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Fertility Drain or Fertility Gain? Emigration and Fertility During the Great Recession in Italy

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ABSTRACT How does emigration affect fertility in the country of origin? We address this question by estimating counterfactual fertility during the Great Recession in order to understand what the effect of the recession on fertility would be in the absence of emigration. Between 2009 and 2014, Southern European countries suffered from harsh economic instability, which triggered a sharp drop in fertility and a spike in emigration. We focus on Italy, exploiting the richness of the Italian Administrative Registry of Italians Residing Abroad (AIRE), which records information about all Italian citizens moving their residence abroad, as well as Italian birth records. Using an instrumental variable approach, which helps overcome endogeneity issues in the fertility-migration relationship, we find a positive impact of emigration on the total fertility rate at the Italian province level. This result suggests that emigrants are selected among those individuals who have a lower risk of having children. Therefore, in the absence of emigration, counterfactual fertility would have been lower than it actually is. Such a positive effect of out-migration on fertility in the area of origin could thereby lead to an underestimation of the effect of the recession on fertility.

KEYWORDS Low fertility • Out-migration • Great Recession • Italian Registry data • Counterfactual fertility

Introduction

The recent demographic literature has shown that the Great Recession negatively affected fertility (Cherlin et al. 2013; Comolli 2017; Matysiak et al. 2018; Schneider 2015; Sobotka et al. 2011), with the European countries most hit by the crisis experiencing the largest drop in fertility, especially among younger individuals (Goldstein et al. 2013). More specifically, the economic recession deeply affected Southern European countries, such as Italy, Greece, Portugal, and Spain, which experienced a substantial increase in unemployment rates and precarious positions among those who were employed (Matysiak et al. 2018). These countries share two other features: very low fertility even before the economic crisis (Eurostat 2015) and a sharp increase in out-migration to other European countries (Schivardi and Schmitz 2020) during the Great Recession. The removal of barriers to labor mobility and the intro-

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duction of the common currency, which allowed for a direct and stable comparison of wages across countries, has substantially facilitated movement of people within the European Union. People, particularly highly educated individuals, are moving from areas in decline to areas experiencing economic growth to take advantage of better economic returns (Grogger and Hanson 2011; Massey et al. 1993). Therefore, as the recession hit Southern European countries harder than other Continental or Northern European countries, individuals have increasingly moved toward more prosperous economies and less stagnant labor markets, such as Germany, the United Kingdom, and Switzerland.

Although the negative impact of economic recessions on childbearing has been widely documented, the effect of emigration on fertility in the country of origin has largely been understudied, and the two phenomena have rarely been jointly investigated. However, as Figure 1 shows, these two dynamics seem to unfold jointly. In Italy, as well as in other Southern European countries (e.g., Greece, Spain, and Portugal), when an upward trend in youth unemployment is observed, a sharp drop in fertility and a spike in emigration are also evident. These synchronous patterns are much less visible in Continental and Northern Europe, where the economic shock was limited, fertility was overall higher (although declining in Northern Europe after 2010), and emigration was more stable over time. The phenomenon of out-migration from Southern European countries became especially relevant in 2010, when the economic performance of these countries started diverging substantially from the rest of Europe.[1]

Exploiting Europe as a "laboratory" of internal mobility, and focusing on Italy as a test bed, we aim to uncover how self-selection into emigration might affect fertility in a sending country with very low fertility. The demographic literature on migration and fertility suggests that the decision to migrate is instrumental to achieve specific goals in other life domains, such as forming a family or having a career (Grundy 1986; Kley 2010; Kulu 2008; Lee 1966; Michielin 2004; Parrado 2015). However, a majority of these studies focused either on the effect of migration on fertility at destination (e.g., Parrado 2011) or on residential relocation (e.g., Kulu 2013). We instead aim at understanding who out-migrates and what their propensity to have children is, in order to uncover how emigration affects fertility in the country of origin. We do so by adopting a counterfactual approach to address the question, What would the effect of the Great Recession be on the total fertility rate (TFR) if emigration were not occurring?

In the last three decades, international migration has been increasingly dominated by high-skilled migration (United Nations and OECD 2013), a phenomenon that has received growing research and public attention. Most of the literature has focused on the economic consequences of high-skilled emigration (Docquier and Rapoport 2012; Dustmann et al. 2015; Elsner 2013; Mishra 2007), both positive (remittances, return migration, and brain gain) and negative (brain drain, lower human capital, and loss of productivity). Moreover, several works have studied how emigration can drive political changes in the area of origin and showed either positive effects driven by

[1] Differences across countries broadened especially because of the sovereign debt crisis affecting Southern European countries.

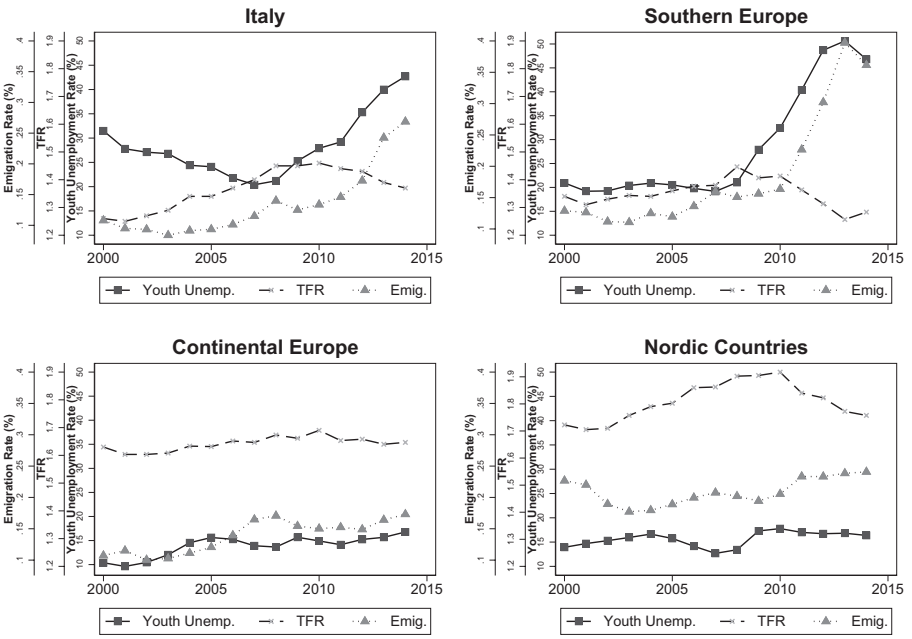

Fig. 1 European cross-country comparison of TFR, unemployment, and emigration trends. Southern European countries include Greece, Portugal, and Spain; Continental Europe includes Austria, Belgium, France, Germany, Luxembourg, and the Netherlands; and Nordic countries include Denmark, Finland, Norway, and Sweden. *Sources:* EUROSTAT data for unemployment and TFR, and OECD data for emigration data.

expatriates' pressure to improve governance (Batista and Vicente 2011) or negative effects related to the departure of young and more open-minded individuals delaying political change (Anelli and Peri 2017). However, little is known about how high-skilled migration affects demographic outcomes at origin, such as fertility.

The present study contributes to three strands of the demography literature. First, it extends the literature on migration and fertility by shedding light on the mechanisms underlying the effect of emigration on fertility at origin, where the origin is a low-fertility setting. The out-migration of individuals in reproductive years mechanically reduces the total number of live births, but we aim to understand the consequences of selection into out-migration for period fertility rates of the population remaining in the sending country. We do so by using an instrumental variable (IV) approach that allows us to estimate the causal relationship between emigration and fertility. This approach helps overcome issues of endogeneity arising from the potential effect that the economic conditions at the origin have on both emigration and fertility.

Second, we contribute to fertility research taking a counterfactual approach. Usually this literature studies a tempo effect on period measures of fertility, based on synthetic cohorts, such as TFR (e.g., Bongaarts and Feeney 1998; Dharmalingam et al. 2014; Kohler and Ortega 2002; Kohler and Philipov 2001; Ortega and Kohler 2002; Rodríguez 2008; Wang et al. 2018). These studies have aimed to show what the

TFR would be if the childbearing age were not rising. Along this line, some research has shown the presence of different sources of bias on immigrants' TFR in the destination country because the calculated TFR is based on an inconsistent synthetic cohort. As a result, immigrants' fertility is overestimated (e.g., for France, Toulemon et al. 2008; for the United States, Parrado 2011). Instead, we aim to uncover counterfactual fertility in the absence of out-migration, focusing on the country of origin. Specifically, we are interested in understanding what the TFR would be in Italy after the Great Recession if emigration were not occurring.

Third, we contribute to the literature on the effect of the economic crisis on fertility (Cherlin et al. 2013; Comolli 2017; Goldstein et al. 2013; Matysiak et al. 2018; Schneider 2015; Sobotka et al. 2011), showing that the effect of emigration on fertility actually buffers the well-known negative impact of the Great Recession on childbearing. Therefore when self-selection into out-migration is not identified and isolated, the negative impact of the recession on fertility is potentially underestimated.

Background and Theoretical Framework

Low Fertility and Emigration During the Great Recession: The Italian Context

After decades of very low fertility (Caltabiano et al. 2009), Italy reached a TFR below 1.3, the so-called lowest-low fertility, in the 1990s (Kohler et al. 2002). Since the beginning of the twenty-first century, Italian fertility rates have gradually increased (Italian National Institute of Statistics [ISTAT] Population Register), reaching 1.4 children per woman in the years preceding the Great Recession. Such an increase in fertility has been characterized by distinct regional patterns, with the northern regions of Italy having higher fertility than the South and the Islands (Caltabiano et al. 2009), as the map of Italian province-level TFR in 2008 shows (see Figure 2). However, as soon as the economic crisis kicked in,[2] fertility dropped again, especially beginning in 2011, returning to rates of about 1.3 children per woman and even below that threshold in some southern regions (ISTAT, Population Register).

Figure 3 provides further evidence that during the recession, Italy experienced both a reduction in fertility and a substantial increase in emigration—the largest such increase relative to its population size, after the Big Exodus (1870–1915). According to AIRE, the yearly outflow of emigrants in 2017 reached around 115,000 individuals, which is almost three times the outflow of 2008. Overall, the net out-migration of Italians from 2008 until 2014 was equal to around 410,000 individuals (740,000 for the 2008–2017 period, equivalent to 1.24% of the entire population), with an outflow in 2014 that was double the one in 2009. Figure 3 clearly shows that those who emigrated during the economic recession were young: the emigration rate for 18- to 45-year-olds sharply increased beginning in 2010, whereas the emigration rate of individuals aged 45 or older remained low during the recession years. Out-migration from Italy to other countries increased during the recession period, but internal

[2] From 2007 to 2014, the Italian gross domestic product (GDP) decreased by 8.5%, and the unemployment rate increased from 6.1% to 12.7%

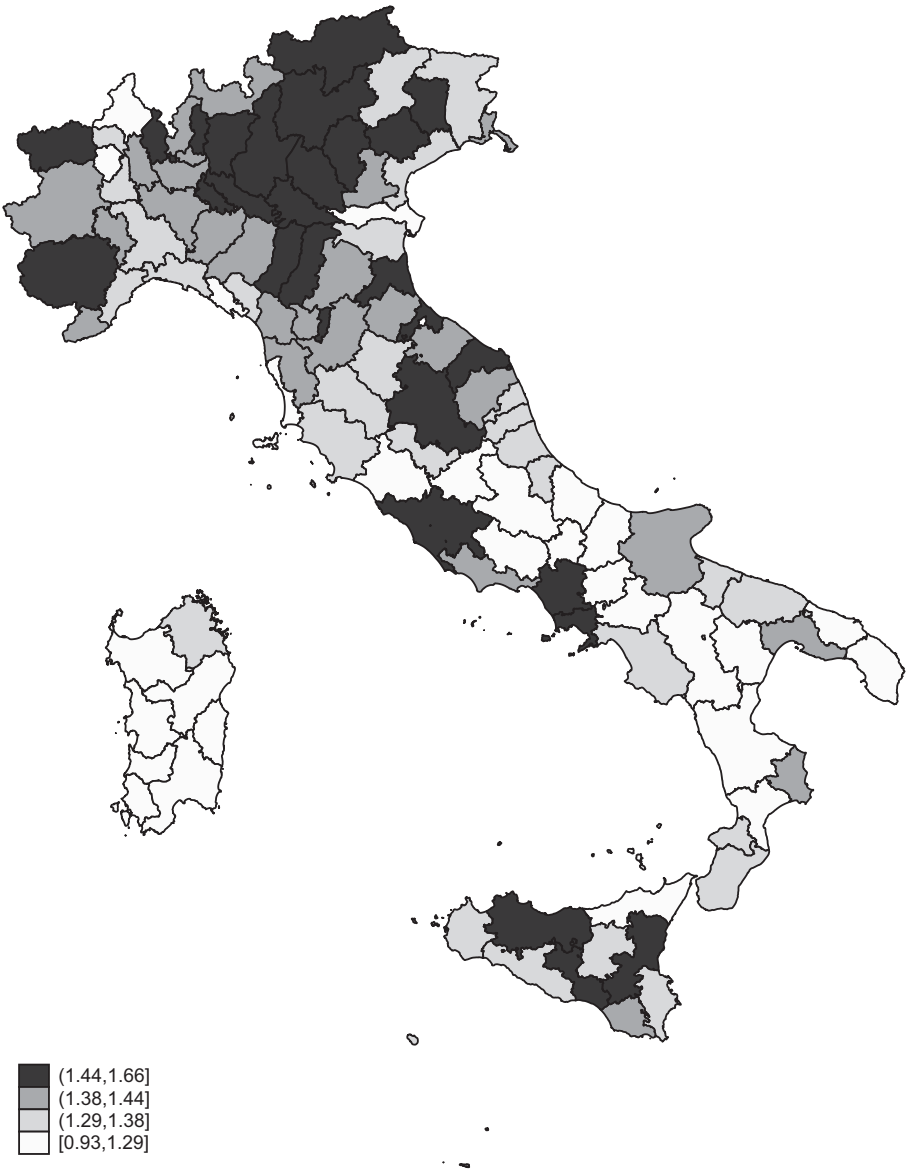

Fig. 2 Maps of TFRs in Italian provinces in 2008. *Source:* ISTAT data.

migration from the South to the North of Italy remained stable at the pre-crisis level (Impicciatore and Panichella 2019). This finding suggests that the increased number of emigrants from the southern regions of the country during the Great Recession is due to additional individuals out-migrating abroad and not to Northern Italy.

Unfortunately, AIRE does not provide information about the educational attainment of emigrants. However, ISTAT has released aggregate statistics on educational attainment of emigrants for 2017. These data show that 31% of all Italians out-migrating in

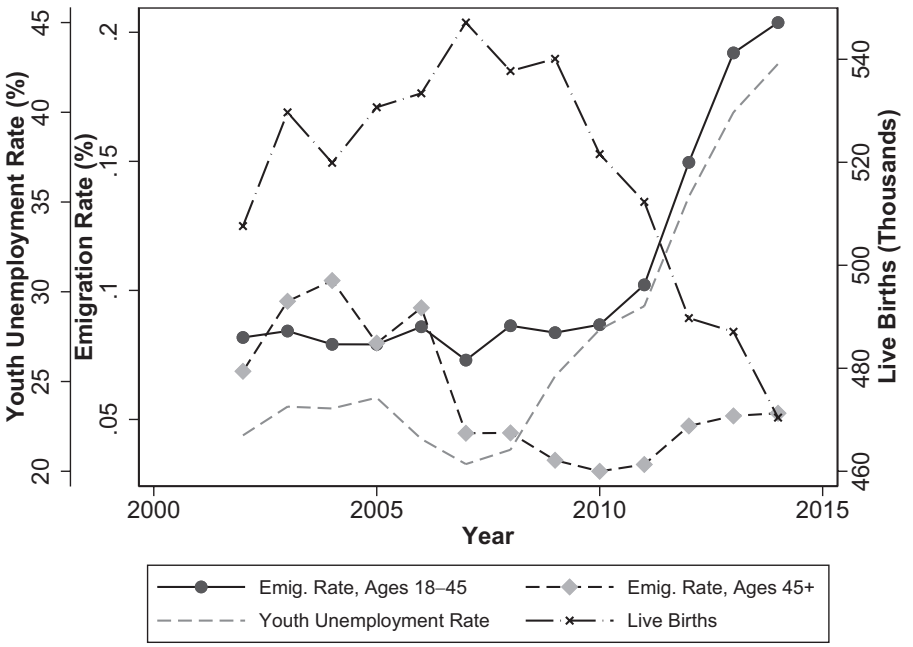

Fig. 3 Trends in fertility, emigration, and unemployment in Italy. *Sources:* ISTAT and AIRE data.

that year had a university degree (ISTAT 2018). When compared with the very low share of Italians in the population with a college degree (16%), this statistic suggests that Italian out-migration is a phenomenon concentrated among highly educated individuals.

Emigration and Fertility

An extensive demographic literature has shown that migration and fertility are interrelated processes, and the relationship can be characterized in two ways. First, a large body of research has investigated how migrating to another country may impact the fertility of immigrants at destination (Andersson 2004; Kulu and Milewski 2007; Milewski 2010; Mussino and Strozza 2012; Sobotka 2008; Tromans et al. 2009). This strand of literature has investigated childbearing behaviors of the first generation and of immigrants' descendants, focusing on countries with different migration, family policies, and fertility patterns (Kulu et al. 2017).

Second, another body of research has claimed that fertility decisions and family formation plans are key drivers of the decision to migrate (Grundy 1986; Kley 2010; Kulu 2008). Such an argument is linked to the selection hypothesis because it suggests that migrants are selected in terms of family formation preferences, fertility ideals, and by their life stages. This approach built on Lee's (1966) pioneering theory of migration, according to which migrating is functional to the achievement of life course goals that can, for instance, range from having children to finding a (better) job. Most of this literature has focused on residential mobility from urban to rural

areas (Kulu 2013) or on relocations within urban areas to suburbs for families with (planned) children (Kulu et al. 2009).

Some studies examined fertility-related consequences of international migrants' selection but focused almost exclusively at the destination country, considering migration from low- and middle-income countries with relatively high fertility to low-fertility developed countries. Particularly interesting for the present research, Parrado (2011, 2015) found that Mexican immigrants in the United States tend to have a child soon after migration. As a result, compared with U.S.-born women, Hispanic women in the United States seem to show much higher fertility because their immigration coincides with family formation. (Toulemon et al. [2008] found similar results in France.) Parrado (2015) also specifically examined the relationship between emigration and fertility during the Great Recession, claiming that the well-emphasized drop in the fertility of Mexican immigrants in the United States during the recessionary period is not the result of changes in Hispanics' fertility behavior and ideals because of the crisis. Parrado showed that the drop in fertility was actually due to the fact that fewer Mexican women emigrated to the United States during the Great Recession, thereby reducing the representation of new immigrants who were more likely to have children.

Only a handful of studies have looked at the effect of emigrating on fertility at origin. These studies have focused on out-migration from low- and middle-income countries to advanced societies. White and Potter (2013) and Gjonca et al. (2008) observed lower fertility in higher-migration areas (in Mexico and Albania, respectively) because of a large out-migration of men, resulting in lack of matching partners for unmarried women. Instead, Fargues (2011) and Lerch (2015) emphasized that in relatively high-fertility contexts, such as Africa or Albania, migrants have been able to convey new family values and low fertility attitudes to nonmigrants of their community of origin. Finally, Ebanks et al. (1975) found that population loss due to emigration played a crucial role on fertility decline on the island of Barbados.

Some economic studies (e.g., Chen 2009; Marchiori et al. 2010) provided further evidence in favor of a reduction of fertility at origin in developing countries experiencing large high-skilled emigration flows. This body of research has claimed that in a situation of permanent high-skilled emigration, parents change their fertility decisions to reflect a strategy of investing in the quality (rather than quantity) of children; that is, these parents reduce the number of children they have and expand their children's education, promoting their children's likelihood of emigrating and subsequently sending back remittances.

To our knowledge, only Sabater and Graham (2018) have linked emigration and fertility at origin by looking at an advanced and low-fertility society, Spain. They focused on the migration-fertility relationship during the Great Recession and found a negative association between emigration and Spanish province-level fertility. The mechanism they proposed to explain this negative link is that those who emigrated from Spain during the economic crisis did so for economic reasons and were likely to be young, thereby reducing the size of reproductive-age cohorts. The authors made use of a spatial approach, which allowed them to conclude that the negative relationship was mainly due to an indirect spillover effect coming from emigration in the neighboring provinces. Yet, they had no specific identification strategy to tackle the potential endogeneity in the emigration-fertility relationship due to the effect of the economic crisis on both factors.

Mechanisms and Hypotheses

In light of the fact that Italy and Spain experienced similar economic shocks during the Great Recession and a comparable, sharp increase in out-migration in that period, we might assume that Italy experienced a similar selection into emigration to the one that occurred in Spain. Following Sabater and Graham (2018), we could then expect that out-migration might have a depressive effect on fertility in the provinces from which emigrants moved, given that those who left were of reproductive age and thus more at risk of having children. Moreover, because out-migration is a phenomenon concentrated among highly educated individuals, we could build on studies (e.g., Hazan and Zoabi 2015) showing that higher-educated individuals are more likely to have children because they have the resources to outsource house-related and child-related services, which allows them to work and have higher fertility. Such evidence also exists for the Italian context: Caltabiano et al. (2009) found that the youngest generations of women in Northern Italy, who have the highest levels of education, are the ones with the highest fertility. Therefore,

> *Hypothesis 1* (H1): If emigrants are selected among those individuals who have a higher risk of having children, we expect to find a negative effect of emigration on fertility at origin. As a result, in the absence of emigration, counterfactual fertility in the provinces with high emigration should be higher.

This hypothesis is further supported by the argument that willingness to take risks positively and significantly affects the probability of both emigrating (Heitmueller 2005) and having children (McDonald 2006).

On the other hand, there are potential mechanisms at work that would support a competing hypothesis. First, the profile of the average recession-era Italian emigrant—that is, highly educated and responsive to economic and job opportunities (Massey et al. 1993)—perfectly fits the lifestyle preferences of the work-centered individual defined by Hakim (2003). Such individuals are more likely to be childless. Therefore, emigrants might be selected among the least likely to have children. In further support of that expectation, Italy is one of the European countries where the work-family reconciliation is more difficult; like Spain or Greece, Italy is characterized by a familist model in which the state does not make up for the personal costs to women of raising children (Esping-Andersen 1999; Sánchez-Barricarte and Fernández-Carro 2007). Matysiak and Vignoli (2013) showed that employed women in Italy are far less likely to have a first child than women who are unemployed or inactive in the labor force. That lack of support for working mothers may become even more problematic amid high rates of female and youth unemployment (Sánchez-Barricarte and Fernández-Carro 2007). Therefore, those individuals who invested in their human capital and are committed to their working career might not be willing to have children in Italy, but they see migration to other European countries, which are more supportive in helping combine work and family, as a strategy to jointly invest in both children and career. Moreover, some studies in the economic literature (Chevalier and Marie 2017; Del Bono et al. 2012) have claimed that in periods of economic turmoil, individuals with higher education are less likely to have children than those with less education because the former have higher opportunity costs of human capital accumulation, and the birth of a child might impact their future earnings more strongly. Such evidence seems to suggest the following:

Hypothesis 2 (H2): If emigrants are selected among those individuals who have a lower risk of having children, we expect to find a positive effect of emigration on fertility at origin. As a result, in the absence of emigration, counterfactual fertility in the provinces with high emigration should be lower.

In addition to the highlighted mechanisms, it is relevant to consider that children of Italian mothers or fathers will automatically acquire Italian citizenship, even when they were born abroad (*jus sanguinis* or *right of blood principle*). Therefore, emigrants who plan to become parents in the future do not need to have children in Italy in order to provide Italian citizenship to their offspring. This latter point, together with the potential thought of moving to a country where it is easier to reconcile work and family, might lead emigrants to decide to postpone their decision to have children until they have settled in the new country. Therefore, if those who left Italy during the Great Recession are mainly postponers, an increase in out-migration of such individuals should lead to a rise in fertility concentrated among younger individuals. We explore this dynamic by conducting an additional analysis on age-specific fertility rates.

Data and Methods

Data

Our two main data sources are AIRE—an official administrative registry of Italian citizens moving their residence abroad—and the Italian birth records provided by ISTAT. AIRE data were obtained from the Italian Government (Ministry of Interior) and provide us with information on the number and the sociodemographic characteristics of emigrants from Italy between 1992 and 2014. We use these data to construct the number of out-migrants from each Italian province who left between 2009 and 2014. For these individuals, we can also observe the country where they resided after migrating, the date of migration, and their age, gender, and marital status. Such information allows us to construct emigration networks by linking the province of origin of each emigrant to their destination country. As we describe in the next section, these networks constitute the main element of our IV and empirical strategy. To our knowledge, AIRE is the only registry worldwide that permits tracking these bilateral networks, but the data have some limitations related to delayed or missed registration. In section A of the online appendix, we discuss these limitations in detail and present a data validation exercise.

We focus on the period 2009–2014 because the Great Recession started to hit Italy most strongly from 2009, and the outflow of emigrants became especially relevant starting from 2010. We stop our observation of the TFR in 2014 because this is the year when both unemployment and the rate of emigration started to slow and GDP growth turned positive.

ISTAT provides us with province-level TFRs. There are 103 Italian provinces. We also have data on GDP and the unemployment rate at the province level from ISTAT for 2004, which we use as pre-recession exogenous controls in our models. Data on GDP are taken from yearly national accounts, whereas unemployment rates are estimated by ISTAT using the Italian Labour Force Survey.

Empirical Strategy

We study the relationship between emigration and fertility at the province level by regressing the change in the TFR during the sharp increase in emigration recorded between 2009 and 2014 on the emigration rate of each province over the same period. Our baseline ordinary least squares (OLS) estimation is based on the following model:

$$\Delta TFR_P = \alpha + \beta ER_P + \delta \mathbf{X}_{P,pre} + \lambda_{region} + \varepsilon_P, \quad (1)$$

where the dependent variable ΔTFR_P is the 2009–2014 change in TFR in province P, ER_P is the emigration rate in province P, calculated as the cumulative outflow of emigrants during the same period relative to the population in year 2000.[3] $\mathbf{X}_{P,pre}$ are provincial-level controls, such as unemployment rate and GDP in the local labor market in which the province is located, in the earliest available year before the recession (2004). λ_{region} are macro-region fixed effects (North, Center, and Island, with South as the reference category).

Establishing a causal link from emigration to fertility is challenging because the factors triggering migration, such as unemployment, might also cause simultaneous changes in fertility patterns, making it difficult to separately identify the effect of emigration from the effect of economic conditions. To overcome this endogeneity problem, we use an IV approach that leverages Lee's theory of migration (Lee 1966), which distinguishes between *push* and *pull* factors affecting emigration. Push factors specific to the province that trigger emigration are likely correlated with local economic conditions, and pull factors depend on destination countries' attractiveness and are likely not correlated with conditions in the province of origin. Moreover, because our analysis focuses on a developed country, pull factors are likely to be the major determinants of the decision to migrate, especially for highly educated individuals.

Following Anelli and Peri (2017), we isolate a component of emigration that depends on pull factors only. Our data on GDP growth in the countries receiving Italian emigrants come from the International Financial Statistics of the International Monetary Fund. We interact those data with the presence of preexisting networks of Italian emigrants in each receiving country. We construct these networks using AIRE data and calculate the stock of Italians from each province living in each destination country in 2000—well before the start of the Great Recession—as a percentage of each province's population, measured from 2000 ISTAT data. The higher the stock of Italians from province P living in destination country D, measured as the percentage of P's 2000 population, the stronger the migration network in P toward D. Given that economic growth was much slower in the Mediterranean economies (Greece, Spain, Italy, and France) than in Northern Europe (see Figure 1), the pull factor to emigrate was much stronger for provinces that had large preexisting networks located in Northern and Continental European countries (e.g., Germany, Switzerland, and the United Kingdom) than those with networks located in Southern Euro-

[3] We measure emigration networks and all population variables in 2000 because we believe the introduction of the euro in 2001 might have produced structural changes in the propensity to migrate, especially toward countries adopting the single currency. Thus, taking 2000 as a reference guarantees a more exogenous baseline.

pean countries. The presence of links to specific countries in the form of networks of pre-2000 emigrants—who reduce the cost of migrating to those countries mainly by providing information about opportunities at destination—allows us to construct the province-specific emigration's pull factor that we use as an instrument to measure the effect of emigration on fertility in Italian provinces. We make this pull-factor intuition operational by multiplying the stock of emigrated Italians from each province P living in each destination country D—measured in 2000 as a percentage of P's 2000 population—with the ratio of GDP growth of D relative to the GDP growth in Italy in the same period. For each province, we then sum the resulting multiplied values over all possible destination countries, which we index from 1 to K. We can formalize our IV as follows:

$$IV_P = \sum_{D=1}^{K} \frac{EmigrantStock_{P \to D,2000}}{Population_{P,2000}} \times \frac{\%\Delta GDP_D}{\%\Delta GDP_{Italy}}. \quad (2)$$

Although the absolute value of the resulting instrument IV_P does not reflect a particular unit of measurement, its variance should be interpreted as pull-factor intensity: the instrument will predict more emigration from P if networks $P \to D$ are stronger for destination countries D that have higher GDP_D.[4]

To estimate the causal relationship between emigration and fertility, we perform a two-stage least squares (2SLS) procedure in which we instrument the endogenous variable ER_P with our pull-factor variable IV_P and then replace the endogenous variable in specification 1 with $\widehat{ER_P}$, as predicted in the first stage. First-stage estimation is robust, with an F statistic for the excluded instrument IV_P of 33.8 at well above 10. Therefore, we are confident that our instrument is relevant. To provide evidence for its validity, we consider alternative strategies. First, we focus on one of the two pull-factor components: the network of emigrants toward any given destination ($EmigrantStock_{P \to D,2000} / Population_{P,2000}$). In an overidentified model, we instrument our endogenous emigration variable with the stocks of emigrants from each province, as a percentage of 2000 population, toward the 12 most popular destination countries.[5] The use of 12 separate instruments for our endogenous variable allows us to run an overidentification restriction test for the validity of our IV strategy. The chi-squared value of the test is 15.7. Evaluated against the relevant critical value with 11 degrees of freedom (19.7), this test does not reject the null hypothesis that our IV strategy is valid. The second component of our baseline IV—GDP growth—cannot be used as a separate instrument in an overidentified model (because it does not vary across province of origin). Therefore, we perform a further robustness check by using a second alternative IV strategy in which we interact the emigrant networks with the 2009–2014 change in destination countries' unemployment rates (instead of GDP growth). In the Results section, we show that estimates are robust to both alternative IV strategies.

[4] As standard in two-stage least squares estimations, results from our instrumented specification will nonetheless reflect the unit of measurement of the observed emigration rate.

[5] We chose the destination countries in which at least 10,000 Italian emigrants were living in 2000: Argentina, Australia, Belgium, Brazil, Canada, France, Germany, Spain, Switzerland, the United Kingdom, the United States, and Venezuela.

The causal estimate of the effect of out-migration on the TFR is an important contribution of our work. Moreover, it is a crucial input for our counterfactual analysis aimed at computing what the counterfactual fertility change would have been during the recession, in the absence of emigration. To do so, we proceed in two steps. We first replace the emigration rate with changes in four crisis indicators (GDP per capita; unemployment; youth unemployment; and the share of youth not in education, employment, or training) in our baseline Eq. (1):

$$\begin{aligned}\Delta TFR_P = \alpha + \beta_1 \Delta GDP_P + \beta_2 \Delta UN_P + \beta_3 \Delta Y.UN_P \\ + \beta_4 \Delta NEET_P + \delta X_{P,pre} + \lambda_{region} + \varepsilon_P.\end{aligned} \tag{3}$$

We use the parameters estimated with this alternative specification to predict the change in TFR attributable to the recession, $\Delta\widehat{TFR_P}$. We then calculate the 2009–2014 counterfactual TFR change in absence of emigration as follows:

$$\Delta TFR_P^{Counter} = \Delta\widehat{TFR_P} - \hat{\beta}_{IV} \times ER_P, \tag{4}$$

where $\hat{\beta}_{IV}$ is our emigration-on-TFR IV estimate from column 2 of upcoming Table 2, and ER_P is the observed emigration rate in province P. We use the estimated counterfactual TFR change to create a map that shows the degree of TFR change that would have characterized each Italian province during the recession in the counterfactual scenario of no out-migration.

Results

Before moving to our main analysis, we describe the characteristics of the Italians who emigrated during the years of the Great Recession (2009–2014), comparing them with the group of individuals who emigrated from Italy in the pre-crisis period (2000–2008). As Table 1 shows, we do not find any substantial difference in the gender balance of the group of emigrants before and during the economic crisis. However, we find three differences between the characteristics of the two groups of emigrants before and after the economic crisis: (1) mean age at emigration decreased from 46.5 to 38.4, suggesting that people emigrating during the crisis were much younger than previous emigrants; (2) the top destinations during the crisis were almost exclusively European and were countries with better economic conditions than Italy (e.g., Germany, the United Kingdom, and Switzerland); and (3) the share of single emigrants after the crisis increased substantially (47%), whereas the majority of Italians leaving the country before 2009 were married (63%). This latter feature might be largely due to the fact that new emigrants were much younger than previous ones, but it could also suggest that a larger share of out-migrants were childless before leaving.

As a subsequent step in our analysis, we use Italian province-level maps to visually compare changes in the emigration rate and changes in TFR in 2009–2014. As shown in Figure 4, both measures are in terms of deviations from the macro-region average, which is exactly the variation we use in our models. The comparison of the maps seems to suggest that provinces that experienced higher emigration (i.e., the darker ones) had larger positive variation in TFR (again, darker provinces). At first glance, then, emigration and province-level TFR seem to be positively associated,

Table 1 Descriptive statistics for emigrants

	2000–2008	2009–2014
Gender (%)		
Female	43.02	40.56
Male	56.98	59.44
Average Age at Emigration	46.50	38.36
Top Destinations		
First	Germany	Germany
Second	Switzerland	United Kingdom
Third	Argentina	Switzerland
Fourth	United States	France
Fifth	United Kingdom	United States
Marital Status (%)		
Single	27.15	47.53
Married	63.47	46.58
Divorced	4.22	3.62
Widowed	5.16	2.27

Source: AIRE data.

which would suggest that emigrants are selected among the least likely to have children. Because this descriptive evidence might be confounded by many factors, we conduct OLS and IV regression analyses to infer any causal effect of emigration on fertility; the results are reported in Table 2.

Column 1 of Table 2 reports estimates of the OLS regression for Model 1 and shows a positive and significant relationship between emigration rate and TFR. To interpret the magnitude of the coefficient, we relate the impact of the emigration rate on the change in fertility to the baseline mean TFR, which was equal to 1.409 in 2008. The overall positive change of 0.091 points in TFR due to a 1% change in emigration rate is equal to about 6.5% of the baseline mean TFR—a substantial effect.

The positive relationship between emigration and fertility revealed by the OLS regression is further confirmed by the IV model estimates, reported in column 2. Here the effect is stronger, which suggests that the instrument is orthogonal to the economic conditions at origin. A worse economic condition in a certain province might lead to both higher emigration from that province and lower fertility because of the crisis. When we eliminate this latter dynamic to capture only the effect of emigration on fertility with our IV approach, it is not surprising that we find a larger positive effect.

In columns 3 and 4, we report estimates obtained using the two alternative IV strategies presented in the Empirical Strategy section. In the overidentified model shown in column 3, the endogenous emigration rate is instrumented by the separate emigration networks toward the 12 most popular destination countries not interacted with the GDP pull factors. The 12 instruments are relevant (first-stage F is 13) and valid according to the overidentification restriction test (the p value for rejecting the null hypothesis of validity is .15). The main effect of emigration on fertility is only marginally larger than the one estimated in the baseline model shown in column 2 and is still statistically significant. Column 4 shows that our results are also robust to

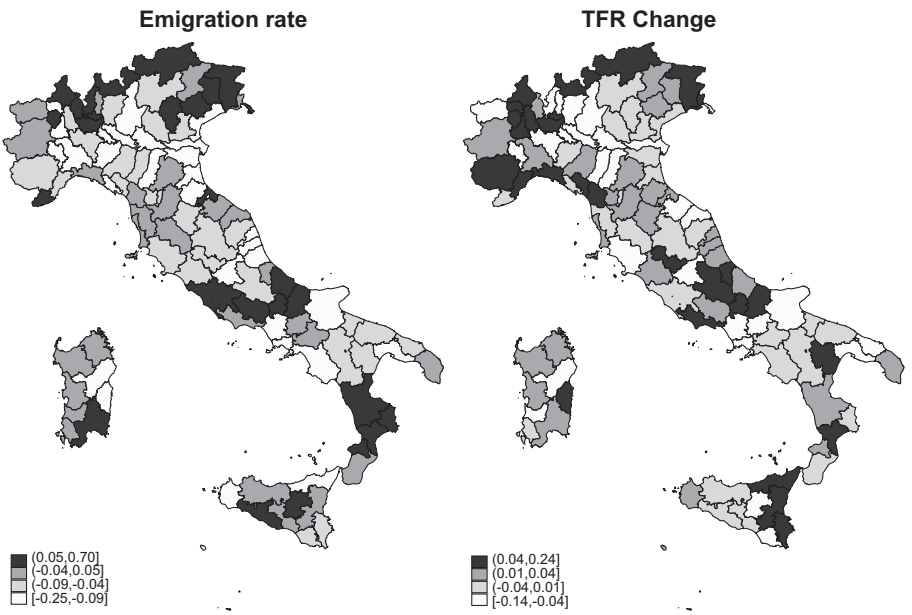

Fig. 4 Emigration rate and TFR change in deviation from macroregion mean, 2009–2014. *Sources:* ISTAT and AIRE data.

replacing the destination countries' GDP with the unemployment rate as the second pull factor in our baseline IV definition.

The simple difference in TFR levels between 2009 and 2014 as the outcome might not fully capture the behavior of TFR for the 2009–2014 period. Indeed, a given 2009–2014 change might be the result of substantially different TFR trajectories over the five years. To avoid this loss of information, in columns 5 and 6, we therefore consider the cumulated TFR change between 2009 and every year from 2010 to 2014: $CUM\Delta TFR = \sum_{t=2010}^{2014}[TFR_t - TFR_{2009}]$. By construction, the resulting alternative dependent variable has more variation than the simple difference. The results shown in columns 5 and 6, therefore, show larger coefficients, but the sign and significance are consistent with our baseline results.

Columns 7 and 8 in Table 2 instead report the estimates for an alternative model that interacts the emigration rate with the dummy variable identifying provinces belonging to Northern Italy. We estimate this interaction model to uncover whether the effect of emigration on fertility is different in the North and in the South of Italy, considering that northern provinces overall have higher fertility, higher human capital, better family-work reconciliation, and better economic conditions (Caltabiano et al. 2009; Vitali and Billari 2017). According to the OLS estimates (column 5), the positive effect of emigration on fertility seems to be driven by the northern provinces. However, using the IV approach (column 6), we actually do not find any significant differential effect of emigration on fertility among the Italian macro-areas.[6]

[6] North-South differences found with the OLS model might be due to an omitted variable bias: because southern provinces experienced harsher economic consequences during the Great Recession, the negative effect on fertility is more likely to confound the emigration-fertility relationship in the south of Italy.

Table 2 Estimates of the OLS and IV regression models on change in TFR between 2009 and 2014

Variables	OLS (1)	IV 1 (2)	IV 2 (3)	IV 3 (4)	OLS CUM (5)	IV 1 CUM (6)	OLS (7)	IV 1 (8)
Emigrated, 2009–2014	0.091†	0.176*	0.186**	0.174*	0.343**	0.536*	0.040	0.145†
	(0.048)	(0.069)	(0.062)	(0.070)	(0.126)	(0.232)	(0.032)	(0.086)
Emigrated × North							0.193*	0.143
							(0.080)	(0.143)
GDP, 2004	–0.120	–0.372	–0.400	–0.365	0.076	–0.493	–0.163	–0.423
	(0.260)	(0.327)	(0.301)	(0.330)	(0.577)	(0.865)	(0.187)	(0.260)
Unemployed, 2004	–0.536†	–0.577*	–0.581*	–0.576*	–1.329	–1.421†	–0.538†	–0.581*
	(0.284)	(0.258)	(0.254)	(0.259)	(0.860)	(0.821)	(0.297)	(0.258)
North	–0.033	–0.016	–0.014	–0.017	–0.121	–0.084	–0.126*	–0.084
	(0.034)	(0.038)	(0.038)	(0.038)	(0.124)	(0.134)	(0.049)	(0.085)
Center	–0.012	–0.006	–0.005	–0.006	0.026	0.039	0.003	0.006
	(0.033)	(0.035)	(0.036)	(0.035)	(0.108)	(0.112)	(0.028)	(0.031)
Islands	0.023	0.016	0.016	0.017	0.013	–0.002	0.028	0.019
	(0.023)	(0.020)	(0.021)	(0.020)	(0.070)	(0.065)	(0.024)	(0.020)
Constant	–0.004	0.003	0.004	0.003	–0.124	–0.106	0.024	0.025
	(0.058)	(0.067)	(0.068)	(0.067)	(0.152)	(0.168)	(0.047)	(0.058)
Number of Observations	103	103	103	103	103	103	103	103
R^2	.146	.091	.078	.094	.228	.207	.227	.159
Average TFR, 2008	1.377	1.377	1.377	1.377	1.377	1.377	1.377	1.377
Average TFR Change	–0.037	–0.037	–0.037	–0.037	–0.078	–0.078	–0.037	–0.037
Model	OLS	2SLS	2SLS	2SLS	OLS	2SLS	OLS	2SLS
F Excluded Instrument		33.83	13.17	31.15		33.83		21.74

Notes: Robust standard errors are shown in parentheses. Observations are Italian provinces. All specifications control for macro-area fixed effects. In columns 2 and 6, the model is our baseline IV interacting emigrant networks with destination country GDP growth in 2009–2014. In column 3, emigrant networks are used as separate instruments and are not interacted. In column 4, the GDP growth of the baseline instrument is replaced by the 2009–2014 change in the unemployment rate of the destination countries. In columns 5 and 6, the dependent variable is the cumulated TFR change between 2009 and every year from 2010 to 2014: $CUM\Delta TFR = \sum_{t=2010}^{2014}[TFR_t - TFR_{2009}]$. Columns 7 and 8 replicate models in columns 1 and 2, but they include the interaction of emigration with a dummy variable for northern provinces.

Sources: AIRE and ISTAT data.

†$p < .10$; *$p < .05$; **$p < .01$

To highlight the substantial role played by out-migration on Italian fertility during the Great Recession, we use our model estimates to compute counterfactual fertility changes between 2009 and 2014 at the Italian province level in the absence of emigration as described by Eqs. (3) and (4). As Figure 5 shows, all provinces with a zero or a small positive impact of the crises on fertility in the presence of out-migration (map on the left side) would actually have had a negative change if out-migration had not occurred (map on the right side). More generally, the counterfactual map suggests that with no out-migration, the effect of the economic crisis on Italian fertility would have been more negative.

Finally, to uncover the extent to which the selection into out-migration is age-specific, we conduct an analysis in which we estimate the 2009–2014 change in several age-specific fertility rates (ASFRs) as a function of changes in the instrumented emigration rate. The results are shown in Figure 6. Each dot in the figure

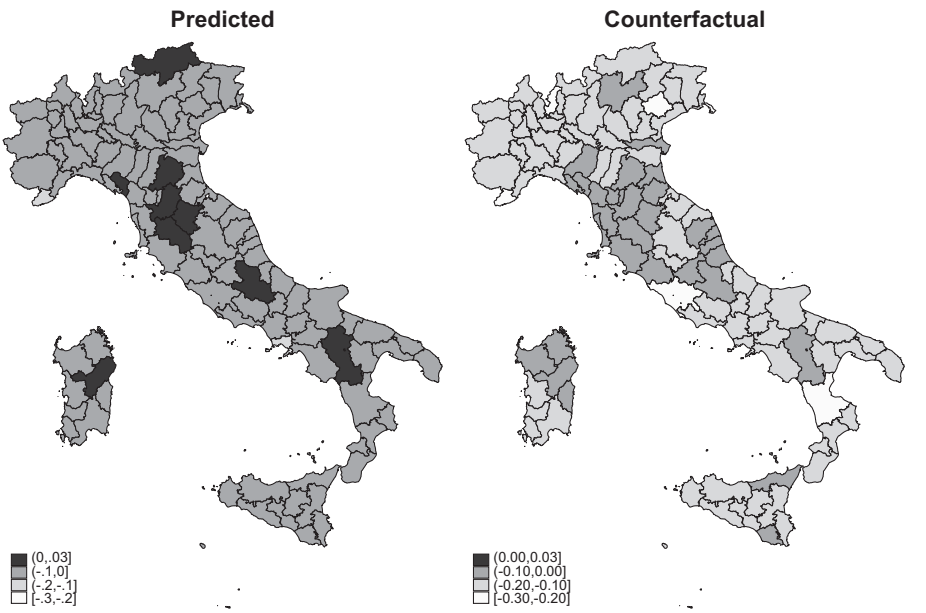

Fig. 5 Predicted and counterfactual change in TFR, 2009–2014. *Sources:* ISTAT and AIRE data.

represents the emigration effect estimated for each of these ASFRs, computed for five-year age groups. For instance, the estimate corresponding to 25 is obtained using the 2009–2014 change in the ASFR for the 23–27 age group. The pattern of estimates shows that most of the selection effect is concentrated in relatively young age groups, whereas it is not statistically different from zero for the age group 32–36 and beyond. This piece of evidence could suggest two, nonmutually exclusive potential dynamics: those who emigrated were (1) young individuals who were childless or less at risk of having children, and (2) young individuals who were postponing childbearing. In a further robustness check (see Table B1, online appendix), we estimate changes in the mean age at birth between 2009 and 2014 as a function of changes in the emigration rate. The negative effect of emigration on mean age at birth, albeit significant only in the OLS specification, is consistent with the evidence from the analysis on ASFRs. However, further analyses on mean age at first birth—information that is unfortunately not available to us—should be ideally carried out in order to be able to conclude that emigrants are selected among postponers.

Robustness Checks

We test the robustness of our analysis to alternative model specifications that consider different space and time definitions. Columns 1 and 2 of Table 3 show estimates from a spatial autoregressive model that allows the change in fertility in one province to be correlated with the change in fertility, 2004 GDP, and unemployment rate of other

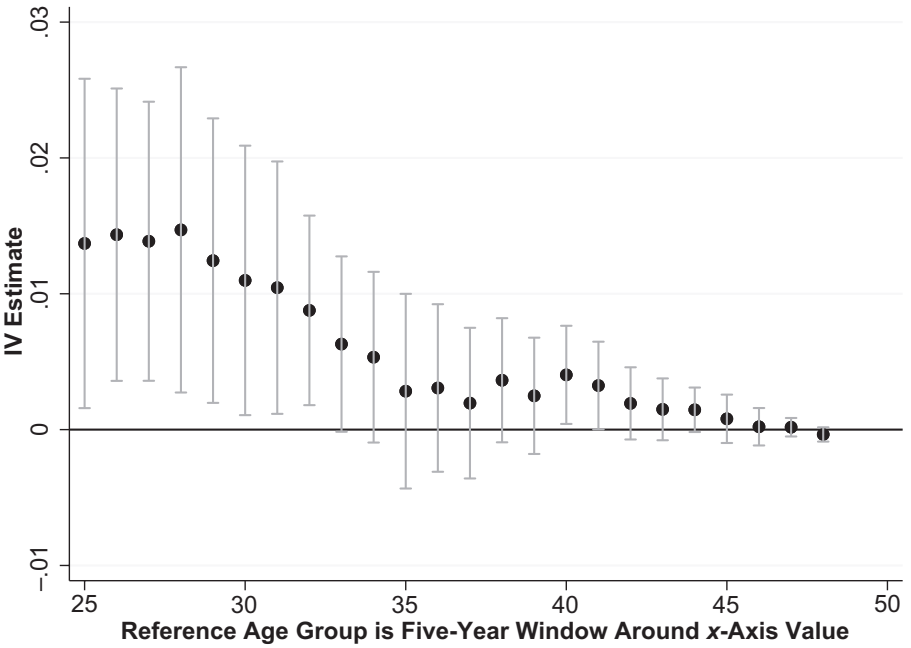

Fig. 6 Effect of emigration on the 2009–2014 change in several different age-specific fertility rates. Each dot represents the parameter estimate obtained by replacing the 2009–2014 change in TFR with the 2009–2014 change in age-specific fertility rates in our baseline IV specification. The estimate is repeated for five-year age groups. Values on the horizontal axis represent the center of each five-year age window. For instance, the estimate corresponding to 25 is obtained using the 2009–2014 change in the ASFR for the 23–27 age group. Whiskers represent 95% confidence intervals around each estimate. *Sources:* ISTAT and AIRE data.

provinces. We use an inverse-distance weighting matrix and allow also for spatial correlation in the error term. The main effects of emigration are consistent with those obtained with our baseline specification and remain significant.

In our baseline model, we focus on fertility and emigration changes between 2009 and 2014. We use 2009 as the starting point because no relevant emigration phenomenon was recorded before that year. Taking 2014 as the end of the analysis window might be more questionable. Indeed, the upward trends in unemployment and emigration started to flatten beginning in 2014, whereas TFR kept falling. Therefore, we test our model using the alternative time window 2009–2015. Columns 3 and 4 of Table 3 show that the results are robust.

Finally, in Tables B2 and B3 in the online appendix, we test the robustness of our main results to the inclusion of two additional controls: the change in the net stock of immigrants and the change in the share of immigrant women of reproductive ages in each province between 2009 and 2014. We do this because existing literature has shown a positive and causal impact of female immigrants on native fertility (Forlani et al. 2016; Furtado 2016) and an increase in period fertility triggered by the reproductive behaviors of immigrant women (Parrado 2011). Results are consistent with those found using our baseline specification.

Table 3 Robustness checks: Spatial correlation and time window

Variables	OLS SAR TFR 2014 – 2009 (1)	IV SAR TFR 2014 – 2009 (2)	OLS TFR 2015 – 2009 (3)	IV TFR 2015 – 2009 (4)
Emigration Rate, 2009–2014	0.094*	0.115*	0.106*	0.156*
	(0.038)	(0.053)	(0.042)	(0.069)
GDP, 2004	–0.055	–0.110	–0.285	–0.431
	(0.246)	(0.258)	(0.211)	(0.286)
Unemployment Rate, 2004	–0.175	–0.201	–0.520*	–0.544**
	(0.246)	(0.248)	(0.225)	(0.206)
North	–0.024	–0.027	–0.037	–0.028
	(0.029)	(0.030)	(0.032)	(0.036)
Center	–0.002	–0.000	–0.034	–0.031
	(0.023)	(0.023)	(0.030)	(0.031)
Islands	–0.008	–0.009	0.000	–0.003
	(0.016)	(0.016)	(0.019)	(0.017)
Constant	–0.017	–0.017	0.012	0.016
	(0.063)	(0.064)	(0.047)	(0.051)
Number of Observations	103	103	103	103
R^2			.136	.115
Average Outcome in 2008	1.377	1.377	1.377	1.377
Average Change in Dependent Variable	–0.037	–0.037	–0.057	–0.057
Model	GS2SLS	GS2SLS	OLS	2SLS
F Excluded Instrument				33.83

Notes: Robust standard errors are shown in parentheses. Observations are Italian provinces. Columns 1 and 2 show results from a spatial autoregressive (SAR) model using generalized spatial two-stage least squares (GS2SLS); column 3 shows results from an OLS model; and column 4 shows results from a two-stage least squares (2SLS) model. All specifications control for macro-area fixed effects. Outcomes are the TFR change between 2009 and 2014 in columns 1 and 2, and the TFR change between 2009 and 2015 in columns 3 and 4.

Sources: AIRE and ISTAT data.

*$p < .05$; **$p < .01$

Discussion and Conclusion

In this article, we study how self-selection of Italians into emigration during the Great Recession has changed the compositional characteristics of the local population, in turn affecting fertility in the Italian provinces of origin. Exploiting the richness of the AIRE, which collects information about all Italian citizens moving their residence abroad, combined with Italian birth records provided by ISTAT, we find a positive effect of out-migration on province-level fertility. This finding suggests that Italian emigrants, who are mainly young and highly educated, are selected among childless individuals—individuals who are less likely to have children or are potential postponers. We can, therefore, conclude that individuals who out-migrate would not want to have children in Italy (either because they are strongly career-oriented and thus not willing to have children at all or because they would have been discouraged by the poor family-work reconciliation setting in Italy).

The contribution of our work is threefold. First, it extends the literature on migration and fertility by providing new evidence on the relationship between out-migration and fertility at origin. We indeed analyze specific selection processes of individuals into out-migration from and to low-fertility settings during a recessionary period. Moreover, from a methodological point of view, we use a rigorous IV approach to overcome endogeneity issues, which mainly arise from the fact that local economic conditions might affect both emigration and fertility. By comparing estimates from OLS and IV models, we find that OLS results are biased downward, likely because of omitted variable bias. Second, we propose a counterfactual analysis to study and understand fertility trends in the absence of out-migration. Whereas prior fertility studies have applied counterfactual strategies only to show the impact of tempo effects on period measures of fertility, we extend this body of research focusing on emigration effects on fertility. We show that Italian fertility would have been much lower at the end of the Great Recession if out-migration had not occurred. Here is where our third contribution lies: this evidence represents an important cautionary tale for investigating the impact of the Great Recession on fertility. Indeed, for the case of Italy and its specific selection into out-migration, not accounting for the effect of emigration leads to a substantial underestimation of the negative impact of the economic crisis on fertility.

We also acknowledge some limitations of our study. First, our analysis is carried out at the province level, but we are aware that the optimal approach to test our theoretical mechanisms would be a micro-level one. To our knowledge, however, no individual-level data contain detailed information on fertility behavior, migration decision, and destination country. Moreover, a micro-level analysis would not allow us to tackle the research question with a credible IV strategy. One should find a pull-factor instrument that, within a given area (e.g., province), is strong for certain individuals but not for others with similar characteristics. Considering that both of these essential issues are currently not easy to overcome, we think that an ecological approach with a credible IV strategy still represents a first important contribution to understanding the role of emigration in affecting fertility patterns during recessions. We hope our study will open up new opportunities for further research to estimate individual-level changes in fertility choices before and after the decision to migrate, while jointly accounting for the impact of the economic circumstances at origin and destination. Second, the administrative data do not include individual-level information on education of emigrants, and to our knowledge, there exists no granular source that can be used to construct TFRs by province-level education. Therefore, we cannot examine heterogeneity in province-level human capital–specific TFR. That could certainly help to test selection processes more directly. Third, we do not analyze any spillover effect at the local level that could have impacted fertility. An example could be the potential reduction in housing costs resulting from high emigration from a certain area, a factor that in turn could have a positive effect on fertility. Such spillover effects are likely to have more delayed and long-term effects on fertility, whereas our study focuses specifically on immediate and more short-term effects of emigration on TFR—that is, during the recession period. Such spillover effects represent a promising avenue for future research if detailed local-level data on the housing market become available. Finally, our IV is constructed using the province-to-destination-country emigration networks measured in 2000. Although these networks were measured well before the Great Recession and are good predictors

of pull factors during the economic crisis, a concern remains that historical networks might have directly affected fertility during the recession, for instance, by affecting the housing market or the local economy. We believe that this potentially direct effect is unlikely to have played a major role in affecting fertility a decade later, but we acknowledge that it might, in theory, constitute a violation of the exclusion restriction of our IV strategy. The overall implication we can derive from the present work is that we need to take into account that we now live in a world where migration flows have become much more reactive than in the past (Livi Bacci 2010). Therefore, we cannot fully capture the effect on fertility of macro-level discontinuities, such as economic recessions or policy changes, assuming that populations are closed to migration. However, although some recent studies have acknowledged the importance of changes in immigration in explaining fertility trends,[7] the role played by out-migration on fertility remains very much overlooked. We hope our work will drive more scientific attention to the importance of emigration dynamics for fertility and to demographic patterns more generally. ■

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[7] See Cherlin et al. (2013) and Villarreal (2014) for studies of the fall in fertility in the United States during the economic crisis; see Coleman (2006), Goldstein et al. (2009), and Sobotka (2008) for studies of short-term changes in fertility in Europe.

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