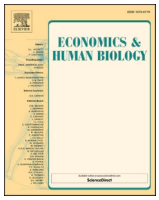
Economics and Human Biology 52 (2024) 101339

Contents lists available at ScienceDirect

Economics and Human Biology

journal homepage: www.elsevier.com/locate/ehb



Fertility and immigration: Do immigrant mothers hand down their fertility pattern to the next generation? Evidence from Norway

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ARTICLE INFO

Keywords:
Fertility
Generations
Immigrants

ABSTRACT

We examined whether the fertility pattern of immigrant mothers is handed down to the next generation. Our analyses were carried out on population register data. These data contained information on all immigrants to Norway from 123 countries during the period 1935–1995. We examined whether there was a relationship between the fertility rate in the country of origin and the number of children for generations 1.5 and 2 in Norway. We estimated three models: fixed effects for country of origin, fixed effects for region, and no fixed effects. The three specifications yielded estimates with overlapping confidence intervals. We interpret the estimates from the models with fixed effects for region, and the model with no fixed effects as upper-bound estimates. They show that an increase of 1.00 in the fertility rate in the country of origin leads to an average increase in the number of children of 0.12 (no fixed effects) or 0.14 (fixed effects for region) for immigrant women in generations 1.5 and 2. The estimate from the model with fixed effects for country of origin was small and not statistically significant at the conventional level. We interpret this as a lower-bound estimate. Our upper-bound estimates for generations 1.5 and 2 are smaller than the estimates for generation 1, i.e. there has been a decrease in the fertility rate from the first to the second generation. As a result, if the proportion of the population with an immigrant background continues to increase, it may increase at a slower rate in the future.

1. Introduction

In this study, we examined whether the fertility pattern of immigrant mothers is handed down to the next generation. So far, nearly all studies on fertility among immigrants have been carried out on first generation women. A consistent finding from this research is that the fertility rate of first generation women is higher than for women in the host country (for a review see: Sobotka, 2008; Adserà and Ferrer, 2015). However, the difference between the rates varies according to the age at emigration, level of education, and cultural proximity of the country of origin to the host country.

Our study moves forward from previous research by studying the fertility pattern of women in generations 1.5 and 2. We examine the extent to which fertility among these women differs from, or converges towards, that of the native-born population in Norway. Little attention has been paid to these immigrant women, partly due to lack of data (Adserà and Ferrer, 2015). In most countries they are young, so that many of them are at the beginning of their fertile age. Their fertility pattern needs to be measured at the end of their fertile age.

Despite the lack of data, studying their fertility pattern is important from a policy point of view. For example, in most western countries, there has been a marked fall in the fertility rate during the last few decades (Eurostat, 2022a; OECD, 2022). It is now below replacement level (Chesnais, 1998; Wilson, 2004). Several policy options are being discussed to reverse this declining trend in fertility (McDonald, 2002; Grant et al., 2006; Bloom et al., 2010). One option is to increase immigration, in particular from high-fertility countries. In the long run, such a policy would be most effective if the fertility rate of women in generations 1.5 and 2 did not converge towards the fertility level of the native-born population.

The dominant view is that changes in fertility preferences occur slowly, and that it takes more than one generation to reach convergence towards that of the native-born population (Adserà and Ferrer, 2015). This view is supported by the findings from the three most distinctive papers within this field (Fernández and Fogli, 2009; Blau et al., 2013; Stichnoth and Yeter, 2016). However, the differences in fertility

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https://doi.org/10.1016/j.ehb.2023.101339
Received 21 June 2023; Received in revised form 3 October 2023; Accepted 6 December 2023
Available online 9 December 2023

between women from the host country and immigrants tend to shrink, i.e. they are smaller for women in generations 1.5 and 2 than for women in generation 1.

The alternative view is that fertility preferences change from one generation to the next. If women in generations 1.5 and 2 are well integrated into the culture and society of the host country, then they may also adapt to the fertility pattern of women in the host country. Using high quality Norwegian register data, we examined whether this was the case. These data contained information on all immigrants to Norway from 123 countries during the period 1935–1995. All persons living in Norway have a unique personal identification number. This made it possible to merge the data from first generation women and their descendants.

Our key results are presented in Fig. 1. The x-axis denotes the total fertility rate in the country of origin of first generation women in the year when they emigrated to Norway. For these women, there is a clear positive association between this fertility rate and the mean number of children (Fig. 1, left). For women in generations 1.5 and 2, there is still a positive association, but it is not as strong as for the first generation (Fig. 1, right). For example, in Somalia the fertility rate is about seven. In Norway, Somalian women in generation 1.5 or 2 gave birth to about two children.

Below, we first briefly describe the relevant literature and discuss the strengths of our study in the light of previous research. We then describe the data and the empirical models. Finally, we present and discuss the results.

2. Background

Our theoretical framework is based on the work of Fernández and Fogli (2009). They used the fertility rate in the immigrants' country of origin as an indicator of the norms governing fertility and preferences for family size. They described this as the culture that mirrors the fertility pattern. The research question is then whether this culture is transferred to the country of destination by first generation immigrants, and if it is, is it transferred further to the next generation? The study of Fernandez and Fogli (2009) used data from the 1970 US Census. Their study encompassed immigrants from 25 countries of origin. Blau et al. (2013) also used US Census data, but included more years (1970, 1980, 1990 and 2000) and more countries (n=69). Stichnoth and Yeter (2016) used survey data from Germany for 2008 and 2012 that included seven countries.

Fernández and Fogli (2009) applied an instrumental variable strategy. In the first stage, they regressed the fertility rate on 25 country dummies. Using this strategy, they identified an effect in the second stage regression. In all three studies, the coefficients estimated from the cross-sectional variation in the fertility rates, were of a reasonable size and statistically significant ($p<0.05$).

In the study of Blau et al. (2013), the variation in the fertility rates within the countries of origin (n=69) was too small to identify an effect. Therefore, they implemented a within identification strategy at a regional level. The countries of origin were grouped according to five regions: 1. Europe, Canada, New Zealand and Australia. 2. Asia. 3. Latin America. 4. Sub-Saharan Africa. 5. Middle East. Using this grouping, an effect was identified.

Stichnoth and Yeter (2016), included fixed effects for country of

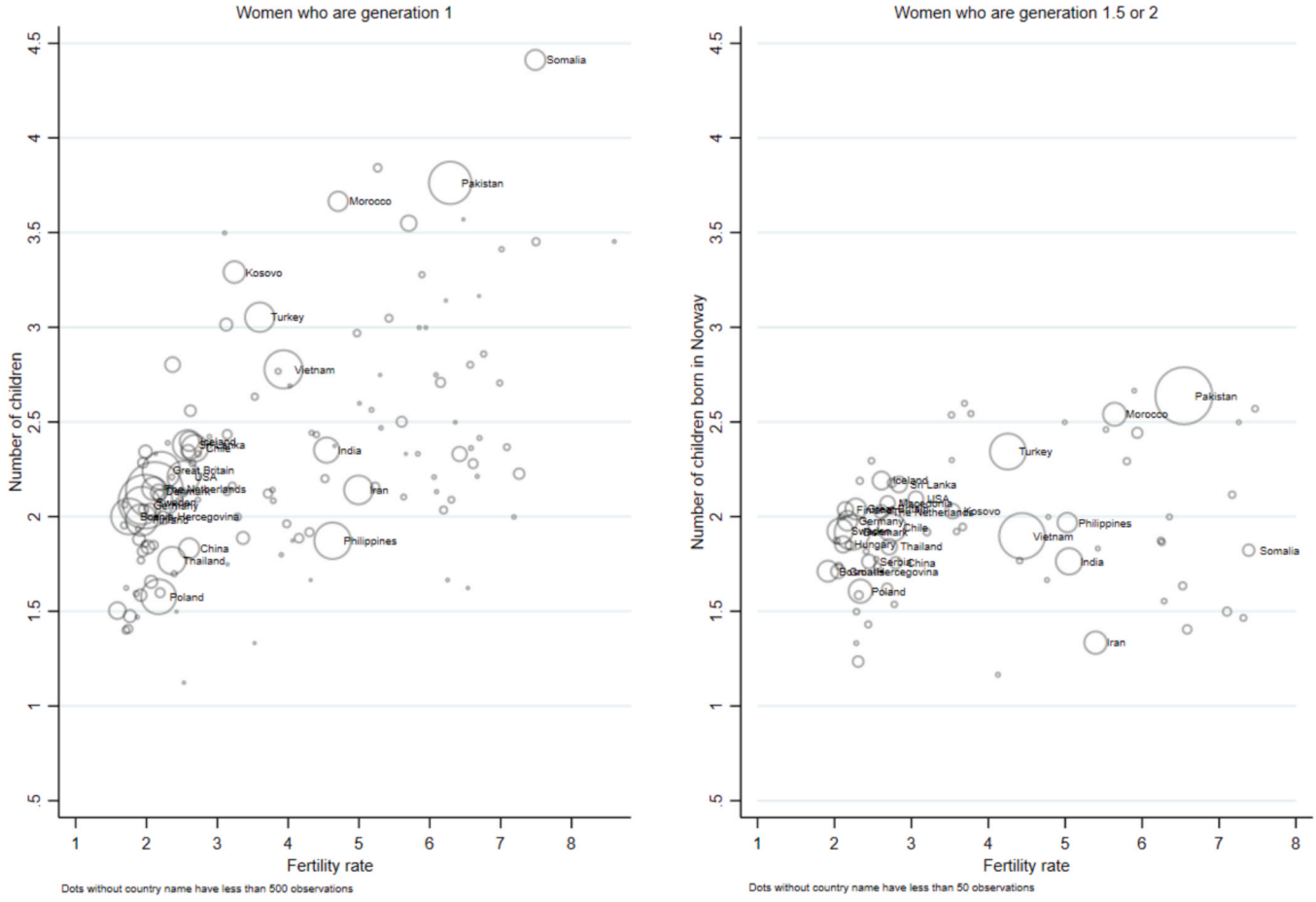

Fig. 1. The relationship between fertility rate and the number of children. The fertility rate is the fertility rate in the country of origin of first generation women in the year when they emigrated to Norway.

origin in their analyses. The coefficient for the fertility rate had the correct sign, but was small (0.03) and not statistically significant (t-value=0.58) at the conventional level ($p<0.05$). In their data, only Turkey had a significant variation in the fertility rate over time. There was little variation in the other countries. Accordingly, the authors concluded that "there may not be enough variation left for identifying the cultural effect in the within model".

We estimated three key models. In the first model, we exploited variation in the fertility rate between and within the countries of origin. This is our baseline model. In the second model, we extended our baseline model by including fixed effects for region. In the third model, we included fixed effects for country of origin. In Model 2, the identification strategy relied on variation in the fertility rate within region. In Model 3, the identification strategy relied on variation within country of origin. Immigrants are not a random sample of the population in their country of origin. For example, their fertility pattern may be more similar to the fertility pattern in their country of destination than in their country of origin. In our analyses, we adjusted for this potential selection bias. The results based on our regression models with control for selection, support the results presented in Fig. 1.

From a methodological point of view, our study has several strengths.

First, it includes immigrants from many countries in the world (n=123). Immigrants from both low- and high-fertility countries are well represented. In the previous studies, mainly low-fertility countries have been included (Fernández and Fogli, 2009; Blau et al., 2013; Stichnoth and Yeter, 2016).

Second, the register data provide accurate information on key variables. The exposure variable is the total fertility rate in the country of origin of first generation women in the year when they emigrated to Norway. This variable is measured the year when first generation women emigrated. Thus, with little or no measurement errors in year of emigration, it is unlikely that our zero-effect is downward biased. In previous studies, information on key variables is less accurate, which may have led to biased results. In particular, this is the case when survey data have been used for the analyses (for a discussion see: Adserà and Ferrer, 2015).

Third, our data cover a long time span (all immigrants who emigrated during the period 1935–1995). During that time there were variations in the fertility rates within most of the countries. This made it possible to extend the analysis without fixed effects for country (model one), to analyses in which country fixed effects were included (model three).

Fourth, we examined the transmission of fertility patterns in Norway between immigrant generations. In our analyses, using register data, we showed that this pattern is not handed down between generations. This was further supported by the findings from the *Survey on living conditions among persons with an immigrant background* (Vrålstad and Wiggen, 2017). First generation immigrants reported that it is very important to have children. Immigrants who were generations 1.5 and 2 reported this to be less important.

Our study gives further insight into this area of research by providing evidence from another European country. Norway is different from the USA in several ways. For example, Norway is a welfare state, developed by strong social democratic governments. Welfare services, such as education and health services, are funded by general taxation. Everybody, immigrants included, has the right to welfare services, and the services are free at the point of consumption. For immigrants who arrive as refugees, they are included in a four-year introduction programme where the goal is to "give the individual basic skills in Norwegian language and a fundamental insight into Norwegian social conditions and to prepare him/her for work or education" (Valenta and Buar, 2010; Ministry of Labour and Social Inclusion, 2014). Thus, the state provides an important framework for integration of immigrants into Norwegian society and culture (Olwig et al., 2012). This may be one explanation why our results differ from the studies from the USA.

3. Material and methods

3.1. Generations, data and samples

We distinguished between three generations of immigrants. The first generation are women who were born abroad and emigrated to Norway at the age of 15 years or older. Generation 1.5 are women who were also born abroad, but who emigrated to Norway before the age of 15. The second generation are women who were born in Norway, but who have two parents who emigrated to Norway.

The women who arrived in Norway before the age of 15 have lived in Norway throughout their adult life. In Norway, they will then have been influenced by the same institutional and economic conditions as women from the second generation. For generations 1.5 and 2, if their fertility pattern in Norway resembles that of women in their country of origin, we assume that this pattern has been transmitted through their mothers. Therefore, in most of our analyses, we included generations 1.5 and 2 in the same sample. To test the robustness of the results, we carried out supplementary analyses in which only second generation women were included.

The source of the data is the National Population Register of Norway. This register contains data on all immigrant women and their children. Our main analyses were carried out on a sample of women 40 years and older (n=9358), i.e. they were nearing the end of their fertile age. They were born in 1980 or earlier. In supplementary analyses, we used a sample of women 45 years and older (n=5357) and a sample of women 50 years and older (n=2792). These women were at the end of their fertile age. For the main analyses, we decided to use the sample for the age group 40 years and older, since this sample was larger than the two other samples. This allowed for more detailed analyses, in particular in subgroups of the data.

3.2. Model specification

Our general model is specified as:

$$\text{Number\_children}_{\text{itacT}} = \beta \text{TFR}_{\text{cT}} + \text{Effects\_parents\_education} + \delta_{\text{t}} + \vartheta_{\text{a}} + \theta_{\text{r/c}} + \varepsilon_{\text{itacT}} \quad (1)$$

where the subscript *i* denotes women in generation 1.5 or 2. For these women, *t* denotes their year of birth. For women in generation 1.5, *a* denotes their age when they emigrated to Norway. The subscript *r* refers to region, *c* refers to country of origin, and *T* refers to the year when mothers in generation 1 emigrated to Norway.

Our outcome is the number of children of women in generation 1.5 or 2. The total fertility rate in the country of origin is TFR_{cT}, measured in the year when first generation mothers emigrated (Gapminder, 2022). As part of our test for robustness, we also used alternative fertility rates, measured at other points of time (for details see the section on Supplementary analyses).

In all regressions, we included the following fixed effects: year of birth (δ_t) and age when women in generation 1.5 emigrated to Norway (ϑ_a). For the variable *age when emigrated to Norway*, women in generation 2 were given the value 0. In some specifications we added the level of education of first generation parents.

In our baseline model, we exploited variation in the fertility rate (TFR_{cT}), between and within the countries of origin; i.e. no fixed effects for region or country of origin were included in the analyses. In the second model, we extended our baseline model by including fixed effects for region (θ_r). In the third model, we extended our baseline model by including fixed effects for country of origin (θ_c).

In previous studies, ordinary least squares (OLS) has been used for the estimation. In order to compare our results with the results from previous studies, we estimated Eq. (1) using OLS regressions. Number of children is a count variable. Therefore, to test the robustness of the OLS regressions, we estimated Eq. (1) using a negative binominal regression

model. In all our analyses, we clustered the standard errors at the level of the country of origin to account for positive serial correlation and within-country-of-origin correlation.

3.3. Control variables

A consistent finding in the literature is that fertility falls as the level of education in the population increases (Martin, 1995; Basu, 2002). Hence, the level of education for first generation emigrants will be negatively correlated with the fertility rate in their country of origin. There is also a positive correlation of level of education between generations. In that way, first generation parents may have an indirect effect on the number of children of second generation parents. Unless this indirect effect is controlled for, the regression coefficient (the β) in Eq. (1) may be upward biased. Therefore, to take account of this potentially confounding effect, we controlled for the level of education of first generation parents in each of the three key models described above (Statistics Norway, 2000). For each of the parents, we included two dummy variables for education in the regressions. The highest educational level is university/college education. The middle educational level is upper secondary school. The lowest educational level is compulsory school education only (=reference category). The education variable had missing values.[1] We treated the individuals with missing values as a distinct group; i.e. we coded these individuals as a separate category in the analyses. To test the robustness of our results, we conducted analyses in which individuals with missing data on the education variable data were excluded.

3.4. Immigrant selection

In Eq. (1), we are interested in the sign and size of the regression coefficient β. A positive and significant regression coefficient would indicate that the fertility pattern of women who are generation 1.5 or 2 resembles that of women in their country of origin. This would also indicate that this pattern has been handed down from first generation mothers.

A small and non-significant regression coefficient β could indicate immigrant selection. Immigrant selection means that women who emigrate differ systematically from women who do not emigrate. The norms of immigrant women regarding fertility and family size are then more similar to the norms in the country of destination than in the country of origin. It is then unlikely that first generation women in Norway would hand down the fertility pattern of their country of origin to the next generation.

In several studies, it is acknowledged that bias could be introduced by not adjusting for immigrant selection (for a review see Adserà and Ferrer, 2015). Ideally, to adjust for immigrant selection, the characteristics of immigrant women should be compared with the characteristics of women who do not emigrate. This comparison should be done for each country of origin at the time the women emigrated. Unfortunately, this information is unavailable for many countries. In our study, we dealt with immigrant selection in two ways. Each of them are described below.

3.5. Adjusting for immigrant selection by using a selectivity variable

In several studies, it has been shown that immigrants have higher education compared to those in their country of origin (Feliciano, 2005a; Rooth and Saarela, 2007; Belot and Hatton, 2012; Bernard and Bell, 2018; Ichou and Wallace, 2019). In fact, among several background characteristics such as occupation, age and gender, education is the characteristic that correlates most with migration. Thus, within the literature on immigration, immigrant selection has been taken into account by controlling for the educational attainment of immigrants relative to non-immigrants in the regression analyses (for example see: Kahn, 1988; Feliciano, 2005b; Ichou and Wallace, 2019). We constructed a selectivity variable that compared the mean years of schooling of immigrants in Norway with that of the same birth cohort in the country of origin. Our selectivity variable was constructed using panel data. In that way we could adjust for changes in immigrant selection within each country of origin over time.

The data from the birth cohorts in the country of origin were obtained from Barro and Lee (2013) (http://www.barrolee.com). This data contained the mean years of schooling for the population aged 15 and over (=Dataset 1). The data were broken down into five-year intervals, starting at the age group 15–19, and ending at the age group 75 and over. For immigrants in Norway, we calculated the mean years of schooling by country of origin at the year of arrival in Norway (Statistics Norway, 2000) (=Dataset 2). Similar to the dataset by Barro and Lee (2013), this calculation was done using five-year age groups.

We merged Dataset 1 and 2 by country of origin, year of arrival and age group at arrival. From this new dataset we constructed a fraction in which the numerator was the mean years of schooling for immigrants at the time of arrival in Norway. The denominator was the mean years of schooling for the population in the country of origin. This ratio can be interpreted as the educational attainment for immigrants relative to that in the country of origin (Appendix, Fig. A1). We included this variable in Eq. (1) to control for immigrant selection. We also included a variable measuring the proportion of immigrants with missing values on the education variable. This was done by country of origin at the year the immigrants arrived in Norway.

For most countries the value of the selectivity variable was around 2, indicating that most immigrants had twice as many years of education as those in their country of origin. For a few years in the early 1970 s, the selectivity variable had values in the range 4–5. More detailed analyses showed that this result was mainly because of immigrants from Pakistan and India. These immigrants constituted a large proportion of immigrants to Norway at that time, and they were well educated.

3.6. Does the fertility pattern of first generation women resemble the fertility pattern in their country of origin?

To test further for immigrant selection, we also estimated three models for first generation women. The general model is specified as:

$$\text{Number\_children}_{\text{jtacT}} = \lambda \text{TFR}_{\text{cT}} + \mu_{\text{t}} + \rho_{\text{a}} + \theta_{\text{r/c}} + \varepsilon_{\text{jtacT}} \quad (2)$$

where the subscript j denotes women in generation 1. The subscript t denotes the women's year of birth and a denotes their age when they emigrated to Norway. T refers to the year when they emigrated. The dependent variable includes children born in their country of origin and children born in Norway.

In all our regressions, we included the following fixed effects: year of birth (μ_t) and age when emigrated to Norway (ρ_a). In our baseline model, no fixed effects for region or country of origin were included in the analyses. In the second model, we extended our baseline model by including fixed effects for region (θ_r). In the third model, we extended our baseline model by including fixed effects for country of origin (θ_c).

If the regression coefficientλ in Eq. (2) is positive, this would weaken the selection hypothesis. Then the fertility pattern of first generation women would resemble that of women in their country of origin.

The analysis in Eq. (2) was carried out on a population of all first generation women who emigrated to Norway during the period 1935–1995 (n=53,630). This population included women with and

[1] The number of fathers with missing information for the education variable was 4383. The corresponding number for mothers was 3208.

without children. The fertility rates in the countries of origin were also calculated for women with and without children (Gapminder, 2022).[2]

3.7. Fertility across generations in Norway

In these analyses, we assume that the fertility pattern of first generation women resembles the fertility pattern in their country of origin; i.e. the regression coefficient λ in Eq. (2) is positive (see also Fig. 1, left). Given this assumption, we tested whether their fertility pattern is handed down to the next generation. We carried out two types of analysis. Each of them are described below. The main focus is on transmission of fertility patterns in Norway between generations.

3.8. Correlations in fertility across generations for immigrants and Norwegians

In these analyses, we examined whether the fertility patterns across generations were similar for immigrants and Norwegians. If the patterns were similar, this could be the result of assimilation of generations 1.5 and 2 into Norwegian culture and society. In that case, we would expect the correlations in fertility across generations to be the same for immigrants and Norwegians. We examined this by estimating the following two regressions, one for immigrant women (Eq. 3) and one for Norwegian women (Eq. 4):

$$\text{Number\_children}_{itac} = \pi\text{Number\_children\_mother}_{itac} + \text{Effects\_parents\_education} + \delta_t + \vartheta_a + \mu_t + \rho_a + \theta_{r/c} + \varepsilon_{itac} \quad (3)$$

$$\text{Number\_children}_{it} = \alpha\text{Number\_children\_mother}_{it} + \text{Effects\_parents\_education} + \omega_t + \kappa_t + \varepsilon_{it} \quad (4)$$

Eq. (3) was estimated on the population of women who belonged to generation 1.5 or 2 (n=9358). The key independent variable was *number of children their mother from generation 1 had*. For women in generation 1, 1.5 or 2, we included fixed effects for year of birth (δ_t and μ_t). For women in generation 1 or 1.5 we included fixed effects for age when emigrated to Norway (ϑ_a and ρ_a). In an additional regression, we included region (θ_r) or country of origin fixed effects (θ_c) and level of education of first generation parents.

Eq. (4) was estimated on a sample of Norwegian women. This sample was made in two steps: First, we selected Norwegian women who were born in the same years as the first generation immigrant women.[3] Second, for these Norwegian women, we identified their daughters who were 40 years or older. Eq. (4) was then estimated on the sample of these daughters (n=651,019). The key independent variable was the *number of children the mothers had*. For women in generation 1 or 2, we included fixed effects for year of birth (ω_t and κ_t). For first generation parents, we included their level of education.

In both Eqs. (3) and (4), we examined the correlation across generations. Following previous research, we expected this correlation to be positive, but small (for a review see Kolk et al., 2014). The key question is whether this correlation is stronger for immigrant women than for Norwegian women; i.e. whether the coefficient π is larger than the coefficient α.

[2] We did not carry out an analysis of Eq. (2) on the population of mothers of women in generations 1.5 and 2. This population included only first generation immigrant women *with* children. Therefore, the outcome variable (= number of children) estimated for these women would not have been comparable with the fertility rates (*TFRs*) in the countries of origin.

[3] These first generation mothers emigrated to Norway during the period 1935–1995. They were born during the period 1900–1960.

3.9. Does the value of having children vary across immigrant generations?

To test the transmission of fertility patterns in Norway between immigrant generations further, we used data from the *Survey on living conditions among persons with an immigrant background* (Vrålstad and Wiggen, 2017). This survey was a cross-sectional study carried out by Statistics Norway in 2016. The sample was drawn from a population consisting of 8156 immigrants aged 16–74 years and who had lived in Norway for two years or more. Altogether immigrants from 12 countries, mainly from the Middle-East, Asia and Africa, were represented in the survey. The data were collected by personal interviews using a questionnaire that was translated into the language spoken by each immigrant group. Altogether, 4435 immigrants participated, which gave a response rate of 54.4%. Statistics Norway has published figures on the representativeness of the sample with respect to gender, age and country of origin for the immigrants. There were only minor deviations between the sample and the population (for details see Vrålstad and Wiggen, 2017).

For our purpose, we used the responses from the following question: *Do you think it is very important, fairly important, neither important nor unimportant, or not important to have children in order to have a happy marriage?* We examined whether the response to this question varied between immigrant generations in Norway by estimating the following multinominal logit model:

$$\ln\frac{P(To\ have\ children_{ic} = x)}{P(To\ have\ children_{ic} = Reference\ group)} = \varphi Generation_{ic} + \theta_c + Control\ variables_{ic} + \varepsilon_{ic} \quad (5)$$

The response variable had four groups (= x): *very important, fairly important, neither important nor unimportant (the reference group), or not important. Generation* is a dummy variable that equals 1 if the individual is an immigrant who is generation 1.5 or 2, or equals 0 if the individual is a first generation immigrant. If immigrants who are generation 1.5 or 2 believe that having children is not important, then we expect the coefficients for the category *very important* to be negative. In that case, it would be less likely that fertility patterns would be handed down to the next generation.

In the survey data, we were able to distinguish between immigrant generations for only four countries: Turkey, Sri Lanka, Pakistan and Vietnam. Thus Eq. (5) was estimated on a sample of 2509 immigrants. In the estimation we included fixed effects for country of origin (θ_c), gender, year of birth, level of education, and age when emigrated to Norway. In the analyses, we clustered the standard errors at the country of origin level.

4. Results

4.1. Descriptive statistics

In Table 1, we present descriptive statistics according to country of origin for women who are generation 1.5 or 2. Women from Western Europe, the Middle East (in particular Turkey and Iran) and Asia make up most of the immigrants. With the exception of Chile, there are few women from South America. From North America, most of the women were from the USA.

The mean number of children varies a lot between regions and between countries. This number is highest in several Middle Eastern countries (for example Turkey and Iraq), in some African countries (for example Morocco) and in some European countries (for example Macedonia and Kosovo). For these countries, the mean number of children is well above 2. The mean number of children is lowest in several European countries (for example Italy, the Czech Republic, Spain and Russia). For these countries, the mean number of children is well below 2.

Table 1
Characteristics of the population.

Country of origin of first generation women	Number of women who are generation 1.5 or 2	Women who are generation 1.5 or 2 Mean number of children	Women who are generation 1 Year of emigration to Norway			Fertility rate in the country of origin of first generation women in the year when they emigrated to Norway		
			Mean	Min	Max	Mean	Min	Max
Europe								
Denmark	788	1.92	1967	1935	1992	2.22	1.38	3.02
Sweden	547	1.93	1966	1936	1994	2.07	1.60	2.59
Germany	298	1.98	1965	1937	1993	2.16	1.31	2.50
Great Britain	287	2.04	1967	1939	1993	2.27	1.72	2.80
Poland	268	1.61	1980	1945	1994	2.33	1.82	3.65
Hungary	214	1.86	1961	1947	1990	2.11	1.81	2.72
Bosnia-Herzegovina	199	1.71	1990	1965	1995	1.91	1.71	3.42
Finland	158	2.04	1969	1944	1991	2.14	1.50	3.41
Iceland	151	2.19	1978	1957	1995	2.61	2.13	4.18
The Netherlands	109	2.03	1967	1936	1992	2.60	1.47	3.22
Serbia	102	1.76	1970	1952	1994	2.44	1.92	3.29
Macedonia	98	2.07	1978	1956	1994	2.69	2.03	4.24
Croatia	94	1.71	1971	1960	1993	2.04	1.54	2.33
Kosovo	84	2.14	1991	1987	1995	3.53	2.70	4.43
Spain	53	1.62	1967	1958	1987	2.68	1.49	2.87
Czech Republic	47	1.85	1968	1948	1989	2.19	1.85	2.92
Italy	46	1.59	1964	1954	1986	2.31	1.38	2.53
Austria	37	1.43	1960	1936	1975	2.43	1.80	2.82
France	27	2.30	1967	1948	1985	2.48	1.84	3.02
Russia	27	1.74	1977	1960	1994	2.05	1.37	2.56
Portugal	23	1.74	1976	1960	1987	2.55	1.65	3.19
Romania	21	2.19	1975	1947	1995	2.33	1.37	3.14
Switzerland	20	1.50	1966	1950	1984	2.28	1.54	2.58
Belgium	15	2.00	1972	1960	1988	2.10	1.57	2.60
Faroe Islands	12	2.33	1979	1971	1994	2.74	2.30	3.20
Slovakia	11	1.82	1975	1969	1991	2.41	1.97	2.51
Greece	7	1.57	1961	1946	1970	2.51	2.34	2.74
Estonia	7	1.00	1971	1960	1993	1.87	1.60	2.07
Bulgaria	5	2.20	1989	1983	1992	1.80	1.60	2.03
Greenland	5	1.60	1983	1977	1989	2.28	2.20	2.35
Ireland	5	1.40	1972	1960	1990	3.26	2.00	3.86
Slovenia	4	1.75	1974	1960	1986	2.09	1.74	2.34
Latvia	3	1.33	1960	1960	1960	1.91	1.91	1.91
Montenegro	3	2.00	1984	1970	1992	2.28	2.05	2.74
Cyprus	2	1.50	1976	1967	1984	2.67	2.45	2.89
Lithuania	2	1.00	1961	1947	1975	2.54	2.21	2.87
Ukraine	2	1.00	1965	1952	1978	2.40	1.99	2.81
Albania	1	3.00	1960	1960	1960	6.49	6.49	6.49
Belarus	1	2.00	1987	1987	1987	2.07	2.07	2.07
Middle East								
Turkey	585	2.35	1981	1966	1995	4.25	2.76	5.93
Iran	223	1.34	1988	1976	1994	5.39	3.50	6.47
Iraq	45	2.44	1989	1961	1995	5.93	5.42	7.36
Syria	17	2.29	1987	1977	1992	5.80	4.92	7.36
Lebanon	13	2.54	1985	1973	1994	3.52	2.69	4.63
Israel	10	2.30	1973	1960	1988	3.52	3.04	3.84
Palestine	4	1.25	1970	1969	1974	7.85	7.65	7.92
Saudi Arabia	4	3.25	1985	1975	1991	6.44	5.76	7.31
Jordan	3	1.67	1971	1964	1975	7.74	7.60	8.03
United Arab Emirates	3	0.67	1987	1987	1988	4.89	4.80	4.93
Kuwait	1	1.00	1992	1992	1992	2.68	2.68	2.68
Asia								
Pakistan	1488	2.64	1978	1969	1995	6.54	5.34	6.61
Vietnam	953	1.90	1984	1964	1995	4.44	2.71	6.46
India	320	1.77	1977	1953	1993	5.05	3.80	5.91
Philippines	169	1.97	1982	1969	1993	5.02	4.11	6.38
Sri Lanka	111	2.17	1986	1963	1995	2.84	2.29	5.18
Thailand	108	1.84	1985	1955	1993	2.71	1.96	6.15
China	62	1.76	1983	1960	1995	2.79	1.64	4.51
Hong Kong	54	1.24	1979	1963	1992	2.30	1.27	4.86
Japan	16	1.88	1967	1960	1980	2.02	1.78	2.12
Afghanistan	14	2.57	1989	1986	1991	7.47	7.46	7.48
South Korea	13	1.77	1968	1936	1989	4.40	1.58	6.18
Bangladesh	9	1.56	1979	1975	1988	6.28	4.93	6.82
Singapore	9	1.78	1975	1960	1984	2.54	1.62	5.82

(*continued on next page*)

Table 1 (*continued*)

Country of origin of first generation women	Number of women who are generation 1.5 or 2	Women who are generation 1.5 or 2 Mean number of children	Women who are generation 1 Year of emigration to Norway			Fertility rate in the country of origin of first generation women in the year when they emigrated to Norway		
			Mean	Min	Max	Mean	Min	Max
Indonesia	8	2.50	1972	1957	1985	4.99	3.75	5.67
Cambodia	5	1.60	1986	1981	1992	5.80	5.24	6.10
Macau	2	2.50	1990	1990	1990	1.72	1.72	1.72
Malaysia	2	3.00	1976	1972	1980	4.42	4.07	4.76
Uzbekistan	2	1.50	1967	1964	1969	6.45	6.38	6.52
Laos	1	0.00	1987	1987	1987	6.31	6.31	6.31
Africa								
Morocco	236	2.54	1980	1960	1993	5.64	3.60	7.04
Somalia	57	1.82	1990	1979	1995	7.38	7.00	7.65
Cape Verde	32	1.41	1976	1964	1989	6.58	5.44	6.99
Uganda	30	1.50	1974	1973	1988	7.10	7.10	7.10
Eritrea	22	1.64	1987	1978	1991	6.52	6.32	6.68
Kenya	17	2.12	1982	1974	1989	7.17	6.24	7.91
Ghana	16	1.88	1983	1973	1989	6.24	5.71	6.89
Ethiopia	15	1.47	1984	1975	1991	7.31	7.14	7.42
Gambia	15	1.87	1980	1972	1991	6.25	6.09	6.34
Mauritius	13	1.92	1973	1960	1985	3.58	2.25	6.17
South Africa	13	2.46	1970	1949	1985	5.53	4.32	6.36
Algeria	11	2.00	1981	1973	1990	6.35	4.73	7.56
Egypt	6	2.67	1974	1966	1991	5.89	4.46	6.53
Madagascar	6	2.50	1967	1960	1977	7.25	6.98	7.31
Congo	4	2.25	1977	1972	1987	6.49	6.27	6.96
Tunisia	4	2.00	1978	1972	1989	5.47	3.68	6.47
Tanzania	3	2.67	1984	1978	1988	6.50	6.33	6.71
Nigeria	2	2.00	1977	1975	1979	6.75	6.71	6.78
Senegal	2	1.00	1983	1981	1985	7.18	7.06	7.30
Zambia	2	1.50	1981	1978	1984	7.02	6.81	7.22
Ivory Coast	1	2.00	1978	1978	1978	7.77	7.77	7.77
Liberia	1	3.00	1979	1979	1979	6.96	6.96	6.96
Rwanda	1	0.00	1990	1990	1990	7.18	7.18	7.18
Sierra Leone	1	3.00	1979	1979	1979	6.68	6.68	6.68
Sudan	1	2.00	1978	1978	1978	6.89	6.89	6.89
Seychelles	1	2.00	1989	1989	1989	2.82	2.82	2.82
North America								
USA	290	2.10	1962	1935	1991	3.05	1.74	3.74
Canada	26	2.08	1966	1946	1989	2.92	1.61	3.88
Dominican Republic	11	2.55	1987	1973	1991	3.77	3.40	5.58
Jamaica	9	2.00	1974	1966	1989	4.78	3.00	5.82
Mexico	5	1.80	1984	1980	1988	4.16	3.68	4.84
Costa Rica	2	2.50	1982	1974	1989	3.57	3.23	3.90
Guatemala	2	2.50	1979	1970	1988	6.11	5.57	6.64
Honduras	2	2.50	1984	1984	1984	5.80	5.80	5.80
Trinidad and Tobago	2	1.00	1978	1978	1978	3.27	3.27	3.27
El Salvador	1	1.00	1983	1983	1983	4.68	4.68	4.68
Grenada	1	0.00	1985	1985	1985	4.23	4.23	4.23
Nicaragua	1	3.00	1988	1988	1988	4.93	4.93	4.93
Saint Lucia	1	2.00	1976	1976	1976	5.35	5.35	5.35
South America								
Chile	349	1.94	1984	1960	1995	2.74	2.31	5.10
Argentina	25	1.92	1973	1937	1990	3.20	2.99	3.44
Brazil	19	1.95	1983	1960	1993	3.66	2.58	6.21
Uruguay	13	1.54	1979	1975	1981	2.77	2.67	2.98
Colombia	10	2.60	1983	1974	1990	3.69	2.99	4.68
Bolivia	6	1.83	1981	1981	1981	5.42	5.42	5.42
Guyana	6	1.17	1978	1974	1983	4.12	3.55	4.69
Peru	6	1.67	1983	1968	1993	4.76	3.51	6.63
Ecuador	3	3.00	1978	1971	1992	5.20	3.59	6.01
Paraguay	3	1.00	1978	1978	1978	5.19	5.19	5.19
Cuba	1	2.00	1960	1960	1960	4.18	4.18	4.18
Suriname	1	2.00	1986	1986	1986	3.28	3.28	3.28
Venezuela	1	2.00	1990	1990	1990	3.45	3.45	3.45
Ocania								
Australia	10	1.40	1967	1960	1992	3.01	1.87	3.44
New Zealand	3	2.00	1964	1949	1974	3.02	2.61	3.50
Total	9358							

Table 2
Number of women who are generation 1.5 or 2 according to country of origin and decade when their mothers emigrated to Norway.

Country of origin of first generation women	Decade						
	1935–1949	1950–1959	1960–1969	1970–1979	1980–1989	1990–1995	Total
Europe							
Denmark	19	104	376	180	104	5	788
Sweden	32	28	279	129	69	10	547
Germany	7	31	179	46	33	2	298
Great Britain	29	18	118	75	44	3	287
Poland	3	12	27	48	150	28	268
Hungary	2	61	126	19	4	2	214
Bosnia-Herzegovina	0	0	17	15	2	165	199
Other European countries	17	59	409	382	213	102	1182
Middle East							
Turkey	0	0	1	278	246	60	585
Iran	0	0	0	6	173	44	223
Other Middle Eastern countries	0	0	11	14	34	41	100
Asia							
Pakistan	0	0	2	1091	362	33	1488
Vietnam	0	0	1	186	626	140	953
India	0	3	8	246	58	5	320
Philippines	0	0	1	59	104	5	169
Sri Lanka	0	0	5	17	41	48	111
Thailand	0	1	1	10	77	19	108
Other Asian countries	1	1	28	65	81	21	197
Africa							
Morocco	0	0	3	149	76	8	236
Somalia	0	0	0	1	26	30	57
Other African countries	1	0	18	112	76	12	219
North America							
USA	39	16	172	42	20	1	290
Canada	4	0	14	3	5	0	26
Other North American countries	0	0	2	12	21	2	37
South America							
Chile	0	0	2	89	230	28	349
Argentina	1	1	6	9	7	1	25
Other South American countries	0	0	4	23	36	6	69
Ocania							
Australia	0	0	8	0	1	1	10
New Zealand	1	0	0	2	0	0	3
Total	156	335	1818	3308	2919	822	9358

In Table 1, in the column to the right, we show the mean fertility rate in the country of origin of first generation women in the year when they emigrated to Norway. There is marked variation in these rates between regions and between countries. The rates are highest for most of the Middle Eastern, Asian and African countries. For several of these countries, the mean fertility rate is well above 4. The rates are lowest for most of the European countries, for several of them just above or just below 2.

Our data for the year when the first generation women emigrated to Norway, covered a long timespan (Table 2 and Fig. 2). For several European countries, first generation women emigrated to Norway from the 1930 s and onwards (Table 2 and Fig. 2). In particular, this was the case for women from the Nordic countries. For women from other continents, most of them emigrated from the 1970 s and onwards. We included data for women who emigrated to Norway up to 1995. Women who are generation 1.5 would then have been born in 1980 or earlier.

Our analysis with fixed effects for country of origin, relies on variation in the fertility rate within the country of origin. For some selected countries, in Fig. 3, we show variation in the rate according to the year when first generation women emigrated to Norway. For each continent, we present the rate for the countries with most immigrants. For most countries there was a marked decrease in the rate over time. This decrease was particularly large for Denmark, Sweden, Bosnia-Hercegovina, Iran, Turkey, Vietnam, Sri Lanka, the Philippines, Thailand and Morocco. In only a few countries (for example Somalia), the fertility rate increased, or was fairly stable.

For the whole study population, the standard deviation of the fertility rate within the country was 0.62 and the standard deviation between countries was 1.85. The overall variation was 1.72. This implies that within-country variation contributed to 36% of the overall variation in the data. In Table 1, we show the maximum and minimum values for the fertility rate in the country of origin, which also gives an indication of the variation in the rate over time. In Table 3, we present standard errors for the model with fixed effects for country of origin and the model without fixed effects. These standard errors were similar. This implies that estimate precision is comparable in the model specifications with and without control for fixed effects for country of origin.

4.2. Main results

In Table 3, we present the results from six linear regression models. In our simplest model, no control variables and no fixed effects for region or country of origin were included in the regression. In this model, there was a positive association between the fertility rate and the number of children for women who were generation 1.5 or 2 ($p<0.01$). This was the case in both OLS regression and in the negative binominal regression. In Model II, we included the level of education of generation 1 (mothers and fathers) as control variables. The coefficient for the fertility rate of the country of origin was still statistically significant at the conventional level ($p<0.05$), but it was reduced to 0.10.

In Models III and IV, we included fixed effects for region with and without the level of education of generation 1 included. The estimates from these models were comparable to the estimates from the models without control for fixed effects for region or country of origin (Models I and II).

In Models V and VI, we included fixed effects for country of origin with and without the level of education of generation 1 included. In both models, the regression coefficients were small and not statistically

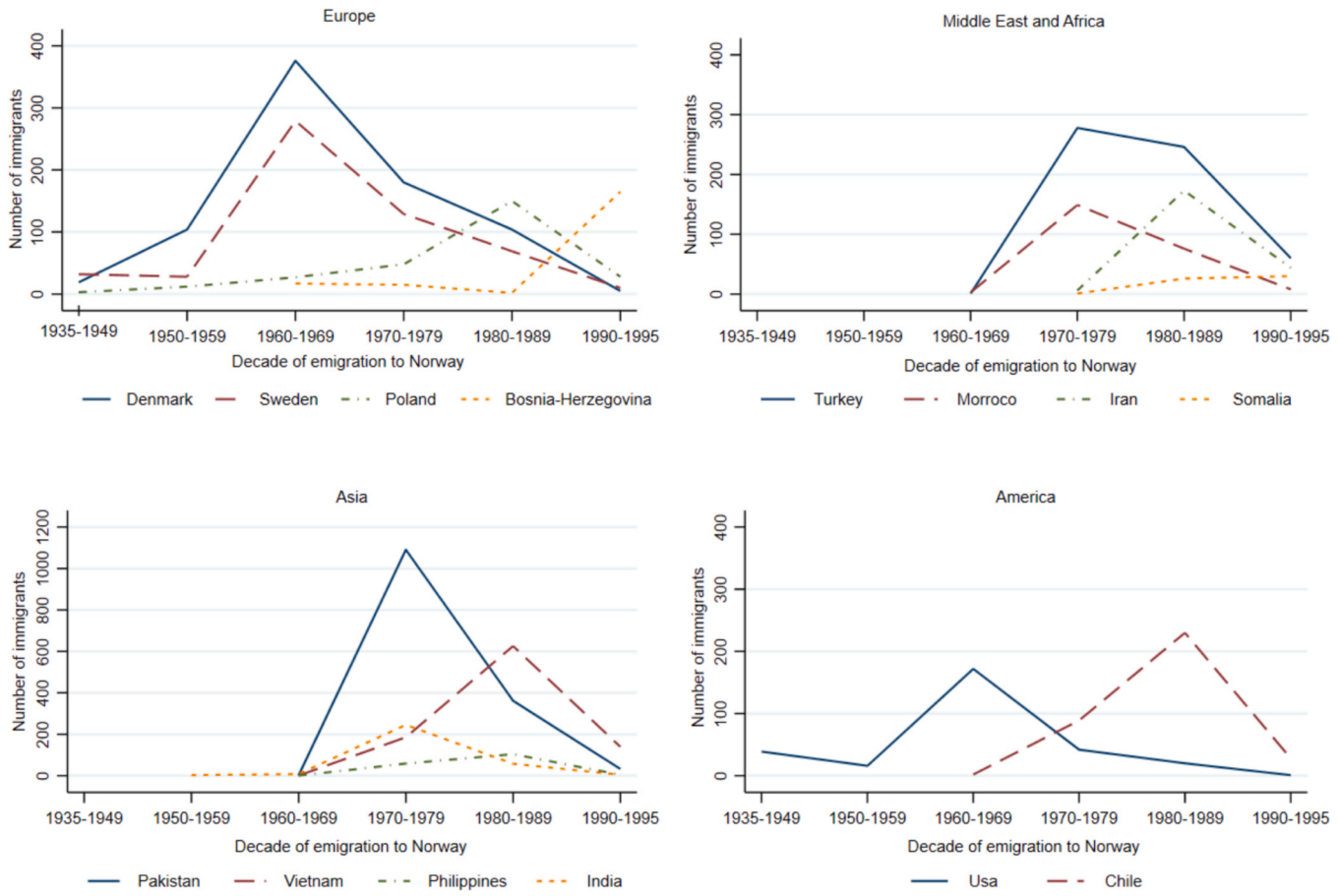

Fig. 2. Number of women who are generation 1.5 or 2 according to country of origin and decade when their mothers emigrated to Norway.

significant at the conventional level.

In Table 3, 95% confidence intervals are reported. The three key specifications (fixed effects for country of origin, fixed effects for region, and no fixed effects) yield estimates with overlapping confidence intervals. We interpret the estimate from the model with fixed effects for country of origin, as a lower-bound estimate. We interpret the estimates from the models with fixed effects for region and the model with no fixed effects as upper-bound estimates. The estimate from the model with no fixed effects included is 0.12 (Model I). In the model with fixed effects for region included, the estimate is 0.14 (Model III). According to these estimates, an increase of 1.00 in the fertility rate in the country of origin leads to an average increase in the number of children of 0.12 (or 0.14) for immigrant women in generations 1.5 and 2 in Norway.

In Appendix Table A1, we report the results from the analyses in which individuals with missing data on the education variable data were excluded. The coefficients from these analyses were fairly similar to the coefficients from the analyses in which individuals with missing values were treated as a distinct group (Table 3, columns II, IV and VI).

In Fig. 4, we present margins plots from non-linear regressions for each of the six models. Dummy variables for the following fertility rates were included in the regressions: <2, 2–2.99, 3–3.99, 4–4.99, 5–5.99, 6–6.99, >=7. The graphs in Fig. 4, support the key findings reported in Table 3. For example, in the models with fixed effects for region, there is a slight increase in the predicted number of children when the fertility rate increases. This is particularly the case for fertility rates in the interval 6–6.99. The same pattern is also found in the margins plots from the models without control for fixed effects for region or country of origin. In the models with fixed effects for country of origin, the predicted number of children is independent of the fertility rate.

4.3. Selection

In Table 4, we included the selectivity variable in the analysis. The coefficients only changed marginally after the inclusion of this variable.[4] For all models, the 95% confidence intervals overlapped.

In Table 5, we present the results from three linear regression models for women of generation 1. In all models, there was a positive and significant association between the fertility rate and the number of children for these women. In the baseline model, in which no fixed effects for region or country of origin was included, the size of the regression coefficient was 0.32 ($p<0.01$). The estimate from the model with fixed effects for region was comparable to the estimate from the baseline model. In Model III, we included country of origin fixed effects. The coefficient for the fertility rate of the country of origin was still statistically significant ($p<0.01$), and equal to 0.16. These results indicate that the fertility pattern of first generation women resembles the fertility pattern in their country of origin.

In Fig. 5, we present margins plots from non-linear regressions for the three models for women of generation 1: fixed effects for country of origin, fixed effects for region, and no fixed effects. These graphs provide further support for the results in Table 5. For example, for the lowest fertility rate in the model with no fixed effects for region or country of origin included, the predicted number of children was about two. For the highest fertility rate, the predicted number of children increased to about four.

[4] The size of the regression coefficient for the selection variable was −0.02 (t-value=3.13). A negative coefficient is a reasonable result. This is because immigrants have more education than those in the population in the country of origin (Appendix Fig. A1), and it is well established that fertility falls as level of education increases (Martin, 1995; Basu, 2002).

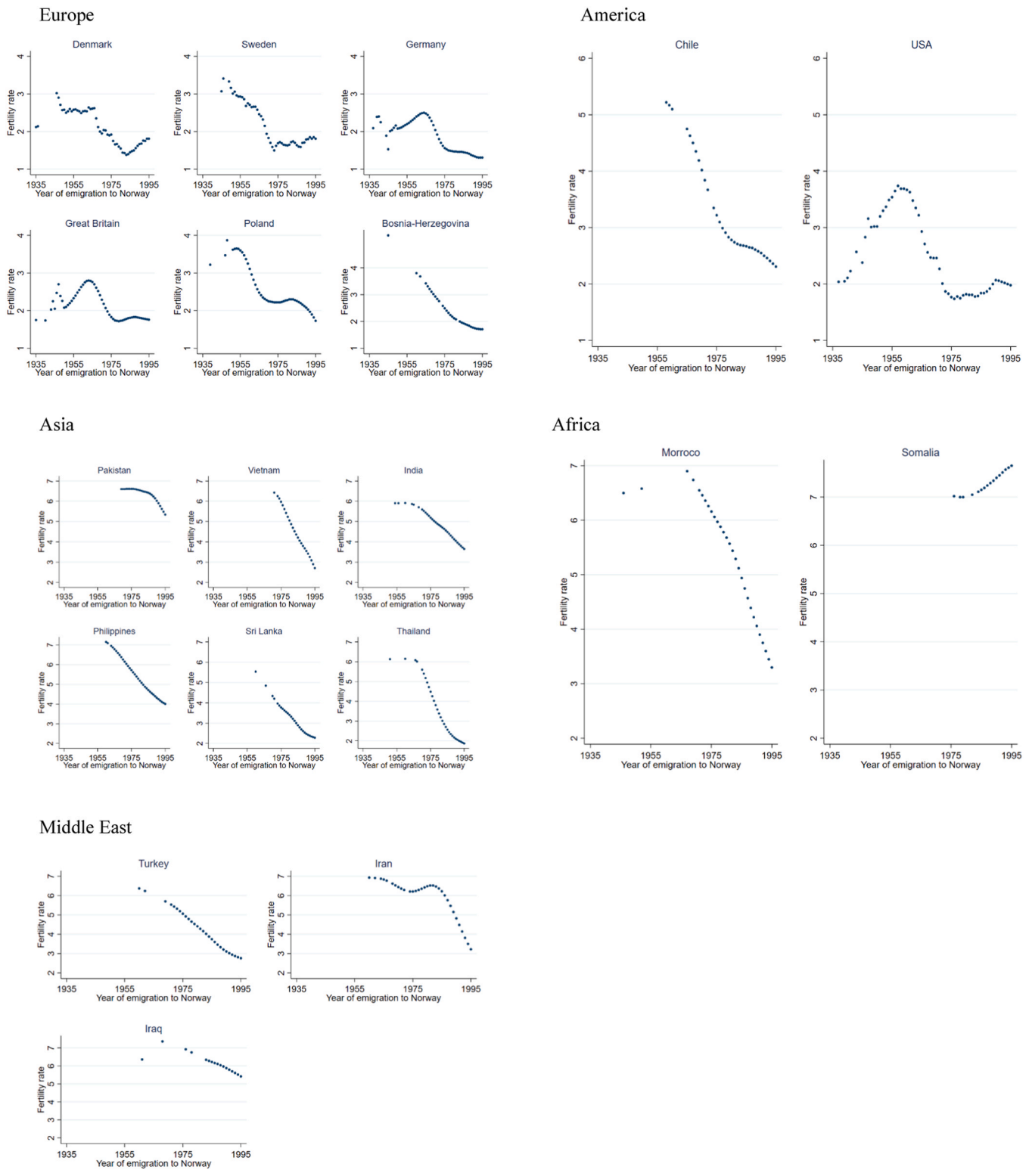

Fig. 3. Fertility rate in the country of origin of first generation women in the year when they emigrated to Norway.

4.4. Are fertility patterns in Norway handed down to the next generation?

In Table 6, we present the results from the analyses in which we compared fertility across generations for immigrant women and Norwegian women. For both groups of women, there was a correlation between the fertility of the mothers and the fertility of the daughters. However, the correlations were small and in the same order of magnitude for both groups. In all models, the size of the regression coefficients were the same, and the 95% confidence intervals overlapped. This is also supported by the margins plots in Fig. 6.

In Table 7, we present descriptive statistics from the *Survey on living conditions among persons with an immigrant background*. A large proportion of first generation immigrants answered that it is *very important* to have children in order to have a happy marriage. For example, this was

Table 3
The effect of the fertility rate in the country of origin on the number of children born in Norway. Women who are generation 1.5 or 2.

	No fixed effects for region or country of origin		Fixed effects for region		Fixed effects for country of origin	
Independent variable	I	II	III	IV	V	VI
Fertility rate						
Ordinary Least Square regression	0.124***	0.100**	0.149**	0.142**	-0.033	-0.024
	(0.047)	(0.044)	(0.075)	(0.066)	(0.036)	(0.036)
	[0.032–0.216]	[0.013–0.187]	[0.001–0.296]	[0.011–0.273]	[−0.104 to 0.037]	[−0.095 to 0.047]
Negative binomial regression	0.060***	0.048**	0.070**	0.067**	-0.019	-0.015
	(0.020)	(0.019)	(0.033)	(0.030)	(0.018)	(0.018)
	[0.020–0.099]	[0.010–0.086]	[0.005–0.136]	[0.008–0.125]	[−0.054 to 0.016]	[−0.050 to 0.021]
Mean number of children (standard deviation)	2.05 (1.25)	2.05 (1.25)	2.05 (1.25)	2.05 (1.25)	2.05 (1.25)	2.05 (1.25)
Number of observations	9358	9358	9358	9358	9358	9358

*p<0.10; ** p<0.05; *** p<0.01.
Notes: This table shows regressions from three key models. In the baseline model there are no fixed effects for region or country of origin (columns I and II). In the second model, the baseline model is extended by including fixed effects for region (columns III and IV). In the third model, the baseline model is extended by including fixed effects for country of origin (columns V and VI). The three models are estimated with and without the level of education of first generation parents. Mother's and father's level of education are included in the regressions in columns II, IV and VI. In all regressions, fixed effects for year of birth, and age when women in generation 1.5 emigrated to Norway, are included. The fertility rate is the fertility rate in the country of origin of first generation women in the year when they emigrated to Norway. Regression coefficients are presented with standard errors clustered at the level of the country of origin (in brackets). 95% confidence intervals are shown in square brackets.

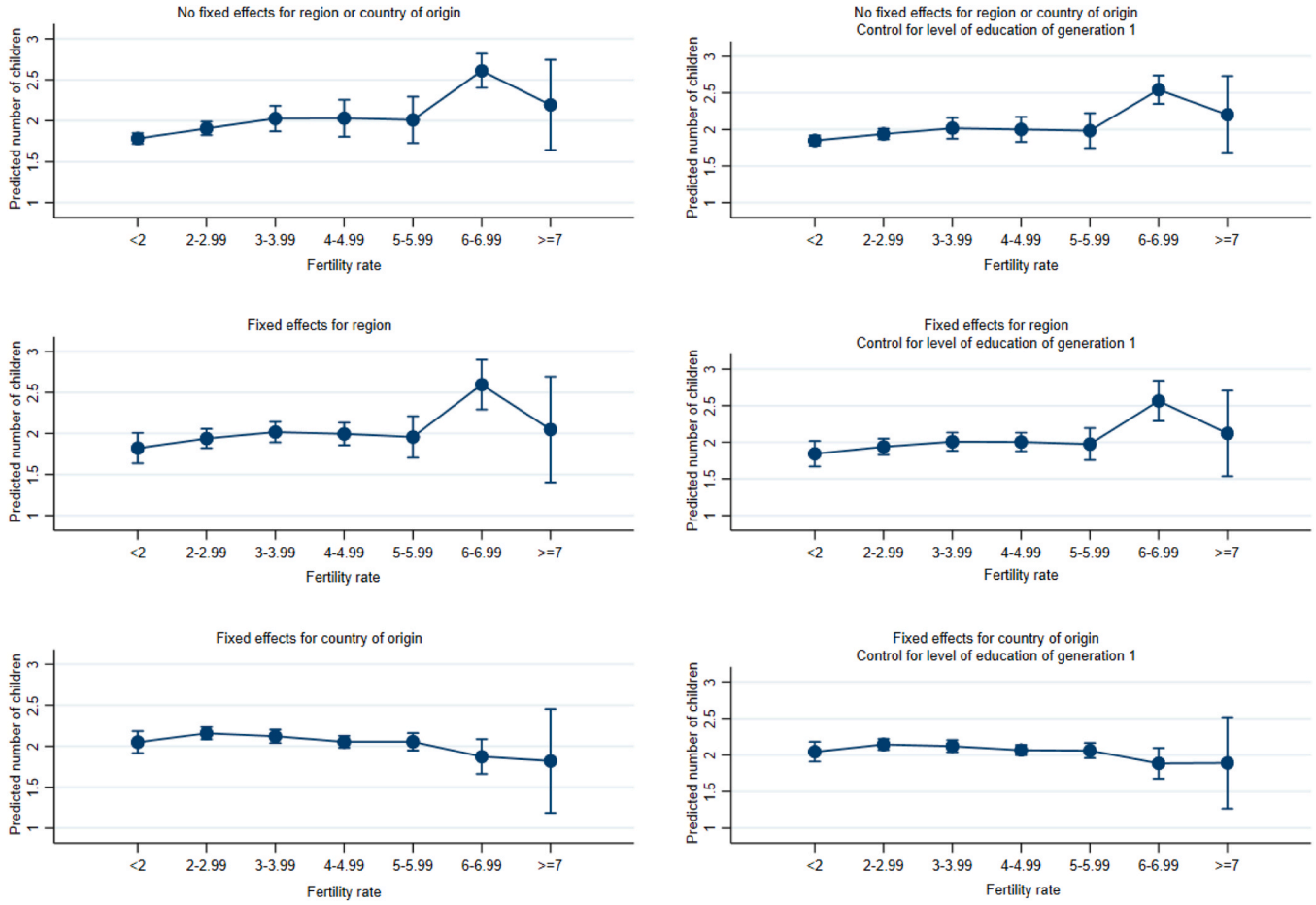

Fig. 4. The relationship between fertility rate and the predicted number of children. Women who are generation 1.5 or 2.
Notes: The figures show regressions from three key models. In the baseline model there are no fixed effects for region or country of origin (top). In the second model, the baseline model is extended by including fixed effects for region (middle). In the third model, the baseline model is extended by including fixed effects for country of origin (bottom). The three models are estimated with and without the level of education of first generation parents. In all regressions, fixed effects for year of birth, and age when women in generation 1.5 emigrated to Norway, are included. The fertility rate is the fertility rate in the country of origin of first generation women in the year when they emigrated to Norway. Non-linear regressions. Margins plots. 95% confidence intervals.

Table 4
The effect of the fertility rate in the country of origin on the number of children born in Norway. Women who are generation 1.5 or 2 Control for immigrant selection.

	No fixed effects for region or country of origin	Fixed effects for region	Fixed effects for country of origin
Independent variable	I	II	III
Fertility rate			
Ordinary Least Square regression	0.113***	0.154**	-0.015
	(0.042)	(0.070)	(0.041)
	[0.029–0.197]	[0.015–0.293]	[−0.096 to 0.066]
Negative binomial regression	0.055***	0.072**	-0.011
	(0.018)	(0.031)	(0.021)
	[0.019–0.090]	[0.011–0.134]	[−0.051 to 0.030]
Mean number of children (standard deviation)	2.08 (1.26)	2.08 (1.26)	2.08 (1.26)
Number of observations	8124	8124	8124

*p<0.10; ** p<0.05; *** p<0.01.

Notes: This table shows regressions from three key models. In the baseline model there are no fixed effects for region or country of origin (column I). In the second model, the baseline model is extended by including fixed effects for region (column II). In the third model, the baseline model is extended by including fixed effects for country of origin (column III). The three models are estimated with the level of education of first generation parents, i.e. mother's and father's level of education included in the regressions. In all regressions, fixed effects for year of birth, and age when women in generation 1.5 emigrated to Norway, are included. The fertility rate is the fertility rate in the country of origin of first generation women in the year when they emigrated to Norway. The selectivity variable is a fraction in which the nominator is the mean years of schooling for immigrants in the year when they emigrated to Norway. The denominator is the mean years of schooling for the population in the country of origin. Regression coefficients are presented with standard errors clustered at the level of the country of origin (in brackets). 95% confidence intervals are shown in square brackets.

Table 5
The effect of the fertility rate in the country of origin on the number of children. Women who are generation 1.

	No fixed effects for region or country of origin	Fixed effects for region	Fixed effects for country of origin
Independent variable	I	II	III
Fertility rate			
Ordinary Least Square regression	0.321***	0.339***	0.166***
	(0.061)	(0.079)	(0.047)
	[0.200–0.442]	[0.183–0.494]	[0.073–0.259]
Negative binomial regression	0.123***	0.126***	0.063***
	(0.017)	(0.024)	(0.017)
	[0.089–0.156]	[0.078–0.173]	[0.029–0.096]
Mean number of children (standard deviation)	2.35 (1.42)	2.35 (1.42)	2.35 (1.42)
Number of observations	53,461	53,461	53,461

*p<0.10; ** p<0.05; *** p<0.01.

Notes: This table shows regressions from three key models. In the baseline model there are no fixed effects for region or country of origin (column I). In the second model, the baseline model is extended by including fixed effects for region (column II). In the third model, the baseline model is extended by including fixed effects for country of origin (column III). In all regressions, fixed effects for year of birth, and age when emigrated to Norway, are included. The fertility rate is the fertility rate in the country of origin of first generation women in the year when they emigrated to Norway. Regression coefficients are presented with standard errors clustered at the level of the country of origin (in brackets). 95% confidence intervals are shown in square brackets.

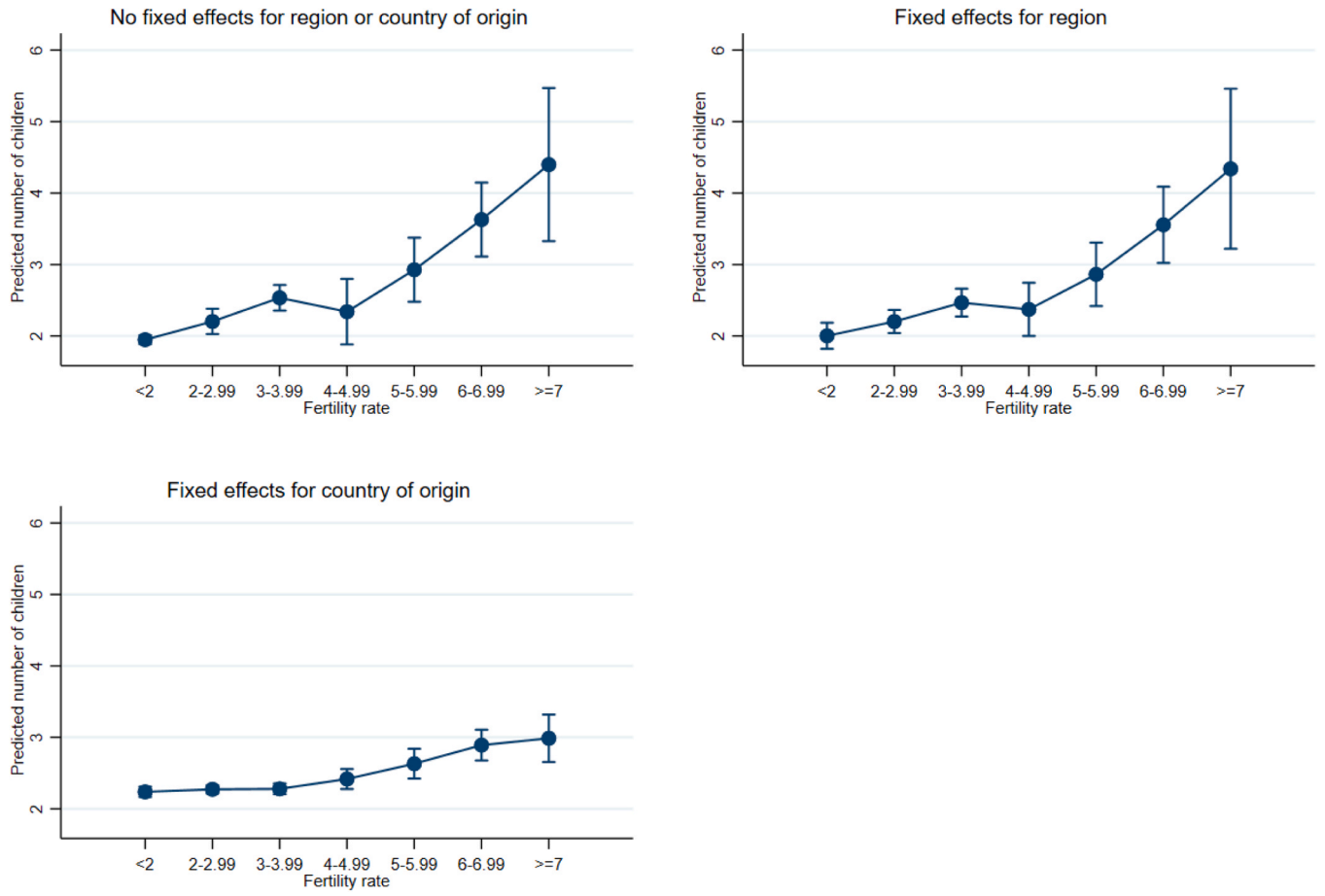

Fig. 5. The relationship between fertility rate and the predicted number of children. Women who are generation 1.
Notes: The figures show regressions from three key models. In the baseline model there are no fixed effects for region or country of origin (top left). In the second model, the baseline model is extended by including fixed effects for region (top right). In the third model, the baseline model is extended by including fixed effects for country of origin (bottom). In all regressions, fixed effects for year of birth, and age when emigrated to Norway, are included. The fertility rate is the fertility rate in the country of origin of first generation women in the year when they emigrated to Norway. Non-linear regressions. Margins plots. 95% confidence intervals.

Table 6
Comparison of fertility across generations for immigrant women and Norwegian women.

	Immigrant women			
	No fixed effects for region or country of origin	Fixed effects for region	Fixed effects for country of origin	Norwegian women
Independent variable	I	II	III	IV
Number of children the mothers had				
Ordinary Least Square regression	0.117***	0.109***	0.088***	0.118**
	(0.021)	(0.019)	(0.016)	(0.002)
	[0.075–0.158]	[0.071–0.146]	[0.038–0.115]	[0.114–0.122]
Negative binomial regression	0.053***	0.049***	0.040***	0.054***
	(0.008)	(0.008)	(0.007)	(0.001)
	[0.037–0.069]	[0.033–0.066]	[0.026–0.055]	[0.052–0.056]
Mean number of children generation 1.5 or 2 (standard deviation)	2.05 (1.25)	2.05 (1.25)	2.05 (1.25)	2.06 (1.11)
Mean number of children generation 1 (standard deviation)	3.58 (1.86)	3.58 (1.86)	3.58 (1.86)	3.01 (1.31)
Number of observations	9358	9358	9358	651,019

*p<0.10; ** p<0.05; *** p<0.01.
Notes: In this table, fertility across generations for immigrant women and Norwegian women are compared. The dependent variable is the predicted number of children for the daughters. For immigrant women, the table show regressions from three models (columns I-III). In the baseline model there is no fixed effects for region or country of origin (column I). In the second model, the baseline model is extended by including fixed effects for region (column II). In the third model, the baseline model is extended by including fixed effects for country of origin (column III). For immigrant women of generations 1 and 1.5, fixed effects for age when emigrated to Norway are included. For immigrant and Norwegian women, the following fixed effects are included: year of birth for generations 1, 1.5 and 2, and level of education of first generation parents, i.e. mother's and father's level of education. Regression coefficients are presented with standard errors clustered at the level of the country of origin (in brackets). 95% confidence intervals are shown in square brackets.

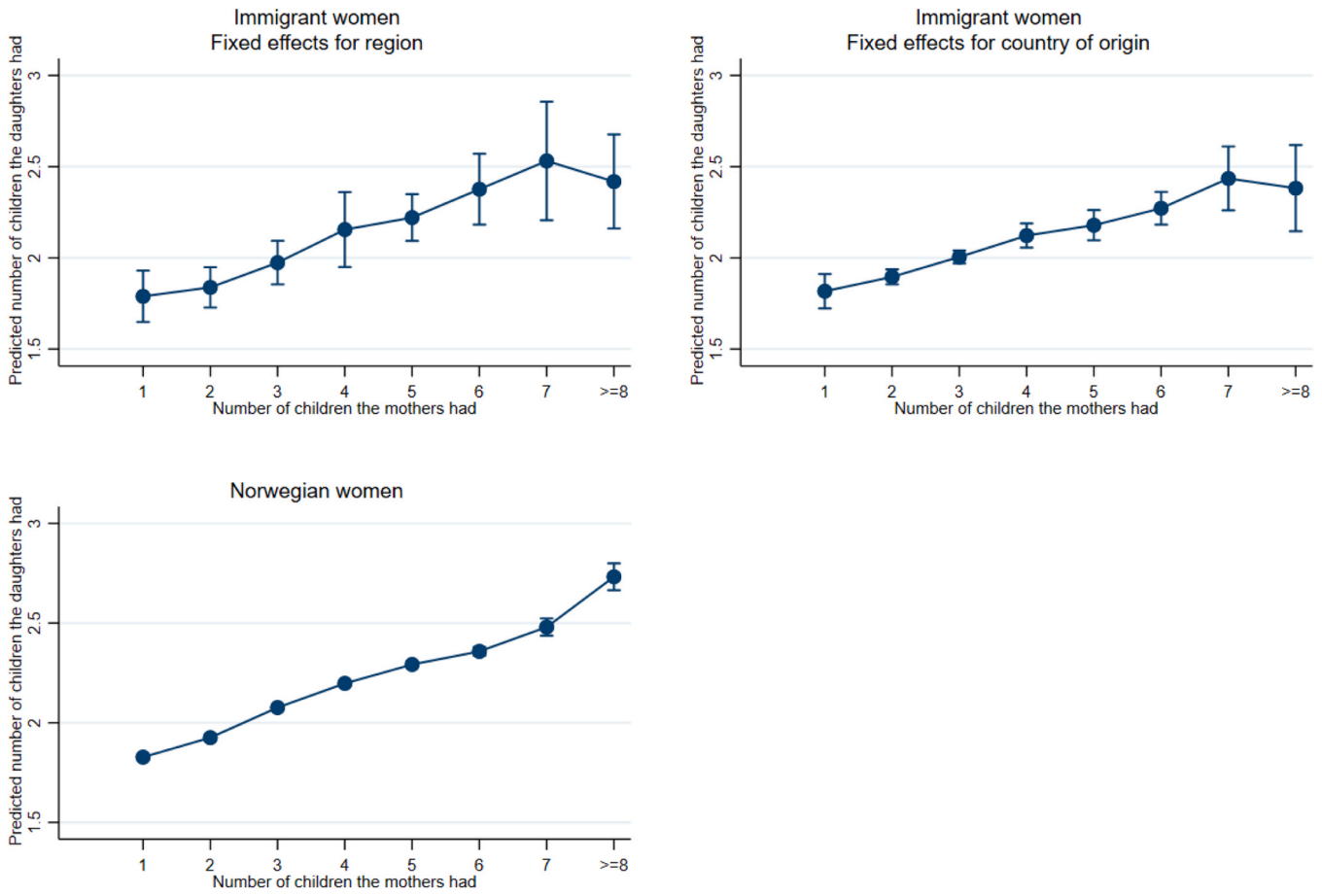

Fig. 6. Comparison of fertility across generations for immigrant women and Norwegian women.
Notes: In these figures, fertility across generations for immigrant women and Norwegian women are compared. The dependent variable is the predicted number of children for the daughters. For immigrant women, the figures show regressions from two models: fixed effects for region (top left) and fixed effects for country of origin (top right). For immigrant women of generations 1 and 1.5, fixed effects for age when emigrated to Norway, are included. For immigrant women and Norwegian women, the following fixed effects are included: year of birth for generations 1, 1.5 and 2, and level of education of first generation parents, i.e. mother's and father's level of education. Non-linear regressions. Margins plots. 95% confidence intervals.

Table 7
The importance of having children according to whether the immigrants were generation 1, or generation 1.5 or 2. Per cent.

	Turkey		Sri Lanka		Pakistan		Vietnam	
The importance of having children	Generation 1	Generation 1.5 or 2	Generation 1	Generation 1.5 or 2	Generation 1	Generation 1.5 or 2	Generation 1	Generation 1.5 or 2
Very important	62.3	47.5	51.2	39.2	67.4	48.9	69.3	40.3
Fairly important	18.5	28.4	43.1	29.3	18.8	28.4	15.4	26.1
Neither important nor unimportant	4.4	7.9	1.5	9.0	6.0	7.1	6.1	8.8
Not important	14.9	16.1	4.2	22.5	7.8	15.6	9.2	24.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of observations	249	366	334	311	282	352	228	387

Source: Survey on living conditions among persons with an immigrant background. Statistics Norway. https://www.ssb.no/sosiale-forhold-og-kriminalitet/artikler-og-publikasjoner/_attachment/309211

reported by 69.3% of first generation immigrants from Vietnam and 67.4% of first generation immigrants from Pakistan. The corresponding percentages for immigrants who were generation 1.5 or 2 were 40.3 (Vietnam) and 48.9 (Pakistan). The same pattern was also found for immigrants from Turkey and Sri Lanka, i.e. first generation immigrants gave more importance to having children than immigrants from generation 1.5 or 2.

In Fig. 7, we show marginal effects for the importance of having children according to whether the immigrants were generation 1, or generation 1.5 or 2. The probability of answering *very important* was 0.13 percentage points lower for immigrants who were generation 1.5 or 2, than for first generation immigrants. There was no difference by gender. In Appendix, Table A2, we present the logit coefficients from the estimation of Eq. (5). Consistent with the graph in Fig. 7, this coefficient was negative for the category *very important*.

4.5. Supplementary analyses

We carried out four supplementary analyses to test the robustness of our key results (Appendices, Tables A3-A6). In the first analysis, we used samples of women 45 years and older and 50 years and older. In the second analysis, we carried out separate analyses for generations 1.5 and

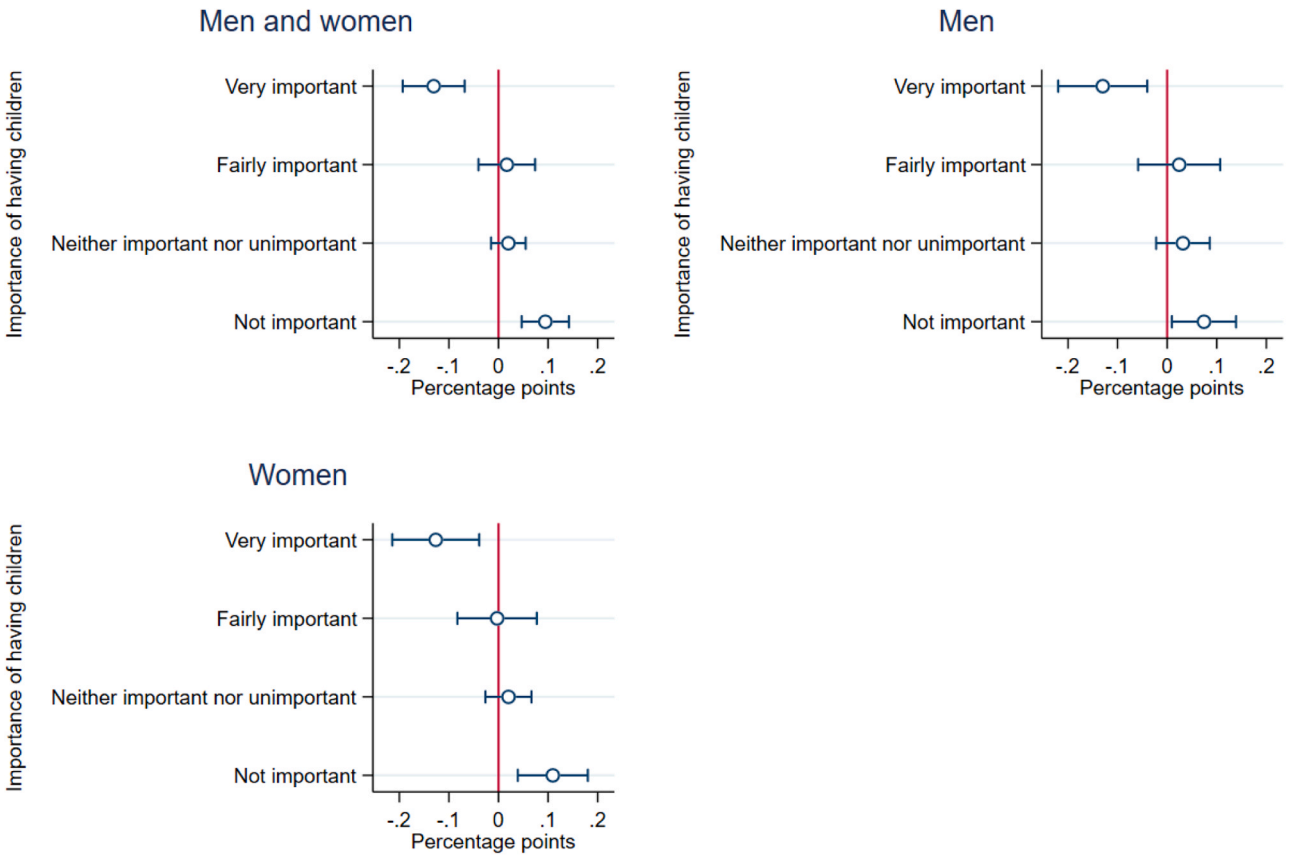

Fig. 7. The importance of having children according to whether the immigrants were generation 1 (= reference group), or generation 1.5 or 2.
Source: Survey on living conditions among persons with an immigrant background. Statistics Norway. https://www.ssb.no/sosiale-forhold-og-kriminalitet/artikler-og-publikasjoner/_attachment/309211.

2, by dividing the main sample into two sub-samples. In the third analysis, we used alternative fertility rates:

- one rate in the country of origin the year the mothers of generations 1.5 and 2 were born
- one rate in the country of origin the year the mothers of generations 1.5 and 2 were 15 years old
- one rate calculated as the difference between the fertility rate in the country of origin and the fertility rate in Norway at the time women who are generation 1 emigrated.

In the fourth analysis, we estimated Eq. (1) using two samples of immigrants from different countries. In the first sample, we included only immigrants who had emigrated to Norway from the same countries (n=25) as those in the study by Fernandez and Fogli (2009). In the second sample, we included only immigrants who had emigrated to Norway from the same countries (n=7) as those in the study by Stichnoth and Yeter (2016). The question is whether the results estimated from these two samples are different from the results in the study by Fernandez and Fogli (2009) and by Stichnoth and Yeter (2016). If the results are different, this indicates that fertility patterns of generations 1.5 and 2 are influenced by the fertility pattern in the country of destination. For example, immigrants could be less integrated into the culture and norms of American society (Fernandez and Fogli, 2009) and German society (Stichnoth and Yeter, 2016) than of Norwegian society.

The results from all the supplementary analyses support our main findings in Table 3. In the supplementary analyses, the sizes of the regression coefficients were nearly identical to the coefficients in our main analyses, and all the 95% confidence intervals overlapped (Appendices, Tables A3-A6).

5. Discussion and conclusion

During the last few decades, there has been a substantial increase in the immigrant population in most western countries. In several countries, immigrants now constitute between 10% and 15% of the population (De la Rica et al., 2015; International Organization for Immigration, 2020; European Commision, 2022). Many first generation women are of childbearing age. Their fertility then determines the number of second generation immigrants. Now, in several western countries, nearly every fourth child that is born is a second generation immigrant (Sobotka, 2008; Office for National Statistics, 2021; Eurostat, 2022b; KIDS COUNT data center, 2022).

An important policy goal is to integrate immigrants socially and economically in their new country. A large body of research has addressed this issue in various areas such as language, education, labour force participation, income and family formation (Chiswick and Miller, 2015). In this paper, we focus on the fertility pattern of women in generations 1.5 and 2.

There are few studies in which the fertility patterns of women in generations 1.5 and 2 have been examined. In the few studies that exist, a positive relationship has been found between the fertility rate in the country of origin and the number of children for women in generations 1.5 and 2 (Fernández and Fogli, 2009; Blau et al., 2013; Stichnoth and

Yeter, 2016). Our upper-bound estimates show that this is also the case in Norway. According to these estimates, an increase of 1.00 in the fertility rate in the country of origin leads to an average increase in the number of children in the range of 0.12 (model with no fixed effects) to 0.14 (model with fixed effects for region) for immigrant women in generations 1.5 and 2. Commonly, this is interpreted as an effect of culture that reflects the norms and preferences for family size in the immigrants' country of origin. The fact that the fertility pattern is handed down from first generation women to women in generations 1.5 and 2, indicates that a cultural effect exists (Fernández and Fogli, 2009; Blau et al., 2013; Stichnoth and Yeter, 2016). We also show that the fertility pattern of first generation women resembles that of women in their country of origin. This finding has also been reported in other studies from Norway (Lappegård, 2000; Tønnesen, 2014).

Our upper-bound estimates for generations 1.5 and 2 are smaller than the estimates for generation 1, i.e. there has been a decrease in the fertility rate from the first to the second generation. As a result, if the proportion of the population with an immigrant background continues to increase, it may increase at a slower rate in the future. So how can this be explained? We cannot draw unequivocal conclusions based on our results. One plausible explanation could be that Norway is a welfare state with extensive social and welfare services that are universal and free at the point of consumption. These services are important for integration of immigrants into Norwegian culture and society. Our results indicate that this integration has come further for immigrant women in generation 1.5 and 2 than for immigrant women in generation 1.

Ethics approval

This study was approved by the Regional Committee for Medical and Health Research Ethics, Norway (REK 2012/1433).

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CRediT authorship contribution statement

J. Grytten, I. Skau and Rune Sørensen all contributed to the conception, design, and data acquisition and interpretation of the findings; carried out the statistical analyses, and drafted and critically revised the manuscript for important intellectual content. All authors gave final approval of the manuscript, and they agree to be accountable for all aspects of the work.

Declaration of Competing Interest

The authors have no conflicts of interest.

Data availability

The authors do not have permission to share data.

Acknowledgments

We wish to thank Linda Grytten for language correction. The data were provided by Statistics Norway.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ehb.2023.101339.

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