Bertoli, Paola; Grembi, Veronica; Nguyen, The Linh Bao

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CINCH – Health Economics Research Center
Weststadttürme, Berliner Platz 6-8
45127 Essen

www.cinch.uni-due.de
cinchseries@cinch-essen.de
Phone +49 (0) 201 183 - 3679
Fax +49 (0) 201 183 - 3716

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CINCH competence in competition + health series

Paola Bertoli,* Veronica Grembi, and The Linh Bao Nguyen

Ethnic Density and Health at Birth†

Abstract

We challenge the use of traditional measures of ethnic density - e.g., the incidence of an ethnic group on the resident population of a special area - when testing the correlation between stronger ethnic networks and health at birth (i.e., birth weight). Using unique data from Italy on the main 44 ethnicities residing across almost 4,500 municipalities, we propose more insightful measures, as the distribution of immigrant associations or the incidence of ethnicities sharing the same language. We prove that, once fixed effects for the municipality of residence and the ethnic group are included, the correlation between ethnic density and health at birth is not statistically different from zero. However, ethnic density does channel positive effects on health at birth when a negative shock, as the 2008 Great Recession, struck the labor market. Exploiting a quasi-randomized diffusion of the recession, we find that its average negative impact on immigrant newborns was mitigated by stronger ethnic networks. We show that this can be explained by through sorting of the healthier and more fertile ethnic groups, which experienced also lower levels of in utero selection.

Keywords: *Ethnics networks, Ethnic density, Great Recession, Immigrants, Low Birth Weight, Premature babies*

JEL classification: *I1; I12; J15; J60*

* *CERGE-EI, a joint workplace of Charles University and the Economics Institute of the Czech Academy of Sciences, Politickych veznu 7, P.O. Box 882, 111 21 Prague 1, Czech Republic.*

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1 Introduction

A rich literature on psychology, sociology, and urban studies has addressed the relationship between health outcomes and ethnic networks, labelling it the *Ethnic Density Effect*: people in racial/ethnic minority groups are healthier when they live in areas where the number of people of their ethnicity/race among the total number of residents is higher (see Becares *et al.*, 2012 for a systematic review). Several of these studies have attempted to assess the effect of ethnic networks on health during pregnancy and at birth since health at birth is predictive of individuals' future health and economic performance (Corman *et al.*, 1987; Behrman and Rosenzweig, 2004; Almond *et al.*, 2005; van den Berg *et al.*, 2006; Currie and Moretti, 2007; Currie, 2009; Almond and Mazumder, 2011; van den Berg *et al.*, 2013; van den Berg *et al.*, 2016). The results have been mixed and a comparison is difficult due to differences in the ethnicity/race under study and the geographical area of reference. For example, McLafferty *et al.* (2012), who study the Bangladeshi community in New York, estimate a positive U-shaped association between ethnic density and low birth weight (*i.e.*, less than 2,500 grams): where Bangladeshi are highly concentrated or isolated, there are more low weight Bangladeshi newborns. Pickett *et al.* (2009) find no effect of ethnic density on birth weight among the Pakistani community in the UK, but they estimate a decrease in the probability of having preterm deliveries. The core evidence from the US refers to the geographical concentration of African Americans across cities and counties (Ellen, 2000; Bell *et al.*, 2006; Mason *et al.*, 2010; Shaw *et al.*, 2010). The findings offer a mixed criticism of the potential segregation mechanisms underlying high levels of ethnic density. Ethnic density can be health protective due to the informal safety net of the reference community (Kramer and Hougue 2009), but African Americans living in concentrated residential communities report high levels of low birth weight and high mortality rates. Causal inference is hard to build, because immigrants or members of minorities do not happen to end up into different geographical areas just by chance: there is an endogenous distribution of settling, with potentially different people self selecting across areas.

We propose a new way to investigate the relationship between ethnic networks and the health of immigrant babies using unique Italian data on babies conceived between 2002 and 2013. The Italian case study allows for a broader overview of the dynamics of the ethnic networks and health at birth since it provides evidence on the 44 main immigrant ethnicities living in the country (see Section 2.2.2). The use of multiple ethnic groups have the benefit to control for ethnicity fixed effects, which capture unobservable time-invariant ethnic characteristics which might be relevant in explaining both health outcomes and the relevance of the ethnic network, as the level of social trust, or the habits related to the use of

health services. Additionally, we are able to place each individual in a municipality (average residents 7,821 people) which allows us to control for municipal time-invariant characteristics which might make some municipalities more attractive for some ethnicities, or the fact that some municipalities might be more welcoming to foreigners than others. We build on the traditional approach based on ethnic density in two ways. On the one hand, we improve on the proxies for the importance of ethnic networks using information about the *organization* of the groups: the number of registered immigrant associations per municipality, and the Euclidean distance of each municipality to the nearest registered immigrant association. Associations have been proved to foster integration, build a sense of community, and maintain a link with the country of origin which can have a positive impact on health. We also generate the incidence of the ethnic groups sharing the same language, and we argue that these measures can provide more information on the role played by ethnic networks than the traditional measures for ethnic density. On the other hand, we use those measure to test not only the link between ethnic networks and health at birth, but also how this link can explain the heterogeneous response to exogenous and negative shocks as the spread of the 2008 recession. We complement this analysis providing evidence that ethnic networks filtered the effect of the crisis through a composition effect of immigrant mothers after the recession, along different characteristics (*e.g.*, level of fertility or use of prenatal care) that can influence health at birth.

Using micro-data for almost 4,500 municipalities, we show that, in contrast with previous evidence, once we use municipal and ethnicities fixed effects, we do not detect any significant link between health at birth and either the size or the organization of ethnic networks. In particular, it is the inclusion of the ethnicities fixed effects that wipes out any significant correlation, addressing the relevance of unobservable time-invariant ethnic characteristics. The role of the ethnicities fixed effects reconciles the mixed evidence produced by the literature since time invariant groups characteristics might be the reason greater geographical density is correlated with better health outcomes at birth for some ethnicities, while for others we have opposite or null results.

However, ethnic networks do matter in filtering the effects of a negative shock, like the GR, which deteriorates health at birth, even when we control for the ethnicities fixed effects. We identify the spread of the GR across Italian municipalities, using the rate of growth of prices per square meter of commercial real estate (*e.g.*, stores) at the municipal level to define the status of a treated area. Prices of commercial estates capture the GR spread without necessarily suffering reverse causation problems, like unemployment rates (Schaller, 2016) or residential estate prices (Dettling and Kearny, 2014). Even if all municipalities ended up to be exposed to the recession, the way in which we capture the spread of the recession appears

totally coherent with the increase of unemployment rates.

Although there are no heterogeneous effects on health at birth driven by the size of the network-the traditional proxy for ethnic density- the organization of an ethnic group plays a positive role as a greater proximity to a registered association and the presence of an association mitigate the negative average effects of the GR. We find that these channels are specific to immigrants. A placebo test performed on the sample of Italian newborns shows that, although the GR worsened the health of Italian babies as well, immigrant associations do not explain any heterogeneous health response to the crisis for them.

Finally, we focus on the potential drivers of the heterogeneous effects for immigrants. Notwithstanding the lack of an average effect on fertility due to the GR, we observe a relocation in municipalities nearest to immigrant associations of the most fertile (World Bank data) and healthiest ethnic groups, according to a widespread proxy for immigrant health (see Chiswick, 1999; Farre', 2015). We also assess the movement of the groups with greater use of prenatal care, although not always with sufficient statistical power. Moreover, where local ethnic networks are better organized, we find less in utero selection of baby boys. This finding is important because it has been shown that exposure to psychological and economic distress during pregnancy increases the probability that more baby girls will be born over baby boys, which could explain the average increase in the incidence of low-weight newborns.

Our findings also enrich the large and conflicting body of literature on the impact of the business cycle on health at birth. Being born in hard times has a positive impact on babies health in the US (Dehejia and Lleras-Muney, 2004) and in Spain (Aparicio *et al.*, 2018) due to the selection of women who decide to give birth despite the recession. It increases the probability of subsequent negative outcomes in the lives of babies born during recessions in Denmark and the Netherlands (van den Berg *et al.*, 2009; van den Berg *et al.*, 2011), while it has no effect on the birth weights of Swedish babies (van den Berg and Modin, 2013). However, it has a negative impact on the health of UK newborns (De Cao *et al.*, 2018). This negative impact is confirmed, absent a mother selection mechanism, by the 2001 Argentinian crisis analyzed by Bozzoli and Quintana-Domeque (2014). To date, this literature has mainly examined the socioeconomic status of mothers to be, proxied by their education, to analyze the heterogeneous effects of the cycle on health. We address the importance of additional channels as those represented by ethnic networks. Providing incentives to local ethnic associations can attenuate the negative impact of employment shocks on health during a recession.

The paper is organized as follows. Section 2 provides a description of our dataset and the ethnic network measures, while Section 3 investigates the association between ethnic networks and infant health. Section 4 provides the econometric specification to capture the

effect of the GR, while the role of ethnic networks is explained in Section 5. In Section 6, we discuss the results regarding the composition effects. We add two online appendices: Appendix A, to which we refer for further tables and figures; and Appendix B, in which we provide more information about immigrant communities in Italy using additional data.

2 Datasets and definitions

Our analysis exploits several data sources, which are described in detail in Table A1 in Appendix A. Overall, our data refer to the 2002-2013 conception period (2003-2014 delivery period) and to the municipalities of northern and central Italy. We restrict the sample to this part of the country for two reasons. First, as shown in Figure B1 in the online Appendix B, the northern and central regions count the highest percentages of resident immigrants. During our observation period, the incidence of immigrants increased, and in the northern and central regions, it was higher than the average national level, as plotted in Figure B2. As depicted in Figure B3, immigrants in these regions also tended to be more educated, and this trend did not change due to the crisis. Second, Northern and Central regions were the most affected by the GR representing the most industrialized areas with the highest concentration of the two sectors that suffered the most from the GR (*i.e.*, manufacturing and construction), as shown in Figure A1.

Our final sample includes data from 4,497 municipalities (approximately 56% of all Italian municipalities) with an average size of 7,821 residents, where we locate almost 540,000 deliveries.

2.1 Measures of health at birth

From the Patient Discharge Records (*i.e.*, *Schede di Dimissione Ospedaliera*) of Italian hospitals provided by the Ministry of Health, we recover the information most used in the literature to assess health at birth: if the baby was less than 2,500 grams (*Low weight*) or less than 1,500 grams (*Very low weight*), was born before the 37th gestational week ($Preterm$), or suffered from any growth problems during pregnancy (*Fetal growth problems*).[1] Obviously, all of these measures are related. For instance, 23% of $Preterm$ cases are $Very\ low\ weight$. However, 85% of $Preterm$ cases coincide with *Low weight*, and 97% of $Very\ low\ weight$ cases are $Preterm$. As such, these measures should be considered interchangeable proxies of

[1]These measures are registered for both legal and illegal immigrants. Delivery is free of charge in public hospitals, with no fear of being turned away. We keep other measures, such as infant mortality, out of the analysis because we cannot recover data on mortality within the first 30 days from birth at the municipal level. However, we plot the trends in infant mortality and unemployment in Figure A2.

the same outcome: poor health at birth.

These data have a few shortcomings. They do not provide any information about the socioeconomic status of the mother (*e.g.*, level of education or employment) nor do they allow us to know the actual consumption of prenatal care during each individual pregnancy. Additionally, we do not have information about birth order, and consequently we cannot discuss the implications of delayed fertility versus childlessness (Currie and Schwandt, 2014; Aparicio *et al.*, 2018).

2.2 How to define ethnic networks and why it matters

According to a vast socioeconomic literature, social relations are quite homogeneous along some sociodemographic characteristics because people tend to relate more to those who are like themselves. This phenomenon is especially marked among immigrants who prefer to associate with individuals of the same racial or ethnic group to the extent that scholars discuss ethnic networks rather than social networks (Topa, 2001; Marmaros and Sacerdote, 2006; Bayer *et al.*, 2007). As a result, immigrants heavily rely on social relations tied to ethnicity and country of origin (Dyck 1995; Dyck 2006; Bayer *et al.*, 2007; McLafferty *et al.* 2012) to support health in the hosting country (Cervantes, Keith, and Wyshak 1999). Traditionally, the importance of ethnic networks has been studie,d examining the size of an immigrant's ethnic community in her area of residence (*e.g.*, county, state), based on the so-called concept of ethnic density. In addition to the size, we also consider further dimensions of these networks, such as their organization.

2.2.1 Size

First introduced in the mental health literature, the ethnic density hypothesis argues that being surrounded by a larger population sharing one's own ethnicity (*i.e.*, a socially and linguistically similar population) has buffering effects that favor social interactions and support (Kawachi 1999; Berkman and Glass 2000) while maintaining a sense of community (Smaje 1995) that positively affects both physical and psychosocial well-being. Ethnic density could also provide stronger protection from the consequences of discrimination and racial harassment (Pickett and Wilkinson 2008; Bécares *et al.*, 2009), as well as further help during periods of stress (Fullilove 1988; Sampson *et al.*, 1999; Wilkinson 2005).

However, the actual impact on health is mixed, and several works have questioned the relationship between ethnic density and immigrant health, showing a null association (Pickett *et al.*, 2009) or a negative association whenever ethnic density captures segregation mechanisms that foster stress and dissatisfaction and/or discourage social interactions outside the

ethnic group (Williams and Collins 2001; Mason *et al.*, 2010; White and Borrell 2011).

We capture the size of the ethnic network through three different measures constructed at the municipal level. First, we apply the traditional definition of ethnic density and we calculate for each baby whose mother resides in municipality m the share of the mother's nationals among the total number of residents (*Ethnic density*): the higher that the share is, the stronger that the network is. Second, we weigh the mother's nationals among the total immigrant residents (*Ethnic concentration*) since the more dominant that an ethnic group is within the local immigrant community, the greater that the likelihood is that its members tend to cluster geographically with a greater risk of social closure. Third, since an important factor that favors social interaction widening the potential network of an individual is the language, we calculate the ratio of the number of immigrant residents sharing the same native language of the newborn's mother to the resident population (*Linguistic density*).

2.2.2 Organization

The variety and complexity of the possible mechanisms linking the size of ethnic networks and health imply that an association (if any) between them can vary depending on the ethnicity since, for example, ethnic groups can differ based on their cultural background (*e.g.*, level of trust). Similarly, the importance of the size of one's own ethnic group can change over time as groups' migratory and settlement patterns develop. For instance, one could expect that the older that the migration process of a given ethnic group is to an area, the less important that its size becomes because its members might be more familiar with the receiving society and better organized to relate to it. Therefore, using the size as the only dimension to capture the role of ethnic networks might not be effective.

For these reasons, we also consider how well organized an ethnic group is in the area in which the immigrant resides. As an expression of the group's organization, we use immigrant associations, that is, voluntary organizations either established by immigrants or actively run by them.[2] These associations can be registered at the municipal level in the registry of local associations, as parts of volunteer work networks. The size of ethnic groups does not drive the creation of these associations in Italy; thus, better organized groups do not necessarily coincide with larger ethnic communities. For example, in our sample, group size and the number of associations at the municipal level have a negligible negative correlation of -0.016. Rather than the size, the settlement patterns turn out to be more important (Caponio 2005).

Associations are important for integrating into the hosting society, gaining practical and informational support (Somerville *et al.*, 2008; Caselli, 2010). In particular, according to

[2]For an overview of the development of immigrant associations and their legislation in Italy, see Caponio 2005.

a 2006 survey by the Italian Volunteering Foundation (FIVOL), almost 60% of immigrant associations in Italy are active in the area of social assistance and provide medical and psychological support services (Frisanco, 2007). Still, the study of immigrant associations has focused mainly on their roles in promoting their groups' identity and integration. A special focus has been devoted to the impact of immigrant associations on political participation (Bousetta 2001, Garbaye 2004, Peró 2007), integration (Layton-Henry 1990; Penninx *et al.*, 2004), and ethnic identity (Vertovec 2004, Bloemraad 2005).

Different from what was previously done, we want to examine the direct relationship between immigrant associations and health. Through the Ministry of Labour and Social Policies, we obtain a unique dataset reporting all registered immigrant associations across Italian municipalities. 6% of the municipalities in our dataset have at least one immigrant association; Figure B4 illustrates the distribution of these associations across Italian provinces. Of these associations, 34% of them are multiethnicity associations and offer their services to any foreign individual, while the remaining 66% are devoted to one or some specific ethnic groups. Based on these data, we generate three variables: *Distance to the nearest association*, *Immigrant association* and *Ethnic association*. The latter is a dummy taking value 1 if there is at least one immigrant association in the municipality of residence of the newborn's mother specific to her ethnic group, while *Immigrant association* takes value 1 if there is at least one immigrant association (*i.e.*, mono- or multiethnicity). Finally, since we are addressing small municipalities, it might be the case that one municipality has no associations but a neighboring municipality has one or more. *Distance to the nearest association* measures the distance in kilometers between the centroid of the municipality of residence of the newborn and the centroid of the nearest municipality with at least one suitable association.[3] Thus, as one's distance from an organized immigrant community increases, the benefit that she receives from it decreases (Patacchini and Zenou, 2012).

3 Ethnic networks and health at birth

We investigate the role of ethnic networks (EN_{mt}) on the health of newborn i born in municipality m and conceived in year t by estimating the following model:

$$Health_{imt} = \delta EN_{mt} + \tau_m + \gamma_t + \beta_a t + E'_{mt}\sigma + \epsilon_{mt} \tag{1}$$

[3]This definition means that the distance will be zero when at least one association is located in the municipality of residence of the mother.

where γ_t are the conception year fixed effects, τ_m the municipal fixed effects, and $\beta_a t$ the macro area trends. We also include E'_{mt} to control for education at the municipal level (*i.e.*, the percentage of college graduates and percentage of high school graduates) and we cluster the standard errors at the municipal level to address possible serial correlation problems (Bertrand *et al.*, 2004).

Since the burst of the GR is exploited in the second part of our analysis, we focus on the conception period of 2002-2007, that is, before the GR. We test Equation 1 on two samples: the sample with all deliveries and the sample of only single babies since multiple pregnancies (*i.e.*, two or more babies) naturally increase the probability of being born at a low weight or preterm. In addition, we perform several checks by controlling: (i) for maternal age (*i.e.*, the percentage of mothers delivering a baby between 25 and 35 years of age and the percentage of those older than 35); (ii) for the municipal average income; (iii) for ethnicity fixed effects to consider the time-invariant characteristics linked to a baby's ethnicity, such as the consumption of prenatal care; (iv) for population density since wealthy areas are generally more densely populated; and (v) for regional trends to control for geographical differences in health services, which, in Italy, are provided by regions.

As shown in Tables 1 and 2, our baseline model (column 1) indicates a statistically significant and negative association between the size of ethnic networks and our health outcomes regardless of the size measure chosen, suggesting that the organization of ethnic networks has a positive impact on health at birth, especially when associations do belong to the same ethnic group. In particular, for example, a 1.5% (*i.e*, one standard deviation) increase in *Ethnic density* is associated with a 2.6% decrease in *Low weight* and a 2.7% decrease in *Preterm*. However, only the associations between distance to the closest association and *Low weight* and between having an immigrant association and *Fetal growth problems* are robust to the inclusion of ethnicity fixed effects (column 5). All others disappear once we account for any differences between ethnic groups, such as cultural attributes, linguistic distance from the Italian language, and the general cultural background, which might affect the propensity to access care. The role of the non-observable attributes connected to the ethnic groups could help to explain the contrasting evidence provided so far on this topic since the focus has been generally on the study of the association between ethnic density and health for specific ethnic groups.

Tables 1 and 2, about here

4 The great recession and health at birth

The analysis of the correlations points to the lack of significance of the role of ethnic networks once we consider the ethnicity fixed effects. In this part, we want to check if the same holds once we consider an exogenous shock such as the 2008 GR. Checking the role of the organization of ethnic networks (if any) would defined important police implications. Italy is the ideal setting for this test, since it was among the European countries most affected by the GR, along with Greece, Spain, and Portugal (Lin *et al.*, 2013). The crisis began during the second quarter of 2008, when a 1.9% drop in GDP was accompanied by a 2% contraction in consumption, a 7.4% fall in exports, and an 8.9% decrease in investment (Busalacchi *et al.*, 2009). The manufacturing industry and the construction sector were among the sectors most affected by the GR, the negative impact of which was especially felt in northern and central Italy (Eurofond, 2010).[4] In 2010, the national economy seemed to register a mild improvement. Still, in summer 2011, the crisis resurged through a sharp increase in the national bond yield. The weak GDP recovery of less than 1% in 2010 was then followed by a severe drop of almost 9% during the 2011-2014 period. Overall, the labor market suffered similar trends to those of GDP, with the first clear growth in the unemployment rate occurring in 2008 and a second increase in 2011, as shown in Figure 1.

Figure 1 , about here

In the literature on health at birth and the business cycle, recessions are proxied by unemployment rates, which could be problematic since, for the unemployment rate to be meaningful, the level of aggregation is generally higher than the municipal level.[5] Moreover, unemployment can be endogenous to fertility decisions and to behavioral decisions on how much to invest in the quality of the offspring. Dettling and Kearney (2014) propose an alternative measure: the prices of residential real estate. However, since residential real estate prices also create identification concerns, with people who are most likely to have a baby also being the most likely to buy a house (rather than renting one), we use commercial real estate prices.

Through the Observatory of Real Estate Transactions (*Osservatorio del Mercato Immobiliare*) of the Italian Land Agency, we collected data on the prices of stores.[6] For each

[4] To provide a picture of the geographical differences across regions in Figure A1 in online Appendix A, we plot the labor districts labeled as manufacturing districts in 2007.

[5] A recent attempt to construct a more granular level of unemployment is in De Cao *et al.* (2018), in which they exploit the requests for unemployment-related benefits in the Middle Layer Super Output Areas (MSOAs) in England to proxy for the unemployment level.

[6] These data are available for all Italian municipalities, except for two regions (*i.e.*, Friuli Venezia Giulia and Trentino Alto Adige), which are omitted from our dataset.

municipality, we take the mean between the maximum and minimum sales price per square meter, calculated based on the transaction flow of clusters of pre-defined stores located in *central* municipal areas and in *normal* commercial positions.

The focus on the *central* areas avoids the problem of a possible variation in the number of stores over time, which could affect price fluctuations through changes in the stock supply. In fact, we can assume that in central areas of Italian municipalities, the supply of commercial locations has low elasticity: it is the *type* of commercial activity practiced in a store that usually changes, while new construction is more constrained. The choice of commercial locations having a *normal* economic position eliminates the risk of capturing the trends of a few stores with extremely high or low prices due to an exceptionally good or bad position. In other words, our treatment is not based on the price fluctuations of a store located in Cathedral Square in Milan or in Saint Mark's Square in Venice.

Store prices provide a good proxy for the spread of the GR while focusing on the municipal level. In fact, the trend in store prices proxies well the trend in the unemployment rate, as shown in Figure 2. As unemployment increases, the (central and normal) store prices decrease.

Figure 2, about here

To capture the dynamic of the GR at the municipal level, we define a dummy, GR, that is equal to 1 from the first year after 2008 (2008 included) in which the growth rate of store prices turns negative for each municipality. We then modify Equation 1 to apply a difference-in-differences approach:

$$Health_{imt} = \delta GR_{mt} + \tau_m + \gamma_t + \beta_a t + E_{mt}^{'}\sigma + \epsilon_{mt} \tag{2}$$

In this way, we exploit both the within and between variance generated by the GR more accurately than through the use of a continuous value of the price growth rate. Since the crisis struck the Italian economy at two moments (2008 and 2011), the dummy disregards situations in which there might be temporary recovery of the local economy, which was negatively affected by the second and more dramatic round of the crisis. Figure 3 provides an example of how our measure is constructed and how it is staggered across municipalities using two major cities: Milan in northern Italy, and Bologna in central Italy. GR was equal to 1 in 2009 in Milan and in 2008 in Bologna. Figure 4 shows the overall spread of the crisis across Italy based on our dummy becoming equal to 1, perfectly capturing how the recession spread according to other sources (Di Quirico, 2010).

Figures 3 and 4, about here

As shown in Tables 3 and 4, the GR worsens all newborn health measures in both of our samples, except for the likelihood of suffering from fetal growth problems. When considering only single deliveries (*i.e.*, our preferred sample in column 1 of Table 4), the GR increases the probability of being low weight by 8.7% at the mean of the variable and that of being very low weight by 36%, while the magnitude of the effect on premature babies is 8.3%.

Tables 3 and 4, about here

Our results are robust to all of the robustness checks previously performed including the addition of ethnicity fixed effects (column 5). We also check for the identifying assumption of common trends by estimating the leads and lags of Equation 2 for the three significant outcomes. The coefficients plotted in Figure 5 show a lack of pre-trends.[7]

Figure 5, about here

5 The ethnic network channels

We estimate any possible filtering effects exerted by the size and organization of the ethnic network according to the model in Equation 3.

$$Health_{imt} = \delta GR_{mt} * D_m + \lambda D_m + \omega GR_{mt} + \tau_m + \gamma_t + \lambda_{ethnicity} + \beta_a t + E_{mt}^{'}\sigma + Age_{mt}^{'}\pi + \epsilon_{mt} \qquad (3)$$

where D is the dummy for each of our measures, constructed based on the distribution of the channel variable in 2007 as described in Table A1. Thus, ω captures the effect of the GR on the subgroup of immigrant newborns for which D is equal to zero (*i.e.*, below the median of the distribution), while δ assesses whether there is any statistically significant difference between the subgroup with D equal to zero and the subgroup with D equal to 1 (*i.e.*, above the median of the distribution). $\lambda_{ethnicity}$ are the ethnicity fixed effects. The results for the sample of single newborns are reported in Table B1.

Being near to a registered association (column 1) and living in a municipality with at least a suitable association (column 2) decrease the probability of being born at a low weight, a very low weight, and preterm. The results in column 3 would also suggest that the presence of an ethnicity-specific association has a positive filtering effect, although this is not statistically

[7] We also check for the average effect of the crisis on immigrant fertility. Table A3 shows that, on average, there was no effect.

significant. Hence, better organized communities have a positive effect on health. Interestingly, none of our measures of the size of the ethnic network (columns 4-6) explains any heterogeneous effects. As a placebo, we run the same heterogeneity analysis on the sample of single Italian newborns. Although the GR has an average negative impact (Tables C1 and C2), this effect is not channeled by immigrant associations or by the size of the immigrant community (Table C3).

Table B1, about here

6 The composition effect

The heterogeneous effects driven by the different characteristics of the ethnic network could have several explanations. There might be a behavioral response because better lifestyle habits could be associated with belonging to a better-organized immigrant community. For instance, associations could provide more information about the benefits of health-enhancing behaviors, especially during pregnancy.[8] In the case of immigrants, as a consequence of the GR, it might also be that people decide to relocate. We test this scenario by applying Equation 1 to three outcomes. The first is the share of immigrants among the overall population (*Immigrant Share*) at the municipality level. The second is the share of female immigrants aged 15-49 years old among the overall immigrant population aged 15-49 (*Share of Females 15-49*). The third is the share of immigrants aged 15-49 on the overall immigrant population (*Share of Immigrants 15-49*). As shown in Table A2, only the *Immigrant Share* is affected, decreasing by less than 3%. However, another concern could be the relocation of specific *types* of people since fertility decisions might be driven by certain types of mothers (Dehejia and Lleras Muney, 2004).

In this section, we analyze this composition effect focusing on the municipality level since the main movement of people is registered at this level, and we estimate Equation 3 on a set of four outcomes: the most fertile groups, the healthiest groups, the most frequent consumers of prenatal care, and the level of the municipal in utero selection.[9]

[8] At the individual level, there is no information regarding a change in habits triggered by the crisis.

[9] A further dimension would be the length of stay, which is not available from the medical records of mothers. To provide some descriptive evidence, we use data on the regional surveys on pregnancy and births in 2003 (pre-crisis) and 2009 (post-crisis). Using these regional data, we estimate the following model, in which *Duration of stay* captures three classes (less than 5 years, between 5 and 10 years, and between 10 and 20 years), and *Crisis year* is equal 1 for the 2009 wave:

$$Duration\ of\ stay_i = \delta Crisis\ Year + Age\ classes_i^{'}\sigma + Education_i^{'}\beta + \tau_a + \epsilon_a \quad (4)$$

The *Most fertile* ethnic groups are classified on the basis of the fertility level of each ethnicity as recorded by the classification provided by the World Bank. We proxy the *Healthiest* groups according to the well-used measure in the literature on immigration, which is the distance between the host country and the country of origin (Chiswick, 1999). As the distance increases, immigrants should be also more selected in health terms. As a result, *Healthiest* is constructed based on those ethnicities whose country of origin is the farthest from Italy (capital from capital). As a consequence of the crisis, the most fertile groups and the healthiest groups move into the proximity of better-organized communities (Tables 6 and 7).

We use the data provided by the WHO on antenatal care coverage in the countries of origin to identify the ethnicities with the highest use of prenatal care, and we construct the *Highest consumers of prenatal*. As apparent from Table 8, although it is not statistically significant, the heterogeneous effect would suggest that better-organized communities also include larger shares of the highest consumers of prenatal care.

Tables 6, 7 and 8, about here

Finally, the results on low weights could be explained by in utero selection. Since males are weaker than females in utero, the incidence of newborn girls would increase during economic downturns (Trivers and Willard, 1973; Krackow, 2002), which would explain the higher incidence of low-weight births. We compute the share of female babies at the municipal level and test Equation 3 on this outcome. Consistent with the hypothesis of in utero selection, the share of females is higher in less organized communities (Table 9).

Table 9, about here

Overall, exploiting a quasi-randomized setting created by an external event such as the GR, we offer a more in depth understanding of the role of ethnic networks. These networks turn out to have a positive effect on health the better organized that they are, rather than the larger that they are. Our findings also prove a more general point: the role of ethnic networks cannot be approximated only from their size when health is at stake. Other attributes of ethnic networks, starting from their organization, might better capture the relationship with health outcomes.

7 Conclusion

The relationship between ethnic networks and health has been traditionally studied relying on group size as a measure of the importance of networks. Differently, we argue that when health

During the crisis, immigrant mothers are more likely to have been residing in Italy for more than 5 or 10 years, as shown by the estimated coefficient in Figure B5).

is at stake, this dimension can be not very informative compared to other features of ethnic networks in general and, specifically, to the organization of ethnic groups into immigration associations. Using municipal and individual deliveries data from Italy during the 2002-2007 conception period, we first show that the inclusion of ethnicity fixed effects basically removes any statistically significant correlations between our measures of the size and organization of ethnic networks. Then, we exploit the burst of the 2008 GR as a quasi-randomized setting to show that, however, the ethnic group organization produces a heterogeneous health response to the crisis. Although the GR caused a deterioration in the health at birth of immigrant newborns, a positive and mitigating effect is due to better-organized communities, as proxied by the presence of an immigrant association or by living closer to a municipality with an immigrant association. During recessions, such communities attract the most fertile and the healthiest ethnic groups, ending up with higher fertility rates and lower in utero selection. Our findings have two important implications. From a policy perspective, they emphasize the relevant role that organizations supporting immigrants' integration and identity can play in attenuating the health-related consequences of employment shocks. From a research point of view, these results also highlight the need to consider alternative features of ethnic networks to have a more in-depth understanding of their actual importance. The focus on their organization is a first step in this direction.

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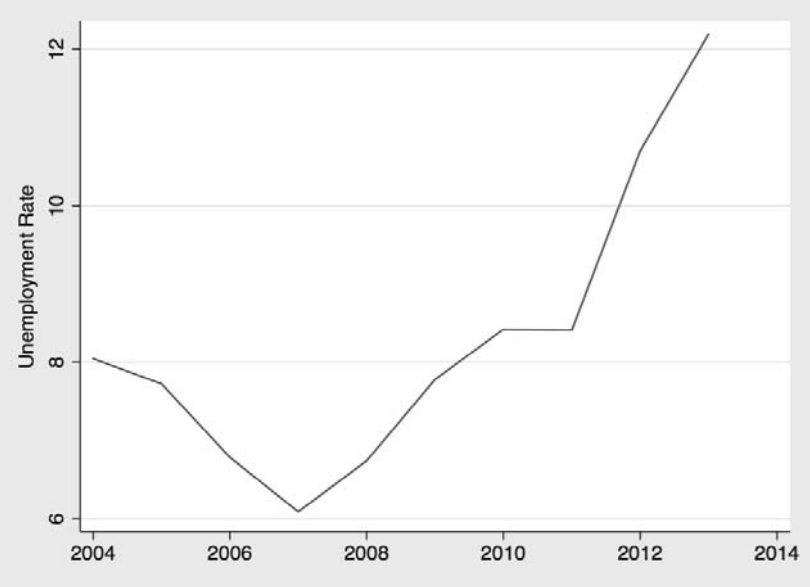
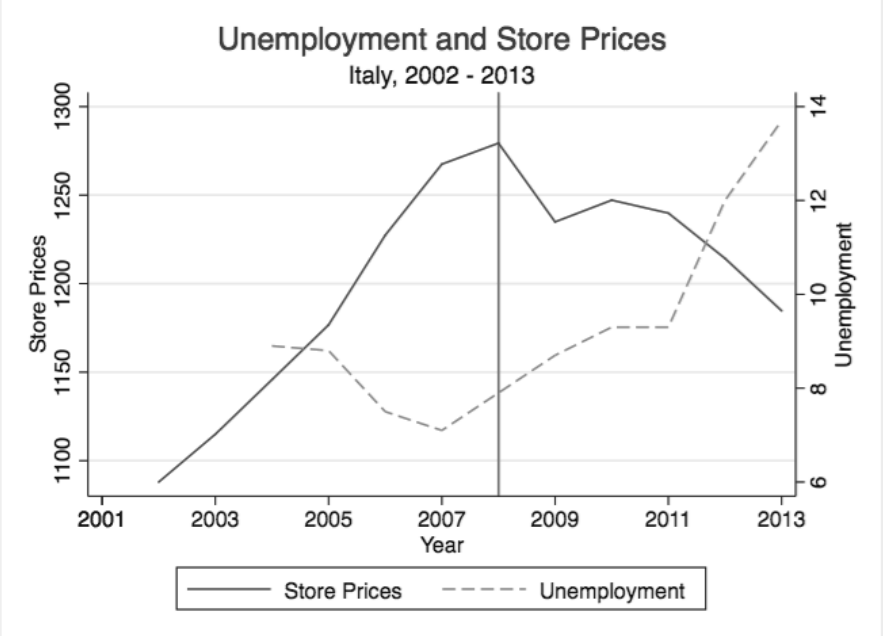
Tables and figures

Figure 1: **Unemployment rate trend**



Note: Data provided by the Italian Institute of Statistics (ISTAT).

Figure 2: **Treatment and unemployment**



Notes: The figures combined data on the unemployment rate and the growth rate of store prices per square meter.

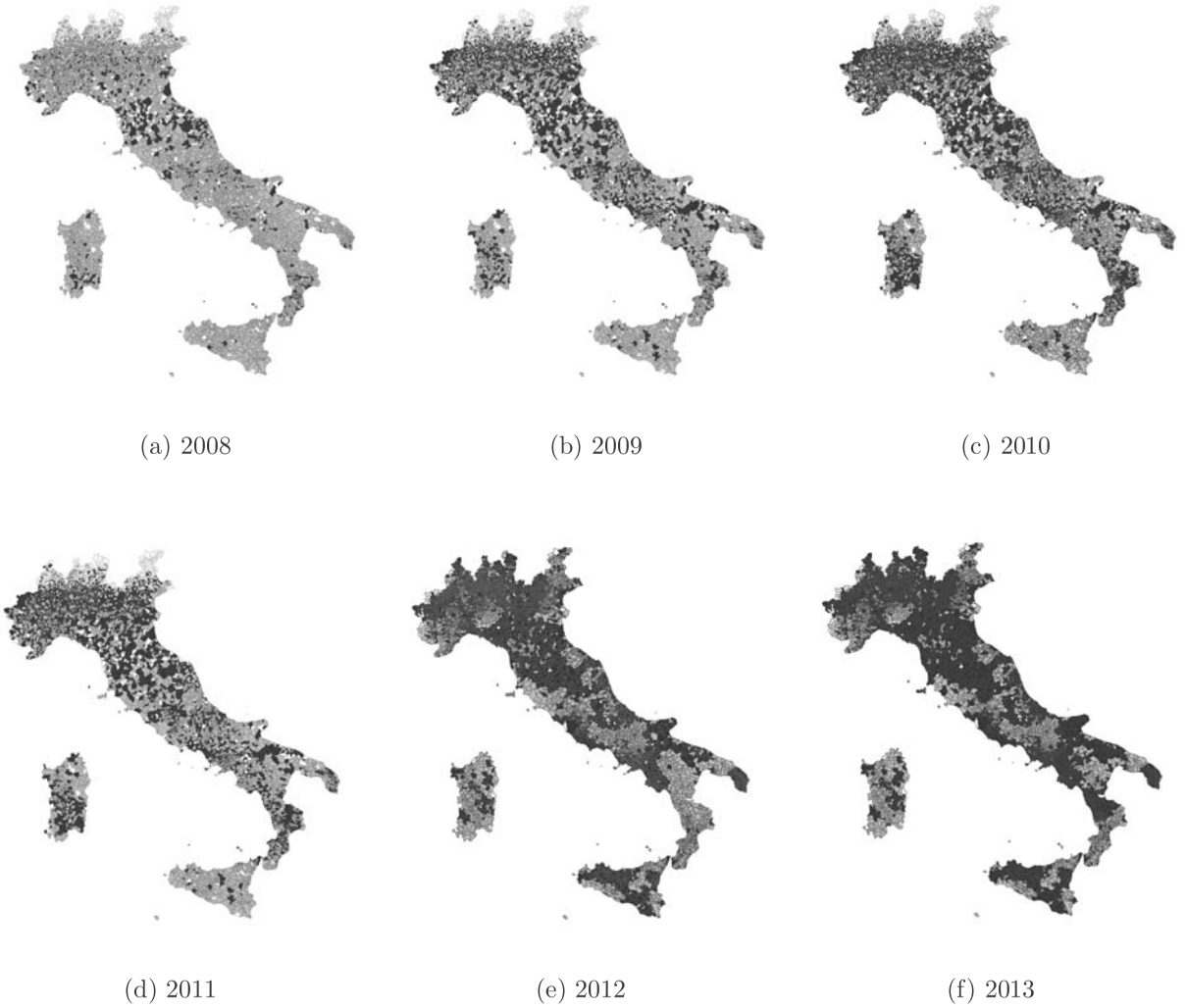
Figure 3: **Treatment across municipalities: Examples**

(a)

(b)

Notes: Each figure plots the trend of the growth rate of store prices per square meter between 2002 and 2013. Milan is located in the north, while Bologna is in the center of the country. According to our definition of the treatment (first year in which the growth rate turns negative), Milan is considered treated in 2009 and Bologna in 2008.

Figure 4: **Spreading of the GR**



(a) 2008 (b) 2009 (c) 2010

(d) 2011 (e) 2012 (f) 2013

Notes: each map represents the municipalities treated as we move from conception year 2008 to 2013.

Table 1: **Ethnic networks and birth outcomes - Full sample**

	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: LOW WEIGHT (<2,500g)						
Distance to the closest association	0.140*	0.140*	0.110*	0.135*	0.138*	0.140*
	(0.084)	(0.084)	(0.057)	(0.082)	(0.084)	(0.084)
Immigrant association	-0.247	-0.259	-0.260	-0.227	-0.372	-0.249
	(0.435)	(0.437)	(0.431)	(0.437)	(0.401)	(0.437)
Ethnic association	-0.123**	-0.123**	-0.124**	-0.124**	-0.020	-0.127***
	(0.049)	(0.049)	(0.049)	(0.049)	(0.044)	(0.049)
Ethnic density	-15.565**	-15.497**	-15.465**	-15.460**	-0.659	-16.031**
	(7.747)	(7.736)	(7.787)	(7.662)	(6.612)	(7.684)
Ethnic on immigrants	-1.775***	-1.769***	-1.769***	-1.772***	-0.372	-1.809***
	(0.663)	(0.662)	(0.665)	(0.656)	(0.683)	(0.660)
Linguistic density	-34.088***	-34.081***	-34.426***	-33.824***	-6.189	-33.393***
	(7.452)	(7.437)	(7.670)	(7.364)	(6.555)	(7.406)
PANEL B: VERY LOW WEIGHT (<1,500g)						
Distance to the closest association	0.110	0.110	0.073	0.106	0.109	0.108
	(0.081)	(0.081)	(0.048)	(0.079)	(0.081)	(0.081)
Immigrant association	-0.257	-0.254	-0.273	-0.241	-0.268	-0.262
	(0.281)	(0.281)	(0.282)	(0.284)	(0.283)	(0.275)
Ethnic association	-0.002	-0.002	-0.003	-0.003	0.024	-0.005
	(0.027)	(0.027)	(0.026)	(0.027)	(0.006)	(0.025)
Ethnic density	-3.770	-3.746	-3.648	-3.687	0.070	-4.232
	(3.066)	(3.063)	(3.099)	(3.028)	(3.644)	(3.119)
Ethnic on immigrants	-0.490*	-0.487*	-0.483*	-0.488*	-0.126	-0.519*
	(0.284)	(0.283)	(0.285)	(0.282)	(0.359)	(0.288)
Linguistic density	-11.161***	-11.137***	-11.567***	-10.952***	-5.883	-10.535***
	(3.751)	(3.729)	(4.044)	(3.643)	(3.893)	(3.524)
PANEL C: PRE-TERM						
Distance to the closest association	0.116	0.116	0.080	0.112	0.114	0.116
	(0.082)	(0.082)	(0.057)	(0.080)	(0.082)	(0.082)
Immigrant association	-0.392	-0.409	-0.408	-0.376	-0.490	-0.396
	(0.389)	(0.392)	(0.384)	(0.390)	(0.363)	(0.391)
Ethnic association	-0.108**	-0.108**	-0.109**	-0.108**	-0.07	-0.110**
	(0.048)	(0.048)	(0.048)	(0.048)	(0.031)	(0.048)
Ethnic density	-16.927**	-16.843**	-16.809**	-16.844**	-1.184	-17.411**
	(7.840)	(7.830)	(7.872)	(7.780)	(6.945)	(7.775)
Ethnic on immigrants	-1.836***	-1.829***	-1.829***	-1.833***	-0.432	-1.874***
	(0.645)	(0.644)	(0.648)	(0.641)	(0.754)	(0.642)
Linguistic density	-34.365***	-34.365***	-34.764***	-34.156***	-6.356	-33.690***
	(8.067)	(8.052)	(8.390)	(7.995)	(7.078)	(8.020)
PANEL D: FETUS GROWTH PROBLEM						
Distance to the closest association	0.009	0.010	0.013	0.008	0.009	0.013
	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
Immigrant association	-0.687**	-0.708**	-0.685**	-0.680**	-0.729**	-0.681**
	(0.309)	(0.308)	(0.309)	(0.310)	(0.314)	(0.309)
Ethnic association	-0.114***	-0.113***	-0.113***	-0.118***	-0.045	-0.114***
	(0.034)	(0.034)	(0.034)	(0.039)	(0.033)	(0.025)
Ethnic density	-13.446*	-13.356*	-13.456*	-13.410*	-2.774	-13.476*
	(7.541)	(7.531)	(7.540)	(7.508)	(6.266)	(7.478)
Ethnic on immigrants	-1.653***	-1.646***	-1.654***	-1.652***	-1.064	-1.663***
	(0.606)	(0.605)	(0.606)	(0.604)	(0.670)	(0.601)
Linguistic density	-21.814***	-21.819***	-21.782***	-21.727***	-3.169	-21.672***
	(7.630)	(7.619)	(7.609)	(7.596)	(6.068)	(7.584)
Observations	263,929	263,929	263,929	263,929	263,929	263,929
% mothers between 25-35		✓				
% mothers above 35		✓				
Average income			✓			
Ethnicity FE					✓	
Population density				✓		
Region FE						✓
Regional trends						✓

Notes: Each specification controls for municipal fixed effects, year fixed effects, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Models (1) - (5) also include macro-area trends. The period considered (2002-2013) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: **Ethnic networks and birth outcomes - Single deliveries sample**

	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: LOW WEIGHT (<2,500g)						
Distance to the closest association	0.147*	0.147*	0.118**	0.142*	0.145*	0.146*
	(0.084)	(0.084)	(0.057)	(0.082)	(0.084)	(0.084)
Immigrant association	-0.246	-0.259	-0.259	-0.226	-0.371	-0.250
	(0.435)	(0.437)	(0.432)	(0.437)	(0.401)	(0.437)
Ethnic association	-0.119**	-0.119**	-0.120**	-0.119**	-0.021	-0.122**
	(0.048)	(0.048)	(0.048)	(0.048)	(0.045)	(0.048)
Ethnic density	-14.512*	-14.444*	-14.411*	-14.411*	0.518	-14.948*
	(7.704)	(7.694)	(7.744)	(7.642)	(6.532)	(7.645)
Ethnic on immigrants	-1.685***	-1.679***	-1.679***	-1.682***	-0.264	-1.716***
	(0.648)	(0.647)	(0.650)	(0.642)	(0.684)	(0.645)
Linguistic density	-32.782***	-32.776***	-33.115***	-32.525***	-4.788	-32.105***
	(7.365)	(7.350)	(7.581)	(7.278)	(6.430)	(7.322)
PANEL B: VERY LOW WEIGHT (<1,500g)						
Distance to the closest association	0.110	0.110	0.073	0.106	0.109	0.108
	(0.082)	(0.081)	(0.048)	(0.079)	(0.081)	(0.081)
Immigrant association	-0.256	-0.254	-0.272	-0.241	-0.267	-0.262
	(0.281)	(0.280)	(0.282)	(0.284)	(0.282)	(0.274)
Ethnic association	-0.002	-0.002	-0.003	-0.003	0.023	-0.005
	(0.027)	(0.027)	(0.026)	(0.027)	(0.035)	(0.025)
Ethnic density	-3.430	-3.406	-3.306	-3.350	0.401	-3.886
	(3.065)	(3.062)	(3.098)	(3.028)	(3.673)	(3.118)
Ethnic on immigrants	-0.453	-0.450	-0.446	-0.451	-0.086	-0.482*
	(0.281)	(0.281)	(0.283)	(0.280)	(0.361)	(0.286)
Linguistic density	-10.781***	-10.755***	-11.189***	-10.574***	-5.492	-10.149***
	(3.756)	(3.734)	(4.053)	(3.649)	(3.899)	(3.528)
PANEL C: PRE-TERM						
Distance to the closest association	0.122	0.123	0.087	0.118	0.120	0.122
	(0.082)	(0.082)	(0.056)	(0.080)	(0.082)	(0.082)
Immigrant association	-0.390	-0.408	-0.405	-0.375	-0.488	-0.396
	(0.389)	(0.392)	(0.384)	(0.391)	(0.364)	(0.391)
Ethnic association	-0.106**	-0.106**	-0.107**	-0.107**	-0.010	-0.109**
	(0.046)	(0.046)	(0.046)	(0.047)	(0.039)	(0.046)
Ethnic density	-16.134**	-16.050**	-16.015**	-16.054**	-0.248	-16.582**
	(7.784)	(7.830)	(7.815)	(7.727)	(6.864)	(7.721)
Ethnic on immigrants	-1.770***	-1.763***	-1.763***	-1.768***	-0.348	-1.804***
	(0.632)	(0.631)	(0.635)	(0.628)	(0.752)	(0.629)
Linguistic density	-33.515***	-33.515***	-33.908***	-33.311***	-5.278	-32.850***
	(7.980)	(7.965)	(8.301)	(7.910)	(7.961)	(7.935)
PANEL D: FETUS GROWTH PROBLEM						
Distance to the closest association	0.016	0.017	0.021	0.015	0.016	0.019
	(0.035)	(0.035)	(0.036)	(0.035)	(0.035)	(0.035)
Immigrant association	-0.685**	-0.706**	-0.683**	-0.678**	-0.727**	-0.680**
	(0.309)	(0.308)	(0.309)	(0.309)	(0.315)	(0.309)
Ethnic association	-0.111***	-0.111***	-0.111***	-0.111***	-0.006	-0.111***
	(0.034)	(0.034)	(0.034)	(0.034)	(0.033)	(0.034)
Ethnic density	-12.914*	-12.826*	-12.927*	-12.881*	-1/917	-12.903*
	(7.698)	(7.690)	(7.698)	(7.666)	(6.138)	(7.631)
Ethnic on immigrants	-1.615***	-1.609***	-1.616***	-1.614***	-1.000	-1.621***
	(0.609)	(0.608)	(0.609)	(0.607)	(0.661)	(0.604)
Linguistic density	-21.231***	-21.237***	-21.191***	-21.150***	-2.050	-21.088***
	(7.697)	(7.686)	(7.671)	(7.663)	(5.904)	(7.647)
Observations	263,173	263,173	263,173	263,173	263,173	263,173
% mothers between 25-35		✓				
% mothers above 35		✓				
Average income			✓			
Ethnicity FE					✓	
Population density				✓		
Region FE						✓
Regional trends						✓

Notes: Each specification controls for municipal fixed effects, year fixed effects, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Models (1) - (5) also include macro-area trends. The period considered (2002-2013) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: **Effects of the GR on birth outcomes - Full sample**

	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: LOW WEIGHT (<2,500g)						
Crisis	0.711*	0.707*	0.679*	0.726*	0.677*	0.755*
	(0.375)	(0.376)	(0.349)	(0.374)	(0.377)	(0.328)
Mean	8.547	8.547	8.547	8.547	8.547	8.547
PANEL B: VERY LOW WEIGHT (<1,500g)						
Crisis	0.757**	0.758**	0.727**	0.763**	0.755**	0.622**
	(0.338)	(0.339)	(0.309)	(0.340)	(0.339)	(0.283)
Mean	2.112	2.112	2.112	2.112	2.112	2.112
PANEL C: PRE-TERM						
Crisis	0.710**	0.705**	0.669**	0.728**	0.677*	0.560*
	(0.358)	(0.359)	(0.336)	(0.356)	(0.361)	(0.319)
Mean	9.066	9.066	9.066	9.066	9.066	9.066
PANEL D: GROWTH PROBLEMS						
Crisis	0.011	0.003	0.004	0.014	-0.007	0.010
	(0.176)	(0.176)	(0.174)	(0.176)	(0.175)	(0.174)
Mean	6.859	6.859	6.859	6.859	6.859	6.859
Observations	539,927	539,927	539,927	539,927	539,927	539,927
% mothers between 25-35		✓				
% mothers older than 35		✓				
Average income			✓			
Ethnicity FE					✓	
Population density				✓		
Region FE						✓
Regional trends						✓

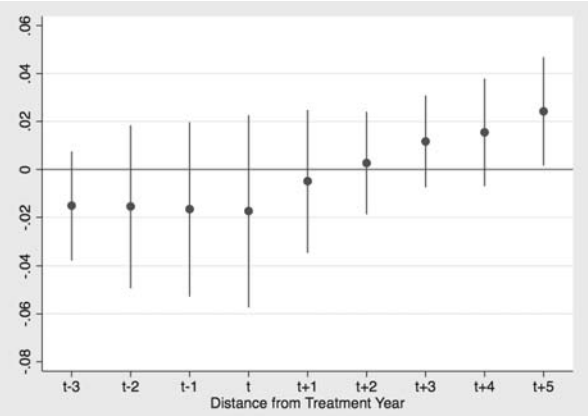
Notes: Each specification controls for municipal fixed effects, year fixed effects, the percentage of the municipal population with a high school degree, and the percentage of th emunicipal population with a college degree. Models (1) - (5) also include macro-area trends. The period considered (2002-2007) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: **Effects of the GR on birth outcomes - Single deliveries sample**

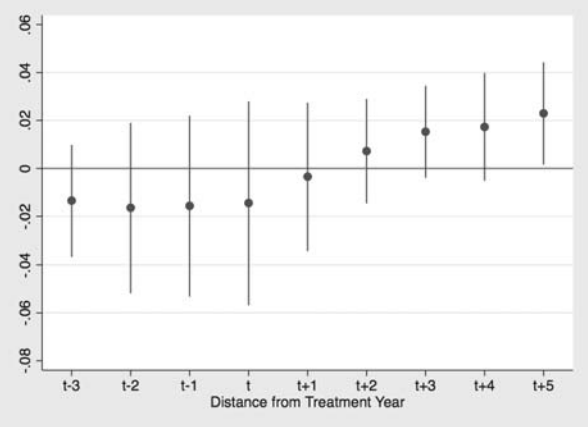
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: LOW WEIGHT (<2,500g)						
Crisis	0.736**	0.732*	0.706**	0.750**	0.701*	0.595*
	(0.374)	(0.375)	(0.348)	(0.373)	(0.376)	(0.328)
Mean	8.433	8.433	8.433	8.433	8.433	8.433
PANEL B: VERY LOW WEIGHT (<1,500g)						
Crisis	0.760**	0.761**	0.730**	0.766**	0.757**	0.625**
	(0.338)	(0.339)	(0.309)	(0.340)	(0.340)	(0.284)
Mean	2.103	2.103	2.103	2.103	2.103	2.103
PANEL C: PRE-TERM						
Crisis	0.741**	0.735**	0.701**	0.758**	0.707**	0.585*
	(0.358)	(0.357)	(0.333)	(0.354)	(0.358)	(0.317)
Mean	8.957	8.957	8.957	8.957	8.957	8.957
PANEL D: GROWTH PROBLEMS						
Crisis	0.032	0.024	0.026	0.034	0.013	0.025
	(0.170)	(0.170)	(0.168)	(0.171)	(0.169)	(0.169)
Mean	6.770	6.770	6.770	6.770	6.770	6.770
Observations	538,367	538,367	538,367	538,367	538,367	538,367
% mothers between 25-35		✓				
% mothers older than 35		✓				
Average income			✓			
Ethnicity FE					✓	
Population density				✓		
Region FE						✓
Regional trends						✓

Notes: Each specification controls for municipal fixed effects, year fixed effects, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Models (1) - (5) also include macro-area trends. The period considered (2002-2007) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

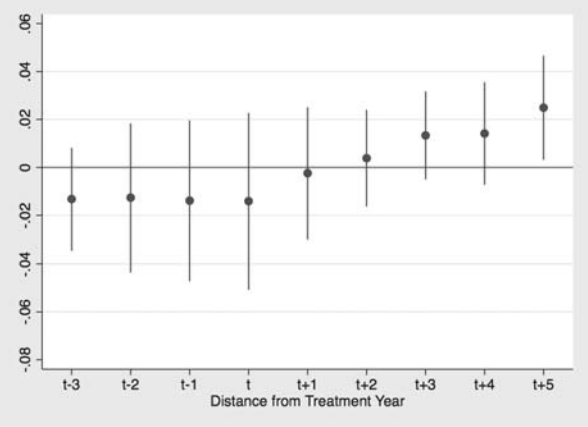
Figure 5: **Leads and Lags**



(a) Low Weight



(b) Very Low Weight



(c) Pre-term

Notes: The figures plot the coefficients for the specified outcome in (a), (b) and (c) of a leads and lags regression of the effects of the Great Recession.

Table 5: **Heterogeneous effects of ethnic networks on birth outcomes**

	(1)	(2)	(3)	(4)	(5)	(6)
	Distance to the closest associations	Immigrant association	Ethnic association	Ethnic density	Ethnic concentration	Linguistic density
PANEL A: LOW WEIGHT (<2,500g)						
	Near	**No**	**No**	**Low**	**Low**	**Low**
Crisis	-1.976**	1.113**	0.984*	0.432	0.464	0.622
	(0.974)	(0.565)	(0.522)	(0.469)	(0.728)	(0.625)
	Far	**Yes**	**Yes**	**High**	**High**	**High**
Crisis	0.730*	0.354	0.406	0.729*	0.712*	0.709*
	(0.376)	(0.282)	(0.326)	(0.377)	(0.370)	(0.363)
Difference	2.706***	-0.758*	-0.578	0.297	0.248	0.088
	(0.924)	(0.449)	(0.421)	(0.317)	(0.542)	(0.416)
PANEL B: VERY LOW WEIGHT (<1,500g)						
	Near	**No**	**No**	**Low**	**Low**	**Low**
Crisis	-0.189	1.048*	0.959*	0.422	0.441	0.469
	(0.528)	(0.549)	(0.504)	(0.386)	(0.665)	(0.555)
	Far	**Yes**	**Yes**	**High**	**High**	**High**
Crisis	0.767**	0.511**	0.550**	0.792**	0.770**	0.786**
	(0.340)	(0.217)	(0.242)	(0.338)	(0.332)	(0.322)
Difference	0.956**	-0.536	-0.408	0.369**	0.329	0.317
	(0.436)	(0.438)	(0.396)	(0.170)	(0.456)	(0.299)
PANEL C: PRE-TERM						
	Near	**No**	**No**	**Low**	**Low**	**Low**
Crisis	-1.599*	1.144**	0.898*	0.710	0.359	0.617
	(0.948)	(0.525)	(0.490)	(0.484)	(0.727)	(0.600)
	Far	**Yes**	**Yes**	**High**	**High**	**High**
Crisis	0.731**	0.337	0.515	0.706*	0.722**	0.716**
	(0.358)	(0.287)	(0.317)	(0.363)	(0.353)	(0.348)
Difference	2.330**	-0.807*	-0.383	-0.003	0.363	0.098
	(0.905)	(0.420)	(0.397)	(0.388)	(0.573)	(0.4186)
PANEL D: FETUS GROWTH PROBLEM						
	Near	**No**	**No**	**Low**	**Low**	**Low**
Crisis	-2.019**	-0.037	-0.068	-0.508*	-0.733	-0.772**
	(0.848)	(0.212)	(0.199)	(0.305)	(0.602)	(0.368)
	Far	**Yes**	**Yes**	**High**	**High**	**High**
Crisis	0.034	0.055	0.045	0.067	0.045	0.093
	(0.169)	(0.199)	(0.209)	(0.171)	(0.169)	(0.1697)
Difference	2.053**	0.092	0.112	0.575**	0.779	0.8640**
	(0.842)	(0.232)	(0.230)	(0.291)	(0.594)	(0.360)

Notes: Each specification controls for municipal fixed effects, year fixed effects, macro-area trends, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Standard errors are clustered at the municipal level. The period considered (2002-2013) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: **Most fertile groups**

	Top 5 groups		**Top 10 groups**	
	(1)	(2)	(3)	(4)
	Distance to the closest associations	Immigrant association	Distance to the closest associations	Immigrant association
PANEL A: MOST FERTILE ON POPULATION				
	Near	**No**	**Near**	**No**
Crisis	0.019***	-0.010*	0.141***	0.024
	(0.007)	(0.006)	(0.022)	(0.022)
	Far	**Yes**	**Far**	**Yes**
Crisis	-0.031***	-0.0001	-0.067***	0.057***
p-value	0.000	0.983	0.001	0.009
Difference	-0.050***	0.010	-0.208***	0.033
	(0.008)	(0.008)	(0.028)	(0.029)
PANEL B: MOST FERTILE FEMALES ON POPULATION				
	Near	**No**	**Near**	**No**
Crisis	0.010***	-0.005*	0.071***	0.008
	(0.003)	(0.003)	(0.010)	(0.013)
	Far	**Yes**	**Far**	**Yes**
Crisis	-0.014***	0.001	-0.032***	0.033***
p-value	0.000	0.746	0.000	0.001
Difference	-0.024***	0.006	-0.103***	0.026*
	(0.004)	(0.004)	(0.012)	(0.013)
PANEL C: MOST FERTILE FEMALES ON FEMALE POPULATION				
	Near	**No**	**Near**	**No**
Crisis	0.051***	-0.019	0.318***	0.044
	(0.015)	(0.014)	(0.046)	(0.045)
	Far	**Yes**	**Far**	**Yes**
Crisis	-0.066***	0.008	-0.152***	0.137***
p-value	0.000	0.592	0.000	0.003
Difference	-0.117***	0.027	-0.470	0.093
	(0.017)	(0.018)	(0.058)	(0.062)

Notes: The unit of observation is the municipal level. Each specification controls for the municipal fixed effects, year fixed effects, macro-area trends, and the percentage of the municipal population with a high school degree, the percentage of municipal population with a college degree. Standard errors are clustered at the municipal level. The period considered (2002-2013) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: **Healthiest groups**

	Top 5 groups		**Top 10 groups**	
	(1)	(2)	(3)	(4)
	Distance to the closest associations	Immigrant association	Distance to the closest associations	Immigrant association
PANEL A: FAR ON POPULATION				
	Near	**No**	**Near**	**No**
Crisis	0.015***	-0.0002	0.018***	0.001
	(0.006)	(0.005)	(0.007)	(0.006)
	Far	**Yes**	**Far**	**Yes**
Crisis	-0.009*	0.006	-0.012**	0.006
p-value	0.066	0.242	0.038	0.345
Difference	-0.024***	0.007	-0.030***	0.005
	(0.006)	(0.006)	(0.007)	(0.007)
PANEL B: FAR FEMALES ON POPULATION				
	Near	**No**	**Near**	**No**
Crisis	0.007*	-0.0004	0.008**	0.001
	(0.003)	(0.003)	(0.004)	(0.004)
	Far	**Yes**	**Far**	**Yes**
Crisis	-0.004	0.003	-0.006	0.003
p-value	0.200	0.358	0.134	0.525
Difference	-0.011***	0.003	-0.014***	0.002
	(0.004)	(0.004)	(0.005)	(0.004)
PANEL C: FAR FEMALES ON FEMALE POPULATION				
	Near	**No**	**Near**	**No**
Crisis	0.038**	0.004	0.045**	0.006
	(0.016)	(0.015)	(0.019)	(0.019)
	Far	**Yes**	**Far**	**Yes**
Crisis	-0.014	0.021	-0.022	0.019
p-value	0.374	0.169	0.248	0.314
Difference	-0.052***	0.018	-0.067***	0.013
	(0.018)	(0.017)	(0.022)	(0.021)

Notes: The unit of observation is the municipal level. Each specification controls for municipal fixed effects, year fixed effects, macro-area trends, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Standard errors are clustered at the municipal level. The period considered (2002-2013) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: **Groups with the highest use of prenatal care**

	Top 5 groups		**Top 10 groups**	
	(1)	(2)	(3)	(4)
	Distance to the closest associations	Immigrant association	Distance to the closest associations	Immigrant association
PANEL A: HIGHEST USERS ON POPULATION				
	Near	**No**	**Near**	**No**
Crisis	0.010	-0.006	-0.011	-0.041**
	(0.007)	(0.007)	(0.018)	(0.018)
	Far	**Yes**	**Far**	**Yes**
Crisis	-0.012	0.004	-0.048***	-0.018
p-value	0.128	0.546	0.009	0.308
Difference	-0.022**	0.011	-0.037**	0.023
	(0.009)	(0.009)	(0.018)	(0.018)
PANEL B: HIGHEST FEMALE USERS ON POPULATION				
	Near	**No**	**Near**	**No**
Crisis	0.008*	-0.002	-0.005	-0.022**
	(0.004)	(0.005)	(0.009)	(0.009)
	Far	**Yes**	**Far**	**Yes**
Crisis	-0.005	0.005	-0.027***	-0.009
p-value	0.287	0.295	0.005	0.315
Difference	-0.014**	0.007	-0.022**	0.013
	(0.006)	(0.005)	(0.009)	(0.009)
PANEL C: HIGHEST USERS ON FEMALE POPULATION				
	Near	**No**	**Near**	**No**
Crisis	0.028	-0.010	-0.051	-0.118***
	(0.021)	(0.023)	(0.043)	(0.045)
	Far	**Yes**	**Far**	**Yes**
Crisis	-0.012	0.024	-0.113**	-0.05
p-value	0.616	0.296	0.017	0.272
Difference	-0.040	0.033	-0.062	0.069
	(0.027)	(0.026)	(0.043)	(0.043)

Notes: The unit of observation is the municipal level. Each specification controls for municipal fixed effects, year fixed effects, and macro-area trends. Standard errors are clustered at the municipal level. The period considered (2002-2013) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: **In utero selection: share of females aged zero**

	(1)	(2)
	Distance to the closest associations	Immigrant association
	Near	**No**
Crisis	-3.020***	-1.333**
	(0.600)	(0.651)
	Far	**Yes**
Crisis	0.457	-1.402**
p-value	0.512	0.027
Difference	3.477***	-0.070
	(0.735)	(0.714)

Notes: The unit of observation is the municipal level. Each specification controls for municipal fixed effects, year fixed effects, and macro-area trends. Standard errors are clustered at the municipal level. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Appendix A

This appendix provides additional tables and figures, which are also discussed in the paper. In particular, we present the following:

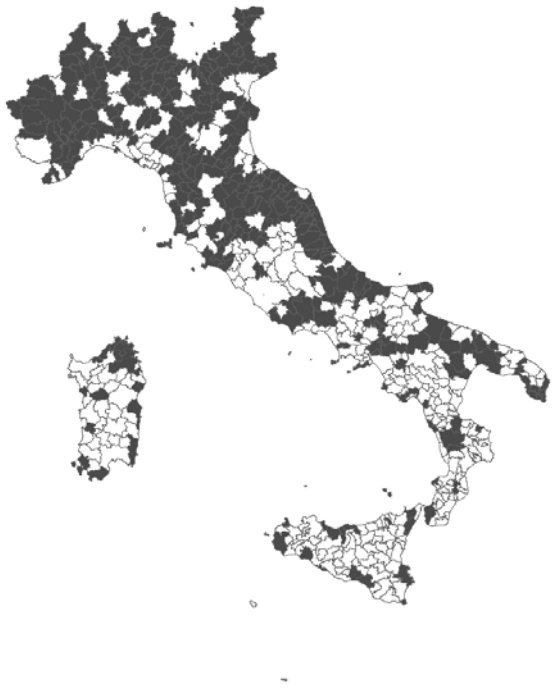
- Explanations of the variables used in the regressions (Table A1);
- Geographical distribution of the manufacturing industry (Figure A1);
- Infant mortality and recession (Figure A2);
- Effects of the GR on the immigrant population (Table A2); and
- Effects of the GR on the birth rate (Table A3)

Table A1: **Variable explanations**

Variable Name	Variable Description	Source	Level
Composition			
Birth Rate	Number of births over the number of female residents 15-49	PDC	M
Most fertile	Residents belonging to the 5 (10) most fertile ethnicities	ISTAT/	
on population	on the overall population	World Bank	M
Most fertile females	Females residents belonging to the 5 (10) most fertile	ISTAT/	
on population	ethnicities on the overall population	World Bank	M
Most fertile females	Female residents belonging to the 5 (10) most fertile	ISTAT/	
on female population	ethnicities on female population	World Bank	M
Far on population	Residents belonging to the 5 (10) ethnicities whose country		
	of origin is the farthest from Italy on the overall population	ISTAT	M
Far females	Female residents belonging to the 5 (10) ethnicities whose country		
on population	of origin is the farthest from Italy on the overall population	ISTAT	M
Far females on	Female residents belonging to the 5 (10) ethnicities whose country		
female population	of origin is the farthest from Italy on female population	ISTAT	M
Highest use	Residents belonging to the 5 (10) ethnicities with the highest	ISTAT/	M
on population	use of prenatal care on the overall population	WHO	M
Highest use females	Female residents belonging to the 5 (10) ethnicities with the highest	ISTAT/	M
on population	use of prenatal care on the overall population	WHO	M
Highest use females	Female residents belonging to the 5 (10) ethnicities with the highest	ISTAT/	M
on female population	use of prenatal care on female population	WHO	M
Share of females aged Zero	Female newborns aged zero on overall newborns aged zero	ISTAT	M
Health Outcomes: Newborns			
Low weight	Dummy=1 if weight< 2,500 gr	PDC	I
Very low weight	Dummy=1 if weight<1,500 gr	PDC	I
Pre-term	Dummy=1 if birth is before 37th week	PDC	I
Fetal growth problems	Dummy=1 if there were problems with the fetal growth	PDC	I
	during pregnancy		
Controls			
% High school	Percentage of residents completing high school out	Census 2001&2011	M
	of the total residents		
% Graduated	Percentage of residents completing college or higher	Census 2001&2011	M
	out of the total residents		
Treatment			
Store price	Price per square meter Growth rate	IAoL	M
Channels			
Immigrant association	Dummy=1 if there is an immigrant association in the municipality	MoL	M
	of residence of the immigrant	MoL	M
Distance to the	Euclidean distance to the nearest municipality with at		
closest association	least one immigrant association	MoL	M
Ethnic density	Share of residents belonging to a given ethnicity on the resident population	ISTAT	M
Ethnic concentration	Share of residents belonging to a given ethnicity on the immigrant population	ISTAT	M
Linguistic density	Share of immigrants sharing the same language on the resident population	ISTAT	M
Ethnic association	Dummy=1 if the immigrant mother has in her municipality of residence		
	at least one immigrant association specific for her ethnic group	MoL	M
Other			
Female income	Continuous for immigrant female, only 2013	IIRS	P
Immigrant share	Share of immigrant on the overall population	ISTAT	M
Share of female 15-49	Share of female immigrants aged 15-49 on the overall immigrant population	ISTAT	M
Share of immigrants 15-49	Share of immigrants aged 15-49 on the overall immigrant population	ISTAT	M

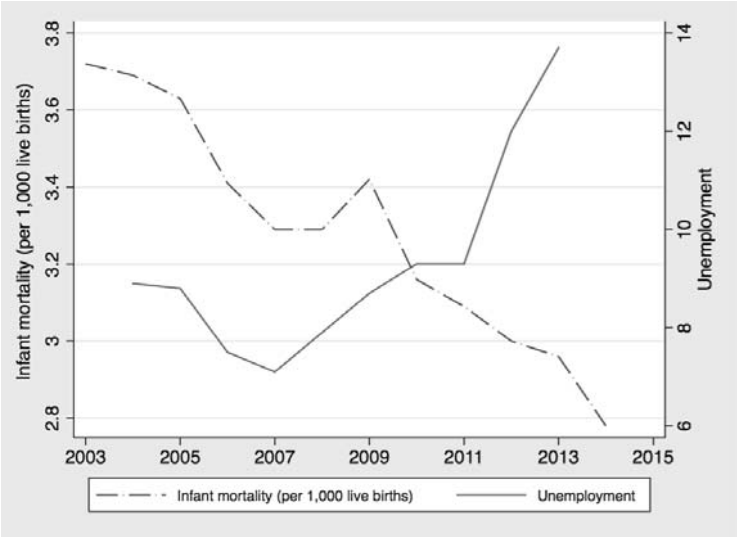
Notes: $ASJP$= Automated Similarity Judgment Program. CC= Chambers of Commerce. EG=Ethnic group. I= Individual. $IAoL$= Italian Agency of Land. $IIRS$= Italian Internal Revenue Service, only released for 2013 and 2014. $ISTAT$= Italian Institute of Statistics. $ISTAT^*$= Italian Institute of Statistics, Surveys on the integration of immigrant workers, 2nd quarter 2008. M= Municipal. MoL= Ministry of Labor. MoF= Ministry of Finance. P=Provincial Level. PDC= Patient Discharge Card, for conception year 2002-2013. WHO= World Health Organization.

Figure A1: **Manufacturing sector: geographical distribution**



Note: The dark color indicates the areas mainly devoted to the manufacturing sector.

Figure A2: **Infant mortality and recession**



Note: The figure plots the overall infant mortality rate (dashed line) and the overall unemployment rate (continuous line) over time in Italy.

Table A2: **Effects of the GR on immigrant population**

	(1) Immigrant Share	(2) Share of Female 15-49	(3) Share of Immigrants 15-49
Crisis	-0.175***	0.337*	0.153
	(0.045)	(0.191)	(0.210)
Observations	53,528	53,528	53,528
Mean	6.093	50.591	69.471

Notes: The unit of observation is the municipal level. Each specification controls for year fixed effects, macro-area fixed effects, macro-area trends, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Standard errors are clustered at the municipal level. *** p<0.01, ** p<0.05, * p<0.1.

Table A3: **Effects of the GR on birth rates**

	Full sample (1)	Singletons (2)
Crisis	0.004	0.055
	(0.121)	(0.120)
Mean	8.256	8.148
Observations	53,584	53,528
% mothers between 25-35	✓	✓
% mothers above 35	✓	✓

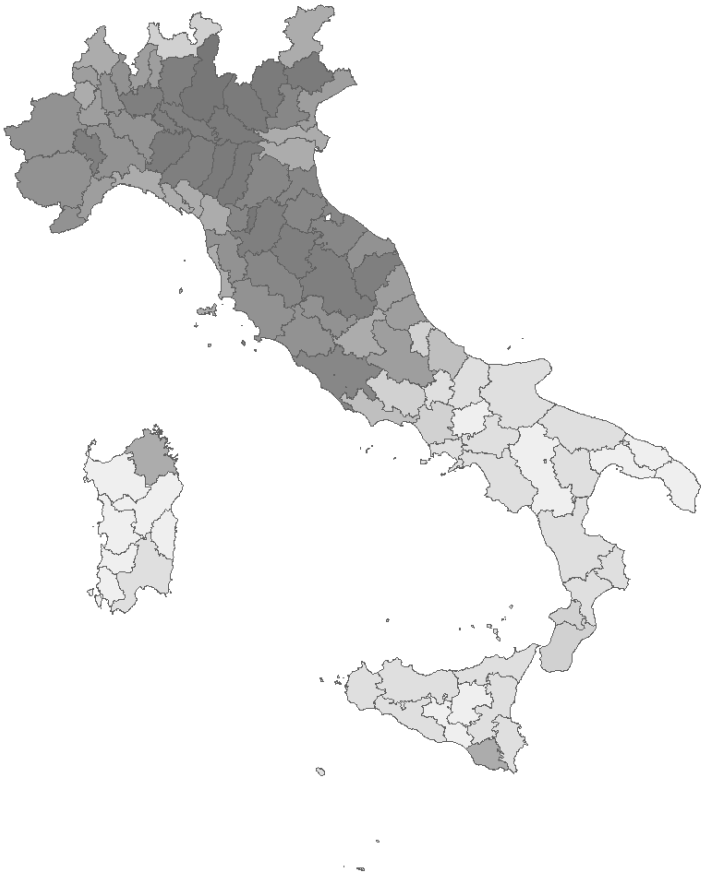
Notes: The unit of observation is the municipal level. Each specification controls for municipal fixed effects, year fixed effects, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree, macro-area fixed effects and macro-area trends. The years in the samples, 2002-2013, refer to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Appendix B

This appendix provides additional tables and figures, with a specific focus on immigration characteristics in Italy:

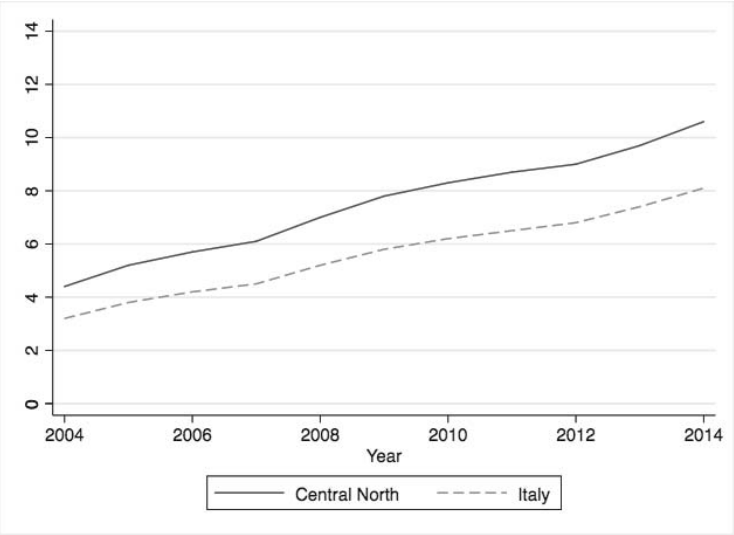
- Distribution of immigrants in Italy (Figure B1);
- Immigrants per 100 residents (Figure B2);
- Immigrants per type of education (Figure B3);
- Immigrants municipal network (Figure B4); and
- Duration of stay: Correlations before and after the crisis (Figure B5).

Figure B1: **Distribution of immigrants**



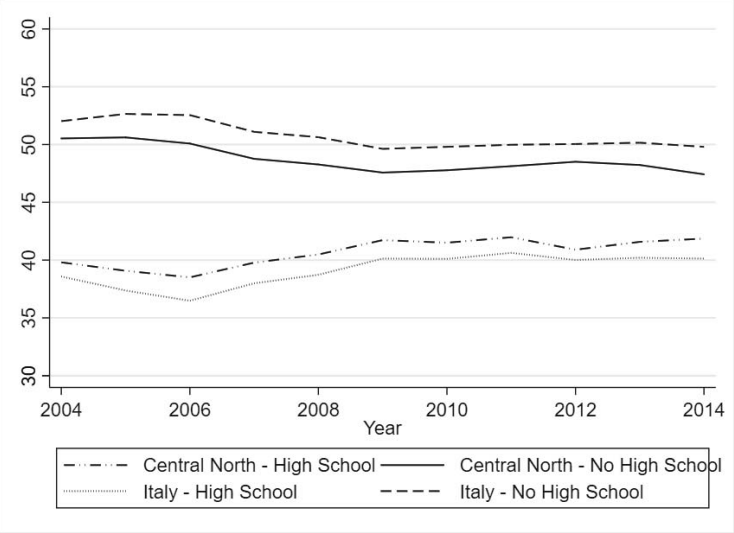
Note: The darker that the area is, the higher that the presence of immigrants is out of the total resident population.

Figure B2: **Immigrants per 100 residents**



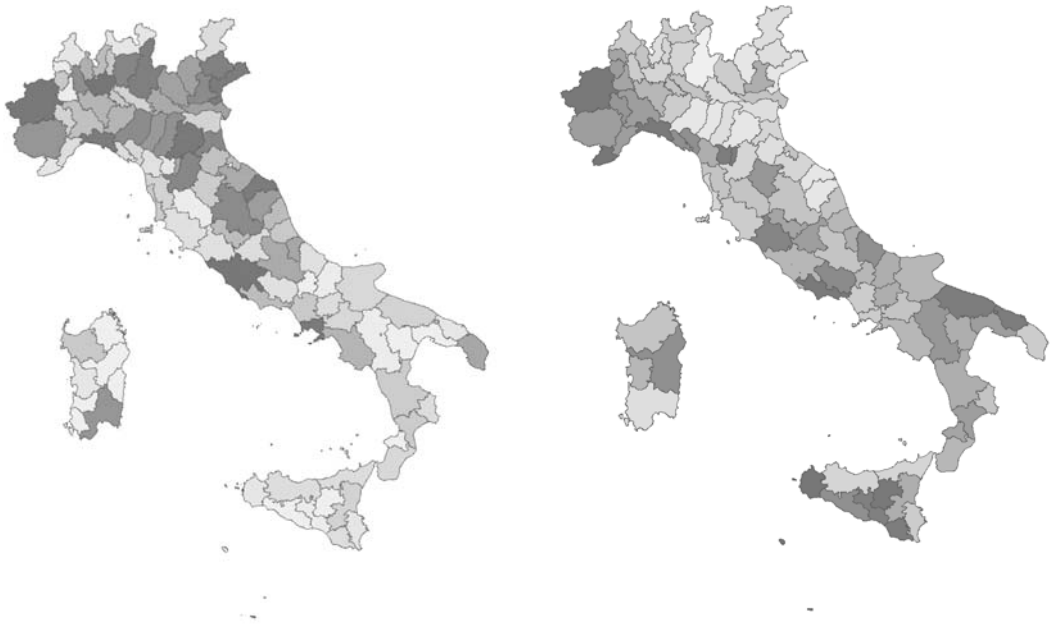
Notes: The figure plots the trend over time of the number of immigrants per 100 residents at the national level and considering only the northern and central regions.

Figure B3: **Immigrants per 100 residents per type of education**



Notes: The figure plots the trend over time of the number of immigrants per 100 residents with a high school diploma, as well of those without a high school diploma, at the national level and considering only the northern and central regions.

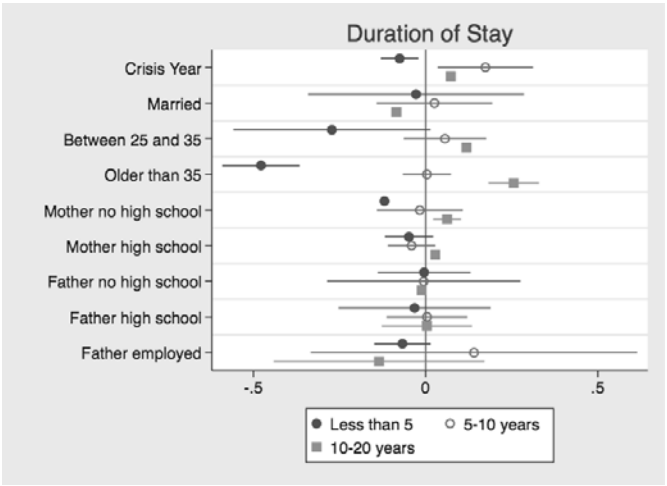
Figure B4: **Immigrant networks**



(a) N association (b) Ethnic concentration

Notes: (a) number of immigrant associations at the provincial level; (b) concentration index of the ethnic community at the municipal level (averaged at the provincial level). The darker areas indicate higher values.

Figure B5: **Duration of stay: Correlations before and after the crisis**



Notes: The figure plots the results of three regressions using data from two waves, dated 2003 and 2009, of cross sectional surveys on births from the Italian Institute of Statistics (ISTAT). The outcomes are dummies for three classes of duration of stay: less than 5 years, between 5 and 10 years, and between 10 and 20 years. Crisis year is equal to 1 for the 2009 wave. See footnote 12.

Table B1: **Heterogeneous effects of ethnic networks on birth outcomes (no ethnicity fixed effects)**

	(1)	(2)	(3)	(4)	(5)	(6)
	Distance to the closest associations	Immigrant association	Ethnic association	Ethnic density	Ethnic concentration	Linguistic density
PANEL A: LOW WEIGHT (<2,500g)						
	Near	**No**	**No**	**Low**	**Low**	**Low**
Crisis	-2.007*	1.178**	1.033**	0.516	0.392	0.661
	(0.976)	(0.567)	(0.520)	(0.491)	(0.732)	(0.626)
	Far	**Yes**	**Yes**	**High**	**High**	**High**
Crisis	0.765**	0.636	0.428	0.759**	0.751**	0.744**
p-value	0.041	0.191	0.192	0.042	0.041	0.039
Difference	2.772***	-0.816*	-0.605	0.243	0.359	0.082
	(0.925)	(0.454)	(0.329)	(0.425)	(0.547)	(0.418)
PANEL B: VERY LOW WEIGHT (<1,500g)						
	Near	**No**	**No**	**Low**	**Low**	**Low**
Crisis	-0.208	1.071*	0.970*	0.559	0.467	0.499
	(0.530)	(0.549)	(0.503)	(0.413)	(0.678)	(0.560)
	Far	**Yes**	**Yes**	**High**	**High**	**High**
Crisis	0.770**	0.498**	0.781**	0.547**	0.773**	0.787**
p-value	0.023	0.020	0.022	0.019	0.019	0.014
Difference	0.979**	-0.573	-0.423	0.222	0.306	0.288
	(0.434)	(0.441)	(0.394)	(0.187)	(0.470)	(0.303)
PANEL C: PRE-TERM						
	Near	**No**	**No**	**Low**	**Low**	**Low**
Crisis	-1.610*	1.214**	0.950*	0.840	0.299	0.669
	(0.949)	(0.526)	(0.489)	(0.520)	(0.734)	(0.601)
	Far	**Yes**	**Yes**	**High**	**High**	**High**
Crisis	0.766**	0.341	0.531*	0.730**	0.760**	0.748**
p-value	0.031	0.228	0.094	0.042	0.030	0.030
Difference	2.376***	-0.873**	-0.419	-0.011	0.460	0.079
	(0.905)	(0.425)	(0.418)	(0.401)	(0.582)	(0.421)
PANEL D: FETUS GROWTH PROBLEM						
	Near	**No**	**No**	**Low**	**Low**	**Low**
Crisis	-2.041**	-0.002	-0.026	-0.493	-0.750	-0.745**
	(0.851)	(0.211)	(0.202)	(0.305)	(0.618)	(0.368)
	Far	**Yes**	**Yes**	**High**	**High**	**High**
Crisis	0.054	0.060	0.039	0.086	0.066	0.111
p-value	0.752	0.765	0.854	0.618	0.700	0.514
Difference	2.095**	0.061	0.064	0.579***	0.816	0.856**
	(0.844)	(0.230)	(0.233)	(0.294)	(0.612)	(0.359)

Notes: Each specification controls for municipal fixed effects, year fixed effects, macro-area trends, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Standard errors are clustered at the municipal level. The period considered (2002-2013) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Appendix C:

This appendix provides some evidence on the sample of Italian newborns.

- Effects of the GR on birth outcomes full sample of Italian newborns (Table C1);
- Effects of the GR on birth outcomes singletons sample of Italian newborns (Table C2); and
- Effects of the GR on the birth rate of Italian women (Table C4).

Table C1: **Effects of the GR on birth outcomes - Full sample of Italian newborns**

	(1)	(2)	(3)	(4)	(5)
PANEL A: LOW WEIGHT (<2,500g)					
Crisis	0.428***	0.416***	0.409***	0.433***	0.407***
	(0.137)	(0.138)	(0.130)	(0.137)	(0.140)
Mean	8.289	8.289	8.289	8.289	8.289
PANEL B: VERY LOW WEIGHT (<1,500g)					
Crisis	0.335***	0.333***	0.320***	0.336***	0.336***
	(0.125)	(0.126)	(0.113)	(0.126)	(0.131)
Mean	1.593	1.593	1.593	1.593	1.593
PANEL C: PRE-TERM					
Crisis	0.312**	0.298**	0.289**	0.320**	0.285**
	(0.132)	(0.132)	(0.123)	(0.131)	(0.133)
Mean	8.570	8.570	8.570	8.570	8.570
PANEL D: GROWTH PROBLEMS					
Crisis	-0.117	-0.129	-0.127	-0.109	-0.132
	(0.105)	(0.104)	(0.103)	(0.102)	(0.092)
Mean	6.436	6.436	6.436	6.436	6.436
Observations	3,046,432	3,046,432	3,046,432	3,046,432	3,046,432
% mothers between 25-35		✓			
% mothers older than 35		✓			
Average income			✓		
Population density				✓	
Region FE					✓
Regional trends					✓

Notes: The unit of observation is the individual level. Each specification controls for municipal fixed effects, year fixed effects, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Models (1) - (5) also include macro-area trends. The years in the samples (2002-2013) refer to the conception year. *** p<0.01, ** p<0.05, * p<0.1.

Table C2: **Effects of the GR on birth outcomes - Single deliveries sample of Italian newborns**

	(1)	(2)	(3)	(4)	(5)
PANEL A: LOW WEIGHT (<2,500g)					
Crisis	0.435***	0.423***	0.416***	0.440**	0.414***
	(0.137)	(0.137)	(0.129)	(0.136)	(0.139)
Mean	8.181	8.181	8.181	8.181	8.181
PANEL B: VERY LOW WEIGHT (<1,500g)					
Crisis	0.335***	0.333***	0.320***	0.336***	0.335**
	(0.126)	(0.126)	(0.114)	(0.126)	(0.131)
Mean	1.586	1.586	1.586	1.586	1.586
PANEL C: PRE-TERM					
Crisis	0.318**	0.304**	0.295**	0.325**	0.289**
	(0.132)	(0.132)	(0.123)	(0.131)	(0.133)
Mean	8.466	8.466	8.466	8.466	8.466
PANEL D: GROWTH PROBLEMS					
Crisis	-0.113	-0.129	-0.127	-0.105	-0.130
	(0.103)	(0.102)	(0.101)	(0.100)	(0.091)
Mean	6.359	6.359	6.359	6.359	6.359
Observations	3,038,443	3,038,443	3,038,443	3,038,443	3,038,443
% mothers between 25-35		✓			
% mothers older than 35		✓			
Average income			✓		
Population density				✓	
Region FE					✓
Regional trends					✓

Notes: The unit of observation is the individual level. Each specification controls for municipal fixed effects, year fixed effects, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Models (1) - (5) also include macro-area trends. The years in the samples (2002-2013) refer to the conception year. *** p<0.01, ** p<0.05, * p<0.1.

Table C3: **Ethnic network and birth outcomes - Single deliveries sample Italian newborns**

	(1)	(2)	(3)
	Distance to the closest associations	Immigrant association	Ethnic density
PANEL A: LOW WEIGHT (<2,500g)			
	Near	**No**	**Low**
Crisis	0.468***	0.349* *	0.506***
	(0.135)	(0.195)	(0.193)
	Far	**Yes**	**High**
Crisis	0.395**	0.486***	0.375***
p-value	0.040	0.000	0.079
Difference	-0.072	0.137	-0.131
	(0.181)	(0.167)	(0.193)
PANEL B: VERY LOW WEIGHT (<1,500g)			
	Near	**No**	**Low**
Crisis	0.302***	0.365*	0.375**
	(0.097)	(0.187)	(0.188)
	Far	**Yes**	**High**
Crisis	0.376**	0.317***	0.301***
p-value	0.046	0.002	0.002
Difference	0.073	-0.048	-0.074
	(0.147)	(0.128)	(0.149)
PANEL C: PRE-TERM			
	Near	**No**	**Low**
Crisis	0.364***	0.300	0.371**
	(0.127)	(0.192)	(0.186)
	Far	**Yes**	**High**
Crisis	0.260	0.328***	0.271**
p-value	0.163	0.010	0.045
Difference	-0.103	0.028	-0.100
	(0.171)	(0.165)	(0.183)
PANEL D: FETUS GROWTH PROBLEM			
	Near	**No**	**Low**
Crisis	-0.075	-0.244**	-0.041
	(0.150)	(0.106)	(0.098)
	Far	**Yes**	**High =**
Crisis	-0.160*	-0.036	-0.175
p-value	0.081	0.791	0.238
Difference	-0.085	0.208	-0.134
	(0.149)	(0.145)	(0.155)

Notes: Each specification controls for municipal fixed effects, year fixed effects, macro-area trends, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree. Standard errors are clustered at the municipal level. The period considered (2002-2013) refers to the conception year. Coefficients are multiplied by 100. *** p<0.01, ** p<0.05, * p<0.1.

Table C4: **Effects of the GR on the birth rate of Italian women**

	Full sample	Singletons
	(1)	(2)
Crisis	-0.069***	-0.067***
	(0.021)	(0.021)
Mean	54.820	53.988
Observations	53,584	53,528
% mothers between 25-35	✓	✓
% mothers older than 35	✓	✓

Notes: The unit of observation is the municipal level. Each specification controls for municipal fixed effects, year fixed effects, the percentage of the municipal population with a high school degree, and the percentage of the municipal population with a college degree, macro-area trends. The years in the samples (2002-2013) refer to the conception year. *** p<0.01, ** p<0.05, * p<0.1.

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