62 | slight |
| Other | 0.9 | 0.76 | 1.0 | 0.81 | 2nd | 1.1 | 0.70 | slight |

Notes: Models are estimated accounting for survey design. Each IRR shows the risk of birth relative to ancestral natives in that birth cohort, where an IRR of 1.0 means that women had the same completed fertility as ancestral natives. The ratio shows second generation IRRs divided by first generation IRRs. Hence, a value larger than 1.0 suggests higher fertility, relative to natives, for the second generation compared with the first. Convergence is assessed consistently using the following rules: 'yes' describes a movement toward native completed fertility (i.e. toward an IRR of 1.0) which is statistically significant at the 10% level ($p<0.1$); 'slight' describes a movement toward native completed fertility which is not statistically significant at the 10% level; 'no' describes any movement away from native completed fertility or where there is no change (i.e. neither group is closer to natives); Source: UKHLS Wave 1 (author's analysis)

**Table A4: Qualitative conclusions that change after the addition of controls**

| | Convergence? | | |
|---|---|---|---|
| **Ancestry** | between | within | across |
| Ireland | no | | |
| India | no | | |
| Pakistan | no | | |
| Bangladesh | slight | | |
| Jamaica | | | |
| Other Caribbean | | | |
| NZ, Aus, US & Canada | | | |
| N. & W. Europe | slight | | slight |
| S. & E. Europe | yes | | slight |
| N. Africa & Middle East | | | |
| W. & C. Africa | | | |
| E. & S. Africa | | | |
| East Asia | | no | |
| Other | no | | no |

Note: This table only shows those results which are different after adding controls for education and partnership history to the models.

Tables A1-A3 show the results without controls.

Source: UKHLS Wave 1 (author's analysis)

**Table A5: A comparison of convergence tests for men and women**

| | MEN | | | | WOMEN | | | |
|---|---|---|---|---|---|---|---|---|
| | comparison: across generations | | | | comparison: across generations | | | |
| **Ancestry** | closer to native norm | ratio: 2nd / 1st | p-value | **convergence?** | closer to native norm | ratio: 2nd / 1st | p-value | **convergence?** |
| Ireland | 1st | 0.9 | 0.76 | no | 2nd | 0.8 | 0.04 | yes |
| India | 2nd | 0.9 | 0.47 | slight | 2nd | 0.9 | 0.49 | slight |
| Jamaica | 2nd | 0.9 | 0.59 | slight | 2nd | 0.5 | 0.00 | yes |
| NZ, Aus, US & Canada | 2nd | 0.9 | 0.63 | slight | 2nd | 1.2 | 0.42 | slight |
| S. & E. Europe | 1st | 0.9 | 0.46 | no | 1st | 0.9 | 0.49 | no |

| | comparison: within (the 1st) generation | | | | comparison: within (the 1st) generation | | | |
|---|---|---|---|---|---|---|---|---|
| **Ancestry** | closer to native norm | ratio: recent / older | p-value | **convergence?** | closer to native norm | ratio: recent / older | p-value | **convergence?** |
| Ireland | older | 0.6 | 0.11 | no | recent | 0.7 | 0.05 | yes |
| India | older | 1.1 | 0.37 | no | recent | 1.0 | 0.96 | slight |
| Jamaica | recent | 0.8 | 0.31 | slight | recent | 0.6 | 0.00 | yes |
| NZ, Aus, US & Canada | older | 1.0 | 0.95 | no | older | 0.8 | 0.26 | no |
| S. & E. Europe | older | 0.9 | 0.54 | no | older | 0.8 | 0.16 | no |

| | comparison: between generations | | | | comparison: between generations | | | |
|---|---|---|---|---|---|---|---|---|
| **Ancestry** | closer to native norm | ratio: 2nd / 1st | p-value | **convergence?** | closer to native norm | ratio: 2nd / 1st | p-value | **convergence?** |
| Ireland | 2nd | 1.6 | 0.08 | yes | 2nd | 1.1 | 0.52 | slight |
| India | 2nd | 0.8 | 0.08 | yes | 2nd | 0.9 | 0.40 | slight |
| Jamaica | 1st | 1.0 | 0.90 | no | 1st | 1.0 | 0.89 | no |
| NZ, Aus, US & Canada | 2nd | 0.9 | 0.43 | slight | 2nd | 1.5 | 0.06 | yes |
| S. & E. Europe | 1st | 1.0 | 0.96 | no | 2nd | 1.1 | 0.36 | slight |

Note: Table notes are identical to those for Tables A1-A3; Source: UKHLS Wave 1 (author's analysis)