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# *Municipality characteristics and the fertility of refugees in Norway*

***Abstract***

The study of the fertility of immigrants has received much attention in recent years, particularly in societies with fertility rates below replacement levels. However, fertility in refugee populations remains understudied. Using rich register data on all female refugees of childbearing age (15–45 years) who arrived and settled in Norway between 2002 and 2015 (N=23,527), we utilize the Norwegian settlement policy for refugees – which assigns all refugees coming to Norway to a municipality where they start their integration process – to study how fertility behavior in the years following settlement is related to the characteristics of the municipality to which refugee women are assigned. Importantly, we are able to control for individual-level characteristics used by the government agency at assignment, thus limiting the problem of selection on (un)observables. As explanatory variables, we focus on municipality unemployment rates, the share of non-Western immigrants already living in the municipality, and the total fertility rate in the municipality, and also control for the municipality's age structure and childcare coverage. The study is thus of an exploratory nature. We measure these municipality characteristics the year before refugees settle and estimate their respective correlations with fertility (measured as the likelihood of having had at least one child in Norway) at the individual level for up to eight years after settlement. We also explore heterogeneity by education and parity at settlement. We find no systematic associations between the share of non-Western immigrants in the municipality and refugees' fertility; however, the municipality's fertility rate is positively correlated with the likelihood of giving birth to a child in Norway, especially for women who are childless at arrival. The links between local unemployment rates and fertility are heterogeneous across education groups and parity.

**Keywords:** immigrant fertility; Refugee; settlement policy; contextual determinants; ethnic enclave; unemployment

## Introduction

Understanding how factors in various levels of society shape fertility behavior lies at the very core of much demographical scholarship (see, for example, Balbo, Billari & Mills 2013 for a relatively recent literature review). A growing body of research has focused on how the social and institutional contexts in which we live shape (and – importantly – are shaped by) individual-level fertility decisions. However, an important methodological challenge when seeking to estimate the causal impact of our social and institutional surroundings is the fact that the place we live in and the people we are surrounded by are anything but random. Any observed relationships between, for example, place of residence, social network and/or local employment structures on the one hand and fertility behavior on the other, may therefore be driven in whole or in part either by selection and/or by reverse causation (Manski 1993, 1995).

Reforms and policy changes can provide valuable opportunities to approximate causal estimation when such selection exists. However, few existing policies directly or indirectly regulate where people live. Assignment or dispersion policies represent one notable exception, where newly arrived refugees are assigned to a geographical location (e.g. a county or a municipality) where they are expected to live and integrate into the host society. Several such policies now exist in Europe (see, for example, Fasani et al. (2018) and Djuve & Kavli (2007) for overviews), but the nature of the assignment process differs substantially between countries and over time. In this study we utilize the current assignment policy in Norway to explore the relationship between municipality characteristics and the fertility behavior of refugee women aged 15–45 at settlement in Norway between 2002 and 2015 (N=23,527). Descriptive analyses from previous studies show that this policy did not assign refugees completely at random; for instance, women and highly educated refugees were more likely to be assigned to central and more densely populated municipalities, whereas resettlement/quota refugees and families with children were more often assigned to smaller and more remote ones (Tønnessen & Andersen 2019). A crucial advantage of our analysis, therefore, is that we have access to most[1] of the individual-level information used by the national authorities during the assignment process, and can use this information to create individual-level controls. While clearly not a perfect safeguard against selection on unobservable characteristics, this (quasi-)random allocation of refugees to municipalities provides a rare and relatively robust opportunity to study the importance of municipality characteristics in explaining variations in refugee fertility.

[1] Due to data regulations and privacy concerns, we do not have access to data on sexual orientation or severe physical illnesses suffered by the women in our sample.

Within rapidly ageing developed societies, the childbearing patterns of migrants have attracted a large body of research (Kulu & Gonzalez Ferrer 2014; Kulu et al. 2019). Refugees make up a substantial proportion of the worlds' international migrants – an estimated 29 out of 272 million (United Nations 2019). The recent influx of refugees to Europe renders questions on their demographic behavior even more pressing, yet data constraints have limited analysis of refugee fertility in many Western countries, and analyses using register data are limited to only a few studies.[2]

In this exploratory paper, we take advantage of the richness of the available data on refugees in Norway and of the nature of the current settlement policy to conduct an innovative analysis that focuses on how the receiving municipalities might contribute to shaping migrant fertility. We are interested in the importance of economic, cultural and social factors and, more specifically, we explore how individual-level fertility varies by municipality unemployment rates, percentage of non-Western immigrants already living in the municipality, total fertility rate in the municipality, and the municipality's age structure and childcare coverage. We also explore how any variations differ depending on refugees' educational level and parity at settlement. It is important to note that our sampling window ends in 2015, i.e. before refugees in the most recent waves had been settled in Norwegian municipalities, but that we draw on rich information on a total of 14 settlement cohorts that is also relevant for the current situation.

Our empirical inquiry draws on three main literatures: the literature on the nature and implications of refugee settlement policies; the literature on the fertility behavior of immigrants in general; and finally, the literature on contextual determinants of fertility. It is from the last literature we derive our municipality-level variables of interest. It is important to stress that this literature relies on several measures of space and location, including countries, cities and neighborhoods. We choose the municipality as the main unit of analysis for two main reasons. First, and importantly, the policy in question assigns individuals to *municipalities*, not to streets, neighborhoods or zip codes, etc. This means that it is the allocation to a municipality that is (quasi-)random (after individual characteristics utilized in the assignment process are accounted for), not the place of residence *within* that municipality. Second, many of the services that are provided to the individuals in our sample are delivered by the municipality. This makes the municipality a suitable unit of analysis when assessing the relationship between institutional characteristics and fertility outcomes. As we detail below, in our empirical analysis we consider the characteristics of the municipality to which individuals were assigned (and first moved to), even though a relatively small proportion of them

[2] See, for instance, Saarela and Skirbekk (2018) on the fertility of the Karelian population forced to move to other regions of Finland in the 1940s.

may have moved out in subsequent years. In that regard, we interpret our estimates as *intention to treat* (ITT) estimates.[3]

Beyond individual characteristics, both the economic and cultural contexts in which individuals live (macro-level factors) and the peers with whom they interact locally (meso-level factors) are relevant to explain fertility behavior (Balbo et al. 2013). On the economic side, key factors include economic trends, social policies and institutional constraints. In this study, we focus on labor market conditions, including measures of total unemployment rates and immigrant unemployment rates. We present findings for non-Western unemployment rates as our main results, and show results for total unemployment in the appendix B. On the cultural side, values and attitudes are somewhat harder to measure quantitatively, especially in administrative register data. In this study, we focus on the total fertility rate in the municipality as a proxy for the local cultural orientation, since it can reflect both pro-natalist policy-making at the local level as well as fertility preferences among the residents.[4] Moreover, the importance of social interaction and social capital for fertility decision-making has received considerable attention in recent years. Both factors are generally closely linked to the place of residence, but a core challenge in the empirical literature is that no large-scale quantitative network data sets have been collected to examine how social networks impact fertility (or other family outcomes). This means that network factors remain prominent in theory but much less studied in empirical research. This study provides no remedy for this challenge, as our data include no social network ties to friends or neighbors, etc. Yet these meso-level characteristics remain important, and we therefore aim to capture key aspects of the social structure of municipalities using a measure of the proportion of non-Western immigrants in the municipality population at the time of settlement. The literature on what are referred to as ethnic enclaves has shown that previously settled migrants in the same municipality constitute a social network that can offer information and support to new arrivals (see, for example, Andersson 2018; Bertrand et al. 2000; Damm 2009).

Taken together, our study offers an opportunity to provide novel insights into the link between municipality characteristics and the fertility behavior of refugees (in general, and by educational

[3] *Intention to treat* (ITT) is a concept borrowed from experimental methods which refers to estimates that are based on the initial treatment assignment (i.e. the assigned municipality) and not on the treatment eventually received (i.e. the municipality where an individual actually lives after a certain number of years in Norway) (Angrist & Pischke 2008). We report ITT estimates first and foremost because we are interested in the municipality of assignment, and because these are not biased by systematic selection in later internal migration. Since most refugees stay in the assigned municipality (Ordemann 2017), the difference between ITT and other estimates such as ATE (*average treatment effect*) is minimized.

[4] Note that Balbo et al. (2013) show that some macro-level studies also look at the role of contraceptive technologies or differences in welfare regimes in fertility dynamics which in our study should be homogeneous across Norwegian municipalities.

attainment and parity) and, if a case for external validity could be made, other population groups as well. The remainder of the article is structured as follows. First, we provide a brief overview of total fertility, immigration and immigrant fertility in Norway. We then give a brief overview of the literature on the effects of refugee placement policies before considering the literature on contextual determinants of fertility to discuss our anticipated results. We also include relevant theories on immigrant fertility. Further, we present an overview of our research method and data material. The main results are shown in the fifth section, which also includes subsample analyses by educational attainment and parity. Finally, we conclude and draw attention to the broader theoretical and policy-related implications of our results. The article also includes appendixes with descriptive analyses (Appendix A) and additional regressions (Appendix B).

## The Norwegian setting

### Fertility trends

Like other Nordic countries, Norway has had a relatively high fertility rate compared to the European average. The generous policies that support women's fertility, large public sectors that provide employment and services, and a more balanced share of household tasks within the couple, are among the most commonly proposed explanations for this pattern (Goldschneider, Bernhardt & Lappegård 2015; Kravdal 2016). In the period we study (2002–2016), the total fertility rate (TFR) in Norway was on average 1.84 children per woman, but with considerable regional variations: while Eastern regions such as Oslo, Hedmark, Telemark and Vestfold had average TFRs below 1.75, the western regions of Rogaland and Sogn og Fjordane had TFRs above 2.0 (Statistics Norway 2020a). Typically, fertility has been particularly high in municipalities around the western coastal cities. For instance, Rennesøy (close to Stavanger), Midsund (close to Molde), and Sveio (close to Haugesund) all had TFR levels of 2.2 or higher. Figure A1 in Appendix A shows the distribution of TFR across municipalities in the period 2003–2014.

### Immigration and refugees

Since the turn of the millennium, immigration to Norway has increased markedly. In 2016, nearly 700,000 immigrants lived in Norway, constituting 13 percent of the population (Statistics Norway 2020b). After the European Union enlargement in 2004, a substantial number of persons from the new eastern European member states came as labor migrants to Norway. Immigration from other parts of the world also increased, and the number of immigrants from Asia, Africa or South/Central America living in Norway more than doubled between 2002 and 2016, from 125,000 to 303,000 (Statistics Norway 2020c).

Most immigrants in Norway live in urban municipalities, and the proportion of immigrants in the population is particularly high in cities such as Oslo and Drammen (25% and 21% immigrants in 2016, respectively), and generally low in many remote municipalities. For instance, in Rindal, Bindal and Tjeldsund, the immigrant population was below 4 percent in 2016 (Statistics Norway 2020b).

In total, the immigrant population in Norway is a highly heterogeneous group with diverse backgrounds and ties to Norwegian society (Brochman & Hagelund 2011; Statistics Norway 2019). Refugees constitute a larger proportion of all migrants in Norway than they do in other OECD countries. Of particular relevance for refugee immigration during our sampling period are wars and humanitarian crises in several African regions in the early 2000.s Around one in five immigrants in Norway, or 3 percent of the entire population, arrived as refugees (Statistics Norway 2020a and 2020b). As of January 2020, the number of refugees living in Norway totaled 174,000, of whom 115,000 arrived as asylum seekers and 41,000 as resettlement refugees. An additional 65,000 had been granted permission to stay based on family connection to a refugee.[5] Together, the two groups constitute around 238,000 persons, and around half of them had Asian origin. The majority was aged between 20 and 49 years as of January 2020, and men constituted 54 percent. Many of them had stayed in Norway for a long time; 58 percent for 10 years or more.

**Immigrant fertility**

The general fertility of migrants in Norway has always been higher than that of natives, but overall fertility rates among immigrants declined from 2.6 in 2000 to 2.0 in 2016 – a decline which to a large extent can be explained by lower fertility among newly arrived immigrant women, particularly from Asia (Tønnessen 2019). Immigrants' fertility also tends to decline proportionate to the duration of their stay. However, apart from a brief overview in Tønnessen and Wilson (2020) showing that refugees on average have higher completed fertility than labor and family migrants, no recent analyses have looked explicitly at the fertility behavior of refugees in Norway. Moreover, no study has previously been conducted on regional differences in immigrant fertility in Norway and the link between local conditions and the fertility of immigrants.

In this study, we use a sample of just over 23,000 women who arrived between the ages of 15 and 45 and were settled in Norway in 2002–2015. This group is further described in the data and methods section below, where we also present more details on the Norwegian system of refugee reception and settlement. In short, this system allocates refugees to different municipalities across Norway, where they receive what is known as an introductory program. This course includes

[5] Spouses of persons who have been granted protection in Norway may also stay in Norway as long as they fulfil certain requirements (Norwegian Directorate of Immigration (UDI) 2020). Note that this group is not included in our analyses.

training in Norwegian language as well as preparation for the labor market or for further studies, and normally lasts two years (during which participants receive financial compensation). Refugees only have the right to attend this introductory course in the municipality to which they are originally assigned.

## Theoretical and empirical background

### The impact of refugee settlement policies

As assignment policies for newly arrived refugees have been implemented in different European countries, the "quasi" random character of some of these policies has been used as the starting point for sociological and economical studies of the outcomes of the refugees affected. Most of these papers focus on the Scandinavian countries and on the implications of local labor market conditions on the labor market outcomes of (mostly male) refugees. Overall, these papers have found that local labor market conditions impact refugees' employment and earnings (see, for example, Edin, Fredriksson, & Åslund 2004; Åslund, Östh & Zenou 2010; Åslund & Rooth 2007; Bevelander & Lundh 2007, Djuve & Kavli 2007). In Norway, Godøy (2017) finds that for resettlement refugees, being placed in a labor market where other non-OECD immigrants do well increases their own labor earnings up to six years after immigration.

Some papers have also exploited the heterogeneity in the ratio of immigrants in the municipality of residence to study the importance of what are referred to as ethnic enclaves for integration. Research from Sweden, Denmark and the US show that a higher concentration of ethnic peers yields mixed results, and is associated with higher earnings (especially when peers in the enclaves are highly educated) (Edin et al. 2003), better school achievement (Åslund, Edin, Fredriksson, & Grönqvist 2011) and more self-employment (Andersson 2018), but also with higher youth crime (Grönqvist, Niknami & Robling 2015) and higher welfare dependency (Åslund & Fredriksson 2009). Neither the composition nor quality of the enclave seems to be decisive for which direction the association takes (Andersson 2018; Åslund & Fredriksson 2009; Beaman, 2012; Edin et al. 2003; Damm 2009, 2014).

It is perhaps unsurprising that various measures of (financial) integration make up the bulk of existing studies on refugee settlement policies, as integration into local labor markets is one of the main purposes behind their implementation. It is, however, somewhat puzzling that this literature has not been accompanied by a parallel literature that focuses on the link between municipality characteristics and demographic outcomes.

**The fertility behavior of immigrants**

As migrants have traditionally arrived from countries with relatively high fertility levels compared to those in the destination country, the literature on immigrant fertility has mostly focused on whether their childbearing patterns ultimately resemble those of natives (Kulu & Milewski 2007; Adserà et al. 2012; Kulu & Gonzalez Ferrer 2014; Kulu et al. 2019). Many (not always competing) hypotheses have been put together to explain different aspects of the fertility behavior of migrants, including *disruption*, *adaptation*, *socialization*, *selection* and *interrelatedness of events* (see Adserà & Ferrer 2014 for an overview). Key tenets of these theories are the ways in which migration impacts fertility through, for example, temporary separation of spouses or other more or less anticipated disruption of fertility (Goldstein & Goldstein 1981; Stephen & Bean 1992), as well as the ways in which the fertility norms from the origin country and the norms, incentives and opportunity structure in the host country both work separately and interact to shape the intended and completed fertility of immigrants (Blau 1992; Kahn 1988; Stephen & Bean 1992). Time since migration has proven to be an important determinant for migrant women's fertility, and several of the theories on immigrant fertility aim to explain this relationship (Andersson 2004; Tønnessen 2019). According to the adaptation hypothesis, immigrants will adapt to the fertility norms and behavior in their destination country, and that adaptation will be stronger the longer they stay. The hypothesis of interrelated events emphasizes that many immigrant women migrate because they wish to start a family, so fertility will be particularly high right after migration, while the disruption hypothesis argues that a drop in fertility can be expected around migration due to stress and separation of spouses. Previous studies suggest that immigrant women in Norway generally have a relatively high fertility after arrival, supporting the hypothesis of interrelated events (Tønnessen 2019; Tønnessen & Mussino 2020). It also tends to decline proportional to duration of stay, which may be a sign of adaptation, but such a decline may also be a result of higher birth intensity right after migration, so that women have most of the children they intend to have right after arrival and thereby are less prone to more births in the following years (Tønnessen & Mussino 2020). This makes it hard to distinguish adaptation from other possible mechanisms such as interrelation of events.

Regarding the fertility of refugees, one plausible explanation for the scarcity of literature is the lack of data on reason for migration (or visa category) in many registers, which makes it hard to distinguish between refugee women and women who migrate for other reasons. Thus, little is known about whether refugees' fertility patterns differ from those of other immigrant women. We may assume that all immigrants share some experiences, such as arriving in a new country, trying to learn the language, find jobs etc. On the other hand, refugees may be differently selected from the origin population compared with people who migrate for other reasons such as work or

education, they may have had a longer period of disruption before arrival in Norway, and they may have different intentions to stay in Norway and adapt to the norms in the destination country. They may also be subject to different legal regulations.

Additionally, it is important to stress that refugees themselves represent a highly diverse group, also when it comes to family life. Kraus et al. (2019) found that spousal migration practices and probabilities of reunifications vary between refugee groups in Germany, which may in turn affect the refugees' fertility. However, even if there are large variations within groups of refugees, we can assume that it is possible to control for the most relevant differences between refugees settled in different Norwegian municipalities. Our empirical setup thus offers a unique opportunity to study whether the macro-level conditions of *where* immigrants are settled are related to their later fertility choices (Brewster 1994; Dribe et al. 2017; Hill & Johnson 2004) and how they adjust to the receiving community. In the following sections, we will explore the theoretical and empirical foundations for why we expect such a relationship to exist, focusing on key municipality characteristics. In the final discussion we also draw attention to some plausible differences between refugees and other immigrant groups.

## Contextual determinants of fertility

In addition to micro-level determinants of fertility at the individual/couple level, the cultural, economic and institutional settings where these individuals and couples are embedded, as well as the social interactions that take place in those settings, are factors that explain fertility patterns (Balbo et al. 2013). In this study, we focus on those that portray important variations at the municipality level to unveil differential fertility behavior among refugees assigned across those municipalities under the settlement policy.

### *Economic factors*

Economic determinants of fertility include economic trends, social policies and institutional constraints. From Balbo et al.'s (2013) literature review it is clear that many studies at this level are national or cross-country studies with limited transferability to our empirical setting; however, these studies still provide a relevant theoretical reference point for how economic recessions or uncertainty can impact fertility. The main point made in these studies is that economic downturns driven by, for instance, increasing unemployment rates, bring about uncertainties which in turn generally lead to postponement of (especially of first-order) births (see Sobotka et al. 2011 for a review). Yet the direction of the impact of local unemployment cannot be unambiguously predicted (Hank 2002).

Situating this general argument in the micro-economic theory of fertility (Becker 1981), economic uncertainty can be expected to impact the fertility decisions of newly arrived refugees in two main ways depending on their existing human capital and expected labor market returns. For women with low human capital (and hereby low opportunity costs of childbearing), being settled in a municipality with high unemployment and poor labor market prospects can make childbearing an appealing alternative to trying to enter the labor market with a low chance of success. Basic income support available in Norway may further reduce incentives for an active job search. On the contrary, for women with high human capital (and higher opportunity costs of childbearing), being settled in a municipality with poor labor market prospects will likely lead to a postponement of childbearing until she gains a foothold in the labor market. This pattern is likely accentuated by the fact that the Norwegian parental leave scheme requires the mother to work at least part-time for six out of the 10 months before the child is born. We therefore expect to see a positive relationship between unemployment and fertility for low-educated women and, potentially, a negative relationship for the highly educated.

At the same time, refugees' rational choice for having a (or another) child may be based on different perceptions of rationality than for non-refugees. As an example, expected labor market returns may be given less weight than, for instance, a desire to have the family grow again after a war, or not wanting the age difference to another child to be too large (Ruis 2019). Some refugees may also have notions of children as something that "just arrive" in the absence of (effective) contraception (Milewski & Mussino 2019). Refugees constitute a diverse group, and economic considerations as those mentioned above may be more or less relevant for different refugee groups. It might therefore be the case that economic conditions do not affect fertility in any group.

In this study we capture economic macro structures by using measures of the unemployment rates in both the total population and among non-Western immigrants in the municipality the year before settlement. As we expect refugees to be more directly impacted by the labor market prospects of (primarily other) non-Western immigrants, we use this variable in our main findings and include models using total unemployment rates in Appendix B (see Tables B1–B3). Robustness models (see Appendix B, Table B4) also include an indicator of centrality to measure proximity to services and markets. The main concern in previous analyses that use local unemployment rates is the endogeneity of those rates to residential and labor force participation decisions, and a few papers have resorted to exogenous unemployment shocks driven by plant closures or Chinese competition (Del Bono et al. 2012; Schaller 2016). In this paper, the (quasi-)random nature of the assignment

policy and the fact that we measure unemployment the year before refugee arrival address both concerns.[6]

***Cultural factors***

Much of the recent research on values, attitudes and culture that pertain to families and childbearing in advanced countries draws on the second demographic transition, which argues that so-called ideational changes (rejection of institutional control, accentuation of individual autonomy and the rise of self-realization needs) are the driving forces behind new family arrangements and behaviors – including the tempo and quantum of births (Lesthaeghe 2010). However, studies that explore this at the local level are lacking, and Balbo et al. (2013) highlight that the difficulty in collecting data on ideational changes at the societal level makes the literature on culture and fertility mainly theoretical. Further, Milewski & Mussino (2019) note that there are few analyses on the cultural side of immigrant fertility and emphasize the need to better understand how ideational differences between natives and migrants (in spheres such as traditional gender norms, lower acceptance of contraception, abortion, or new types of partnership) operate to explain fertility differentials.

For immigrants, the move to a new country can mean a substantial shift in the commonly held perceptions of both family size and constellation. This means that studying the ways in which local fertility rates and other measures of family norms and values at the municipality level are related to immigrant fertility at the micro level provides an opportunity to take the analysis of culture and fertility adaptation one step further. Since we focus only on refugees, we will not be able to compare refugees' fertility levels directly with those of natives, but we will be able to make a meaningful contribution to this literature by exploring whether high levels of fertility at the municipality level correspond to high fertility at the individual level. To better isolate the contribution of fertility rates from that of the demographic structure or pro-natalist policies in the municipality, we include controls for age structure and access to public childcare in all models.

The mechanisms linking our measure of local fertility at the municipality level to refugee fertility at the individual level can be multiple (and non-competing). Information on services for families with young children living in municipalities with higher fertility may be more readily available (especially for the low-educated) and may boost the ability of refugees to fulfill their preferred fertility. Further, individuals living in such municipalities may have differential fertility preferences, which may transpire in their everyday interactions with refugees or as potential partners. This may be

[6] As other papers in the settlement literature mention, an additional concern is that unemployment rates of non-Western migrants may underestimate true unemployment if underemployment, self-employment and discouragement are proportionally higher among migrants than among natives (Godøy 2017). Thus, we can consider those rates as lower bound levels.

particularly relevant for women arriving without previous children. In that regard we hypothesize that higher local fertility rates can be positively linked to refugees' fertility through mechanisms at both the macro and meso levels. Because women who settle with no or few children presumably are further away from realizing their fertility intentions than those who settle with many children, we expect any positive correlation between TFR and fertility to be stronger in the former group.

In robustness models (see Appendix B, Table B4), to capture another strand of the community's values, we also include electoral results at the municipal level that reflect political preferences on issues such as welfare support, services and immigrant reception. Papers on the settlement literature looking at the impact of refugee arrival on local redistributive policies have employed a similar variable (Dalhberg et al. 2012). Based on these studies, we expect a more left-leaning constituency to be more welcoming to immigrants and their needs, and fertility to be higher in such municipalities.

***Social capital and social interactions***

Within contextual factors, the types of social relations (i.e. friends, family, neighbors and colleagues, etc.) and social support that individuals have in the municipality in which they reside are important. The relevance of social embeddedness in explaining behavior has received increasing emphasis in social science literatures over time, and in their literature review, Balbo et al. (2013) distinguish between two clusters of studies: one that focuses on social networks as a source of social capital in the form of emotional and material aid, and one that looks at the role of interpersonal interactions. It is important to stress that we have no individual-level information on personal relationships, perceptions of social support, etc., and that we are limited to aggregate-level proxies of these measures.

Social capital relates to financial and emotional support which individuals receive from their personal network, and can include economic resources, information, work referrals, political leverage or help in reconciling family and work, among other things (Coleman 1988). Demographers have shown how the strength of social capital (or the lack thereof), in addition to individual and macro level factors, influences household choices (e.g. Philipov et al. 2006). Given our focus on refugees, it is important to note that long-term, stable relationships such as with family members and close friends, might be disrupted by the migration process. Following the literature on ethnic enclaves (see, for example, Andersson 2018; Damm 2009; Edin, Fredriksson & Åslund 2003), which highlights how such peer groups can be valuable resources for newly arrived immigrants, we explore the relevance of the relative size of immigrant groups in the municipality as a predictor of individual-level fertility. As the majority of refugees originate from outside

Western countries, we focus on the share of non-Western immigrants already living in the municipality and expect to see a positive correlation between this variable and the fertility of the refugees that settle there. A high concentration of ethnic peers may have positive implications for integration through several channels. Groups of ethnic peers may, for instance, disseminate useful information in a language which refugees are more familiar with (Bertrand et al. 2000), and they may have knowledge of job vacancies in ethnic businesses or of services provided to families. Living close to peers may strengthen the socialization mechanism and moderate adaptation to the childbearing patterns of the destination municipality.

Many papers have shown intergenerational continuities of fertility among migrants in general (Milewski 2007, 2010; Fernandez & Fogli 2009). Wilson and Kuha (2018) find that, among second-generation migrants or those who arrived before age 16, high community-level concentration of ethnic peers during childhood positively impacts their fertility behavior during adulthood. Further, ethnic enclaves may substitute the extended family and network that refugees lost by leaving their countries and, in that regard, provide support for coming mothers. A large number of ethnic peers may also provide more potential partners to women who are looking for men with the same background to start a family.

A few studies also demonstrate that social interactions with the personal network, such as coworkers, family and friends, are key in shaping fertility decisions (see Billari et al. 2009; Balbo et al. 2013 for an overview). To what extent the information that individuals gather from others in their community and from the social norms and behavior they observe (such as contraception behavior) ultimately affects their childbearing plans, depends on the strength of those norms and on the influence of the peers (Montgomery & Casterline 1996). Given that our data lack information on the social network at the individual level, looking to the neighborhood or broader geographical context as a source of influence and learning is a natural extension of these network approaches. Several studies document fertility differences by place of residence and access to housing (Mulder 2006) along several dimensions, including across regions and rural and urban divides (Hank 2002; Kulu & Vikat 2007) and within urban areas (Kulu et al. 2009; Kulu & Boyle 2009; Kulu 2011). To capture the closeness of personal relations at the local level in robustness analyses (see Appendix B, Table B4), we rely on measures of population density as well as on the housing stock in the municipality. Although crude, these measures can say something about the likelihood of a random person in a municipality interacting with someone else on a regular basis, and we expect them to be associated with higher fertility.

## Methods and data

### Research strategy and the refugee settlement policy

Characteristics of the place of residence have long been considered important factors determining fertility patterns of individuals (Brewster 1994; Hill & Johnson 2004; Kulu & Washbrook 2014; Dribe et al. 2017; Wilson and Kuha 2018); however, the ability to interpret estimates and draw causal conclusions is often hindered by the fact that individuals generally choose (i.e. self-select into) residential locations. Hank (2002), for example, finds that in the German context most fertility variation at the regional level is likely driven by differences in the spatial distribution of individual characteristics.

In that regard, the Norwegian system for refugee settlement adopted in the 1990s, in which a central agency – the Directorate of Integration and Diversity (IMDi) – assigns each refugee to a municipality based on an agreement between the government and each municipality, offers a unique research opportunity. Since then, refugees granted a residence permit in Norway have been settled by the Norwegian authorities (represented by IMDi since 2006) in one of Norway's more than 400 municipalities, in order to participate in introductory programs (from 2004 onwards) and integrate into Norwegian society. The motivation for implementing this system was not only to limit the concentration of refugees in metropolitan areas and reduce the fiscal burden of integration for some municipalities, but also to use it as an explicit strategy to accelerate integration (Valenta & Bunar 2010). A main goal of the introductory program, as stated in the Norwegian Introduction Act (section 1), is to "increase the possibility of newly arrived immigrants participating in working and social life and to increase their financial independence" (Lovdata 2020). Hence, refugees are strongly encouraged to enter the Norwegian labor market, and if they get a job during the introductory program, this is seen as an acceptable reason for leaving the course (Directorate of Integration and Diversity 2020). The Introduction Act, which has been in place since 2003, specifies that the course should be full-time and include teaching in Norwegian language and society and qualification measures for work or education (Lovdata 2020). The municipalities are also required to issue certificates to participants when the course is completed. During the introductory program, refugees are entitled to economic introductory support of around USD 20,000 annually.[7] After the course, refugees have the same welfare benefit rights as others in Norway.

[7] More precisely, 2G (two times the National Insurance scheme basic amount), which in 2019 equalled almost NOK 200,000.

Compared to other policies for refugee settlement, the level of coercion is generally higher in Norway than in, for instance, Sweden, and the possibilities for refugees to choose their own municipality is more limited (Valenta & Bunar 2010). After five years, less than 30 percent of the refugees who arrived between 2002 and 2010 had left the municipality they were settled in (Ordemann 2017). The implementation of the income-compensated introductory program also increased financial incentives to stay in the assigned municipality for the duration of the program (usually about two years), since refugees moving out of the municipality risk losing this support. The system is the same for quota/replacement refugees and asylum seekers who have been granted permission to stay. The main consideration for IMDi when allocating refugees to different municipalities is the political goal of "rapid settlement", so that refugees do not have to wait too long before starting the integration process in a municipality. IMDi also aims to find a good match between municipalities and refugees when it comes to, for instance, refugees' qualifications and municipalities' labor market and educational institutions (Tønnessen & Andersen 2019).[8] If several persons arrive as a couple or family, they are normally assigned to the same municipality.

Tønnessen and Andersen (2019) describe the Norwegian assignment system in more detail, and explore what refugee traits correlate with some key characteristics of the assigned municipality. For instance, they show that refugees with high education have a somewhat higher probability of being settled in more central municipalities, while families with children, as well as quota refugees, are somewhat less likely to be assigned to the central municipalities. However, compared with the situation in, for instance, Sweden, where a large share of refugees choose their municipality themselves, the refugees in Norway are far more randomly distributed across municipalities. Moreover, while we recognize that this is far from a perfect safeguard against selection on unobservable characteristics, controlling for the refugee characteristics used by IMDi in the assignment process meaningfully limits remaining systematic sorting on observable, and presumably also unobservable, characteristics. Our analytical strategy is thus closely related to papers that use settlement policies to provide intention to treat (ITT) estimates of local conditions for earnings and employment of refugees (Godøy (2016) in Norway; Edin, Fredriksson & Aslund (2003) and Damm (2009) in Sweden and Denmark). To our knowledge, this is the first paper to use the settlement policies to analyze the fertility behavior of refugees.

To assess the relationship between municipality characteristics and refugees' fertility behavior, we estimate a set of linear regression models with robust errors that are clustered at the municipality level. The dependent variable in all models takes the value 1 if a woman has had any births in

[8] This highlights that the assignment process is not completely random, and underscores the importance of using IMDi's data on individual characteristics in our estimations.

Norway by a given year after settlement and 0 otherwise.[9] We follow women annually for the first eight years in the country.[10] Models include the key municipality variables of interest, a large battery of individual controls as defined below, as well as controls for the year and month of settlement. Results are robust to estimating logistic models instead.

**Data sources**

The data used in this study have two main sources, explained in more detail in Tønnessen and Andersen (2019). We obtained data from IMDi on all refugees who were granted permission to stay from 2002 to 2015, and on the municipality they were settled in. In addition, this data source provides information on other individual characteristics that were available to officials making the settlement decisions, such as sex and age at settlement, date of settlement, family type and whether the person was a quota (replacement) refugee or an asylum seeker granted permission. We also used data from registers maintained by Statistics Norway in several ways. All the municipality variables used in this study are from Statistics Norway's registers, most of which are publicly available at Statistics Norway's StatBank (www.ssb.no/en/statbank).[11] For the individual variables, data from Statistics Norway have been used to ascertain the quality of the data from the Norwegian Directorate for Immigration (UDI), such as for family type.[12] Some additional variables on the individual level have been drawn from Statistics Norway's registers, partly because they did not exist in the data from UDI and partly because the quality of the information in Statistics Norway's registers was more consistent. This is the case for country of origin, educational level at settlement, and births. Data on births (used to create both outcome variables and pre-migration births, i.e. parity at arrival) are based on data from the population register. The registers in Statistics Norway cover the entire population, including all immigrants who have permission to stay in Norway, and are generally considered to hold high quality. The register includes information about births in Norway and the stated number of previous births for those women who give birth in Norway. This means that information on pre-migration births may be lacking for women who have children abroad who they did not bring to Norway and women who never give birth to another child in Norway – a situation that is more likely for women who are older when they arrive.

From the UDI/IMDi data set, we select female refugees who arrived at childbearing age (15–45 years) and who were settled in Norway between 2002 and 2015, totaling 23,527 women. We follow

[9] Note that we have also estimated models with a count variable for the number of children a woman has had in Norway, and that the results show the same overall patterns.
[10] If we were to follow them for more than eight years, our sample would be too small.
[11] The only municipality variable in this study that is not available in StatBank is the TFR at municipality level, which is calculated by the authors based on population and birth data in Statistics Norway's registers.
[12] Discrepancies between the two data sets are discussed in Tønnessen and Andersen 2019).

these women until the end of 2016; in other words, each woman is followed for between one and eight years. Variables are linked using unique personal identifiers. Individual-level characteristics in our sample are summarized in Table 2 below. The distribution of the individual-level variables differs somewhat by the women's follow-up; this is explored in more detail in Appendix A, Table A2.

**Variables**

This study relies on several variables on both the municipality and the individual level. The outcome variable as well as the explanatory and control variable on each level are explained in more detail below. Table 1 and Table 2 show descriptive statistics on this study's municipality and individual variables, respectively.

*Outcome variable*

The main outcome variable in this study is the probability that a refugee woman has given birth to at least one child after settling in a Norwegian municipality. Data on births are drawn from the population register in Norway, showing births by calendar year. Since births usually are initialized nine months in advance, most births during the first year of settlement can hardly be affected by conditions in the municipality of settlement. Hence, we only include births from the first calendar year after settlement onwards (i.e. if a woman settled in 2005, we record births from 2006 onwards).

*Municipality variables*

We use the municipality's general *level of unemployment* and *unemployment of non-Western immigrants* (those from Asia including Turkey, Africa, South and Central America and Oceania excluding Australia and New Zealand), calculated annually in the fourth quarter. Table 1 shows that in the years of settlement in the present study (2002–2015), the total unemployment rate in Norwegian municipalities ranged from 0 to 9.40 percent, with a mean of 2.64 (Statistics Norway 2019a). The unemployment rate among mon-Western immigrants was higher overall, ranging from 0.5 to 41.3 percent, with a mean of 9.31 (Statistics Norway 2019b).

TABLE 1 ABOUT HERE

The *total fertility rate* (TFR) in the municipality is the average in the five-year period prior to the relevant year. Since some municipalities in Norway are small (the smallest municipality has around 200 inhabitants), a five-year period is needed to obtain more robust TFRs. The rate shows quite considerable variation, from less than 1 in the small northern municipality of Vega in the first part of our study period to more than 2.7 in the western municipalities of Stordal and Modalen in the last part of the period.

The *share of non-Western immigrants* among all the municipality's inhabitants considers immigrants as foreign-born persons with foreign-born parents and grandparents who have moved to Norway to stay for at least six months. This proportion varies from zero in several rural municipalities – at least in the first part of our study period – to more than 13 percent in the capital Oslo in 2015, although the mean is below 4 percent. See Figure A2 in Appendix A for the dispersion by year across municipalities.

In addition to these three key municipality variables, all models include controls for *age structure* (defined as the share of older residents (50–74) among the adult population (15–74)) and *childcare coverage* (defined as the proportion of one-year-olds in the municipality who are enrolled in publicly subsidized daycare), as outlined in our theoretical overview. Robustness estimates (see Appendix B, Table B4) include the following additional covariates at the municipality level: population *density* (total population in thousands in the municipality divided by the geographical size of the municipality in km2); *voting shares for socialist parties* (the Labour party, Socialist Left Party, Communist Party, Red Electoral Alliance and The Red Party) in municipal elections (held 1999, 2003, 2007, 2011 and 2015); a measure of *centrality* by Høydahl (2017) that takes into account the number of workplaces and service functions that can be reached within 90 minutes by car from the municipality; the share of all residential dwellings that are *apartments* (in multi-dwelling buildings) (available from 2006 onwards); and the *share of employees with low education*.

The number of observations in Table 1 shows the number of refugees settled in municipalities with non-missing values on each variable. For non-Western unemployment rates, some rural municipalities lack information because they had no non-Western immigrants in the labor force the year before the refugee settled here. Moreover, no data exist on the housing stock variables for refugees who settled before 2006. Appendix A, Table A1 shows a correlation matrix between all these municipality variables.

As can be seen in Table 1, the share of apartments ranges between 0 percent in some rural municipalities to 73 percent in Oslo (2010). Age structure also varies, from 24 to 54 percent aged 50–74, with a mean of 36 percent. Population density varies considerably between Norwegian municipalities as well, from less than 0.5 persons per $km^2$ in some remote municipalities to more than 1,800 persons per $km^2$ in the city of Stavanger. The proportion of left-wing (socialist) votes shows considerable variation, and even though the average is 39 percent, some municipalities, such as small industrial (including fishing) municipalities along the coast, have zero percent votes for these parties. In Norway, the share of socialist votes is generally higher in the central and northern parts of the country. The proportion of all employees with lower education this ranges from 15 to

52, with an average of 26 percent. This means that the labor market prospects of those with low education can vary considerably between municipalities. Finally, the proportion of one-year-old children enrolled in publicly subsidized daycare varies from 0 to 100 percent (both extremes typically representing municipalities with only a few young children), with a mean of 57 percent. In a few of the years there were some municipalities that had no one-year-olds in their population, thereby generating missing values on this variable (N=34).

*Individual control variables*

All models include information on refugee's *age* (and age squared), parity and type of family structure – all measured at time of settlement. In terms of *parity,* nearly half of the women did not have a child at the time they settled in Norway. Approximately 18 percent had one child, 15 percent had two, 10 percent had three and 11 percent had four or more children.

TABLE 2 ABOUT HERE

Using a family identifier in the UDI dataset, we constructed five *family types* to which refugees belonged on arrival: single refugees (those who were settled alone), two married adults without children, small families (two to four persons) with at least one child (also including single parents with up to three children), large families (five persons or more) with at least one child, and families without children (two or more unmarried adults). In this typology children were defined as persons aged 0–18 years.

For the individual variables, Table 2 shows that the mean age in our sample (which is restricted to women age 15–45 on settlement) is close to 28 years. The largest share of these women, 39 percent, belonged to what we define as a small family (two to four persons) with at least one child, whereas 25 percent belonged to large families (five persons or more) with at least one child. 28 percent were not registered with any family members in UDI's data.

From data on country of birth, we create dummies for the four countries with more than 1,500 people present, and categories based on regions (Africa, Asia (including Turkey) and Eastern Europe) for the remaining countries. Somalia is the biggest single country group (N=4,991, 21%), followed by Eritrea (N=3,995, 17%), Iraq (N=1,984, 8%) and Afghanistan (N=1,698, 7%). Eight percent of the refugees settled in this period were from Eastern Europe, where no single country was represented by more than 1,500 people. This category is used as the reference category in the regressions.

To create a proxy for human capital at arrival, we use Statistics Norway's information on the refugees' *highest educational level* completed *before* the first day of settlement. We group educational

levels into four: i) No education, primary education, lower secondary education (corresponding to the Norwegian *grunnskole* or less), ii) upper secondary education (corresponding to Norwegian *videregående skole*), iii) higher education (corresponding to Norwegian university or college education), and iv) unknown/missing education information. This educational variable has a high share of unknown/missing information (45%), which is a common challenge when identifying the educational background of immigrants. As explored in more detail in Appendix A, Table A3, the majority of refugees with missing/unknown education comes from countries where more than 70 percent of those who *did* have information on education had lower secondary education or less. Those with missing/unknown education are therefore pooled with those with no education, primary education or lower secondary education (i.e. into group i) in the main regressions; however, to account for any heterogeneous patterns between these two groups, we use all four groups in the subsample analyses.

We also include an indicator for participation in the *introductory program* that all Norwegian municipalities have been obliged to offer for refugees since September 2004. In total, eight out of ten refugees in our sample participated in the Norwegian introductory program, and the majority of those who did not participate arrived prior to the implementation. On average, each refugee woman spent 18 months in this program. Among those who participated, the average number of months in the program was 22.5, i.e. nearly two years.

Given their differential assignment processes, we distinguish between the following two categories of refugees: i) people who have travelled to Norway as asylum seekers and whose asylum application has been approved, often after they have spent several months in asylum centers in Norway, and ii) *quota* (or *resettlement*) refugees, who are usually registered as refugees by the UNHCR, often in refugee camps close to the world's conflict areas. Norwegian authorities decide the size of the annual quota and who gets to come to Norway. The quota refugees are usually settled directly in a municipality on arrival in Norway. Quota refugees constitute almost 20 percent of our sample. The largest origin counties among quota refugees in this period were Myanmar/Burma, Syria, Iran and Afghanistan.

Finally, we use dummies for the *month* (1–12) *and year of settlement* (2002–2015) to account for changing refugee flows to Norway as well as for changing conditions in the Norwegian municipalities over time.

## Results

### Main results

We present our regression outcomes in three main tables: one for the full sample (Table 3), one split by education (Table 5) and one split by parity at arrival (Table 6). Due to space constraints, we present estimations with control variables only, and do not include estimates for all the controls (these are, of course, available upon request). One exception is Table 4, which shows the results for the full sample with all municipality variables (column a), all individual variables (except year and month of settlement) (column b), and both municipality and individual variables (column c, which corresponds to Table 3) for years 1, 3 and 5. These results are described in more detail below.

FIGURE 1 ABOUT HERE

FIGURE 2 ABOUT HERE

The figures above show the share of women who had given birth to at least one child, by year since settlement in the total sample and by four groups of educational background (Figure 1), and by parity at arrival (Figure 2). Almost half the refugee women gave birth in Norway during their first eight years since settlement. However, the share of women who gave birth varies with their education background after the second year in Norway. Those with missing education information were most likely to give birth, followed by those with low education and then higher education. For the non-missing groups, this pattern is similar to the historical fertility pattern among native Norwegian women, where fertility traditionally has been higher among women with low education (Jalovaara et al. 2018).[13] The share of women who gave birth was, perhaps surprisingly, lowest among women with "medium" length of education, i.e. upper secondary school. However, this pattern may be explained by the fact that the figures are unconditional on previous births and the age of the women. By parity (see Figure 2), those who arrived in Norway with only one child are most likely to have at least one additional child after settlement, over two-thirds of them by year 8. Those who were childless at settlement were, not surprisingly, less likely to transition to childbirth during the first years in Norway; however, they surpass those who already had two children after the fifth year. Only around one-third of those who already had four or more children have another child after being settled in a Norwegian municipality.

Finally, from Figures 1 and 2 we note that the share of women who have had at least one child increases most rapidly during the first years, which indicates that fertility is particularly high right

[13] Note, however, that for younger cohorts of native Norwegians, patterns of educational differences in (cohort) fertility have almost completely vanished (Jalovaara et al., 2018).

after immigration. This lends more support to the hypotheses of interrelated events and less to the disruption hypotheses. This could, of course, be impacted by the fact that some women have already spent some time at refugee centers before being settled. The fact that the slopes become less steep by duration of stay may be due to adaptation, but can also be because the share of women who had their first Norwegian-born child was particularly high during the first years after arrival, due to factors explained by the hypothesis of interrelated events. Since both these hypotheses predict lower birth intensity by duration of stay, it is normally difficult to distinguish between the two. However, our study offers a rare opportunity to analyze whether female refugees settled in municipalities with relatively high fertility have a higher chance of giving birth than those settled in municipalities where fertility is lower.

Table 3 presents estimates for the whole sample of refugees by number of years since settlement in Norway for the first eight years in the country. Even though our sample size decreases with the number of years because each year comprises fewer cohorts, coefficients for our key variables of interest are remarkably stable. We interpret the estimates as *intention-to-treat estimates* (ITT), as each refugee is linked to the characteristics prevailing in their assigned municipality the year before arrival (irrespective of whether they are still residing in the community). All columns include estimates from models with the complete set of individual level controls, the municipality age structure and childcare coverage, as well as year and month of settlement in Norway.

TABLE 3 ABOUT HERE

With regard to economic conditions, the first line of the table shows that a higher unemployment rate for non-Western immigrants already living in the municipality is positively correlated (and statistically significant, $p<0.05$) to fertility for years 2 to 5. This indicates that, for the average refugee woman, worse labor market prospects imply a higher likelihood of having a child, due potentially to the lower opportunity cost of childbearing. Table B1 in Appendix B shows that refugees are also more likely to have a child in Norway if they are settled in a municipality experiencing relatively high *total* unemployment; however, none of these coefficients reaches statistical significance. As we discussed in the introductory chapters, the importance of local economic conditions is ambiguous and likely mediated by the individual characteristics of refugees, as we will explore in the next sections on subsamples.

Contrary to our hypothesis, the proportion of non-Western immigrants in the municipality is not significantly linked to the likelihood of having a child in Norway. We note that all estimates are positive, however, and that when we control for total rather than non-Western unemployment rates (see Table B1) one estimate (year 3) is significant at the five-percent level. At the same time,

there are no consistent pattern that show up for this variable. Finally, we see that women settled in municipalities with relatively higher fertility rates during the previous five years are significantly more likely to give birth to at least one child during the middle of the follow-up period (years 3–6). This lends support to the adaptation hypothesis, and indicates that such adaptation is strongest after some years in Norway. Estimates in the model controlling for total unemployment (Appendix B, Table B1) are somewhat more precise than the estimates in Table 3, potentially as a result of the slightly larger sample size.

In robustness estimates presented in Appendix B, Table B4, we sequentially add additional municipality indicators discussed in the theoretical section to the models presented in Table 3. We present only the fifth year due to limited space. The degree of centrality of the municipality is not related to fertility, and its inclusion in Model 2 does not affect the other covariates meaningfully. Density is consistently positive but not significant in any of the models, and again, little happens to the main parameters of interest. The same is true for the proportion of employees that are low-skilled, the proportion of socialist votes in the most recent local election[14], and the share of apartments in the municipality. Note that the size of the sample drops because of the shorter coverage of the latter variable. In the most complete model (Model 6), neither of the additional estimates for municipality variables is statistically significant from zero, and we see that the size and precision of the main variables of interest remain relatively unchanged from Model 1.

TABLE 4 ABOUT HERE

To get a better sense of the size and direction of our control variables, as well as of the relative contribution of the municipality vs. individual-level variables in explaining heterogeneity in refugee fertility, Table 4 includes the estimates for different combinations of all control variables used in our models (except for year and month dummies, which are excluded due to space constraints) for years 1, 3 and 5. Column (a) includes municipality variables only, column (b) includes individual variables only, and column (c) includes both. Overall, the individual-level estimates take the expected size and direction, and we see that women who are settled as part of a couple as well as those with at least one child at arrival are most likely to have a (or another) child in Norway. Regarding country/region of origin, fertility is particularly high among Somali and Iraqi women, whereas women from the remaining Asian countries are less likely to have a child after five years have passed. There are no statistically significant differences by education after all these other variables are accounted for. Interestingly, we see that quota refugees are less likely to have a child

[14] Further, in separate estimations, we have added instead the share of votes for the Progress Party in the municipality at the national elections to capture anti-immigrant sentiment. The variable is statistically insignificant.

compared to asylum seekers, and that participating in the introductory program is associated with an increased likelihood of childbearing after three years have passed. Finally, by looking at the $R^2$ in the bottom row of the table, we see – as expected – that it is the individual-level variables that are most important for explaining within-individual differences in fertility behavior between the refugees in our sample.

**Analyses by education**

The role of economic, cultural and social interaction factors in fertility decisions is likely affected by the aspirations of individuals and by economic conditions in their country of origin. Human capital is a key determinant of the latter. To understand whether our main results hide some more nuanced differences across groups of women, we estimate our main models separately by the four educational groups we outlined above. As the majority of refugees comes from less developed countries with relatively poor educational infrastructures, the groups with low education and with missing education information are by far the largest, and encompass the majority of the sample. Due to space constraints, we only show three selected years (1, 3 and 5) for each group.

TABLE 5 ABOUT HERE

The positive relationship between non-Western migrant unemployment and fertility in Table 3 is, perhaps unsurprisingly, driven by the least educated, who may not aspire to careers or permanent attachment to the labor market. The coefficients for those with missing education are also consistently positive but fail to achieve significance. On the contrary, the coefficient on unemployment is effectively zero for those with higher education. Interestingly, being settled in a municipality experiencing relatively high *total* unemployment is associated with a significant reduction in the likelihood of women with upper secondary (but not higher) education bearing a child (see Appendix B, Table B2). This is consistent with the expectations outlined in the theory section that these women may have higher aspirations of getting settled in the mainstream labor market. Fertility postponement in that context is natural. Interestingly, the unemployment rate of non-Western migrants is not significant for this group. One could reasonably argue that non-Western unemployment is more relevant for the low-educated, who might compete in that market. This suggests that the low-educated women in our sample may have distinctively different aspirations (and opportunities) compared to their more educated peers.

With regard to the concentration of non-Western peers that give access to peer support and may protect the survival of social norms acquired in the country of origin, those with upper secondary education (and, after five years of follow-up, those with missing education) respond positively to a higher concentration of non-Western migrants. Whether the mechanisms driving these patterns

differ between the groups cannot, unfortunately, be answered with the data at hand. More detailed information on local individual networks, including childcare support or job referrals, would be needed.

Moving to the total fertility rate at the municipality level, we see that this is only significantly (and positively) related to the fertility of those with missing education and, when total unemployment rates are used in lieu of non-Western unemployment rates (see Appendix B, Table B2), of the low-educated. Even though the respective coefficients in the subsample of those with upper secondary education are relatively similar to those of the other two groups, lack of power could explain their failure to reach statistical significance. For refugee women with higher education, we again see no statistically significant estimates, but we cannot rule out that power is an issue also in this subsample. Overall, however, it seems that the fertility behavior of those with higher education does not correlate strongly with the characteristics of the municipality in which they are settled.

**Analyses by parity**

The significance of the context of settlement can easily differ by the life-cycle stage in which the woman finds herself when she settles in Norway. Close to half of the refugees are childless at arrival and thus have no previous experience of the hurdles of motherhood and may be more apt to absorbing information from local norms and benefiting from support from peers than those who are more experienced. Furthermore, some of them may still need to enter into a partnership.

TABLE 6 ABOUT HERE

In Table 6 we estimate models by parity at arrival to see whether indeed the relevance of municipality characteristics varies by previous childbearing experience. There are few statistically significant estimates in either group for non-Western unemployment rates and share of non-Western immigrants living in the community; however, the model using total unemployment rates (Appendix B, Table B3) shows some positive associations between total unemployment and fertility for those with one to two children at arrival ($p<0.05$) as well as positive estimates for the share of non-Western immigrants among those with three or more children at arrival ($p<0.05$). The latter suggests that those arriving with large families are possibly encouraged to bear more children when supported by large social networks of peers that also may provide continuity of norms from origin countries. For the municipality TFR, both models consistently show that childless women being settled in a municipality with relatively higher fertility are significantly more likely to enter motherhood during the first five years after settlement than those settled in municipalities with lower TFR. In Table B3, Appendix B, the coefficient is also marginally significant ($p<0.1$) in year 3 for those with only one to two children, but there are no associations

between the municipality TFR and fertility for those with three or more children. However, this does not necessarily mean that they are *not* affected by local fertility norms; since they already have more children than the average woman in any Norwegian municipality, *not* having another child may actually be a sign of adaptation.

FIGURE 3 ABOUT HERE

Finally, Figure 3 shows the (unadjusted) differences between the parity groups split by education. For all women who have had at least one child before settlement, the proportion that gave birth (again) after settlement is consistently lower among those with higher or upper secondary education than among those with lower or missing education information. The difference between educational groups is particularly large for women with two children at arrival. For women who arrived childless, however, there are small differences between the educational groups. Interestingly, in this group those with missing education information have a consistently lower probability of having a child than the other three groups, at least for the first seven years. The fact that the probability of having a child is lowest for those with missing education and no children while highest for all the other parities, is most likely related to partnership formation among those arriving childless and, likely, from the poorest countries.

## Discussion and conclusion

Many previous studies have sought to estimate the relevance of local conditions in explaining heterogeneity in fertility and other outcomes at the individual level, but it remains methodologically challenging to account for reverse causality in local conditions. It is therefore hard to say whether local factors are the predecessors of fertility behavior or the other way around. In our study of refugees in Norway, we can explore this question in somewhat more detail, as we can control for many of the individual factors used by Norwegian authorities to assign refugees to municipalities. In other words, we can "net out" some of the main sources of systematic selection inherent to the assignment process. While the resulting "quasi"-random assignment of individuals to municipalities provides a strong foundation for our analysis, some threats to causality interpretation remain, given the potential inability to control for remaining differences in unobservable characteristics that might have mattered for the municipality of assignment and for later fertility behavior. Nonetheless, we hope that the current study provides valuable insight into the fertility behavior of refugees and takes us one step closer to a (more) causal understanding of how local characteristics might inform fertility decisions.

Our analyses have focused on three main aspects of the municipality where refugee women are settled, namely unemployment rate, local TFR, and share of non-Western immigrants. These characteristics are intended to capture some of the economic, cultural and social aspects of the municipality which might be expected to shape fertility decisions. For local labor market conditions, we expected to find a positive correlation between local unemployment rates and fertility – especially for low-educated women, who have the lowest opportunity costs of childbearing (Becker 1981). Our results are in line with this expectation; women with low education are indeed more likely to have at least one child in Norway if they are settled in a municipality with higher non-Western unemployment rates. However, the fertility decisions of those with higher education at arrival do not seem responsive to the local labor market. Interestingly, we also find that being settled in a municipality experiencing relatively high *total* unemployment is associated with a significant reduction in fertility for women with upper secondary (but not higher) education, suggesting that these women might have higher aspirations of getting settled in the mainstream labor market.

Regarding local fertility rates, we expected to find a positive association between local fertility rates and individual-level fertility, especially for women with no or few children at arrival. Our results confirm this expectation, and we find that women settled in municipalities with relatively higher fertility rates during the last five years are significantly more likely to give birth to at least one child during the middle of the follow-up period. This pattern, which is most pronounced among childless women, lends support to the adaptation hypothesis and indicates that such an adaptation increases by duration of stay in Norway. We observe no associations between the municipality TFR and fertility for those with three or more children. This pattern may have several different explanations, but we argue that it may also be a sign of adaptation, given that these women already have more children than the average woman in any Norwegian municipality.

Regarding the share of non-Western immigrants already living in the municipality, we expected to see a positive correlation between immigrant concentration and fertility. This expectation was based on studies that highlight how ethnic peers might be an important source of both information and support for newly arrived immigrants (see, for example, Andersson 2018; Bertrand et al. 2000; Damm 2009; Edin, Fredriksson & Åslund 2003). Contrary to this hypothesis, the proportion of non-Western immigrants in the municipality was not consistently linked to the likelihood of having a child in Norway, and the p-values of the estimates were somewhat sensitive to what control variables we included in the models. One relatively robust exception to this (uncertain) null-finding is women with three or more children at arrival; for this group we find a positive association between the share of non-Western immigrants and fertility. We wish to stress, however, that using

the share of non-Western immigrants as a proxy for social capital and support is likely too simplistic, and that our study is not suited to draw any firm conclusion about what mechanisms might be driving these patterns.

Taken together, our results suggest that the context of settlement directly or indirectly shapes refugee's fertility behavior to some extent, particularly among those without higher education and with no children at arrival. That refugees' parity and level of education at arrival seems to moderate the relationship between municipality characteristics and childbearing highlights both the diverse contextual responses observed within this subset of the immigrant population and how important it is that policymakers recognize and account for this complex interaction between local and individual characteristics when developing policies that involve this group. In particular, the finding that refugees with lower (and missing) education seem most responsive to variations in the labor market conditions of non-Western immigrants whereas those with completed upper secondary (but not higher) education are most responsive to general labor market fluctuations, highlights how individual labor market ambitions, local opportunity structures and the opportunity costs of childbearing may converge to shape refugee women's decisions about whether or not to have a (or another) child in the municipality where they are settled.

This study adds to three main strands of literature. First, we add to the literature on (correlational and causal) implications of refugee settlement policies by focusing on fertility as an outcome, and by showing that also refugees' fertility may be impacted by where they are settled. We also add to the literature on contextual determinants of fertility by showing how economic factors such as the local unemployment rate, cultural factors (proxied by the local TFR) and, to a lesser extent, how social factors (here proxied quite crudely as the share of other non-Western immigrants) are related to fertility in some groups. We also show that these contextual factors seem to matter far less than the individual characteristics. Finally, we add to the literature on migrant fertility by focusing on a less studied migrant group – refugees – and by showing that also for refugees, fertility tends to be relatively high right after arrival (supporting the hypothesis of interrelated events). Even more interestingly, our study design has made it possible to separate the effect of adaptation from other effects such as interrelated events or disruption. When our results suggest that the local fertility level seems to matter for refugees' fertility, at least after some years and for women with no pre-arrival births, this provides some "pure" support for the adaptation hypothesis.

The individual-level control variables have also provided some insights with broader implications. In particular, results show that quota refugees are *less* likely than asylum seekers to have a child in Norway. Moreover, participating in the (semi-)mandatory introductory program for newly arrived

immigrants is positively related to fertility throughout most of the follow-up period. Interestingly, however, the estimates are only significant starting in the third year – i.e. when women having pursued the typically two-year-long program should have completed it. This may indicate that these women postpone childbearing until completing the course. This could mean that women in the introductory program become better informed about the Norwegian context and the opportunities available to their future children and themselves, and moreover that the introductory program may facilitate the formation of a network at the municipality level (even within other refugees) that supports those women in their future childbearing plans.

An important question is whether our findings on the role of local conditions are generalizable to immigrant populations beyond refugees and/or to the general population. This is, unfortunately, unclear, and would require further analysis. Immigrants might share some experiences that are unrelated to their motives to migrate, but specific characteristics and life experiences of refugees may also make them more or less susceptible to be influenced by the characteristics of their residential locations than other immigrant groups. The fact that about half of refugees arrive with children and around 10 percent of women have four or more children once they settle in the municipality sets them somewhat apart from other types of migrants (see also Tønnessen & Wilson 2020). However, the finding that key municipality characteristics are significantly related to fertility in numerous ways and that the associations differ by both educational level and parity at arrival, is worth considering for further research. Future research should also explore interaction effects between fertility determinants on various societal levels. If, for instance, the local TFR proxies of family norms and expectations among residents, an observed impact of TFR on immigrant fertility, should – assuming that social learning and influence are relevant mechanisms – be stronger in municipalities where social interaction is higher.

## References


Adserà, A., & Ferrer, A. (2014) Immigrants and Demography: Marriage, Divorce, and Fertility. In *Handbook on the Economics of International Migration*, Volume 1, edited by B. R. Chiswick and P. W. Miller for the "Handbooks in Economics Series", Kenneth J. Arrow and Michael D. Intriligator eds., Elsevier B.V.

Adserà, A., Ferrer, A. M., Sigle-Rushton, W., & Wilson, B. (2012) Fertility patterns of child migrants age at migration and ancestry in comparative perspective. *The Annals of the American Academy of Political and Social Science*, 643(1), 160–189.

Andersson, H. (2018) *Ethnic Enclaves, Self-Employment and the Economic Performance of Refugees*. Nationalekonomiska institutionen, Uppsala universitet. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-347043

Angrist, J., & Pischke, J.-S. (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.

Åslund, O. (2005) Now and forever? Initial and subsequent location choices of immigrants. *Regional Science and Urban Economics*, *35*(2), 141–165. https://doi.org/10.1016/j.regsciurbeco.2004.02.001

Åslund, O., Edin, P.-A., Fredriksson, P., & Grönqvist, H. (2011) Peers, Neighborhoods, and Immigrant Student Achievement: Evidence from a Placement Policy. *American Economic Journal: Applied Economics*, *3*(2), 67–95. https://doi.org/10.1257/app.3.2.67

Åslund, O., & Fredriksson, P. (2009) Peer Effects in Welfare Dependence Quasi-Experimental Evidence. *Journal of Human Resources*, *44*(3), 798–825. https://doi.org/10.3368/jhr.44.3.798

Åslund, O., Östh, J., & Zenou, Y. (2010). How important is access to jobs? Old question—improved answer. *Journal of Economic Geography*, *10*(3), 389–422. https://doi.org/10.1093/jeg/lbp040

Åslund, O., & Rooth, D.-O. (2007) Do when and where matter? initial labour market conditions and immigrant earnings*. *The Economic Journal*, *117*(518), 422–448. https://doi.org/10.1111/j.1468-0297.2007.02024.x

Balbo, N. F.C. Billari, & M. Mills (2013) Fertility in advanced societies: A review of research, *European Journal of Population/Revue européenne de Démographie* 29 (1), 1-38

Beaman, L. A. (2012) Social Networks and the Dynamics of Labour Market Outcomes: Evidence from Refugees Resettled in the U.S. *The Review of Economic Studies*, *79*(1), 128–161. https://doi.org/10.1093/restud/rdr017

Becker, G. (1981) *A Treatise on the Family*. Cambridge, MA: Harvard University Press.

Bertrand, Marianne, Erzo F. P. Luttmer and Sendhil Mullainathan (2000) "Network Effects And Welfare Cultures," *Quarterly Journal of Economics*, 2000, v115(3,Aug), 1019-1055

Bevelander, P., & Lundh, C. (2007) *Employment Integration of Refugees: The Influence of Local Factors on Refugee Job Opportunities in Sweden* (SSRN Scholarly Paper No. ID 958714). Rochester, NY: Social Science Research Network. Retrieved from https://papers.ssrn.com/abstract=958714

Billari, F. C., Philipov, D., & Testa, M. (2009) Attitudes, norms and perceived behavioural control: Explaining fertility intentions in Bulgaria. *European Journal of Population*, 25(4), 439–465.

Blau, F.D. (1992) The fertility of immigrant women: Evidence from high-fertility source countries. In J.B. George & R.B. Freeman (Eds.), Immigration and the Work Force: Economic Consequences

for the United States and Source Areas (pp. 93-133). Chicago and London: The University of Chicago Press.

Blom, S. (2017) *Holdninger til innvandrere og innvandring 2017* (Statistics Norway No. Reports 2017/38).

Blom, S., & Enes, A. (2015) Introduksjonsordningen-en resultatstudie. *Reports 2015/36,* Statistics Norway.

Brewster, K. L. (1994) Neighborhood context and the transition to sexual activity among young black women. *Demography*, 31(4), 603–614.

Brochman, G., & Hagelund, A. (2011) Migrants in the Scandinavian Welfare State. The Emergence of a Social Policy Problem. *Nordic Journal of Migration Research*, 1, 13-24

Coleman, J. S. (1988) Social capital in the creation of human capital. *American Journal of Sociology*, 94(Supp), S95–S120.

Damm, A. P. (2009) Ethnic Enclaves and Immigrant Labor Market Outcomes: Quasi-Experimental Evidence. *Journal of Labor Economics*, *27*(2), 281–314. https://doi.org/10.1086/599336

Damm, A. P. (2014) Neighborhood quality and labor market outcomes: Evidence from quasi-random neighborhood assignment of immigrants. *Journal of Urban Economics*, *79*, 139–166. https://doi.org/10.1016/j.jue.2013.08.004

Del Bono, E., A. Weber, A. and R. Winter-Ebmer, R. (2012) "Clash of Career and Family: Fertility Decisions after Job Displacement.," *Journal of the European Economic Association*, vol 10, no. 4: 659–683

Directorate of integration and diversity - Integrerings- og mangfoldsdirektoratet (2020) Stans av introduksjonsprogrammet. https://www.imdi.no/introduksjonsprogram/regler-om-deltakelse-i-introduksjonsprogramet/stans-av-introduksjonsprogram/. Accessed August 2020.

Djuve, A. B., & Kavli, H. C. (2007) *Integrering i Danmark, Sverige og Norge : Felles utfordringer - like løsninger?* Nordisk ministerråd. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:norden:org:diva-1199

Djuve, A. B., Kavli, H. C., Sterri, E. B., & Bråten, B. (2017) *Introduksjonsprogram og norskopplæring* (Fafo-rapport No. 2017:31). Retrieved from https://www.fafo.no/index.php/zoo-publikasjoner/fafo-rapporter/item/introduksjonsprogram-og-norskopplaering

Dribe, M., Juárez, S. P., & Scalone, F. (2017) Is it who you are or where you live? Community effects on net fertility at the onset of fertility decline: A multilevel analysis using Swedish micro-census data. *Population, Space and Place*, 23(2), e1987

Edin, P.-A., Fredriksson, P., & Åslund, O. (2003) Ethnic Enclaves and the Economic Success of Immigrants—Evidence from a Natural Experiment. *The Quarterly Journal of Economics*, *118*(1), 329–357. https://doi.org/10.1162/00335530360535225

Edin, P.-A., Fredriksson, P., & Åslund, O. (2004) Settlement policies and the economic success of immigrants. *Journal of Population Economics*, *17*(1), 133–155. https://doi.org/10.1007/s00148-003-0143-4

Fasani, F., Frattini, T. & Minale, L. (2018) (The Struggle for) Refugee Integration into the Labour Market: Evidence from Europe (SSRN Scholarly Paper). Rochester, NY: Social Science Research Network.

Fernández, R., & Fogli, A. (2009) Culture: An empirical investigation of beliefs, work, and fertility. *American Economic Journal: Macroeconomics,* 1(1), 146–177.

Godøy, A. (2017) Local labor markets and earnings of refugee immigrants. *Empirical Economics*, *52*(1), 31–58. https://doi.org/10.1007/s00181-016-1067-7

Goldscheider, F. Bernhardt, E. & Lappegård, T. (2015) The Gender Revolution: Theoretical Framework for Understanding New Family-Demographic Behavior. *Population and Development Review*, 41(2), 207-239

Goldstein S, & Goldstein, A. (1983) Inter-relations between migration and fertility: Their significance for urbanisation in Malaysia. *Habitat International* 8(1): 93-103.

Grönqvist, H., Niknami, S., & Robling, P. O. (2015) Childhood Exposure to Segregation and Long-Run Criminal Involvement - Evidence from the "Whole of Sweden" Strategy. *SOFI Working Paper*, *1/2015*.

Hank, K. (2002) Regional social contexts and individual fertility decisions: A multilevel analysis of first and second births in western Germany. *European Journal of Population*, 18(3), 281–299.

Henriksen, K. (2012) Overføringsflyktninger i Norge. Report 7/2012, Statistics Norway

Hill, L. & Johnson, H. (2004) Fertility changes among immigrants: Generations, neighborhoods, and personal characteristics. *Social Science Quarterly* 85(3): 811– 826.

Høydahl, E. (2017) Ny sentralitetsindeks for kommunene. Documents 2017/40, Statistics Norway.

Jalovaara, M., Neyer, G., Andersson, G. et al. Education, Gender, and Cohort Fertility in the Nordic Countries. European Journal of Population 35, 563–586 (2019). https://doi.org/10.1007/s10680-018-9492-2

Kahn, J.R. (1988). Immigrant selectivity and fertility adaptation in the United States. *Social Forces* 67(1): 108-128.

Kraus, E., Sauer, L., & Wenzel, L. (2019) Together or apart? Spousal migration and reunification practices of recent refugees to Germany. *Journal of Family Research*, 31(3), 303-332.

Kravdal, Øystein (2016) "Not so Low Fertility in Norway—A Result of Affluence, Liberal Values, Gender-Equality Ideals, and the Welfare State." Low Fertility, Institutions, and their Policies. Springer, Cham, 13-47.

Kulu, H. (2011) Why do fertility levels vary between urban and rural areas? *Regional Studies*, 1–17.

Kulu, H., & Boyle, P. J. (2009) High fertility in city suburbs: Compositional or contextual effects? *European Journal of Population*, 25(2), 157–174.

Kulu, H., Boyle, P., & Andersson, G. (2009) High suburban fertility: Evidence from Four Northern European Countries. *Demographic Research*, 21(31), 915–944.

Kulu, H., & González-Ferrer, A. (2014) Family dynamics among immigrants and their descendants in Europe: Current research and opportunities. *European Journal of Population*, 30(4), 411–435.

Kulu, H. & Milewski, N. (2007) Family change and migration in the life course: An introduction. *Demographic Research,* 17: 567-590

Kulu, H., N. Milewski, T. Hannemann, & J. Mikolai (2019) A decade of life-course research on fertility of immigrants and their descendants in Europe, *Demographic Research* 40 (46), 1345-1374.

Kulu, H., & Vikat, A. (2007) Fertility differences by housing type: The effect of housing conditions or of selective moves? *Demographic Research,* 17(26), 775–802.

Kulu, H., & Washbrook, E. (2014) Residential context, migration and fertility in a modern urban society. *Advances in Life Course Research*, 21, 168–182.

Lesthaeghe, R. (2010) "The Unfolding Story of the Second Demographic Transition," *Population and Development Review,* June, 36(2): 211-251.

Lillegård, M., & Seierstad, A. (2013) Introduksjonsordningen i kommunene. En sammenligning av kommunenes resultater. *Reports 55/2013*.

Lovdata (2020) Introduksjonsloven (The Norwegian Introductory Act). https://lovdata.no/dokument/NL/lov/2003-07-04-80. Accessed Aug 2020.

Marks, Jessica A. (2014) Rural Refugee Resettlement: Secondary Migration and Community Integration in Fort Morgan, Colorado, New Issues in Refugee Research Research Paper No. 269, UNHCR.

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) Fertility of Immigrants. A Two-generational Approach in Germany. Berlin/Heidelberg: Springer

Milewski, N. & Mussino, E. (2019) Editorial on the Special Issue "New aspects on Migrant Populations in Europe: Norms, Attitudes and Intentions in Fertility and Family Planning". *Comparative Population Studies* (43), 371-398.

Montgomery, M. R., & Casterline, J. B. (1996) Social influence, social learning, and new models of fertility. In J. Casterline, R. Lee, & K. Foote (Eds.), Fertility in the United States: New patterns, new theories (pp. 87–99).

Mulder, C. (2006) Population and housing: A two-sided relationship, *Demographic Research* 15(13): 401–412.

Norwegian Directorate of Immigration (UDI) (2020) Family immigration with a person who has protection (asylum) in Norway. https://www.udi.no/en/word-definitions/family-immigration-with-a-person-who-has-protection-asylum-in-norway/ Accessed August 2020.

Ordemann, Adrian Haugen, 2017: Monitor for sekundærflytting. Sekundærflytting blant personer med flyktningbakgrunn bosatt i Norge 2005-2014. Reports 2017/18, Statistics Norway

Philipov, D., Speder, Z., & Billari, F. C. (2006) Soon, later, or ever? The impact of anomie and social capital on fertility intentions in Bulgaria (2002) and Hungary (2001). *Population Studies*, 60(3), 289–308.

Ruis, A. (2019) Building a new life and (re)making a family. Young Syrian refugee women in the Netherlands navigating between family and career. *Journal of Family Research* 31(3), 287-302.

Saarela, J., & Skirbekk, V. (2019). Forced migration in childhood and subsequent fertility: The Karelian displaced population in Finland. Population, Space and Place, 25(6), e2223.

Schaller, J. (2016) Booms, Busts, and Fertility: Testing the Becker Model Using Gender-Specific Labor Demand, *Journal of Human Resources,* 51 no. 1: 1–29.

Stambøl, L. S. (2013) *Bosettings- og flyttemønster blant innvandrere og deres norskfødte barn* (Reports 2013/46). Statistisk sentralbyrå.

Stambøl, L. S. (2016) *Sysselsetting og flytting blant innvandrere belyst ved regional arbeidsmarkedsmobilitet* (Reports 2016/06). Statistisk sentralbyrå. Retrieved from https://brage.bibsys.no/xmlui/handle/11250/2445400

Statistics Norway (2019) Immigrants and Norwegian-Born to Immigrant parents. Retrieved from https://www.ssb.no/en/innvbef.

Statistics Norway (2020a) Immigrants by reason for immigration. Retrieved from https://www.ssb.no/en/innvgrunn, August 2020. Statistics Norway (2020b) Persons with refugee background. Retrieved from https://www.ssb.no/en/befolkning/statistikker/flyktninger

Sobotka, T. , V. Skirbekk, and D. Philipov. (2011) Economic Recession and Fertility in the Developed World, *Population and Development Review* 37 (2011): 267–306.Stephen E.H. & Bean, F.D. (1992) Assimilation, disruption and the fertility of Mexican–origin women in the United States. *International Migration Review*, 26(1), 67–88.

Tønnessen, M. and S. Andersen (2019) Bosettingskommune og integrering blant voksne flyktninger: Hvem bosettes hvor, og hva er sammenhengen mellom bosettingskommunens egenskaper og videre integreringsutfall?, Rapporter 2019/13, Statistics Norway.

Tønnessen, M. and E. Mussino (2020) Fertility patterns of migrants from low-fertility countries in Norway. *Demographic Research,* 42, 859-874.

Tønnessen, M. and B. Wilson (2020) Visualising immigrant fertility: Profiles of childbearing and their implications for migration research. *Journal of International Migration and Integration*

Tønnessen, M. (2019) Declined Total Fertility Rate Among Immigrants and the Role of Newly Arrived Women in Norway. Forthcoming in *European Journal of Population*.

United Nations General Assembly (2016) *New York declaration for refugees and migrants: resolution/adopted by the General Assembly, 3 October 2016*. A/RES/71/1. New York: United Nations.

United Nations, Department of Economic and Social Affairs. Population Division (2019) International Migrant Stock 2019 (United Nations database, POP/DB/MIG/Stock/Rev.2019).

Valenta, M., and N. Bunar (2010). State Assisted Integration: Refugee Integration Policies in Scandinavian Welfare States: the Swedish and Norwegian Experience. *Journal of Refugee Studies*, *23*(4), 463–483. https://doi.org/10.1093/jrs/feq028

Wilson, B. and J. Kuha (2018) Residential segregation and the fertility of immigrants and their descendants, Popul Space Place. 2018;24:e2098. https://doi.org/10.1002/psp.2098

# Tables and figures

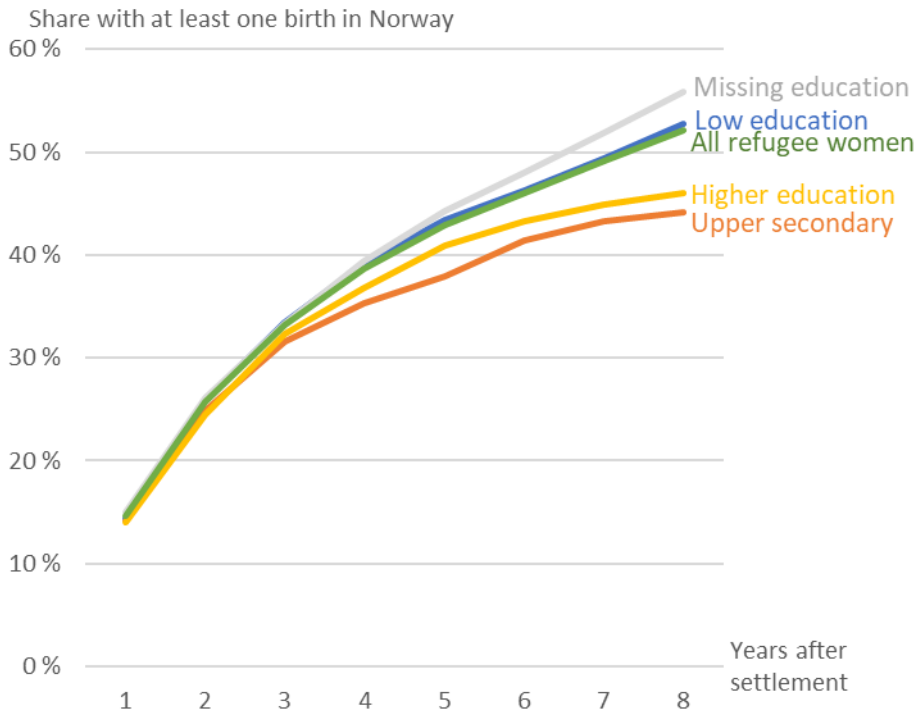


Figure 1: The proportion of refugee women that gave birth to at least one child since being settled in a Norwegian municipality, by year after settlement, in total and by educational level.

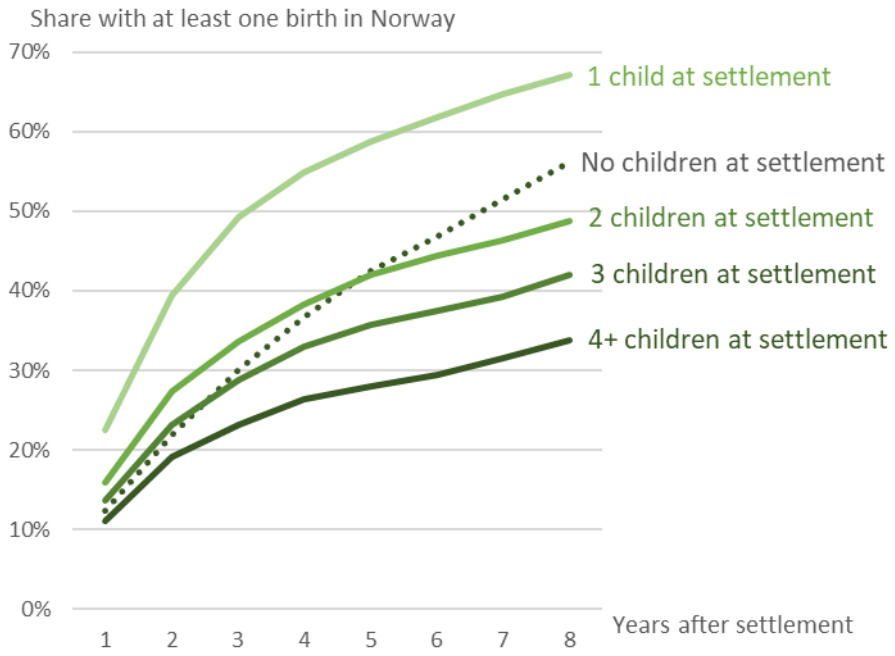


Figure 2: The proportion of refugee women that gave birth to at least one child since being settled in a Norwegian municipality, by parity at settlement.

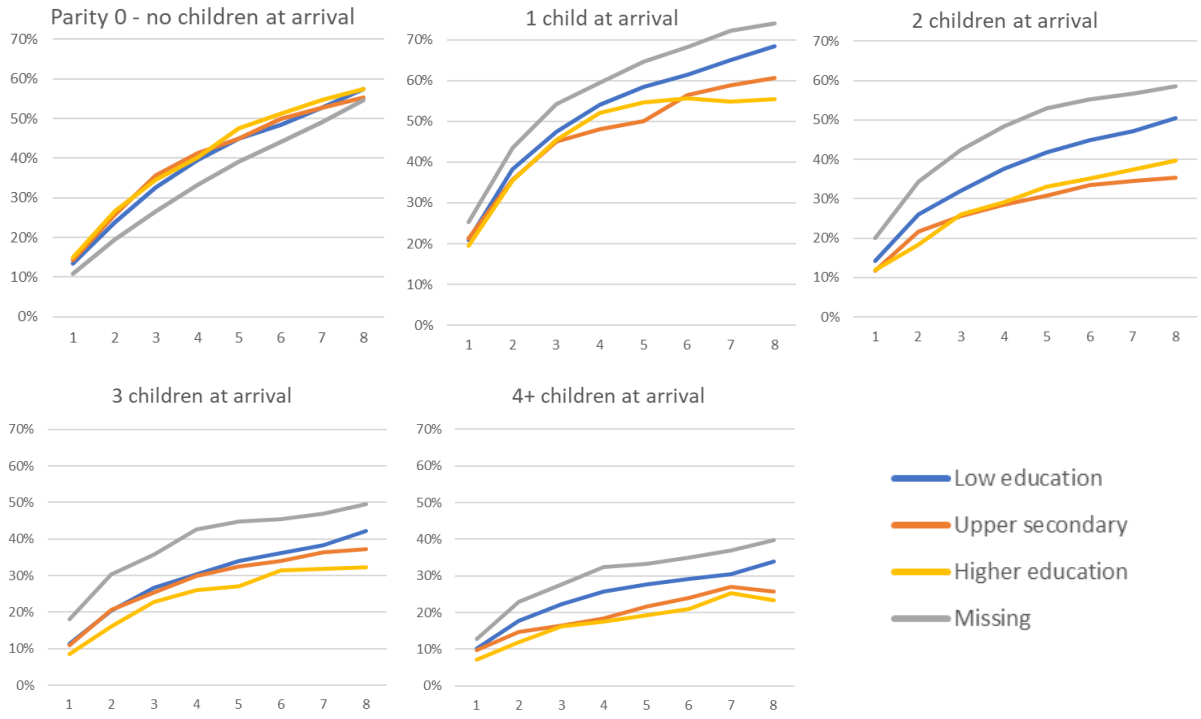


Figure 3: The proportion of refugee women that gave birth to at least one child since being settled in a Norwegian municipality, by educational level and parity at settlement.

**Table 1: Descriptive statistics, municipality variables. Minimum value, maximum value, mean and standard deviation.**

| | Mean | Std. dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| **Labor market conditions** | | | | | |
| Unemployment rate, non-Western immigrants | 9.31 | 4.23 | 0.50 | 41.30 | **22,262** |
| Total unemployment rate | 2.64 | 0.96 | 0 | 9.40 | **23,527** |
| Percentage of employees with low education | 25.96 | 04.00 | 15.37 | 52.01 | **23,527** |
| **Population** | | | | | |
| Population density | 264.71 | 400.73 | 0.47 | 1860.59 | **23,527** |
| Percentage of non-Western immigrants | 3.87 | 2.89 | 0 | 13.28 | **23,527** |
| Percentage aged 50–74 | 35.83 | 4.40 | 23.74 | 53.90 | **23,527** |
| Housing stock – percent apartments | 17.68 | 19.26 | 0 | 73.01 | **17,280** |
| **Geography** | | | | | |
| Centrality | 795.16 | 128.09 | 315 | 1000 | **23,527** |
| **Fertility** | | | | | |
| TFR last five years | 1.8768 | 0.1711 | 0.9812 | 2.6652 | **23,527** |
| **Election outcomes** | | | | | |
| Percentage of socialist votes, local election | 39.07 | 11.43 | 0 | 83.85 | **23,455** |
| **Childcare coverage** | | | | | |
| Percentage of one-year-olds enrolled in public daycare | 57.33 | 21.26 | 0 | 100 | **23,495** |

**Table 2: Descriptive statistics, individuals. Minimum value, maximum value, mean and standard deviation. N=23,527**

| | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|
| **Age at settlement**[a] | 27.83 | 7.67 | 15 | 45 |
| **Family type**[a] | | | | |
| One adult | 0.2830 | 0.4505 | 0 | 1 |
| Two married adults, no children | 0.0439 | 0.2048 | 0 | 1 |
| Small family with at least one child | 0.3899 | 0.4877 | 0 | 1 |
| Large family with at least one child | 0.2530 | 0.4348 | 0 | 1 |
| Family without children | 0.0302 | 0.1711 | 0 | 1 |
| **Parity at arrival**[b] | | | | |
| No children | 0.4620 | 0.4986 | 0 | 1 |
| One child | 0.1769 | 0.3816 | 0 | 1 |
| Two children | 0.1521 | 0.3591 | 0 | 1 |
| Three children | 0.0982 | 0.2976 | 0 | 1 |
| Four or more children | 0.1109 | 0.3140 | 0 | 1 |
| **Country of origin, region**[a, b] | | | | |
| Eastern Europe, total | 0.0798 | 0.2710 | 0 | 1 |
| Eritrea | 0.1698 | 0.3755 | 0 | 1 |
| Somalia | 0.2121 | 0.4088 | 0 | 1 |
| Africa, other | 0.1583 | 0.3650 | 0 | 1 |
| Afghanistan | 0.0722 | 0.2588 | 0 | 1 |
| Iraq | 0.0843 | 0.2779 | 0 | 1 |
| Asia, other | 0.2240 | 0.4169 | 0 | 1 |
| **Resettlement refugee**[a] | 0.1957 | 0.3968 | 0 | 1 |
| **Educational level at settlement**[b] | | | | |
| Lower secondary or less | 0.3835 | 0.4862 | 0 | 1 |
| Upper secondary or post-secondary | 0.0805 | 0.2721 | 0 | 1 |
| University or college | 0.0900 | 0.2862 | 0 | 1 |
| Unknown/missing | 0.4460 | 0.4971 | 0 | 1 |
| **Introductory program**[b] | | | | |
| Participation in introductory program, any | 0.8047 | 0.3964 | 0 | 1 |
| Participation in introductory program, months | 18.08 | 11.85 | 0 | 61 |
| **Year of settlement**[b] | | | | |
| 2002 | 0.0885 | 0.2840 | 0 | 1 |
| 2003 | 0.0675 | 0.2509 | 0 | 1 |
| 2004 | 0.0576 | 0.2329 | 0 | 1 |
| 2005 | 0.0512 | 0.2204 | 0 | 1 |
| 2006 | 0.0460 | 0.2095 | 0 | 1 |
| 2007 | 0.0440 | 0.2052 | 0 | 1 |
| 2008 | 0.0513 | 0.2206 | 0 | 1 |
| 2008 | 0.0740 | 0.2617 | 0 | 1 |
| 2010 | 0.0701 | 0.2554 | 0 | 1 |
| 2011 | 0.0759 | 0.2649 | 0 | 1 |
| 2012 | 0.0835 | 0.2766 | 0 | 1 |
| 2013 | 0.0937 | 0.2914 | 0 | 1 |
| 2014 | 0.0925 | 0.2898 | 0 | 1 |
| 2015 | 0.1043 | 0.3056 | 0 | 1 |

[a]: Derived from IMDi/UDI data

[b]: Derived from Statistics Norway data

**Table 3: Intention-to-treat estimates, full sample. The outcome variable is the probability that a woman has had at least one child in Norway 1-8 years after settlement. With covariates.**

| | 1 year | 2 years | 3 years | 4 years | 5 years | 6 years | 7 years | 8 years |
|---|---|---|---|---|---|---|---|---|
| Unemployment rate, non-Western immigrants | 0.0014* | 0.0028** | 0.0027* | 0.0024* | 0.0024* | 0.0019 | 0.0017 | 0.0013 |
| Proportion of non-Western immigrants | -0.0378 | 0.0705 | 0.3090+ | 0.2260 | 0.2510 | 0.2020 | 0.0230 | 0.0317 |
| TFR last five years | 0.0238 | 0.0383 | 0.0861** | 0.100** | 0.0865* | 0.0767* | 0.0613 | 0.0636 |
| *With individual- and municipality-level controls* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* |
| **N** | **22,233** | **19,922** | **17,861** | **15,780** | **13,867** | **12,134** | **10,570** | **8,936** |

Note: +: p<0.1 *:p<0.05 **:p<0.01 ***: p<0.001

Estimates include controls for age, age squared, family composition and parity at settlement, country/region of origin, educational level at settlement, quota refugee status, participation in introductory program, year and month of settlement, municipality age structure and municipality childcare coverage. Errors are clustered at municipality level.

**Table 4: Intention-to-treat estimates, full sample. The outcome variable is the probability that a woman has had at least one child in Norway 1, 3 and 5 years after settlement. Stepwise model with municipality variables only (a), individual variables only (b) and all variables (c).**

| | 1 year | | | 3 years | | | 5 years | | |
|---|---|---|---|---|---|---|---|---|---|
| | (a) | (b) | (c) | (a) | (b) | (c) | (a) | (b) | (c) |
| **Municipality variables** | | | | | | | | | |
| Unemployment rate, non-Western immigrants | 0.0026*** | | 0.0014* | 0.0038*** | | 0.0027* | 0.0041*** | | 0.0024* |
| Proportion of non-Western immigrants | -0.2660* | | -0.0378 | 0.3120 | | 0.3090+ | 0.5560* | | 0.2510 |
| TFR last five years | -0.0222 | | 0.0238 | 0.0249 | | 0.0861** | 0.0275 | | 0.0865* |
| Age structure | -0.0025** | | 0.0002 | -0.0007 | | 0.0020 | 0.0002 | | 0.0025 |
| Childcare coverage | -0.0004** | | 0.0006** | -0.0007** | | 0.0004 | -0.0008** | | 0.0004 |
| **Individual variables** | | | | | | | | | |
| Age | | 0.0475*** | 0.0470*** | | 0.0798*** | 0.0794*** | | 0.0855*** | 0.0843*** |
| $Age^2$ | | -0.0009*** | -0.0009*** | | -0.0016*** | -0.0015*** | | -0.0018*** | -0.0017*** |
| Family type (ref=single) | | | | | | | | | |
| Couple without children | | 0.1550*** | 0.1570*** | | 0.1850*** | 0.1920*** | | 0.132*** | 0.1420*** |
| Small family with children | | 0.0054 | 0.0043 | | -0.0754*** | -0.0760*** | | -0.120*** | -0.1200*** |
| Large family with children | | -0.0070 | -0.0096 | | -0.0768*** | -0.0767*** | | -0.128*** | -0.1250*** |
| Family without children | | -0.0206+ | -0.0194 | | -0.0797*** | -0.0722*** | | -0.0950*** | -0.0828** |
| Parity at arrival (ref=no children) | | | | | | | | | |
| 1 child at arrival | | 0.0873*** | 0.0869*** | | 0.2250*** | 0.225*** | | 0.2300*** | 0.2330*** |
| 2 children at arrival | | 0.0339** | 0.0336** | | 0.1160*** | 0.112*** | | 0.1300*** | 0.1280*** |
| 3 children at arrival | | 0.0270* | 0.0310** | | 0.0937*** | 0.0917*** | | 0.1080*** | 0.1090*** |
| 4 or more children at arrival | | 0.0211+ | 0.0211 | | 0.0786*** | 0.0764*** | | 0.0972*** | 0.0945*** |
| Country/region of origin (ref=E. Europe) | | | | | | | | | |
| Eritrea | | -0.0093 | -0.0091 | | 0.0066 | 0.0069 | | 0.0051 | 0.0070 |
| Somalia | | 0.0350*** | 0.0359*** | | 0.0885*** | 0.0937*** | | 0.0713*** | 0.0760*** |
| Africa, other | | -0.0147 | -0.0157 | | -0.0094 | -0.0107 | | -0.0153 | -0.0134 |
| Afghanistan | | -0.0322** | -0.0359** | | -0.0530** | -0.0578** | | -0.0300 | -0.0315 |
| Iraq | | 0.0422*** | 0.0386** | | 0.0698*** | 0.0682*** | | 0.0816*** | 0.0829*** |
| Asia, other | | -0.0126 | -0.0124 | | -0.0280+ | -0.0252+ | | -0.0456** | -0.0428** |
| Introductory program participation | | 0.0011 | 0.0029 | | 0.0409** | 0.0433** | | 0.0637*** | 0.0628*** |
| Educational level at arrival (ref=u. sec.) | | | | | | | | | |
| Higher education at arrival | | -0.0085 | -0.0061 | | 0.0022 | 0.0048 | | 0.0258 | 0.0221 |
| Lower education at arrival | | 0.0140 | 0.0151+ | | 0.0082 | 0.0083 | | 0.0246 | 0.0218 |
| Quota refugee | | -0.0259*** | -0.0267*** | | -0.0496*** | -0.0517*** | | -0.0562*** | -0.0604*** |
| $R^2$ | *0.003* | *0.065* | *0.065* | *0.003* | *0.145* | *0.147* | *0.003* | *0.186* | *0.186* |
| **N** | **22,233** | **22,262** | **22,233** | **17,861** | **17,890** | **17,861** | **13,867** | **13,873** | **13,867** |

Note: +: p<0.1 *:p<0.05 **:p<0.01 ***: p<0.001

Estimates for year and month of arrival is omitted due to space considerations and are available upon request. Errors are clustered at municipality level. Main estimates for model (c) correspond to those reported in Table 3.

**Table 5: Intention-to-treat estimates, by highest completed educational level at settlement. The outcome variable is the probability that a woman has had at least one child in Norway 1, 3 and 5 years after settlement. With covariates.**

| | Low education | | | Upper secondary education | | | Higher education | | | Missing education info. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years |
| Unemployment rate, non-Western immigrants | 0.0018+ | 0.0039** | 0.0037* | 0.0015 | -0.0019 | -0.0031 | 0.0019 | 0.0051+ | 0.0045 | 0.0008 | 0.0017 | 0.0015 |
| Proportion of non-Western immigrants | 0.0536 | 0.379 | -0.0401 | 0.7520* | 1.5120** | 1.5650* | -0.3740 | -0.6170 | -0.6230 | -0.1360 | 0.2770 | 0.5710* |
| TFR last five years | 0.0374 | 0.0602 | 0.0302 | 0.0706 | 0.0741 | 0.1330 | -0.0232 | 0.0637 | 0.1060 | 0.0162 | 0.1190** | 0.1340** |
| *With individual- and municipality-level controls* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* |
| **N** | **8,477** | **7,444** | **6,113** | **1,797** | **1,542** | **1,321** | **2,042** | **1,815** | **1,533** | **9,917** | **7,060** | **4,900** |

Note: +: p<0.1 *:p<0.05 **:p<0.01 ***: p<0.001

Estimates include controls for age, age squared, family composition and parity at settlement, country/region of origin, quota refugee status, participation in introductory program, year of settlement, municipality age structure and municipality childcare coverage. Errors are clustered at municipality level.

**Table 6: Intention-to-treat estimates, by parity at settlement. The outcome variable is the probability that a woman has had at least one child in Norway 1, 3 and 5 years after settlement. With covariates.**

| | No children | | | 1–2 children | | | 3 or more children | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years |
| Unemployment rate, non-Western immigrants | 0.0006 | 0.0021 | 0.0018 | 0.0026 | 0.0034 | 0.0019 | 0.0002 | 0.0012 | 0.0014 |
| Proportion of non-Western immigrants | 0.0526 | 0.3460 | 0.3910 | -0.6880* | 0.4560 | 0.5180 | 0.4120+ | 0.5760 | 0.1540 |
| TFR last five years | 0.0441+ | 0.1350** | 0.1550*** | -0.0497 | 0.0846 | 0.0759 | 0.0131 | 0.0489 | -0.0439 |
| *With individual- and municipality-level controls* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* |
| **N** | **10,312** | **8,083** | **6,073** | **3,951** | **3,235** | **2,505** | **3,376** | **2,792** | **2,255** |

Note: +: p<0.1 *:p<0.05 **:p<0.01 ***: p<0.001

Estimates include controls for age, age squared, family composition at settlement, country/region of origin, educational level at settlement, quota refugee status, participation in introductory program, year of settlement, municipality age structure and municipality childcare coverage. Errors are clustered at municipality level.

## Online Appendix A: Descriptive statistics

**Table A1: Correlation matrix for main municipality variables.**

| | Unemp., tot. | Unemp., non-W. | Imm., non-W. | TFR | Age str. | Centrality | Pop. dens. | Low-skilled | Apart-ments | Socialist, nat. | Socialist, loc. | Childc. cov. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unemp., tot.** | 1.0000 | | | | | | | | | | | |
| **Unemp., non-W.** | 0.5606 | 1.0000 | | | | | | | | | | |
| **Imm., non-W.** | 0.3456 | 0.0338 | 1.0000 | | | | | | | | | |
| **TFR** | -0.2334 | -0.1403 | -0.2981 | 1.0000 | | | | | | | | |
| **Age str.** | 0.0052 | 0.2064 | -0.5675 | -0.1342 | 1.0000 | | | | | | | |
| **Centrality** | 0.1239 | -0.0621 | 0.6565 | -0.2005 | -0.6776 | 1.0000 | | | | | | |
| **Pop. dens.** | 0.1778 | -0.0777 | 0.7982 | -0.1937 | -0.6593 | 0.6990 | 1.0000 | | | | | |
| **Low-skilled** | 0.0574 | 0.0916 | -0.2313 | 0.1475 | 0.1968 | -0.3748 | -0.2911 | 1.0000 | | | | |
| **Apartments** | 0.2242 | -0.0013 | 0.8190 | -0.2305 | -0.5918 | 0.5388 | 0.7866 | -0.2273 | 1.0000 | | | |
| **Socialist, nat.** | 0.0988 | 0.1722 | 0.0708 | -0.3819 | 0.0859 | 0.0262 | 0.0013 | -0.0021 | 0.1342 | 1.0000 | | |
| **Socialist, loc.** | 0.1679 | 0.1513 | 0.1534 | -0.3675 | -0.0043 | 0.0764 | 0.0429 | -0.0905 | 0.1590 | 0.7714 | 1.0000 | |
| **Childc. cov.** | 0.0704 | -0.0712 | 0.0302 | 0.0148 | 0.0262 | -0.0223 | -0.0437 | -0.1596 | -0.0651 | 0.1130 | 0.1173 | 1.0000 |

Note: Abbreviations are as follows:

*Unemp., tot.*: Unemployment rate, total population
*Unemp., non-W.*: Unemployment rate, non-Western immigrants
*Imm., non-W.*: Proportion of non-Western immigrants
*TFR*: TFR last five years
*Age str.*: Age structure
*Pop. dens.*: Populations density
*Low-skilled*: Proportion of low-skilled employees
*Apartments*: Proportion of apartments of total housing stock
*Socialist, nat.*: Proportion of socialist votes, national election
*Socialist, loc.*: Proportion of socialist votes, local election
*Childc. cov.*: Proportion of 1-year olds living in municipality that are enrolled in public daycare

**Table A2: Descriptive statistics, individuals, by follow-up. Means.**

| | 1 year | 2 years | 3 years | 4 years | 5 years | 6 years | 7 years | 8 years |
|---|---|---|---|---|---|---|---|---|
| **Age at settlement[a]** | 27.60 | 27.73 | 27.45 | 27.48 | 27.10 | 27.84 | 28.67 | 28.05 |
| **Family type[a]** | | | | | | | | |
| One adult | 0.3433 | 0.3463 | 0.3439 | 0.2958 | 0.3191 | 0.3903 | 0.2839 | 0.2109 |
| Two married adults, no children | 0.0408 | 0.0386 | 0.0345 | 0.0423 | 0.0437 | 0.0364 | 0.0431 | 0.0498 |
| Small family with at least one child | 0.3155 | 0.3849 | 0.3875 | 0.4017 | 0.4009 | 0.3752 | 0.3891 | 0.4090 |
| Large family with at least one child | 0.2548 | 0.2118 | 0.2123 | 0.2312 | 0.2049 | 0.1703 | 0.2333 | 0.3027 |
| Family without children | 0.0457 | 0.0184 | 0.0218 | 0.0290 | 0.0314 | 0.0279 | 0.0506 | 0.0275 |
| **Parity at arrival[b]** | | | | | | | | |
| No children | 0.5206 | 0.4906 | 0.5191 | 0.4857 | 0.5140 | 0.5352 | 0.4828 | 0.3962 |
| One child | 0.1525 | 0.1755 | 0.1819 | 0.1838 | 0.1809 | 0.1691 | 0.1971 | 0.1778 |
| Two children | 0.1203 | 0.1493 | 0.1252 | 0.1441 | 0.1394 | 0.1455 | 0.1402 | 0.1744 |
| Three children | 0.0958 | 0.0827 | 0.0844 | 0.0815 | 0.0801 | 0.0673 | 0.0816 | 0.1207 |
| Four or more children | 0.1109 | 0.1020 | 0.0894 | 0.1049 | 0.0857 | 0.0830 | 0.0983 | 0.1308 |
| **Country of origin, region[a, b]** | | | | | | | | |
| Eastern Europe | 0.0122 | 0.0156 | 0.0186 | 0.0214 | 0.0157 | 0.0212 | 0.0236 | 0.1703 |
| Eritrea | 0.2585 | 0.2435 | 0.2196 | 0.2154 | 0.2548 | 0.3109 | 0.3126 | 0.0431 |
| Somalia | 0.1512 | 0.2471 | 0.3022 | 0.3009 | 0.2732 | 0.2315 | 0.1052 | 0.1855 |
| Africa, other | 0.1260 | 0.1791 | 0.1692 | 0.1512 | 0.1725 | 0.1358 | 0.1489 | 0.1637 |
| Afghanistan | 0.0709 | 0.0528 | 0.0880 | 0.0901 | 0.0817 | 0.0485 | 0.0724 | 0.0718 |
| Iraq | 0.0098 | 0.0230 | 0.0299 | 0.0300 | 0.0224 | 0.0588 | 0.0931 | 0.1556 |
| Asia, other | 0.3718 | 0.2389 | 0.1742 | 0.1925 | 0.1803 | 0.1933 | 0.2460 | 0.2100 |
| **Resettlement refugee[a]** | 0.2401 | 0.1272 | 0.1411 | 0.2067 | 0.2419 | 0.2012 | 0.2523 | 0.1904 |
| **Educational level at settlement[b]** | | | | | | | | |
| Lower secondary or less | 0.0444 | 0.0740 | 0.0381 | 0.0754 | 0.1036 | 0.0952 | 0.0552 | 0.0999 |
| Upper secondary or postsecondary | 0.0465 | 0.0533 | 0.0599 | 0.0784 | 0.0862 | 0.0861 | 0.0920 | 0.1200 |
| University or college | 0.2703 | 0.2044 | 0.2976 | 0.3697 | 0.2828 | 0.4467 | 0.6218 | 0.4405 |
| Unknown/missing | 0.6388 | 0.6684 | 0.6044 | 0.4766 | 0.5274 | 0.3721 | 0.2310 | 0.3397 |
| **Introductory program[b]** | | | | | | | | |
| Participation in int. course, any | 0.8687 | 0.8971 | 0.8893 | 0.9017 | 0.9121 | 0.9218 | 0.9253 | 0.6656 |
| Participation in intr. course, months | 11.11 | 18.51 | 21.88 | 23.44 | 23.72 | 24.26 | 24.15 | 14.57 |
| **Year of settlement[b]** | | | | | | | | |
| 2002 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.2179 |
| 2003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.1662 |
| 2004 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.1417 |
| 2005 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.1260 |
| 2006 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.1133 |
| 2007 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.1084 |
| 2008 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.1263 |
| 2009 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.0000 |
| 2010 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.0000 | 0.0000 |
| 2011 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2012 | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2013 | 0.0000 | 0.0000 | 1.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2014 | 0.0000 | 1.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2015 | 1.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **N** | **2,453** | **2,177** | **2,204** | **1,964** | **1,786** | **1,650** | **1,740** | **9,553** |

**Table A3: Missing education in the sample, and share of those with information on education who have lower secondary education or less. Origin countries with more than 1% of all missing in the sample.**

| Origin country | Share with missing education | Share among *non-missing* with lower secondary education or less | Share among all missing |
|---|---|---|---|
| Somalia | 57% | 91% | 27% |
| Eritrea | 37% | 77% | 14% |
| Iraq | 51% | 55% | 10% |
| Afghanistan | 54% | 77% | 9% |
| Ethiopia | 43% | 70% | 6% |
| Syria | 64% | 54% | 8% |
| Russia | 25% | 54% | 3% |
| Iran | 48% | 57% | 5% |
| Myanmar/Burma | 26% | 81% | 2% |
| Sudan | 49% | 67% | 3% |
| D.R. Congo | 37% | 70% | 2% |
| Kosovo | 24% | 53% | 1% |
| Palestine | 39% | 36% | 1% |
| China | 38% | 27% | 1% |
| **Total** | **45%** | **69%** | 92% |
| **N** | **23,527** | **13,034** | **10,493** |

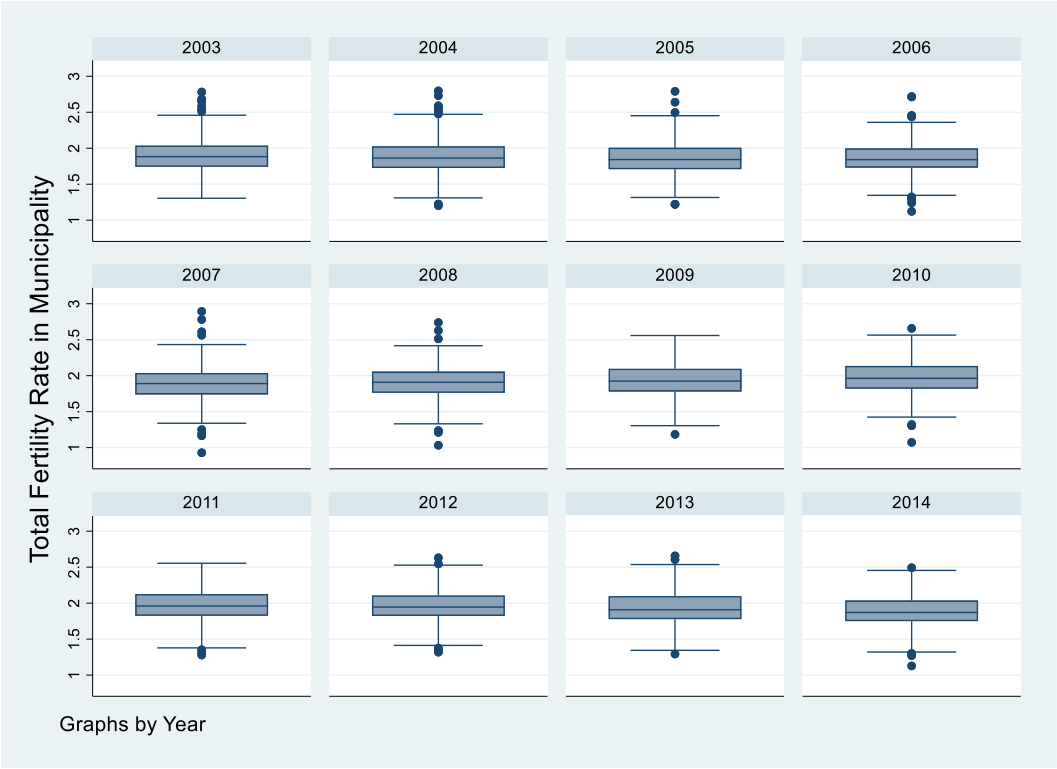


**Figure A1: Total fertility rates distributed across Norwegian municipalities, by year. 2003–2014.**

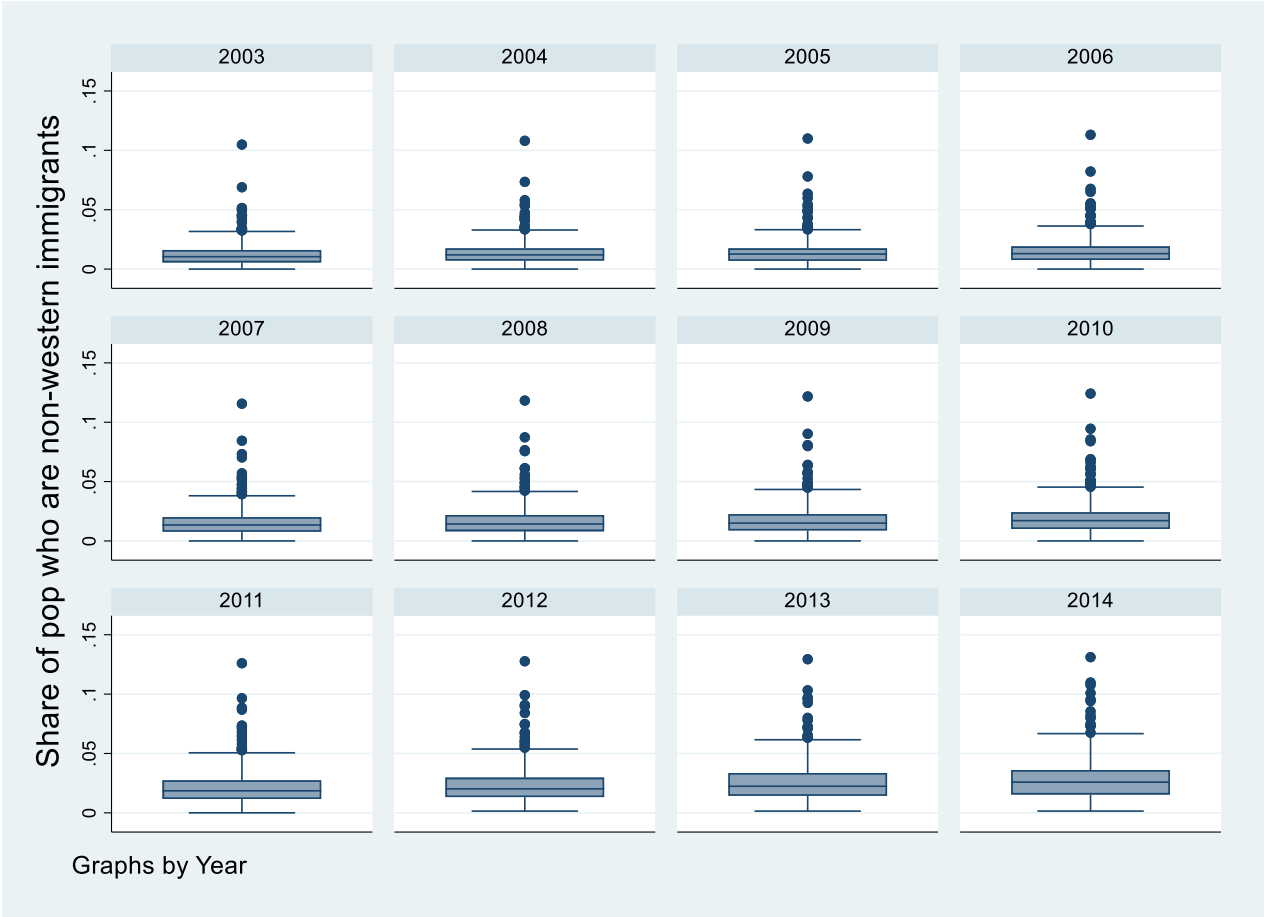


**Figure A2: Share of population, non-Western immigrants, across Norwegian municipalities, by year. 2003–2014.–**

## Online Appendix B: Regression models

**Table B1: Intention-to-treat estimates, full sample. Total unemployment. The outcome variable is the probability that a woman has had at least one child in Norway 1–8 years after settlement. With covariates.**

| | **1 year** | **2 years** | **3 years** | **4 years** | **5 years** | **6 years** | **7 years** | **8 years** |
|---|---|---|---|---|---|---|---|---|
| Unemployment rate, total | 0.0016 | 0.0078+ | 0.0078 | 0.0062 | 0.0069 | 0.0067 | 0.0060 | 0.0091 |
| Proportion of non-Western immigrants | 0.0506 | 0.1630 | 0.3820* | 0.2640 | 0.2940+ | 0.2240 | 0.0140 | -0.0102 |
| TFR last five years | 0.0333+ | 0.0561* | 0.0921** | 0.100** | 0.0913** | 0.0823* | 0.0618+ | 0.0664+ |
| *With individual- and municipality-level controls* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* |
| **N** | **23,493** | **21,040** | **18,863** | **16,678** | **14,718** | **12,932** | **11,282** | **9,542** |

Note: +: p<0.1 *:p<0.05 **:p<0.01 ***: p<0.001

Estimates include controls for age, age squared, family composition and parity at settlement, country/region of origin, educational level at settlement, quota refugee status, participation in introductory program, year and month of settlement, municipality age structure and municipality childcare coverage. Errors are clustered at municipality level.

**Table B2: Intention-to-treat estimates, by highest completed educational level at settlement. Total unemployment. The outcome variable is the probability that a woman has had at least one child in Norway 1, 3 and 5 years after settlement. With covariates.**

| | Low education | | | Upper secondary education | | | Higher education | | | Missing education info. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years |
| Unemployment rate, total | 0.0018 | 0.0168* | 0.0164* | -0.0095 | -0.0491** | -0.0460** | 0.0053 | 0.0051 | 0.0080 | 0.0020 | 0.0101 | 0.0079 |
| Proportion of non-Western immigrants | 0.1870 | 0.4310+ | 0.0869 | 0.9230* | 2.238*** | 2.0640*** | -0.4660 | -0.6630 | -0.7030 | -0.0747 | 0.2340 | 0.3900 |
| TFR last five years | 0.0539* | 0.0821* | 0.0658 | 0.0709 | 0.0692 | 0.1070 | -0.0515 | 0.0189 | 0.1150 | 0.0242 | 0.115** | 0.0990* |
| *With individual- and municipality-level controls* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* |
| **N** | **9,008** | **7,900** | **6,526** | **1,892** | **1,622** | **1,392** | **2,114** | **1,884** | **1,598** | **10,479** | **7,457** | **5,202** |

Note: +: p<0.1 *:p<0.05 **:p<0.01 ***: p<0.001

Estimates include controls for age, age squared, family composition and parity at settlement, country/region of origin, quota refugee status, participation in introductory program, year of settlement, municipality age structure and municipality childcare coverage. Errors are clustered at municipality level.

**Table B3: Intention-to-treat estimates, by parity at settlement. Total unemployment. The outcome variable is the probability that a woman has had at least one child in Norway 1, 3 and 5 years after settlement. With covariates.**

| | No children | | | 1–2 children | | | 3 or more children | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years | 1 year | 3 years | 5 years |
| Unemployment rate, total | -0.0040 | 0.0078 | 0.0089 | 0.0190* | 0.0228* | 0.0131 | -0.0145+ | -0.0227+ | -0.0210 |
| Proportion of non-Western immigrants | 0.0756 | 0.2790 | 0.3100 | -0.5460+ | 0.5040 | 0.5620 | 0.7340** | 1.0220* | 0.6110 |
| TFR last five years | 0.0248 | 0.1070** | 0.1320** | 0.0033 | 0.1170+ | 0.0878 | 0.0628 | 0.0883 | 0.0272 |
| *With individual- and municipality-level controls* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* |
| **N** | **10,855** | **8,510** | **6,423** | **4,155** | **3,399** | **2,641** | **3,573** | **2,953** | **2,399** |

Note: +: p<0.1 *:p<0.05 **:p<0.01 ***: p<0.001

Estimates include controls for age, age squared, family composition at settlement, country/region of origin, educational level at settlement, quota refugee status, participation in introductory program, year of settlement, municipality age structure and municipality childcare coverage. Errors are clustered at municipality level.

**Table B4: Intention-to-treat estimates, stepwise models for robustness. Full sample. The outcome variable is the probability that a woman has had at least one child in Norway 5 years after settlement. With covariates.**

| | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** |
|---|---|---|---|---|---|---|
| Unemployment rate | 0.0024* | 0.0023* | 0.0023* | 0.0023* | 0.0023* | 0.0039* |
| Proportion of non-Western immigrants | 0.2510 | 0.3130 | 0.3090 | 0.2900 | 0.3130 | -0.2800 |
| TFR last five years | 0.0865* | 0.0799* | 0.0799* | 0.0808* | 0.0738+ | 0.0965* |
| Age structure | 0.0025 | 0.0020 | 0.0020 | 0.0021 | 0.0020 | 0.0031 |
| Childcare coverage | 0.0004 | 0.0003 | 0.0003 | 0.0004 | 0.0004 | 0.0003 |
| Centrality | | -0.0000 | -0.0000 | -0.0000 | -0.0000 | 0.0000 |
| Population density | | | 0.0005 | 0.0025 | 0.0003 | 0.0083 |
| Proportion of low-skilled employees | | | | 0.0258 | 0.0198 | -0.0811 |
| Proportion of socialist votes, local | | | | | -0.0210 | 0.0000 |
| Proportion of apartments | | | | | | 0.0490 |
| *With individual-level controls* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* |
| **N** | **13,867** | **13,867** | **13,867** | **13,862** | **13,835** | **8,098** |

Note: +: p<0.1 *:p<0.05 **:p<0.01 ***: p<0.001

Estimates include controls for age, age squared, family composition and parity at settlement, country/region of origin, educational level at settlement, quota refugee status, participation in introductory program, and year and month of settlement. Errors are clustered at municipality level.